Date Due

STATE COLLEGE BULLETIN

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MASSACHUSETTS STATE COLLEGE

Report Issue for Year 1932-33

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CONTENTS

	PAGE
Report of the President	3
Budget for 1934	16
Report of the Dean	18
Report of the Director of the Graduate School	21
Report of the Director of Short Courses	23
Report of the Librarian	24
Report of Director of Placement Service	25
Report of the Field Secretary	28
Synopsis of the Report of the Director of the Experiment Station*	29
Report of the Director of the Extension Service	32
Report of the Treasurer	40
Tables and Statistics	48

*The complete report of the Director of the Experiment Station is published separately as a bulletin of the Experiment Station.

Massachusetts State College

REPORT OF THE PRESIDENT TO THE BOARD OF TRUSTEES FOR THE PERIOD FEBRUARY 1 TO NOVEMBER 30, 1933

A New President's First Report to his Board of Trustees

While the idea of the first report of a new president to his Board of Trustees is interesting and rather intriguing, to the new President, it is for him also a somewhat sobering obligation. I am tempted to discuss with you my personal experiences of the past nine months, my personal reaction to the responsibilities and the opportunities of so important a piece of work as the presidency of one of the fine old Land-Grant colleges of the United States.

There are, however, so many important problems before you, the governing Board of the College, resulting primarily from the unsettled times and the rapid growth of the College, that a discussion of my personal reactions to new conditions, new personalities and new problems, would hardly be pertinent at this time. Therefore, it is my purpose to put before you something of a review of nine months of activity at and by the College and to follow this review with brief discussion of certain conditions and problems affecting the life of the College.

Inauguration of the President

The tradition and standing of the Massachusetts State College were well exemplified in the exercises which marked the inauguration of her eleventh president on October 6, 1933. These exercises were modest, yet marked with a befitting dignity and all in all, I feel that they reflected much credit upon the Trustees, faculty, students, and alumni. The program and arrangements were ably administered by a committee of Trustees and faculty under the chairmanship of the Dean of the College. Official delegates from seventy-three universities and colleges honored us by their presence. As the new president, I think I may say with all modesty that the occasion seemed to me to be most auspicious for the beginning of a new administration at our College.

A Year of Change Within and Without

In entering upon the work of the College on February 1st, 1933, there seemed to be but one definite and tangible fact which could be used as a beginning point, that was the fact of change. Several years of very close contact with business organizations in different parts of the country, preceded and followed by educational experiences, had given me a very keen interest in the social and economic and political changes through which the country was passing at the time. As the College gradually came "into view" for me, there seemed on the surface to be little of indefiniteness and of change in the College itself. There was every evidence that it was a substantial institution with a loyal and hard working staff and a surprisingly earnest and wide-awake group of students and, of course, an excellent plant. The very fact of its location, character of work, and effective organization, had caused the impact of change from the outside to be felt but little at the College, and it is still not being felt in the way that change has been felt by business, industry and by government in its various forms in the country.

Through the first months of my work at the College it seemed almost incredible to me that so substantial an educational institution, which through the years has formed an increasingly worthwhile part of the educational program of the State was so little affected by outside change and chaos. Of course with further study it was evident that under the surface the College was being stirred thoroughly, but it seemed that there was before us a fine opportunity to begin definite planning that we might adjust our work, our program, in such a way as to hold our students more effectively, particularly that they may be able to meet the problems of a new

world as they leave the College. At the same time, there seemed to be great opportunity for making the effective working organization of men and women known as our teaching staff, Extension Service and Experiment Station of greater service to the State in the difficult period of readjustment. Therefore, groups of the staff were brought together for discussion of what the College might do to assist the State, at the time, in meeting difficult conditions of unemployment and intangible needs of readjustment. Some things worthwhile have been done during the past year in this effort to meet the needs of the State. Not all has been accomplished that was planned or hoped, and yet, there has been very considerable increase in knowledge and appreciation of the great changes taking place in the economic, social and political life of the country both by the staff of the College and I believe, the student body as well.

Specifically, some of the things that have been done at the College to meet changing social and economic ideas and conditions are:

First, stimulation of thinking on the part of the entire staff of the College of the educational and the civic opportunities and obligations before us coming in part from the effort to reply to a series of questions submitted in the early spring by the President. The splendid response from the entire staff to this questionnaire was referred to in the President's address at the time of his installation and appreciation was expressed at that time. Numerous members of the staff have told me that in responding to this questionnaire, they had, for the first time since coming to the College, given serious thought to the educational activities of the College as a whole and to its civic obligations and they felt that it was an opportunity to express themselves freely and fully. Continued and helpful use will be made of the replies to this questionnaire.

Second, recognizing both the physical and mental needs confronting the white collared unemployed, it was felt that a continuation of the summer school, offering particularly a number of special vocational courses, would be a means of helping the unemployed and especially the local unemployed school teachers and college and high school students. A series of vocational courses was offered in connection with the summer school and to make the expense less of a stumbling block the period of the school was shortened and hours in the various courses, therefore, increased. Through your approval, the sum of one thousand dollars was apportioned for the summer school. The result has been reported to you but it would not be out of place to repeat it here. For a sum of money one-fifth the amount of that used for the usual summer school periods previous to 1932, when the summer school was discontinued, more than 80% of the ordinary number of people were given worth while instruction.

Third, as a result of reports from many parts of the State that there was danger of closing of playgrounds and recreational centers by schools and communities, and as a result of a series of conferences at the College, a special course was offered by the Physical Education Department for a group of honor students at the College with the idea of fitting both men and women to go out into the State during the summer to assist in continuing recreational and playground opportunities for the young people of the State. This course worked out quite satisfactorily and the service given during the summer was considerable.

Fourth, to meet changes particularly throughout the State and away from the College, the extension division and the experiment station greatly increased the effectiveness of their services. The sub-station at Waltham was particularly effective in the region which it served.

And, finally, that we may understand and be prepared to adjust ourselves to changes as they may affect the College in its work on the Campus and throughout the State, plans were made for the setting up of faculty committees which during the first half of 1934 will give serious study to the relationships of the College to the State and all of its activities and to the curriculum of the College.

Losses Sustained by the College through Death

During the year the College suffered severe loss in the deaths of three most able and earnest workers: Trustee Frank Gerrett, Professor Charles H. Patterson, and former-President Roscoe W. Thatcher.

Frank Gerrett

The death on July 29, 1933, of Honorable Frank Gerrett took from our Board of Trustees a long-active and influential member. He was first appointed to the Board in 1907 by Governor Curtis Guild and had served continuously ever since. During the last eight years he served as auditor of the Board and for four years as Chairman of the Finance Committee. Mr. Gerrett was always energetic in promoting the best interests of the students at the College, and he was a valued adviser in the financial policy of the institution. His loss is keenly felt by the College and by his associates on the Board of Trustees.

Charles H. Patterson

An outstanding teacher was lost to the College when Professor Charles H. Patterson died suddenly on August 11, last. He had served the College as Professor of English for seventeen years and during the last seven years, he was Head of the large and important Department of Languages and Literatures. The faculty of the College at their meeting on October 30 ordered that an appropriate memorial statement be spread upon their records and similar action was later taken by the Board of Trustees.

Roscoe W. Thatcher

Dr. Thatcher's sudden death on December 6 while at work in his laboratory was a severe blow to his associates on the faculty and to his many friends outside. He had organized and had well under way a research project in the nutrition of plants which gave promise of yielding valuable scientific data. His guidance of graduate students in Chemistry had already come to mean much to the twenty-three students who were working for advanced degrees in that field. As President and Professor, Dr. Thatcher had contributed a great deal to the welfare of this College. We all miss him as a friend and the College suffers from the loss of a skilled and conscientious worker.

I have appointed a special committee of the faculty composed of Professors Sievers, Rand and Chamberlain, to arrange a suitable memorial in commemoration of his outstanding service.

Staff Changes

Eight new members have been added to the professional staff during the year to fill vacancies and to provide much needed teaching assistance in those departments of the College in which increased enrollment had made it impossible to carry the teaching load with the former staff. The sudden death of Professor Patterson made necessary a quick reorganization of the Department of Languages and Literatures which, in view of the emergency, was carried out on a temporary basis. Professor Rand was made acting head of the Department, and three new instructors were appointed, for in addition to the loss of Professor Patterson, Mr. Barnard, instructor, had resigned and there was need for additional assistance because of increased enrollment.

Mr. J. Harry Rich was appointed assistant professor of Forestry, a new position created to supply much needed teaching assistance in this field of work.

Mr. George W. Westcott was appointed extension specialist in Agricultural Economics to fill the vacancy caused by the resignation of Mr. Harold B. Rowe.

Promotions

Long urged promotions were early brought to my attention and the justification for them clearly demonstrated. While I recognized the impossibility of providing for any increase in salaries, it seemed to me just and in the best interests of the College to recognize these outstanding cases of exceptional service by promotion in rank. Your Board supported my recommendations in this matter and, as a result, the following promotions were made:

Arthur K. Harrison—From Assistant Professor of Landscape Architecture to Professor of Landscape Architecture, effective March 1, 1933.

R. P. Holdsworth—From Professor of Forestry to Head of Department of Forestry, effective June 1, 1933.

Frank C. Moore—From Assistant Professor of Mathematics to Associate Professor of Mathematics, effective September 1, 1933.

Walter E. Prince—From Associate Professor of English to Professor of English, effective September 1, 1933.

F. P. Rand—From Associate Professor of English to Professor of English, effective September 1, 1933.

Ray E. Torrey—From Assistant Professor of Botany to Associate Professor of Botany, effective September 1, 1933.

I am convinced that the action of your Board in providing this academic recognition has done much toward preserving the morale of our staff. I only hope that the time will soon come when it can be supported by financial recognition.

Recognition of Long Service by the Staff

The Associate Alumni arranged a very fitting testimonial to the members of the College staff who had served for twenty-five years or more when on May 20 a banquet was served in Draper Hall followed by an appropriate speaking program. Nineteen members of the faculty were honored guests at this occasion. David H. Buttrick of the Class of 1917, President of the Associate Alumni, was toastmaster for the after-dinner program which included as speakers Dr. Joseph B. Lindsey, '83, Charles H. Gould, '16, Professor Frank Prentice Rand, Professor Frank A. Waugh, and President Hugh P. Baker. As a rule college professors get little recognition for the work which they do, and I think the Associate Alumni deserves high commendation for their interest in arranging such a worthwhile event in our annual program.

Publication of College History

Another plan of the Associate Alumni which came to fruition during the year was the publication of our college history "Yesterdays at Massachusetts State College" by Professor Frank Prentice Rand. This is a unique book. It presents an historical statement in dramatic form which is most interesting to read, and yet, through its narrative and supplement, it preserves, I believe, all of the essential historical data of the institution. The book has received much praise from readers and it makes an outstanding contribution to the records of the work of the College.

Student Enrollment

Again the enrollment of students in the College has increased, but unlike the situation in recent past years, the increase this time is entirely in the four-year undergraduate course, where it has grown from 850 students a year ago to 951 at the present time. The growth in student enrollment in this course has amounted to 60% in four years, that is, it has grown from 592 in 1929 to 951 in the current year, and it has been a rather regular growth, averaging 90 students per year. We still have one undergraduate class, the present Senior class, which did not enter the College with the maximum student enrollment now allowed, that is, 300 students. If pressure for entrance continues as during the past two years, and there is every indication that it will, we should reach our maximum enrollment under the present limitation next year with approximately 1000 students in our undergraduate course. This figure allows for normal losses due to academic failures, financial difficulties, and other factors which cause the withdrawal of students.

Enrollment in the Graduate School fell off this year for the first time in many years, there being a reduction from 127 to 105 students. Enrollment in the Stockbridge School of Agriculture was also smaller this year. One hundred eighty-nine students enrolling as compared with 243 last year. One explanation of changes in these enrollment figures undoubtedly is that the continuing financial stringency has made it impossible for some of the young people to enroll for these courses. While the same factor operates in the undergraduate course there is a larger field there from which students are attracted, and those who, under normal conditions, might go to more expensive institutions under the circumstances enroll here, taking the places of the poorer boys and girls who have to give up the opportunity entirely.

All in all, there is net gain of 25 students in the total enrollment—the figure being 1245 this year as compared with 1220 last. It is interesting to note that the same number of men students are enrolled this year as were enrolled last, and that the entire gain is composed of women students of whom there are 289 this year as compared with 264 last.

New Class Schedules

The College has this year returned to the semester basis after seventeen years on the term plan and the transition seems to have been made in an efficient manner. In order to make a more satisfactory arrangement for a general student assembly, classes were put forward from 8:30 to 8 o'clock in the morning and the period from eleven to twelve on Thursday of each week has been devoted to a convocation of the undergraduate students. Under this arrangement the former twenty minute Chapel periods on Monday and Friday mornings and the monthly assembly period on Wednesday afternoons have been combined into this single weekly exercise. This arrangement has worked very satisfactorily. Outstanding speakers have been secured to bring their messages to our students and in this way, the educational program of the College has been measurably broadened. The Sunday morning assembly has been continued as in the past and at this time each week during the winter months from November to March inclusive, speakers are brought to the College who can bring inspirational messages to our students. This plan of two general meetings each week for the entire undergraduate group has so far proved to be a very satisfactory arrangement.

Administration of Student Tax Funds

This year we have improved our organization for the management of the expenditure and accounting of student tax funds through the appointment of Assistant Dean Lanphear as faculty adviser to classes and other student governmental groups. All expenditures of student tax funds by these organizations now come under his direct supervision under a concise set of regulations which have, I believe, placed these activities on a much sounder business basis. All funds used for the support of student activities are handled in the office of the Treasurer of the College and all accounts are kept there. Expenditure of these funds is under the supervision of a faculty adviser in each of the three divisions of student activities; that is, academics activities, athletic activities, and student government activities. These accounts are audited each year and an annual report published in the student weekly paper, the *Collegian*.

Organization of the Placement Service

The Placement Service of the College has heretofore been largely an adjunct to the division of Short Courses and, except for such incidental service as Miss Hamlin and Mr. Grayson have been able to render in addition to the placement of Stockbridge students, very little has been done to assist our undergraduates and alumni of the four-year course. A special committee of the alumni of the College studied the situation and recommended to the Administration that some steps be taken to provide a placement service for the four-year group. This appealed to me as an important matter and after conference with various officials at the College arrangements were made by which Assistant Professor G. V. Glatfelter should give part time to this service. In order to make it function most effectively, the placement service was organized as an adjunct to the Administration Division and Mr. Grayson, Mr. Glatfelter, and Miss Hamlin placed in this department under the direct supervision of the President of the College. The Placement Service for Stockbridge students will be carried on as before and in addition every effort will be made to render needed service to our four-year students and alumni. The effectiveness of this new organization and the great value of the service has been demonstrated to my satisfaction and I trust that your Board also will feel favorably impressed and will wish to see the service continued and possibly expanded as opportunity is afforded and need exhibited.

A separate report of the work of the Placement Service is published herein.

Some Student Activities and Needs

Because of the serious need which has been evident during the past three years for financial assistance to students, and because of limited funds for scholarships, you authorized last spring the insertion in the appropriation askings for the College of an item of $2,500 for worthy and needy students. This appropriation was available only until November 30th, the end of the fiscal year, and had to be used to assist students between the opening of College and that date. The work of organizing this assistance for students was put into the hands of the Placement Service and was handled very effectively by Professor Guy V. Glatfelter. His report on the use of this fund will be found in the report of the Placement Service. With your sanction the appropriation for the coming year includes an item for $5,000 for assistance to worthy and needy students. Beyond question, this special fund has resulted in keeping a number of boys and girls in College and the way in which it has been expended has added to the self respect of the students because it has been used entirely for labor.

Certain physical changes have been made at the College which seem to have benefited the student body as a whole. The most important of these is the closing of the two so-called "College Stores" and the discontinuance of a number of what might be called individual stores scattered over the Campus and the opening of a much more satisfactory general College Store in what was the Social Union room in North College. The purpose of the store is primarily service in behalf of the students in making possible purchase of needed articles at the lowest possible price. Another physical change which has been very helpful is the moving of the cooking laboratory for women from a very unsatisfactory basement room in Fernald Hall to the second floor of Flint Laboratory. This change should greatly increase the interest of the women students in Home Economics activities.

The Commencement exercises of June, 1933, were held in the Rhododendron Garden near the President's House, as there was no auditorium on the Campus large enough to take care of numbers desirous of attending the Commencement exercises of the College. This experiment of an outdoor Commencement exercise seemed to work out very satisfactorily. While the weather is always an important consideration, and perhaps a controlling consideration, it is planned to continue outdoor Commencements insofar as that may be possible.

In closing the discussion as to the student at the College and his needs, I would not be fair to the student body if I did not emphasize to you the serious situation with which we are confronted in maintaining satisfactory health conditions among the students. The College Physician, Dr. Radcliffe, is wide awake and aggressive in his care of the students, but his hands are very much tied by the fact that two small infirmary buildings will take care of a maximum of twelve students. When it is appreciated that we have twelve beds to take care of twelve hundred students, it can be seen that our facilities for maintaining satisfactory health are wholly inadequate. With your permission we have inserted in the appropriation bill now before the Legislature an item of $15,000 to move the old Horticultural Barn from its present location to a new site at the rear of the Infirmary buildings and the rebuilding of this barn for infirmary purposes. It is estimated that this rebuilt barn will give us two open wards which should take care of forty to fifty students in each ward. The danger of serious epidemic is always before us during the winter season. In times past, buildings sorely needed for instruction and student activities have had to be closed and used for temporary hospitals. While our building needs at the College are great, and while the rebuilding of the barn to be used as a hospital ward may help somewhat in the year or two ahead, yet I would be remiss if I did not emphasize to you the necessity for planning and working for the securing of a satisfactory college hospital building.

Student government as it is now working out at the College, through the men's Senate and the Women's Student Government Association, seems to me to be unusually successful. It is conceivable, of course, that emergencies will arise where student government will be inefficient or will break down entirely. However, the chances for its success in such a College as ours are greater than in other types of institutions where the student body is perhaps a little less earnest, and a little less concerned with education. Because of the success of student government, we have

not hesitated to recommend to you during the year that two of the sororities be allowed to live in houses. Following your action on our recommendations, these two sororities have taken houses close to the Campus and their performance so far would seem to indicate that they may work out as satisfactorily as the fraternities. The success of the two sororities now living in houses, may induce other local sororities to be formed largely to meet the housing and the boarding problem. It will be the aim of the administration to move slowly in allowing such further developments.

Honorary Degrees

At the Commencement exercises of June, 1933, the College honored itself in conferring honorary degrees as follows: George Henry Ellis, LL.D.; Homer Jay Wheeler, Sc.D.; Joseph B. Lindsey, Sc.D.

Because of the place of the College in the educational program of the State, and because of its traditions, it is felt that the College should guard with jealousy its privilege and authority in the granting of honorary degrees. It may be considered as almost unfortunate that under our form of government about the only means we have of recognizing meritorious public service, or great contributions in the field of science or art, is the conferring of an honorary degree by a college or a university. There are times, of course, when the College honors itself greatly by recognizing outstanding accomplishment on the part of its own alumni, or on the part of those who have contributed greatly in times past to the College, the State, or the Nation. It would be a little unfortunate if it should become a fixed custom for the College to confer its honorary degrees upon its own graduates only and particularly upon graduates of certain classes only. Through the years the field of work of the College has broadened greatly and its Alumni have occupied almost every field of human activity with success. It is my hope and my belief that the College will continue to guard the privilege and the power of granting honorary degrees in the years to come to the end that neither the College nor the degree nor the recipient of a degree, may be cheapened by hasty or careless action.

Meeting Increased Needs for Economy

At various meetings of committees of the Board and of the Board itself during the period covered by this report, I have presented for your discussion and action certain changes necessary to meet the increasing need of economy. May I summarize actions that have been taken to bring about economies.

First, the discontinuation of the retail milk service by the Dairy Department of the College. This change was made purely from the standpoint of needed economy and not because of inefficiency in service or criticism from the outisde.

The second action in meeting needed economy was the closing of the so-called horticultural barn, by the movement of horses used by the Grounds Service to the farm barn. This has resulted in savings both in man power and in cost of feed, bedding materials, etc. While it was felt at the time this change was made that it might result in inconvenience and some loss of time to the Grounds Service, the result during the last six months of the period seems to show that it is working very satisfactorily.

The third move in the direction of economy was the centralizing of the several service staffs of the College. For some time the steam and sanitary work under Mr. Bidwell and the repair services under Mr. Jewett have been a part of the organization of the Treasurer's Office. The Grounds Service, on the other hand, was under the direction of the Department of Landscape Architecture. This was a natural development and through the years has worked out very effectively. The transfer of the Grounds Service to the direction of the Treasurer has, I believe, made for some economy and has brought about better coordination of the various service forces.

The last change to be referred to as measure of meeting economy was the unfortunate necessity of releasing certain men from the staff of the College. These releases were made only after the most careful consideration and consultation with those most concerned with control of personnel of the College and then only in fields of work where standards and efficiency could be maintained, for a time, at least, by remaining personnel.

Extending Knowledge of the College into the State

Through the years the College has been performing service of great value to the State and its character and its influence have been extended through this State and through the Nation by the alumni who have gone out from year to year. Changes of great importance have come in the character and the work of the College. These changes evidenced by the change of name of the College have meant and are meaning that we are not less interested in education for effective agriculture and service to the State outside the College in the field of agriculture, but that we are more interested in preparing our men and women effectively for the business of living and that we want these men and women to be better educated people.

The fact that change has taken place in the College and its activities through recent years is not generally known through the State even by the alumni. It would seem that if the College is to maintain its position in the educational program of the State; if it is to continue to be an effective agency of service throughout the State, to the end that there may be more wholesome and satisfactory living in the State, that there must be better understanding of what the College is doing in preparing men and women for more satisfactory living through making them better educated people. Therefore, it is my purpose to carry forward, with your help, several different types of activities that may lead to a better knowledge of the College throughout the State.

It is an interesting and a rather significant fact that out of some five thousand alumni nearly a half are living and working within the State. It is important that we bring these alumni closer to the College in their interests and in their work whatever it may be. To determine the response which we may expect from our alumni living in Massachusetts, I sent recently to a carefully selected list of about 250 men and women a cordial personal note transmitting two of the informational statements on the work of the College which have been distributed during the past nine months largely for your information. As an alumnus of two other institutions of standing, the response to my letter to this selected list of alumni has been not only very satisfactory but somewhat amazing. I am confident from this first effort that the body of alumni of the State may be made a very effective agency for bringing about a better understanding of the College and its work.

Another means of bringing about a better understanding of the College, especially through personal contact, is the bringing to the Campus from year to year an increasing number of groups of people for meetings and conferences. It is estimated that during the past year more than thirty-five thousand people visited the campus in connection with meetings, conferences, short courses, etc. A definite effort is being made to attract a larger number of organizations within the State to hold their meetings at the College. For groups of people concerned in any way with activities within the field of the College, it would seem that the College is peculiarly fitted to serve as a meeting place.

With increasing numbers of people visiting the campus from year to year, it will probably be necessary to plan for the increasing of facilities for housing and feeding these people. The cafeteria, for instance, can be made much more effective with very slight additional equipment, which would allow two lines of people to be served at one time instead of one. It is planned to carry out this improvement in the cafeteria during the coming summer.

Another means of importance in taking the work of the College out into the State is organized effort in making available members of the staff as speakers for conventions, clubs, and gatherings of all kinds. The Extension Service is doing a very effective piece of work in supplying speakers in the field of agriculture and home economics and the call upon them for assistance along these lines has increased as the result of the depression.

Somewhat as an experiment and with the belief that members of the staff of other divisions besides the Extension Service could be made helpful in taking the work of the College out into the State, a special faculty committee was appointed in the spring to develop a special Speakers' Bureau. The Secretary of the College was chairman of this committee and after careful checking of the staff at the College, a list of speakers was sent to a small group of service clubs and other

organizations in parts of western Massachusetts. The result of this effort has been of very great interest as it has indicated that members of the resident teaching staff and the Experiment Station staff may be sent out from time to time without serious interference with work here at the College, and every time that such a speaker goes out, the knowledge and the influence of the College is extended. The activities of this special Speakers' Bureau will be continued during the coming year, still somewhat as an experiment, and I assure you that the sending out of speakers will be done in such a way as not to interfere with resident instruction or with the work of the experiment station, or the administrative division.

As fundamental to the idea of extending the knowledge of the College into the State, plans were made early last spring for a study of publicity for the College as a whole with the hope that such a study would result in the development of an effective plan. At the present time two men are carrying on publicity work or educational work with the press of the State, but these men are in the employ of the Extension Division and their first obligations are, of course, to that Division. Even with these obligations to the Extension Division, Messrs. Oleson and Baker have been exceedingly helpful as far as general publicity of the College is concerned. It was felt, however, that the College as a whole is not being covered in a satisfactory way.

The Director of Extension, Mr. Munson, was asked to loan Mr. John Baker of his publicity bureau for a period of six months for a study of publicity by the College and the working out of a plan. Such a study was made and a plan has been submitted. In a word this plan recommends the development of a centralized bureau which will cover the entire College in all of its activities.

In discussing publicity as fundamental to the extending of knowledge of the College into the State, it should be emphasized that there is no thought of carrying on what is ordinarily known as a publicity campaign. In other words, there is no thought of ballyhooing the work of the College or burning red fire. There is, however, need for taking the work of the College out into the State in the form of stories for newspapers and publications, because in almost every case these stories are educational in value. In this connection, it would not be out of place to indicate that the purpose of the College is primarily resident instruction and yet adult instruction throughout the State within our field of work must of necessity compare in importance with resident instruction. At the present time, this adult instruction through the State is being carried on very effectively through the Extension Service and the Experiment Station. There has been lacking, however, a proper coordination between the resident instruction and adult instruction through the State. The setting up of a publicity bureau, simple in form, would tend to bring about very satisfactory correlation and cooperation.

Campus Improvements and Building Program

It is probable that every annual report from every president for the past twenty-five years has discussed the necessity for additional housing for students and the need for buildings that will improve opportunities for research and give better facilities for teaching, and other services of the College. Several years ago your body accepted recommendations as to a building program to be striven for over a period of years. It is not my thought to review this program, but rather, to indicate such progress as has been made and perhaps to emphasize certain needs that have arisen as a result of an increasing student body and changes on the Campus.

You are informed of the success of our efforts to secure funds from the P. W. A. for buildings and campus improvement. Allotments have been made for three projects totaling $527,000. These projects, if and when carried out, will make available much needed buildings such as the library and a men's dormitory. One of the projects provides for the completion of the relaying of heating mains and the replacement of certain equipment in the heating and lighting plant.

If there is a possibility of further federal funds being made available for P. W. A. projects, we shall press for additional allotments for the College. You have passed upon some six additional projects including a women's dormitory, administration building, completion of the microbiology building, etc.

Though the allotment of C. W. A. funds has been made to the College after the close of the period covered by this report, it is in place perhaps to refer to them as they are helping to meet certain very needed improvements on the Campus. The rebuilding of the Stockbridge Homestead will mean a great deal to the Campus, as will the grading of athletic fields, the building of roads and walks, etc.

In the discussion of student needs reference has already been made to the great need which the College has for more adequate student hospitalization. In this connection, it is significant that there is no other state institution whether charitable, penal, or educational where there are so many men and women working under the direction of the State, where there is such unsatisfactory provision for maintaining the health of the group as at our College.

Additional Land

It would seem that in view of the amount of land owned by the College at Amherst that we cannot possibly be in further need. However, careful study of the land owned by the College at Amherst indicates that there will always be certain needs arising from necessity for consolidating holdings or improving access to various parts of the College property and perhaps for elimination of nuisances.

There is before us now one rather important need from a land standpoint and one other that must eventualy be met. For a number of years the College has leased a tract of land of 25 acres lying between what is known as Lovers' Lane and the Dickinson Farm to the north. This land has been of very great value in connection with the work of the Experiment Station. Because of the fact that growth of the College in the future will probably be to the north rather than in any other direction and in view of the fact that the land leased from Francis Tuxbury may be put upon the market immediately at the expiration of our lease because of the necessity for settling an estate, plans should be made for the acquirement of this land for the College.

Earlier and rather frequent recommendations have been made to your body that lands about the south entrance of the College must eventually be acquired for the use of the College or for the building of fraternity houses. It is my thought at this time merely to re-emphasize the necessity of keeping in mind the clearing up of the south entrance both as a protection to students and as of importance in making the south entrance, which is the most important entrance to the Campus, rather more attractive than it is at the present time.

Problems and Policies

Since coming to the College on February first of last year, much serious thought has been given to the necessity for clearer definition of the work of the College and for plans and policies that will be objectives worthy of our best efforts.

What kind of a college is the Massachusetts State College? Is it still in fact an agricultural college? Or, is it more largely scientific and technical in its interests and activities? Is there possibility of its becoming more liberal in its work? In other words, is there in the future a liberal arts development that will compare with agricultural and scientific development of the past.

In this period of confusion in our economic, our social, and our educational life, it would, perhaps, be easier to pursue a laissez faire policy, leaving things as they are, carrying on as effectively as possible with the means at hand and not attempting to define or solve problems until they are immediately upon us. Such procedure would not be the part of courage and could not lead to more than a crude "messing through" in meeting our obligations and opportunities as they come to us. It is my strong belief that we owe it to our students and our alumni and the taxpayers of the State to see if our activities cannot be defined; to see if we cannot determine what kind of a college we are and what our future is to be. In other words, it seems to me exceedingly important that insofar as it can be done, we should develop a plan for the years ahead. In the brief discussions of problems and policies which will form a part of this report, I propose to take up some of the efforts which are being made to determine policies and to develop plans by which we may carry out these policies.

The College—a Land-Grant Institution

Without attempting to answer at this time the question of what kind of a college we are, it seems in place to refer briefly to the meaning of agriculture in Massachusetts and the relation of the College to agriculture and its future. As I see agriculture at the present time in this State, it is a permanent industry and it has every promise of being a more satisfying industry and within certain limits an increasingly profitable industry. Because of the physical character of the State and because of the large proportion of our population engaged in industry, our agriculture must be confined largely to the production of food, such as dairy products, fruit, poultry, vegetables for nearby populations. As a Land-Grant College, we are committed and more obligated by our history and by our relations with the State and Nation to continue to be effective in the work of training young men and women for the business of agriculture. Equally, we are obligated to serve in the State in developing agriculture wherever there is need. It is my present contention that by increasing our effectiveness in the fields of science and technology and with some increasing liberalization of our work that we can be more effective in the training of men and women for the business of agriculture.

Changing Definition of Agriculture

Speaking of the meaning of agriculture in Massachusetts, it is my belief that perhaps through the years the College has defined agriculture a little too narrowly. As I see the development of the land area of the State in the years ahead, we must be concerned not only with the portion of the State that is enclosed within farms, but we must be concerned equally with the entire land area and must serve the State effectively in the right development of the more than 65% of the State that is not enclosed within farms. It would seem as if we have not defined agriculture, as far as the College is concerned, as going much beyond the production of crops from the soil. Yet, we have gone a little beyond this point and have recognized that agriculture may, under certain circumstances, include also the processing of the raw products from the fields, the orchard, and food producing animals. It seems to me that our activities in the field of so-called horticultural manufactures have been particularly worthwhile. It is my belief now that the term horticultural manufactures has become too narrow and that the service of that particular department might well be extended to cover the processing of all food produced from the soil whether directly or by food producing animals. We have made one successful adventure in the field of utilization of agricultural products. May there not be other adventures of equal importance to the College and the State? Can we stop now with production and processing or utilization? Really, we are not even stopping at these two particular phases of agriculture. Through our extension division, we are carrying on instruction in the marketing and in the use of food and other products in farm homes. Is there not a greater field of work before us in emphasizing to the entire State that agriculture today and for the future means production, processing, marketing, and the proper use of the products in the home.

Relation of the College to the State

What is our part in the educational program of the State? What should be our relationship to economic procedure in the State? Where can we serve effectively in helping the State to meet its complex social problem? In asking these questions, I am not indicating that the College has not tried in the past to answer them and has answered them somewhat, but in the face of fundamental changes arising from the chaotic conditions resulting from the breakdown of 1929, it seems important that we should again consider these questions to see if it may not be possible now to work out more definite policies and formulate more effective plans. As one of the first steps in meeting this situation, a strong committee of the faculty has been appointed to study the whole question of the relationship of the College to the State. By this time next year, I hope that I shall be able to reflect to you the results of this study, and it is my belief that good will come from the effort.

If changing conditions resulting from the panic and the effort to readjust ourselves nationally is calling for a study of our relations to the State as a whole, then, it is of equal importance that we should study our own activities within the College

to see if our resident instruction in particular is being carried on in such a way as to prepare young men and women for conditions as they will find them as they leave the College. Again to meet this situation an effective group of men and women on the staff has been appointed as a committee on the study of our curriculum. It is evident from the way this committee is beginning its work that there will be not only thorough study but the most serious thought given to the determination of a program perhaps a little better fitted to the needs of our student body than that which we are now following out.

In the light of the increased interest of our students in what is going on here at the College and in the outside world, it has seemed to me to be in place to seek the help of the student body in our study of the curriculum. Therefore, I have appointed a very representative committee of some seven students who will go forward with an independent study and bring in recommendations as to such changes as they may think will benefit the College.

The Need of a Campus Plan

A problem that has seemed to be of continuous importance through the years has been the working out of a definite campus plan. This matter has been discussed repeatedly in the reports of former presidents. Plans have been prepared, but unfortunately, changing conditions have made it seem desirable to depart from these plans with the result that there is no comprehensive and satisfactory campus plan in existence today. It seems to me that it is vital that there should be a plan worked out which can be followed over a period of years. In other words, that we should have a definite objective in the development of our campus as an effective place in which to carry on the work of an educational institution.

During the period covered by this report, a committee of the faculty headed by Director Fred J. Sievers has been studying the campus with the idea of recommending a plan of development. The recommendations of this committee have been put upon paper by Professor Harrison of the Landscape Architectural Department and will doubtless come to this body through the Trustee Committee on Buildings and Grounds.

Building a Stronger Staff

Through the years, educators have given much thought to the idea of satisfactory incentives in the primary and secondary schools of this country. Equal thought has been given to the development of satisfactory incentives in our colleges and universities. Therefore, we have set up certain honorary fraternities, certain prizes and fellowships are offered, public recognition is given to honor students, etc. As men and women become a part of the teaching or research staff of an educational institution, it might possibly be considered that no further incentives for self-improvement are necessary. However, we have recognized the necessity for incentives and have offered certain limited opportunities for professional improvements. We have attempted to emphasize security of position as an incentive in teaching work. Perhaps the greatest incentive, not only to men and women who are teaching, but to all men and women working in various professional and business fields in this country is that of fair compensation for work done. The idea that a laborer is worthy of his hire is just as important, just as applicable in our colleges as it is in any other field of activity.

At this particular time in the life of the College and the State, it is perhaps untimely to discuss the need of improved salary grades at the College. However, I would not be fair to the College and to the staff if I do not emphasize at this time and continue to emphasize the necessity for the gradual establishment as conditions improve of grades of salaries that will make it possible to attract and hold the best among teachers and researchers in the field of work of the College. The average of salaries at the Massachusetts State College is low and as long as this continues, the College will suffer by having the best, particularly of the younger group of teachers and researchers, attracted to other institutions.

In speaking as I do of the low salary level of the College, I do not minimize the difficulties involved in the development and the accomplishment of a plan that will bring about better salaries. However, as indicated above, I feel that I would not

be fair if I do not emphasize and continue to emphasize the necessity of right recognition by the State of the fact that the teachers and researchers of the College cannot be classed with other workers in the State and further, that if the State is to develop at the College an institution of which it is to be proud, it must make possible the securing and holding of increasingly effective teachers and researchers.

This same problem of building up a stronger corps of teachers and researchers involves the incentive of opportunity for professional improvement. As the years pass, it must be possible for us to offer as a reward for accomplishment by members of the staff longer periods than from three to six months for professional improvement. The sabbatical year idea has been worked out to very great advantage in a very large number of institutions of this country. Even through the period of this depression many of our institutions have continued the idea of the sabbatical year as fundamental to the maintaining of high standards and high accomplishments in teaching and research.

Appreciation

A common criticism of the young people of today and of the past is and has been that they fail to show appreciation for what is being done for them through the help and often the sacrifice of others. Perhaps this is a very logical failure on the part of youth and comes from the self-centered enthusiasms with which youth faces life. In concluding this, my first report to your Board, let me indicate that through my first period at the College, I have felt again the enthusiasm and the hope of youth. However, with this youthful enthusiasm, there is very keen appreciation of the fact that accomplishment, particularly in an executive position, is far from the result of the efforts of the executive himself.

There is very keen appreciation on my part of the splendid service which your Board is giving to the College and the State. It has been increasingly helpful to me through the year to become better acquainted with each of you and to sense your interest in the College and your determination to see it make progress along the right lines. And, beside the interest and help which you have given, what little has been accomplished at the College has been the result of team work; of fine cooperation with the administrative officers in particular, of all of the other members of the staff. My last word is that I am very thankful for the new friends and for the splendid cooperation which I have received at the College from Faculty, students, and Alumni.

Hugh P. Baker,
President.

BUDGET FOR 1934

The budget for 1934 as approved by the Board of Trustees calls for small increases for instruction and for maintenance of the physical plant and is based upon needs for continuing the program of the College substantially on the 1933 basis.

General Maintenance

	1934 Personal Service	1934 Maintenance Expenses	1934 Total Request	1933 Appropriation
General College	$360,450	$94,000	$454,450	$452,600
Experiment Station	92,640	24,760	117,400	114,360
Extension Service	59,000	31,850	90,850	90,850
Short Courses	54,270	10,125	64,395	65,660
Heat, Light and Power	–	40,000	40,000	40,000
Physical Plant	88,500	25,500	114,000	104,800
Fertilizer Control Law	11,250	3,000	14,250	14,125
Poultry Disease Law	20,000	9,000	29,000	31,525
Milk Testing Law	600	450	1,050	1,025
Feeding Stuffs Law	9,000	1,600	10,600	9,925
Seed Control Law	4,000	1,700	5,700	5,700
Trustee Expenses	–	1,200	1,200	1,200
Printing Reports	–	1,300	1,300	1,300
Totals	$699,710	$244,485	$944,195	$933,070

Permanent Improvements

The request for funds for permanent improvements took into consideration the plans of the Public Works Administration to provide for three construction projects on the Campus: namely, (1) Reconstruction of Steam Lines and Replacement of Heating and Lighting Equipment, (2) Construction of Library, and (3) Construction of Men's Dormitory. The request, therefore, included only nine projects totaling $251,500.

Request for Special Appropriations, 1934

1. Dormitory for Women Students, $195,000. Dormitory accommodations are entirely inadequate, providing for only about one hundred women of the total number of two hundred fifty enrolled. This means that more than one hundred women students have to live off Campus, frequently under unsatisfactory conditions.

The building herein requested would provide accommodations for one hundred fifty women students, together with dining hall facilities. The project is planned to be self-sustaining and self-liquidating.

2. Moving and Reconstruction of Horticultural Barn for Hospital Ward, $15,000. Present hospital facilities are very inadequate, accommodations being available for only twelve patients, to care for a student body of approximately thirteen hundred. Practically every year we are required to take class room or other space for emergency hospital wards. This is a very unsatisfactory arrangement from a health viewpoint, and handicaps the other work of the College. The present proposal is to move the Horticultural Barn, use of which was recently discontinued, to a point contiguous to the present hospital buildings, and to renovate it so as to make it adaptable for use as a hospital ward. It is estimated that it can thus accommodate forty beds.

Some provision needs to be made for the repair of the building anyway, and this is apparently an efficient and economic proposal, since it not only disposes of the barn, but provides much needed hospital facilities.

3. Road Construction, $10,000. Much of the main Campus roadway is in poor repair and needs to be macademized to withstand the heavy use. One of the important main roads was partly rebuilt in 1929, and it is now proposed to continue this construction to the main highway at the north entrance to the Campus, together with main connecting roads, a total distance of approximately two thousand feet.

4. New Floor in Drill Hall, $3,000. The under floor has rotted away so that the finish floor is loose, making a dangerous condition. This floor is in almost constant use as the women's gymnasium, and the need for this repair is urgent.

5. Fire Protection, New Water Mains, $10,000. The water mains supplying the Campus are too small to provide adequate fire protection. The engineer of the State Department of Public Health has studied the situation and recommends that an eight-inch main be installed for the entire campus. Part of this work was done in 1932, and the amount requested herein is to complete the project.

6. Installation of Incinerator at Power Plant, $6,000. All the institutional rubbish is at present dumped in one section of the college farm. The only suitable place for such disposal has become so full that this method ought to be discontinued. Also, the haul is long and much time could be saved by the construction of the incinerator at the power plant.

7. Rebuilding Upper Plant House, $2,500. This plant house is in poor state of repair, frames and supports having rotted so that the need for repair is urgent. The house is used for an instruction laboratory and is needed particularly in view of the increased student enrollment.

8. Student Aid Fund, $5,000. When the Board of Trustees increased the rate of students' tuition last year, they voted at the same time to provide a small appropriation which might be used to aid worthy and needy students for whom the increased rate of tuition would work a great hardship. A sum of $2,500 was appropriated this year for the first half of the academic year, and this is being used very advantageously to provide employment for worthy and needy students. For the full academic year of 1934, we are asking for the minimum fund of $5,000 which can be used to great advantage for the employment of the worthy and needy students at the College.

9. Emergency Fund, $5,000. This fund is to provide for emergency situations in the harvesting of crops and in productive enterprises where increase in receipts would justify additional expenditures.

REPORT OF THE DEAN

This has been a year of unusual activity and crowned with real achievements. These ranged from the induction of Hugh Potter Baker as the eleventh President of the College to the finding of a job for a needy student.

The most significant event of the year was the Inauguration of President Baker on October 6, 1933. The program consisted of an Academic Procession, the induction exercise, a reception by President and Mrs. Baker, and the Inaugural Banquet. The academic procession was the most colorful event ever seen on the campus. Representatives from seventy-three institutions of higher learning, the Governor of the Commonwealth, the Commissioners of Education of Massachusetts and New York, the trustees and faculty of the college, the members of the senior class and representatives of every student organization all in Academic Costume and led by Grand Marshal Colonel Charles A. Romeyn and Dean William L. Machmer, Chairman of the Inaugural Committee, made an impressive sight as they proceeded under a cloudless sky from Memorial Hall to Bowker Auditorium. At the induction exercises the presiding officer was Dean Machmer. The invocation was pronounced by the Rev. J. Paul Williams. Governor Ely was then introduced and in a most cordial and forceful address formally inducted the new President. Greetings were then extended by Commissioner Graves on behalf of the honored delegates, by Commissioner Smith on behalf of the State Department of Education, and by Alvan Ryan on behalf of the student body. The thoughtful and forward looking inaugural address of the President concluded the program.

The reception by President and Mrs. Baker was held at the President's house. In the receiving line besides President and Mrs. Baker were Governor and Mrs. Ely, Commissioner and Mrs. Smith, and Dean and Mrs. Machmer.

The Inaugural Banquet in Draper Hall was a fitting climax to a most successful event. Trustee Philip Whitmore acted as toastmaster and introduced the following speakers: President Stanley King, of Amherst College; Mrs. Lottie Leach, Trustee of this College; Professor Frank P. Rand of this College; Professor Alfred C. Lane of Tufts College; and President E. M. Lewis of the University of New Hampshire. This event had a most wholesome effect on the morale of students, faculty, and the alumni. President Baker appears to be just the type of administrator needed at Massachusetts State during this new era of growth.

Driven by necessity to effect economies the fraternities began to board their own members last year. The venture proved so successful that a definite set of regulations for its development was approved by the Administration early last spring. In order to give the necessary assurance to warrant the fraternities in making the investment needed for a fair trial, it was agreed that the plan should continue in effect for five years. All but two of the fraternities are now serving meals at a very marked cash saving over the average charge made for board elsewhere since a large part of the work is done by the students themselves.

Two of the four sororities are living in rented off-campus houses. Both furnish board to members. At present a total of two hundred and twenty-five students, one hundred and eighty-five men and forty women, are eating in fraternity and sorority houses. A faculty committee of which Assistant Dean M. O. Lanphear is chairman acts in an advisory capacity to these sororities. The new venture has worked out quite well and is assisting the Administration in the housing of women students.

The dormitory facilities for men students in North and South College take care of the housing of one hundred and two of the two hundred and twenty-five freshmen admitted. We hope the new dormitory for men authorized by the P. W. A. will enable us to house all first year men on the campus after September, 1934.

With the opening of the new college year in September the College returned to the semester plan. The change from the three-term system in use since 1916 was made easily and appears to be generally satisfactory to both the students and the faculty.

Instructional relief was given to the departments of Mathematics, Languages and Literatures, Chemistry, Physics, and Forestry through the appointment of new instructors. If proper provision for classroom and laboratory facilities can be made through the use of the present Library building and other room transfers, the limit set for our entering class in September 1934 may be raised from three hundred to three hundred and seventy-five students.

During the year the college has not neglected the sources of its raw material,

Schools and academies have been visited, a high school day with a carefully planned program was held, and the opportunities at the College were presented through conferences, addresses, and correspondence. But much more must be done before the citizens of the State really know the true place of the College in the scheme of public education supported by the Commonwealth.

In the all important field of scholarship we have had a good year. Twenty-two students are registered for departmental honors in twelve departments as compared with eleven in four departments last year. The Dean's Scholarship Groups include the names of those students whose averages for the entire college year were eighty per cent or higher. Group I lists those whose averages are between 90–100 per cent, Group II those with an average of 85–90 per cent, and Group III those with an average of 80–85 per cent. The comparative numbers in these groups for the college years 1931–32 and 1932–33 follow:

	1931–32	1932–33
Group I	5	5
Group II	37	44
Group III	85	110
Totals	127	159

The freshman average for the class of 1935 was 71.01 per cent and for the class of 1936, 72.44 per cent, a reasonably good increase.

The work of the Freshman Advisers deserves more than passing notice. Although required to carry heavy teaching schedules these selected members of the faculty perform a real service to the advisees assigned to them. For the college year 1932–33 these advisers in addition to the Dean and Assistant Dean were Professors Serex, Rand, Moore, Julian, Goding, Skinner, Knowlton, Briggs, Fessenden, and Messrs. Briggs and Boutelle.

As our members increase, the work of these advisers assumes greater significance. Through them the college keeps in personal touch with the individual student. Without such contacts our work will lose much of its effectiveness.

This office is giving a great deal of attention to the organization of work and activities aimed at the stimulation of worthwhile avocational interests. New and additional group activities are fostered among our undergraduates by the Academic Activities and the Athletic Boards. Everything points towards a reorganization of commercial and economic life, which will leave many individuals an increased amount of leisure time to devote to the pursuit of their hobbies and cultural avocations. Surely the colleges must assume some responsibility to guarantee a profitable and not a wasteful use of this free time. The Departments of Literature, Physical Education, and Music have a splendid opportunity to organize effective programs in this direction.

Students respond wholeheartedly to leadership correctly conceived. A single example may be cited to illustrate this principle. In an effort to bring a little more wholesome holiday spirit on the campus, the suggestion of a suitable program of carol singing was made to a group of students interested in a campus chorus. The idea was accepted, music purchased, and rehearsals begun. The result was an excellent program rendered to a large appreciative group the Sunday evening before the Christmas recess. This interest led to the placing of the first Christmas tree on the campus under the direction of the President of the College. So successful was this entire venture that a Christmas tree and a creditable program of Christmas music annually will become traditional on our campus.

All exercises of this nature occupy, at present, a place of significance all out of proportion to the immediate importance of each event viewed by itself.

Several very important problems call for an early solution. First, this September the fourth entering class of three hundred will be admitted. This will mean another increase in our total enrolment which is already taxing the facilities of certain departments to the limit. Some adjustment will have to be made either through a modification in the required courses in the curriculum or by providing additional facilities for laboratory work. The pressure is especially great in the Chemistry, Physics, and Bacteriology Departments.

Second, some plan should be set up which will enable us to accept well qualified applicants soon after they have completed the first half of their senior high school

course. Such an arrangement will effect at least two very desirable ends: (1) it will distribute the work of admission over a longer period, thus giving us an opportunity to do our work more thoroughly and (2) by removing the uncertainty of admission we may expect such students to devote their last semester's work to courses and reviews which in the joint opinion of the College and the principal will be most valuable to them.

The splendid cooperation of the students with the College Administration made our problems of discipline few in number. We have the very minimum of expressed rules governing student conduct but we do expect every student to behave as a gentleman or lady. The College has not found it necessary to restrict the students in the use of automobiles. It has, however, a real problem on the matter of making our dances and other social functions genuine laboratories for the practice and teaching of good manners and good form. We are making progress but much more can be done and we are greatly encouraged by the splendid support and attention which the students are giving to this matter.

It is difficult to understand why so many students living in dormitories should be noisy, careless in their conduct, and lax in keeping their rooms orderly and clean. When the new dormitory is opened, sufficient supervision will be provided so that the building will be at all times homelike, orderly, and peaceful. The College will meet its obligation in full if the occupants of dormitories observe a code of conduct worthy of a well ordered home.

In recent years the Committees on Personnel Methods and on College Testing of the American Council of Education, the Commission of the Relation of School and College of the Progressive Education Association, the Cooperative Test Service, and the Educational Records Bureau have done much to stimulate thought relative to the guiding philosophy and ultimate goals of education, as well as to provide various means that may be employed to test and record progress in attaining those goals. During our period of rapid growth which also brings a demand for changes, our objectives must be clarified. The public has seen its normal schools changed to colleges and many of the agricultural and mechanical colleges to universities. Surely these institutions were founded to serve students of a wide variety of interests and capacities. But once established they yielded to the pressure to become educationally orthodox. As some one has said, "Our American idea seems to have been not only that we should give everybody an educational opportunity, but that we should give everybody the same opportunity." In enlarging our facilities to take care of more students, I am confident that we will have many misfits if this expansion is made wholly in terms of traditional college curricula and programs. There should be genuine differentiation in terms of the abilities and capacities and interests of students. In our procedure we must think on the one hand of a constructive program for the needs of young people of widely varied types of background and ability, and on the other of the means that will insure that the individual finds his proper place in such a program.

This calls for intelligent student selection and guidance. For this important work the various associations and groups interested in educational records and objective testing can be of great assistance.

There has been an urgent request that the college offer a major in Physical Education for men who are desirous of fitting themselves for directors of Physical Education in the Public Schools, for positions as teacher-coach, and for directors of recreational, camp, and community activities. To meet this demand which is favored by the Commissioner of Education of the Commonwealth, a curriculum is now being arranged. It is expected that the Course of Study Committee will approve it early enough to put it into effect in September 1934.

Additional work in Music should be offered and I would strongly recommend that steps be taken leading to the appointment of a full time instructor in Music. In addition to teaching certain courses for credit this instructor should be made responsible for encouraging group singing. The need for this service is most urgent.

We have had a good year. I have great confidence in the type of student now coming to us. They are conscientious and capable. In providing educational facilities for them on a college level, the Commonwealth is making a sound investment.

Wm. L. Machmer,
Dean.

REPORT OF THE DIRECTOR OF THE GRADUATE SCHOOL

To Massachusetts State College should go the recognition of being the first land grant college making an organized effort to closely identify the instruction in the graduate school with the activities in the experiment station. Since this organization was perfected about four years ago, other similar institutions have followed the lead and, while the wisdom of this direction may still be questioned there is at least theoretically, no reasonable argument in opposition and many points are in its favor.

The contention at the time of the organization or combination of these two services was that the benefits would be mainly two fold. It was held, that the student would profit if he had the guidance and counsel of members of the experiment station staff in conducting the research required for a satisfactory thesis. The experiment station, it was contended, would be compensated by the service received from the student when assigned to some specific portion of an approved project or to some independent unit of research related to work in progress.

The results in support of the former contention would naturally be so intangible as to be difficult to offer as proof, and one must therefore depend almost entirely upon the expressed reaction of the parties concerned. These reactions have in all cases been favorable to the point of enthusiasm. In the service to the experiment station, the results have been more definite and definable. A summary of the thesis titles of investigations conducted by students in fields entirely within the province of the experiment station, should prove interesting. Such a list covering the last four years is herewith submitted.

Titles of Theses

The Ammonification and Nitrification of Cottonseed Meal and the Nitrification of Ammonium Sulfate.

A Study of Varietal and Cultural Factors Affecting Stand and Yield of Soybeans.

The Application of the Complement-Fixation Reaction as a Means of Detecting Minute Quantities of Decomposition of Beef.

Studies in the Protein Content of Normal Avian Blood.

The Effect of Different Concentrations of the Hydrogen-Ion upon the Solubility of Manganese Sulfate in Solutions of Six Representative Nutrient Salts.

The Effect of Nitrate of Soda Applications on Fruit Bud Formation in the Strawberry.

Chemotropic Studies of the Japanese Beetle (Popillia Japonica Newm.)

Morphological and Ecological Studies of the Mexican Bean Beetle.

A Comparison of Single and Double Stage Homogenization.

An Analysis of Cooperative Agricultural Organizations in Massachusetts, 1929.

Pasteurization of Dates. Time-Temperature-Humidity Relationships.

Some Factors Affecting the Flora of Pastures.

The Effect of Some Forms of Nitrogen on the Growth and Nitrogen Content of Wheat and Rice Plants.

The Wheat Industry in Maryland.

A Measure of Some Factors Affecting the Development of the Honeybee Colony.

Studies in Tropisms and Ecology of the Bed Bug—Cimex Lectularius L.

Migration of Farm Families.

The Mineral Composition of Dates.

A Study of the Elimination of Phosphorus Following its Ingestion in Organic and Inorganic Forms.

Use of Smoke in the Preparation of Smoked Haddock with Particular Reference to the Significance of Formaldehyde.

Studies of Methods for Determination of Magnesium Deficiency in Soils.

A Study of Massachusetts Ice Cream.

Vitamin C Content of Cranberries.

Fertility and Hatchability Studies in Poultry.

Preservation, Utilization and Properties of Cranberry Juice.

A Study in Avian Behavior to Determine the Nature and Persistency of the Order of Dominance in the Domestic Fowl and to Relate these to Certain Physiological Reactions.

Biochemical Studies on the Cocci of Sewage Sludge.

Studies on the Effect of Different Temperature Gradients as Produced under Three Brooder Stoves upon Body Weight, Feathering and Sleeping Groups of Chicks During Two Periods of Brooding.

The Specificity of Soluble Bacterial Substances from Certain Members of the Salmonella Group.

A Study of Ice Cream High in Fat Content.

An Attempt to Find Salts which in Saturated Solution Yield Relative Humidities not yet Obtainable for Use in Biological Research.

Enlarging the Consuming Area for Massachusetts Apples.

Study of the Influence of Certain Environmental Conditions on the Duration of Viability of *Salmonella Pullorum*.

Temperature and Humidity as they Affect the Life Cycle of the Lesser Grain Borer, *Rhizopertha Dominica* Fab.

A Study of the Economic History of Three Marginal Farm Towns in Massachusetts.

Plastic Cream as an Ingredient of Ice Cream.

Studies in Oven Canning.

A Study of the Correspondence Courses at Massachusetts State College in the Field of Agriculture.

The Use of Red Squill as a Raticide.

Influence of Initial Contamination, Time and Temperature upon the Rate of Multiplication of Escherichia Communior in Raw Milk.

Agricultural Land Utilization in the Connecticut Valley in Massachusetts.

A Study of the Depopulation of the Small Towns in Windham County, Vermont.

Chemical and Microbiological Studies on Citron. (*Citrus Medica, Linn.*)

A Study of the Properties of Insulin and Its Quantitative Determination in Artichoke Tubers.

While there has not been the increase in the enrollment of the graduate school that would normally be expected, the fact that there has been no actual decline in face of the conditions of depression, and increased tuition both resident and non-resident is really most encouraging if not surprising. The total enrollment is 113 for the present year with Education and Chemistry leading in regard to majors. The high non-resident tuition has had the predicted effect of practically prohibiting non-resident enrollment, and while this may seem sound and desirable during this period of industrial distress and unorganized constructive thinking, it is the hope that when this panicky period of our history has passed, that we will again see the value of the non-resident student influence. While it is recognized that the first function of the college is to serve the State and nation by providing thorough education, a better equipped citizenship, it must also be born in mind that this service can be rendered most effectively only by maintaining an up-to-date institution and a well qualified staff. For this standard, free intercourse and close contact with educators and educational policies is necessary. Located as we are in Massachusetts, at the extreme geographical margin of our country, these contacts are not made without some effort and expense. To deny ourselves these contacts, by discouraging the enrollment of students from out of State institutions through a high non-resident tuition will of itself necessitate a more liberal policy of sabbatical leave or exchange professorship if Massachusetts is to remain sufficiently abreast of the times to maintain her present position, or to aspire to the position she so justly deserves—the most prominent Land Grant College in New England in the field of Graduate Study The high tuition during this period of our development, when a subsidy would seem much more justifiable is, it would seem, the greatest handicap to the attainment of that standard of quality to which all friends of the college aspire. This limitation can and should be corrected as soon as we can right ourselves and take a more optimistic view of the future.

FRED J. SIEVERS,
Director.

REPORT OF THE DIRECTOR OF SHORT COURSES

The adoption of the semester plan by the College has made necessary a complete revision of all major course programs in the Stockbridge School of Agriculture. Many courses previously offered in separate terms have been combined into a single semester, and other courses shifted from one year to the other. As a result there have had to be made many substitutions and adjustments this year before the new plan can really be functioning smoothly.

One serious feature is the inequality of the two semesters of the freshman year, the first one, a period of sixteen weeks from October to February, and the second one, only a half semester, or in actual time allotment, a period of eight weeks. A longer semester cannot be arranged without interfering with the placement training program. In fact, the present plan is making it very awkward for poultry majors whose placement jobs usually require them to report to employers as early as March 1. Many of these men will, therefore, have to be released from classes before even the first half of the eight week semester can be completed, with a consequent greater loss of class work, and, at best, only a brief introduction to any work undertaken in this last half semester. How this situation can be improved or remedied remains to be seen, after the experience of this coming spring.

In the program of the Winter School the Poultry Husbandry Department has felt it highly desirable to have their poultry short courses start before the usual January 1 date as in other years. This year they have rearranged the course into three 3-week units, beginning November 20, with Thanksgiving and Christmas holidays breaking into the first and second units, and causing what would seem to be an added expense to students attending those units. In other ways, perhaps, the staggered arrangement of the new plan with courses offered each succeeding year, whereby a student may complete the whole course by attending only a three week session at the same date annually over a period of three years, will render a real service in these days of necessary economies.

The General Agriculture short course has been discontinued, and a new one-week course in Forestry is offered for 1934 to assist woodlot owners, forest wardens, and supervisors of forestry improvements.

The placement training program for freshmen students in the Stockbridge School of Agriculture again faced a critical year, but Mr. Grayson was able to secure positions for practically all students. In many cases they were not the type of jobs we have been able to arrange for in other years, and in certain lines of work, notably Horticulture and Floriculture there existed a distinct shortage of employment positions. A more detailed statement of the placement training program will be found in the report of the College Placement Service.

It was found possible to revive the Summer School in 1933, after a lapse of one year, and a four week session in place of the usual six week program was held. Because of a greatly reduced budget only six credit courses could be offered. These proved of considerable service especially to our own college undergraduates who were faced with the necessity of making adjustments from the term to the new semester system, inaugurated last September. A total of sixty-nine students registered for the credit courses and of the group thirty-one were undergraduates of this College.

To aid unemployed and part-time workers, a new series of two-week short courses comprising such subjects as, (1) Small Fruits, (2) Vegetable Gardening, (3) Garden Flowers, (4) Trees and Shrubs, (5) Home Poultry Flock, (6) Carpentry and Metal Work, and (7) Food Preservation was presented by members of the college staff.

I wish to recommend a similar program next year to give this type of work a chance to prove its utility to larger groups of students.

For the second year in succession the Stockbridge School enrollment has shown a decrease from the year preceding, and in October just one hundred new students were registered for the full two-year program. This reduction can be best explained by the conditions under which all agricultural enterprises have been forced to operate during the past few years. With prices of farm products at a discouragingly low point, and the shrunken wages of farm employees, many young men have had to postpone their further education at Stockbridge until better times arrive. This

situation seems to be adjusting itself and we may look forward hopefully to a larger student group another year.

Despite the concentrated class and laboratory program of our Stockbridge students, we believe they receive much benefit from the supervised program of sports and games provided by the Physical Education Department. Under the direction of Coach Lorin E. Ball this phase of student training is being soundly and practically developed. I quote herewith a short report submitted by him to show the type of work provided. It is significant that more than fifty per cent of the student body participated in some way.

"Class work in physical education was required of all men not participating in football or cross-country running. Two class periods a week were given. Men were divided into teams and leagues and scores and standings were kept which added much interest. The senior class work consisted of instruction in badminton, volley ball, archery, and swimming, with the idea of introducing sports which would have carry over values. Much interest resulted and a few of the students expressed a desire to buy badminton rackets and birds so as to continue their play at other than the class periods. Each class period was divided into a free period at the start of class when the men could just practice, an instruction period during which a certain skill was taught, and a game period when scores were kept and the men played for competition. The freshman class work was run in the same manner, but different sports were taken up. Their program consisted of soft ball, touch football, soccer, golf, and swimming. Next year they will receive the senior program as outlined above. Men taking the class work are expected to keep a change of clothing in their baskets and are required to take a shower after the exercise period. There were approximately fifty students taking the class work in each group.

A squad of fifty men participated in football this fall. These men remained out during the entire season and our squad increased, rather than decreased, as is usually the case. We feel that this was due to the fact that games were arranged for all men so that everybody on the squad participated in at least two games with outside opponents. A regular schedule of seven games was played with three additional games for the second and third teams.

About ten men were on our cross-country squad which had several meets with good success.

During the winter basketball and indoor track are offered and already a squad of thirty men have reported for basketball. This squad will not be cut, but everyone who wishes to stay out will receive instruction and be given a chance to play."

ROLAND H. VERBECK,
Director of Short Courses.

REPORT OF THE LIBRARIAN

The Library now contains 96,891 books which are regularly catalogued, in addition to numbers uncatalogued. The net gain during the year was 2,770 volumes. The number of department libraries is now 45.

The Library has been kept open for study and borrowing of books 342 days during the year. During the academic year the building is kept open fourteen hours per day, and five hours on Sundays. There were loaned for use outside the building during the year, 12,360 books, 968 pamphlets, and 80 volumes of loans to other libraries. The months of largest circulation were April, January, May and February, in which books and pamphlets were borrowed respectively as follows: 1,784 books, 119 pamphlets; 1,566 books, 88 pamphlets; 1,484 books, 94 pamphlets; 1,425 books, 96 pamphlets.

Over five hundred periodicals and serials are now received and filed ready for immediate consultation.

The large task of arranging and cataloguing of the College History or Memorabilia collection has been pushed forward during the year, until it is well on the way to completion, and has proved notably useful in helping in the writing of the history of the College recently issued.

The need of a fireproof structure, with more space for readers and books, is still keen, but at last there is good ground for cheer in the prospect of its near approach.

B. B. Wood,
Librarian.

REPORT OF THE DIRECTOR OF PLACEMENT SERVICE

The Placement Service as at present organized at Massachusetts State College was put into operation by President Baker last September to broaden the scope of its activities in order that the college graduates and undergraduates might share some of the benefits of a program which has been carried on for a number of years, almost entirely for the students and graduates of the Stockbridge School of Agriculture. Ever since the inception of this School, there has been a so-called Supervisor of Placement Training whose principal function was the finding of suitable jobs and the placing of the freshmen on these jobs in order that they might gain practical training along the lines of their major interest at the School. This work led naturally into the next step, that of finding employment for the seniors after graduation in June, and the next step after this, that of conducting a placement bureau for graduates, also developed in the natural order of events. These various functions have been carried on for several years by the Supervisor of Placement Training under the Director of Short Courses because the work was carried on almost entirely with Short Course or Stockbridge School students and graduates. Some little placement of college seniors and graduates has been done in the past few years by this officer, especially in the fields of Agriculture and Horticulture, because as his contacts broadened, he became in a position to help the college men majoring in these fields.

During most of this period, Miss Margaret Hamlin has been taking care of the few girls in the Stockbridge School, but has been spending most of her time and efforts in the various phases of placement and guidance of the college girls.

President Baker felt that the placement program should be expanded, and that another man should be put on, for part time at least, whose duties and responsibilities would be entirely with the college men, and especially with that group of college men for whom practically nothing was being done by the Placement Department, namely, those not majoring in the Divisions of Agriculture or Horticulture, the larger portion of our student body at the present time.

Mr. Glatfelter, who for a number of years has been Assistant Professor in the Animal Husbandry Department, was chosen as the man to take over this new work by President Baker and began his new duties September 1, 1933. He still carries on some class work in the Animal Husbandry Department. Already there is need for his full-time service in Placement Work.

Here is a brief summary of the present organization of the Placement Service.

Margaret Hamlin, Placement Officer—to carry on all the various phases of placement work for the women of both the College and Stockbridge School.

Professor Glatfelter, Placement Officer—to inaugurate and carry on the different placement functions for the college men outside the field of Agriculture and Horticulture.

Emory E. Grayson, Director of Placement Service—to carry on as before for the Stockbridge School and broaden the scope of these activities to include the college men majoring in Agriculture and Horticulture.

The duties of all three persons have these major divisions; part-time employment during college, summer placement, senior placement, graduate placement and guidance.

Student Employment

With unemployment of tremendous proportions, the youth of America are urged to stay in school, "the best place for them." Hence we have in college students who not only are preparing for occupational opportunities but awaiting them. This activity of staying in school is not without its financial burden, therefore, there is a great demand for part-time jobs by students. The State legislature appropriated $2,500 for student employment during the past year, and up to December 31, 120 students were employed by 38 departments in jobs especially created for this purpose, earning the full amount appropriated. In addition to this special emergency fund, many other part-time jobs were filled by students. At the Dining hall alone 70 students during the year of 1932 and 1933 earned a total of $9,450.42. It is very difficult to estimate the total sum earned by students per year because of the great variety of odd jobs available.

Six Months' Placement Training

President Baker was especially anxious that the Stockbridge School of Agriculture should not suffer in any way by the change made in the Placement Service, and I am sure that it will not suffer because no definite change is intended in the placement program of the Stockbridge School.

Last March 92 men students of the Stockbridge School were eligible for the six months' placement training and of this number employment was found for all but two. It was the most difficult year in which to make placements. Not all of the trainees put in a full six months on the job as some of them were let go a little earlier in the fall and others were forced to take some time off during the middle of the summer. Lost time occurred almost entirely in the Horticulture Division, whereas the Division of Agriculture or farm group, were steadily employed for the full six months and even longer in some cases. The last couple of seasons have not offered all that one might wish for in the way of training because of the lack of choice in jobs. This is especially true in the General Horticulture major, which each year comprises about one-third of the entire class. If it were not for the great diversity of placement possibilities for this group, it would be practically impossible to line up anything for each and all of them to work at during the summer. They are placed with nurseries, parks, cemeteries, estates, landscape service companies, forestry projects, and golf courses.

The nurseries were formerly the largest outlet for our Horticulture students and incidentaly one of the best types of training jobs, but with practically all nurseries in New England in very poor condition at the present time, this opportunity has temporarily vanished.

Wages have likewise dropped off very considerably. There was a time when the money a placement student earned during his six months' work period would finance at least half of his senior year, in fact, I can recall students returning with over $400 earned and saved during the placement period. Last year a job was considered quite satisfactory from a financial standpoint if it netted $5.00 a week, and that was about the average. As I recall it the highest paid student last season received $47.50 a month and maintenance.

Graduate Placement

An important activity of the Placement Service is to interview members of the graduating class to secure as complete personnel information as possible in the hope that this information will be helpful in effective placement.

Results in placement of graduates to date have been meager, due to the adverse business conditions. Some placements, however, have been made in the Federal Land Bank, chemical concerns, and other industries. We have also placed a considerable number of men in special C. W. A. projects.

In order that the service be adequate, it is necessary to interview industrial concerns of the State and thereby call their attention to the quality and personality of our graduates. This is bound to be a valuable service for both graduate and industry concerned. It is very apparent that the industries of the State are uninformed as to the versatile training which our graduates receive. Hence this organization serves not only as a means of placing our graduates, but also to bring

more effectively to the attention of the industrial leaders the work and functions of the College. These interviews also give an opportunity for the placement officers to gain valuable opinions by industrial leaders as to what the College might do to contribute to industry. It is very gratifying to note how eagerly industrial men listen to information about our College and its graduates. Opportunities for employment by industries will undoubtedly increase as more contacts are made, and the Placement Service considers this as one of its most important functions.

Following is a brief summary of the graduate placement service rendered during the year 1933 in the field of Agriculture and Horticulture.

	Div. of Agri.	Div. of Hort.	All Others
S. S. A. Alumni Enrolled	112	66	2
College Alumni Enrolled	18	12	29
Totals	132	78	31 = 241

Positions Available

Div. of Agri.	Div. of Hort.	All Others	Total	
77	20	5 =	102	Also 23 for sale, rent, lease, or share propositions. (Of very little value.)

Graduates Placed

	Div. of Agri.	Div. of Hort.	All Others
S. S. A.	36	5	3
College	4	1	1
Totals	40	6	4 = 50

The fifty graduates placed were on permanent positions varying from farm managers on large farms to plain labor.

Placement of Women

The work of the Placement Service for women is of six types. First, the permanent placement of the alumnae of the College and of the Stockbridge School; second, the temporary placement of undergraduate women needing summer jobs to earn toward college expenses or to gain practical experience in the field of their major interest; third, the temporary placement of the Stockbridge School girls for required placement training; fourth, the finding of self-help work for women students in need; fifth, student interviews, letters, outside trips to make contacts for future positions; sixth, supervision of Stockbridge School girls in their placement training.

This has been a busy year in all of these activities. Of the 260 girls in college, many more have asked for work than could be supplied. Freshmen are not encouraged to work during their first year and very little work has been available for them. In all, 83 girls were given some work. Since September, 34 girls were given work from the Special Emergency Fund, 38 more from other sources. Places in town where two could work for board, and similar places where nine others could earn both room and board. A few were able to find for themselves opportunities to earn. Forty-four girls were helped to find temporary positions, mostly during summer vacation, and thirteen were placed permanently.

Vocational advice is one of the most important functions of a Placement Bureau. Since the opening of college in September, there have been 372 interviews with the women students. 38 of the 43 girls of the present senior class have already been in once, and some of them a number of times. With the Placement Service established on a recognized basis, there is certain to be an increasingly larger opportunity for usefulness both to undergraduates and to alumnae.

Emory E. Grayson,
Director of Placement Service.

REPORT OF THE FIELD SECRETARY AND ASSISTANT ALUMNI SECRETARY

This report covers the period between December 1, 1932, and November 30, 1933, and is composed of two parts, the report of the field secretary and the report of the assistant alumni secretary.

Report of the Field Secretary

During the past year the office of the Field Secretary engaged in the following activity.

1. The preparation of a large book of pictures and descriptive matter of the College for use in secondary schools and at various college exhibits. The book has been so used.

2. The planning and conducting of the Twenty-Fourth Annual High School Guest Day, with Secretary Hawley and a faculty committee. High School Guest Day was held on Saturday, May 6, 1933. Attendance was 618.

3. The planning and conducting of the Fourth Annual Interscholastic Judging Day, with a faculty committee. Interscholastic Judging Days were held on Friday and Saturday, October 13 and 14, 1933. Attendance was 261.

4. The planning and conducting of the Sixth Annual Dads' Day, with a student committee. Dads' Day was held on Saturday, October 14, 1933. Attendance was 350. The Collegian called this Dads' Day the best event of its kind ever held at the College.

5. By request, the field secretary, explained entrance requirements of the College at the Westfield High School on February 8, 1933.

Report of the Assistant Alumni Secretary

During the past year the Alumni Office carried on, so far as was possible with decreased funds, its regularly organized work of keeping up-to-date its address, geographic, occupational, and biographic records.

In April 1933 a detailed occupational summary of all Alumni was completed.

It is felt that diligent and careful follow-up of expiring memberships in the Associate Alumni has resulted in keeping membership at a satisfactory level.

In May 1933 the Alumni Office sponsored and helped arrange a dinner for members of the faculty and staff who had served the College twenty-five years or more.

The Alumni Office attended to most of Mr. Rand's correspondence relative to the history of the College, and typed the manuscript complete.

The history index was compiled in the Alumni Office.

The histories arrived from the printer on November 1, 1933, and 1,250 copies were distributed at once to Alumni and others.

The Alumni Office sponsored and helped arrange the Annual Alumni Night meetings (November 9, 1933), class reunions at Commencement (June 10, 1933), and local alumni meetings. Attendance at all of these gatherings and reunions numbered over 1,000 Alumni.

The Alumni Office made up and supplied various lists at the request of Alumni.

Ten issues of the *Alumni Bulletin* were published.

The Directors of the Associate Alumni met, in Amherst, several times during the past year and, among other things, made a study of the newspaper publicity received by the College; made a study of the housing situation for students in Amherst and appointed a committee to investigate the possibility of a dormitory being erected at the College; recommended Mr. George H. Ellis to receive an honorary degree from the College; appoint a committee to express Alumni opinion in the matter of appointments to the board of trustees; and considered the possibility of erecting a stone tower on the Clark estate.

In all its relations with graduates, the Alumni Office has attempted to keep Alumni interested in and proud of Massachusetts State College, to the end that both Alumni and the College may benefit.

George E. Emery,
Field Secretary and Assistant Alumni Secretary.

SYNOPSIS OF THE ANNUAL REPORT OF THE EXPERIMENT STATION

(The complete report of the Experiment Station is published separately as an Experiment Station Bulletin.)

The Experiment Station, besides maintaining the field stations at Waltham and East Wareham, supports eight special control services and operates its research program through the direction of sixteen different departments. It also cooperates in four activities with the United States Department of Agriculture. As illustrations of the services of the Experiment Station, I shall describe a few of the results of the year's work without attempting to give a complete account here.

In the field of Agronomy efforts were concentrated on the improvement of methods of culture and fertilizing as well as breeding of both onions and tobacco, with the result that methods have been developed which make for considerable saving in fertilizer costs, and also in the production of varieties that are more or less immune to some of the very destructive diseases. The pasture work, undertaken very extensively a few years ago, is still under way but in a less extensive and more specialized form.

In Agricultural Economics a study has been completed in the extension of markets for Massachusetts apples. This is published in bulletin form and has proven very timely. The work on part-time farming has attracted national attention, and so has also the recent investigation on the recreational use of land in Massachusetts.

In Agricultural Engineering investigations in apple storage show that the humidity factor is of profound importance. The construction of efficient and inexpensive equipment for apple handling in the warehouse, the development of an apple washer to remove spray residue, and checks on the adaptability and efficiency of pumping equipment for cranberry bogs have received foremost consideration with the result that we are in a position to lend real aid to the fruit industry in these relationships.

Our Bacteriologists have been devoting much time in perfecting methods for the better determination of what constitutes a sound sanitation test for both milk and water. The results from nitrogen fixation investigations show that some of these values are exceedingly difficult to measure, and although legumes give evidence of nitrogen fixation, there is no absolute evidence that this property may not be found in non-leguminous crops also.

In Botany attention has been given to the control of downy mildew of cucumbers and lettuce, the leaf mold of tomatoes, diseases of herbaceous ornamental plants, and the control of carnation blight. The fact that artificial light in the greenhouse can be used effectively in bringing gladiolus into bloom out of season, and the development of a sound scientific basis for the use of plant containers, are meeting much popular approval. With the many different pests and diseases to be controlled in connection with greenhouse plants, the investigations directed to determine the influence of one treatment (fumigant or spray) on another when used simultaneously are proving very timely.

At the Cranberry Station the general tests of pyrethrum dusts have shown that this product is effective in the control of practically all of the cranberry insects. Flooding for the control of the grub worm is becoming a well-established practice as a result of our findings and demonstrations. At present there is pronounced interest in chemical weed killers and already we have considerable information on various products. The work in correlating weather observations with the requirements of the industry has resulted in our ability to make some much worthwhile short time weather predictions. In the cooperative project with the United States Department of Agriculture our efforts are devoted to the development of a strain of cranberries resistant to the false blossom disease, to the relationship of the oxygen content of flood water to some of the injuries resulting from flooding and to conditions influencing essentials in proper storage of the fruit.

In Dairying the study of ice cream is giving some very definite results concerning the effect of aging on quality and appearance. Plastic cream, a new product still very much unstandardized but offering evidence of being favorably accepted as a substitute for butter as a spread, has received recent attention. Some very unique and interesting combinations have been produced. The demands for a better method for cooling milk in the farm dairy are, of course, always with us.

In Entomology much time is devoted to testing for efficiency of the many commercial spray products that continually appear on the market. The development of the spray residue problem has forced us to make a great many analyses to determine how near to the lead and arsenic tolerance our commercial industry is operating. The introduction of the parasite, *Macrocentrus ancylivorus*, has proved very effective in the control of the oriental fruit moth on peaches. The work on plum curculio control has offered an entirely new slant regarding spray methods in that it is the first work of its kind that shows possibilities of explaining some of the inconsistencies from spraying results by relating them to variations in temperature at the time the spray is applied. The work on the control of mealy bugs and the carrot rust fly offers much encouragement.

In Farm Management the detailed studies of the economic significance of certain practices are showing conclusively that certain details of management are not justified on the basis of cost in spite of prevalent beliefs. This method of approach is being quite generally developed and promises to be very effective in serving the fruit grower, vegetable gardener, dairyman, and poultry raiser in an attempt to analyze his business for the purpose of eliminating wasteful practices.

At the Waltham Station the field facilities are used in a very effective program demonstrating the practical use of some of the results obtained in the laboratory. The major work is devoted to projects of this type. There have also been held the Horticultural and Garden Schools, and the Florists' and Nurserymen's meetings. Much practical information is being accumulated on greenhouse and hotbed construction which is proving of interest and service to many of the operators and especially to those making their first venture in the industry.

In Floriculture the demonstration field at the Field Station has been very much worth while, not only because of the information available therefrom, but also because of its general attractiveness. The results on breeding snapdragons for rust resistance have developed varieties that are proving of considerable promise. The use of plant nutrients in growing carnations under glass has been studied to a point where we now seem to have some evidence as to what constitutes the development of imperfect flowers.

In Home Economics the study comparing the values of whole milk, condensed milk, and tomatoes in the diet is rapidly reaching completion. Indications are now that the benefits from all of these products, while quite evident, are nevertheless, not sufficiently different but what all deserve about the same endorsement.

In Horticultural Manufactures many new things have been learned about vitamin values of a number of fruits and their products. Apples, cranberries, apple cider and tomatoes are included in the list. Methods are being investigated of processing onions for purposes of utilizing those not sufficiently attractive to be marketable directly. The very popular oven canning for home produced fruits and vegetables has been given a fairly thorough test with not especially encouraging results for the process.

In Chemistry we are accumulating information on the relationship between the quality and composition of tobacco as influenced by different methods of culture and nutrition. Oil sprays are being tested to determine their limitations and emulsifying index. The study of mineral requirements for dairy claves indicates that many of the common feeds are deficient in phosphorus.

In Pomology the stock and scion study shows rather conclusively that the stock deserves more consideration than it has been previously extended. The Dutch Doucin seems to have advantages in this respect over many of the other sources of stock material. The variety identification activities are still in progress and there is an attempt to extend this method of spotting varieties to other fruits besides those previously included. Results from the peach breeding program sh ow evidence of the possibility of establishing a variety that may prove of merit for a climate like ours in Massachusetts. The field work with strawberries is showing that in the presence of so many uncontrollable factors it is becoming evident that no very clearcut deductions can ever be made from information available from this source, although the study has given us much of value concerning cultural practices. Results from blueberry investigations are being compiled

in the hope that a more or less complete publication on this subject may be developed. Use of commercial fertilizers and some attempt at improving conditions for the blueberries growing in Nature show that much can be done in increasing production and quality without the necessity of artificial planting.

In Poultry the main work has been in genetics regarding broodiness, egg production, color, health, etc., until at present we feel able through breeding to control to a considerable extent any of these factors.

Work in Vegetable Gardening has been stressed in asparagus culture, and in improvement of vegetable varieties in general. Progress in this field is naturally slow but can be justified because of the enthusiasm with which the grower accepts anything that proves of advantage to what is now available on the market.

In Veterinary Science the main energy, of course, is expended in the pullorum disease service where more than 300,000 blood tests are being made annually. This program has been supplemented with research making for the standardization and improvement of the test until now the quality of the service in Massachusetts ranks as high as any in the country. A method for the control of Laringotrachitis is available, but not sufficiently perfected to be considered safe in the hands of the practical poultryman. It is also still an open question whether this disease should be dealth with through methods of control or methods of eradication. In avian paralysis it is the hope that a more simplified method of control may be developed which can be safely and effectively used by the poultryman himself. The identification of sex in chicks is under investigation and promises much of value in affording an opportunity to make this distinction at an early age and thus avoiding the necessity of growing a larger number of cockerels which may not necessarily prove profitable.

The cooperative project in tobacco breeding has developed a variety that seems to have all of the good qualities of the best tobacco now grown in the Connecticut Valley and still possesses very evident immunity to black and brown root-rot diseases.

In the Control Services—Fertilizer, Feeds, Seeds, Dairy Glassware as well as in certifying testing—there is little change so far as type and amount of service is concerned. The spirit in which the public is receiving the results from these services, however, is the best evidence that we are proceeding on a very sound basis and apparently are giving the interpretation to these regulatory measures that was primarily intended when the legislation was enacted. It may be of interest to know that our appropriation for services in Feed Control has always been very much restricted, so that at present and for the last several years the income has been almost twice the cost. Because of this fact the feed dealers intend to introduce a bill in the present Legislature asking that the cost of analyses be decreased 50 per cent. Should this bill pass it would still afford us an opportunity to render the same service we are now giving, but it provides absolutely nothing for the investigational work necessary to keep methods of analysis in line with the pronounced claims made by manufacturers for special nutritional values concerning their products. We have no provision in this service for testing the value claimed for vitamins, irradiation, etc., although claims concerning these values are rapidly developing and are gradually being accepted.

Fred J. Sievers,
Director.

REPORT OF THE DIRECTOR OF THE EXTENSION SERVICE

The year 1933 has probably been one of the most trying for extension agents in the history of the extension service. A greatly increased number of persons have found their way to the extension offices to consult with the agents on all sorts of matters pertaining to agriculture. The extension service with its knowledge of the actual farm business, its list of people engaged in various divisions of farming and its facilities for reaching these people through meetings, letters, and newspaper articles has been a great convenience to all branches of the government that had to deal with farming people.

It is in times of such emergency that our extension organization can fulfill or can supply with very little trouble or expense the needed means of contact that otherwise would be difficult to establish.

Farmers in the Connecticut Valley, because of the nature of their business, had very little income at the beginning of 1933. The Connecticut Valley Agricultural Improvement Committee developed a plan whereby farmers would be given the opportunity to apply to the Regional Agricultural Credit Corporation for loans. In order to get this system of loans started, members of the extension staff spent 111 days on the project. The volume of the loans resulting from these activities was $203,380. The greatest benefit was probably secured by those who obtained warehouse loans for sorting their tobacco, as the sale of sorted crops will probably return double that of unsorted tobacco. In addition to the above, approximately $210,000 has been borrowed from this same agency in other parts of the State.

Employed extension workers spent 166 days (paid committee men and emergency assistants 369 days) on the Tobacco Adjustment program of the Connecticut Valley which was to reduce production of the crop through the method of renting or leasing the land by the Secretary of Agriculture. A total of 496 contracts, representing a little more than half of the number of tobacco farms in the area, were signed offering to rent about 1,500 acres. It is expected that by the time the final payment is made by the Adjustment Administration those signing contracts will have received approximately $140,000. These contracts have two more years to run and plans are under way for their operation another year.

Our economics specialists spent 46 days on the dairy adjustment program. The nature of the work consisted of assembling factual information for the use of dairymen selling milk in the secondary markets and to arrange for marketing agreements in these markets. Advisory interpretation of this material was furnished in respect to formulating the various exhibits in the agreements and how they could best be adapted.

Under the direction of members of our College and county staffs, 23 communities conducted gardening and food preservation projects for their welfare groups. The projects not only gave welfare recipients an opportunity to be busy in their respective gardens or community gardens, but also helped materially to reduce the welfare costs in these communities. From these plots, it is estimated that 812,000 pounds of products were harvested and 212,300 jars canned, at a total value of $213,600, with the initial cost $38,000.

Among the other items of an emergency nature reported were: assisting 350 farmers in obtaining seed loans or other emergency Federal credit, 429 in making mortgage or other debt adjustments, 3,106 farm families in producing a larger part of their food, and 9,129 families in their home gardens or small poultry flocks.

The home economics section has been especially active in meeting the emergency. The State officers and the field workers of the Departments of Education, Public Health, and Public Welfare have been kept informed of the programs which are being carried by the extension service in the various communities. The nutrition specialist, with the assistance of the agents, has met with the members of public and private welfare boards to make suggestions regarding market orders. The clothing specialist has worked out organization plans and trained leaders to operate "Clothing Shops" where garments are renovated and distributed.

A survey of the relief work in seven towns, namely: Clinton, Maynard, Pepperell, Walpole, Ware, Webster, and West Springfield, was made in November. The survey covered the work of all the welfare agencies within the towns, how they were organized, their purpose, function and duties. It was found that those towns which

had community gardens saved money and gave the welfare recipients better food; that there was a need for the homemaker on welfare to learn how to budget, buy, and prepare food; and that classes were needed on how to utilize the yard goods furnished by the Red Cross and other agencies.

The extension staff is making an increasing use of radio. Four programs a week are presented over WBZ–WBZA, three by State specialists and one by the Middlesex county workers. Nineteen speakers took part in broadcasts over WGY. During the summer months, two programs a week were presented by county agricultural agents over WBZ–WBZA. A daily agricultural program, Farm Flashes, has been broadcast by six Massachusetts Stations. Recently the name has been changed to Farm and Garden Chats, and the number of stations has been increased to eight, including one each in New Hampshire and Maine. The Worcester county extension service presents a daily farm program which is outstanding in the entire country. During June, 1932, 150 requests for bulletins came to the mailing room of the extension service as a result of radio broadcasts. During the same month in 1933, the number was 580.

Our informational news has been continued to a selected list of daily, weekly, and farm papers; two of the feature weekly releases being The Back Yard Gardener and Fun at Home. Due to demand from citizens of the State for printed information, 28 extension leaflets were revised and 12 new ones printed.

Although the attendance at Farm and Home Week was not quite as large as in 1932, the visitors to the campus showed much interest in the programs and entered into the various discussions. Members of the staff assisted at the fall fairs in judging, demonstrations, in supervising camps and departments. Small unit exhibits, featuring some one practice, were prepared at the College and shown at nine fairs.

More different types of community organizations have requested Program Hints, a monthly service to those in charge of educational programs.

The cooperation of the members of the College staff, both resident and experiment station, has been most helpful in carrying on some of the extra duties of the extension service during this emergency period.

Agriculture

Extension work in agriculture in Massachusetts has been affected greatly by the National Farm Adjustment Program. The dairy industry has felt the influence of a proposal to supervise the production and sale of milk. In the Connecticut Valley the tobacco adjustment program has been undertaken and a great deal of the time and effort has been required of the extension agents. Farmers have devised programs of their own for adjusting their business; always one of the most helpful signs of recovery. Extension agents have been called upon to assist welfare committees in arranging for community gardens and for preserving the products of these gardens; and to aid various local agencies of the government to provide farmers with credit to continue their business.

The farm management and economic specialists, at the close of 1932, made an economic analysis of the dairy, poultry, and apple industries in Massachusetts in cooperation with the commodity extension specialists and others concerned. This was worked into a state-wide coordinated program of extension teaching for each of these projects. Assistance was then given in presenting these programs, together with the economic information on which they were based, to farmer committees in each county as a means for determining county extension programs to be stressed during the year. These series were supplemented by meetings in the towns of five counties on the same subjects, the county agents presented similar material and asked farmers in the community to decide upon a program.

The objectives back of this program making were: to develop extension programs founded upon economic fact, to more closely coordinate the work of various specialists, and to focus extension effort on those activities which seemed most urgent in view of less favorable farming conditions resulting from the depression.

Agricultural Economics

The Springfield Egg Auction was established patterned closely after the Brockton Auction which has been in operation a little more than a year. Surveys have been

made in Middlesex and Essex counties for a similar purpose. Apple growers of Middlesex County have been helped to reorganize a cooperative to handle apples. The local meetings of the New England Milk Producers' Association were attended and the economic situation presented. The Massachusetts Farm Bureau Federation and the Massachusetts Dairymen's Association appointed special committees to work with the extension agents on the codes and the marketing agreements.

The extension men were called upon to furnish a great deal of statistical information concerning the dairy industry of the State. A production outlook was prepared for apples, dairy products, poultry products, potatoes, onions, tobacco, turkeys, market garden crops, and small fruits. Statistical information concerning the supply of feed and fertilizer was also published. The New England Outlook was distributed and also *Farm Economics Facts*. A radio talk on the economic situation was given every month.

Agricultural Engineering

Two hundred plans for farm buildings have been distributed, 150 for dairy, 20 for poultry, and 30 miscellaneous. Fifty dairy structures and 10 three-deck poultry houses have been built, and 50 more dairy structures are contemplated during 1934. The value of these buildings amounts to about $150,000. This is the result of the establishment this year of a plan service which comprises a total of 35 designs. All are standard and available for use.

Agronomy

Potato acreage is increasing in Massachusetts. The 300 Bushel Potato Club had its largest enrollment, 33 members. Ten grew more than 400 bushels, 3 produced 500, and one 567 bushels to the acre. More thorough spraying has probably contributed to the increased yield than any other one practice.

Low milk prices and higher grain prices have resulted in a keener interest in home-grown feeds. The cheapest of these has been hay, and due to the low price for nitrogen, 3 dollars expended in fertilizer on good hay lands buys a ton of hay. Pasture improvement is now so general that no practical means of measuring the change has been found by extension agents. It is sufficient to say that the care of pastures is now a common farm practice on dairy farms. One farmer this year put 200 cows on good pasture and saved 2 cents a quart on the cost of producing milk. Two hundred and fifty acres of ladino clover have been planted for pasture purposes.

Animal Husbandry

A part of the coordinated programs for the dairy industry was adopted in every county in the State and consisted of the following: proved sires project resulting in an increase of 25 new animals being added to the list, animal breeding schools in nine counties, feeding schools in three counties, and many pasture meetings.

The disease control program pertained mostly to mastitis and Bang's disease; 26 meetings were held. Supplementing these meetings, the bromethymol blue test was demonstrated for the detection of mastitis. The tuberculosis eradication program has progressed speedily with practically all of the towns in the State having signed petitions for area tests. The program is so well under way that it seems as though the goal of complete eradication might be reached in 1934.

Milk marketing has been a major project of the extension agents in most counties. Many codes and marketing agreements have been formulated. These are now pending approval and adoption.

Farm Management

Farm Management continued to assist Agricultural Economics extension during 1933 in supplying farmers with annual and seasonal outlook information regarding production and marketing conditions. Seasonal information on onions, potatoes, and other vegetables has also been prepared at timely intervals as well as regular monthly articles on farm prices, labor and farmers' purchasing power for Farm Economic Facts.

Account work has been continued both as a means of supplying information for extension teaching and affording farmers a means of analyzing the factors affecting

costs and returns on individual farms. In carrying out these projects, about 350 account books were distributed to poultrymen, 20 to market gardeners, and 80 to general and dairy farmers. Apple cost records have also been kept by about 50 farmers and potato cost records by 30. Mimeographed summary reports, based upon cost accounts of the previous year, were prepared, showing detailed costs of growing both apples and potatoes on these farms.

Under emergency work, direct assistance has been given with the educational campaign and with field inspection work in carrying out the United States Government's tobacco acreage reduction program in the Connecticut Valley. In connection with this work, the farm management specialists discussed the program with 409 tobacco growers, assisted in training inspectors, made farm visits, and tabulated the data from 500 inspection reports for permanent record. Direct assistance was also given last spring in helping farmers make application for government loans to finance their 1933 crop production.

Herd Improvement Association records were summarized for two county associations for the purpose of bringing out efficiencies in feeding practices. Survey records were also obtained from 22 dairymen in one of the counties for the purpose of determining further economies in the operation of dairy farms. More than the usual amount of subject matter information has been given to farmers relative to farm reorganization and to prospective farmers relative to experience and capital required, opportunities in, and probable returns from farming.

Forestry

Special attention has been given to planting and care of forests. Reports show that farmers planted over 116,000 trees, thinned 1,333 acres, weeded 736 acres, pruned 257 acres, and cut 6,211 cords of wood. The weeding and the wood were used for home consumption and for sale. A market for the trash wood from thinnings was found through the production of sawdust. Two machines reducing the wood to chips and then to sawdust have been found. An attempt to have these installed at various points in the State will be made.

In the hope of creating interest, a booklet on establishing school forests has been prepared. Much time has been spent in the C. C. C. Camps in instructing the boys in forestry and assisting them with their projects.

Home Grounds

A three-meeting project was held in 31 centers to teach the theory, value, and practice of gardening on the home grounds. Demonstration meetings have been held in 22 communities on such subjects as outdoor fireplaces, flower arrangement, planting, Christmas greens, and the construction and maintenance of gardens. Among the welfare projects supervised were improvement of school grounds, parks, swimming pools, and highway improvement.

A highway improvement institute was held at the College for local officials and interested persons to receive constructive suggestions for the improvement of roadsides in such a way that they would not be a burden to the taxpayers in the future. The results are becoming evident along the highways of this State.

Horticultural Manufactures

Twenty-three communities worked on the emergency food program. The majority of these communities actually went into the garden and canning project with the result that a total of approximately 500 acres of community gardens were planted. The total canning approximated 212,000 cans. Stored crops for winter distribution amounted to approximately 20 tons in four communities having "mass" gardens. No reduction of activity in home food preservation was apparent with 5,546 in attendance at 206 meetings.

Interest in storage activities has continued with the creation of two custom storages at country points with a combined capacity of 100,000 bushels and the refrigeration of three air-cooled storages totalling 28,000 bushels. In spite of the interest in refrigerated storage, there are more air-cooled storages in process of development than for a long time. Six potato storages have been developed with a capacity of more than 50,000 bushels.

Plant Pathology

The radio spray service for apple scab control was continued over WBZ, WEEI and WTAG. This information was based upon detailed study of the development of scab spores in different parts of the State, together with special daily weather forecasts from the Boston office.

The cause and control of diseases of fruits, vegetables, potatoes, and ornamentals were given by means of illustrated and radio talks, field surveys, news articles, method and result demonstrations, diagnosis, and correspondence. In the vegetable disease control sub-project, emphasis on seed treatment, soil disinfection with formaldehyde dust, and crop rotation was stressed. The results of these methods were outstanding in most instances in the form of marked reduction in damping-off of tomatoes, peppers, and other crops in plant houses and hot beds where formaldehyde dust was used; increases in stand and yield of spinach and carrots from mere traces to 200 per cent from seed treatment with red oxide of copper; and a very noticeable reduction in the amount of black rot in stored squash from seed disinfection, two to three year crop rotation, and squash dipping in formaldehyde at harvest.

Other demonstrations for the control of important diseases were as follows: determination of seed borne diseases of sweet corn, seasonal behavior of the nematode causing strawberry "dwarf" on Cape Cod, importance of outside nurseries and local growers as sources of black-root and other diseases of strawberries, and new spray materials for apple scab control.

Pomology

Orchard pest control is still receiving major emphasis. Eighty-six growers have qualified this season for the "90% Clean Apple Club," compared to 57 last year. This list includes eight growers whose orchards were badly infested four years ago, and who have since cooperated in apple maggot control.

More attention has been paid to the removal of neglected apple trees than ever before. A survey showed in the neighborhood of 10,000 such trees removed by fruit growers in Massachusetts. Five apple maggot control areas have been conducted, each involving from 6 to 12 property owners.

A motion picture depicting proper methods of spraying was shown to 1,654 growers, and a similar picture on picking and handling apples is available for the coming year. Along marketing lines the most important development is the widespread use of the orchard crate, by at least a half of the commercial growers.

Poultry

Definite progress has been made in breeding for egg size, greater uniformity generally, and early feathering. The latter is of considerable economic value, especially in marketing broilers, as it adds 2 to 5 cents a pound to the selling price.

A recent survey on 200 or more poultry farms indicates that poultrymen are making use of information on disease control and poultry sanitation, as the present crop of pullets is above the average in quality for the past few years.

There has been an increased demand for schools on poultry housing and information on remodeling barns and ventilating poultry houses. This project has stimulated the use of newer methods in ventilation and environmental control.

For years, poultrymen in many sections have been seeking a method of determining sex at hatching time. Now that this has been accomplished, many of our poultrymen are planning to destroy the males at hatching time if meat prices remain at or near present levels, as the cockerels cannot be profitably grown at present price levels.

HOME ECONOMICS

The most important line of endeavor by both the Extension Staff and the homemakers of the State has been to secure factual basis for program planning and action in the various phases of homemaking. Unless there is an "awareness" of the existing needs with an earnest desire to want to do something about it, little progress will be made.

There has been an increasing interest in both the regular educational program in homemaking and in the assistance given in the relief work of the State. One

objective of the program is to extend it into a larger number of homes, and this has been successfully accomplished. During the past year, the number of families taking advantage of adult education with the Extension Service increased from 25,081 to 27,267. This increase was made possible because of the fine leadership on the part of 3,858 leaders who assisted in disseminating information. During the past year, increased effort was made to coordinate the work of all specialists to meet the needs of the homemakers more effectively.

In relief programs there has been very close cooperation with such agencies as the Departments of Education, Public Health, Public Welfare, and the Red Cross. Never in the history of the service have its workers been called upon to assist with plans and programs of other agencies to the extent they were during 1933.

Child Development and Parent Education

Realizing that learning is an important factor in the behavior of children, consideration has been given to how the child learns and the responsibility of the home in stimulating the type of learning which will be found most effective. Emphasis has been placed upon the development of self-reliance in thinking and acting, as well as the encouragement of a spirit of cooperation in the individuals in the home rather than a competitive relationship. It is recognized that a feeling of security and confidence in the environment and with one's self is a fundamental need of human nature.

In the past, little attention has been given to the problems of the adolescent stage of development, an expressed need of parents. This year, definite plans were made to fill this need. Many mothers of teen-age children were gotten together for study, and the discussions extended to a large number of women through trained leaders. Their leadership has also sustained interest in child development and parent education, and stimulated related activities beyond the duration of the organized program.

Clothing

As money for clothing expenditures continues to be limited, major efforts were directed toward teaching methods of renovating and making over clothing for themselves and families to the largest possible number of women. Safe methods to use at home in cleansing, dyeing, and pressing as applied to men's, women's and children's garments have been stressed. Fifty-nine women in one section reported saving $84.00 in the course of six weeks, largely through the use of improved methods in renovating clothing. Renewing worn clothing for adults and transforming old materials into attractive useful garments for children formed the major part of the program. One leader reported a saving of $66.75 on 16 garments remodeled in her local group. Representatives of clothing welfare agencies have attended the majority of these meetings in order to secure information to help them in their relief problems.

With lowered incomes, the need for clothing construction has increased and it has been necessary to organize beginners' classes. These mothers had never learned to sew, to use a pattern, or to take care of a sewing machine. Leaders trained in clothing construction have assisted with this work.

Community Program Planning

Special emphasis has been made this year on planning community programs in recreation to take care of the individual as well as the community needs. Assistance in conducting community studies has been given to make the homemakers more aware of the existing conditions of their community. In accomplishing this, there has been cooperation with every organization within the community.

Music and amateur dramatics were encouraged in both family and community programs. A play writing tournament is being conducted to encourage the production of amateur plays. Historical pageants have been written and staged by homemakers. The interest in recreation is very keen. Attendance at all kinds of meetings is increasing and the need for wholesome, home-made recreation is very evident. Many leaders in recreation have been developed through study classes.

Our objective has been to help solve the problem of a better use of leisure time.

In every community with an increasing number of young men and women, many of whom are unemployed, the problem of recreation has been acute. A recreation institute held at the college last spring was a beginning in the plan to have each community study its facilities, human and physical, and its needs and interests in order to get a plan for recreation for all age groups.

Family Finance

Due to economic conditions, homemakers throughout the State have felt the need for help in money management. The Home Accounts Project has been carried in an effort to give the homemakers assistance in maintaining their standards of living on lowered incomes. In addition to this program, single meetings in Family Finance have been held in all sections of the State. Through the keeping of home accounts, the families are able to help themselves by analyzing where the money goes and in making a plan for spending the family income. In this way the home is placed on a more stable financial basis for the future.

Home Furnishing

Attractive home surroundings can play an important part toward keeping up the morale of families in these uncertain times. Many homemakers of the State have realized this fact and have used their ingenuity in making the home as attractive and cheerful as possible at little or no cost. The continued use of good furniture which adds to the attractiveness of the home has been made possible through refinishing and reupholstering.

With the size of the family augmented by relatives who have been taken into the home because of unemployment, and because of the need for more home recreation, it is very necessary that homemakers be given assistance in making their homes as comfortable, convenient, and attractive as possible.

Home Management

During the past year, emphasis has been placed upon better use of the homemaker's time. An effort has been made to find what the time problems are, what resources are available, and to suggest ways and means for reducing time in routine work. An effort has been made to make the entire family time-conscious so that the best possible adjustments may be made in the distribution and use of time within the home.

Special emphasis has been placed upon the need for a plan of work so that there may be time for home leisure, activities, and recreation, and a participation in community programs. Inexpensive time-saving conveniences that can be made at home have been used at the group discussions on the use of the homemaker's time.

Assistance in better buying practices has been given through study groups. The increasing number of homemakers who are adding to the income through some kind of productive work such as handicraft, wayside stands, tea rooms, and tourist homes have received help through study groups and home visits.

Nutrition

Since, in most families, the cost of food is the largest item in the budget, it is always important that economy in food purchasing be emphasized. During the past year, with decreased incomes, more attention has been paid to teaching homemakers how to provide the greatest amount of nourishment at the smallest cost. Particular emphasis has been put upon building the inexpensive diet around milk, vegetables, and the grain products. The food preservation, gardening, and nutrition specialists have worked together to make available vegetables in the home garden, and to teach their value and use in family meals. Continued effort has been made to interest mothers with small children in the study of their nutrition problems. Advice has been given to welfare agencies, particularly in small towns, on how best to spend the money allotted for food. Assistance has also been given to the families on relief as to how to use the food to the best advantage.

4-H CLUB WORK

The slogan for 4-H Club members for 1933 has been "Home Made Happiness." Keener interest has been maintained among the club members of the State and more older members have taken an active part in promoting the work. Each county has a group of older members known as a Service Club, whose objective is to aid the county club agents in furthering and developing their program. These groups sent delegates to the State camp to discuss common problems, and consider the possibility of a state-wide organization.

The enrollment in 1933 was 19,728, or an increase of 21% during the past five years. The greatest increase has been among the older club members. This may be partly due to the increase in number of volunteer local leaders, there being 1,618, or an increase of 42% over 1929.

The State camp, Camp Gilbert, was reorganized into two 10-day camps. The young people were invited to attend according to our major projects. Only older club members were invited, as it was the intention to have only leaders or prospective leaders in attendance. In this way, it was hoped that with the training they received they would be able to return to their respective communities and act as leaders or assistant leaders. This plan resulted from the program arranged in 1932, when more than 85% of those in attendance returned home and became leaders in their communities.

The new Farley 4-H Building on the campus, built by money subscribed by 4-H Club boys and girls and their friends in sums ranging from one cent to fifty dollars, has become a reality. The building will be used by the State camp, county groups, the campus 4-H Club, as well as numerous other groups coming to the College.

Boys' Work

The depression has seemed to offer an added impetus to the work. An increase of 660 boys in the agricultural projects over the preceding year was noted. One of the most gratifying trends has been the desire of more older boys to retain active membership in the work. There were 142 more boys over 16 years of age than there were a year ago. The state dairy judging team won first place at the Eastern States Exposition in competition with seven states. One of the animals of a Massachusetts boy's own breeding won the breed championship in the 4-H classes. The most promising leaders in the handicraft project were those trained at the State camp. This, supplemented with county and sectional training meetings, has been a contributing factor in the growth of the project. The number in the garden club project increased in every county with over 4,000 enrolled. The first state-wide 4-H garden club exhibit was held at Boston in connection with an exhibit of the Massachusetts Horticultural Society. Over 20,000 hens belonging to the club members were entered in the seven months' egg laying contest, resulting in the highest average yield of any contest. The enrollment remained about the same, but more older members were continuing with the project. Massachusetts won second place in the National 4-H poultry judging contest in New York.

Girls' Work

4-H Club enrollment among the girls increased by 906 over 1932.

All the girls' projects showed the results of stronger leader training programs. Emphasis was placed on making products with less cost and a higher standard of workmanship.

The majority of the girls enrolled in 4-H Club work carried on some phase of community service work as a part of their Heart-H program. More than 50 different types of service were reported, varying from the preparation of meals for an aged couple to the making of scrapbooks for children in hospitals.

Members have been on the alert to preserve surplus products and those enrolled in the project report canning 153,710 jars. Interest has been maintained in the food preparation, lunch box, and nutrition projects. As a part of the project, 32,000 meals were prepared and 19,673 lunches packed. Special emphasis has been placed on the care and repair of clothing, in addition to making new garments, gifts, household, and miscellaneous articles. It is estimated that the girls enrolled in the clothing and home-craft projects saved better than $6,300. Grain bags were

used by many of those girls living on farms as a source of material for the garments made. One of the interesting phases of the room improvement project was a $2 contest carried in one county. A phase of the 4-H radio broadcasts was the presentation of the music memory contest. The numbers played were those used in the music appreciation project.

WILLARD A. MUNSON,
Director.

REPORT OF THE TREASURER

The support of the College comes principally from State appropriations. In 1933 the Legislature appropriated to the College the sum of $933,070.00. During the year, there was a balance of $20,007.91 brought forward to cover bills that were incurred but not paid in the previous fiscal year. This makes a total amount of $953,077.91. There has been expended an amount of $922,206.41, leaving an unexpended balance of $30,871.50 to take care of outstanding accounts, and including our fuel bills which amount to $24,597.40. This leaves a net balance of $6,274.10 of our State appropriation for 1933 reverting to the Commonwealth.

The Federal year ends June 30th of each year. Payments from the Federal Government to the College Treasurer are made at the beginning of the year—some for the full year, some for a six months' period, and some quarterly. The greater call for Extension Service funds comes after the beginning of the new fiscal year, so that the balance of these funds at the close of the State fiscal year is much greater than it would ordinarily be if the funds were received and paid on a pro rata basis. The balance of the Federal funds brought forward December 1, 1932, was $63,081.06, and the annual Federal appropriation received during the year was $214,508.61, making a total of $277,589.67 available during the State fiscal year. There was expended during the State fiscal year $215,882.00, leaving a balance of $61,707.67 that was brought forward at the close of that fiscal year.

Our Trust Funds, which include Endowment Securities, Dining Hall, Athletics, etc., show a balance of $88,600.89 brought forward December 1, 1932. The receipts were $270,031.73, making a total of $358,632.42 available for the year. The expenditures during the year were $282,003.03, leaving a balance of $76,629.39.

The special appropriations granted by the Legislature for the year 1933 were $30,000. This included:

$25,000	Steam Mains
2,500	Aid to Certain Students
2,500	Emergency Crop Production

There was brought forward a balance of $14,965.81 and of this amount, $12,254.78 reverted to the State Treasurer as the period for which these funds were appropriated had passed. This leaves a balance of $2,711.03 for use during the year, plus our appropriation of $30,000, made this year, gives the total amount of $32,711.03 available. There was expended during the year $24,890.56, leaving a final balance of $7,820.47.

A summary of our receipts and disbursements is as follows:

Dec. 1, 1932	Balance	$166,647 56	
Nov. 30, 1933	Available Funds	1,467,618 25	
			$1,634,265 81
Nov. 30, 1933	Expenditures	$1,444,982 00	
Nov. 30, 1933	Reverted to the Commonwealth	12,254 78	
			1,457,236 78
Nov. 30, 1933	Balance unexpended		$177,029 03

This unexpended balance is divided as follows:

College	$30,871 50
Federal Funds	61,707 67
Endowment	23,318 80
Student and other Trust Funds	53,310 59
Special Appropriations	7,820 47
	$177,029 03

The receipts of the Institution for the year were $264,376.88. This is a decrease of $2,234.55, which is largely due to a decrease in the Control Laws.

The inventory of the Institution shows a value of $3,214,278.27, a decrease of $6,347.28 over the preceding year, due to a decrease in the inventory of the Power Plant supplies.

The income from our Endowment Funds amounts to $7,132.76. This was decreased by an amount of $829.50 due to a default in the payment of interest on our New York Central stock, $132.00, and on the following bonds:

State & Washington Building	$150 00
Texas-Louisiana	300 00
Prudence Bonds Corp.	55 00
Prudence Company	192 50
	$829 50

The total amount of invested funds at the par value is $148,339.83, and the market value December 1, 1933, was $92,466.83, which is sixty-two plus per cent of our total investment.

This year we received the William Wheeler bequest of $10,000.00, which was invested in United States Treasurer bonds, 1946, at 3⅛%.

From our Trust Funds, there were one hundred and twenty-four loans made to students during the year, amounting to $8,032.50.

An examination of the accounts of the Institution for the year ending November 30, 1932, was made under the direction of the State Auditor.

A complete detail of all receipts and expenditures follows.

Fred C. Kenney,
Treasurer.

REPORT OF THE TREASURER

For the Fiscal Year Ending November 30, 1933

Consolidated Statement of Federal and State Credits and Payments

		Debit	Credit
1932			
Dec. 1.	To balance on hand	$63,081 06	
1933			
Nov. 30.	To interest on Government funds	97 02	
Nov. 30.	To departmental income	264,376 88	
Nov. 30.	To receipts from State Treasurer	747,084 72	
Nov. 30.	To receipts from United States Treasurer	208,524 93	
Nov. 30.	To bills paid by State Treasurer	206,543 06	
Nov. 30.	Refunds transferred to State Treasurer		$644 15
Nov. 30.	Expenditures for fiscal year		1,162,881 95
Nov. 30.	Income transferred to State Treasurer		264,376 88
Nov. 30.	Income transferred to U. S. Treasurer		97 02
Nov. 30.	Balance on hand		61,707 67
		$1,489,707 67	$1,489,707 67

Comparative Receipts for Five Years Ending November 30, 1933

	1929	1930	1931	1932	1933
Charges to Students	$66,240 94	$70,684 26	$81,360 67	$97,856 20	$126,306 26
Personal Services and Retirement	1,065 53	1,412 60	1,831 94	1,479 26	776 33
Sales	70,827 73	64,927 98	63,502 90	66,101 68	54,885 17
Miscellaneous	8,190 63	7,382 31	6,950 90	4,797 88	3,026 41
Totals	$146,324 83	$144,407 15	$153,646 41	$170,235 02	$184,994 17
Experiment Station	23,422 21	17,293 60	16,161 80	6,981 71	2,895 33
Laws	81,956 97	79,361 74	80,176 82	68,522 84	52,920 69
Service	1,252 10	1,039 13	998 25	1,077 25	922 45
Totals	$106,631 28	$97,694 47	$97,336 87	$76,581 80	$56,738 47
Extension Service	824 81	769 56	479 08	328 91	243 32
Short Courses	17,796 80	17,875 75	19,791 25	19,361 50	22,280 00
Waltham Field Station	272 47	282 25	295 73	104 20	120 92
Grand Totals	$271,850 19	$261,029 18	$271,549 34	$266,611 43	$264,376 88

Comparative Expenditures from State Appropriations for Maintenance Expenses for Five Years Ending November 30, 1933

	1929	1930	1931	1932	1933
Administration	$41,492 16	$37,105 61	$37,826 82	$34,668 00	$33,694 63
Instruction	226,785 53	232,457 39	242,989 15	249,050 88	235,472 30
Maintenance:					
Departmental	70,387 26	66,451 57	65,826 49	64,184 53	61,118 47
Farm	29,304 17	35,391 53	34,417 78	34,262 55	30,086 16
Operating	53,074 13	61,468 63	66,808 23	64,812 48	61,188 96
Repairs	21,859 57	24,345 07	22,965 94	20,864 95	26,741 18
Replacements	1,933 66	1,574 28	1,511 30	794 49	468 27
Travel	6,231 77	5,966 07	5,332 77	3,444 45	2,972 67
Supplies and Equipment	98,498 47	95,383 04	93,599 11	87,869 50	84,721 02
Heat, Light and Power	47,284 31	44,108 71	32,203 00	41,180 81	34,263 24
Farm	—1,596 04	—3,836 26	—2,280 40	—3,007 11	—1,972 64
Repairs	20,215 60	27,254 86	21,045 73	17,834 73	24,142 41
Replacements	19,846 31	19,797 88	18,165 36	8,903 43	7,611 91
Printing Reports	1,150 59	1,137 42	2,013 70	425 49	1,148 05
Trustees Expenses	1,029 28	795 34	690 63	1,299 03	1,199 88
Totals	$637,496 77	$649,401 14	$643,115 61	$626,588 21	$602,856 51
Experiment Station:					
Personal Service	78,180 76	83,336 12	86,722 64	90,935 11	79,615 17
Supplies and Equipment	18,050 75	18,986 16	17,143 22	14,345 88	17,182 68
Travel	2,461 02	2,735 59	2,669 17	1,724 49	1,708 68
Totals	$98,692 53	$105,057 87	$106,535 03	$107,005 48	$98,506 53
Dairy Law:					
Personal Service	481 60	484 50	547 35	621 00	512 90
Travel	376 42	370 22	353 07	331 28	293 77
Supplies and Equipment	94 92	514 32	371 08	215 63	180 87
Sub-totals	$952 94	$1,369 04	$1,271 50	$1,167 91	$987 54
Feed Law:					
Personal Service	8,725 15	8,489 69	8,628 66	8,802 84	8,539 19
Travel	541 79	449 04	428 91	336 94	416 78
Supplies and Equipment	1,682 16	1,724 62	1,803 68	1,065 17	1,085 74
Sub-totals	$10,949 10	$10,663 35	$10,861 25	$10,204 95	$10,041 71
Fertilizer Law:					
Personal Service	10,890 56	10,954 90	11,222 84	11,092 33	10,891 63
Travel	1,214 97	955 96	1,163 15	841 86	740 75
Supplies and Equipment	1,701 99	2,699 14	2,636 02	2,457 94	2,801 21
Sub-totals	$13,807 52	$14,610 00	$15,022 01	$14,392 13	$14,433 59

Comparative Expenditures from State Appropriations for Maintenance Expenses for Five Years Ending November 30, 1933 (*Continued*)

	1929	1930	1931	1932	1933
Poultry Law:					
Personal Service	$19,167 52	$21,611 22	$23,709 46	$20,515 30	$17,594 65
Travel	2,827 24	3,276 53	2,884 26	1,659 98	1,122 67
Supplies and Equipment	12,630 19	11,843 22	14,484 67	8,032 23	2,279 00
Sub-totals	$34,624 95	$36,730 97	$41,078 39	$30,207 51	$20,996 32
Seed Law:					
Personal Service	3,734 14	3,354 80	3,800 24	4,506 04	4,218 85
Travel	66 15	71 66	102 91	33 24	28 93
Supplies and Equipment	898 11	1,647 01	1,262 10	1,037 40	827 36
Sub-totals	$4,698 40	$5,073 47	$5,165 25	$5,576 68	$5,075 14
Laboratory Service:					
Personal Service	4,939 20	5,010 22	5,325 00	4,900 57	4,325 00
Maintenance	511 61	488 44	436 14	237 42	392 03
Sub-totals	$5,450 81	$5,498 66	$5,761 14	$5,137 99	$4,717 03
Grand Totals	$70,483 72	$73,945 49	$79,159 54	$66,687 17	$56,251 33
Extension Service:					
Personal Service	$58,849 83	$65,899 79	$67,384 00	$66,071 65	$58,226 31
Supplies and Equipment	17,066 89	17,809 75	18,755 56	14,033 51	15,758 66
Travel	20,248 28	21,608 12	23,334 12	19,012 45	15,722 54
Sub-totals	$96,165 00	$105,317 66	$109,473 68	$99,117 61	$89,707 51
Short Courses:					
Personal Service	59,221 50	60,988 59	64,023 97	59,635 66	56,878 09
Travel	1,624 45	1,461 94	1,552 54	1,193 34	1,048 52
Supplies and Equipment	9,420 11	9,166 61	9,360 11	8,231 53	6,871 58
Sub-totals	$70,266 06	$71,617 14	$74,936 62	$69,060 53	$64,798 19
Waltham Field Station:					
Personal Service	7,994 87	8,619 48	9,355 48	4,575 33	4,404 24
Maintenance	4,889 72	6,561 60	6,902 36	6,295 95	5,682 10
Sub-totals	$12,884 59	$15,181 08	$16,257 84	$10,871 28	$10,086 34
Grand Totals	$985,988 67	$1,020,520 38	$1,029,478 32	$979,330 28	$922,206 41

Summary of Inventory

Land	$176,693 08
College Buildings	1,893,816 67
College Equipment	918,410 32
Experiment Station: Buildings	90,926 86
Experiment Station: Equipment	134,431 34
Total	$3,214,278 27

Dining Hall Statement, November 30, 1933

Balance Dec. 1, 1932		$14,631 88	
Less Dec. 1932 Board paid in advance		5,013 18	$9,618 70
Disbursements			
Labor	$30,335 74		
Provisions	47,202 18		
Rent	2,600 00		
Refunds	2,297 75		
Laundry and Fuel	2,980 84		
Permanent Equipment	6,646 43		
China, Glass and Equipment Repairs	1,263 84		
Miscellaneous	1,686 60	$95,013 38	
Outstanding Bills		2,813 58	
Outstanding Accounts 11/30/33:			
Board			860 14
Special Service			72 41
Inventory 11/30/33			3,681 08
Total Collections 12/1/32–12/1/33			83,109 38
Dec. 1932 Board collected before December			5,013 18
Balance		4,527 93	
		$102,354 89	$102,354 89

Consolidated Endowment Funds

Name and Description of Funds	Operation of Fund for the Year Ending Nov. 30, 1933			Balance to Credit of Fund Nov. 30, 1933	
				Income	*Principal*
Alvord Dairy Scholarship — Gift of Henry E. Alvord (1914). Income used for graduate work in Dairy Industry.	*Receipts*				
	Balance Dec. 1, 1932	$242 70			
	Income from investment	228 93			
			$471 63		
	Payments				
	Expended for scholarships	510 00			
	Balance Nov. 30, 1933	—38 37			
			471 63	$—38 37	$4,000 00
D. K. Bangs Fund — Gift of Louisa A. Baker (1909). Income used as a loan fund.	*Receipts*				
	Balance Dec. 1, 1932	1,435 51			
	Loans outstanding Dec. 1, 1932	6,361 90			
	Income from investment	350 00			
	Income from interest on loans	206 40			
	Unearned premium on bonds	31 25			
			8,385 06		
	Payments				
	Loans made and outstanding Nov. 30, 1933	5,548 97			
	Loan cancelled	142 50			
	Expense in changing bonds	34 73			
	Balance Nov. 30, 1933	2,658 86			
			8,385 06	2,658 86	7,000 00
George H. Barber — Gift of George H. Barber (1927). Income to be used for encouragement of general athletics.	*Receipts*				
	Income from investment	250 00	250 00		
	Payments				
	Transferred to Sessions Fd.	197 00			
	Balance Nov. 30, 1933	53 00			
			250 00	53 00	5,000 00
Burnham Emergency — Gift of T. O H. P. Burnham of Boston (1893). Income to be used in cases of emergency without restrictions.	*Receipts*				
	Balance Dec. 1, 1932	72 56			
	Income from investment	305 00			
			377 56		
	Payments				
	Expended under order of President	249 14			
	Balance Nov. 30, 1933	128 42			
			377 56	128 42	5,500 00

Name and Description of Funds	Operation of Fund for the Year Ending Nov. 30, 1933		Balance to Credit of Fund Nov. 30, 1933	
			Income	*Principal*
F. G. Crane Fund — Gift of F. G. Crane of Dalton (1924). Income used for scholarships, preference being given to residents of Berkshire County.	*Receipts*			
	Balance Dec. 1, 1932	$2,744 37		
	Income from investment	1,424 46		
	Income from interest on loans	2.40		
		4,171 23		
	Payments			
	Expended for scholarships	2,690 00		
	Balance Nov. 30, 1933	1,481 23		
		4,171 23	$1,481 23	$25,250 00
John C. Cutter — Gift of Dr. John C. Cutter of Worcester, Mass. (1909). Income to be used for purchase of books on Hygiene.	*Receipts*			
	Balance Dec. 1, 1932	21		
	Income from investment	50 00		
		50 21		
	Payments			
	Expended for Books on Hygiene	17 09		
	Balance Nov. 30, 1933	33 12		
		50 21	33 12	1,000 00
Endowed Labor Fund — Gift of a friend of the College (1901). Income to be used for student labor.	*Receipts*			
	Balance Dec. 1, 1932	405 66		
	Income from investment	320 00		
		725 66		
	Payments			
	Expended for student labor	25 80		
	Balance Nov. 30, 1933	699 86		
		725 66	699 86	9,000 00
J. D. W. French Fund —Gift of the Bay State Agricultural Society (1923). Income used to defray expenses of judging team to National Dairy and Livestock shows, also scholarships, loans and prizes in Dairying and Forestry.	*Receipts*			
	Balance Dec. 1, 1932	1,762 65		
	Income from investment	568 92		
		2,331 57		
	Payments			
	Expended for student judging trips	539 15		
	Expended for scholarships	310 00		
	Expended for speakers on Animal Husbandry	72 22		
	Balance Nov. 30, 1933	1,410 20		
		2,331 57	1,410 20	10,000 00
Gassett Scholarship — Gift of Henry Gassett of Boston, Mass. (1888). Income used for scholarships	*Receipts*			
	Balance Dec. 1, 1932	295 67		
	Income from investment	53 75		
		349 42		
	Payments			
	Balance Nov. 30, 1933		349 42	349 42	1,500 00
Charles A. Gleason Fund — Gift of Charles A. Gleason of North Brookfield (1926). Income used as a loan fund to students.	*Receipts*			
	Balance Dec. 1, 1932	867 94		
	Loans outstanding Dec. 1, 1932	790 00		
	Income from investment	137 50		
	Income from interest on loans	53 20		
		1,848 64		
	Payments			
	Loans made and outstanding Nov. 30, 1933	1,230 40		
	Balance Nov. 30, 1933	618 24		
		1,848 64	618 24	5,000 00
Grinnell Prize Fund — Gift of Hon. Wm. Claflin (1874). Income to use as a prize fund and given to the two members of the graduating class who pass the best examination in theory and practice of agriculture.	*Receipts*			
	Balance Dec. 1, 1932	476 87	476 87	
	Payments			
	Expended for prizes	50 00		
	Balance Nov. 30, 1933	426 87		
		476 87	426 87	1,000 00
Hills Fund — Gift of Leonard M. and Henry Hills of Amherst (1867). Income to be used to establish and maintain a Botanic garden. Botany $291 37 Hort. 607 69	*Receipts*			
	Balance Dec. 1, 1932	672 49		
	Income from investment	618 11		
		1,290 60		
	Payments			
	Expended for Botany and Hort. Departments	899 06		
	Balance Nov. 30, 1933	391 54		
		1,290 60	391 54	16,114 75

Name and Description of Funds	Operation of Fund for the Year Ending Nov. 30, 1933			Balance to Credit of Fund Nov. 30, 1933	
				Income	*Principal*
Library Fund — 1883–1894. This fund raised by alumni and other friends of the College. Income to be used to purchase books for Library.	*Receipts*				
	Balance Dec. 1, 1932	$130 73			
	Income from investment	461 63			
			592 36		
	Payments				
	Expended for books for Library	569 50			
	Balance Nov. 30, 1933	22 86			
			592 36	$22 86	$10,375 52
M. S. C. Investment (1893). Investment made by vote of Trustees in 1893. Income of this fund is allowed to accumulate.	*Receipts*				
	Balance Dec. 1, 1932	–	131 76		
	Payments				
	Balance Nov. 30, 1933	–	131 76	131 76	550 00
Porter L. Newton Fund — Gift of Porter L. Newton of Waltham, Mass. (1926). Income to be used for scholarships.	*Receipts*				
	Balance Dec. 1, 1932	951 19			
	Income from investment	1,255 55			
			2,206 74		
	Payments				
	Expended for scholarships	1,840 00			
	Balance Nov. 30, 1933	366 74			
			2,206 74	366 74	23,411 33
Robt. F. Pomeroy Library Fund — Gift of Ellen Pomeroy Moore (1928). Income to be used to purchase books on Horticulture and Landscape Architecture for that section of the Library.	*Receipts*				
	Balance Dec. 1, 1932	72 07			
	Income from investment	75 00			
			147 07		
	Payments				
	Expended for books on Hort. and Land. Arch.	73 24			
	Balance Nov. 30, 1933	73 83			
			147 07	73 83	1,500 00
Alan Leon Pond Memorial (1920). Given by friends of the College to establish a fund, income of which to be used for the promotion of athletics.	*Receipts*				
	Income from investment	33 16			
			33 16		
	Payments				
	Expended for medal	23 46			
	Balance Nov. 30, 1933	9 70			
			33 16	9 70	744 78
Mary Robinson Fund — Gift of Mary Robinson of Medford (1874). Income used for scholarships.	*Receipts*				
	Balance Dec. 1, 1932	48 33			
	Income from investment	31 23			
			79 56		
	Payments				
	Balance Nov. 30, 1933	–	79 56	79 56	1,000 00
Wm. R. Sessions Fund — Gift of Clara Markham Sessions (1918). Income used for the college as the Trustees may direct.	*Receipts*				
	Balance Dec. 1, 1932	680 82			
	Income from investment	427 00			
			1,107 82		
	Payments				
	Expended under order of President	1,029 59			
	Balance Nov. 30, 1933	78 23			
			1,107 82	78 23	5,000 00
Betty Steinbugler Fund — Gift of John L. Steinbugler (1930), as a prize for the best essay in English written by a junior or senior girl.	*Receipts*				
	Income from investment	7 27	7 27		
	Payments				
	Expended for prize	7 00			
	Balance Nov. 30, 1933	27			
			7 27	27	200 00
Whiting Street Scholarship Fund — Gift of Whiting Street of Northampton, Mass. (1879). Income used for scholarships.	*Receipts*				
	Balance Dec. 1, 1932	97 06			
	Income from investment	40 00			
			137 06		
	Payments				
	Balance Nov. 30, 1933	137 06	137 06	137 06	2,000 00
William Wheeler Fund — Gift of William Wheeler of Concord, Mass. (1933). Income to be used for the best interests of the College in the judgment of the Trustees.	*Receipts*				
	Income from investment	23 33			
	Unearned premium on bond	6 37			
			29 70		
	Payments				
	Expense in connect. buying bond	47 74			
	Balance Nov. 30, 1933	–18 04			
			29 70	–18 04	10,000 00
Helen A. Whittier Scholarship Fund — Given by Mass. State Federation of Women's Clubs (1929). Income to be used for scholarships in Art as applied to living.	*Receipts*				
	Balance Dec. 1, 1932	206 54			
	Income from investment	172 30			
			378 84		
	Payments				
	Expended for scholarships	274 98			
	Balance Nov. 30, 1933	103 86			
			378 84	103 86	3,193 45
				$9,198 22	$148,339 83

Trust Account

Student Loan Fund

		Distribution	
		Notes	Cash
Original Gift	$500 00	–	–
Interest earned	100 08	–	–
	$600 08	$585 00	$15 08

4-H Club for Boys

Original Gift	$1,000 00	–	–
Interest earned	97 18	–	–
	$1,097 18	$805 00	$292 18

4-H Club for Girls

Original Gift	$100 00	–	–
Additional	35 00	–	–
Interest earned	16 45	–	–
	$151 45	$140 00	$11 45

Vincent Goldthwait Loan

Original Gift	$5,175 00	–	–
Additional	275 00	–	–
Interest earned	42 50	–	–
	$5,492 50	$3,297 50	$2,195 00
		$4,827 50	$2,513 71
Total Trust Fund Account		$7,341 21	

Endowment Fund — Securities and Income for 1933

Stocks or Bonds	Name	Int. Rate	Par Value	Cost (Prin.)	Market Value Dec. 1, 1933	Income Received
	Amherst Savings Bank	4½	$2,239 83	$2,239 83	$2,239 83	$125 31
30	Amherst Water Co.	6	100 00	3,000 00	3,000 00	180 00
4	Boston & Albany stock	–	100 00	400 00	439 00	35 00
8	Brown Company	5½	1,000 00	7,880 00	2,480 00	440 00
4	Cities Service Power & Light	5½	1,000 00	3,870 00	1,220 00	220 00
5	Florida Power & Light Co.	5	1,000 00	4,875 00	2,654 00	250 00
5	Florida Power Corp.	5½	1,000 00	4,700 00	2,450 00	275 00
1	Gatineau Power	5	1,000 00	927 50	770 00	50 00
1½	Indiana Hydro Elec. Power	5	1,000 00	1,477 50	795 00	75 00
5	Indianapolis Water Works Securities	5	1,000 00	4,962 50	3,300 00	250 00
4	Illinois Power & Light Corporation	5	1,000 00	3,840 00	1,960 00	200 00
5	Illinois Power & Light Corporation	5½	1,000 00	5,137 50	2,500 00	275 00
6	Illinois Power & Light Corporation	6	1,000 00	5,960 00	3,360 00	360 00
5	Monongahela West Penn Public Service	5½	1,000 00	4,950 00	3,000 00	275 00
5	N. E. Power Ass'n	5½	1,000 00	4,900 00	2,750 00	275 00
1	New York Central	4	1,000 00	982 50	690 00	40 00
9	New York Central	4	1,000 00	9,000 00	7,110 00	360 00
22	New York Central Stock	–	100 00	2,200 00	759 00	–
4	Northern New York Utilities	6	1,000 00	4,000 00	3,280 00	240 00
5	Oklahoma Gas & Elec. Co.	6	1,000 00	4,925 00	3,400 00	300 00
6	Pacific Telephone & Telegr.	5	1,000 00	5,886 25	6,240 00	300 00
1	Power Corp. of N. Y.	5½	1,000 00	985 00	530 00	55 00
4	Power Corp. of N. Y.	6½	1,000 00	4,000 00	2,800 00	260 00
2	Prudence Bonds Corp.	5½	1,000 00	2,000 00	900 00	55 00
7	Prudence & Company	5½	1,000 00	6,970 00	3,150 00	192 50
5	Puget Sound Power & Light	5½	1,000 00	5,050 00	2,050 00	275 00
10	Scranton Spring Brook Water Service	5	1,000 00	9,450 00	6,200 00	500 00
3	State & Washington Bldgs.	5	1,000 00	2,940 00	300 00	–
5	Texas-Louisiana Power Co.	6	1,000 00	4,975 00	900 00	–
3	Texas Elec. Service	5	1,000 00	2,910 00	1,950 00	150 00
1	Toledo Edison Co.	5	1,000 00	941 25	850 00	50 00
1	Union Elec. Light & Power	5	1,000 00	1,027 50	970 00	50 00
1	United States Treasury	3⅛	10,000 00	9,993 63	9,700 00	29 70
5	Virginia Elec. Light & Power Co.	5	1,000 00	4,825 00	4,350 00	250 00
4	Wichita Water Co.	5	1,000 00	3,800 00	3,400 00	200 00
	Barber Fund Transfer	–	–	–	–	197 00
	Interest from loans	–	–	–	–	262 00
	(Union Electric — sold)	–	–	–	–	81 25
		–	$148,339 83	$145,980 96	$92,446 83	$7,132 76

STATISTICS

Table I. — New Appointments

A. In the Academic Departments

Junior Clerk and Stenographer, President's Office: Mrs. Gladys W. Barnes.
Senior Clerk, Treasurer's Office: Percy E. Bassett.
Instructor in English: Evelyn A. Beaman, B.S., Massachusetts State College, 1931.
Instructor in History: Harold W. Cary, A.B., Williams College, 1925; A.M., Harvard, 1926.
Junior Clerk and Stenographer, President's Office: Mrs. Gladys M. Deno.
Instructor in English: Maxwell H. Goldberg, B.S., Massachusetts State College, 1928; M.A., Yale, 1932; Ph.D., Yale, 1933.
Instructor in English: Vernon P. Helming, B.A., Carleton College, 1925.
Instructor in Mathematics: George A. Marston, B.S., Worcester Polytechnic Institute, 1930; M.S., University of Iowa, 1933.
Instructor in Animal Husbandry: Ralph W. Phillips, B.S.A., Berea College, 1930; M.A., University of Missouri, 1931.
Assistant Professor of Forestry: J. Harry Rich, B.S., New York State College of Forestry, 1913.
Laboratory Assistant in Physics: William H. Ross, B.A., Amherst College, 1929; M.A., Amherst College, 1930.

B. Experiment Station

Laboratory Assistant in Home Economics: Margaret H. O'Donnell.
Research Professor of Chemistry: Roscoe W. Thatcher, B.Sc., University of Nebraska, 1898; M.A., 1901; D.Agr., 1920; LL.D., Hobart College, 1925; LL.D., Amherst College, 1932.

C. — Extension Service

Junior Clerk and Stenographer: Marian H. Rogers.
Extension Specialist in Agricultural Economics: George W. Westcott, B.S., Iowa State College, 1926; M. S., 1931.

Table II. — Speakers for the Year

A. Assembly and Convocation

1932
Dec. 7. Dean Charles R. Brown, Yale University.
1933
Jan. 11. Mlle. Berthe Hebert, Folk Songs.
Feb. 8. President Hugh P. Baker, M.S.C.
Mar. 1. Professor Frank A. Waugh, M.S.C., Illustrated talk on Oriental Travels.
Mar. 8. Student Forum.
Apr. 4. Samuel S. Board, Vocational Counselor, Yale University.
Apr. 26. Dr. W. Elmer Ekblaw, Professor of Geography, Clark University, Worcester, Mass.
May 17. Burnham Declamation Contest.
Sept. 28. President Hugh P. Baker, M.S.C.
Oct. 5. Dr. Bernhard Ostrolenk, College of the City of New York.
Oct. 26. Dr. George Barton Cutten, President, Colgate University.
Nov. 2. Mr. Dudley Harmon, Executive Vice-President, New England Council.
Nov. 9. Professor Frederick B. Loomis, Amherst College.
Nov. 16. Hon. Charles P. Howard, Chairman, Massachusetts Commission on Administration and Finance.
Nov. 23. Mr. Judd Dewey, Massachusetts Savings Bank Life Insurance League.

B. — Sunday Chapel

1932
Dec. 4. Bishop Francis J. McConnell, Methodist Episcopal Church, New York.
Dec. 11. Rev. W. Russell Bowie, Grace Church, New York City.
1933
Jan. 8. Dr. Clarence A. Barbour, President, Brown University.
Jan. 15. Rev. J. Paul Williams, M.S.C.

Jan. 22. Professor Hugh Black, Union Theological Seminary.
Jan. 29. Professor Harold E. B. Speight, Dartmouth College.
Feb. 5. Mr. James T. Cleland, Amherst College.
Feb. 12. Rabbi Harry Kaplan, Temple Anshe Amonim, Pittsfield, Mass.
Feb. 19. Rev. Sidney Lovett, Yale University.
Feb. 26. Rev. J. Elliott Ross, University of Virginia.
Mar. 5. Rev. William P. Schell, Presbyterian Board of Foreign Missions, N. Y.
Nov. 5. Rev. James Gordon Gilkey, South Congregational Church, Springfield, Mass.
Nov. 19. Rev. William P. Schell, Presbyterian Board of Foreign Missions, New York.
Nov. 26. Rev. J. Paul Williams, M.S.C.

TABLE III. — ATTENDANCE

	Registration Nov. 1, 1932			Registration Nov. 1, 1933		
	Men	Women	Total	Men	Women	Total
A. In the Work of College Grade						
Graduate Students	98	29	127	84	21	105
Senior Class	96	30	126	118	43	161
Junior Class	126	43	169	166	57	223
Sophomore Class	181	67	248	178	80	258
Freshman Class	225	84	309	228	79	307
Special Students	–	1	1	1	1	2
Totals	726	254	980	775	281	1,056
B. Stockbridge School						
Second year	109	5	114	84	4	88
First year	119	5	124	96	4	100
Special Students	4	–	4	1	–	1
Totals	232	10	242	181	8	189
C. Short Course Enrollment						
Winter School	90	3	93	102	1	103
Summer School	–	–	–	40	31	71
Totals	90	3	93	142	32	174

D. Educational Meetings

	1932	1933
Agricultural Teachers and Principals of High Schools	75	–
Allard Dairy Group	30	–
All Star Meeting	–	20
Amherst, Junior High School Group	–	25
American Physical Education Association	–	75
Annual Extension Service Conference	100	115
Arlington Garden Club (Waltham Field Station)	–	11
Basketball Coaches Meeting with Principals	–	80
Berkshire County Service Club	–	15
Boy Scoutmasters (twice)	–	70
Camp Gilbert (4-H Club Members and Leaders)	115	235
Camp Middlesex	80	115
Cape Cod Cranberry Growers' Association (Wareham Field Station)	–	400
C. C. C. Recreation Conference	–	30
Columbia University Foreign Students	25	–
Conference on Homemaking	200	–
Conference on Onion Variety Project	–	10
Connecticut Fruit Tour	–	75
Connecticut Valley Day	600	780
Dad's Day	295	350
Dramatics School	40	–
Eastern Intercollegiate Apple Judging Contest	–	16
Economic Departments of Connecticut Valley Colleges	–	60
English Folk Dance School	120	–
Extension Home Economics Conference	30	20

Fall Horticultural Exhibition	7,000	11,000
Farm and Home Week	4,200	3,500
Field Day (Waltham Field Station)	862	961
Florists School (Waltham Field Station)	225	180
Franklin County Basketball League	–	10
Fraternity Cooks	–	20
4-H Dairy Day	95	81
4-H Garden Club (Waltham Field Station)	–	11
4-H Hampshire County Canning Leaders	60	21
4-H Sewing Contest	30	–
Game Management Committee of Farm Bureau	–	10
Greenkeepers' Exhibition and Conference	–	225
Hampshire County Adult Canning Groups (5)	44	176
Hampshire County 4-H Leaders	–	10
High School Day	523	618
Highway Beautification Institute	–	150
Holyoke and Northampton Garden Club (twice)	–	55
Home Gardeners' School (Waltham Field Station)	873	486
Home Economics Faculties of Rhode Island and Connecticut	–	15
Home Economics Leaders Meeting	–	20
Institute of Rural Electricity	126	–
International Poultry Science Association	196	–
Interscholastic Judging Contests	236	261
Lanesboro 4-H Club	–	12
Massachusetts Farm and Garden Association Committee	–	12
Massachusetts Future Farmers of America	–	50
Massachusetts Veterinary Association	37	35
Meat Cutters' School	25	–
Middlesex County 4-H Club Champions	75	80
Milking Machine Demonstrations (2)	–	75
Mother Craft Club	–	125
Mother's Day	–	100
Mt. Holyoke College Student Groups (3)	60	85
New England Chemists	–	24
North Amherst, Boy Scouts	–	12
Northampton Botanical Group	–	20
Parent-Teachers Association Conference	20	–
Plymouth County 4-H Group	45	32
Poultry Breeders' Conference	65	100
Public Health Workers	–	33
Quadrilateral Club	–	?
Recreational Institute	–	200
Rock Garden Conference	–	90
Rural Adult Education Conference	–	60
Secondary School Principal's Conference	750	440
Small High School Basketball Tournament	10,132	11,704
Small High School Spring Relays	300	400
Small High School Track Meet	300	500
Smith College Training Class	60	–
South Amherst, Girl Scouts	–	25
South Deerfield High School Class	–	35
Three County Beekeepers	–	20
Three County Fruit Meeting	125	100
Waban Garden Club (Waltham Field Station)	–	14
Ware Nature Students	–	35
Waltham Garden Club (Waltham Field Station)	–	20
Western Massachusetts Basketball Coaches' Club	60	35
Women's Advisory Council	–	20
Vocational Agricultural Judging Elimination Contest	–	70
Young Farmers' Club of Connecticut	64	–
	28,298	34,875

Table IV. — Statistics of Freshmen Entering in September, 1933

A. *Home Addresses of Students (Classified by Towns and Cities)*

Acton	1	Greenfield	11	Orange	3
Adams	3	Hadley	1	Orleans	1
Agawam	5	Hamden, Conn.	1	Ossining, N. Y.	1
Amesbury	2	Hanover	2	Palmer	3
Amherst	14	Hanson	2	Peabody	1
Andover	1	Hardwick	1	Pelham	1
Ashfield	3	Harvard	1	Pittsfield	5
Ashland	2	Hatfield	5	Quincy	1
Athol	2	Haverhill	1	Raynham	1
Auburn	1	Hingham	1	Rehoboth	1
Barre, Vt.	1	Holliston	1	Rockport	1
Belchertown	1	Holyoke	23	Salem	1
Belmont	1	Hudson	1	Sandwich	1
Beverly	3	Huntington	1	Schenectady, N. Y.	1
Billerica	1	Ithaca, N. Y.	1	Sheffield	2
Boston	24	Kingston	3	Shrewsbury	1
Boylston	2	Lawrence	4	Shutesbury	1
Brattleboro, Vt.	1	Lee	1	Somerville	1
Brockton	1	Leicester	1	Southbridge	1
Brookfield	1	Leominster	1	South Hadley	3
Canton	1	Lexington	3	Springfield	15
Carlisle	1	Ludlow	4	Sunderland	2
Charlemont	1	Lynn	4	Taunton	1
Charlton	1	Malden	4	Tenafly, N. J.	1
Chester	1	Marblehead	1	Torrington, Conn.	1
Chicopee	2	Maynard	1	Valley Falls, N. Y.	1
Conway	2	Medford	2	Walpole	1
Danbury, Conn.	2	Medway	1	Ware	1
Danvers	1	Melrose	2	Watertown	2
Dartmouth	1	Methuen	3	West Boylston	1
Deerfield	1	Milford	1	Westfield	4
Dennis	1	Milton	1	Weston	1
Dracut	1	Montague	7	Westport	1
Duxbury	1	Monterey	1	West Springfield	4
Easthampton	6	Natick	1	Weymouth	2
East Longmeadow	1	Needham	1	Whately	3
Enfield	1	New Bedford	2	Wilbraham	1
Erving	1	Newton	4	Williamsburg	1
Everett	1	Northampton	11	Williamstown	1
Fairhaven	2	North Andover	1	Winchester	1
Foxborough	1	North Brookfield	1	Winthrop	3
Framingham	1	Northfield	3	Worcester	3
Georgetown	1	Norwood	1		

B. *Home Addresses (Classified by States and Countries)*

	Number	Per Cent		Number	Per Cent
Connecticut	4	1.30	New York	4	1.30
Massachusetts	296	96.42	Vermont	2	.65
New Jersey	1	.33		307	100.00

C. *Home Addresses (Classified by Counties of Massachusetts)*

	Number	Per Cent		Number	Per Cent
Barnstable	3	1.01	Hampshire	46	15.54
Berkshire	13	4.39	Middlesex	32	10.81
Bristol	9	3.04	Norfolk	10	3.37
Dukes	–	–	Plymouth	11	3.71
Essex	25	8.45	Suffolk	27	9.16
Franklin	38	12.83	Worcester	19	6.41
Hampden	63	21.28		296	100.00

D. *Nativity of Parents*

	Number	Per Cent
Neither parent foreign born	185	60.26
Both parents foreign born	80	26.06
Father (only) foreign born	22	7.17
Mother (only) foreign born	20	6.51
	307	100.00

E. Education of Father

	Number	Per Cent
Common School	129	42.02
High School	77	25.08
Business College	38	12.38
College or University	52	16.94
No Statistics	11	3.58
	307	100.00

F. Occupation of Father

	Number	Per Cent
Agriculture and Horticulture	48	15.64
Artisans	57	18.57
Business	92	29.96
Professional	34	11.07
Miscellaneous	48	15.64
Retired	3	.98
Deceased	20	6.51
No Statistics	5	1.63
	307	100.00

G. Intended Vocation of Students

	Men	Women	Total	Per Cent
1. *Farming*, including Market Gardening, Nursery business, Florist's business, Fruit Growing, Management of Estates, General Farming, Poultry Husbandry, Livestock Breeding, etc.	19	–	19	6.19
2. *Agricultural Business*, including sales of agricultural products and other capacities such as the fertilizer industry, the feed industry, etc.	3	–	3	.98
3. *Science*, including Chemistry, Botany, Entomology, Bacteriology, etc., in such capacities as research experts, laboratory assistants, technologists	61	15	76	24.79
4. *Landscape Architects*, Agricultural Engineers, and Foresters	20	–	20	6.51
5. *Teachers*, including College Professors, High School Instructors, Specialists in Extension Education, etc.	10	10	20	6.51
6. *Professional Practitioners*, including Physicians, Surgeons, Dentists, Lawyers, Veterinarians, Ministers, etc.	49	5	54	17.58
7. *Civil Engineers*	4	–	4	1.30
8. *Industrial Enterprises*, including Manufacturing, Merchandising, Advertising, Banking, Accounting, Real Estate, Insurance, etc.	10	2	12	3.91
9. Authors, Artists, Journalists, etc.	4	1	5	1.63
10. Home Economics	–	22	22	7.16
11. Social Service	6	12	18	5.86
12. Undecided	42	12	54	17.58
	228	79	307	100.00

H. Farm Experience

	Men	Women	Total	Per Cent
Brought up on a farm	34	18	52	16.94
Not brought up on a farm and having no or practically no farm experience	174	59	233	75.90
Not brought up on a farm but having had some farm experience	20	2	22	7.16
	228	79	307	100.00

I. Miscellaneous Statistics

Average age (years)	18.38

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THE COLLEGE CATALOGUE

This issue of The Bulletin contains the catalogue of the College for the sessions of 1933-34 which is part of the Seventy-first Annual Report of the Massachusetts State College and as such is part II of Public Document 31. (Sec. 8, Chapter 75 of the General Laws of Massachusetts.)

7m—11-'33. No. 9732

Publication of this Document approved by the Commission on Administration and Finance

CONTENTS.

Calendar, 1934–35	3
The Trustees	4
Officers of the Institution	6
Standing Committees	17
General Information	19
Admission	33
Collegiate Courses of Instruction	42
Description of Courses	45
Graduate School	97
Summer School	98
Non-Degree Courses of Instruction	99
Degrees Conferred — 1933	101
Registration	103
Index	126

LEGISLATION PERTAINING TO THE COLLEGE.

Without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and mechanic arts in such manner as the legislatures of the states may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life. — *Act of Congress, July 2, 1862.*

THE COLLEGE CHARTER. — "The leading object of the college shall be to teach subjects relating to agriculture and the mechanic arts, so as to promote liberal and practical education. Its curriculum may include other scientific and classical studies and shall include military tactics." — *From Chapter 75 of the General Laws of Massachusetts.*

FOREWORD.

This issue of the catalogue presents a description of the course of study as it is planned for the college year 1934–35.

The College reserves, for itself and its departments, the right to withdraw or change the announcements made in its catalogue.

CALENDAR.

1934.

February 3, Saturday, 12.00 M.	First semester ends
February 7, Wednesday, 8.00 A.M.	Second semester begins
February 22, Thursday	Holiday, Washington's Birthday
March 31–April 9, Saturday, 12.00 M.–Monday, 8.00 A.M.	Spring Recess
April 19, Thursday	Holiday, Patriots' Day
May 30, Wednesday	Holiday, Memorial Day
June 1–4, Friday–Monday	Stockbridge School Commencement
June 8–11, Friday–Monday	Commencement
June 14–16, Thursday–Saturday	Entrance Examinations
July 2–31, 1934	Summer School
September 12–15, Wednesday–Saturday	Entrance Examinations
September 17, Monday	First semester begins for Freshmen
September 19, Wednesday	First semester begins for Upper Classmen
October 1, Monday	First semester begins for Stockbridge School
October 12, Friday	Holiday, Columbus Day
November 12, Monday	Holiday, Observance of Armistice Day
November 28–December 3, Wednesday, 12.00 M.–Monday, 8.00 A.M.	Thanksgiving Recess
December 19–January 2, Wednesday, 12.00 M.–Wednesday, 8.00 A.M.	Christmas Recess

1935.

February 2, Saturday, 12.00 M.	First semester ends
February 6, Wednesday, 8.00 A.M.	Second semester begins
February 22, Friday	Holiday, Washington's Birthday
March 30–April 8, Saturday, 12.00 M.–Monday, 8.00 A.M.	Spring Recess
April 19, Friday	Holiday, Patriots' Day
May 30, Thursday	Holiday, Memorial Day
May 31–June 3, Friday–Monday	Stockbridge School Commencement
June 7–10, Friday–Monday	Commencement
June 13–15, Thursday–Saturday	Entrance Examinations

THE TRUSTEES.

Organization of 1933.

Members of the Board.

	Term expires
George H. Ellis of West Newton	1934
Philip F. Whitmore of Sunderland	1934
John Chandler of Sterling Junction	1935
Frederick D. Griggs of Springfield	1935
Nathaniel I. Bowditch of Framingham	1936
Howard S. Russell of Waltham	1936
Mrs. Lottie A. Leach of Walpole	1937
James F. Bacon of Boston	1937
*Frank Gerrett of Greenfield	1938
Harold L. Frost of Arlington	1938
Charles H. Preston of Danvers	1939
David J. Malcolm of Charlemont	1939
Davis R. Dewey of Cambridge	1940
John F. Gannon of Pittsfield	1940

Members Ex Officio.

His Excellency Joseph B. Ely, *Governor of the Commonwealth.*
Hugh P. Baker, *President of the College.*
Payson Smith, *Commissioner of Education.*
Arthur W. Gilbert, *Commissioner of Agriculture.*

Officers of the Board of Trustees.

His Excellency Joseph B. Ely of Boston, *President.*
George H. Ellis of West Newton, *Vice-President.*
Robert D. Hawley of Amherst, *Secretary.*
Fred C. Kenney of Amherst, *Treasurer.*
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Arthur W. Gilbert.
Mrs. Leach.

[1] The President of the College is ex-officio member of each committee.
* Died July 29, 1933.

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Mrs. Leach.

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James F. Bacon.
Frederick D. Griggs.

Executive Committee

George H. Ellis.
James F. Bacon.
Philip F. Whitmore.

* Died July 29, 1933.

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One of the outstanding achievements of the middle of the nineteenth century was the remarkable development in the field of science. This, in turn, brought about great changes in industry, transportation and agriculture and stimulated the desire for new information and further training. People were enthusiastic about the possibilities of the future. It is not surprising, therefore, that scientific courses gradually found their way into the academies and colleges. This was not without opposition from the friends of the old classical training, however. In many instances institutions founded along literary and philosophical lines did not favor the introduction of courses based on the needs of students desiring to perfect themselves in the technical principles and practices of the arts and industry. The demand for such courses increased nevertheless. It was evident that the old order of education was changing but at the time the new was not apparent. It was under such conditions that the Massachusetts State College had its birth.

The Morrill Act.

This demand for technical education finally crystallized into a bill before Congress known as the Morrill Act of 1862 endowing colleges for this purpose in every state of the Union. The original bill was framed by Senator Justin L. Morrill of Vermont and its final enactment obtained under his leadership. This bill provided in each state for "the endowment for and maintenance of at least one college where the leading object shall be, without excluding other scientific and classical studies and including military tactics, to teach such branches of learning as are related to agriculture and the mechanics arts in such manner as the legislatures of the states may respectively prescribe in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life." Massachusetts accepted the provisions of the Morrill Act in 1863 by founding a new college at Amherst to be known as "Massachusetts Agricultural College" and Chapter 75 of the General Laws of the Commonwealth states that "the leading object of the College shall be to teach subjects relating to agriculture and the mechanics arts so as to promote liberal and practical education. Its curriculum may include other scientific and classical studies and shall include military tactics."

Founding and Early Growth of the College.

The Trustees of the Massachusetts Agricultural College were incorporated in 1863 and officers were appointed in that year. It was not until October 2, 1867, however, that the institution at Amherst was formally opened to students. At that time there were four teachers on the faculty and four wooden buildings on the campus. The number of students steadily increased during the first term and by December, 1867, forty-seven had been admitted. From this modest beginning the College has grown steadily and its influence has been felt in many parts of the world. On April 15, 1931, the name of the institution was changed by legislative enactment to Massachusetts State College.

Scope of the Institution.

In a sense, experimental work is as old as the institution, for during its earliest years some very important investigations were carried on by the instructors. Research work was established as a separate unit, however, in 1882, when the State provided for the establishment of an agricultural experiment station here. In 1887 another experimental unit, the Hatch Experiment Station, was provided by Federal appropriation. These two stations were combined in 1895 and have since been known as the Massachusetts Agricultural Experiment Station.

State law also provides for the maintenance at this College of a Control Service the purpose of which is to regulate the sale of certain agricultural products for the protection of purchasers and also to eliminate certain diseases of poultry.

The Extension Service of the College was established in 1912 and was first

supported by grants of Federal Funds in 1914. This division of the College undertakes the large responsibility of teaching adults and boys and girls throughout the State, who cannot come to the College for instruction, better methods in agriculture and home-making.

Resident Instruction.

Opportunities for resident instruction have greatly expanded since the founding of the College in 1863. The courses offered now include such short courses as the Winter School, Summer School, and the two-year course in practical agriculture known as the Stockbridge School. Then, there are the four-year course leading to the Bachelor of Science degree and the Graduate School which offers opportunity for study for advanced degrees. The undergraduate curriculum leading to the Bachelor of Science degree offers opportunity for specialization in Agriculture, Home Economics, Horticulture, Landscape Architecture, Physical and Biological Sciences and Social Sciences. The curriculum includes strong supporting courses in the Humanities and the aim is to give to each student as high a degree of efficiency in some particular branch of learning as is possible without sacrificing the breadth of knowledge and training which should characterize the well-rounded college course.

THE COLLEGE CAMPUS.

Hand in hand with this steady growth of the College, there has come a marked expansion in physical equipment. The original farm of 1867, with its run-down fields and degenerated apple orchards cut up here and there by old Virginia rail fences and hedge rows has metamorphosed into one of the most attractive college campuses in New England. A brief statement of land, buildings and equipment will show to what extent the original four wooden buildings have been out-grown.

Location and Lands.

The State College is located in Amherst, a town of about six thousand people, overlooking one of the most picturesque sections of the Connecticut Valley. From the standpoint of teaching material in the field of science and agriculture, the location is ideal. Amherst is ninety-seven miles from Boston and may be reached by the Central Vermont Railroad, or by bus connections from Northampton, Holyoke, Greenfield, and Springfield. The campus consists of a tract of approximately seven hundred acres, lying about a mile north of the village center. In addition the college owns another area of seven hundred and fifty-five acres located about six miles north of the campus on Mount Toby. This is used for a demonstration forest.

Buildings and Equipment.

The campus is laid out in the form of an oval attractively set off by the college pond in the center. Around this oval are grouped the main buildings of the college. In the following list the buildings are presented in order about this oval.

South College. — Here are located the administrative offices, including the offices of the President, Dean, Treasurer, Secretary, the Extension Service, Short Courses, and Women's Adviser. The Department of Agricultural Economics also has offices here. The west wing is used as a freshman dormitory and accommodates thirty-four students. Erected 1885.

North College. — Primarily a freshman dormitory accommodating about seventy-five students. On the first floor is located the College Store and Barber Shop. Erected in 1868.

Flint Laboratory. — The work in Dairy Industry is carried on here. The building is well equipped with modern machinery for the production of market milk, ice-cream, butter and cheese. This building was erected in 1911 and was named in honor of Charles L. Flint, fourth president of the college. On the second floor is located the foods laboratory of the Department of Home Economics.

Stockbridge Hall. — Here are located the departments of Agronomy, Animal Husbandry, Agricultural Engineering, Farm Management, Poultry Husbandry, Education and English. In addition to the lecture rooms and offices are labora-

tories for soil fertility, field crops, poultry, and a drafting room for engineering. The clothing and house furnishing laboratories for the Home Economics Department are also located here. In the rear of the building are the greenhouse and head house used by the Department of Agronomy for work with crops and soils. A special reference library for the Division of Agriculture is on the second floor. Bowker Auditorium, the largest auditorium on the campus, is also in this building. It has a seating capacity of nine hundred and is named in honor of William H. Bowker, a member of the first graduating class, later a Trustee of the College, and one of the pioneers in the fertilizer industry. Stockbridge Hall was erected in 1914 and named in honor of Levi Stockbridge, a former president and professor of Agriculture in the college.

Horticultural Manufactures Laboratory. — Erected in 1929. Both research and instructional work in food preservation are carried on here. The laboratories are well equipped with modern apparatus used in this rapidly developing field.

Grinnell Arena. — Erected in 1910 primarily for livestock judging. An abattoir was constructed in 1930 as an addition to the original building. Named in honor of James S. Grinnell, for twenty-two years a trustee of the College.

Farley 4-H Building. — This building was constructed in 1933 as an assembly hall and general headquarters for 4-H Club activities upon the campus. The cost of the building was met by gifts from club members throughout the state.

Agricultural Engineering Laboratory. — Included in this laboratory for students of Agricultural Engineering, are a carpenter shop, general repair shop, and a laboratory for farm machinery and motors. The building was erected in 1916.

Draper Hall. — This is the college dining hall. Service is by cafeteria style and there are seating accommodations for about four hundred and fifty at one time. There is a small banquet room on the second floor and several dormitory rooms. Erected 1903 and an addition in 1912, and named in honor of James Draper, for twenty years a trustee of the college.

Goessmann Laboratory. — This is a modern chemical laboratory. The building is approximately two hundred feet by eighty feet and contains eight large laboratory rooms, an auditorium, a chemical library, and lecture rooms. The east wing of the third floor is occupied by the research professors in Chemistry of the Experiment Station. In addition to the work in Chemistry the class work in German is held in this building. Goessmann Laboratory was erected in 1924 and named in honor of Charles A. Goessmann, the first professor of Chemistry at the college.

West Experiment Station. — The state control work is centralized here. Fertilizers, seeds, feeds and dairy glassware are analyzed or inspected in accordance with the state law, to determine whether or not they meet their guarantee. Erected 1886.

East Experiment Station. — The office of the Director of the Experiment Station and other administrative offices of the Experiment Station are located in this building.

Abigail Adams House. — This is a modern girls' dormitory accommodating about one hundred students. It was erected in 1919 and named for Abigail Adams, a staunch believer in farm life, the wife of John Adams, second President of the United States. In the rear of the building is an athletic field used in connection with the physical training of the women students.

The Homestead. — Girls majoring in Home Economics receive their Home Management practice in the Homestead. It is a remodelled colonial farmhouse equipped with all the modern conveniences of the home.

Bacteriology and Physiology Laboratory. — This building, erected in 1915, is especially designed to carry on work in Bacteriology as it relates to soil, industry, dairying, foods and public health. There are four class laboratories, several private laboratory rooms and offices and a lecture room. In addition there are incubator rooms, sterilizing rooms, hood rooms, washing rooms, inoculating rooms, weighing rooms, an animal room, a photographic and dark room, and a sub-basement refrigerator room. There is also a well-equipped library containing books and current periodicals useful in the conduct of bacteriological and physiological study.

Infirmary. — The Infirmary consists of two small cottages on the hillside east of the Bacteriology Laboratory. They are especially designed to care for sick or injured students. A trained nurse is on duty at all times.

Physics Building. — This is a wooden building erected in 1867. It contains a well-equipped laboratory for work in college Physics and also one lecture room.

Wilder Hall. — Here are located the departments for Landscape Architecture and Horticulture. The building is chiefly devoted to classrooms, drafting rooms, and offices. It was erected in 1905 and named in honor of Marshall P. Wilder, a pioneer in the movement for agricultural education in Massachusetts and one of the first trustees of the college.

Fisher Laboratory. — This is a well planned and equipped fruit packing and storage house. It includes six refrigerator rooms, four storage rooms not refrigerated, one large laboratory room, one class room besides ample storage space for fruit packages and equipment. The equipment for the building itself includes four types of apple sizers, packing tables and box and barrel presses of various types, besides all kinds of packages with smaller equipment necessary for thoroughly modern work in grading and packing fruit. This building is used by the Pomology Department and was named in honor of Jabez Fisher, one of the foremost, early horticulturists of the State. Erected 1910.

French Hall. — French Hall houses the departments of Pomology, Floriculture, Forestry and Vegetable Gardening. The classroom work in Economics, Sociology, French and Spanish is also given here. Just to the rear of the building is the new Durfee range of greenhouses, devoted to the growing of carnations, roses, chrysanthemums, violets, etc. One house is maintained as a conservatory and contains a collection of plants used primarily for decorative purposes. Another house is devoted to greenhouse vegetables. The old Durfee range located just to the north of French Hall is used chiefly for the growing and maintenance of a collection of conservatory plants. There are also many of economic value such as the bamboo, camphor tree, guava, palm, etc. French Hall was erected in two sections; the first in 1908, the second in 1913. It was named in honor of Henry S. French, the first president of the college.

Clark Hall. — Here are located the offices, lecture rooms and laboratories of the Department of Botany. In addition to the main building, there is a greenhouse used for research and laboratory purposes. The herbarium contains about twenty thousand sheets of seed plants and ferns, twelve hundred sheets of liverworts and mosses and a collection of twenty-five thousand specimens of fungi. Erected in 1906 and named in honor of William S. Clark, president of the college 1867 to 1879.

Fernald Hall. — This building, erected in 1909, was named in honor of Professor Charles H. Fernald, who served the college for twenty-four years, built up a strong department in Zoölogy, created the department of Entomology, and acted as Director of the Graduate School. Fernald Hall houses the Department of Entomology, Zoölogy and Geology. In addition to laboratories, lecture rooms, and offices, there is a Geological Museum, a Zoölogical Museum and a collection of over 160,000 insects. Material in these collections is available for study and for exhibition purposes.

Mathematics Building. — This is a small frame building containing classrooms for instruction in mathematics and surveying. There is also a well equipped drafting room, and a small one devoted to blue-printing.

Paige Laboratory. — The work in Veterinary Science is located in this building. In addition to the class, lecture, and laboratory rooms, there are the laboratories for Research work on animal diseases and Control Service in Poultry Disease Elimination. The museum contains a growing number of anatomical and pathological specimens, most of which are used for teaching purposes. In the rear of the building are the stables for housing both laboratory and larger animals under isolation conditions for dissection, post mortem examinations and for incineration purposes. Paige Laboratory was erected in 1898 and named for James B. Paige, professor of Veterinary Science from 1891 to 1922.

Physical Education Building. — This building dedicated at Commencement in 1931, offers splendid modern facilities for physical education including a swimming pool 75 by 30 feet, an exercise hall 150 by 180 feet, locker rooms,

baths, hand ball court, and other modern facilities. Of the total cost of $287,000, alumni and friends of the college contributed $115,000; the remainder was appropriated by the State Legislature.

Drill Hall. — This building houses the Department of Military Science. It also contains locker and dressing rooms for women students and a large exercise hall for their work in physical education.

Alumni Field. — This tract of land was transformed into an Athletic Field, containing a baseball diamond, football field, and cinder track, by the Alumni and friends of the college. Completed 1915.

Memorial Hall. — The social center of student life is Memorial Hall. It was erected by the Alumni, students, faculty and friends of the college in memory of those men of this college who died in the World War. In the basement are bowling alleys, pool tables, and game rooms. On the main floor are eight offices for the leaders of various student activities, a large reading room and a beautiful Memorial Room in which is found a tablet bearing the names of the sons of the college who gave their lives in the Great War. On the second floor is an auditorium seating 350 persons. This room is also used for college dances. Memorial Hall was erected in 1921.

Library. — The Library contains one of the best collections in agriculture and related sciences in the country, with especial strength in entomology, botany, chemistry, horticulture, landscape architecture, soil science and animal husbandry, but with considerable collections also in literature, history, economics and sociology. There are over 90,000 bound books, and over 50,000 classified pamphlets giving most recent information. The periodical file contains over 550 current magazines, both scientific and popular, and a careful selection of newspapers, together with many periodical publications of learned societies. The Library is unusually rich in files of journals and proceedings of Experiment Stations and learned societies. The building is open on week days from 8 A.M. to 10 P.M., and from 1:30 to 4:30 and 7 to 9 P.M. on Sundays during terms, and with somewhat shorter hours during vacations and Summer School. The fine granite building was erected in 1885 and originally housed both College Chapel and Library.

Power Plant. — Heat and light are supplied to all the buildings on the campus from a central power plant. This was erected in 1902 and has been subsequently remodeled.

Farm Buildings, Land and Equipment.

College Farm and Barns. — The college farm consists of 240 acres located just west of South College. Most of it is suitable for cultivation and is operated in regular rotation. Much of the farm as it now stands has been made productive by tile draining and clearing the land of brush and stumps. The principal crops raised are those which can be utilized by the livestock, together with some cash crops such as cabbage, carrots, potatoes, and hay. For instructional work the farm is available for study in field crops, planning of crop rotation, practical field operation of farm machinery and tractors and farm management. The livestock of the farm consists of about 200 head of registered cattle which are excellent representatives of the Ayrshire, Guernsey, Holstein, Jersey, Milking Shorthorns, and Hereford breeds, a considerable number of registered Berkshire and Chester White swine, a flock of about 100 Shropshire and Southdown sheep and 30 Percheron horses. These animals are used chiefly for demonstrational and instructional work in feeding and herd management and in the teaching of correct types by much practice in judging. The farm buildings are model structures for their various purposes. They were erected in 1909 and subsequently. The dairy barns contain efficient and modern equipment for their respective purposes. The sheep barns and piggery are located several hundred yards from the dairy barns.

Cavalry Stable. — This stable has a capacity for the sixty horses which are used by the college cavalry troop. Erected in 1925.

Poultry Plant. — The college poultry plant consists of about twenty acres of land in addition to the various buildings that go to make up a modern poultry plant. Although only eight acres of the land comprising the plant are college-owned this quantity permits for a three-year growing rotation. The plant will

accommodate 2,000 laying birds and has growing facilities for about 7,000 chicks. The incubator capacity of the plant is approximately 12,000 eggs at one time. Located about one-half mile east of the college, on East Pleasant Street, is the experimental poultry farm which accommodates about 1,200 adult birds and has hatching facilities for about 3,000 chicks. Here experiments on breeding poultry for egg production and disease control are carried on under strict quarantine.

The Hatch Barns. — These structures house the live stock which have been segregated from the main herd and flocks for the purpose of experimentation in connection with the subject of feed and feeding. Erected in 1891.

Experiment Station Barns. — These buildings contain the equipment and animals used in connection with the work of the Experiment Station.

Orchards and Vineyards. — The college orchard contains about 20 varieties of peaches, 25 of plums, 20 of pears, and 100 of apples. Common varieties of grapes are grown in the vineyards and with the various approved trellis systems. These orchards are used for teaching material in Pomology.

Vegetable Gardens. — Here are grown the class material used by the vegetable gardening department.

Mt. Toby Demonstration Forest. — This is an area of approximately 750 acres located on Mt. Toby. It contains the various types of forest growth found throughout the State. It serves as a field laboratory in forestry. Students have the privilege of working out problems in silviculture, forest mensuration and management. Improvement cuttings, cuttings for utilization and forest planning are conducted here also.

COURSES OF INSTRUCTION.

Courses Leading to a Degree.

Four-Year Course. — The degree of Bachelor of Science is granted to those students who satisfactorily complete the regular four-year course. Special arrangement is made for some graduates of county agricultural schools to receive the degree Bachelor of Vocational Agriculture for four years of college work.

Five-Year Course in Landscape Architecture. — A five-year course is offered in Landscape Architecture leading to the degree of Bachelor of Landscape Architecture.

Graduate School. — The degrees of Master of Science, Master of Landscape Architecture and Doctor of Philosophy may be granted upon the completion of satisfactory study, research and a thesis.

Summer School. — Both graduate and undergraduate courses are offered in the six weeks' summer school and credits earned may apply toward the Bachelor's degree or advanced degrees.

Non-Degree Courses.

Several short courses in agriculture are offered which do not lead to a degree. These are for the benefit of those who are not prepared to take the degree course or who desire only a practical training in modern agriculture methods.

Stockbridge School of Agriculture. — This is a two-year course in practical agriculture offering a high type of training to those who wish to enter some special agricultural enterprise. A separate descriptive catalogue will be sent on request.

Winter School. — A ten weeks' practical course in agricultural and horticultural subjects begins about January first each year. The courses are so arranged that a student may choose such subjects as will enable him to specialize in the line of work in which he is most interested.

HEALTH SERVICE.

The College endeavors to safeguard the health of all students while on the campus, and for this purpose maintains a Physician as Supervisor of Student Health, a resident registered nurse, and a small infirmary.

(1) Physical examination by the Supervisor of Student Health is required of all undergraduate students annually, or oftener if indicated. This examination is given to freshmen during matriculation week. Entering

women are also required to present an examination certificate from their family physician on forms supplied by the College.

(2) The Supervisor of Student Health has offices in the Physical Education Building where he may be consulted during college hours.

(3) Infirmary — Its purpose is to furnish a suitable place for professional attention in case of illness or accident. The out-patient clinic is held here daily.

(4) Students are urged to consult the Supervisor of Student Health or the resident nurse at the first sign of physical disorder or for even minor accidents. Many severe illnesses and much lost time can be avoided by early or preventive treatment.

(5) The infirmary charges will be at the rate of $2 per day, and will be charged when one or more meals are obtained at the infirmary or when the student remains at the infirmary for one or more nights. A nominal charge may be made to out-patients for miscellaneous treatment of a minor character.

(6) In addition to the fee charged as specified in paragraph 5, the following additional expenses will be charged to the patient.

(a) *Nurses.* — In case a special nurse is required for the proper care of an individual the services and board of this nurse will be paid by the patient. Such a nurse will be under the general supervision of the resident nurse.

(b) *Professional Service.* — If a student requires continuous medical attention by a physician, he may be required to select his physician and become responsible for fees charged by that physician.

(c) *Supplies.* — Special medical supplies prescribed by a physician will be charged to the patient.

(d) *Laundry.* — Expense for personal laundry incurred by students while in the infirmary will be charged to the individual student.

STUDENT EXPENSES.

Student college expenses vary from approximately $450 per year to $600 for the normal economical student. First year expenses are usually greater than those of the other three years and there is less opportunity in this year to earn. It is, therefore, recommended to the entering student that he have available at least $450 with which to meet the expenses of the first year. Women students are recommended to plan on a minimum expense of $550.

The following summary of a year's expenses includes only those items which are strictly college costs and does not include amounts for clothing, travel, etc., which vary with the individual. Tuition for residents of Massachusetts is $100 and for others $220.

	Low	Normal
Tuition (citizens of Massachusetts)	$100.00	$100.00
Room in college dormitory or in private house	70.00	140.00
Board, $5.50 per week (College Dining Hall)	187.00	187.00
Laundry, 50 to 85 cents a week	18.00	30.00
Books, stationery and miscellaneous items	60.00	90.00
Student Taxes	25.00	25.00
	$460.00	$572.00

Initial Payment for Freshmen.

The initial payment required of freshmen at the time of fall registration is approximately $190 and is made up of the following items:

Tuition (citizens of Massachusetts)	$50.00
Room rent (dormitory)	54.00
Board (College Dining Hall to Dec. 1) (Approx.)	60.00
Military Uniform	18.00
*Student Tax	12.25
	$194.25

* This tax is for the support of student activities and entitles each student to free participation in the various enterprises represented.

Graduation Requirement.

No student will be graduated unless all bills due the college are paid on or before the Wednesday preceding the graduation exercise. If paid after that date and otherwise eligible he may graduate the following year.

Diplomas and letters of honorable dismissal will be withheld from all students who have not paid bills due the college or legitimate bills for room rent due fraternities or private individuals.

Advance Payment.

Prospective new students will be expected to make an advance payment of $15 to the Treasurer of the College as soon as they are notified by the Dean that they are accepted for admission. This will be considered as first payment on registration fees which will be due at time of matriculation in September and will be returned to the student if he advises the College before August 20 that he will not present himself for admission. If the student fails to notify the College of withdrawal before that date this preliminary payment will be forfeited and will be considered payment for the expenses involved in preliminary admission arrangements.

Refunds.

A student who leaves college for any reason before a semester is half completed will have refunded to him one-half the fees paid for that semester, but one who leaves after a semester is half over will be allowed no rebate of fees and a refund of only unused board and room charges.

College Fees.

Tuition. — Residents of Massachusetts are charged a tuition fee of $100 per year, payable in advance in two installments of $50 each on the first day of each semester. For those who are not residents of Massachusetts, the tuition fee is $220 per year. Students entering from Massachusetts are required to file with the Treasurer a statement signed by town or city clerk, stating that the applicant's father or guardian is a legal resident of Massachusetts, unless applicant himself is of legal age, in which case a similar statement must be filed indicating his own legal residence.

Military Uniform. — All students taking military drill are required to make a deposit of $18.00 for the uniform. A rebate of $15 is made when this uniform is returned.

Board.

All freshmen students and all residents of college dormitories are required to board at the college dining hall. Service is on a cafeteria basis and students pay in advance at the rate of $5.50 per week, approximately, as follows:—

At the opening of college	$55.00
At December 1	38.50
At the beginning of second semester	44.00
Upon return from spring recess	44.00

For absences of one week or more rebates at the rate of $5.00 per week may be granted provided the absence is authorized by the Dean and the rebate approved by the Treasurer. No rebates will be allowed for absences of less than one week.

If a student's home is nearby and for this or any similar reason he is regularly absent from the campus over week ends, upon request from his parent or guardian, approved by the Dean of the College, he may board in the college dining hall for a five-day week (fifteen consecutive meals beginning with Monday breakfast) at the rate of 80 per cent of that paid for a seven-day week.

Excuses from compliance with these regulations concerning board shall be made only by the Treasurer of the College, who may require a recommendation in individual cases from the Student Health Officer, if the excuse is requested for health reasons, or from the Dean if the reason has to do with the student's academic opportunities.

Rooms

1. It is the policy of the Board of Trustees that freshmen men students and all women students in the four-year course shall be housed in campus dormitories in so far as accommodations are available.

2. Since sufficient dormitory accommodations for all of these students are not available at the present time, the following procedure will be followed to the end that those which we do have will be used to capacity and that assignments will be made with justice to all concerned.

Women Students.

a. All freshman girls will be assigned rooms in campus dormitories. The Adviser of Women may excuse any at her discretion for the reasons that they wish to live at home or that they have opportunity to earn board and room in a private residence.

b. All sophomore girls will live in campus dormitories to the extent that accommodations are available unless excused by the Adviser of Women.

c. Upper-class girls may live in campus dormitories if accommodations are available and their wishes should take precedence over the sophomore requirement. Their selection of rooms will be by lot under the supervision of the Adviser of Women.

d. At the close of each college year all sophomore girls will draw lots for dormitory rooms for the next year. Assignments to rooms will be made in accordance with the sequence fixed by this draw. As vacancies occur during the year, the Adviser of Women will assign these vacated rooms to sophomore girls in accordance with this sequence and any student thus assigned to a dormitory room must take up residence there within two weeks after receipt of notice.

e. It is expected that not more than two sophomore girls from any one sorority will be assigned dormitory rooms in any single year under the provisions of "d."

f. Dormitory accommodations are available for about one hundred and twenty women students in the Abigail Adams House and Draper Hall. These rooms are furnished except for necessary bedding or linen and are cared for by the students occupying them. A list of approved off-campus rooms is kept by the Adviser of Women.

Men Students.

a. Assignment of rooms for men students is in charge of the Assistant Dean.

b. Freshman men students will be assigned to rooms in college dormitories in so far as these are available. A list of approved off-campus rooms is kept by the Assistant to the Dean.

c. Dormitory accommodations are available for about one hundred and ten freshman men in North College and South College. The rooms are furnished except for necessary bedding or linen. They are cared for by the students who occupy them. Upper class men usually obtain rooms in private dwellings located near the campus. In most cases these rent for from $2.50 to $4 per week, depending somewhat on the location, and whether or not they are single or double. Such rooms are usually furnished. Students desiring aid in obtaining off-campus rooms should write to the Assistant to the Dean. The College does not secure these rooms for the student but does keep a desirable list for student aid.

3. The general supervision of housing of students is in charge of the Faculty Committee on Housing.

STUDENT EMPLOYMENT.

The College affords opportunity for part-time employment for a limited number of needy students. The number of applicants usually far exceeds the number of positions open so that no guarantee can be made that a student will find employment through the College. The College Placement Service renders every possible assistance to deserving students in search of employment. Besides such opportunities on the campus as waiters and kitchen helpers at the dining hall, janitors for buildings, assistants on the farm and in college laboratories, there are some opportunities in private homes and businesses in the town.

Prospective students should be cautioned not to depend too much upon their earning capacity in the first year. This year is the most difficult to finance for two reasons. This is the student's first experience with college work and the usual result is that more time is required for study and less is therefore available for work. In this year also, since it is the first, the student is less familiar

with his surroundings and not so able to locate work. Upper class men usually have most of the available jobs before the freshmen get acclimated. Students who are planning to enter college for the first time are therefore advised that they should have at least $450 available with which to meet the expenses of the first year. Some students stay out of school for a year after graduating from high school in order to work and save this amount.

SCHOLARSHIPS.

Scholarships are awarded only to needy students of high character, whose habits of life are economical and who have maintained an average of at least 70% in their college course during the preceding year. Scholarships from the Crane and Ward Funds may be granted to applicants for admission to the College provided they are candidates for a degree, are in need of financial assistance and are able to meet the entrance requirements in full. Complete information relative to the student's need for financial aid must be presented before any application can be acted upon. Scholarships are paid in installments at the beginning of each semester in the form of a credit on the student's bill for that term. A scholarship may be discontinued at the close of any semester if the scholastic record of the recipient is unsatisfactory.

Blanks for applying for a scholarship may be obtained from the Dean of the College. Applicants from the three upper classes must file at the Dean's Office before the close of the college year an account of their income and expenses for that college year together with a statement of their resources for the coming year. Prospective freshmen may file their applications at the time their entrance requirements are satisfied in full.

The following scholarships are available:

1. General scholarships:
   a. Nineteen scholarships of $60 each, known as the Porter L. Newton Scholarships.
   b. One scholarship of $60 known as the Mary Robinson Scholarship.
   c. One scholarship of $60 known as the Henry Gassett Scholarship.
   d. One scholarship of $60 known as the Whiting Street Scholarship.
2. Scholarships limited to students from Berkshire County:
   a. At least ten scholarships of $60 or more, known as the Frederick G. Crane Scholarships.
3. Scholarships limited to women students:
   a. One scholarship of $150, known as the Helen A. Whittier Memorial Scholarship.
   b. One scholarship covering all college expenses of the freshman year, known as the Cotting Memorial Scholarship.
4. Scholarships limited to men students of Hampshire County:
   a. Twenty-five scholarships of approximately $100 known as the Wilbur H. H. Ward Scholarships.
5. Scholarships limited to students from Worcester:
   a. Two scholarships of approximately $250 each provided by a bequest from Mrs. Betsey Pinkerton.
6. Hood Dairy Scholarships:
   a. Four scholarships of $200 each for students of Dairying provided by the gift of Dr. Charles H. Hood.

LOANS.

Loans may be granted to needy students requiring some assistance in meeting the expenses of the college course. The student must present a properly endorsed note at the time a loan is made. Money thus loaned is at a low rate of interest until the student graduates or severs his connections with the college. Applications for a loan may be made at the Treasurer's Office.

These loans are made available through the income from the following funds:

Danforth Keyes Bangs Fund. — This is a gift of $6,000 from Louisa A. Baker of Amherst, the income of which is to be used annually in aiding poor, industrious and deserving students to obtain an education in the Massachusetts State College.

Charles A. Gleason Fund. — This is a gift of $5,000 from Charles A. Gleason of North Brookfield, Massachusetts, a trustee of the college from 1889 to his death, September 29, 1925.

Massachusetts Agricultural Club Fund. — The Massachusetts Agricultural Club has given $500 to be used as a loan fund at the Massachusetts State College to help out deserving students there who intend to go into agricultural work.

4-H Club Loan Fund for Boys. — A loan fund of $1,000.

4-H Club Loan Fund for Girls. — A loan fund of $100.

Vincent Goldthwait Memorial Loan Fund. — A gift of $5,000 from Dr. Joel E. Goldthwait in memory of his son.

SCHOLARSHIP HONORS AND AWARDS.

Dean's Scholarship Groups. — At the beginning of each semester a list is posted of those students who during the previous semester made a general average of 80 per cent or better. Three groups are recognized: those between 90 and 100; those between 85 and 90; and those between 80 and 85. Sophomores, Juniors and Seniors in the first two groups are allowed considerable freedom in the matter of class attendance.

General Honors Course. — High ranking Seniors who have maintained an average of 80 per cent throughout the college course are given the privilege of enrolling for a general honors course given during the second semester. Some outstanding instructor on the staff of the College or some other college is chosen to teach this. Since he has a group of selected senior students he is allowed the greatest freedom in the matter of course content and method of presentation.

Departmental Honors. — A student who has shown outstanding promise within some department and has maintained a general scholastic average of 80 per cent or better is permitted to apply for the privilege of registering for departmental honors. If his application is accepted by his department and the Honors Committee, he is allowed to pursue a course of independent study within the department of his choice throughout his senior year. This may include intensive reading, investigation or laboratory work in connection with some problem that he chooses for his consideration. The objective is to create on the part of the student initiative, the power of independent investigation and to develop in him the spirit of research. Although the student is responsible for his undertaking he is encouraged to consult with his department in regard to his work should the need arise. At the close of his study the student presents a thesis covering his investigation. In addition he may be required to appear for an oral or written examination. If by the excellence of his work he satisfies all the requirements of his department and the Honors Committee his name will appear on the commencement program as receiving honors in the field of his specialization.

Phi Kappa Phi Elections. — Those members of the senior class whose scholarship average has been 85 or above are eligible for election to the Honorary Scholarship Society of Phi Kappa Phi. Not more than 15 per cent of the class can be elected, however.

Scholastic Prizes.

Phi Kappa Phi Award for Scholarship. — Massachusetts Chapter of the Phi Kappa Phi Honorary Scholarship Society offers an award of $50 for outstanding work in scholarship. This is given to some member of the Senior class at the opening of college in the fall. The award is based on the record of the first three years.

The Grinnell Prizes. — Given by the Hon. William Claflin of Boston, in honor of George B. Grinnell, Esq., of New York, for excellence in theoretical and practical agriculture. The contest is open to those senior students whose records on the registrar's books show an average standing of 80 or above for the technical work taken in the Divisions of Agriculture and Horticulture during the junior and senior years. There are three prizes of $25, $15, and $10.

The Burnham Prizes. — These were made possible through the generosity of Mr. T. O. H. P. Burnham of Boston. Prizes of $15 and $10 are awarded to those

students delivering the best and second best declamations in the Burnham contest. The preliminary contests are open under certain restrictions to freshmen and sophomores.

The Flint Prizes. — The Flint Oratorical Contest was established in 1881 by a gift of the late Charles L. Flint, a former president of the college. After his death the prizes were continued by college appropriation. Prizes of $30 and $15 are awarded as first and second prizes to those two students delivering the best orations in this contest.

The Hills Botanical Prize. — This is given through the generosity of Henry F. Hills of Amherst, for the first and second best herbaria. Competition is open to members of the senior, junior and sophomore classes. First prize $20, second prize $15.

The Betty Steinbugler Prize in English. — This prize was endowed by John L. Steinbugler, New York City, in honor of his daughter Elizabeth Steinbugler Robertson, a graduate of this College in the Class of 1929. It is awarded annually to a woman in the junior or senior class who has written the best long paper on a subject of literary investigation in a course in English during the year.

ATHLETIC AND ACADEMICS PRIZES.

The Allan Leon Pond Memorial Medal. — This medal is awarded for general excellence in football in memory of Allan Leon Pond of the class of 1920, who died February 26, 1920. He was a congenial companion, a devoted lover of Alma Mater, a battle-scarred, though youthful, veteran of the Great War, a fine all-round athlete and a true amateur. He would rather win than lose, but he would rather play fair than win. He has been characterized as a typical student of this College.

The Southern Alumni Baseball Cup. — This cup is awarded to that member of the baseball team who contributes most to the success and reputation of the team, both in respect to skill and spirit.

The Thomas E. Minkstein Memorial Award. — This award is made by the Class of 1931 in memory of their classmate who died July 16, 1930, while he was captain-elect of football. The award is given to one of the outstanding men in the Junior Class who has as nearly as possible attained those standards of athletics, scholarship and leadership set by him whose memory this award honors.

The George Henry Richards Memorial Cup. — This cup is awarded annually to the member of the basketball team who shows the greatest improvement in leadership, sportsmanship, and individual and team play during the season. It is in memory of George Henry Richards of the Class of 1921 who died suddenly while a student at the College.

Academics Conspicuous Service Trophy. — This trophy is awarded to that student who during the past 12 months has made the most important, single contribution to the Academic Activities.

Academics Managers' Prize. — Fifty dollars in gold awarded annually to that Academics manager who fulfills his duties most efficiently.

Poetry Prize. — Twenty-five dollars awarded to the author of the best poem published in the *Collegian* during the year.

Interfraternity Leadership Cup. — This cup is awarded annually to the Fraternity which receives the highest average rating in scholarship, Academics, and Athletics for the entire year.

STUDENT ACTIVITIES AND ORGANIZATIONS.

No small part of the value received from four years of college is the training that one acquires through participation in student activities. Student organizations offer excellent opportunities for leadership in a wide variety of fields.

Student Government.

The Senate. — This is a student governing council. It is composed of representatives elected from the Junior and Senior classes. Besides acting as general director of undergraduate conduct it represents the interests of the students and the student body before the Faculty.

Adelphia. — This is a senior honorary society. The members are usually chosen from those who have been prominent in college activities. The society attempts in a quiet, unassuming way to mold student life on the campus.

The Honor Council. — The Honor System prevails at this college. The foreword of the Honor System reads as follows: "We, the students of the Massachusetts State College, believe that the goal of education is character. The man of character deals fairly with himself, and with others, and would rather suffer failure than stoop to fraud. The Honor System stands for this attitude in all relations of the students with the Faculty. In expression of our belief we pledge ourselves to the support of the constitution of the Honor System." Matters pertaining to the Honor System are in direct charge of the Student Honor Council, consisting of members elected from the four classes.

The Women's Student Council. — All appropriate matters pertaining to the conduct of women students are under the control of this council. It is composed of members selected from the senior, junior, and sophomore classes by all the women students.

Academic Activities.

The College Musical Clubs include an orchestra, a band, and a mixed chorus. These make various appearances during the year, both in Amherst and on tour.

The Dramatic Club, the Roister Doisters, presents annually a revue and two plays, one in connection with the Junior Promenade, and the other at Commencement. There is a Debating Society which conducts both class and intercollegiate debates. All academic activities are supervised by the Academic Activities Board composed of alumni, faculty, and students, and find recognition in semi-annual awards of gold and silver medals.

"The Massachusetts Collegian" is a weekly newspaper, published by the undergraduates of the college.

"The Index" is the college yearbook published by the members of the Junior class.

College Fraternities and Sororities

There are several national and local fraternities represented on the campus. Rushing rules and general matters dealing with fraternity life are in charge of the Inter-fraternity Conference. This conference awards scholarships, a baseball cup, and a relay plaque to the winners of the Inter-fraternity Contests.

There are four local sororities and an Inter-sorority conference which deals with affairs of interest to all of the societies.

Inter-Collegiate Athletics

The College is represented in inter-collegiate athletics by teams in all the leading sports, including football, baseball, track, hockey, soccer and basketball. General policies governing athletics are in charge of the Athletic Board, composed of Alumni, Faculty, and students.

Professional Clubs.

There are several professional clubs established in connection with the various major courses of study. These clubs stimulate the students' professional interest in their chosen subject-matter fields and afford opportunity for discussion of technical subjects of mutual interest.

Religious Organizations.

The Young Men's Christian Association and the Young Women's Christian Association are active both on the campus and off. In addition there is a Catholic Club, and a Jewish Menorah Society. The Cosmopolitan Club has as its object the cultivation of peace and the establishment of strong international friendship.

The Social Union.

The Social Union was established in 1907. All students become members of the Union in consideration of a small part of the Student Activities Fee. In the fall and winter months the Union gives a series of entertainments.

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Academic Activities.

The College Musical Clubs include an orchestra, a band, and a glee club. These make various appearances during the year.

The Dramatic Club, the Roister Doisters, presents annually a revue and two plays, one in the winter, and the other at Commencement. There is a Debating Society which conducts both class and intercollegiate debates for both men and women. All academic activities are supervised by the Academic Activities Board composed of alumni, faculty, and students, and find recognition in semi-annual awards of gold and silver medals.

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Professional Clubs.

There are several professional clubs established in connection with the various major courses of study. These clubs stimulate the students' professional interest in their chosen subject-matter fields and afford opportunity for discussion of technical subjects of mutual interest.

Religious Organizations.

Five religious organizations are active on the Campus: The Christian Association, the Young Women's Christian Association, the Menorah Club (for Jewish students), the Newman Club (for Catholic students), and the Stockbridge Y (for two-year students). These five organizations unite in forming a Student Religious Council which strives both to further amity among the religious faiths and to promote religious activities and thinking in the student body. These various religious organizations are sponsored by a Faculty Committee on Religious Work and they are under the supervision of the Director of Religious Education. The College conducts an assembly on each Sunday from November 1 through March at which some of the great religious leaders of our country speak.

The Social Union.

The Social Union was established in 1907. All students become members of the Union in consideration of a small part of the Student Activities Fee. In the fall and winter months the Union gives a series of entertainments.

STANDARDS OF DEPORTMENT.

The customary high standard of college men and women in honor, manliness, self-respect and consideration for the rights of others constitutes the standards of student deportment.

The privileges of the college may be withdrawn from any student at any time, if such action is deemed advisable.

It should be understood that the college, acting through its president or any administrative officer designated by him, distinctly reserves the right, not only

to suspend or dismiss students, but also to name conditions under which students may remain in the institution. For example, if a student is not doing creditable work he may not only be disciplined but he may also be required to meet certain prescribed conditions in respect to his studies, even though under the foregoing rules his status as a student be not affected. The same provision applies equally to the matter of absences ("cuts"). According to the rules juniors and seniors are allowed a certain percentage of absences from class and other exercises. This permission, which implies a privilege and not a right, may be withdrawn at any time for any cause.

Similarly, also, it applies to participation in student activities. Though this will ordinarily be governed by the rules as already laid down, yet if, in the judgment of the college authorities, a student is neglecting his work on account of these activities, the privilege of participating in them may be withdrawn for such time as is considered necessary. Moreover, it may be withdrawn as a punishment for misconduct. Prospective students or their parents may, upon application, obtain a copy of the faculty rules governing student relations to the college.

FRESHMAN REGISTRATION.

All members of the incoming freshman class are required to be in residence on the campus for the period of September 16 to September 21, 1935, inclusive. This period is known as Freshman week. During this week will be given the several psychological examinations and tests required of freshmen. In addition physical examinations will be given to the men students. Such matters as pertain to schedule and section assignments will be taken care of at the same time. Lectures on student activities, college customs, and college curriculum will be given also. The object of this week is to introduce the new student into the college, so that only the minimum amount of time will be lost when the actual studies begin.

Admission to Collegiate Courses.

A. APPLICATION FOR ADMISSION.

Correspondence concerning admission should be addressed to the Dean's office.

Every applicant for admission to the college must be at least sixteen years old, and must present to the Dean proper testimonials of character, which, whenever possible, should come from the principal of the school at which the applicant has prepared for college. All applications for admission should be received at the Dean's office on or before June first of the year in which the candidate expects to enroll. Blanks for such application may be obtained by addressing the Dean of the college. All entrance credentials must be in the hands of the Dean before the applicant can matriculate.

B. MODES OF ADMISSION.

Students are admitted to the freshman class either upon certificate or upon examination. No *diploma* from a secondary school will be accepted.

Certificates. — The Massachusetts State College is affiliated with the New England College Entrance Certificate Board. Therefore certificates of admission will be accepted from schools approved by the Board. Certificates of admission will also be accepted from any Massachusetts school listed as class "A" by the State Department of Education, but not included in the approved list of the New England College Entrance Certificate Board. Principals of schools in New England who desire the certificate privilege should address the secretary of the Board, Professor Frank W. Nicolson, Wesleyan University, Middletown, Conn. Certificates from schools outside of New England may be received if those schools are on the approved list of the leading colleges of the section in which the school in question is located.

The credentials of the Board of Regents of the State of New York are accepted as satisfying the entrance requirements of this college when offered subject for subject, provided the grades are satisfactory.

Certificates in order to be accepted must present in the prescribed and restrictive elective groups at least three of the necessary fourteen and one-half units. It is to be understood, however, that responsibility for certification in either elementary French, elementary German, English 1 or English 2, Latin A, Greek A or Algebra, must be assumed by one school, if the candidate has received his preparation in any one subject named above in more than one school. Subjects lacking on certificate must be made up at the time of the examinations for admission. Conditions to the amount of two units will be allowed.

Blank forms for certification — sent to principals or school superintendents only — may be obtained on application to the Dean of the college.

Special Certificate Arrangement for Students from Agricultural Schools. — Superior graduates of Vocational Schools of Agriculture in Massachusetts and Vocational Agricultural Departments in Massachusetts High Schools may be accepted for the Degree of Vocational Agriculture provided: —

(*a*) they are unqualifiedly recommended by the Vocational Division of the Department of Education as *bona fide* Vocational Graduates with superior rank; and

(*b*) that they can present at least 14½ units of certified entrance, approved as to quality and quantity by the State Department of Vocational Education.

Admission by Four Comprehensive Examinations. — By this plan a candidate's qualifications for admission will be based upon the following considerations:

(*a*) School Record: A candidate must present to the Committee on Entrance a complete transcript of his secondary school course giving the subjects and the grades for the four years previous to college entrance, and a confidential estimate of character, personality, and promise of ability to do college work from the school principal. This should be sent to the Dean not later than May 1. The Committee must give its permission before the applicant may take the examinations.

(*b*) The following comprehensive examinations must be taken unless for satisfactory reasons the Committee allows a substitution for either 3 or 4: —

1.	English	three units
2.	Mathematics	three units
3.	History	one unit
4.	A foreign language	two units

These must be the College Entrance Examination Board Plan B examinations given in June. A candidate under this plan will be admitted without condition or refused admission. In the event that a substitution is allowed for foreign language the student must take at least one year of modern language in college without receiving college credit therefor.

C. EXAMINATIONS.

Entrance examinations for admission to the Massachusetts State College will be held at the following centers: —

In June . . . . . Amherst, Stockbridge Hall, room 114.
Cambridge, Massachusetts Institute of Technology, Massachusetts Ave. entrance.

In September . . . Amherst, Stockbridge Hall, room 114.

Please note that September examinations are held in Amherst only.

Schedule for Entrance Examinations June 13–15, 1935.

First Day.

8.30 A.M. Algebra.
10.30 A.M. Chemistry.
2.00 P.M. History (ancient, medieval and modern, English, United States and Civics).

Second Day.

8.30 A.M. English 1 and 2.
11.30 A.M. Botany and Biology.
2.00 P.M. Plane Geometry.
3.30 P.M. Physics.

Third Day.

8.30 A.M. French, German, Spanish, required and elective.
1.00 P.M. Latin, elementary, intermediate and advanced, and all one-half credit electives, except those already noted.

Schedule for Entrance Examinations September 11–14, 1935.

First Day.

2.15–5.00 P.M. Greek, elementary and intermediate.

Second Day.

8.30 A.M. Algebra.
10.30 A.M. Chemistry.
2.00 P.M. History (ancient, medieval and modern, English, United States and Civics).

Third Day.

8.30 A.M. English 1 and 2.
11.30 A.M. Botany and Biology.
2.00 P.M. Plane Geometry.
3.30 P.M. Physics.

Fourth Day.

8.30 A.M. French, German, Spanish, required and elective.
1.00 P.M. Latin, elementary, intermediate and advanced, and all one-half credit electives, except those already noted.

D. REQUIREMENTS FOR ADMISSION.

The requirements for admission are based on the completion of a four-year high school course or its equivalent and are stated in terms of units. A unit is the equivalent for at least four recitations a week for a school year.

Fourteen and one-half units must be offered for admission in accordance with the entrance requirements outlined below. In some instances students are allowed to enter conditioned in not more than two units.

Entrance Requirements.

1. *Prescribed.* — The following units are required: —

Algebra	1½
Plane Geometry	1
English 1 (Grammar and Composition)	2
English 2 (Literature)	1
History	1
A foreign language	2
	8½

2. *Restricted electives.* — From two to six units selected from the following subjects: —

Mathematics and Science.

Solid Geometry	½
Trigonometry	½
Biology	1
Botany	½ or 1
Chemistry	1
Geology	½
Physical Geography	½
Physics	1
Physiology	½
Zoölogy	½

History.

Ancient	1
English	1
Medieval and Modern	1
United States and Civics	1

Foreign Language.

Elementary French	2
Elementary German	2
Elementary Spanish	2
Elementary Latin	2
Elementary Greek	2
Intermediate French	1
Intermediate German	1
Intermediate Spanish	1
Intermediate Latin	1
Intermediate Greek	1
Advanced French	1
Advanced German	1
Advanced Spanish	1
Advanced Latin	1

3. *Free margin electives* — not over four units. In case fourteen and one-half units cannot be presented in the prescribed and restricted elective groups, units not to exceed four may be offered as free margin electives. Credit in the free margin will be allowed for any substantial courses (agriculture, general science and fourth year English included) not listed under the prescribed and restricted elective groups for which credit of not less than one-half unit earned in one year

is given toward a secondary school diploma. Since no entrance examinations are given in these subjects they may be offered only on certificate.

E. OTHER INFORMATION ABOUT ENTRANCE.

1. If elementary algebra and plane geometry are counted as three units the total requirement for admission will be fifteen.
2. Both the credits under the prescribed and restricted elective groups must be presented either by certificate from an approved school or by examination or by a combination of both. Credit by certificate will not be accepted unless at least three units are offered.
3. Candidates are allowed to spread their entrance examinations over the three consecutive periods just previous to their entrance into college. A period means June to September of the same year.
4. Examinations for the removal of entrance conditions will be held during the second week of January.
5. All entrance conditions must be satisfied before a student is permitted to enter upon the work of the sophomore year.
6. The privileges of the college may be withdrawn from any student at any time if such action is deemed advisable, regardless of whether entrance was gained by certificate or examination.
7. The passing grade for an entrance examination is 60 per cent.

F. ADMISSION TO ADVANCED STANDING.

A student desiring to transfer to this college from another of recognized standing must present the following credentials: —

1. A letter of honorable dismissal from the institution with which he has been connected.
2. A statement or certificate of his entrance record.
3. A statement from the proper officer showing a complete record of his work while in attendance.
4. A marked catalogue showing the courses pursued.
5. A statement from the proper officer, giving the total number of credits required for graduation by the institution from which the applicant is transferring, and, of this total, the number that the applicant has satisfactorily completed at the time of the transfer.

The above credentials must be sent directly from the Registrar's office of the college from which the student is transferring. They should be addressed to the Dean of the Massachusetts State College. Applications will be judged wholly on their merits. The college may prescribe additional tests before accepting applicants or determining the standing to be granted them.

At least one year's work in residence is required of any student desiring to be recommended for the Bachelor of Science degree.

G. STATEMENT OF PREPARATION REQUIRED FOR ADMISSION.

Agriculture.

Entrance credit in agriculture is granted on the following basis: —

I. The Massachusetts State College accepts a maximum of four units in agriculture (except as described on page 17) from any secondary or county agricultural high school offering work in that subject, provided evidence of such work having been done is submitted on a principal's statement, as is indicated in the "free margin" group.

II. In high schools organizing agricultural club work under the supervision and rules of the junior extension service of the college, one credit is granted for each full year of work performed under the following plan: —

Work of the Winter Term. — (*a*) The study of textbooks such as are suitable for secondary school instruction in agriculture.

(*b*) Course of study: A general outline of suggested topics for study.

(*c*) Visits by a representative of the Massachusetts State College for observation, counsel and advice in regard to kind and amount of work being done in agriculture.

(*d*) Formation of an agricultural club with officers from among its own members,

meeting once a month under local supervision of someone authorized to act for the school authorities.

Work of the Spring Term. — Same in general form as winter term.

Work of Summer Term. — An approved project conforming to the rules of some one or more of the agricultural clubs of the junior extension service of the Massachusetts State College.

Work of the Fall Term. — (*a*) An exhibit of work.

(*b*) Reports and story of achievement submitted to the junior extension service of the college.

Biology.

The entrance examination in biology will cover the work outlined by the College Entrance Examination Board. This work should extend through one full year and include both laboratory and textbook study. The requirements are met by Hunter's *Civic Biology* and similar texts.

Botany.

For one unit of credit in botany, the work outlined in the statement of requirements issued by the College Entrance Examination Board, or its equivalent, will be accepted. This work should occupy one school year and include laboratory and supplementary textbook study. For one-half unit of credit, work that covers the same ground but occupies half the time required for a full unit of credit will be accepted. These requirements are met by such texts as Stevens' *Introduction to Botony* and Bergen & Davis' *Principles of Botany*. A notebook, containing neat, accurate drawings and descriptive records forms part of the requirement for either the half-unit or the one-unit credit. The careful preparation of an herbarium is recommended to all prospective students of this college, although the herbarium is not required.

Chemistry.

The entrance examination in chemistry will cover the work outlined by the College Entrance Examination Board as preparatory for college entrance. In general, this consists of a year of high school chemistry from any standard textbook, with laboratory work on the properties of the common elements and their simpler compounds. No particular work is prescribed. The keeping of a notebook is required.

Students who do not take chemistry in the preparatory school begin the subject in college.

Mathematics.

(*a*) *Required.* — Algebra: The four fundamental operations for rational algebraic expressions; factoring, determination of highest common factor and lowest common multiple by factoring; fractions, including complex fractions; ratio and proportion; linear equations, both numerical and literal, containing one or more unknown quantities; problems depending on linear equations; radicals, including the extraction of the square root of polynomials and numbers; exponents, including the fractional and negative; quadratic equations, both numerical and literal; simple cases of equations with one or more unknown quantities that can be solved by the methods of linear or quadratic equations; problems depending upon quadratic equations; the binomial theorem for positive integral exponents, the formulas for the *n*th term and the sum of the terms of arithmetic and geometric progressions, with applications.

Plane Geometry: The usual theorems and constructions of good textbooks, including the general properties of plane rectilinear figures; the circle and the measurement of angles; similar polygons; areas; regular polygons and the measurement of the circle; the solution of numerous original exercises, including loci problems; applications to the mensuration of lines and plane surfaces.

(*b*) *Elective.* — Solid Geometry: The usual theorems and constructions of good textbooks, including the relations of planes and lines in space; the properties and measurement of prisms, pyramids, cylinders and cones; the sphere and spherical triangle; the solution of numerous original exercises, including loci problems; applications to the mensuration of surfaces and solids.

Plane Trigonometry: A knowledge of the definitions and relations of trigonometric functions and of circular measurements and angles; proofs of the principal formulas and the application of these formulas to the transformation of the trigonometric functions; solution of trigonometric equations, the theory and use of logarithms, and the solution of right and oblique triangles.

Physics.

To satisfy the entrance requirement in physics, the equivalent of at least one unit of work is required. This work must consist of both classroom work and laboratory practice. The work covered in the classroom should be equal to that outlined in Hall & Bergen's *Textbook of Physics* or Millikan & Gale; the laboratory work should represent at least thirty-five experiments involving careful measurements, with accurate recording of each in laboratory notebook.

Physiology.

Hough & Sedgwick's *The Human Mechanism;* Martin's *The Human Body; Briefer Course.*

Zoology, Physical Geography, Geology.

The following suggestions are made concerning preparation for admission in the subjects named above: —

For physiography, Davis' *Elementary Physical Geography;* Gilbert & Brigham's *Introduction to Physical Geography.* For zoölogy, textbooks entitled *Animals* or *Animal Studies,* by Jordan, Kellogg and Heath; Linville & Kelley's *A Textbook in General Zoology.* For geology, A. P. Brigham's *A Textbook of Geology* or Tar's *Elementary Geology.*

Examination in these subjects will be general in recognition of the different methods of conducting courses; but students will be examined on the basis of the most thorough secondary school courses.

History.

The required unit must be offered in either ancient history, medieval and modern history, English history, or United States history and civics. Either one, two or three elective units in any of the historical subjects here named may be offered, provided that no unit be offered in the same subject in which the required unit has been offered.

Preparation in history will be satisfactory if made in accordance with the recommendations of the committee of seven of the American Historical Association, as outlined by the College Entrance Examination Board. The examination will require comparisons and the use of judgment by the candidate rather than the mere use of memory, and it will presuppose the use of good textbooks, collateral reading and practice in written work. Geographical knowledge may be tested by requiring the location of places and movements on outline maps.

To indicate in a general way the character of the textbook work expected, the texts of the following authors are suggested: Botsford, Morey or Myers, in ancient history (to 814 A.D.); Adams, West or Myers, in medieval history; Montgomery, Larned or Cheyney, in English history; Fiske, together with Muzzey and West, in United States history and civics.

English.

The study of English in school has two objectives: first, the ability to use the English language, in both speech and writing, clearly, correctly and effectively; and, second, the ability to read English literature with understanding and appreciation.

(1) *Grammar and Composition* (Two Units). — The first objective makes necessary a rigorous and reiterated instruction in grammar and composition, with special emphasis upon: spelling, sentence structure, punctuation and paragraph development.

(2) *Literature* (One Unit). — The second objective is that of the progressive, four-year course in literature. The student should be trained to read aloud, to memorize significant passages, to associate the books with their historic background and to have well in hand both content and structure. He should be prepared to

answer general questions upon poetry, the essay, prose fiction, the drama and biography by the presentation of varied and definite detail from such standard books as those recommended by the College Entrance Examination Board in its current bulletin. However accurate in subject matter, no paper will be considered satisfactory if seriously defective in punctuation, spelling or other essentials of good usage.

The candidate may effect admission in English: by passing the College Entrance Examination Board's comprehensive examination (3 units), by certification, from an accredited school, in English 1 (2 units) and English 2 (1 unit); or by passing this college's examinations in these subjects in June or in September. Regardless of his method of admission, however, he will be gravely handicapped in his freshman English courses if inadequately prepared in any one of the three phases of study indicated in this statement.

Foreign Languages.

(French, Spanish, German, Latin, Greek.)

Two, three, or four* units of entrance credit in each of the above foreign languages may be presented by certificate or by written examination. Not less than two units (first two years) will be accepted in any one language.

No examination for a third or a fourth unit of credit in any language will be given unless the candidate has previously presented by certificate or by written examination the two or three preceding units respectively in that language.

The preparation expected for each of the above units is that stated in the Definition of Requirements of the College Entrance Examination Board.

* A maximum of three units may be offered in Greek.

Collegiate Course of Instruction.

The course of study consists of four years of work planned to provide scientific foundation, cultural background, and professional training, and leads to the degree of Bachelor of Science (B.S.). The following five different major lines of specialization are provided: Agriculture; Horticulture; Home Economics; the Physical and Biological Sciences; and the Social Sciences.

FRESHMAN YEAR.

The work of the freshman year consists of definitely required subjects, most of which are identical for all students, in order to insure a uniform preparation in the more fundamental collegiate subjects. However, some differentiation is required in order to properly introduce each student to some major line of work in which he may find his professional interest, and major faculty contacts. This course is presented below in tabular form.

Table of Freshman Subjects.

(Groups A and C of each semester are required of all freshman men, Groups A and D of all freshman women, and one of the options of Group B must be selected by each freshman to complete his year's program of study.)

Group		First Semester	Cr.	Second Semester	Cr.
A		English 1	3	English 2	3
		Mathematics 1†	3	Mathematics 2†	3
		Botany 1* or	4	Botany 1* or	4
		Chemistry 1 or 3*	4	Chemistry 1 or 3*	4
		History 1* or	3	History 1* or	3
		Orientation 1*	3	Orientation 1*	3
B	I	AGRICULTURE divisional electives			
		Agriculture 1	3	Agronomy 2	3
	II	HOME ECONOMICS divisional electives			
		Home Economics 1	3	Home Economics 2	3
	III	HORTICULTURE and LANDSCAPE ARCHITECTURE divisional electives			
		Horticulture 1	3	Agronomy 2	3
	IV	PHYSICAL and BIOLOGICAL SCIENCE divisional electives			
		French 1 or 5 or 7	3	French 2 or 6 or 8	3
		German 1 or 5	3	German 2 or 6	3
	V	SOCIAL SCIENCE divisional electives			
		French 1 or 5 or 7	3	French 2 or 6 or 8	3
		German 1 or 5	3	German 2 or 6	3
C		Military 1	2	Military 2	2
		Physical Education 3	1	Physical Education 4	1
		Physical Education 1	1		
D		Freshman Course 5	1	Freshman Course 6	1
		Physical Education 7	2	Physical Education 8	2
		Physical Education 1	1		

† French or German is optional for Mathematics for students who intend to specialize in Home Economics.

* One semester of each required during freshman year.

SOPHOMORE YEAR.

The work of the sophomore year is also largely prescribed in order to insure as broad a cultural background as possible in preparation for the more specialized training of the last two years. Under the guidance of a major group advisory committee the student begins in this year certain optional choices of electives leading to the special courses of major work which he will later pursue. This course is presented on following page in tabular form.

TABLE OF SOPHOMORE SUBJECTS.

(Groups A and C are required of all sophomore men; Groups A and D of all sophomore women; and two of the electives of Group B must be selected by each sophomore, with the approval of his major group advisory committee.)

Group		First Semester	Cr.	Second Semester	Cr.
A		English 25 and 29	3	English 26 and 30	3
		Economics 25	3	Psychology 26	3
		Sophomore Science	3	Sophomore Science	3
B	I	AGRICULTURE divisional electives			
		Dairy 25 or Poultry 25	3	Animal Husbandry 26	4
		Bacteriology 31	3	Chemistry 30	3
		Mathematics 27	3	Mathematics 28	3
		Chemistry 25	4	Chemistry 26	4
	II	HOME ECONOMICS divisional electives			
		Home Economics 25	3	Home Economics 30	3
		Drawing 31	3	Home Economics 32	3
				Chemistry 30	3
	III	HORTICULTURE and LANDSCAPE ARCHITECTURE divisional electives			
		Olericulture 25	3	Pomology 26	3
		Drawing 25	3	Drawing 26	3
		Botany 25	3	Entomology 26	3
		Chemistry 25	4	Floriculture 26	3
		Bacteriology 31	3	Horticulture 26	3
	IV	PHYSICAL and BIOLOGICAL SCIENCE divisional electives			
		Mathematics 25	3	Geology 28	3
		Mathematics 27	3	Mathematics 28	3
		Physics 25	3	Physics 26	3
		Chemistry 25	4	Chemistry 26	4
		Zoölogy 25	3	Zoölogy 26	3
		Botany 25	3	Physiology 32	3
				Chemistry 30	3
				Entomology 26	3
	V	SOCIAL SCIENCE divisional electives			
		French 7, 29, or 31	3	French 8, 30, or 32	3
		German 25 or 27	3	German 26 or 28	3
		Sociology 27	3	Agricultural Economics 26	3
		History 25	3	History 32	3
		History 27	3		
C		Military 25	2	Military 26	2
		Physical Education 23	1	Physical Education 24	1
D		Physical Education 27	2	Physical Education 28	2

JUNIOR AND SENIOR YEARS.

The work of the junior and senior years is, with certain restrictions, elective under the guidance of a special adviser, who is a member of the advisory committee of the major group which the student selects during his freshman year as his field for professional training. The aim of the last two years is to give to each student as high a degree of proficiency in some one branch of learning as is possible without sacrificing the breadth of knowledge and training which should characterize a well-rounded college course. In order to insure this result, each student is required to complete, during his last two years of study, certain requirements for specialization within his major group and certain minimum requirements in other groups:

I. Agriculture: Departments of Agricultural Engineering; Agronomy; Animal Husbandry; Dairy Industry; Farm Management; Poultry Husbandry.

II. Home Economics: Department of Home Economics.

III. Horticulture: Departments of Floriculture; Forestry; Landscape Architecture; Horticultural Manufactures; Olericulture; Pomology.

IV. Physical and Biological Sciences: Departments of Bacteriology and Physiology; Botany; Chemistry; Entomology, Zoölogy, and Geology; Mathematics and Civil Engineering; Physics; Veterinary Science.

V. Social Sciences: Departments of Agricultural Economics; Education; Economics, History, and Sociology; Languages and Literature; Physical Education.

For purpose of fulfilling the extra group requirements specified below, Groups I to III inclusive are regarded as a unit, since their work is comparable in field and character.

SPECIFIC REQUIREMENTS.

RULE 1. *Credits for Graduation.* — The minimum number of credits for graduation shall be 72 junior-senior credit hours, in addition to the satisfactory completion of the required courses of the freshman year and of the required and elective groups of the sophomore year.

RULE 2. *Credits Each Semester.*—Except upon special permission from the Scholarship Committee, no student shall enroll for more than 20 nor less than 16 credits each semester of his junior and senior years.

RULE 3. *Specialization.*—At the close of his sophomore year each student shall designate some department within his major group in which he desires to specialize, and shall complete, during his junior and senior years, not less than 18 and not more than 36 credits in junior-senior courses offered in that department. In special cases, with the approval of the student's major adviser and the Dean, this requirement may be satisfied by the selection of at least the minimum number of credits from two or more departments of closely related work.

RULE 4. *Requirements in Other Groups.* — Each student shall complete, during his junior and senior years, not less than 12 credits in other than his major group unit.

RULE 5. *Credit in Military Science and Tactics.* — Not to exceed 12 junior-senior credits in Military Science may be included in the minimum requirements for graduation.

RULE 6. *Advisers.* — The work of each student will be under the general supervision of his major group advisory committee from the beginning of his sophomore year, and during his junior and senior years under the immediate supervision of a special adviser who shall be some member of that committee and shall represent the department in which the student is to specialize under the terms of Rule 3. The adviser has full authority to prescribe the student's work required by Rules 3 and 4, and may advise the student with reference to his elections under Rule 7.

RULE 7. *Free Electives.* — Subject to the limitations imposed by Rules 2, 3, 4, and 5, each student may elect during his junior and senior years any courses offered in the catalogue for which he has the necessary prerequisite training.

RULE 8. *Registration.* — No junior or senior shall register until his course of study is approved by his adviser.

A card for recording the election of courses for each semester will be issued from the Schedule Room. This election card, properly filled out and signed, must be returned to the Schedule Room on or before June 1 of each year for first semester courses, and January 10 for second semester courses.

RULE 9. *Changing of Major Group.* — Application for change of major group can be made to the Dean in writing at any time, when approved by both major group advisory committees concerned and by the Dean and the Scholarship Committee, the change becomes operative at the beginning of the term following, provided that no change in the selection of a major group may be made by any student after registration day of his senior year.

Description of Courses.

[Heavy-faced Roman numerals indicate the semester in which the course is given. Numbering of courses: 1 to 24, inclusive, freshmen; 25 to 49, inclusive, sophomores; 50 to 74, inclusive, juniors; 75 to 99, inclusive, seniors.]

SPECIAL COURSES FOR FRESHMEN.

1. **I and II.** Orientation Course. — The word orientation may be defined as "the determination of one's bearings or true position in relation to circumstances, ideas, etc." This course attempts to orient the student to the physical and social world in which he lives and works. The first part deals primarily with the nature of our universe and the method of thinking used by man in coming to an understanding of it. An attempt is made to establish a time and space perspective and to form a well defined conception of the cosmos and one's relation to it. A total viewpoint is sought. It is shown that this comes only through a synthesis of the contributions of many subjects, astronomy, geology, chemistry, physics, biology, etc. During the second part of the course the main theme is man in society. The student is made conscious of his own original nature and of the several institutions which serve that nature. The development of these institutions is traced. The student is urged to identify his own activities with them. There is also an introduction to some of the social problems man now faces because of his attempt to understand and control his physical environment and himself. This is really an orientation to the social sciences.

The central thought of the course is human life. The aim is to see life as a whole. Since this is the objective no attempt is made to teach the subject matter of any one science. Rather the course seeks to organize around the individual life the material from many sciences without considering the conventional lines separating one from the other. It suggests how from such an organization a fuller understanding of life may arise and how this may lead to the living of life more knowingly and abundantly. It is hoped that by this orientation the student may see unity in the mass and maze of college subjects and that he may be led to plan his course more intelligently. Theoretically, such an orientation should assist the student in organizing his future information and aid him at the end of his senior year in making the final synthesis of his four years of subject matter in terms of his own life.

3 class hours. Credit, 3.

Assistant Professor Lanphear.

5. **I.** College Adjustments. — For freshman women. A study of the experiences of everyday life in college, to help students recognize various social problems and think in terms of their solution.

1 class hour. Credit, 1.

Miss Skinner.

6. **II.** Vocational Opportunities for Women. — For freshman women. An outline of the occupational progress of women, with special attention to the opportunities for women in those vocations for which the Massachusetts State College gives foundation preparation.

1 class hour. Credit, 1.

Miss Hamlin.

DIVISION OF AGRICULTURE.

Professor Rice.

1. **I.** The Agricultural Industry. — For freshmen. During the first half of the semester this course will include a survey and description of the major types of agriculture found in New England and the United States, and the reasons for their existence. The economic laws of diminishing returns, comparative advantage and opportunity cost will be analyzed from the theoretical and practical standpoints. The practical application of these basic principles and their importance to the individual farm proprietor will be brought out by visits to representative farms. Approximate expense for travel is $3.00.

The second half of the semester will be devoted to mechanical drawing, which consists of geometric construction, graphs, orthographic projections, isometrics, perspective, and the making of working drawings.

3 2-hour laboratory periods, credit, 3.
Assistant Professors MIGHELL and MARKUSON.

Agricultural Engineering.

Professor GUNNESS, Assistant Professor MARKUSON, Assistant Professor TAGUE, Mr. PUSHEE, Mr. NEWLON.

The courses in agricultural engineering are planned to give a working knowledge of those phases of engineering which apply directly to the farm. It is expected that the student will acquire a clear understanding of modern farm practice as it relates to permanent improvements of the farm and the farmstead, and in the selection and use of farm equipment.

Elective Courses.

50. **II.** SHOP WORK. — For juniors; seniors may elect. This course gives instruction in the care and use of carpenters' tools through bench work, repair of farm equipment, and building construction. Practice in building forms, mixing and placing concrete, framing, cutting rafters, etc., make up this portion of the subject. Instruction in forging, pipe fitting, soldering, and the use of machinists' tools for the repair of farm machinery and miscellaneous farm equipment, together with a study of pumps and water supply systems make up the other portion of the work.

3 2-hour laboratory periods, credit, 3.
Mr. PUSHEE and Mr. NEWLON.

51. **I.** HOUSE PLANNING AND CONSTRUCTION. — For juniors; seniors may elect. Plan designs of the small house will be made. The arrangement of interior equipment, especially in the kitchen, lighting, heating, water supply, and sewage disposal will be studied, together with a brief history of the house, materials, construction methods, equipment, and architectural styles. Consideration will be given to the economics of house building, including financing and to maintenance and overhead expense.

1 class hour. 2 2-hour laboratory periods, credit, 3.
Assistant Professor MARKUSON.

52. **II.** RURAL SANITARY EQUIPMENT. — For juniors; seniors may elect. This course deals with the problems of water supply, sewage disposal, and ventilation which pertain to the farm and small community. Careful studies are made of water systems and sewage disposal plants and their adaptability to various conditions.

1 class hour. 1 2-hour laboratory period, credit, 2.
Assistant Professor MARKUSON.

60. **II.** HOUSEHOLD EQUIPMENT. (1934–35). — For juniors and seniors. A study of the selection, operation, care, and efficient arrangement of equipment, with an analysis of the time and energy required in various processes. Given in alternate years.

2 class hours. 1 2-hour laboratory period, credit, 3.
Assistant Professor TAGUE.

71. **I.** MOTORS. — For seniors; juniors may elect. The course deals with the gasoline engine as used for stationary work, automobiles, and tractors. The theory of the internal combustion engine is taken up in order to emphasize the effect of design and operation on power and economy. The various types of carburetors, ignition, and lubrication systems are studied in detail. Instruction is given by means of lectures and textbooks, and by operating and repairing stationary engines, automobiles, and tractors. Special attention is given to overhauling and repairing. This course also deals with the application of electricity to farm operations including wiring and electric motors, and refrigeration equipment as used on New England farms.

3 2-hour laboratory periods, credit, 3.
Assistant Professor TAGUE and Mr. PUSHEE.

72. **II.** Drainage and Irrigation Engineering. — For seniors; juniors may elect. The course covers the engineering phase of drainage and irrigation. The various systems are studied, and practice is given in the design of drainage and irrigation systems. Field work gives practice in surveying for drains, platting, locating drains, erecting batterboards, and laying tile. Practice is given in assembling equipment for spray irrigation, and the flow of water through nozzles is studied by means of laboratory tests.
1 class hour. 1 2-hour laboratory period, credit, 2.
Assistant Professor Markuson.

74. **II.** Farm Structures. — For seniors; juniors may elect. A study of the strength and durability of concrete, wood, stone, and clay products, and of the mechanical principles underlying their use in farm construction. The design of various farm buildings, such as the general purpose barn, dairy stable, hog house, sheep barn, milk house, etc. In the drafting room, details of construction will be worked out, a study of the mechanics of simple roof trusses will be made, and a complete design of some major farm building will be finished in all essential details. Blueprints of the finished design will be made.
1 class hour. 2 2-hour laboratory periods, credit, 3.
Assistant Professor Markuson.

80. **II.** Dairy Mechanics (1935–36). — For juniors; seniors may elect. A study of dairy machinery, including steam boilers, engines, pumps, traps, refrigeration machinery, and heat-controlling devices. Practice is given in pipe fitting, packing valves, lacing belts, and similar repair jobs on the equipment used in dairy plants. Given in alternate years.
1 class hour. 1 2-hour laboratory period, credit, 2.
Assistant Professor Tague and Mr. Newlon.

83. **I and II.** Agricultural Engineering Problems. — Open only to seniors specializing in the department. This course consists of individual problems chosen by the students under guidance of the department. The work is of an advanced nature, supplementing that of the regular agricultural engineering curriculum. Copy of project outline, indicating the number of credits, must be filed with the department and with the Dean at the opening of the semester.
Credit, 3.
The Department.

85. **I.** Rural Electrification (1936–37). — For seniors; juniors may elect. This course is planned primarily for students who are interested in the application of electricity to agriculture. It includes a study of the generation and distribution of electricity for light and power. Special emphasis is placed on the utilization of electricity on the farm and in rural communities. Given in alternate years.
2 class hours. 1 2-hour laboratory period, credit, 3.
The Department.

Agronomy.

Professor Eisenmenger, Professor Beaumont, Assistant Professor Dickinson, Mr. Thayer, Mr. Haddock

The courses in agronomy are designed to give instruction concerning the basic knowledge of the soil and its management, fertilizers and their use, and the principal products of the field. An important objective of our undergraduate teaching is to give supporting training to groups specializing in other departments. For undergraduates desiring to specialize in agronomy adequate courses are offered, but for those expecting to go into advanced educational or research work our graduate training is recommended as preferable.

Elective Courses.

2. **II.** Soils. — For freshmen. This course is designed to give the student an intimate knowledge of the nature, properties, and management of soils. Classification and some of the broader aspects of utilization of soils will be stressed.
2 class hours. 1 2-hour laboratory period, credit, 3.
Mr. Haddock.

51. **I.** Field Crops. — For juniors and seniors. A study of methods and problems of production of field crops important in New England. The successful production of good forage is essential to profitable dairy farming. Special emphasis will be given hay, pasture, and other crops important in dairy farming.
2 class hours. 1 2-hour laboratory period, credit, 3.
Mr. Haddock.

52. **II.** Soil Utilization. — For juniors and seniors. A course intended primarily for those not having had other courses in soils. It deals with the nature and properties of soil types, their adaptation to crops, and special problems arising in the management of extreme soil types.
3 class hours. Credit, 3.
Mr. Haddock.

54. **II.** Turf and Forage Grasses. — For juniors and seniors. Designed to give a practical working knowledge of fine turf and forage grasses. The identification of seeds and plants, their ecology and relative value will be emphasized.
2 class hours. 1 2-hour laboratory period, credit, 3.
Assistant Professor Dickinson.

77. **I.** Crop Improvement. — For seniors. Theory and practice of the improvement of field crops by breeding and selection.
2 class hours. 1 2-hour laboratory period, credit, 3.
Mr. Haddock.

Prerequisite, Agronomy 51.

78. **II.** Fertilizers. — For seniors; juniors may elect. A study of the source, properties, and behavior of commercial fertilizers and soil amendments. Attention will be given to such questions as home-mixed versus commercial fertilizers, the use of concentrated materials, and the economical purchase of fertilizers.
2 class hours. 1 2-hour laboratory period, credit, 3.
Professor Eisenmenger.

82. **II.** Special Problems in Agronomy. — For seniors taking major work in agronomy.
3 2-hour laboratory periods, credit, 3.
Professor Eisenmenger.

Animal Husbandry.

Professor Rice, Assistant Professor Glatfelter, Assistant Professor Parsons, Mr. Foley, Mr. Phillips.

The courses in animal husbandry are designed to give the student a thorough grounding in the scientific, practical, and commercial phases of horse, sheep, swine, beef, and dairy cattle production. The choice of supporting courses is governed by the student's ultimate objective. Upon completion of the four years' course, three general fields are open to the graduate. First, the practical field comprising the actual production of livestock and its products or the management of livestock farms; second, the professional field which embraces college, secondary school, or extension teaching, or federal, state, or commercial research; and third, the commercial field comprising all phases of the meat-packing, milk-production, wool or feed industries, including connections with the large companies, farmers' cooperative associations, or the operation of local plants.

Elective Courses.

26. **II.** Types, Breeds and Judging of Livestock. — For sophomores. This first course in animal husbandry is designed to acquaint the student with the history, developmental trends, and present status of all the breeds of horses, cattle, sheep, and swine in the United States. It also serves as a survey course showing the magnitude of the livestock industry, and the indispensability of livestock and their manifold products in a modern, civilized country. During April and May trips will be taken on Saturdays to the leading herds of dairy cattle in New England where practice in show ring judging will be given and the three highest ranking students in this judging will represent the college in the intercollegiate Dairy Cattle

Judging Contests at the Eastern States Exposition and the National Dairy Show the following fall.

2 class hours. 1 4-hour laboratory period, credit, 4.
Mr. Foley.

51. I. The Nutrition of Farm Animals. — For juniors; seniors may elect. This course is planned to acquaint the student with the chemistry and physiology of digestion, resorption and assimilation, in work, meat, wool or milk production. The feed requirements of the various classes of livestock in terms of energy, proteins, minerals and vitamins are ascertained, as well as the role of the various feeds in meeting these requirements.

2 class hours. 1 2-hour laboratory period, credit, 3.
Mr. Phillips.

52. II. The Breeding and Improvement of Farm Animals. — For juniors; seniors may elect. This course is planned to acquaint the student with the facts of reproductive physiology, with the facts and theories of modern genetics, and to show how such knowledge may be utilized for the creation of more beautiful and more efficient animal types.

2 class hours. 1 3-hour laboratory period, credit, 3.
Professor Rice

53. I. Meat and Meat Products. — For juniors. This course embraces a study of the market classes and grades of beef cattle, sheep, and swine. It also deals with the manufacture of animals into their various commercial products and the distribution of these products to the consumer. Practice is given in the slaughtering of beef cattle, hogs, and sheep; judging of carcasses; cutting and curing of meats. The practical work is augmented by studies in the grading of fat stock, in packing-house methods, in the magnitude and trends of the meat industry, and in the opportunities of local New England marketing.

1 class hour. 2 2-hour laboratory periods, credit, 3.
Mr. Foley.

Prerequisites, Animal Husbandry 26 and 51.

56. II. Beef and Sheep Production and Fat Stock Judging.—For juniors. The purpose of this course is to seek the solution of the various economic, nutritional, genetic, and managerial problems concerned in the production of beef cattle and sheep. During May and June trips will be taken on Saturdays to the leading herds and flocks in New England where practice in show ring judging will be given. The five highest ranking students in this judging will represent the college in the intercollegiate Fat Stock Judging Contests at the Eastern States Exposition and the International Livestock Exposition the succeeding fall.

2 class hours. 1 4-hour laboratory period, credit, 4.
Assistant Professor Glatfelter.

Prerequisites, Animal Husbandry 26 and 51.

75. I. Horse and Swine Production. — For seniors. The purpose of this course is to seek the solution of the various economic, nutritional, genetic and managerial problems concerned in the production of horses and swine. The student is called upon to utilize the scientific principles of feeding, breeding, etc., which he has mastered in his first three years of college work in solving the manifold problems concerned in successful livestock production.

2 class hours. 1 4-hour laboratory period, credit, 4.
Mr. Phillips.

78. II. Dairy Cattle and Milk Production. — For seniors. The same as Course 75 above but applied to Dairy Cattle and Milk Production.

1 4-hour and 2 2-hour laboratory periods, credit, 4.
Professors Rice and Parsons.

80. II. Advanced Breed Studies. — This course is open only to those specializing in animal husbandry. Some one or more breeds of livestock will be thoroughly studied especially from the standpoint of its genetic make-up and of the selection of a foundation herd or flock.

1 2-hour laboratory period, credit, 1.
Professor Rice.

82. II. Animal Husbandry Seminar. — Required of students specializing in animal husbandry. Students will prepare original papers and talks on various pertinent topics. Round table discussions of animal husbandry investigational work and practices will be conducted.
1 class hour. Credit, 1.
The Department.

91. I. Genetics and Eugenics. — For juniors and seniors. This course is open to students who have not taken Animal Husbandry 52, and deals with the general problems concerned in human reproduction and inheritance. The main topics studied will consist of the physiology of reproduction, the physical basis of inheritance, and the mode of transmission of human characteristics. Consideration will also be given to such questions as the causes of variation, the relative importance of genetic and environmental influences, the mechanism of sex determination, as well as population trends, sterilization, and kindred eugenic problems.
3 class hours. Credit, 3.
Professor Rice.

Dairy Industry.

Professor Frandsen, Assistant Professor Mack, Mr. Lindquist.

The courses in dairy industry are offered to meet the needs of students interested in the scientific study of handling market milk, and the making of ice cream, butter, cheese, and other dairy products; agricultural college teaching, and experiment station work; high and secondary school teaching; extension work; research and investigational work.

Elective Courses.

25. I. General Dairying. — For sophomores. A general course, introductory to all other courses in dairy industry, and for those who wish to take only one course in dairying to get a general knowledge of the subject. The work covers briefly: a study of milk, its secretion, composition, and various tests applied thereto; methods of pasteurizing and handling milk and cream; the use of separators; elements of ice cream, butter, and cheese making.
2 class hours. 1 2-hour laboratory period, credit, 3.
Professor Frandsen and Mr. Lindquist.

50. II. Judging Dairy Products. — For juniors; seniors may elect. A study of market standards and grades of dairy products, with practice in judging milk, ice cream, butter, and cheese. The student learns to recognize quality in dairy products, to detect specific defects, and to know their causes and the means of their prevention. A team is chosen from this class to represent the college in dairy products judging contests at the Eastern States Exposition and the National Dairy Industries Exposition.
1 2-hour laboratory period, credit, 1.
Assistant Professor Mack and Mr. Lindquist.

52. II. Market Milk. — For juniors; seniors may elect. A study of the various phases of the market milk industry: sanitary production, transportation, pasteurization and handling in the city plant, marketing, delivery systems, milk and its relation to public health, inspection, milk laws, food value, and advertising. Cultured milk and other milk drinks also are included. Some milk plants are visited, the cost of the trip not exceeding five dollars.
2 class hours. 2 2-hour laboratory periods, credit, 4.
Mr. Lindquist.

75. I. Dairy Chemistry (1936–37). — For juniors and seniors. The various physical and chemical properties of milk, milk products, and their components are studied. Testing and control methods commonly used commercially for milk and dairy products are included; moisture and fat determinations, casein, salt, and acid tests, work with the Mojonnier apparatus, and other applied chemical tests are taken up in the laboratory. Given in alternate years.
1 class hour. 2 2-hour laboratory periods, credit, 3.
Assistant Professor Mack.

77. **I.** Butter and Cheese Making. — For juniors and seniors. The first half of the semester is devoted to butter making, the remainder to cheese making, condensed and powdered milks. The various phases of the butter industry studied are: separators and cream separation; pasteurization, neutralization, and ripening of cream; preparation of starter cultures; churning, marketing, and scoring of butter; creamery management. The work in cheese making includes Cheddar, cream Neufchâtel, cottage, processed cheeses, etc. The manufacture of condensed and powdered milk, and commercial casein is also covered.
2 class hours. 2 3-hour laboratory periods, credit, 5.
Assistant Professor Mack and Mr. Lindquist.

Prerequisite, Dairy 25.

78. **II.** Ice-Cream Making. — For juniors and seniors. The course includes a study of the principles and practices of ice-cream making. The effects of such factors as composition, quality, pasteurization, homogenization, aging, and freezing on the finished product are considered. Sherbets, ices, fancy and individual forms, and all flavors of ice cream are studied. Some time is devoted to refrigeration machinery, delivery equipment, and merchandising methods as they are related to the industry.
2 class hours. 2 2-hour laboratory periods, credit, 4.
Assistant Professor Mack.

79. **I.** 80. **II.** Seminar. — For students specializing in dairy industry. The course consists of a study of research done by the experiment stations, also a review of foreign literature. Students prepare papers on timely dairy subjects. Frequent addresses are made to the class by visiting authorities in dairying.
1 class hour. Credit, 1.
Professor Frandsen.

Farm Management.

Assistant Professor Mighell, Assistant Professor Barrett.*

The purpose of the courses in farm management is to acquaint the student with the economic ideas and principles which apply to the organization and operation of the farm business. Farm Management brings together the research and knowledge from the other sciences, and studies them for the purpose of determining how to organize the farmer's resources so as to obtain the maximum economic return.

Elective Courses.

75. **I.** Farm Organization. — For seniors. This course analyzes the functions of the farmer as a business proprietor. Some of the problems and principles considered are: selection and combination of the factors of production, choice and combination of farm enterprises, least cost and highest profit, farm and building layout, the economical use of funds, farm credit, adjustments of production and price cycles as affecting farm organization. Records of the organization of actual farms are studied and analyzed.
3 class hours. Credit, 3.
Assistant Professor Mighell.

Prerequisite, the required freshman and sophomore work in agriculture or horticulture, or the permission of the instructor.

76. **II.** Farm Operation and Advanced Farm Organization. — For seniors. The first part of this course further develops the principle of opportunity costs, and includes the use of farm records and accounts as a basis for planning and budgeting, "scientific management" as applied to efficient farm technique, and the execution of the plans and policies of the organization. The last part of the semester will be given over to a more specific study of the principles and practices outlined in Course 75, with special reference to their application to selected farms. Field trips are required. The approximate expense for travel is five dollars.
1 class hour. 1 4-hour laboratory period, credit, 3.
Assistant Professor Mighell.

Prerequisite, Farm Management 75.

* On leave of absence.

78. II. Seminar. — For seniors majoring in agriculture; others by arrangement. Farm management problems will be considered from the viewpoint of research, extension, and teaching.
1 class hour. Credit, 1.
The Department.

80. II. Advanced Farm Operation. — For seniors majoring in agriculture; others by permission of instructor. A study of the efficiency of operations on a specific farm. An original semester paper will be required.
3 hours or equivalent. Credit, 3.
Assistant Professor Mighell.

Poultry Husbandry.

Professor Graham, Professor Sanctuary, Assistant Professor Banta, Mr. Vondell.

The department aims to give instruction in the science, art, and practices of poultry keeping not only to the men majoring in this department, but also to students majoring in other departments and desiring supporting courses in poultry husbandry. Our major courses prepare men for the successful operation of commercial poultry farms and marketing projects either as owners or managers; for graduate work, teaching, extension and investigational work.

Elective Courses.

25. I. Poultry Judging. — For sophomores. A study of the origin and evolution of our standard breeds and varieties of domestic fowl; judging production quality, using trapnested birds; judging exhibition quality by score card and comparison. One or more poultry farms, an egg-laying contest, and a poultry show will be visited. Poultry judging teams competing in the intercollegiate contest each January are trained in this course.
1 class hour. 2 2-hour laboratory periods, credit, 3.
Assistant Professor Banta.

51. I. Poultry Feeds and Feeding. — For juniors; seniors may elect. A study of the common feeds and the scientific principles underlying the field of nutrition. Recent experimental work and current feeding problems will receive special consideration. For observational practice and accumulation of original data, the management of a group of birds will be required for a period of a few weeks.
3 class hours. 1 2-hour laboratory period, credit, 4.
Assistant Professor Banta.

52. II. Incubation and Brooding. — For juniors; seniors may elect. A study of the fundamental principles underlying incubation and brooding practices. The science of physics and general biology is applied to the study of incubation and brooding processes. Students become thoroughly acquainted with modern incubation and brooding equipment through detailed study and operation of typical incubators and brooders. Present-day problems are considered and some are investigated as a part of the class work.
1 class hour. 2 2-hour laboratory periods, credit, 3.
Professor Sanctuary.

54. II. Poultry Housing and Sanitation. — For juniors; seniors may elect. A consideration of the biological needs of poultry from the standpoint of housing, and the economic principles governing designing and construction of poultry houses and equipment for poultry farm buildings. The course also embodies a study of the principles of poultry sanitation, including external parasites and the insecticidal agents for their control.
1 class hour. 1 2-hour laboratory period, credit, 2.
Professor Sanctuary.

75. I. Market Poultry and Poultry Products. — For seniors. A study of market classes of poultry and eggs; preparation of poultry products for market; requirements of different markets; methods of marketing, involving a study of distribution, finances, and business organizations; cold storage and transportation;

advertising, prices, and food values. Laboratory exercises in candling, packing, killing, dressing, and similar operations to make the above named factors more concrete. Students are required to fatten pens of chickens, keeping accurate data of the gains in weight and quality, also the costs of feed and labor, and resultant profit or loss. When possible, a short trip to Springfield is arranged to study the handling of poultry products in the local market.

1 class hour. 1 2-hour laboratory period, credit, 2.
Mr. Vondell.

77. I. Poultry Breeding. — For seniors. Methods of selection and improvement of poultry are developed through the study of the principles of heredity. Most of the course centers around the progeny test and pedigree method of breeding. Students taking this course participate in the college plant selection in pedigree work. Three breeds of poultry, each pedigreed for from seven to twenty years, furnish practice materials. A trip to some college or institution doing experimental work in breeding is required of students taking this course.

2 class hours. 1 2-hour laboratory period, credit, 3.
Professor Sanctuary.

78. II. Poultry Farm Organization. — For seniors. This course embodies the application of economic and business principles to poultry farming. The place and importance of the various branches of well-organized poultry farms and their relation to each other receive special consideration; also the study of surveys and production costs. A trip covering three or more days will be made to representative successful poultry farms. The expense per student is approximately fifteen dollars. This trip is required of each student taking the course for credit.

1 class hour. 1 2-hour laboratory period, credit, 2.
Assistant Professor Banta.

Prerequisite, Poultry 77.

80. II. Farm Poultry. — For seniors; juniors may elect. For those students who desire a general knowledge of poultry husbandry but who cannot devote more than one term to the subject; it is not intended for students specializing in poultry, and such students are admitted only by special permission. Emphasis is placed on the farm flock and its economic management. Housing, culling, feeding, hatching, rearing, production, marketing, disease control, record keeping and flock management receive special consideration.

2 class hours. 1 2-hour laboratory period, credit, 3.
Assistant Professor Banta.

81. I. 82. II. Poultry Problems. — For seniors only. This course consists of individual problems chosen by the students under guidance of the department. The work is of an advanced nature, supplementing that of the regular poultry curriculum. Copy of project outline, indicating the number of credits, must be filed with the department and with the Dean at the opening of the semester. Two hours are required in the second semester. Two additional hours may be elected in the first or second semesters.

Credit, 1 to 4.
The Department.

DIVISION OF HOME ECONOMICS.

Professor Skinner.

Home Economics.

Professor Skinner, Assistant Professor Knowlton, Assistant Professor Briggs.

The home economics courses offered are planned to meet the needs of (1) those students who are interested in education for homemaking as an integral part of the general education of women; (2) those who are interested in professional or vocational work in which an understanding of home economics is fundamental; (3) those who are interested in preparing for home economics extension service, both junior and adult; (4) those who wish to enter a graduate school leading to professional work. Other departments offer courses planned especially for students in

home economics, as follows: House Planning and Construction in the Department of Agricultural Engineering; General Design in the Department of Landscape Gardening; and Food Preservation in the Department of Horticultural Manufactures.

Elective Courses.

1. **I.** Introduction to Home Economics. — For freshmen. A brief study of the share which women have had in social progress, in order that each student may recognize the importance of her relationships to her own family group, and may become conscious of problems in the modern home which need to be considered.
3 class hours. Credit, 3.
Professor Skinner.

2. **II.** Clothing Selection. — For freshmen and sophomores. A study of the principles of clothing selection in order to assist each student to choose satisfactorily line, color, and texture. Clothing costs in relation to a student's own wardrobe, hygiene and care of clothing, and the essentials of good grooming are considered.
2 class hours. 1 2-hour laboratory period, credit, 3.
Assistant Professor Briggs.

25. **I.** Textiles. — For sophomores. A study of fibers, yarns, and fabrics with the aim of developing good judgment in the buying and using of clothing and house furnishing materials.
1 class hour. 2 2-hour laboratory periods, credit, 3.
Assistant Professor Briggs.

30. **II.** Foods. — For freshmen and sophomores. A study including fundamental principles and comparative methods of food preparation with emphasis on the nutritional and economic aspects of foods. A basic course for further study of foods.
1 class hour. 2 2-hour laboratory periods, credit, 3.
Assistant Professor Knowlton.

32. **II.** Applied Design. — For sophomores. Applications of the principles of design are worked out in specific problems, using various media. Much opportunity is allowed for individual expression. The estimated cost of materials used is five dollars. Students provide all materials subject to the approval of the instructor.
3 2-hour laboratory periods, credit, 3.
Assistant Professor Briggs.

51. **I.** Foods. — For juniors. A continuation of Course 30 with a study of foods from the standpoint of the day's meals. Especial emphasis on economy in expenditure of money, time, and labor.
1 class hour. 2 2-hour laboratory periods, credit, 3.
Assistant Professor Knowlton.

52. **II.** Nutrition and Dietetics. — For juniors. A study of food needs of the body under varying conditions of size, activity, age and health, and the value of different foods in contributing to these needs. Special emphasis is placed on the relationship of the nutritive value of food to its cost. This course is designed to help students to understand how food selection is related to achieving and maintaining health.
2 class hours. 2 2-hour laboratory periods, credit, 4.
Assistant Professor Knowlton.

61. **I.** Clothing Selection and Construction. — For juniors. A study of art principles as they apply to clothing design. Principles of construction are given through the use of commercial patterns and flat pattern work in the making of garments. Students provide all materials subject to the approval of the instructor.
1 class hour. 2 2-hour laboratory periods, credit, 3.
Assistant Professor Briggs.

62. **II.** Home Furnishing. — For juniors. A study of the fundamental principles which underlie the successful planning and furnishing of a satisfying home.

Many applications of these principles are worked out in practical problems. Class trips will be taken at an estimated expense of two dollars.
1 class hour. 2 2-hour laboratory periods, credit, 3.
Assistant Professor Briggs.

75. **I.** Home Management. — For seniors. A study of personal and family standards of living in the modern home, the economic relations of the household, and the use of time, energy, and money as a means to influence the home situation.
3 class hours. Credit, 3.
Professor Skinner.

77. **I or II.** Home Management Practice. — For seniors. Students live in the Home Management House for an interval varying in length from one-half semester to one semester. This course provides an opportunity for a student to assume responsibilities involved in managing a home and to apply the technical and laboratory training of the previous three years. Their activities include budgeting, accounting, buying, planning, preparing and serving meals, care of the house, and social management.
Credit, 4.
Assistant Professor Knowlton.
Prerequisites, Home Economics 30, 75, and the approval of the department.

80. **II.** Problems of the Family. — For seniors. This is a study of the problems of family life in relation to the modern social organization. This course aims to develop an intelligent social consciousness and a sense of individual responsibility in family relationships.
3 class hours. Credit, 3.
Professor Skinner.

81. **I.** Methods of Teaching Home Economics. — For seniors, by arrangement with the head of the division. A study of educational objectives especially as applied to the teaching of home economics in junior and senior high schools, with detailed study of organization problems and the selection and arrangement of equipment. This course also includes an evaluation of instructional material, and the selection and organization of subject matter for secondary schools. A few required trips, estimated cost three dollars.
2 class hours. 1 2-hour laboratory period, credit, 3.
The Department.

83. **I.** 84. **II.** Problems in Home Economics. — For seniors who are home economics majors. A more intensive application of home economics to special problems. This course also serves as a beginning of simple research work. For students particularly interested in the teaching of home economics, there may be an opportunity for observation and practice teaching under supervision. Required trips at an estimated cost of five dollars.
2 class hours. 1 2-hour laboratory period, credit, 3.
The Department.

86. **II.** Child Development (1935–36). — For seniors. A study of the growth and development of the child, the care of children at various ages, treatment in behavior problems, and the influence of environment in shaping personality. Field trips at an estimated cost of two dollars. Given in alternate years.
3 class hours. Credit, 3.
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87. **I.** Advanced Clothing Problems. — For seniors. Continuation of clothing selection with especial emphasis on economic problems involved. Costume designing and modeling are included which give opportunity for experimentation in designing. A study is made of available source material. Students provide all materials subject to the approval of the instructor.
1 class hour. 2 2-hour laboratory periods, credit, 3.
Assistant Professor Briggs.

DIVISION OF HORTICULTURE.

Professor Van Meter.

Floriculture.

Professor Thayer, Assistant Professor Hubbard, Mr. Ross.

The courses are intended to give the student a general knowledge of the various fields of floriculture, greenhouse design, construction, heating and management, methods of culture and uses of florists' crops (under glass and outdoors), floral decoration and arrangement, and the marketing of plants and flowers. The department aims primarily to train students so that they may take up (1) various phases of commercial floriculture, (2) positions in nursery establishments, (3) the management of conservatories, (4) private estate work, (5) positions in professional work.

Elective Courses.

26. **II.** Garden Materials. — For sophomores; juniors and seniors may elect. A study of the annuals, biennials, herbaceous perennials, bulbs, bedding plants, and roses that are valuable for use in floricultural or landscape gardening work. Methods of propagation, culture, and uses of the various plants are considered; identification of materials; lectures, assigned readings, and reports.
2 class hours. 1 2-hour laboratory period, credit, 3.
Professor Thayer and Mr. Ross.

51. **I.** Greenhouse Management. — For juniors; seniors may elect. This course is intended to familiarize students with the methods and principles involved in the management of greenhouses and greenhouse crops; history and development of the floricultural industry; preparation of soils; fertilizers; potting; watering; ventilation; control of insects and diseases; methods of plant propagation; forcing of plants. At some time during the semester the members of the class will be required to take a one-day trip to visit large commercial establishments at an approximate expense of five dollars. Lectures, assigned readings, reports, and laboratory practice.
2 class hours. 1 2-hour laboratory period, credit, 3.
Professor Thayer.

52. **II.** Floral Arrangement. — For juniors; seniors may elect. A study of the principles involving the arrangement and use of cut flowers and plants; funeral designs, basket and vase arrangements, table decorations, home, church, and other interior decorations. A study of color and color harmony as applied to such work. Lectures, assigned readings, reports and laboratory practice. This course is limited to ten students, preference being given to major students in Floriculture and Landscape Architecture.
1 class hour. 2 2-hour laboratory periods, credit, 3.
Professor Thayer.

54. **II.** Greenhouse Construction and Heating. — For juniors; seniors may elect. The location, types, arrangement, construction, cost, equipment, heating, and ventilation of greenhouse structures; the drawing of plans and study of specifications. Special emphasis laid on heating problems. Lectures, assigned readings, and problems.
2 class hours. 1 2-hour laboratory period, credit, 3.
Professor Thayer.

58. **II.** Amateur Floriculture. — This course is intended primarily for major students in the Division of Home Economics and for other women students. Three phases of floriculture will be considered: (1) the arrangement and use of cut flowers for decorative purposes in the home and elsewhere, (2) house plants, methods of propagation, (3) garden flowers and their uses on the home grounds.
2 class hours. 1 2-hour laboratory period, credit 3.
Professor Thayer and Mr. Ross.

75. **I.** 76. **II.** Commercial Floriculture. — For seniors. A detailed study of the cultural methods for the important commercial cut-flower crops and potted

plants. The marketing of flowers and plants, including the management of wholesale markets and retail stores, a study of systems of record keeping, cost analysis, inventory methods, and other phases of this important part of the floricultural industry. Trips may be taken to nearby commercial establishments. The lectures are supplemented with textbooks, assigned readings and problems.
2 class hours. 1 2-hour laboratory period, credit, 3.
Assistant Professor HUBBARD.

Prerequisite, Floriculture 51.

79. **I.** CONSERVATORY PLANTS (1936–37). — Alternates with Course 81 for students specializing in floriculture. For juniors and seniors. A study of the foliage and flowering plants used in conservatory work; methods of propagation; assigned readings, reports, and identification of materials.
1 class hour. 1 2-hour laboratory period, credit, 2.
Professor THAYER.

81. **I.** HERBACEOUS GARDENS AND BORDERS. — Alternates with Course 79 for students specializing in floriculture; given annually for students specializing in landscape architecture. For juniors and seniors. This course is a continuation of Course 26 with emphasis on the uses of herbaceous materials in various types of plantings. Lectures, assigned readings, planning of borders and gardens.
1 class hour. 1 4-hour laboratory period, credit, 3.
Professors THAYER and HUBBARD.

Prerequisite, Floriculture 26.

82. **II.** SEMINAR. — For seniors specializing in floriculture. Presentation and discussion of research work in floriculture and other related fields, reports on assignments by individual members of the class, and the preparation of a thesis dealing with an assigned subject. Seminars are conducted weekly.
1 class hour. 4 laboratory hours, credit, 3.
Professor THAYER.

Forestry.

Professor HOLDSWORTH, Assistant Professor RICH.

The courses in forestry are designed for students who desire a knowledge of the management, regulation and improvement of woodlands of moderate area. They are further intended to develop the place of forest cultivation in land utilization and to be explanatory of the general field of forestry for those who plan to become students in graduate schools of forestry.

Elective Courses.

55. **I.** THE MANAGEMENT, PROTECTION AND USE OF WOODLANDS. — For juniors and seniors. Methods of determining the volume and value of the forest growing stock; the determination of growth and yield; the principles of forest regulation and sustained yield; forest protection; forest development and maintenance. The course is presented with especial emphasis on the application of the principles of forestry to New England conditions. Problems in applied forestry are carried out on the Mount Toby Demonstration Forest. Text and assigned readings.
1 class hour. 1 4-hour laboratory and field period, credit, 3.
Professor HOLDSWORTH.

56. **II.** THE PRINCIPLES OF SILVICULTURE AND WOOD PRODUCTION. — For juniors and seniors. The nature of a forest; factors influencing and controlling the growth and development of forest trees and stands; forest effects on site conditions; methods of forest reproduction through silvicultural practice; intermediate cuttings; choice of species for forest use; supplementary seeding and planting; forest sanitation and its relation to silviculture; the products of the forest. The field work in applied forestry is conducted principally on the Mount Toby Demonstration Forest. Visits of inspection are made to certain accessible forests which have been under scientific management for many years.
1 class hour. 1 4-hour laboratory and field period, credit, 3.
Professor HOLDSWORTH.

58. **II.** Forest Economics and Policy. — For juniors and seniors. The growth and development of forestry from an historic viewpoint; the forest as a natural resource and its place in our economic life; our past and present forest resources; Federal and State forest organization; private forestry; the development of a National Forest Policy. Text, assigned readings. A semester paper, the subject to be selected by the student after conference with the instructor, will be required.
3 class hours. Credit, 3.
Professor Holdsworth.

Horticultural Manufactures.

Professor Chenoweth, Mr. Rice.

The courses in Horticultural Manufactures (Food Technology) have been planned to give the student (1) training in food preservation sufficient to meet the needs of a general education, and (2) training for technical work in the food industries including business, research, and teaching.

Students who desire the elementary training only as given in (1) above will restrict their work to the first year courses and they will not be required to offer prerequisites other than the required general courses in the sciences. Students who desire to make Horticultural Manufactures their major or specialized subject will be expected to take the full two years' work as outlined, and should consult with the department as to required courses in chemistry and bacteriology.

Elective Courses.

51. **I.** Fruit and Vegetable Products. — For juniors; seniors may elect. This course together with Course 52 gives the student a general elementary knowledge of the science and practice of food preservation. Principles and theories of the various methods of food manufacture are the basis for classroom exercises. The laboratory work during the first semester deals largely with the preservation of the autumn fruits and vegetables, small fruit products, freezing, and dehydration.
1 class hour. 2 2-hour laboratory periods, credit, 3.
Professor Chenoweth.

52. **II.** Miscellaneous Products. — For juniors; seniors may elect. This is a continuation of Course 51. The laboratory work includes pickles and pickle products, maple products, citrus products, fruit syrups, soups, condiments, and the canning of meats, poultry, and the spring vegetables.
1 class hour. 2 2-hour laboratory periods, credit, 3.
Professor Chenoweth.

Prerequisite, Horticultural Manufactures 51.

61. **I.** Commercial Practices. — For seniors who specialize in horticultural manufactures. A survey of commercial practices in the manufacture and preservation of food products. This will involve a study of equipment, factory arrangement, sanitation, and government regulations, the operation of types of commercial equipment in quantity production.
1 class hour. 2 2-hour laboratory periods, credit, 3.
Professor Chenoweth.

Prerequisites, Horticultural Manufactures 51 and 52.

62. **II.** Food Preservation Problems. — For seniors who specialize in horticultural manufactures. This is a continuation of Course 61. The class exercises will deal largely with a survey study of the sources of raw materials, commercial methods of manufacture, packing and distribution of the more common foods, also a study of the more important contributions of research. Laboratory work will include the formation of research projects, interpretation of research data. The use of preservatives, the simple analysis of foods and the commercial practices as applied to preservation of such materials as are available: fish, meats, poultry, and spring vegetables.
1 class hour. 2 2-hour laboratory periods, credit, 3.
Professor Chenoweth.

Prerequisite, Horticultural Manufactures 61.

71. I. 72. II. Seminar. — For seniors who specialize in horticultural manufactures. Two seminar sessions are held each week.
2 class hours. Credit, 2.
The Department.

75. I. Food Preservation. — For seniors and graduate students. Not open to students who have credit for Horticultural Manufactures 51, 52, or 81. This is a general course in food preservation and intended only for those who desire a broad general knowledge of the subject because of its cultural or practical value.
1 class hour. 2 2-hour laboratory periods, credit, 3.
Mr. Rice.

81. I. Home Food Preservation. — For junior women; seniors and graduate students may elect. This course covers the general field of food preservation as applied to the home. A textbook is used as a basis for classroom exercises. Laboratory work deals with the canning of fruits, vegetables, meats and poultry; the manufacture of food products including jams, jellies, conserves, marmalades, pickles, fruit butters, etc. The emphasis in both class and laboratory is placed on scientific, economical practices for home food preservation.
1 class hour. 2 2-hour laboratory periods, credit, 3.
Mr. Rice.

82. II. Special Products. — For seniors and graduate students. The materials offered in this course are as follows: the home manufacture of fruit preserves, candied and glacéd fruits, fruit pastes, confections, candies, and other specialties. Approximately one-half the semester is devoted to elementary work in candy making.
2 2-hour laboratory periods, credit, 2.
Professor Chenoweth and Mr. Rice.

Landscape Architecture.

Professor Waugh, Professor Harrison, Professor Blundell, Mr. Robertson, Mr. Lowry.

The instruction in this department is aimed at two objectives: first, the contribution to general education; second, the preparation of men for the professional practice of landscape architecture. The former objective seems important from the fact that landscape architecture offers an excellent opportunity for the practical discussion of the principles underlying all the fine arts. In the professional courses students are prepared, as well as time permits, to begin work in landscape architecture which leads through field experience or post-graduate study to permanent establishment in that profession.

Drawing.

Elective Courses.

25. I. Free-Hand Drawing. — For sophomores; juniors and seniors may elect. Lettering; free-hand perspective; sketching from models; laying flat and graded washes in water colors; water-color rendering.
2 3-hour laboratory periods, credit, 3.
Mr. Robertson.

26. II. Mechanical Drawing. — For sophomores; juniors and seniors may elect. Inking exercises; geometric problems; isometric projection; intersections; shades and shadows; parallel, angular, and oblique perspectives; perspective drawings of buildings. Students should have preparation in plane and solid geometry.
2 3-hour laboratory periods, credit, 3.
Mr. Robertson.

31. I. Elementary Design. — For sophomore women. Elementary principles of design, with applications to costume design, interior decoration, etc.
3 2-hour laboratory periods, credit, 3.
Mr. Robertson.

Landscape Architecture.

Elective Courses.

51. **I.** Topography and Mapping. — For juniors. Reconnaissance, location, and topographical surveys and mapping. The data desired and the methods used in landscape architecture. Must be followed by Course 52.

3 3-hour laboratory periods, credit, 4.
Professor Harrison.

Prerequisites, Drawing 25 and 26.

52. **II.** Elements of Landscape Architecture. — For juniors. Engineering details; drive design, grade design, drainage, play areas, etc. Study of selected designs, examination of completed works, and, when possible, those under construction; field notes or written reports.

3 3-hour laboratory periods, credit, 4.
Professor Harrison.

Prerequisites, Landscape Architecture 51 and either Horticulture 51 or advanced Mathematics.

54. **II.** Garden Design. — For juniors. Fundamental principles of design with application to simple problems in the design of gardens and small home grounds.

3 3-hour laboratory periods, credit, 4.
Professor Waugh.

Prerequisite, Landscape Architecture 51.

75. **I.** Theory of Landscape Art. — For seniors and graduates. The general theory and application of landscape study, including an examination of the principles underlying all the fine arts with special reference to art appreciation.
3 class hours. Credit, 3.
Professor Waugh.

76. **II.** Civic Art. — For seniors. The principles and applications of modern civic art, including land subdivision, city planning, city improvement, and rural improvement.

3 3-hour laboratory periods, credit, 3.

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Prerequisites, Landscape Architecture 51 and 52.

78. **II.** History of Art. — For juniors and seniors. An historical, appreciative survey of art from earliest times to the present, with special reference to the relations of the fine arts to the problems of daily life.
3 class hours. Credit, 3.
Mr. Robertson.

79. **I.** Construction and Maintenance (1935–36). — Alternates with Course 83. For juniors and seniors. Detailed instruction in staking out work; methods of construction and planting; organization, reporting, accounting, estimating, etc.
3 class hours. Credit, 3.
Professor Harrison.

80. **II.** Literature of Landscape Architecture. — For seniors only. The literature of landscape architecture, gardening, plants, forestry and nature appreciation. Requires extensive readings, oral and written reports and the preparation of assigned theses and bibliographies.
1 lecture hour, 1 conference period. Credit, 2.
Professor Waugh.

81. **I.** Advanced Design. — For seniors. Grading and planting plans; garden designs and planting.

3 3-hour laboratory periods, credit, 4.

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Prerequisites, Landscape Architecture 51, 52, and 54.

82. **II.** Advanced Design. — For seniors. A series of problems in the design of estates, parks, and small property.

3 3-hour laboratory periods, credit, 4.
Professor Harrison.

Prerequisite, Landscape Architecture 81.

83. **I.** Architecture (1936–37). Alternates with Course 79. For juniors and seniors. The history of architectural development, the different historic types, with special reference to the underlying principles of construction and their relation to landscape design. Illustrated lectures, field trips, the study of details, preparation of plates.

3 class hours. Credit, 3.
Professor Harrison.

84. **II.** Sketching. — For juniors and seniors. The use and development of technique in water color, pencil, pen and ink sketching of outdoor and indoor scenes.

2 class hours. Credit, 2.
Mr. Robertson.

Horticulture.

Elective Courses.

1. **I.** Plant Propagation. — For freshmen. This course serves as an introduction to the field of horticulture, emphasizing the methods and underlying principles involved in the propagation of horticultural plants.

2 class hours. 1 2-hour laboratory period, credit, 3.
Mr. Lowry.

26. **II.** Plant Materials. — For sophomores. Detailed study of deciduous and evergreen trees, with special reference to the form and character of mature trees, means of identification, natural associations, and uses of the various types of trees in landscape work.

1 class hour. 2 2-hour laboratory periods, credit, 3.
Professor Blundell.

51. **I.** Plant Materials. — For juniors; seniors may elect. Detailed study of shrubs and woody vines, and their identification, with especial emphasis given to their adaptability to the various landscape uses, methods of handling, and care.

1 class hour. 2 2-hour laboratory periods, credit, 3.
Professor Blundell.

Prerequisite, Horticulture 26.

Olericulture.

Professor Van Meter, Assistant Professor Snyder and Mr. Tuttle.

The object of the courses in olericulture is to train men (1) for the commercial branches of vegetable production and marketing, and (2) for the professional fields of research, extension work, and teaching.

Elective Courses.

25. **I.** General Olericulture. — For sophomores; juniors and seniors may elect. A study of the factors affecting plant growth which are essential to a thorough understanding of vegetable plants and their culture, or for vocational teaching, or professional work other than teaching.

2 class hours. 1 2-hour laboratory period, credit, 3.
Assistant Professor Snyder.

51. **I.** Olericulture. — For juniors; seniors may elect. A study of the principles underlying vegetable production; the vegetable plant, soil and its treatment, plant nutrition, seed, and seedage.

2 class hours. 1 2-hour laboratory period, credit, 3.
Assistant Professor Snyder.

52. **II.** Olericulture. — For juniors; seniors may elect. A study of the principles underlying vegetable production; the vegetable plant and its responses

to environmental conditions; methods of culture, marketing, storage, and pest control.
2 class hours. 1 2-hour laboratory period, credit, 3.
Assistant Professor Snyder.

75. **I.** Systematic Olericulture. — For seniors. A critical study of variety identification; nomenclature and classification; variety improvement and seed sources; judging and exhibiting.
1 class hour. 2 2-hour laboratory periods, credit, 3.
Assistant Professor Snyder.

76. **II.** Greenhouse Crops and Plant Growing. — For seniors. A study of the culture of vegetable plants under glass: in the greenhouse, plant house, hotbed, and cold frame; the growing of seedling plants both under glass and in the open for local, retail, or wholesale business.
2 class hours. 1 2-hour laboratory period, credit, 3.
Assistant Professor Snyder.

78. **II.** Commercial Olericulture. — For seniors. A study of the problems in the commercial production of vegetables: general culture, fertilizers and manures, machinery, labor, handling, and marketing. One or more trips to important market or truck growing sections are required. Twenty-five dollars will cover the cost of such trips.
2 class hours. 1 2-hour laboratory period, credit, 3.
Assistant Professor Snyder.

Prerequisite, Olericulture 25 or 51 or 52.

Pomology.

Professor Sears, Professor Van Meter, Assistant Professor French, Mr. Roberts.

It is the object of the courses in pomology to give the student a thoroughly practical training, so that he may be able to perform or supervise all of the different operations in connection with the growing and marketing of the various fruits. At the same time he is given a thorough grounding in the scientific principles on which the practical work is based, in order that he may better understand the various practices taught.

Elective Courses.

26. **II.** Small Fruits. — For sophomores; juniors and seniors may elect. A study of the growing of small fruits, including raspberries, blackberries, strawberries, currants, blueberries, and grapes, dealing with such questions as varieties, selecting a site for the plantation, soils, fertilizers, pruning, harvesting, marketing, etc.
2 class hours. 1 2-hour laboratory period, credit, 3.
Professor Sears.

53. **I.** General Pomology. — For juniors; seniors may elect. A study of the most improved practices in fruit production, including such questions as the selection of orchard sites and soils, laying out and setting the orchard, the structure and growth of fruit plants; the bearing habits, pruning, and training of fruits; fertilizers, pollination, winter injury, etc.
2 class hours. 1 2-hour laboratory period, credit, 3.
Professor Sears and Mr. Roberts.

56. **II.** Spraying. — For juniors; seniors may elect. (*a*) Spraying materials, their composition, manufacture, and preparation for use; the desirable and objectionable qualities of each material; formulas used, cost, tests of purity. (*b*) Spraying machinery, including all the principal types of pumps, nozzles, hose, and vehicles; their structure and care. (*c*) Orchard methods in the application of the various materials used, with the important considerations for spraying each fruit and for combating each orchard pest. This course is designed especially to familiarize the student with the practical details of actual spraying work in the orchard.
1 class hour. 2 2-hour laboratory periods, credit, 3.
Mr. Roberts.

75. I. Systematic Pomology (1936–37). — For juniors and seniors. A study of the more important kinds and varieties of fruits grown in the United States, their relationships and nomenclature. Particular emphasis is placed upon the identification, classification, and value of varieties including a study of the characters of the plant as well as the fruit. Given in alternate years.
1 class hour. 3 2-hour laboratory periods, credit, 4.
Assistant Professor French.

77. I. Commercial Pomology (1935–36). — For juniors and seniors. The picking, handling, storing, and marketing of fruits, including a discussion of storage houses, fruit packages, methods of refrigeration, grading, and packing. This course also considers the leading American and foreign centers of fruit production as they affect our own fruit industry through competition here or abroad. Given in alternate years.
2 class hours. 1 2-hour laboratory period, credit, 3.
Mr. Roberts.

81. I. 82. II. Advanced Pomology. — For seniors. A consideration of the scientific principles governing the growth and behavior of fruit-bearing plants. Special attention is given to a critical survey of the more important research work in the field of pomology.
2 class hours. 1 2-hour laboratory period, credit, 3.
Professor Van Meter.

Prerequisite, Pomology 53.

83. I. 84. II. Seminar. — For seniors specializing in pomology. Advanced study of problems relating to the business of fruit growing. Each student is assigned a major problem in lines of work in which he is particularly interested. He pursues his studies both by reading and research, and the materials obtained will be worked into theses, which are presented to the seminar for discussion. No lectures are given, but seminar meetings are held for one period each week.
1 class hour. Credit, 1.
The Department.

Plant Breeding.

Elective Courses.

54. II. Plant Genetics. — For juniors and seniors. A study of the principles of inheritance as applied to plants, together with a consideration of the methods used and problems involved in the improvement of horticultural crops.
3 class hours. Credit, 3.
Assistant Professor French.

76. II. Advanced Plant Breeding. — For seniors. An advanced study of experimental methods, Mendelian analysis, fluctuating variations, mutations, sterility, disease resistance, etc. Laboratory work in the experimental breeding of plants.
2 class hours. 1 2-hour laboratory period, credit, 3.
Assistant Professor French.

Prerequisite, Horticulture 54.

DIVISION OF PHYSICAL AND BIOLOGICAL SCIENCES.

Professor Gordon.

Bacteriology and Physiology.

Professor Gage, Professor Bradley, Miss Garvey, Dr. Rakieten.

The courses in bacteriology and physiology have been planned to furnish: (1) general training in these subjects for all college students, (2) training for those interested in agriculture, industries, and domestic science, (3) training for prospective students of human or veterinary medicine and public health, (4) training for teachers and laboratory workers in the biological sciences. The courses in bacteriology include introductory and general courses, and advanced work, most of which precedes the applied bacteriology of agriculture, the arts, industry, domestic science, and public health. The course in physiology includes considerations of modern ideas on this subject in relation to human welfare.

Bacteriology.

Elective Courses.

31. **I.** Introductory and General Bacteriology.—For sophomores who are not majoring in the physical and biological sciences; juniors and seniors may elect. Designed to make micro-organisms real and significant. The laboratory covers the use and proper care of the compound microscope, the preparation of culture media, methods of sterilizing equipment, the isolation and handling of pure cultures, simple and differential staining, studies on classification and cultural and biochemical studies on type species of pathogenic and nonpathogenic bacteria. Individual practice in the isolation and identification of bacterial forms is a required part of the laboratory assignment. The course aims to provide a basis for bacteriological study and interpretation and to furnish such material as will be valuable in understanding agriculture, domestic science, and public health problems.

2 3-hour laboratory periods, credit, 3.
Professor Bradley and Miss Garvey.

52. **II.** Advanced Bacteriology. — For juniors; seniors may elect. A continuation of Course 31. The identification and differentiation of bacterial species by morphological, cultural, physiological, and serological studies. The combined courses give to the student not only a comprehensive picture of various forms of existing bacteria but develop a specialized technique for their cultivation, isolation, and identification.

2 3-hour laboratory periods, credit, 3.
Professor Bradley and Miss Garvey.

Prerequisite, Bacteriology 31.

61. **I.** Bacteriology. (Public Health.) — For juniors; seniors may elect. Considers the relation of the human body to its environment in the maintenance of health and the production of disease. The administration and organization of community health, the prevention or control of animal or human diseases of public health significance are considered. A study of special community health problems and the relationship of these problems to social welfare is discussed.

2 class hours. Credit, 2.
Professor Bradley.

62. **II.** Bacteriology. (Public Health.) — For juniors; seniors may elect. Sanitation and its relation to agriculture, industry, and public health. The microbiological features of air, water, soil, sewage, and refuse; industrial hygiene and the control of municipal and rural sanitary projects are considered.

2 class hours. Credit, 2.
Professor Bradley.

Prerequisite, Bacteriology 31 or 61.

81. **I.** 82. **II.** Applied Bacteriology. — For seniors; juniors may elect. These two courses covering a full year's work are designed to give the student a working knowledge of present-day applied bacteriology. The work in the laboratory is presented in three distinct sections: (1) soil, (2) food, (3) dairy. In soil, such subjects as the number and development of micro-organisms in different soils, factors influencing their growth and activity and changes wrought upon matter in the production of soil fertility, ammonification, nitrification, etc., receive attention. In food, a study of preservation, fermentation, spoilage and methods of sanitary examination are considered. In dairy, emphasis is placed upon modern methods for examining the sanitary quality of milk and milk products. Groups of bacteria normally present, abnormal and normal fermentations, effect of temperature and the rôle of milk in the transmission of disease are some of the subjects receiving special consideration.

2 3-hour laboratory periods, credit, 3.
Professor Bradley or Miss Garvey.

Prerequisite, Bacteriology 52.

85. **I.** Bacteriology. (Serology.) — For seniors. This course aims to supplement Course 52 and is planned to complete work essential for the advanced study in bacteriology and physiological science. This course includes the study,

preparation and standardization of such biological products as antigens, agglutinins, precipitins, hemolysins, and complement-fixation bodies, and the use of the same in differential bacteriology and disease diagnoses. Consideration is also given to isohemagglutinins and their relation to human blood groups. Class limited to ten students.

2 3-hour laboratory periods, credit, 3.
Professor GAGE.

Prerequisite, Bacteriology 52.

PHYSIOLOGY.

Elective Courses.

32. **II.** PHYSIOLOGY. — For sophomores. This course presents the subject of physiology from the standpoint of its definition and modern scope. The laboratory demonstrations and practice are planned to meet best the requirements of a preliminary course in physiology. Basic anatomical knowledge essential to physiological interpretations will be considered. Exercises on neuromuscular physiology, blood, the circulatory system, and alimentation are included. This course is suited to the needs of students who elect only one course in physiology.
2 class hours. 1 2-hour laboratory period, credit, 3.
Professor GAGE and Dr. RAKIETEN.

75. **I.** PHYSIOLOGY. — For seniors; juniors may elect. The object of this course is to establish a broad basis for physiological study. The study and use of instruments is emphasized. The correlation of physics, chemistry, and biological science to the interpretation of functional activities is particularly considered. Aspects of nerve muscle physiology, hemodynamics, alimentation, intermediate metabolism, and the general plan and structure of the body pertaining to each division of the work will be considered.
2 class hours. 1 2-hour laboratory period, credit,
Professor GAGE and Dr. RAKIETEN.

76. **II.** PHYSIOLOGY. — For seniors; juniors may elect. Physiology of internal and external respiration including studies on calorimetry and basal metabolism. This will be followed by work on the physiology of excretions. An introduction to the physiology of the special senses will be presented. This course is especially planned for students with a broad training in biological subjects.
2 class hours. 1 2-hour laboratory period, credit, 3.
Professor GAGE and Dr. RAKIETEN.

Prerequisite, Physiology 75.

Botany.

Professor OSMUN, Associate Professor CLARK, Associate Professor TORREY, Assistant Professor DAVIS, Miss ANDERSON.

The courses in botany are of three types: (1) those which present the principles of plant life both for their fundamental importance in this and other branches and for their general educational value; (2) those which have for their chief aim direct support of technical courses in agriculture and horticulture; (3) those providing broad, intensive training leading to specialization in the science. Courses in the last group also offer helpful training for students specializing in other sciences and in scientific agriculture.

Required Course.

1. **I and II.** INTRODUCTORY BOTANY. — For freshmen. Through laboratory, textbook, and lantern slides an attempt is made to set forth a body of facts dealing with the morphology and physiology of plants which may serve not only as a foundation for future professional work in biological science, but may be of intrinsic value to the educated layman. The topics of seed germination, ecological adaptations, floral structures, taxonomy, botanical history, cytology, wood anatomy, plant physiology and plant reproduction, receive appropriate elementary treatment. The lectures attempt to interpret the facts of plant structure and function in the light of the major biological principles.
2 class hours. 2 2-hour laboratory periods, credit, 4.
Associate Professor TORREY.

Elective Courses.

25. I. Cryptogamic Botany. — For sophomores; juniors and seniors may elect. Selected forms typifying the slime-molds, bacteria, algæ, fungi, lichens, liverworts, mosses and fernworts. The course has a two-fold purpose: (1) it is intended for students who desire to extend their knowledge to the principal branches of the plant kingdom, thus rounding out a general course of which Course 2 constitutes the first part; (2) it is also planned as an introduction to certain advanced courses for which it is prerequisite.
1 class hour. 2 2-hour laboratory periods, credit, 3.
Professor Osmun.

Prerequisite, Botany 1.

51. I. Diseases of Vegetables. — For juniors and seniors. Study of the principal diseases of vegetables occurring in field and greenhouse, with especial attention to those important in Massachusetts, and consideration of combative measures. This course is planned and conducted primarily for students interested in vegetable gardening, but those intending to enter any branch of plant industry should find it of interest. Students who desire to extend their knowledge of plant diseases over a wider range of crops may do so by taking, in addition to this, any or all of Courses 52, 53, and 54.
1 class hour. 1 2-hour laboratory period, credit, 2.
Assistant Professor Davis.

Prerequisite, Botany 1.

52. II. Diseases of Fruits. — For juniors and seniors. The plan of this course is similar to that of Course 51, but it is intended primarily for students interested in pomology.
1 class hour. 1 2-hour laboratory period, credit, 2.
Assistant Professor Davis.

Prerequisite, Botany 1.

53. I. Diseases of Field Crops. — For juniors and seniors. The plan of this course is similar to that of Course 51, but it is intended primarily for students interested in field crops.
1 class hour. 1 2-hour laboratory period, credit, 2.
Assistant Professor Davis.

Prerequisite, Botany 1.

54. II. Diseases of Floricultural Crops, Ornamentals, Shrubs, and Trees. — For juniors and seniors. The plan of this course is similar to that of Course 51, but it is intended primarily for students interested in floriculture, nursery practice, and forestry.
1 class hour. 1 2-hour laboratory period, credit, 2.
Assistant Professor Davis.

Prerequisite, Botany 1.

56. II. Diseases of Crops. — For juniors and seniors. This is a general course in which representative diseases of the principal crops grown in Massachusetts are studied. The plan of the course is otherwise similar to that of Course 51. It is intended for students majoring in entomology and others who desire a brief, general course of this nature.
1 class hour. 1 2-hour laboratory period, credit, 2.
Assistant Professor Davis.

Prerequisite, Botany 1.

58. II. Microtechnique. — For juniors and seniors. A course in the preparation of microscopic mounts including the celloidin and paraffin methods and involving the use or microtomes and of differential stains.
2 2-hour laboratory periods, credit, 2.
Associate Professor Torrey.

Prerequisite, Botany 25.

59. I. 60. II. Systematic Botany of the Higher Plants (1934–35). — Alternate with Courses 61 and 62. For juniors and seniors. An intensive study of gymnosperms and angiosperms. Lectures deal with the interrelations

of the flowering plants and with their ecology, geography, and economic importance. Laboratory work consists of a study of types from the most important natural plant families. Particular emphasis is laid on the flora of Massachusetts. The department herbarium and greenhouses supply material of important tropical forms for study.

2 class hours. 1 2-hour laboratory period, credit, 3.
Prerequisite, Botany 1. Associate Professor TORREY.

61. I. 62. II. THE COMPARATIVE ANATOMY OF GREEN PLANTS (1935–36.) — Alternate with Courses 59 and 60. For juniors and seniors. In the lectures an intensive study is directed to the comparative anatomy of green plants from the evolutionary standpoint. Particular emphasis is laid upon the woody forms both living and extinct. Of the latter, the department is fortunate in possessing excellent sets of micro-preparations and lantern slides.

2 class hours. 1 2-hour laboratory period, credit, 3.
Prerequisite, Botany 25. Associate Professor TORREY.

63. I. 64. II. SYSTEMATIC MYCOLOGY. — For juniors; seniors may elect. Morphology and development of typical species representing the orders and families of fungi; practice in identification, collection and preservation of fungi; systems of classification; collateral reading.

1 class hour. 2 2-hour laboratory periods, credit, 3.
Prerequisite, Botany 25. Assistant Professor DAVIS.

75. I. 76. II. PLANT PATHOLOGY. — For seniors. Comprehensive study of diseases of plants; training in laboratory methods and technique, includin culture work and artificial inoculation of hosts; miscellaneous diagnosis; study of literature and representative life histories of pathogens. Prepares for civil service, experiment station, and college work.

1 class hour. 4 2-hour laboratory periods, credit, 5.
Prerequisite, Botany 25. Professors OSMUN and DAVIS.

77. I. 78. II. PLANT PHYSIOLOGY. — For seniors; juniors may elect. Study of the factors and conditions of (*a*) plant nutrition, including the taking up of water and mineral substances, the assimilation of carbon and nitrogen, and the release of energy due to the processes of dissimilation; (*b*) plant growth, including the influence of internal and external factors on growth, the development of reproductive and vegetative organs; (*c*) plant movements, including those due to the taking up of water, and those of both motile and fixed forms in response to external stimuli. Weekly conferences are held, at which students report on assignments to original sources in the literature.

2 class hours. 3 2-hour laboratory periods, credit 5.
Prerequisites, Botany 25; Chemistry 51. Associate Professor CLARK.

80. II. PLANT PHYSIOLOGY. — For seniors; juniors may elect. A briefer course than Course 77 and 78, designed especially for students in horticulture agronomy, and floriculture, and aiming to give the underlying principles of plant physiology which will supply the scientific basis for the manifold practices in the various fields of plant culture.

2 class hours. 2 2-hour laboratory periods, credit, 4.
Prerequisite, Botany 1; Chemistry 30. Associate Professor CLARK.

81. I. PLANT ECOLOGY. — For seniors. Study of plants in relation to their environment, with special emphasis on the newer field studies, which have given increasing insight into the physical and chemical factors as they influence growth and development in the field and the adaptability of plants to changes in their normal environment. The various types of plant formations and successions are studied, as well as the mutual and antagonistic relations of certain plants.

1 class hour. 1 2-hour laboratory period, credit, 2.
Prerequisite, Botany 1. Associate Professor CLARK.

84. II. THE FERNS (1934–35). — For seniors; juniors may elect. Intensive study of the morphology, life-history, and taxonomy of the fern plants, with especial attention to the fern flora of New England. Given in alternate years.

1 class hour. 1 2-hour laboratory period, credit, 2.
Prerequisite, Botany 25. Professor OSMUN.

Chemistry.

Professor Ritchie, Professor Chamberlain, Professor Peters, Assistant Professor Serex, Assistant Professor Fessenden, Mr. Parrott, Miss MacMasters.

In the courses in chemistry, emphasis is laid on both their educational and their vocational value. The courses in the freshman year deal with fundamental principles and give the student such an understanding of the subject as will enable him to appreciate the relation of chemistry to the other sciences and to agriculture and industry. The more advanced courses, including quantitative analysis, organic, physiological, and physical chemistry, are for those who intend to take up graduate study, to become teachers and workers in the allied sciences, or who desire to follow chemistry as a vocation. Those completing the undergraduate courses are fitted for positions in the agricultural industries — fertilizer, feed, and insecticide manufacture — as well as in other lines of industry, and in the State experiment stations, Federal departments, commercial laboratories, and in high school teaching. Postgraduate students are prepared for positions as teachers in colleges, and for more advanced positions in industry and in the experiment stations.

Required Courses.

1. **I** and **II.** General Chemistry. — For freshmen who have not had chemistry and who begin the subject in college. It presents an introduction to the fundamental chemical laws, together with a study of the typical acid- and base-forming elements and their compounds.
2 class hours. 2 2-hour laboratory periods, credit, 4.
Mr. Parrott and Miss MacMasters.

3. **I** and **II.** General Chemistry. — For freshmen who have had chemistry in high or preparatory school. A study of the fundamental concepts of chemistry. The laboratory work is the central feature of the course, and is supplemented closely by the lectures. The object of the course is to give the student a scientific training as well as to prepare him for advanced courses.
2 class hours. 2 2-hour laboratory periods, credit, 4.
Assistant Professor Fessenden and Miss MacMasters.

Elective Courses.

25. **I.** General Chemistry. — For sophomores. The laboratory work consists largely of a study of the reactions of the ions of the common metallic elements, the devising and testing of methods of separation of a few elements and the gradual building up of a scheme of analysis. The lectures discuss the principles involved in the laboratory work.
2 class hours. 2 2-hour laboratory periods, credit, 4.
Assistant Professors Serex and Fessenden.
Prerequisite, Chemistry 1 or 3.

26. **II.** Qualitative Analysis. — For sophomores. A study of the characteristic properties, reactions and the systematic separation and identification of the common cations and anions.
2 class hours. 2 2-hour laboratory periods, credit, 4.
Assistant Professor Serex.
Prerequisite, Chemistry 25.

30. **II.** Organic Agricultural Chemistry. — For sophomores; juniors and seniors may elect. Embraces the study of the most important groups of organic compounds of plants and animals, the composition of plants and animals, the metabolism of fats, proteins, and carbohydrates, and a brief consideration of the vitamines. This course is not intended as a substitute for Chemistry 51 and 52 or Chemistry 79, and should not be taken by students expecting to take these courses.
3 class hours. Credit, 3.
Mr. Parrott.

51. **I.** 52. **II.** Organic Chemistry. — For juniors; seniors may elect. A systematic study, both from texts and in the laboratory, of the more important compounds in the entire field of organic chemistry. Especial attention is given

to those compounds which are found in agricultural products or are manufactured from them. These include alcohols, acids, esters, fats, carbohydrates, and proteins. In the second semester compounds in the benzene series are considered. The work forms a foundation for courses in physiological chemistry and agricultural analysis, and is especially planned for those majoring in chemistry or the other sciences.

3 class hours. 2 2-hour laboratory periods, credit, 5.
Professor CHAMBERLAIN.

Prerequisite, Chemistry 1 or 3. Chemistry 26 is prerequisite for those majoring in chemistry.

61. I. 62. II. QUANTITATIVE ANALYSIS. — For juniors; seniors may elect. The course includes gravimetric and volumetric analysis. The gravimetric determination of chlorine, sulfur and iron; volumetric analysis with acids and bases; indicators, hydrogen-ion concentration and pH; analysis of limestone; the use of potassium dichromate, permanganate and iodide as reagents; chemical calculations and problems; water analysis.

1 class hour. 2 4-hour laboratory periods, credit, 5.
Professor PETERS.

Prerequisite, Chemistry 25. Chemistry 26 is prerequisite for those majoring in chemistry.

75. I. PHYSICAL CHEMISTRY. — For seniors. A study of the fundamental theories and laws of physical chemistry, together with laboratory work which includes the important methods of physicochemical measurements.

3 class hours. 1 4-hour laboratory period, credit, 5.
Prerequisite, Chemistry 61. Assistant Professor SEREX.

79. I. PHYSIOLOGICAL CHEMISTRY. — For seniors. Supplementary to Courses 51 and 52. For those who expect to take up scientific work in microbiology, botany, agronomy, animal husbandry, etc., and who have had Courses 51 and 52, it gives acquaintance with the chemistry of the physiological processes in plants and animals, by means of which some of the important organic compounds studied in Courses 51 and 52 are built up in the living organism or are used as food by it. In the lectures, the study of food and nutrition as related to both human and domestic animals is the principal subject. In the laboratory, experimental studies are made of both animal and plant materials and processes.

2 class hours. 2 3-hour laboratory periods, credit, 5.
Mr. PARROTT.

86. II. REVIEW OF GENERAL CHEMISTRY. — For seniors. Primarily for students majoring in chemistry; others may elect by permission of the instructor. A knowledge of physical chemistry is desirable. The review of general chemistry is largely theoretical. Some subjects may be enlarged by special lectures, such as atomic structure, Werner's co-ordination theory, crystal structure as shown by X-rays.

2 class hours. Credit, 2.
Professor PETERS.

88. II. HISTORY OF CHEMISTRY. — For seniors. An historical and biographical study of chemistry and chemists. The aim of the course is: (1) to give the student a comprehensive view of the science as a whole, through a study of the development of new ideas and the establishment of new theories and laws; and (2) to arouse an enthusiastic interest in the subject and an appreciation of the true spirit of scientific research, through a sympathetic presentation of the work and lives of the great chemists who have been the creators of the chemistry of today. The course will consist of lectures, supplemented by systematic correlated reading and the preparation of reports or essays.

2 class hours. Credit, 2.
Professor CHAMBERLAIN.

92. II. INTRODUCTION RESEARCH. — For seniors specializing in chemistry. The aim of the course is to give the student an opportunity to learn the purpose and methods of research. To each student is assigned some special subject or

problem in one of the following fields of chemistry, viz., analytical, biochemical, inorganic, organic, physical. A careful study of the literature goes hand in hand with the working out of the problem in the laboratory.

10 laboratory hours, credit, 5.
The Department.

Entomology, Zoology, and Geology.

Professor Gordon, Professor Alexander, Professor Crampton, Assistant Professor Sweetman, Assistant Professor Warfel, Assistant Professor Kellogg, Miss Morse.

Courses in entomology are for two purposes: (1) The introductory courses aim to give the students a general knowledge of insects, particularly in their relations to man, his crops, his domestic animals, and his health. (2) More advanced courses are intended to train students desiring to specialize in entomology to become United States, State, or experiment station entomologists, teachers, foresters, tree wardens, entomologists connected with insecticide-manufacturing companies, consulting entomologists, or to occupy other positions where an expert knowledge of insects is called for. The beekeeping courses are offered with the following aims: (1) To meet the increase in vocational opportunities for the production of bees or honey as a business. (2) To study the beekeeping needs of fruit and truck-crop industries and the part that bees play in the pollination of flowers. (3) To acquaint the student with a recreational field of many phases, which can be made profitable.

The offerings in zoölogy comprise (1) two introductory courses intended primarily for sophomores, and (2) a number of distinct and somewhat special courses of a more advanced nature.

Entomology.

Elective Courses.

26. **II.** General and Field Entomology. — Primarily for sophomores intending to major in one of the biological sciences; other sophomores, juniors, and seniors may elect. For students who desire some knowledge of insects but cannot give more than one semester to the subject; also an introduction to the later courses for those who intend to follow entomology further. Two lectures throughout the semester are devoted to a brief survey of the entire field of entomology; structure and metamorphosis; the more important methods and materials for control of injurious species; a survey of the more conspicuous and important insects with particular attention to the fauna of New England. A laboratory period will be devoted to the preparation and formation of a collection of insects. Until about April 10th, this work will be done indoors and will consist of lectures and practical work preparatory to the field work after that date. Collections made by the students are studied in later courses.

2 class hours. 1 2-hour laboratory period, credit, 3.
Professor Alexander.

51. **I.** Pests of Special Crops. — For juniors and seniors not specializing in entomology. The laboratory work in this course is largely individual. Students specializing in subjects other than entomology, who desire a more complete knowledge of the insects connected with their major lines of work, can obtain it through this course. Work consisting of a critical study of the important economic insect pests leads to an ability to recognize their different stages, and their work, and to a knowledge of the best methods for their control. Work of this nature is available on the insects attacking field crops, market-garden crops, tree fruits, small fruits, shade trees and shrubs, forest trees, flowers, the domestic animals, household articles, and man.

2 2-hour laboratory periods, credit, 2.
Assistant Professor Kellogg.

Prerequisite, Entomology 26.

52. **II.** Forest and Shade-tree Insects. — For juniors; seniors may elect. The lecture work deals with the principles and methods of controlling insects which attack forests and forest products, shade trees, etc. The laboratory periods

are devoted to a study of the more important species, their identification, biology, and specific control measures. One entire Saturday for a field excursion is required.
1 class hour. 2 2-hour laboratory or field periods, credit, 3.
Professor ALEXANDER.

Prerequisite, Entomology 26; 55 and 57 desirable.

53. I. PESTS OF SPECIAL CROPS. — For juniors specializing in entomology; seniors may elect. Individual laboratory work on the more important insect pests in this country, together with the preparation and presentation of bulletin material on the same.
2 2-hour laboratory periods, credit, 2.
Assistant Professor KELLOGG.

Prerequisite, Entomology 26.

54. II. ADVANCED ENTOMOLOGY. — For juniors. Two distinct subjects, (1) Medical entomology: diseases of man and animals that are transmitted by insects and other arthropods; (2) Coccidology: scale insects, their structure, habits; methods of mounting; identification.
2 class hours. 2 2-hour laboratory periods, credit, 4.
Professor CRAMPTON.

Prerequisites, Entomology 26, 55, and 57.

55. I. 56. II. CLASSIFICATION OF INSECTS. — For juniors specializing in entomology. Laboratory work on the identification and classification of certain of the major orders of insects.
2 2-hour laboratory periods, credit, 2.
Professor ALEXANDER.

Prerequisite, Entomology 26, accompanying Entomology 57.

57. I. INSECT MORPHOLOGY. — For juniors specializing in entomology, and for a limited number of others having the prerequisite. The lectures treat of the external anatomy of insects, particular stress being given to those parts needed in classification, for use in the parallel Course 55. In the laboratory, the external anatomy of the more important groups is studied, with emphasis on those characters used in the determination of insects.
1 class hour. 2 2-hour laboratory periods, credit, 3.
Professor CRAMPTON.

Prerequisite, Entomology 26.

75. I. ADVANCED ENTOMOLOGY. — For seniors. Two distinct subjects, (1) Internal anatomy: a study of the organology of insects; (2) Insect physiology: a consideration of the organs of the insect body and their functions, with especial reference to respiration and nutrition; the relationship of physiology to behavior, biochemistry, and biophysics.
3 class hours. 1 2-hour laboratory period, credit, 4.
Professors CRAMPTON and SWEETMAN.

Prerequisites, Entomology 26, 54, and 57.

76. II. ADVANCED ENTOMOLOGY. — For seniors. Two distinct subjects, (1) The immature stages of insects, with particular stress on their structure and recognition; (2) Classification of the minor orders of insects. Taxonomy of all insect groups not earlier considered in Courses 55 and 56.
1 class hour. 2 2-hour laboratory periods, credit, 3.
Professors CRAMPTON and ALEXANDER.

Prerequisites, Entomology 26, 55, 56, and 57.

77. I. ADVANCED ENTOMOLOGY. — For seniors. Studies of the life history, habits, and methods of control of the important insect pests of the United States; recognition tests of these pests; a study of the literature; methods of bulletin and thesis preparation.
2 2-hour laboratory periods, credit, 2.
Professor ALEXANDER.

Prerequisites, Entomology 26, 52, 53, 54, 55, and 57.

78. **II.** Insecticides and Their Application. — For seniors; qualified juniors may elect. Composition, preparation, and methods of application of insecticides; other control measures.
2 class hours. Credit, 2.
Assistant Professor Sweetman.
Prerequisites, Entomology 26; Chemistry 51 and 52.

79. **I.** Insect Ecology and Biological Control. — For seniors. The ecological work considers the relation of the insect to its environment, covering such topics as definitions, present status of the subject, factors of the environment, as temperature, moisture and light; biotic potential; environmental resistance; terrestrial and aquatic insect communities; applied ecology. In the second part of the semester, the problem of biological control is begun, this treating of the types of parasitic organisms, insect parasites; predators; and similar matter.
3 class hours. Credit, 3.
Assistant Professor Sweetman.
Prerequisite, Entomology 26.

80. **II.** Biological Control and Insectary Practice. — For seniors. A continuation of Course 79. The work on biological control is concluded, discussing problems such as insect diseases; other organisms as parasites of insects; the natural ecological status of insect parasitism and the economic status of parasites. In the laboratory, the students are assigned individual problems which are conducted on a research basis. These problems may deal with any of the following phases: physiology, insecticides, ecology, biological control, or applied entomology.
1 class hour. 2 2-hour laboratory periods, credit, 3.
Assistant Professor Sweetman.
Prerequisite, Entomology 79.

90. **II.** Evolution. — For seniors; juniors may elect. In order to demonstrate the universal scope and operation of the laws of evolution, the course includes a brief sketch of the probable origin and evolution of matter as viewed in the light of modern physical and chemical research; the evolution of the solar system, leading to the formation of the earth; the changes in the earth, preparatory to the production of life; the physical and chemical basis of life; the probable steps in the formation of living matter, and the theories concerning it; the evolution of living things; the developmental history of man, and of the races of mankind; the evolution of human intelligence, languages, culture, institutions, etc., and man's probable future in the light of his past development. Especial consideration is given to the factors of evolution, the basic principles of heredity, variation, and similar topics, with particular reference to their application to human welfare; and the recent contributions in the field of entomology to the advancement of our knowledge of these fundamental principles are briefly reviewed.
2 class hours. Credit, 2.
Professor Crampton.

91. **I.** 92. **II.** Special Problems in Entomology. — For seniors and graduate students. Intended especially for qualified seniors and for graduate students desiring to do special work in some branch of entomology.
Credit, 2 or 3.
The Department.
Prerequisites, Entomology 26, 55, and 57.

Apiculture.

Elective Courses.

66. **II.** Introductory Beekeeping. — For juniors and seniors. In the classroom a study is made of the evolution of the bee, its anatomy and physiology, the races and types of bees, the history of beekeeping, the organization of the colony, and the life of the individual bee. Work in the laboratory and apiary will include a study of the equipment necessary for beekeeping, pollination and pollen-producing plants, nectar-producing plants, and spring management of colonies. Each student will be given an opportunity to observe and handle bees for himself. During the first half of the semester lectures will be substituted for

some of the laboratory periods. To be complete, this course should be followed by Course 85.

1 class hour. 2 2-hour laboratory periods, credit, 3.
Assistant Professor KELLOGG.

85. **I.** INTRODUCTORY BEEKEEPING. — For seniors. A continuation of Course 66. The classroom work consists of lectures and readings in fall management, wintering of colonies, care of the honey crop, the characteristics of honey and wax, and bee diseases Work in the apiary will include fall management of colonies, wintering, and in the laboratory studies will be made on the physical and chemical characteristics of honey and wax, with some simple biometrical problems.

2 class hours. 1 2-hour laboratory period, credit, 3.
Prerequisite, Entomology 66. Assistant Professor KELLOGG.

86. **II.** PROBLEMS IN APICULTURE. — For seniors. Studies are made in important problems connected with beekeeping, such as anatomy and physiology; bee behavior; parasites and diseases of bees; queen-rearing; pollination, and biometry. Students taking this course will be encouraged to carry on individual work in their particular problems.

1 class hour. 2 2-hour laboratory periods, credit, 3.
Prerequisites, Entomology 66 and 85. Assistant Professor KELLOGG.

ZOOLOGY

Elective Courses.

25. **I.** ELEMENTS OF ZOOLOGY. — For sophomores; juniors and seniors may elect. This course or its equivalent is prerequisite to all other courses in zoölogy or entomology. It consists of an elementary treatment of the principles of animal biology, and provides a measure of preparation for such subsequent studies as assume some acquaintance with the phenomena of animal life.

2 class hours. 1 2-hour laboratory period, credit, 3.
Professors GORDON, WARFEL, and Miss MORSE.

26. **II.** FORMS OF INVERTEBRATE ANIMALS. — For sophomores; juniors and seniors may elect. Required for graduation of students who intend to specialize in entomology, except that a student in entomology may substitute for Zoölogy 26 a year's work in Zoölogy 69 and 70. The course is designed to give a substantial introduction to the more important classes of non-vertebrated animals, and is intended for future students of entomology, zoölogy, and general biology. This course is recommended to students who purpose to take the course in historical geology. See description of Courses 69. I, and 70. II, for those who plan to specialize in zoölogy.

1 class hour. 2 2-hour laboratory periods, credit, 3.
Prerequisite, Zoölogy 25. Assistant Professor WARFEL.

50. **II.** ELEMENTS OF MICROSCOPIC TECHNIQUE. — For juniors; seniors and graduate students may elect. Open to students upon consultation with the department. The course consists of a series of practical exercises in preparing animal tissues for microscopic examination, and a study of principles and methods involved in such work.

2 2-hour laboratory periods, credit, 2.
Prerequisite, Zoölogy 25. Miss MORSE.

65. **I.** 66. **II.** COMPARATIVE VERTEBRATE ZOOLOGY. — For juniors, seniors, and graduate students. The work is arranged to run through the year and deals primarily with features of adult anatomy, with only a minimum of embryology (see Courses 75. I, and 76. II,). A year's work is recommended for those who wish a broad knowledge of comparative vertebrate zoölogy, and is required of those who specialize in zoölogy. Premedical students will find a full year's work in comparative anatomy most helpful, but may elect only one semester, either 65. I, or 66. II, if the requirements for admission to medical school may thus be satisfied. The laboratory work in Course 65. I, is devoted chiefly to the dissection

of the dogfish; that in Course 66. II, to mammalian anatomy. A knowledge of vertebrate zoölogy is very helpful in the study of historical geology.

1 class hour. 2 2-hour laboratory perioes, credit, 3.
Prerequisite, Zoölogy 25. Assistant Professor WARFEL.

69. I. 70. II. COMPARATIVE INVERTEBRATE ZOOLOGY. — For juniors, seniors, and graduate students. These courses offer a broad survey of the field of invertebrate zoölogy. Marine, fresh water, terrestrial, and parasitic forms are included, and fossil as well as living types are considered. For those who specialize in zoölogy either 69. I, or 70. II, is required and adapted for those who have had Zoölogy 26; for those who have not had Zoölogy 26 both 69. I, and 70. II, are required. Students who are not specializing in zoölogy, who have had Zoölogy 26, may elect either Course 69. I, or 70. II; for those who have not had Zoölogy 26 and desire the more advanced work in invertebrate zoölogy instead of Course 26, both Courses 69. I and 70. II, are required.

1 class hour. 2 2-hour laboratory periods, credit, 3.
Prerequisite Zoölogy 25. Miss MORSE.

75. I. 76. II. VERTEBRATE EMBRYOLOGY. — For seniors and graduate students; juniors may elect. Students are admitted to these courses only upon consultation with the instructor. The work is arranged to run through the year. Students may take Course 75 without continuing with Course 76, but may not elect Course 76 without having had Course 75 or its equivalent. In general practice a student takes the work in embryology along with or subsequent to the study of comparative vertebrate anatomy. Course 75 in the lectures reviews certain general principles of embryology and the early stages of development of Amphioxus and of the fish, frog, bird, and mammal; and in the laboratory is devoted to the study of embryos, in toto and in sections, of the early stages of the frog and the chick. Course 76 in the lectures reviews the later stages of development of the chick and mammal, with comparisons with the frog, and in the laboratory deals with embryos, in toto and in sections, of the later stages of development of organs and organ systems in the chick and mammal.

1 class hour. 2 2-hour laboratory periods, credit, 3.
Prerequisite, Zoölogy 25. Professor GORDON.

80. II. ORNITHOLOGY. — For juniors; seniors and others may elect. The orders of birds, based on the American Ornithologists' Union Check-List of North American Birds; ordinal characters of birds; families and family characters of Passerine birds; origin and relationships, adaptative radiation, migrations, distribution, and habits of birds. This course is conducted by means of lectures, practical exercises in the museum, assigned reading, and studies in the field.

1 class hour. 2 2-hour laboratory periods, credit, 3.
Prerequisite, Zoölogy 25. Professor GORDON.

85. I. CLASSES OF ARTHROPODS OTHER THAN INSECTS. — For seniors; juniors may elect. Arthropods are studied from the phylogenetic standpoint, with especial reference to their relationship to the origin and evolution of insects.

1 class hour. 2 2-hour laboratory periods, credit, 3.
Prerequisite, Zoölogy 25. Professor CRAMPTON.

91. I. 92. II. SPECIAL PROBLEMS IN ZOOLOGY. — For seniors and graduate students. Students who are especially interested in the field of zoölogy, and who have met the requirements for specialization in this field, and qualified graduate students may arrange for work on a special problem in zoölogy. Students specializing in zoölogy, who have satisfied the requirements of specialization in this field and have sufficiently high scholastic record, may elect a special problem in zoölogy for Honor's work.

Credit, 2 or 3.
Prerequisite, Zoölogy 25. The DEPARTMENT.

GEOLOGY.

Elective Courses.

Each of the courses described below is distinct. Course 28 is recommended for those who plan to take only one course in physical geology. It is also desirable as a

first course for those who plan to take any of the other courses in geology. Course 52. II, logically precedes the study of petrology, or the science of rocks.

28. **II.** Introductory Geology. — For sophomores; juniors and seniors may elect. This is a general course in physical geology. It deals in an elementary way with the different classes of rocks, and treats more fully of geological agents and processes, and the history of development of land forms.
2 class hours. 1 2-hour laboratory period, credit, 3.
Professor Gordon.

52. **II.** Descriptive and Determinative Mineralogy. — For juniors; seniors and graduate students may elect. This course deals with many of the common or useful minerals and involves the consideration of their composition, crystal forms, occurrence, and economic uses, if any. The laboratory work consists of the study of the physical properties or characters of various minerals as a means of sight recognition, and simple tests, including the blowpipe, for their determination.
1 class hour. 2 2-hour laboratory periods, credit, 3.
Professor Gordon.

61. **I.** Elements of Petrology. — For seniors; juniors and graduate students may elect. The various rock-forming minerals are first reviewed. Then follows a discussion of the different kinds of igneous, sedimentary, and metamorphic rocks, with consideration of their petrographic distinctions, modes of occurrence, and structural features.
1 class hour. 2 2-hour laboratory periods, credit, 3.
Professor Gordon.

62. **II.** Historical Geology. — For seniors; juniors and graduate students may elect. In this course the principal events in the physical history of North America are reviewed in chronological sequence, with a survey of the plant and animal life of the past.
3 class hours. Credit, 3.
Professor Gordon.

Mathematics and Civil Engineering.

Professor Ostrander, Professor Machmer, Associate Professor Moore, Mr. Boutelle, Mr. Marston.

The work of the freshman year is required. It is intended to furnish the necessary drill and groundwork needed for many of the scientific and practical courses of other departments. Thoroughness and accuracy are insisted upon. The advanced work in mathematics is taught from a practical standpoint, and many of its applications to other subjects are given. The courses in surveying and civil engineering are given to furnish the groundwork for a professional career. Special emphasis is given to the subjects bearing on highway construction and maintenance.

Required Courses.

1. **I.** Higher Algebra. — For freshmen. A brief review of radicals, quadratic equations, ratio and proportion, variation, and progressions; graphs, binomial theorem, determinants, permutations and combinations, probability, logarithms, compound interest and annuities, and theory of equations.
3 class hours. Credit, 3.
Professors Machmer, Moore, Mr. Boutelle, Mr. Marston.

2. **II.** Plane Trigonometry and Mathematical Analysis. — For freshmen. The trigonometric functions as lines and ratios, proofs of the principal formulas, transformations, inverse functions, applications to the solution of right and oblique triangles, practical applications, trigonometric equations. This is followed by a brief study of some of the different modes of variation, finding the exact or approximate relations (equations) between the varying quantities, particularly as illustrated by the use of the graph. Also a review of methods of computation, with special emphasis on short processes and the making of close approximations, and the use of the slide rule.
3 class hours. Credit, 3.
Professors Machmer, Moore, Mr. Boutelle, Mr. Marston.

Elective Courses.

25. **I.** Plane Surveying. — For sophomores; juniors and seniors may elect. The elements of the subject, including the adjustment and use of the usual instruments. Textbook, lectures, and field work.
2 class hours. 1 2-hour laboratory period, credit, 3.
Professor Ostrander.

27. **I.** Analytical Geometry. — For sophomores; juniors and seniors may elect. A discussion of the line, circle, conic sections, and the higher plane curves.
3 class hours. Credit, 3.
Professors Machmer, Moore, Mr. Boutelle, and Mr. Marston.

28. **II.** Differential Calculus. — For sophomores and juniors; seniors may elect. The basic ideas and methods of the differential calculus. The course aims to give the student a realization of the power of the calculus as an instrument for dealing with problems of geometry and the physical sciences.
3 class hours. Credit, 3.
Associate Professor Moore and Mr. Boutelle.
Prerequisite, Mathematics 27.

51. **I.** Differential and Integral Calculus. — For juniors; seniors may elect. A continuation of Mathematics 28 into the field of the integral calculus, with special emphasis on applications to problems of physics and chemistry.
3 class hours. Credit, 3.
Associate Professor Moore.
Prerequisite, Mathematics 28.

53. **I.** Elementary Structures. — For juniors; seniors may elect. An elementary course in the stresses in roofs and bridges. Textbook and lectures.
2 class hours. 1 2-hour laboratory period, credit, 3.
Professor Ostrander.

54. **II.** Roads and Railroads. — For juniors; seniors may elect. Highway surveying, curves, earthwork, pavements. Textbooks, lectures, and field work.
2 class hours. 1 2-hour laboratory period, credit, 3.
Professor Ostrander.
Prerequisite, Mathematics 25.

56. **II.** Materials of Construction, Foundations, and Masonry. — For juniors; seniors may elect. Textbook and lectures.
3 class hours. Credit, 3.
Professor Ostrander.

60. **II.** Spherical Trigonometry. — For juniors and seniors. A study of the trigonometry of the sphere with applications to astronomy and navigation.
1 class hour. Credit, 1.
Associate Professor Moore.
Prerequisite, Mathematics 51.

75. **I.** Hydraulics and Water Supply. — For seniors. Textbook and lectures.
3 class hours. Credit, 3.
Professor Ostrander.

76. **II.** Sewers and Sanitary Engineering. — For seniors. Textbook and lectures.
3 class hours. Credit, 3.
Professor Ostrander.
Prerequisite, Mathematics 75.

91. **I.** 92. **II.** Differential and Empirical Equations. — For seniors. A course dealing with the methods of solution of the simpler forms of differential equations and their applications, especially to chemical and physical problems, and the determination of empirical equations from observed data. Textbook and lectures.
2 class hours. Credit, 2.
Associate Professor Moore.
Prerequisite, Mathematics 51.

Astronomy and Meteorology.

Elective Course.

58. **II.** Descriptive Astronomy and Meteorology. — For juniors and seniors. A brief non-mathematical descriptive course which presents a general survey of the elementary facts and principles of astronomy and meteorology. The chief objective is to make the student alive to the beauty and the order that is revealed in the sky. The course deals with a consideration of the atmosphere through which astronomical phenomena are observed; fundamental conceptions of the celestial sphere, the solar system, stars, constellations, and nebulæ. Two hours of observation and discussion may be substituted for any lecture period.
2 class hours. Credit, 2.
Assistant Professor Lanphear.

Physics.

Professor Powers, Assistant Professor Alderman, Mr. Ross.

The courses in this department present a basic study of the physical laws and phenomena of nature with special emphasis on the applications of the principles studied. These courses furnish satisfactory training for pre-medical students and for prospective teachers in secondary schools. Courses 25 and 26 constitute a study in general physics. The other courses afford opportunity for more advanced and individual work.

Elective Courses.

25. **I.** Mechanics and Heat. — For sophomores; juniors and seniors may elect. This course is largely a study of the following and related topics: equilibrium of bodies; forms of energy and work; motion; fluids; surface tension; molecular phenomena; elasticity; wave-motion; thermometry; expansion; hygrometry; transmission of heat; changes of state; radiation.
2 class hours. 1 2-hour laboratory period, credit, 3.
The Department.

26. **II.** Light and Electricity. — For sophomores; juniors and seniors may elect. Includes wave-theory of light; optical instruments; analysis of light; interference; polarization; magnetism; electrostatics; production and properties of electric currents; electrical appliances and machines; oscillatory circuits; vacuum tubes, and related topics.
2 class hours. 1 2-hour laboratory period, credit, 3.
The Department.

51. **I.** 52. **II.** Magnetism, Electricity, Photo-electricity, Thermionics, and Applications. — For juniors and seniors. Course 51 deals largely with direct currents, Course 52 with alternating currents, applications of thermionics, and photo-electricity. These courses are planned to give the student a good grounding in theory and methods of measurement in the subjects indicated, which are useful in many fields of investigation. Modern methods are stressed and instruments of precision are used.
2 class hours. 1 2-hour laboratory period, credit, 3.
Professor Powers.
Prerequisites, Physics 26 and Mathematics 28 for Course 51; Physics 51 for Course 52.

53. **I.** Optics. — For juniors; seniors may elect. An intermediate course in the theory of light. Work in geometrical and physical optics is done. Precision instruments are used in the laboratory.
2 class hours. 1 2-hour laboratory period, credit, 3.
Assistant Professor Alderman.
Prerequisite, Physics 26; Mathematics 28.

54. **II.** Thermodynamics. — For juniors; seniors may elect. A study of heat exchanges and energy changes due to heat in systems of matter. The subject material and experimental methods are useful in other branches of science.
2 class hours. 1 2-hour laboratory period, credit, 3.
Assistant Professor Alderman.
Prerequisite, Physics 25; Mathematics 28.

75. I. 76. II. Advanced Experimental Work in Selected Topics. — For seniors. These courses are largely experimental, and the subject matter is adapted to the needs of the individual student. The research viewpoint is emphasized.

3 2-hour laboratory periods, credit, 3.
Professor Powers.

Prerequisites, Physics 25, 26; 51 and 52; or 53 and 54; Mathematics 28 and 51.

85. I. 86. II. Modern Physics. — For seniors. Typical subjects studied are theories of the atom, radiation, quantum theory, spectra, X-ray analysis, etc.
3 class hours. Credit, 3.
Professor Powers.

Prerequisites, Physics 25, 26, 51, 53, 54, or equivalent; Mathematics 28 and 51.

Veterinary Science.

Professor Lentz.

The courses in veterinary science are arranged to meet the needs of students who expect to follow practical agriculture; of prospective students of veterinary and human medicine, and of teachers and workers in the biological sciences.

Elective Courses.

51. I. Veterinary Hygiene. — For juniors; seniors may elect. Students are acquainted with the influences which air, water, feed, disposal of animal waste material, etc., may have upon the health of animals, and upon the health of those who use both animals and animal products.
3 class hours. Credit, 3.
Professor Lentz.

75. I. Comparative Veterinary Anatomy. — For seniors; juniors may elect. The structure of the horse is studied and the structures of other farm animals are compared with it. This is a lecture and demonstrational course.
3 class hours. Credit, 3.
Professor Lentz.

76. II. General Veterinary Pathology. — For seniors; juniors may elect. A study of fundamental, general pathological conditions; inflammation, fever, etc., and application of principles to etiology, pathogenesis, and prophylaxis of communicable and non-communicable diseases of domesticated animals.
3 class hours. Credit, 3.
Professor Lentz.

88. II. Avian Pathology. — For seniors. Consists of lectures devoted to principles of pathology, with specific application to avian diseases. Etiology, pathogenesis, and prophylaxis will be emphasized.
3 class hours. Credit, 3.
Prerequisites, Bacteriology 31 and 52; Physiology 75 and 76. Professor Lentz.

DIVISION OF SOCIAL SCIENCES.

Professor Mackimmie.

Agricultural Economics.

Professor Cance, Professor Lindsey, Assistant Professor Jefferson, Mr. Smart, Dr. Foley.

Instruction in agricultural economics is designed to show that the agricultural industry justifies its existence chiefly as a supplier of food and raw textile materials for human consumption; that agricultural success is measured by production of values as well as by production of volume of agricultural products; that the goal of the farmer is the largest net profit over a long-time period; that agricultural production includes all processes from purchase of seed and fertilizer and preparation of seedbed until the product reaches the consumer, including collection, transportation, storage, financing, packing, handling, and selling; that a knowledge of the business of agriculture and agricultural commerce is today more necessary than a knowledge of agricultural technique. The work of this department is conducted by means of lectures, readings, and research in both library and field.

Elective Courses.

26. **II.** Economic Geography. — For sophomores. The purpose of this course is to present to the student, the geographic distribution of natural and human resources, the physiographic bases of the agricultural, manufacturing, and allied industries, their economic characteristics, and the physical and social reasons for their geographic location.
3 class hours Credit, 3.
Dr. Foley.

51. **I.** The Economics of Production. — For juniors; seniors may elect. A presentation of the industrial relationships and the principles upon which the production of economic goods is based. The choice and use of land, equipment, and labor in agriculture and the manufacture of derivative products and the significant related cost and production problems are considered.
3 class hours. Credit, 3.
Professor Cance.

52. **II.** The Fundamentals of Cooperation. — For juniors; seniors may elect. The history, principles, and business relations of agricultural cooperation. (1) A survey of the development, methods, and economic results of farmers' organizations and great cooperative movements; (2) the business organization of agriculture abroad, and the present aspects and tendencies in the United States; (3) the principles underlying successful cooperative endeavor among farmers, and practical working plans for cooperative associations, with particular reference to purchase of supplies and the marketing of perishable products. Lectures, text, assigned readings, and practical exercises.
3 class hours. Credit, 3.
Professor Cance.

53. **I.** Marketing and Marketing Problems. — For juniors; seniors and graduate students may elect. A study of the forces and conditions which determine prices and the mechanism, methods, and problems concerned with transporting, storing, and distributing farm products and related goods. Supply and demand, course of prices, terminal facilities, the middleman system, speculation in agricultural products, protective legislation, the retail market, and direct sales are taken up. The characteristics and possibilities of the New England market are given special attention. Lectures, readings, assigned studies, and field work. Class trip to Boston or Springfield for market inspection, at an estimated expense of five to ten dollars.
3 class hours Credit, 3.
Professor Cance.

55. **I.** Economics of Consumption. — For juniors; seniors and graduate students may elect. The purpose of this course is a consideration of the importance of consumption in modern industry and commerce. It includes a study of the laws of consumption, standards of living, sources and factors determining family incomes, and of the administration of these incomes as shown by the expenditures of the nation and of various groups. The relation of consumption to the problems of population and to the development of society is also studied. Lectures, assigned readings, and class discussions.
3 class hours. Credit, 3.
Dr. Foley.

56. **II.** Advertising and Salesmanship. — For juniors; seniors may elect. This course is a practical study of the technique of present-day market distribution of agricultural and other products. Emphasis is placed on the functions of advertising, and upon the steps involved in the preparation of the finished advertisement. The principles and problems of selling goods and services are analyzed and discussed and the assistance of advertising to the salesman is stressed.
3 class hours. Credit, 3.
Dr. Foley.

75. **I.** Current Economic Problems. — For seniors and grauated students; juniors may elect. An advanced course for those desirous of studying more intensively some current economic problems. Studies in economic philoso-

phy and the economic aspects and consequences of progress in the physical and biological sciences, current economic questions, agricultural legislation, and government aids and subsidies are some of the problems discussed. Particular attention will be given to economic problems relating to New England. Students will be encouraged to pursue lines of individual interest.

3 class hours. Credit, 3.

Professor CANCE.

76. **II.** PRINCIPLES OF TRANSPORTATION. — For seniors and graduate students; juniors may elect. The development of highway, waterway, and railway transportation, and its relation to the agricultural and industrial development of the country; the principles governing the operation and control of transportation agencies; present-day problems relating to the shipment of farm products, rates, facilities, and services; methods of reducing wastes in transportation; the economics of the good roads movement and of motor transportation. Lectures, text, and field work.

3 class hours. Credit, 3.

Professor CANCE.

77. **I.** ECONOMICS OF FOREIGN TRADE. — For seniors; juniors and graduate students may elect. A study of the principles and practices of international trade, including a survey of historical trends of the foreign trade of the United States, particularly with reference to agricultural products; the business methods of foreign traders; foreign exchange; and the efforts made by governments and business groups to influence foreign trade. Textbook, lectures, class discussions, and class trip to Boston at an estimated expense of twelve to fifteen dollars.

3 class hours. Credit, 3.

Dr. FOLEY.

78. **II.** MONEY, BANKING, AND AGRICULTURAL CREDIT. — For seniors; juniors and graduate students may elect. The development of the monetary and banking systems of the United States; the operation of various types of financial institutions; the use of credit in economic production and the development, organization, and operation of agricultural and industrial credit institutions.

3 class hours. Credit, 3.

The DEPARTMENT.

79. **I.** PRINCIPLES AND METHODS OF STATISTICS. — For seniors and graduate students; juniors may elect. Methods of collecting, analyzing, interpreting, and presenting statistical information. The application of statistical methods to the fields of agriculture, economics, education, business, and industry is emphasized through practical laboratory problems.

1 class hour. 2 2-hour laboratory periods, credit, 3.

Professor LINDSEY.

80. **II.** ADVANCED STATISTICS. — For seniors and graduate students. This course deals with the use of statistics in the analysis of economic data with special emphasis upon prices; the use of multiple correlation methods in the study and analysis of prices of agricultural and certain other commodities.

1 class hour. 2 2-hour laboratory periods, credit, 3.

Professor LINDSEY.

81. **I.** ELEMENTARY BUSINESS ACCOUNTING. — For seniors; juniors may elect. This course aims to give the student an elementary working knowledge of the principles underlying the accounting system in the gathering, analysis, and interpretation of accounting data, and the methods used in accounting and preparing the usual types of business statements for individual proprietorship businesses and partnerships. The managerial uses of accounting as a means of business control are the keynote of the course.

1 class hour. 2 2-hour laboratory periods, credit, 3.

Professor LINDSEY.

82. **II.** ADVANCED BUSINESS ACCOUNTING. — For seniors. This course covers the problems of corporation accounting and accounting for cooperative organi-

zations. Considerable time is spent on problems in amortization, depreciation, and the preparation, analysis, and interpretation of financial statements.
1 class hour. 2 2-hour laboratory periods, credit, 3.
Professor LINDSEY.

84. **II.** RURAL AND BUSINESS LAW. — For seniors; juniors may elect. Land, titles, public roads, rights incident to ownership of livestock, contracts, commercial paper, and distinctions between personal and real property. Text, written exercises, lectures, and class discussions.
3 class hours. Credit, 3.
Mr. SMART.

91. **I.** 92. **II.** SEMINAR. — For seniors and graduate students. Research in agricultural economics and history; problems of New England agriculture. Library work and reports. If desirable some other topic may be substituted.
1 or 2 2-hour conference periods, credit, 1 to 3.
The DEPARTMENT.

Education.

Professor WELLES, Professor GLICK, Professor DESILVA, Dr. ELLIS, Mr. HEALD,[1] Mr. CARPENTER.

The primary aim of the department is to be of maximum service to those students who plan to engage in some form of educational work and whose ability, personality, and attitude indicate that they are suitable candidates. Also, many of the courses are taken for their cultural values. Students intending to teach vocational agriculture or related subjects need to consult the head of the department and the State Agent for Agricultural Teacher-training as early as possible to insure a desirable range of preparation.[2]

EDUCATION.

Elective Courses.

65. **I.** PRINCIPLES AND METHODS OF TEACHING. — For juniors; seniors may elect. The course is offered for those students who are preparing to teach. Others must have the consent of the instructor before registering. A text, case studies, current educational literature, related books, and lectures compose the materials of the course. Class discussion, reports, and short papers indicate the method. The final weeks of the semester are given up to studies of special methods in certain subjects of the high school curriculum.
3 class hours. Credit, 3.
Professor WELLES.

67. **I.** HISTORY OF EDUCATION. — For juniors; seniors may elect. This course opens a long vista in the development of one very important human endeavor — the passing on to succeeding generations of the accumulating social heritage of the race. An effort will be made to keep educational development related to other human interests as the race has progressed. Reference work on topics and a basic text with discussions.
3 class hours. Credit, 3.
Professor WELLES and Dr. ELLIS.

72. **II.** VOCATIONAL EDUCATION IN AGRICULTURE. — For juniors; seniors and graduate students may elect with permission of the head of the department. The course demands certain prerequisites of experience and objective which make permission necessary. It is the first of the series of special courses (72, 78, 82) with a survey of vocational education and an introduction to the teaching of agriculture in secondary schools. Information and observation preparatory to the apprenticeship course. Required of candidates for the agricultural teacher-training certificate.
3 class hours. Credit, 3.
Professor WELLES and VOCATIONAL DIVISION OF STATE DEPARTMENT OF EDUCATION.

[1] State Agent for Agricultural Teacher-Training representing the State Department of Education in the administration of vocational education acts.

[2] A vocational teacher-training certificate will be awarded by the State Division of Vocational Education to those who qualify. (Required courses, 71, 78, 81. Recommended course 65.)

76. **II.** Methods in Extension Teaching. — For seniors; juniors and others qualified may elect. Admission after consultation with the instructor in charge. The course deals with various phases of extension work and the methods by which this work is accomplished. The specific lines studied are those of the state director, state leaders, agricultural and home economics specialists, and county agricultural, home demonstration, and 4-H club agents. The different phases of the work will be discussed by members of the extension staff who are specialists in their particular lines.
2 class hours. Credit, 2.
Professor Welles and Mr. Carpenter.

78. **I** and **II.** Apprentice Teaching. — For a limited number of qualified candidates in vocational education. A full year in absentia, normally following the junior year in college, teaching agriculture, horticulture, and related subjects. Candidates should have completed the course in Education 72, and in Education 65 if possible, and must apply early to the head of the department. Occasionally open to graduate students.
Maximum credit, 6 semester hours.
Professor Welles and Vocational Division of State Department of Education.

80. **I** and **II.** Supervised Teaching. — For seniors; qualified juniors may be admitted. No student will be enrolled for the course except by arrangement with the head of the department. Special professional reading, assigned and optional, is required. A conference is required each week for reporting on the work each student is doing and for general discussion. The amount of credit depends upon the amount and character of the work. A thesis covering all work in the course during the semester is required.
1 class hour. 2 to 4 laboratory hours, credit, 1–2.
Professor Welles.

82. **II.** Technique of Teaching Agriculture. — For seniors and others qualified, by arrangement with the head of the department. By preference this course follows Courses 72 and 78. It covers the material, methods, policies, and special requirements of the state for teaching agriculture and related subjects in vocational schools. Required of candidates for the agricultural teacher-training certificate.
2 class hours. Credit, 2.
Professor Welles and Vocational Division of State Department of Education.

84. **II.** Secondary Education. — For seniors; juniors may elect. The course has two main objectives: (1) To give a perspective of the high school as to its aims, relations, organization, and functions; (2) To present in some detail the agencies and operations that carry these out through the curricula, schedules, and extra-curricular activities. A basic text is used with supplementary reading and problem assignments.
3 class hours. Credit, 3.
Professor Welles.

Psychology

Required Course.

26. **II.** Introductory Psychology. — For sophomores. This is an introductory course for those anticipating further study in psychology, physiology, sociology, education, etc., as well as a practical and cultural course for those who can take only one in this field. It deals with the fundamental principles of psychology in their application to understanding and control of human thought and action.
3 class hours. Credit, 3.
Professor DeSilva and Dr Ellis.

Elective Courses.

51. **I.** Experimental Psychology — For juniors; seniors may elect. The course is designed to acquaint students with typical problems and techniques of

research in psychology. Each student will be allowed to spend a certain amount of time on an independent problem in addition to demonstrations, assigned readings, and class experiments.
3 class hours. Credit, 3.
Prerequisite, Psychology 26. Professor DeSilva and Dr. Ellis.

54. **II.** Educational Psychology — For juniors; seniors may elect An application of psychology to the field of education. The course deals with the original nature of the child, the psychology of learning, individual differences, transfer of training, mental tests, etc.
3 class hours. Credit, 3.
Professor Glick.
Prerequisite, Psychology 26 or the consent of the instructor.

85. **I.** Abnormal Psychology. — For seniors; juniors may elect. A study of abnormal behavior patterns and diseased personalities with a view to a better understanding and control of oneself.
3 class hours. Credit, 3.
Professor DeSilva.
Prerequisite, Psyschology 26 or the consent of the instructor.

86. **II.** Mental Hygiene. — For seniors; juniors may elect. The applications of psychology to mental health. It will be the aim of the course to deal with the principles involved in preserving mental health, and developing mental efficiency through the encouragement of right mental habits.
3 class hours. Credit, 3.
Professor DeSilva.
Prerequisite, Psychology 26 or the consent of the instructor.

89. **I.** Psychology of Guidance. — For seniors; juniors may elect. A study of the various factors involved in guidance programs in general. Interests, attitudes, and general personality tests are studied, and the psychological devices for measuring these are also considered and applied. Practice is given in administering and scoring tests, and statistical devices are used to interpret results.
3 class hours. Credit, 3.
Professor Glick.
Prerequisite, Psychology 26 or the consent of the instructor.

90. **II.** Contemporary Psychologies. — A survey of the history of psychology with special emphasis upon the analysis and evaluation of current psychological theories and schools.
2 class hours. Credit, 2.
Dr. Ellis.

Philosophy.

Elective Courses.

61. **I.** History of Philosophy. — For juniors; seniors may elect. A study of the development of western thought in general from the time of the early Greeks to the recent past. This course attempts to provide a background for the evaluation and understanding of present theories in education, religion, ethics, metaphysics, etc.
3 class hours. Credit, 3.
Professor Glick.

62. **II.** Types of Contemporary Philosophy. — For juniors; seniors may elect. A study of current types of philosophy including naturalism, idealism, scepticism, mysticism, and pragmatism. An attempt is made to evaluate and criticize the various types of philosophy in the light of modern knowledge and historical perspective.
3 class hours. Credit, 3.
Professor Glick.

Economics, History, and Sociology.

Professor Mackimmie, Assistant Professor Cutler, Assistant Professor Jefferson, Mr. Williams, Mr. Cary.

The courses in economics, history, and sociology are planned with the purpose of giving the student that knowledge and understanding of the important factors and problems in this field of study and life which every active citizen and educated

man ought to have. In addition they enable a student to specialize in history and sociology and related science, or in social work.

Economics.

Required Course.

25. **I.** Economic Principles. — For sophomores. Definitions of economic terms, such as wealth, capital, value, etc.; factors of production, exchange, and consumption; principles of economic production, supply and demand, diminishing returns, division of labor, productive organization; principles of exchange, theories of value, money and its problems; international trade, tariff and free trade theories; forms of income, wages, interest, rent, profits, and the forces which govern them; principles of spending, economy, luxury; principles and agencies for saving, investments, banks, building associations, insurance. Textbook and readings.
3 class hours. Credit, 3.
Professors Mackimmie, Lindsey, and Dr. Foley.

Elective Courses.

51. **I.** Business and Industry. — For juniors and seniors. The forms, organization, administration, and labor problems of business. Methods of organizing, financing, and administering corporations and partnerships; forms of business administration, wholesaling, jobbing, retailing, advertising, credits and collections; system of industrial remuneration for wage earners, cooperation and preserving industrial peace; problems concerned with protective legislation for workmen and employers, sweated industries, prison labor, child labor, and industrial education.
3 class hours. Credit, 3.
Professor Mackimmie.

52. **II.** Public Finance. — For juniors and seniors. Principles of public revenues and expenditures with special emphasis on the systems and problems of taxation.
3 class hours. Credit, 3.
Professor Mackimmie.

History.

Required Course.

1. **I** and **II.** History of the United States. — For freshmen. A study of the growth of the United States with emphasis upon the development of republican principles.
3 class hours. Credit, 3.
Professor Glick, Assistant Professor Cutler, and Mr. Cary.

Elective Courses.

25. **I.** American Government. — For sophomores; others admitted by permission of instructor. A study of the structure and operation of the machinery of our government; also a study of the history of its development from its inception to the present day.
3 class hours. Credit, 3.
Assistant Professor Cutler.

27. **I.** Economic History of the United States. — For sophomores; juniors and seniors may elect. A study of the factors and forces which have affected the economic development of the United States. Special attention is focused on the working out of economic principles, and on the interaction between the economic, social, and political conditions and institutions. Text, lectures, and prepared discussions.
3 class hours. Credit, 3.
Assistant Professor Jefferson.

32. **II.** English History. — For sophomores; juniors and seniors may elect. A study of the political, social, and religious movements in England, with special reference to an understanding of English literature.
3 class hours. Credit, 3.
Professor Mackimmie.

51. **I.** GOVERNMENT. — For juniors and seniors. Forms and working methods of the governments of Great Britain, Germany, France, Russia, Switzerland, New Zealand, and Canada; historic types and theories of government; forms and methods of Federal, State, and local governments in America; progress and problems of democracy, and new reform movements in organization and administration; new tendencies towards social legislation and extension of governmental control.
3 class hours. Credit, 3.
Professor MACKIMMIE.

53. **I.** MODERN EUROPEAN HISTORY. — For juniors and seniors. The political and social history of the principal countries of Europe from 1500 to 1830.
3 class hours. Credit, 3.
Professor MACKIMMIE.

54. **II.** EUROPEAN HISTORY SINCE 1830. — For juniors and seniors. The rise of nationalism and imperialism; the unification of Italy and of Germany; the Third French Republic; European expansion; the Russo-Japanese War; the World War. While this course is a continuation of Course 53, it is complete in itself and may be elected by those who have had no history training. Its aim is to provide a basis for an understanding of present-day conditions.
3 class hours. Credit, 3.
Professor MACKIMMIE.

55. **I.** THE HISTORY OF RELIGIONS. — For juniors and seniors. Primitive religions, Hinduism, Buddhism, Mohammedanism, and Christianity. Consideration will be given to the application of the material of the course to current religious problems.
2 class hours. Credit, 2.
Mr. WILLIAMS.

56. **II.** THE LITERATURE OF THE BIBLE. — For juniors and seniors. An introduction to the literature and teachings of the Old and New Testaments.
2 class hours. Credit, 2.
Mr. WILLIAMS.

58. **II.** THE PROBLEMS OF RELIGION. — For juniors; seniors may elect. The field of this course is that of the philosophy of religion. However, no attempt will be made to cover all the problems of this discipline. Only those problems will be considered which the students electing the course desire to have considered. Any current religious problem will be considered within the scope of the course.
2 class hours. Credit, 2.
Mr. WILLIAMS.

60. **II.** THE UNITED STATES SINCE THE CIVIL WAR. — For juniors and seniors. An historical treatment of the political, economic, social, and intellectual development in recent years. The new South, development of the West, the rise of cities, expansion of the power of the Federal Government, social politics, progressivism, American Imperialism and participation in world affairs, American life, letters and art.
3 class hours. Credit, 3.
Mr. CARY.

76. **II.** HISTORY OF THE RENAISSANCE. — For seniors only. The later Middle Ages; the Church at the height of power; the rise of nationalities; the Italian towns; the New Learning and its relation to art, science, invention, geographical discoveries; spread and effects of the Renaissance.
3 class hours. Credit, 3.
Professor MACKIMMIE.

SOCIOLOGY.

Elective Courses.

27. **I.** ELEMENTS OF SOCIOLOGY. — For sophomores; others admitted by permission of instructor. A study of the individual considered as a member of his various groups; the group fallacy; the conditioned reflex; emotion; person-

ality; social behavior; social stimulation; the group and the crowd; social attitudes, ideals, and adjustments; influence of environment; rural life; field and viewpoint of scientific sociology. Lectures and readings.
3 class hours. Credit, 3.
Assistant Professor CUTLER.

51. I. 52. II. SOCIOLOGICAL LAWS AND THEIR APPLICATION. — For juniors; seniors may elect. A study of the scientific principles which characterize the relation of the individual to his various groups — the family, the school, the club, recreational institutions, the church, business, the government, and others. Practical application. This study is partly directed toward rural phases of the subject. Lectures, readings, field work, discussions, and topical reports. These courses are sequential, but may be elected independently.
3 class hours. Credit, 3.
Assistant Professor CUTLER.
Prerequisite, Sociology 27, or the consent of the instructor.

54. II. HISTORICAL SOCIOLOGY. — For juniors; seniors may elect. Characteristics of primitive man, departure from the animal status and beginnings of civilization; origin and development of industries, arts, and sciences, including agriculture, of languages, warfare, migrations, and social institutions; a study of the powerful natural and human forces that have brought man from the early stages to modern development; characteristic features of the leading civilizations and races of ancient and modern times; beneficial and dangerous factors in American life.
5 class hours. Credit, 5.
Assistant Professor CUTLER.
Prerequisite, Sociology 27, or the consent of the instructor.

75. I. PROBLEMS OF SOCIAL REFORM. — For seniors; juniors by permission. Such current problems as eugenics, race suicide, divorce, crime and delinquent classes, prison reform, prevention and treatment of dependents and defectives, poverty, its causes and preventions; constructive modern social reform movements for insurance of wage earners, farm relief, protection of childhood, assurance of safety, health, and play time for all classes. The correctional and charitable institutions of Massachusetts are studied in considerable detail.
5 class hours. Credit, 5.
Assistant Professor CUTLER.
Prerequisite, Sociology 27, or the consent of the instructor.

77. I. FIELD WORK IN SOCIOLOGY. — For seniors; juniors may elect. Designed to meet the needs of students who wish to do some constructive work in social service while still in college. Any project for which credit in this course is to be asked must first have the approval of the head of the department.
2 to 6 laboratory hours, credit, 1 to 3.
Assistant Professor CUTLER.
Prerequisite, Sociology 27, or the consent of the instructor.

78. II. SOCIOLOGICAL RESEARCH. — For seniors; juniors may elect. Research methods — measurements, exploration, criticism, surveys; a careful study of the scientific method as applied to social problems; the technique of investigation and research; the procedure of gathering sociological data by means of the survey; the interpretation and graphic presentation of social facts. Text, lectures, field and laboratory work.
3 class hours. Credit, 3.
Assistant Professor Cutler.
Prerequisite, Sociology 27, or the consent of the instructor.

79. I. 80. II. SEMINAR. — Enrolment is open to graduate students, and seniors majoring in social science who are especially prepared. Topics recently studied are: modern economic theory; civilization as reflected in great literature; sociology of American colonies in the Caribbean region; success in community leadership; sociology of the Old World and Far East; the standard of living in

American life; proposed improvements in local government; international social problems; the art of straight thinking; Utopias; the state government of Massachusetts. Courses are sequential but may be elected independently.
2 class hours. Credit, 2.
Professors MACKIMMIE and CUTLER.

84. **II.** CONSERVATION OF THE FAMILY (1935–36). — For seniors; juniors may elect. A study of some of the modern problems in family life which can be traced to ancient lineage; ways in which an individual and society can help to conserve the family; some hindrances to normal family life; the contribution of the successful family toward community and world progress. Given in alternate years.
3 class hours. Credit, 3.
Professor SKINNER.

Languages and Literature.

Professor RAND, Professor JULIAN, Professor PRINCE, Assistant Professor GODING, Assistant Professor FRAKER, Assistant Professor GOLDBERG, Mr. ELLERT, Mr. TROY, Miss BEAMAN, Mr. HELMING, Mr. STENE.

The courses in English are intended to enable students to express themselves effectively and to appreciate the ideals of English-speaking people throughout their history; those in French, Spanish, and German to give a practical knowledge of these languages for the purpose of wider reading and research, leading to a better understanding of the art and the science and the peoples concerned; those in music, to furnish in a non-technical way, a background of the history of music and its interpretation.

ENGLISH.

Required Courses.

1. **I.** 2. **II.** ENGLISH COMPOSITION. — For freshmen. Intended to teach straight thinking, sound structure, clear and correct expression. Lectures, recitations, theme writing, and conferences.
3 class hours. Credit, 3.
Professors PRINCE and RAND, Dr. GOLDBERG, Mr. TROY, Miss BEAMAN, Mr. HELMING.

25. **I.** 26. **II.** A SURVEY OF ENGLISH LITERATURE. — For sophomores. A general reading course with lectures, from the beginning of English literature to the end of the Nineteenth Century.
2 class hours. Credit, 2.
Professor PRINCE.

29. **I.** 30. **II.** PUBLIC SPEAKING. — For sophomores. The purpose of the course is to teach, by means of practice in the composition, memorization and delivery of short speeches, an effective, confident, and clearly enunciated presentation.
1 class hour. Credit, 1.
Dr. GOLDBERG, Mr. TROY, Miss BEAMAN, Mr. HELMING.

Elective Courses.

50. **II.** ARGUMENTATION AND ORATORY. — For juniors and seniors. It presents the fundamental principles of argumentation with the principles and the practice of formal oratory, prescribing the preparation and delivery of one original oration, and reading in oratory. It is recommended for those who desire to enter the intercollegiate debates or the Flint Contest.
3 class hours. Credit, 3.
Professor PRINCE.

51. **I.** ROMANTIC POETRY (1936–37). — For juniors and seniors. A study chiefly in the beginning of Romanticism in English poetry as found in the work of Collins, Gray, Burns, and Blake, with considerable attention to the culmination of Romanticism in the poetry of Shelley and Keats. Given in alternate years.
3 class hours. Credit, 3.
Professor PRINCE.

52. **II.** English Literature from Donne to Milton (1934–35). — For juniors and seniors. A treatment of the "Metaphysical School," the "Church Poets," and other writers of the period is brought to bear upon an intensive study of Milton. Given in alternate years.
3 class hours. Credit, 3.
Dr. Goldberg.

53. **I.** English Prose of the Eighteenth Century (1935–36). — For juniors and seniors. A brief exposition of the thinking of the period, in philosophy, government, and criticism is followed by a study of essayists and letter writers from Defoe to Godwin. Given in alternate years.
3 class hours. Credit, 3.
Professor Prince.

55. **I.** English Prose of the Nineteenth Century. — For juniors and seniors. Consideration of the major prose writers of the early part of the century, particularly in relation to the English periodicals of their day and to the Romantic Movement in England, France, and Germany, is followed by a study of the chief Victorian prose writers. Especial attention is devoted to Carlyle, Arnold, and Newman.
3 class hours. Credit, 3.
Dr. Goldberg.

56. **II.** American Literature (1934–35). — For juniors and seniors. A course in the chief American writers, among those studied being Irving, Cooper, Melville, Hawthorne, Emerson, Freneau, Bryant, Poe, Longfellow, and Whitman. Given in alternate years.
3 class hours. Credit, 3.
Professor Prince.

58. **II.** Victorian Poetry (1935–36). — For juniors and seniors. A study of the Pre-Raphaelites, Tennyson, and Browning. Given in alternate years.
3 class hours. Credit, 3.
Professor Rand.

60. **II.** Chaucer (1935–36). — For juniors and seniors. Reading of the principal works of Chaucer; a study of Chaucer's development as a creative artist; an attempt to appreciate his humanism. Given in alternate years.
3 class hours. Credit, 3.
Professor Prince.

62. **II.** Biography (1935–36). — For juniors and seniors. A study of distinguished biographies written in English and noteworthy both as portraits of significant people and as examples of biographical method. Given in alternate years.
3 class hours. Credit, 3.
Mr. Helming.

64. **II.** Romantic Poetry (1934–35). — For juniors and seniors. A contrasting study of Byron and the Lake Poets, and in some ways a continuation of Course 51. Given in alternate years.
3 class hours. Credit, 3.
Professor Rand.

65. **I.** Creative Writing. — For juniors and seniors. Advanced work in writing based upon specimens by authors of established reputation and upon the personal experience of the student.
3 class hours. Credit, 3.
Professor Rand (1934–35), Mr. Helming (1935–36).

67. **I.** Library Research (1935–36). — For juniors and seniors. Each student makes a considerable investigation of a subject of his own selection. An orderly accumulation of material is followed by one or more formal interpretations of its significance. Given in alternate years.
3 class hours. Credit, 3.
Professor Rand.

69. I. Tudor Literature (1936–37). — For juniors and seniors. A study of the non-dramatic verse and prose of the Tudor period, with special emphasis upon Spenser's "Færie Queene." Given in alternate years.
3 class hours. Credit, 3.
Mr. Helming.

71. I. Elizabethan Dramatists. — For juniors and seniors. A study of Elizabethan drama, exclusive of Shakespeare, with special consideration of the plays of such men as Lyly, Peele, Greene, Kyd, Marlowe, Jonson, Beaumont, Fletcher, Webster, Massinger.
3 class hours. Credit, 3.
Professor Prince.

72. II. History of Literary Criticism (1935–36). — For juniors and seniors. Major theories of criticism, from Aristotle to the present, are considered in relation to the philosophic backgrounds out of which they emerge and to attendant critical practice. This course is designed especially for students concentrating in languages and literature. Given in alternate years.
3 class hours. Credit, 3.
Dr. Goldberg.

76. II. English Prose Fiction (1934–35). — For juniors and seniors. A course of lectures and reading designed to illustrate the development of English prose fiction, with emphasis upon the great novels of the eighteenth and nineteenth centuries. Given in alternate years.
3 class hours. Credit, 3.
Mr. Helming.

79. I. Shakespeare. — For juniors and seniors. This course is based upon the reading of about thirty of Shakespeare's plays, and attempts both to indicate the evolution of the dramatist and to emphasize the various phases of his art.
3 class hours. Credit, 3.
Professor Rand.

80. II. Modern Drama (1934–35). — For juniors and seniors. This course traces the development of English drama from the time of Ibsen to the present day. Its purpose is to impart an intelligent and sympathetic interest in the theatre of the twentieth century. Given in alternate years.
3 class hours. Credit, 3.
Professor Rand.

82. II. Modern Poetry (1935–36). — For juniors and seniors. This course attempts to trace the spirit of twentieth century poetry from such authors as Hardy, Whitman, and Emily Dickinson to those of the present day. Given in alternate years.
3 class hours. Credit, 3.
Professor Rand.

French.

Elective Courses.

1. I. 2. II. Elementary French. — For freshmen; sophomores, juniors, and seniors may elect. The essentials of grammar are rapidly taught and will be accompanied by as much reading as possible.
3 class hours. Credit, 3.
Mr. Stene.

5. I. 6. II. Intermediate French. — For freshmen and sophomores; juniors and seniors may elect. Grammar review and composition. Training for rapid reading. The reading of short stories, novels, and plays, selected readings from periodicals and scientific texts in the library.
3 class hours. Credit, 3.
Assistant Professors Fraker and Goding.
Prerequisites, French 1 and 2 or their equivalent.

7. I. 8. II. French Survey. — For freshmen and sophomores; juniors and seniors may elect. A general survey of the history of French literature and

the development of French culture, with representative works of the important periods.
3 class hours. Credit, 3.
Assistant Professors Fraker and Goding.
Prerequisites, French 5 and 6 or their equivalent.

29. I. 30. II. French Classicism (1935–36). Alternate with Courses 31. I and 32. II. — For sophomores; juniors and seniors may elect. A survey of the Classical period, with readings from representative works.
3 class hours. Credit, 3.
Assistant Professor Fraker.
Prerequisites, French 7 and 8 or their equivalent.

31. I. French Romanticism (1936–37). Alternates with Course 29. — For sophomores; juniors and seniors may elect. A detailed study of the Romantic period. Readings from Hugo, de Vigny, Lamartine, de Musset, and others. The influence of English, German, and Italian literature is stressed.
3 class hours. Credit, 3.
Assistant Professor Goding.
Prerequisites, French 7 and 8 or their equivalent.

32. II. French Realism (1934–35). Alternates with Course 30. — For sophomores; juniors and seniors may elect. A detailed study of the Realistic period and the modern writers. Readings from Balzac, Flaubert, Stendahl, Loti, Daudet, Anatole France, and others.
3 class hours. Credit, 3.
Assistant Professor Goding.
Prerequisites, French 7 and 8 or their equivalent.

71. I. Voltaire (1936–37). Alternates with Course 79. — For juniors and seniors. A study of the eighteenth century through the life and works of Voltaire.
3 class hours. Credit, 3.
Assistant Professor Fraker.
Prerequisites, French 7 and 8 or their equivalent.

72. II. French Lyricism (1934–35). Alternates with Course 80. — For juniors and seniors. A study of the French lyric poets, including excerpts in modern translation from the Middle Ages and from the various modern movements through the nineteenth century. Collateral readings and reports.
3 class hours. Credit, 3.
Assistant Professor Fraker.
Prerequisites, French 7 and 8 or their equivalent.

79. I. Balzac (1935–36). Alternates with Course 71. — For juniors and seniors. A study of the life, works, and ideas of Balzac based upon a careful reading of about fifteen of his most important novels.
3 class hours. Credit, 3.
Assistant Professor Goding.
Prerequisites, French 7 and 8 or their equivalent.

80. II. Advanced Grammar and Composition (1935–36). Alternates with Course 72. — For seniors; juniors may elect with the consent of the instructor. A thorough review of grammar, with increasing attention paid to style in both oral and written composition.
3 class hours. Credit, 3.
Assistant Professor Goding.

Spanish.

Elective Courses.

51. I. 52. II. Elementary Spanish. — For juniors and seniors; open to other students upon arrangement. Grammar, exercises in composition and conversation, reading of selected short stories.
3 class hours. Credit, 3.
Assistant Professor Fraker.

75. I. 76. II. Modern Spanish Authors. — For seniors. Reading from modern Spanish novel and drama; composition; outside reading.
3 class hours. Credit, 3.
Assistant Professor Fraker.

Prerequisite, Spanish 52.

German.

Elective Courses.

1. I. 2. II. Elementary German. — For freshmen; sophomores, juniors, and seniors may elect. Grammar, reading, and prose composition. Special emphasis is placed on the acquirement of a fundamental stem vocabulary and the ability to understand simple German paragraphs in German.
3 class hours. Credit, 3.
Professor Julian, Mr. Ellert, and Mr. Stene.

5. I. 6. II. Advanced German. — For freshmen; sophomores, juniors and seniors may elect. Reading and study of some important literary productions of the classical period; spoken German; passages of prose and poetry to commit to memory.
3 class hours. Credit, 3.
Mr. Ellert.

Prerequisites, German 25 and 26, or Entrance German.

25. I. 26. II. Intermediate German. — For sophomores; juniors and seniors may elect. The German short story; the simpler German drama; grammar review and advanced prose composition. Simple passages of prose and poetry to commit to memory.
3 class hours. Credit, 3.
Mr. Ellert.

Prerequisites, German 1 and 2.

27. I. 28. II. Advanced German. — For sophomores; juniors and seniors may elect. Goethe's Faust.
3 class hours. Credit, 3.
Professor Julian.

Prerequisites, German 5 and 6, or 25 and 26.

51. I. 52. II. Scientific German. — For juniors and seniors. Intensive and specialized reading of literature in standard German scientific journals and reference books.
3 class hours. Credit, 3.
Professor Julian.

Prerequisites, German 5 and 6, or 25 and 26.

75. I. 76. II. Early German Literature and History. — For seniors. The *Niebelungenlied* and *Parzival* in modern German versions.
3 class hours. Credit, 3.
Professor Julian.

Prerequisites, German 27 and 28.

79. I. 80. II. Conversational German. — Open to advanced students in German, by permission of the instructor in charge. Practice in the oral use of German, based on reading material prepared in advance, and dealing with present-day Germany.
2 class hours. Credit, 2.
Professor Julian and Mr. ———.

Music.

Elective Courses.

51. I. History and Appreciation of Music. — For juniors and seniors. The Classical School. Works of Bach, Handel, Haydn, and Mozart are performed and studied. Lectures, musical illustrations, and outside readings.
3 scheduled hours. Credit, 2.
Assistant Professor Goding.

52. II. History and Appreciation of Music. — For juniors and seniors. A continuation of Course 51. The Romantic School: Beethoven, Schubert, Weber, Mendelssohn, Schumann, Chopin, Berlioz, Liszt. The Italian, French, and German schools of opera; modern and contemporary composers.
3 scheduled hours. Credit, 2.
Assistant Professor Goding.

Prerequisite, Music 51.

61. I. 62. II. Evolution of Modern Music. — For juniors and seniors. A thorough survey is made of the most important trends and personalities of music, from the earliest times to the present. It is designed to acquaint the student with the background for the understanding of contemporary music, which is treated in detail. Lectures, illustrations, and outside readings.
3 scheduled hours. Credit, 2.
Mr. Stratton.

75. I. 76. II. Harmony. — For juniors and seniors. A study of the development of harmonic principles up to the present time. Part-writing for four voices, and harmonic analysis. Emphasis is placed upon ear-training, to promote the student's aural imagination and recognition of all material studied. Previous musical experience is desirable, but not required. Course 75 is prerequisite to Course 76 except during the year 1934–35.
3 scheduled hours. Credit, 2.
Mr. Stratton.

GENERAL DEPARTMENTS.

Military Science and Tactics.

Colonel Charles A. Romeyn, Cav. (D. O. L.), U. S. A.; Captain Dwight Hughes, Jr., Cav. (D. O. L.), U. S. A.; Captain Herbert E. Watkins, Cav. (D. O. L.), U. S. A.; Technical Sergeant Jonathan Madden, U. S. A., Retired; Technical Sergeant James A. Warren, Cav. (D. E. M. L.), U. S. A.; Sergeant Frank Cronk, Cav. (D. E. M. L.), U. S. A.; Sergeant Roy Tanner, Cav. (D. E. M. L.), U. S. A.; and a detachment of enlisted men of the United States Army.

Under act of Congress, July 2, 1862, the College was required to provide a two-year course in military instruction under a regular army officer. All able-bodied four-year male students are required to take this course. Under act of Congress, June 3, 1916, as amended by act of Congress, September 8, 1916, there was established at this college in April, 1917, an infantry unit of the Reserve Officers' Training Corps. Following the World War and an act of Congress, July 19, 1918, the Reserve Officers' Training Corps has been in operation under the regulation of the War Department, administered by the president of the college and the professor of military science and tactics. Beginning with the fall term, 1920–21, the infantry unit of the Reserve Officers' Training Corps was converted into a cavalry unit.

The primary object of the Reserve Officers' Training Corps is to provide systematic military training at civil educational institutions, for the ultimate purpose of qualifying selected students of such institutions as reserve officers in the military forces of the United States. It is intended to attain this object during the time the students are pursuing their general or professional studies, with the least practicable interference with their civil careers, by employing methods designed to fit men physically, mentally, and morally for pursuits of peace as well as war.

The course for cavalry units of the Reserve Officers' Training Corps includes theoretical and practical instruction in all phases of cavalry work, so distributed over the four-year college course as to qualify students at the end of the freshman year as privates of cavalry, at the end of the sophomore year as non-commissioned officers of cavalry, and upon graduation as reserve officers. The instruction in this department covers cavalry drill, cavalry weapons — rifle, pistol, machine rifle, and machine gun — map reading, minor tactics, equitation, etc. The course in equitation includes cross-country riding and jumping. Forty per cent of the course is classroom work. All practical instruction is out of doors.

All male candidates for a degree in the four-year course must take at least

three hours a week of military training for two years. Students who are approved by the president and the professor of military science and tactics may take the advanced course in their junior and senior years if they so elect. The advanced course consists of at least five hours per week and a summer camp of about six weeks during the summer vacation between the junior and senior years. Students taking this course are paid by the Federal Government at a rate to be fixed by the Secretary of War, not to exceed the value of the army ration. The rate now is twenty-six cents per diem amounting for the two years to $140.40 to which should be added pay at camp of $27.93 making a cash value of $168.33. Students are required to equip themselves with riding boots but remainder of uniform is furnished by the college and becomes the property of the student upon graduation. Students graduating in the advanced course are eligible for commissions in the Officers' Reserve Corps, but are not required to accept such commissions if offered.

Uniforms for freshmen and sophomores are supplied by the college without cost except for shoes. A deposit of $18.00 is required to pay for shoes and insure return of other parts of uniform. The uniforms for the juniors and seniors (advanced course) are similar to U. S. army officers' uniforms tailor-made for the individual student. A deposit of thirty dollars for this uniform is required at the beginning of the junior year. The student is reimbursed through the allowances for clothing and rations.

Required Courses.

1. **I.** 2. **II.** For freshmen. Theoretical and practical instruction in courtesy and discipline, rifle marksmanship, hygiene and first aid, dismounted drill, and musketry.

3 scheduled hours, credit, 2.
ARMY INSTRUCTORS.

25. **I.** 26. **II.** For sophomores. Theoretical and practical instruction in leadership, riding, drill, saber, machine rifle and pistol, and employment of cavalry.

3 scheduled hours, credit, 2.
ARMY INSTRUCTORS.

Elective Courses.

51. **I.** 52. **II.** For juniors. Cavalry drill and riding, selection and care of horses, pistol marksmanship, machine guns, map reading, map making, jumping, and employment of cavalry.

5 scheduled hours, credit, 3.
ARMY INSTRUCTORS.

75. **I.** 76. **II.** For seniors. Military law, history, correspondence and records, engineering (bridges and explosives), cavalry drill, leadership and command, riding, mounted sports, competitions, horse-show preparation and management, cross-country riding, and employment of cavalry.

5 scheduled hours, credit, 3.
ARMY INSTRUCTORS.

Physical Education and Hygiene.

Professor HICKS, Professor GORE, Professor RADCLIFFE, Mrs. HICKS, Assistant Professor DERBY, Assistant Professor TAUBE, Mr. BALL, Mr. BRIGGS, Mr. ROGERS, Miss BLATCHFORD.

The purpose of the laboratory courses offered by this department is to provide active exercise regularly, in order that all students may properly care for their health and maintain their physical condition throughout their college course. It is also hoped that the health and exercise habits thus established will be continued after leaving college. The course in Hygiene is a series of lectures designed to give to the new student the simple rules of living both as an individual and in his relations with others. The required courses for men and for women are supplemented by special lectures on social hygiene and social relations. A specialized course of study in physical education for men is now offered. This course anticipates that the graduates specializing in physical education will be well-trained in general scientific and cultural subjects, as well as prepared to direct and conduct public school physical education programs and athletics or to supervise park, pub-

lic area, playground or camp activities. The course will be open by permission only to those men who by training and aptitude seem fitted for work in physical education.

Every year a number of our graduates plan to go into the teaching field, more particularly that of high school science, and in the past they have been asked to coach and also to supervise physical education programs. The physical education field of specialization is planned to meet this rather insistent demand. It includes courses in other departments, such as Education, Psychology, History, and Public Health. The curriculum for Leaders in Recreation anticipates close liaison with the Departments of Landscape Architecture, Forestry, and Agronomy, with courses recommended in Forestry, Landscape Architecture, Agronomy, Turf Management, and Sociology.

Men.

Required Courses.

1. **I.** Hygiene. — For freshmen. Lectures on personal hygiene, including the physiological basis for sound health habits, the importance of the systematic planning of a student's daily program in order to provide the proper amounts of time for study, with suitable periods of sleep, relaxation, recreation, and sports; posture, appropriate types of exercise, proper nutrition, social adjustment, the necessity for frequent medical, optical, and dental advice; sanitation and group health requirements.

1 class hour. Credit, 1.

Professor Radcliffe.

3. **I.** Physical Education Activity. Instruction and Practice in Carry-over Value Sports and Team Games. — For freshmen. One hour a week of carry-over sport instruction in swimming, golf, tennis, fishing, and hiking is required. Two sessions a week are elective. Men may choose recreation which includes volley ball, touch football, swimming and track and field achievement tests, or one of the following team games: freshman football, freshman soccer, freshman swimming, or freshman cross country.

1 1-hour laboratory and 2 2-hour laboratory periods, 1st half of semester, Credit, 1.

The Department.

4. **II.** Physical Education Activity. Instruction and Practice in Carry-over Value Sports and Team Games. — For freshmen. The one-hour a week requirement of carry-over value sport instruction in swimming, golf, tennis, and hiking is continued. Two sessions a week are elective. Men may choose recreation which includes softball, swimming, tennis and golf or one of the following team games: freshman baseball, freshman track, varsity swimming, or varsity spring football.

1 1-hour laboratory and 2 2-hour laboratory periods, 2d half of semester, Credit, 1.

The Department.

23. **I.** Physical Education Activity. Instruction and Practice in Carry-over Value Sports and Team Games. — For sophomores. Men may elect recreation which includes tennis, golf, swimming, badminton, and archery, or one of the following team sports: varsity swimming, varsity football, varsity soccer, varsity cross country or outing club hiking.

2 2-hour laboratory periods, 1st half of semester, credit, 1.

The Department.

24. **II.** Physical Education Activity. Instruction and Practice in Carry-over Value Sports and Team Games. — For sophomores. Men may elect archery, badminton, tennis, golf, varsity swimming, varsity baseball, varsity track, varsity spring football or outing club hiking.

2 2-hour laboratory periods, 2d half of semester, credit, 1.

The Department.

Elective Courses.

Admission by permission only.

51. **I.** Introductory Course for Teacher-Coaches. — For juniors and seniors. This course outlines the coaching of football, soccer, and basketball. There are several lectures on competitive psychology. Lectures, collateral readings, theory situations, and notebook. Directed teaching, practice teaching, observation, officiating, and supervision of football, soccer, basketball, and physical education classes.
2 class hours. 1 2-hour laboratory period, by arrangement, credit, 3.
The Department.

52. **II.** Introductory Course for Teacher-Coaches. — For juniors and seniors. Continuation of Course 51. This course outlines the coaching of baseball, track and field athletics, and hockey and winter sports, also lectures on athletic pedagogy. Lectures, collateral readings, theory situations, and notebook. Directed teaching, practice teaching, observation, officiating, and supervision of baseball, track and field athletics, hockey, winter sports, miscellaneous games, intramural athletics, and physical education classes.
2 class hours. 1 2-hour laboratory period, by arrangement, credit, 3.
The Department.

53. **I.** Physical Education Theory and Practice. — For juniors and seniors. This course includes lectures covering the objectives, organization, significance, and content of physical education in the grade schools. The course is correlated with the requirements of the State Department of Education. Rhythmics, games, marching, story plays, self-testing activities and posture training are considered in the laboratory period.
2 class hours. 1 2-hour laboratory period, by arrangement, credit, 3.
The Department.

[All undergraduate students are given a physical examination upon entering.]

54. **II.** Physical Education Theory and Practice. — For juniors and seniors. This course includes lectures covering the objectives, significance, organization and content of physical education in junior and senior high school. The course is correlated with the requirements of the State Department of Education. Folk dancing, apparatus work, games, achievement tests and sports like archery, badminton, tennis and golf which have a distinct after-school value are considered. Attention will be given to the formation of leaders' clubs and the development of intramurals.
2 class hours. 1 2-hour laboratory period, credit, 3.
The Department.

55. **I.** History and Purposes of Physical Education. — For juniors and seniors. A brief study of the history of the development of the various systems of physical education and the men who promoted them and a study of the aims and ideals of present-day physical educators. Lectures, textbooks, reports on assigned readings, and a final outline
2 class hours. Credit, 2.
The Department.

56. **II.** Organization and Administration of Physical Education. — For seniors. Considers the relation of athletics to physical education and to education, organization of athletics in a department of physical education, athletic committees and associations, budget, purchase and care of equipment; finances, student manager systems, construction and upkeep of fields, courts and other facilities, awards, health control of athletics and office routine.
2 class hours. Credit, 2.
The Department.

57. **I.** Camping Technique. — For juniors and seniors. Two lectures and one afternoon of field work each week. This course covers the details of camping

technique, including the special skills and the theory and practice of camping in the open.

2 class hours. 1 2-hour laboratory period, by arrangement, credit, 3.
The Department co-operating with the Department of Forestry and other Departments.

58. **II.** Camping Leadership, Administration and Maintenance. — For juniors and seniors. Two hours of lecture and afternoon field work each week. The development and spread of the camping idea and its present ramifications. Case studies of special camps, both private and organized. Studies made of organized camps as a part of education, camp standards and practices, and the qualifications necessary to become camp counselors and camp administrators. Course will cover camp program building.

2 class hours. 1 2-hour laboratory period, by arrangement, credit, 3.
The Department.

59. **I.** Scouting Elements and Principles. — For juniors and seniors. A course in scoutmastership. It includes lectures, discussions, practice, field trips and exhibits, covering the aims and content of the Boy Scout Program. The literature of Scouting requirements, methods of conducting patrol and troop meetings, merit badge work, record keeping, troop committee management and ceremonies are presented in detail.

1 class hour. 1 2-hour laboratory period, credit, 2.
The Department co-operating with Local Scout Executives.

71. **I.** 72. **II.** Special Problems Course in Physical Education. — For seniors specializing in physical education. Presentation and discussion of research work in physical education, health education and athletics. Assignments and library work required. Each student will make a special study of some phase of physical education.

3 class hours. Credit, 3.
The Department.

73. **I.** Recreation Activities and Skills. — For seniors; juniors may elect. This course includes a study of recreation technique and skills and methods of recreation leadership, game leadership, social recreation, community music and drama, handcraft, nature study, home recreation and playgrounds.

2 class hours. 1 2-hour laboratory period, by arrangement, credit, 3.
The Department co-operating with the Extension Service and other Departments.

74. **II.** Recreation Organization and Administration. — For seniors; juniors may elect. This course of training is organized with the purpose of placing before the men for discussion the subject matter, the methods and the information which seems essential and best adapted for preparing students for recreation leadership. A discussion of the executive and administrative problems arising out of the conduct of community-wide recreation programs, leisure surveys, supervision of recreational areas, park recreation problems, program making, community centers and the lay-out and equipment of play facilities.

2 class hours. 1 2-hour laboratory period, by arrangement, credit, 3.
The Department.

75. **I.** Health Education Theory and Practice. — For seniors. This course gives the teaching supervision, and administration of school health programs. Duties of health counselors and the co-ordination of all health factors for the child are stressed. Trends in health education, use of materials, health tests and measurements as well as the teaching of health habits, and safety education set-ups are considered. This course also consists of first aid as applied in the home, on the street, and on the athletic field. Prevention of athletic injuries is considered. Practice is given in bandaging and taping. Men who complete this course satisfactorily will be given American Red Cross First Aid Certificates. Lectures, demonstrations, and notebook.

1 class hour. 1 2-hour laboratory period, by arrangement, credit, 2.
The Department.

77. **I.** Anatomy General. — For juniors. A course in structural human anatomy, including bones, ligaments, muscles, circulation, digestion, nervous system and respiration.
2 class hours. 1 2-hour laboratory period, credit, 3.
Dr. Radcliffe.

78. **II.** Anatomy Applied. — For juniors. A course in applied anatomy or kinesiology aimed to give the anatomical knowledge and application basal to a thorough understanding of the mechanical problems in apparatus, athletic and corrective exercises. The lectures are supplemented by discussions and demonstrations.
2 class hours. 1 2-hour laboratory period, credit, 3.
Dr. Radcliffe.

Women.

Required Courses.

1. **I.** Hygiene. — For freshmen. Lectures on personal hygiene, including the physiological basis for sound health habits, the importance of the systematic planning of a student's daily program in order to provide the proper amounts of time for study, with suitable periods of sleep, relaxation, recreation, and sports; posture, appropriate types of exercise, proper nutrition, social adjustment, the necessity for frequent medical, optical, and dental advice; sanitation and group health requirements.
1 class hour. Credit, 1.
Professor Radcliffe.

7. **I.** Recreation. — For freshmen. Outdoor season: archery, games, soccer, special gymnastics, tennis, track; indoor season: badminton, basketball, clog, folk, and tap dancing (rhythmic dances), special gymnastics, swimming, volley ball, games.
2 2-hour laboratory periods, credit, 2.
Mrs. Hicks.

8. **II.** Recreation. — For freshmen. Indoor season: badminton, basketball, clog, folk, and tap dancing, special gymnastics, indoor baseball, swimming, volley ball, games; outdoor season: archery, baseball, special gymnastics, tennis, track.
2 2-hour laboratory periods, credit, 2.
Mrs. Hicks.

27. **I.** Recreation. — For sophomores. Outdoor season: archery, soccer, special gymnastics, tennis, track; indoor season: badminton, basketball, dancing, special gymnastics, swimming.
2 2-hour laboratory periods, credit, 2.
Mrs. Hicks.

28. **II.** Recreation. — For sophomores. Indoor season: badminton, basketball, dancing, special gymnastics, indoor baseball, swimming; outdoor season: archery, baseball, special gymnastics, tennis, track.
2 2-hour laboratory periods, credit, 2.
Mrs. Hicks.

Elective Courses.

61. **I.** 62. **II.** Recreation. — For juniors. Outdoor season: sports and games depending upon the physical condition and needs of the students; indoor season: natural dancing.
2 1-hour laboratory periods, credit, 1.
Mrs. Hicks.

81. **I.** 82. **II.** Recreation. — For seniors. Outdoor season: sports and games for physical benefits and further development of skill and for social contacts; indoor season: natural dancing.
2 1-hour laboratory periods, credit, 1.
Mrs. Hicks.

The Graduate School.

F. J. Sievers, *Director.*

Graduate courses leading to advanced degrees have been available at the college practically since its establishment. At the beginning these courses leading to the degrees of master of science and doctor of philosophy were confined almost entirely to the offerings in the field of science. Since then the work has expanded until now a major toward either degree may be selected in any of the following subjects:

Agricultural Economics
Agronomy
Bacteriology
Botany
Chemistry
Entomology
Pomology
Sociology

The following departments offer major work toward a master of science degree only:

Animal Husbandry
Dairy Industry
Education
Floriculture
Home Economics
Horticultural Manufactures
Poultry Science

The degree of master of landscape architecture is granted to students completing the two years' graduate work offered by the department of landscape architecture; while students taking the equivalent of one year's graduate work n that major may be granted the degree of bachelor of landscape architecture.

Several other departments in the institution, while not regularly organized for major work in the graduate school, do, nevertheless, offer courses which may be selected for minor credit. These are:

Economics
English
French
Forestry
Geology
German
History
Landscape Architecture
Mathematics
Physical Education
Physics
Physiology
Veterinary Science
Zoölogy

The general requirements of the graduate school regarding entrance, residence, credits, tuition, fees, etc., together with specific information concerning details of interest to prospective students are set down in a separate bulletin which may be obtained upon request to the Director's Office.

The Summer School.

For twenty-six years the college has conducted a summer session, starting at first with a four-weeks' program consisting largely of teacher training and adult courses in nature study, vegetable gardening, fruit growing, poultry raising, and ornamental gardening, all organized without reference to credits or degree. Gradually the emphasis on such work changed and the need for more professional courses of college grade has resulted since 1924 in a six-weeks' session offering a well-balanced program of credit courses. These are arranged to assist (1) superintendents, principals, and teachers, connected with high or elementary schools who desire advanced instruction either with or without relation to academic credits; (2) classroom teachers who seek to prepare themselves more effectively in their special studies; (3) college undergraduates who wish to satisfy deficiencies or secure courses not otherwise available; and (4) any man or woman who finds courses of special interest and aid for leisure or livelihood.

In addition to the full session courses of college grade a number of shorter courses, one or two weeks, are offered to enable citizens of the state to secure training in practical agriculture and horticulture, and in the special phases of homemaking. Fees and living expenses are very moderate so that many people arrange their vacation periods to include some sections of the summer session.

A carefully-planned program of entertainment including instruction in such sports as tennis, badminton, and archery, with hiking and picnics, swimming and golf, provides recreation for all.

Admission.

There are no formal examinations for admission to the summer school. Undergraduate students are admitted to such courses as their preparation justifies. Admission to the graduate school will be granted to graduates of the Massachusetts State College and to the graduates of other institutions having substantially equivalent requirements for the bachelor's degree.

The following courses were offered in the 1934 session and illustrate the type of program at present available.

College Credit Courses (July 2 — August 10, 1934).

American Literature	Genetics and Eugenics
Representative Novels	General Botany
Dramatic Production	Amateur Floriculture
The One-Act Play	The History of the United States
The Effective Spoken Word	The United States Since the Civil War
Economic Principles	Floral Arrangement
English History	Plant Breeding
Introduction to Sociology	Public Health
Community Recreation Leadership	Business Law
Animal Biology	Current Economic Problems

Courses in Education — (University Extension).

Principles and Methods of Teaching	Psychology of Guidance
History of Education	General Psychology
Ethics	Mental Hygiene

These courses were given for a period of four weeks in 1934 under the Division of University Extension of the State Department of Education. It is planned to place them back in the program of the summer session for 1935.

Utility Courses (Non-credit) Two-week Units.

Home Beekeeping	Home Ground Plantings
Home Carpentry and Metal Work	Home Poultry Flock
Home Fruit Gardening	Home Vegetable Gardening

Homemaking Courses (Non-credit) One-week Units.

Children's Coats
Growth and Development During the Early Years
Furniture Renovation
Home Canning in Tin
Money Management
Three Meals a Day
Home Manufacture of Fruit Products
Art Problems of the Home
Problems of the Adolescent Period
Time Management in the Home
Clothing Construction
The Food Budget

For further information, write or apply to Roland H. Verbeck, Director of Short Courses, Massachusetts State College, Amherst, Mass.

For information concerning graduate work in the summer school, write or apply to Fred J. Sievers, Director of the Graduate School, Massachusetts State College, Amherst, Mass.

Non-Degree Courses of Instruction.

THE STOCKBRIDGE SCHOOL OF AGRICULTURE.

General Information.

The Stockbridge School of Agriculture was organized in 1918, under the name of "The Two-Year Course in Practical Agriculture," for the purpose of meeting the demand for a short course in agriculture which might be taken by students who could not satisfy college entrance requirements or who, for one reason or another, were unable to take the college course. The name was changed to the present one by vote of the trustees of the college in 1928.

This course trains men and women for the practice of farming or associated agricultural industries. Graduation from it does not fulfill the requirements for entrance into the degree course nor are credits earned during the course transferable toward credit for a degree.

As the course is now organized, students may specialize in any one of seven vocations: animal husbandry, dairy manufactures, floriculture, horticulture, fruit growing, poultry husbandry or vegetable gardening. Specialization in a vocation does not prevent students from securing a general working knowledge of other subjects. The Stockbridge School will appeal not only to young men and women, but also to men and women of mature years and practical experience who wish to know more about the business of farming or associated agricultural industries. The School is not intended for students enrolled in a high school; such students should complete their high school course before seeking admission to this school.

Entrance Requirements.

Applicants for admission must be at least seventeen years of age and must have completed at least an elementary school course or its equivalent. Before being enrolled for the work of the second year, students must have completed six-months' practical experience approved by the supervisor of placement training.

Students who are already enrolled in high schools and who wish to enter this school before the completion of the high school course should bring a statement, either from the principal of the high school or from the parent or guardian, requesting enrollment.

Instruction.

The instruction is given by the regular faculty by means of classroom teaching, laboratory exercises, and practical work. The work of the classroom is supplemented by demonstration work in the laboratory, dairy room, greenhouse, and stables, and by a six months' period of farm placement training during the spring and summer following the second semester (eight weeks only) of resident instruction. The course is designed to offer plain, practical, direct information, and to establish the underlying reasons for, as well as methods employed in, the various operations.

Credit and Diploma.

In order to obtain a diploma, the student must complete satisfactorily all the work required in the vocational course which he has selected. This course consists of six months of class and laboratory work from October to April supplemented by six months of practical experience gained between the first and second years of resident instruction and subject to the approval of the supervisor of placement training.

No student failing to meet the requirements of his six months' summer training can be enrolled for the second year, since the placement training is an absolutely necessary prerequisite.

Graduates of county schools of agriculture or of agricultural departments of high schools may complete the course for a diploma in one year if they are recommended by the director of the county school or by the instructor in charge of the department of agriculture in the high school.

Special Catalog.

For a complete catalog of the Stockbridge School of Agriculture, containing an application blank, write or apply to Director Roland H. Verbeck, Massachusetts State College, Amherst, Mass.

THE WINTER SCHOOL.

Short Courses are based on the idea that the motive which inspires study is the most significant factor in study itself, and that this motive rises when the student himself realizes he faces a problem that calls for a solution. Therefore, there is no age limit. Enrolled in short courses are found the young and the old, the experienced and the inexperienced, the theoretical and the practical. In this grouping there is a value, since students learn from each other as well as from the instructors. Practically all Short Course students intend to make a direct application of the knowledge gained. Hence the aim of Short Course work is to offer the largest amount of information and training in agricultural and horticultural lines in the shortest possible time. During the past twenty years Short Courses have served hundreds of students in this Commonwealth, and the demand for these courses in recent years has steadily continued.

The Winter School has been established for a number of years at the college, and has proved to be very popular.

Instruction in the following courses will be offered this year:

(1) Nine Weeks' Course in Poultry Raising. November 19 to February 1.
(2) Ten Weeks' Course for Greenkeepers. January 2 to March 14.
(3) Two Weeks' Course in Dairy Bacteriology. January 2 to January 12.
(4) One Week Course in Milk and Cream Testing; Analyzing and Inspecting Milk Products. January 14 to January 19.
(5) One Week Course in Milk Plant Operation and Manufacture of Surplus Milk Products. January 21 to January 26.
(6) One Week Course in Ice Cream Making for Beginners. January 28 to February 2.
(7) One Week Course in Ice Cream Making for Experienced Men. February 4 to February 9.
(8) One Week Course in Practical Horticulture. March 4 to March 9.
(9) One Week Course in Vegetable Gardening. April 8 to April 13.
(10) One Week Course for Tree Wardens and Town Foresters. March 25 to March 30.

During the one week the student devotes all of his time to the work of the special course in which he has enrolled. The instruction lasts throughout the day from 8 to 5. These courses meet a very definite need in the State for those who wish instruction, but who cannot attend for a longer period of time, and who do not wish to take other subjects.

Tuition and Fees.

	Tuition	*Registration*	*Health*
Greenkeepers' Course	$10.00	$5.00	$1.50
Poultry Course	9.00	5.00	1.50
Dairy Bacteriology Course	2.00	2.00	None
Dairy Courses, each	2.00	2.00	None
Practical Horticulture Course	2.00	2.00	None
Vegetable Gardening Course	2.00	2.00	None
Tree Wardens' and Town Foresters' Course	2.00	2.00	None

DEGREES CONFERRED — 1934.

Doctor of Philosophy (Ph.D.)

Chap, James John, A.B., Bates College, M.S., Massachusetts State College . West Springfield.
Cleveland, Maurice Mortimer, B.S., M.S., Massachusetts State College . East Pepperell.
MacMasters, Majel Margaret, B.S., M.S., Massachusetts State College . Amherst.
Nickerson, Ralph Francis, B.S., M.S., Massachusetts State College . Attleboro.
Redmon, Bryan Collins, B.S., University of Kentucky . Amherst.
Spooner, Laurence Whipple, B.S., Massachusetts State College, M.S., Lafayette College . Brimfield.

Master of Science (M.S.)

Bennett, Emmett, B.S., Ohio State University . Amherst.
Brown, Mildred Shepard, B.S., Massachusetts State College . North Amherst.
Buck, Robert Edward, B.A., Cornell University . Mexico, N. Y.
Chapman, Kenneth William, B.S., Massachusetts State College . Springfield.
Darnell, Matthew Cotton, Jr., B.S., University of Kentucky . Frankfort, Ky.
Fabyan, Warren White, B.V.A., Massachusetts State College . East Weymouth.
Fletcher, Robert Bliss, B.S., Massachusetts State College . Worcester.
Foley, Elizabeth Frances, B.S., Westfield State Teachers' College . Springfield.
Gilgut, Constantine Joseph, B.S., Massachusetts State College . North Amherst.
Hilliker, Una Dean, B.S., Bridgewater Teachers' College . Springfield.
Jeffrey, Fred Painter, B.S., Pennsylvania State College . Tranger, Penn.
Kane, Eugene Joseph, B.S., Massachusetts State College . Westfield.
Knightly, Agnes E., A.B., Mount Holyoke College . Amherst.
Lovejoy, Richard P., B.Ch.E., Northeastern University . Saugus.
Lyons, Anthony Timothy, B.A., Amherst College . North Brookfield.
McIntire, Clara Luella, B.C.S., Northeastern University . Pittsfield.
Maloney, Willard Thomas, B.S., Pittsfield State Teachers' College . Pittsfield.
Naoum, Abraham, A.B., Hope College . Amherst.
O'Connell, John James, B.A., Catholic University . Florence.
Orcutt, Leon Munroe, B.A., University of Maine . Westfield.
Rawlings, Charles, A.B., Illinois College . Jacksonville, Ill.
Reynolds, James Patrick, A.B., College of the Holy Cross . Pittsfield.
Rice, Roy C., B.S., University of New Mexico . Wilbraham.
Rogosa, Morrison, B.A., State University of Iowa . Lynn.
Smith, George Gilman, B.S., Massachusetts State College . Lebanon, N. H.
Supowitz, Bernard Eli, B.S., Massachusetts Institute of Technology . Chelsea.

Bachelor of Landscape Architecture (B.L.A.)

Brown, J. Lee, B.S., Colorado Agricultural College . Fort Collins, Col.
Butterfield, Neal A., B.S., Oregon State College . Woodburn, Ore.
Howes, Robert Milton, B.S., Massachusetts State College . Swift River.

Bachelor of Science (B.S.)

Adams, Laura Elizabeth . Athol.
Ainsworth, Gordon Ellery . South Deerfield.
Alton, Herbert Roger . Webster.
Anderson, Alice Gunhild . Everett.
Barrett, Wilmer Dwight . West Bridgewater.
Bates, Roger Gordon . Cummington.
Batstone, Frank Arthur, Jr. . West Newton.
Bernstein, Harry Bernard . Everett.
Bick, David Louis . Everett.
Bigelow, George Harrison . Marlboro.
Bingham, Leonard Joseph . North Andover.
Blatchford, Ethel Winifred . Attleboro.
Bourgeois, George Albert, 3rd . Williamsburg.
Bowler, Gerald Thomas . Westfield.
Brackett, Muriel Viola . Marblehead.
Bresnick, Samuel . Revere.
Brown, Chester Cromwell . Wayland.
Burke, Raymond Francis . Woronoco.
Burr, Franklin Gilmore . Worthington.
Bush, Louis Joseph . Turners Falls.
Caird, David William . Dalton.
Campbell, Ruth Dexter . Springfield.
Cande, Elinor Sherman . Sheffield.
Carl, Erma Marie . Holyoke.
Caswell, Carolyn Marieta . Shattuckville.
Chapin, Norton Spencer . Lynn.
Chase, Donald William . Haverhill.
Chase, Greenleaf Tucker . Newburyport.
Chesbro, Wallace Lea . Osterville.
Clark, Frederick Griswold . West Deerfield.
Clark, Margaret Lydia . Greenfield.
Cole, Randall Knight . West Medway.
Clow, Edmund James . Orange.
Coldwell, Raymond Dunham . Framingham.
Cole, Kendrick McDowell . Needham.
Coleman, Robert Taylor . Boston.
Cook, Elizabeth Addie . Shrewsbury.
Cook, Frances Lora . Waltham.
Cooke, Theodore Frederic, Jr. . Richmond.
Coombs, Charles Edwin . Holyoke.
Cosgriff, David Edward . Springfield.
Costa, Flory Gloria . North Agawam.

Costello, Raphael Fiorani	Franklin.
Cowing, Roy Tapley	West Springfield.
Crean, Margaret Patricia	Turners Falls.
Cutler, Richard Thompson	South Sudbury.
Cutler, Roland Rogers, Jr.	South Sudbury.
Dance, Darrell Alderson	Windsor, Conn.
Denmark, Hyman Samuel	Holyoke.
Dennis, Gordon Bowman	Framingham.
Dexter, Ralph Warren	Gloucester.
Doran, Dorothy Frances	Springfield.
Duckering, Florence Augusta	Dorchester.
Dunphy, Charles Henry	Palmer.
Durrell, William Donald	Attleboro.
Edney, James Palmer	South Acton.
Einbinder, Celia Harriet	Springfield.
Ellis, Catherine MacInnis	East Brewster.
Esselen, William Brigham, Jr.	Millis.
Farrar, John Biggs	South Lincoln.
Fisher, Josephine Frances	Jamaica Plain.
Flynn, James Henry	Easthampton.
Freedman, Alexander Harvey	Dorchester.
French, Chester Leroy	Greenfield.
French, Marjorie Louise	West Newton.
Frigard, Wilho	Maynard.
Gagnon, Russell Thomas	Gloucester.
Gerrard, Barbara Kimball	Holyoke.
Gorey, Robert Francis	South Deerfield.
Green, Arthur Allerton	Windsor, Conn.
Griswold, Norman Bulkeley	Hartford, Conn.
Gunn, Alice Severance	Turners Falls.
Hager, Fanny Abigail	South Deerfield.
Harvey, Edward Winslow	Amherst.
Hast, Lillian Hannah	Worcester.
Healey, Elsie Elizabeth	Lee.
Henry, Ralph Joseph	Methuen.
Herbert, Charles Reitz	Squantum.
Hiland, Page Livingston	Sheffield.
Hill, Nathaniel Bartram	Amherst.
Hillberg, Pauline Louise	Pittsfield.
Hoagland, Descom DeForest, Jr.	Waltham.
Hodgen, Alden Reginald	Hubbardston.
Hoffman, Archie Arthur	Chelsea.
Hurwitz, Charles	Springfield.
Jackson, Harriette Morgan	Orange.
Jackson, Robert Crompton	New Bedford.
Jenkins, Herbert	Methuen.
Jensen, Marjorie Ann	Worcester.
Karlson, Erik Richard	Worcester.
Kibbe, Milton Homer	West Springfield.
Klar, James Shepard	Springfield.
Kozlowski, William	Lynn.
Kucinski, Karol Joseph	Amherst.
Landsman, Eliot	Dorchester.
LeClair, Charles Alonzo	Amherst.
Lincoln, Stephen Albert	Oakham.
Lister, William Seaton, Jr.	Stoneham.
*Lojko, Joseph	Northampton.
Lucey, Alexander Ambrose, Jr.	Medford.
MacCleery, Russell Eldridge	Winthrop.
MacDonald, Kathleen Jane	Greenfield.
Mackimmie, James Paige	Amherst.
MacMackin, Carleton Archie	Lancaster.
Magay, Robert Andrew	Worcester.
McCarthy, Shirley Elizabeth	Greenfield.
McGuckian, Ambrose Thomas	Roslindale.
Merrill, Arthur Carlton, Jr.	Rockport.
Merrill, James Willis	South Hadley Falls.
Moody, George Deming	North Andover.
Mountain, David Charles	Pittsfield.
Nichols, Nathan Paddock	Hathorne.
Nisbet, Fred Jouett	Roslindale.
O'Neil, Cornelius Francis	Northampton.
Papp, Walter Louis	North Falmouth.
Peaslee, Sarah Augusta	Woodville.
Potter, Harold Carpenter	Greenfield.
Pozzi, John Frank	North Adams.
Pushee, Ruth	North Amherst.
Pyenson, Harry	East Lee.
Robertson, James Walter, Jr.	Dorchester.
Rogers, Mark Henry	West Newbury.
Rowland, Laura Elizabeth	Springfield.
Royal, Raymond Edward	Adams.
Russell, Nancy Elizabeth	Springfield.
Russell, Waldo Rufus	Townsend.
Ryan, Alvan Sherman	Needham Heights.
Schenck, Wolcott Lawrence	Longmeadow.
Schuman, Harold	Dorchester.
Sherman, Albert	Stoneham.
Sibson, James Albert	Milford.
Sievers, Howard Ralph	Amherst.

* Awarded posthumously.

Simmons, Gladys Josephine	Pittsfield.
Skipton, Alberta Elizabeth	Springfield.
Smith, Donald Hartwell	South Berlin.
Smith, Edith Janette	State Line.
Snow, Russell Linnell	Arlington.
Southworth, Warren Hilbourne	Lynn.
Steffek, Edwin Francis	Westfield.
Stephansen, Hans Paul	Amherst.
Stewart, Malcolm Chamberlain	Needham.
Stoeber, Florence Pauline	Adams.
Sturtevant, Russell	Halifax.
Taft, Russell Eugene	Greenfield.
Talbot, Edward James	Springfield.
Taylor, Elizabeth Alton	Holyoke.
Taylor, Mary Isabelle	Groton.
Thomas, Winthrop Snowdon	West Newton.
Tiffany, Grace Elizabeth	Holyoke.
Tomlinson, Mary Arundale	West Newton.
Walker, Henry Atchinson	Southbridge.
Watson, Vernon Kenneth	Amherst.
Wheeler, Elizabeth	Worcester.
Wheeler, Nelson Adrian	Belchertown.
Wilcox, Joan Elizabeth	Boston.
Wood, Harold Spencer	Central Village.
Wordell, Hillman Hathaway	Somerset.
Wyman, Edward Rochford	Turners Falls.
Zielinski, Joseph Francis	Holyoke.
Zillman, Joseph Frank	Dorchester.

Bachelor of Vocational Agriculture (B.V.A.)

Stockbridge, Robert Reed	Worcester.

Honorary Degrees.

Doctor of Laws (LL.D.)

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Graduate Students.

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Williams, Inez W.[1 3] Entomology . . . . . Brockton.
B.S., M.S., Massachusetts State College.
Wilson, Edward H.[1] Entomology . . . . . North Amherst.
B.S., University of Maine.
White, Mildred W.[2] . . . . . Amherst.
A.B., Connecticut College.
Yoerg, Mary C.[3] . . . . . Holyoke.
B.S., New York University.
Young, E. Lois.[1] Education . . . . . Pittsfield.
A.B., Smith College.

Summary Graduate Students.

	Men	Women	Total
Enrolled during academic year, 1933–34	97	27	124
Enrolled in Summer School, 1934	15	13	28
Enrolled during first semester, 1934–35	82	30	112
Total excluding duplications	162	55	217

Undergraduate Students.

Class of 1935.

Abbott, Robert West	Falmouth	63 East Pleasant Street.
Allen, Robert John, Jr.	Worcester	French Hall.
Andrews, Frederick Newcomb	South Weymouth	53 Lincoln Avenue.
Arenberg, David Lewis	Rochester	9 Phillips Street.
Arnold, Stuart Aborn	Rehoboth	Alpha Sigma Phi.
Ashley, Madelyn Gertrude	Greenfield	Lambda Delta Mu.
Avery, Ruth Anna	Pocasset	117 Butterfield Terrace.
Bailey, John Lewis	Kingston	Alpha Sigma Phi.
Baker, Jean Sutherland	Braintree	Abigail Adams House.
Barr, Iona Elizabeth	Greenfield	The Homestead.
Bartlett, Dorothy Eleanor	Chicopee Falls	3 Cosby Avenue.
Bartlett, Helen Elnora	Framingham	24 North Prospect Street.
Becker, Roland Frederick	Methuen	35 Lincoln Avenue.
Beebe, Helen Elizabeth	Monson	The Homestead.
Bell, Vernon Adam Veith	Amherst	11 Cottage Street.
Bernstein, Anna Judyth	Greenfield	Abigail Adams House.
Bertorelli, Ollie Leonard	Milford	4 Chestnut Street.
Bingham, Laura	Athol	Abigail Adams House.
Blackburn, James William	Springfield	26 Fearing Street.
Blackburn, Roger Tait	Stoneham	Lambda Chi Alpha.
Blake, Lamont Vincent	Springfield	Kappa Sigma.
Bliss, Sheldon Pratt	Greenfield	94 Pleasant Street.
Boynton, Willard Harold	Groveland	63 East Pleasant Street.
Bozian, George	Fall River	97 Pleasant Street.
Brayden, Walter Edward	Maynard	68 Lincoln Avenue.
Brennan, Mary Teresa	Ipswich	Sigma Beta Chi.
Brown, William Clay	Winchester	Lambda Chi Alpha.
Bullard, Lawrence Mason	Berlin	Sigma Phi Epsilon.
Burgess, Albert Franklin, Jr.	Greenfield	Phi Sigma Kappa.
Cahoon, Kenneth Bangs	Centerville	4 McClure Street.
Caron, Francis Leo	North Adams	Sigma Phi Epsilon.
Casey, Charlotte Belcher	Easthampton	Alpha Lambda Mu.
Caswell, John Alden	Milford	Alpha Gamma Rho.
Clark, Curtis Mason	Millis	Q. T. V.
Clark, Lester Wilbur	Montague	12 Main Street, Montague.
Clark, Philip Hartshorn	Waltham	Kappa Epsilon.
Colson, Alma Hough	North Agawam	Alpha Lambda Mu.
Congdon, George Steadman	Millis	Q. T. V.
Connery, Ellen Rose	Easthampton	3 Knight Avenue, Easthampton.
Connolly, Helen Margaret	Amherst	21 Lincoln Avenue.
Consolati, John Joseph	Lee	Kappa Epsilon.
Cook, Dorothy Flora	Amherst	Lambda Delta Mu.
Corcoran, Frederick Leo	Stoneham	Lambda Chi Alpha.
Corcoran, Hugh Joseph	Westfield	Q. T. V.
Cox, Alfred Elmer, 3rd	Bridgewater	72 Lincoln Avenue.

Cross, Chester Ellsworth	Onset	Clark Hall.
Cumming, Roderick Wells	Bristol, Conn.	Q. T. V.
Currier, Marie Eleanor	Amesbury	Lambda Delta Mu.
Daniels, Charles Howard	Melrose	Phi Sigma Kappa.
Davis, Myron Carl	Stafford Springs, Conn.	Alpha Gamma Rho.
Davis, William Milford	South Lee	Kappa Sigma.
Dearden, Amy	Palmer	19 Park Street, Palmer.
Di Marzio, Raymond	North Plymouth	Alpha Sigma Phi.
Dimock, Catharine Elizabeth	East Springfield	Lambda Delta Mu.
Dobbie, Howard Ralph	Haverhill	42 Lincoln Avenue.
Dolan, Bernice Jo-Ann	Turners Falls	37 Cottage Street.
Doyle, Bernard Joseph	Northampton	Kappa Epsilon.
Dubin, Max	Malden	9 Phillips Street.
Dwight, Alice Isabel	Griswoldville	12 North East Street.
Dworman, Joseph Aaron	Worcester	Alpha Epsilon Pi.
Elder, Henry Holton	Mt. Hermon	35 Lincoln Avenue.
Eldridge, John Crosby	West Bridgewater	65 Lincoln Avenue.
Elliott, Charles Francis	Waltham	Kappa Sigma.
Epstein, Henry David	Brookline	Care of James Howard, North Pleasant Street.
Evans, Raymond Knightly	Easthampton	President's House.
Fay, Florence Chesson	Chicopee Falls	Sigma Beta Chi.
Feinberg, Abraham	Dorchester	9 Phillips Street.
Fisher, Ernest Brayton, Jr.	Walpole	Alpha Gamma Rho.
Foley, Cornelia Frances	Amherst	The Homestead.
Foley, Daniel Joseph	Salem	Q. T. V.
Fowler, Charles Bostwick	West Newton	Mount Pleasant.
Frey, Christine Louise	South Hadley Falls	9 Prospect Street, South Hadley Falls.
Friedrich, Lois Florence	Florence	Sigma Beta Chi.
Gavagan, James Edward	Dorchester	Box 36, North Amherst.
Gendler, Minnie	Greenfield	23 Beech Street, Greenfield.
Genest, Edward Harry, Jr.	Pittsfield	Kappa Sigma.
George, Clayton Herman	Belchertown	Fernald Hall.
Gilbert, Vincent Cooper	Belmont	Theta Chi.
Gold, Arthur	Springfield	3 Farview Way.
Golub, Barnett Louis	East Longmeadow	105 Porter Road, East Longmeadow.
Goulart, Grace Mae	Fairhaven	8 Allen Street.
Govoni, Irene Edna	North Agawam	Draper Hall.
Granger, Ralph Hawthorne	Westfield	Alpha Gamma Rho.
Griffin, Julian Philip	Indian Orchard	Kappa Sigma.
Guenard, Edward Frederick, Jr.	Dracut	Care of Mr. Webb, Baker Lane.
Gunn, Evelyn Alice	Southampton	Southampton.
Guzowski, Victor Stanley	Northampton	64 Nonotuck Street, Northampton.
Hall, Eben Theodore	Upton	Phi Sigma Kappa.
Harrington, Elizabeth Katharine	Ludlow	46 McClellan Street.
Harris, Marion Threasa	Leominster	Abigail Adams House.
Hartwell, George Albert	Malden	Theta Chi.
Hermanson, Robert Harlow	Brookline	Alpha Epsilon Pi.
Hinckley, Howard Lester, Jr.	Dorchester	Alpha Sigma Phi.
Hovey, Albert Bancroft	Wakefield	Theta Chi.
Hovey, Mildred Martina	Springfield	Lambda Delta Mu.
Hovey, Wendell Roy	Wakefield	Theta Chi.
Hubbard, Richard William	Sunderland	Sunderland.
Hunter, Robert Packard	Melrose	Phi Sigma Kappa.
Hutchinson, Charles Wooding	Amherst	Theta Chi.
Jackimczyk, Zigmund John	Florence	109 Butterfield Terrace.
Jaworski, Ernest Anthony	Adams	Kappa Epsilon.
Jillson, Stuart Farnham	Readsboro, Vt.	Care of Mr. Webb, Baker Lane.
Johnson, Walter Oscar	Haverhill	French Hall.
Jordan, William Joseph, Jr.	Revere	Phi Sigma Kappa.
Keil, Joseph Francis	Attleboro	Phi Sigma Kappa.
Kellogg, Eloise Beers	Arlington	44 Pleasant Street.
Kimball, Leslie Collis	Pelham	1 Harkness Road, Pelham.
Kingston, Mary Emma	Springfield	The Homestead.
Koch, Robert Magoon	Greenfield	Sigma Phi Epsilon
Koskela, Violet Sylvia.	Maynard	Sigma Beta Chi.
Landis, Albert Browdy	Amherst	2 Allen Street.
Leary, Theodore Moreau	Turners Falls	53 Lincoln Avenue.
Leavitt, Roger Kenison	Framingham	Alpha Sigma Phi.
Lebeshevsky, Louis Herbert	Thompsonville, Conn.	45 Fearing Street.
Levine, Arthur Sidney	Brookline	Alpha Epsilon Pi.
Libbey, Robert Franklin	Westboro	Phi Sigma Kappa.
Lillie, Lucien Bingham, III	New Bedford	Lambda Chi Alpha.
Lindquist, Ruth Lydia	East Longmeadow	27 Fearing Street.
Loring, Elizabeth	Melrose Highlands	Sigma Beta Chi.
Lubin, Bert	Boston	9 Phillips Street.
MacQueston, Everett Spencer	Winchendon	Box 115, North Amherst.
Markley, Ruth Annette	Greenfield	11 Powers Court, Greenfield.
Masters, Edward Danville	Athol	Durfee Range.
McKelligott, John Henry	Palmer	Q. T. V.
Merry, Alma Standish	Duxbury	Alpha Lambda Mu.
Michelson, Howard Bryne	Dorchester	21 Paige Street.
Miller, Joseph	Roxbury	Alpha Epsilon Pi.
Mitchell, Robert Dawson	Holyoke	525 South Street, Holyoke.
Moran, James Frederick	Millis	Q. T. V.
Morland, Harold Laurud	Westwood	17 Phillips Street.

Moulton, John Jesse	Weymouth	94 Pleasant Street.
Mozden, Walter Stanley	Three Rivers	Q. T. V.
Mulhall, William Paul	Ashland	20 Pleasant Street.
Muller, William Richard	Darien, Conn.	Lambda Chi Alpha.
Murphy, Marguerite Anne	Springfield	60 Grenada Terrace, Springfield.
Murray, Robert Vincent	Holyoke	12 Miller Avenue, Holyoke.
Nassif, Edward Bedré	North Adams	Sigma Phi Epsilon.
Newcomb, Stanley Stowell	Orange	Kappa Epsilon.
Newton, Alfred Eastman	Sharon	Lambda Chi Alpha.
Norris, Ralph Eaton	Sharon	Kappa Epsilon.
Novick, Julius	Amherst	56 Pleasant Street.
O'Brien, Allan John	Northampton	124 South Street, Northampton.
Packard, Edward Lawrence	Amherst	8 College Avenue.
Parker, Leonard Ward	Amherst	Sigma Phi Epsilon.
Patt, Hermann George	Granville	10 McClellan Street
Pease, George Raymond	Amherst	13 East Pleasant Street.
Pease, Howard Edson	Ashfield	Q. T. V.
Pelissier, Ruth Elizabeth	Hadley	Lambda Delta Mu.
Perry, Elizabeth Cushman	Watertown	Phi Zeta.
Pollin, Leo	Springfield	92 Belle Street, Springfield.
Powers, Helen Louise	Hadley	The Homestead.
Prentiss, Edward LeRoy	Upton	Phi Sigma Kappa.
Putnam, Shirley Dorothy	Springfield	Lambda Delta Mu.
Raleigh, Walter Dalton	West Springfield	Sigma Phi Epsilon.
Ramsdell, Albert Bradbury, Jr.	Palmer	Alpha Sigma Phi.
Riseman, Henry Frank	Winthrop	Alpha Epsilon Pi.
Robinson, Phillip	Revere	9 Phillips Street.
Rod, Sylvia Lillian	Becket	Draper Hall.
Roper, Harriet Ann	Westminster	Lambda Delta Mu.
Salamoff, Sydney Arthur	Roxbury	23 Sunset Avenue.
Sargent, Janet Christie	Auburndale	61 Lincoln Avenue.
Sargent, Ruth Wentworth	Wollaston	Abigail Adams House.
Schaffner, Paul Webster	Dover	Amherst Fire Department.
Schlaefer, William	Englewood, N. J.	66 Lincoln Avenue.
Schreiter, Ralph William	Walpole	Lambda Chi Alpha.
Schubert, Bernice Giduz	Boston	Abigail Adams House.
Scott, William Arthur	Bloomfield, Conn.	Phi Sigma Kappa.
Senecal, Willard Henry	Williamsburg	4 Nutting Avenue.
Shapiro, Maurice	North Adams	23 Sunset Avenue.
Sharff, Hyman	Chelsea	23 Sunset Avenue.
Shattuck, Rosamond	East Pepperell	Lambda Delta Mu.
Shaw, Glenn Frederick	Palmer	Alpha Gamma Rho.
Siira, John Raymond	Centerville	Baker Lane.
Sleep, Charlotte Fogwell	Fitchburg	Abigail Adams House.
Smith, Marion Estelle	Greenfield	Alpha Lambda Mu.
Snow, Samuel Peaslee	West Roxbury	2 Mount Pleasant.
Steadman, Kenneth Austin	Needham	Kappa Sigma.
Stepat, Walter	Braintree	Alpha Gamma Rho.
Stevens, Nelson Pierce	Haverhill	Kappa Epsilon.
Stewart, Donald Mitchell	Arlington	President's House.
Stone, Philip Carlton	Athol	Phi Sigma Kappa.
Streeter, Helen Guild	Springfield	The Homestead.
Sumner, James Ellsworth	Quincy	15 Phillips Street.
Tani, Sulo John	Worcester	Lamdba Chi Alpha.
Tannenbaum, Harold Samuel	Amherst	23 Sunset Avenue.
Thatcher, Eleanor Charlotte	Athol	Abigail Adams House.
Thayer, Carrol Edwin	Williamsburg	32 North Prospect Street.
Thompson, Wallace Wetherell	Worcester	Theta Chi.
Thornton, Edna	Amherst	7 High Street.
Tinti, Corada Sarah	North Agawam	22 King Street, North Agawam.
Tirrell, Wilbur Greene	South Weymouth	94 Pleasant Street.
Tosches, Joseph John	Milford	11 Phillips Street.
Tramposch, Emil John	Huntington Station, L. I., N. Y.	Q. T. V.
Valentine, James Jackson	Framingham Center	Theta Chi.
Veerling, John Peter	East Weymouth	94 Pleasant Street.
Weiner, Myer Louis	Malden	9 Phillips Street.
Welcker, Merrill Louis, Jr.	Holyoke	97 Pleasant Street.
Whitton, Gaie Dorothy	North Adams	Sigma Beta Chi.
Wihry, Benjamin Joseph	Haverhill	Q. T. V.
Winokur, Louis Isaac	Dorchester	Alpha Epsilon Pi.
Wood, Paul Owen	Amherst	Phi Sigma Kappa.
Wood, Robert Holman	West Upton	Phi Sigma Kappa.
Zucker, Dante	Holyoke	67 Lincoln Avenue.

CLASS OF 1936.

Abbott, Charlotte Louise	Quincy	52 Lincoln Avenue
Adams, Ralph Terry	Athol	Colonial Inn.
Allen, Elmer Howes	South Hadley	French Hall.
Allen, George Howard	Westboro	42 McClellan Street.
Allen Roger Everett	Shrewsbury	65 Lincoln Avenue.
Allis, Gertrude Helen	Conway	35 Woodside Avenue.
Anacki, Michael	West Suffield, Conn.	30 North Prospect Street.
Andrus, Harriett Katherine	Springfield	Lambda Delta Mu.
Arnold, Ralph Alexander	Franklin	R. F. D. 3, Box 81.
Babcock, Chester Ira	Newtonville	Kappa Sigma.
Baizman. Maurice Herman	Chelsea	23 Sunset Avenue.
Baker, Elizabeth Weston	Braintree	10 Kellogg Avenue.
Balavich, Daniel Algerd	North Andover	42 McClellan Street.
Ballou, Donald Murch	Holyoke	Alpha Sigma Phi.

Barrows, Randolph Corbin	Stafford Springs, Conn.	Q. T. V.
Barton, Jackson Arthur	Boston	11 Phillips Street.
Bearse, Carleton Everett	Sharon	Lambda Chi Alpha.
Becker, Philip	Easthampton	23 East Pleasant Street.
Bernstein, Morris	Everett	31 East Pleasant Street.
Bilsky, Florence Selma	Springfield	Abigail Adams House.
Bishop, Gordon Harold	Athol	Phi Sigma Kappa.
Bixby, Arthur Frederick	Sunderland	Sunderland.
Bliss, William Roderic	Springfield	24 Fearing Street.
Bosworth, Clare Elizabeth	Holyoke	19 Phillips Street.
Boylan, Myles Gerald	Watertown	North College.
Bradley, Barbara Barker	Southfield	Draper Hall.
Bray, Robert Story	Gloucester	Alpha Sigma Phi.
Brennan, Owen Joseph	Wheelwright	8 Cosby Avenue.
Bridges, Ella Mable	South Deerfield	South Deerfield.
Briere, Arnold Charles	Holyoke	168 Essex Street, Holyoke.
Britton, Elva Louise	Pittsfield	Sigma Beta Chi.
Browning, Ernestine Charlotte	Springfield	Phi Zeta.
Brueckner, Alfred Herold	Springfield	Kappa Sigma.
Bruns, Helen Norris	Somerville	3 Sunset Court.
Bull, Frederick Kemmerer	Springfield	Kappa Sigma.
Bullard, Marian Elizabeth	Orange	Alpha Lambda Mu.
Burke, Francis Campbell	Clinton	Phi Sigma Kappa.
Cance, Edmond Leland	Amherst	9 Fearing Street.
Cawley, Mary Alice	Winthrop	Abigail Adams House.
Charron, Arthur Wilfred	Turners Falls	60 Fourth Street, Turners Falls.
Chase, Madelin	Winthrop	Alpha Lambda Mu.
Chase, Milton Earle	Monument Beach	Alpha Gamma Rho.
Chilson, William Wallace	Northampton	84 Pleasant Street.
Clapp, James Wellington	Springfield	Kappa Sigma.
Clark, Robert Brown	Sharon	R. F. D. 3, Box 81.
Clarke, James Roe	Milton, N. Y.	Kappa Sigma.
Congdon, Frederick Richard	Great Barrington	Theta Kappa Gamma.
Cook, Philip Richard	Haydenville	84 Pleasant Street.
Cooney, Mary Abbie	Interlaken	Alpha Lambda Mu.
Corcoran, Dorothy Mary	Stoneham	Sigma Beta Chi.
Crabtree, Lois	Gardner	Lambda Delta Mu.
Cronin, Joseph Vincent	Haverhill	East Experiment Station.
Crowe, Gerald David Garth	Schenectady, N. Y.	5 Sunset Avenue.
Cuthbertson, Kenneth Earl	Millers Falls	Stockbridge Hall.
Czajkowski, Janina Mary	Amherst	R. F. D. 3, Box 88.
Danaczko, John	South Hadley	26 Ferry Street, South Hadley.
Davidson, James	Norwood	Care of Dr. Alexander, Old Town Road.
Davis, Barbara Jewell	Lexington	Abigail Adams House.
De Felice, Domenic	Belmont	65 Lincoln Avenue.
de Wilde, Louis	Shiloh, N. J.	84 Pleasant Street.
Dimock, Ralph Warren	Oxford	Baker Lane.
Donnelly, Donald Tracy	Chester	6 North Hadley Road.
Dow, Hazel Marie	Haverhill	Phi Zeta.
Driscoll, Frances Mary	Holyoke	Phi Zeta.
Driscoll, Paul John	Northampton	303 Prospect Heights, Northampton.
Dunbar, Malcolm Ramsey	Barre	Phi Sigma Kappa.
Dunker, Carl Frederick	Holyoke	65 Lincoln Avenue.
Eaton, Alden Robinson	North Reading	South Amherst.
Ferguson, Herbert William	Pittsfield	13 Phillips Street.
Fillmore, Eleanor Clarke	Melrose	22 Fearing Street.
Finkelstein, Carlton Jesse	Revere	23 Sunset Avenue.
Fisher, Allyn Hubbard	Norwood	Care of Dr. Alexander, Old Town Road.
Fiske, Franklin Howe	Greenfield	109 High Street, Greenfield.
Fitzgerald, Patrick James	Haverhill	83 Pleasant Street.
Flynn, Anna Agnes	Millers Falls	70 Lincoln Avenue.
Flynn, John Hanlon	Palmer	538 North Main Street, Palmer.
Ford, Marguerite	Brockton	2 Cosby Avenue.
Forer, Bertram Robin	Springfield	7 Nutting Avenue.
Foster, Jack Walter	Winthrop	86 Pleasant Street.
Franco, John Estrela	East Falmouth	65 Lincoln Avenue.
Frank, Melvin Herbert	Roxbury	44 Triangle Street.
Frye, Bradley Luther	Orange	26 Fearing Street.
Garbose, Dorothy	Gardner	61 Lincoln Avenue.
Gardner, Alfred Hamilton, Jr.	Belmont	Phi Sigma Kappa.
Gates, Chester Mason	Southbridge	Theta Chi.
Gillett, Lewis Chapman	Littleton	65 Lincoln Avenue.
Gillette, Willard Raymor	North Billerica	32 North Prospect Street.
Gingras, Irene Virginia	Blackinton	19 Phillips Street.
Glazier, Lynn Rodney	Leverett	10½ Kellogg Avenue.
Glick, Dean Newton	Amherst	6 North Hadley Road.
Glickstein, Myer	Chelsea	34 McClellan Street.
Glynn, Charles Nelson	Springfield	Eames Avenue.
Goddard, William Leonard	Littleton	65 Lincoln Avenue.
Gold, Arthur Jacob	Boston	Alpha Epsilon Pi.
Goldman, David	Boston	23 Sunset Avenue.
Govone, Louise Charlotte	Sandwich	Alpha Lambda Mu.
Graves, Russell Thompson	Northampton	236 Grove Street, Northampton.
Greenwood, Frank	Methuen	R. F. D. 3, Box 81.
Guion, Ellen	Newton	Sigma Beta Chi.

Hager, Elizabeth Warner	South Deerfield	30 Fearing Street.
Hakanson, Christine Evelyn	Worcester	Phi Zeta.
Hale, Harold Homer	Tolland	Sigma Phi Epsilon.
Haley, Louise Mary	Chester	Lambda Delta Mu.
Hall, Constance Hathaway	Sharon	22 Fearing Street.
Hannum, Calvin Siddell	Pittsfield	North College.
Harris, Robert Russell	Leominster	Q. T. V.
Hartwell, Priscilla Frances	Dover	Phi Zeta.
Haselhuhn, Donald Henry	Springfield	45 Fearing Street.
Hixon, Adin Allyne	Worcester	Theta Chi.
Hopkins, Alice Lillian	Orleans	44 Triangle Street.
Horgan, Frances Mary	Beverly	Abigail Adams House.
Horrigan, Leonta Gertrude	West Springfield	Abigail Adams House.
Howes, John Benjamin	Middleboro	Q. T. V.
Hutchinson, Margaret Lois	Amherst	33 Northampton Road.
Hutt, Robert Frederick	Glastonbury, Conn.	Sigma Phi Epsilon.
Johnson, Carroll Reed	Shirley	Theta Chi.
Johnson, David Lewis	Holden	Birch Lawn.
Johnson, Harry Agnew	Northborough	Alpha Sigma Phi.
Jones, Marion Elnora	Springfield	Phi Zeta.
Kaplovitz, Maxwell	Winthrop	21 Paige Street.
Kaufman, Allan Max	Dorchester	Alpha Epsilon Pi.
Keefe, Robert Alexander	Franklin	Alpha Sigma Phi.
Kelleher, Bernard John	Turners Falls	Sigma Phi Epsilon.
Kennett, Richard Tomfohrde	West Medford	Theta Chi.
Kerr, James, Jr.	Adams	3 McClellan Street.
Kerr, Theodore William, Jr.	Arlington	35 Lincoln Avenue.
King, Priscilla Mills	Melrose	8 Allen Street.
Kingston, Lucy	Springfield	Phi Zeta.
Kleyla, Mildred Elizabeth	South Deerfield	South Deerfield.
Klickstein, David	Malden	Alpha Epsilon Pi.
Koenig, Emil John, Jr.	Jefferson	Alpha Gamma Rho.
Krasnoff, Joseph Harold	Roslindale	44 Triangle Street.
Krtil, Charles Lewis	Westfield	Phi Sigma Kappa.
Laubenstein, Norvin Clement	Maynard	Lambda Chi Alpha.
Lavin, Edward	Springfield	43 Algonquin Street, Springfield.
Law, Edward Victor	Belmont	Theta Chi.
Le Duc, Marguerite Rita	Ware	Abigail Adams House.
Lehr, Fred Anthony	Springfield	East Experiment Station.
Lesquier, Dolores Emma	Springfield	Phi Zeta.
Levine, Lester Henry	Dorchester	31 East Pleasant Street.
Lincoln, Madeline Hazel	Belchertown	44 Pleasant Street.
Lincoln, Robert Bradley	Taunton	Kappa Sigma.
Lipovsky, Irving	Springfield	63 Church Street, Springfield.
Logan, Robert Mellor	Lawrence	84 Pleasant Street.
Lord, Francis Alfred	Northampton	Q.T.V.
Lord, Thomas Henry	Arlington	Kappa Epsilon.
Lothrop, Cummings Lincoln	South Hingham	22 Sunset Avenue.
Low, Elizabeth	Arlington	46 McClellan Street.
Lubach, Helen	Mattapan	Draper Hall.
Macintosh, Phyllis Garry	North Dana	Alpha Lambda Mu.
Malloch, Ronald Carnegie	Greenfield	Alpha Gamma Rho.
Mallory, Evelyn Marie	Amherst	73 East Pleasant Street.
Marsh, Charles William	Feeding Hills	Alpha Sigma Phi.
Martin, Gertrude Evelyn	Shrewsbury	19 Phillips Street.
Masters, Dorothy Louise	Stockbridge	Sigma Beta Chi.
McConchie, John Lewis	Monson	Phi Sigma Kappa.
Michaelson, Abraham Irving	Revere	Alpha Epsilon Pi.
Midgley, Harold Austin	Worcester	Phi Sigma Kappa.
Miner, Philip Barton	Holyoke	65 Columbus Avenue, Holyoke.
Monroe, George Edward	East Weymouth	Lambda Chi Alpha.
Moran, Charles Henry	East Boston	Stockbridge Hall.
Murphy, Fred Joseph	Belmont	Sigma Phi Epsilon.
Neuman, Samuel	Dorchester	7 Phillips Street.
Newman, Kenneth Raycraft	Hoosac Tunnel	Alpha Gamma Rho.
Newman, William Joseph MacKenzie	Florida	Alpha Gamma Rho.
Nietupski, Peter Andrew	Three Rivers	Three Rivers.
Norwood, Terrence Shanahan	Greenfield	193 Silver Street, Greenfield.
Noyes, Lorraine Fisherdick	Hartsdale, N. Y.	Sigma Beta Chi.
Nurmi, Dorothy	Westminster	Lambda Delta Mu.
O'Brien, Katherine Louise	Amherst	18 Nutting Avenue.
Packard, Clarence Adelbert	Amherst	8 College Avenue.
Parker, Howard Clarence	Bondsville	Alpha Gamma Rho.
Parsons, Edith Mildred	Turners Falls	22 Fearing Street.
Paulding, Marion Louise	South Hanson	52 Lincoln Avenue.
Pearlmutter, David Berstein	Revere	Alpha Epsilon Pi.
Peckham, Richard Tufts	West Medford	42 McClellan Street.
Peterson, Lester Carl	Quincy	30 North Prospect Street.
Pineo, Clare Linwood	Mount Tom	Kappa Epsilon.
Plastridge, Daniel Clayton	Bedford	15 Woodside Avenue.
Popp, Edward	Pittsfield	30 North Prospect Street.
Potter, Wendell Judson	Melrose	French Hall.
Pratt, Harry Davis	North Adams	10 Farview Way.
Proctor, Bessie Louise	Lunenburg	Alpha Lambda Mu.
Proctor, Raymond Norris	Lunenburg	65 Lincoln Avenue.
Putnam, Arthur Allan	Wilbraham	Theta Chi.
Putnam, Oliver Ripley	Danvers	Alpha Gamma Rho.
Rafter, Beatrice Norma	Sharon	22 Fearing Street.

Reardon, Helen Marie	Amesbury	Sigma Beta Chi.
Reed, Ruth Vassall	Waltham	5 McClure Street.
Richards, Albert Peter	Amherst	Sigma Phi Epsilon.
Riggs, Maida Leonard	Grafton	Abigail Adams House.
Riley, Richard Grimshaw	Barre Plains	Phi Sigma Kappa.
Robinson, Arthur Edward, Jr.	Arlington	Kappa Sigma.
Rose, William Arthur	Winthrop	Colonial Inn.
Roys, Charles Trescott	Sheffield	65 Lincoln Avenue.
Rutstein, Jack	Everett	Alpha Epsilon Pi.
Sandford, Addison Lawton	Ware	Sigma Phi Epsilon.
Saulnier, Florence Mae	Worcester	Abigail Adams House.
Savaria, Thomas Joseph	Ware	Q. T. V.
Sawyer, Helen Louise	Littleton	8 Allen Street.
Shulkin, Arnold Samuel	Revere	Alpha Epsilon Pi.
Simmons, George Walker, Jr.	Amherst	97 Pleasant Street.
Sjogren, Charles Norman	Easthampton	14 Chapman Avenue, Easthampton.
Smith, Francene	Walpole	Phi Zeta.
Smith, Gladys Virginia	Westfield	Phi Zeta.
Snow, Raymond Milton [1]	Lawrence	West Experiment Station.
Soulliere, Edward Joseph	Worcester	101 Pleasant Street.
Stefanelli, Velda	South Hadley	16 Alvord Street, South Hadley.
Stewart, John William	Needham	Kappa Sigma.
Stratton, Virginia	Lee	Alpha Lambda Mu.
Sturtevant, Jack [1]	Lynnfield Centre	Sigma Phi Epsilon.
Sullivan, Edmund Joseph	Milford	Phi Sigma Kappa.
Sweinberger, Ralph Frederick	Holyoke	15 McClellan Street.
Tanner, Royal Kendrick	Greenfield	85 Sanderson Street, Greenfield.
Taylor, David Henry	Methuen	Kappa Sigma.
Thayer, Charles Vallentine	Amherst	Hickory Farm.
Thompson, Richard Hugh	Colrain	Theta Chi.
Trask, Owen Smith	Lexington	Theta Chi.
Valentine, James Alden, Jr.	South Walpole	Phi Sigma Kappa.
Vassos, George Arthur, Jr.	Springfield	Davenport Inn.
Vickery, Gertrude Mabel	Greenfield	52 Lincoln Avenue.
Wainio, Walter	Maynard	Lambda Chi Alpha.
Warner, Roger Lewis	Williamsburg	Phi Sigma Kappa.
Wentworth, Frances	Pittsfield	Abigail Adams House.
Whaley, William Gordon	East Moriches, N. Y.	84 Pleasant Street.
Whitaker, Spofford	West Medford	Phi Sigma Kappa.
Whitney, Marjorie Eleanor	Westminster	Lambda Delta Mu.
Willard, Luther Lincoln	Worcester	Davenport Inn.
Winsor, Sylvia Bancroft	New Bedford	3 Cosby Avenue.
Wolcott, Thomas Bernerd	Westfield	Kappa Sigma.
Wood, John Langille	Greenfield	Sigma Phi Epsilon.
Worden, Betsy,	West Springfield	Phi Zeta.
Zak, John Michael	Sunderland	64 Lincoln Avenue.
Zewski, Walter Bernard	Northampton	357 Bridge Street, Northampton
Ziomek, Apolonia Julia	Amherst	R. F. D. 3, Box 129.

CLASS OF 1937.

Aiken, Ralph Emerson, Jr.	Georgetown	4 Allen Street.
Anderson, Philip Brigham	Framingham	86 Pleasant Street.
Appel, Charles	Holyoke	44 Brookline Avenue, Holyoke.
Appel, John F.	Holyoke	44 Brookline Avenue, Holyoke.
Ash, Rose Jane	Holyoke	24 North Prospect Street.
Atlas, Herbert Bernard	Brookline	11 Phillips Street.
Avery, Arthur Chester	Amherst	4 Chestnut Street.
Baggs, Barbara Edwards	Belchertown	24 North Prospect Street.
Barnard, Lois Anna	Hatfield	67 Main Street, Hatfield.
Barnes, Lois Brewster	Northampton	Sigma Beta Chi.
Barr, Isadore	Springfield	2 Allen Street.
Basamania, Alfred Walter	Holyoke	60 Union Street, Holyoke.
Benea, Charles	North Plymouth	Alpha Sigma Phi.
Berman, Nathan Milton	Mattapan	9 Phillips Street.
Bernstein, Edwin George	Springfield	4 Chestnut Street.
Berry, Franklyn Doane	Dennis Port	Alpha Sigma Phi.
Bevington, Alice Barlow	Lawrence	Abigail Adams House.
Bieber, Robert Anthony	Hatfield	Sigma Phi Epsilon.
Birdsall, Ernest Leslie	Lawrence	65 Lincoln Avenue.
Birnie, Catherine Martha	Ludlow	Abigail Adams House.
Blackmer, Leroy Lewis, Jr.	North Brookfield	Kappa Sigma.
Blassberg, Ruth	Turners Falls	27 East Pleasant Street.
Bliss, Shirley Alberta	Springfield	Abigail Adams House.
Bliss, Walter Drahorad	Attleboro	10 Nutting Avenue.
Bohm, Richard Oscar	East Milton	19 Fearing Street.
Bolton, Horace Winfield	East Northfield	11 Phillips Street.
Bongiolatti, Louis	Adams	6 North Hadley Road.
Boucher, Mary Elizabeth	Easthampton	3 Sunset Court.
Boyden, Alma Ruth	Boylston	27 East Pleasant Street.
Bradford, Priscilla Marie	North Raynham	Sigma Beta Chi.
Breault, Louis Adelard, Jr.	Auburn	Lambda Chi Alpha.
Breinig, Mary Rebecca	Northfield	Phi Zeta.
Brenna, Frank George	Milford	11 Phillips Street.
Bristol, Gilbert Dearborn [1]	East Longmeadow	Alpha Gamma Rho.

[1] Candidate for Degree of Bachelor of Vocational Agriculture.

Brooks, John Poor	Holliston	53 Lincoln Avenue.
Brouillet, Lucille Constance	Springfield	13 Fearing Street.
Brown, Dorothy Imogene	Feeding Hills	Sigma Beta Chi.
Bruneau, Alfred Washburn	North Plymouth	67 Lincoln Avenue.
Bryant, Warren Estey	Lowell	51 Amity Street.
Burnham, Dorothy Lois	Maynard	27 East Pleasant Street.
Butler, Malcolm Suffolk	Saugus	46 Pleasant Street.
Butterfield, Norman Wesley	Pittsfield	42 Lincoln Avenue.
Byrnes, John Joseph	Pittsfield	10 Nutting Avenue.
Cain, Muriel Elizabeth	Conway	Phi Zeta.
Cain, Marjorie Grant	Conway	Phi Zeta.
Calkins, Margaret	Harvard	Abigail Adams House.
Carbonneau, Leo William	Ware	Kappa Sigma.
Chandler, Webster Allen	Melrose	Davenport Inn.
Ciosek, Carl Peter	Chicopee	84 Pleasant Street.
Clark, Barbara May	Dodge	Abigail Adams House.
Clark, Barbara Ruth	Ashfield	Abigail Adams House.
Clark, Leroy French	Walpole	15 Fearing Street.
Cohen, Howard Stanley	Dorchester	84 Pleasant Street.
Cohen, Melvin Irving	Roxbury	21 Paige Street.
Conant, Chester Cook	Greenfield	81 Pleasant Street.
Conner, Virginia Justine	Westfield	Phi Zeta.
Conway, Raymond Francis	Holyoke	Amherst Fire Department.
Cosmos, Louis Elias	Springfield	38 Cottage Street.
Couhig, Robert Emmet	Beverly	15 Fearing Street.
Craft, Clayton Chester	Ashfield	83 Pleasant Street.
Crowley, Leo Vincent	Amherst	83 Main Street.
Cushman, Francis Elliot	Kingston	Alpha Sigma Phi.
Cutter, James Frederick	West Hatfield	Kappa Sigma.
Dame, Frederick Russell	Athol	Lambda Chi Alpha.
Davis, Ernest Kirk	Lee	Kappa Epsilon.
Davis, Frederick Leroy	Portland, Maine	Kappa Epsilon.
Dickens, Frederick Leland	Ashland	Q. T. V.
Dihlmann, Henry George	Shutesbury	Care of Mrs. Cooley, North Amherst.
Dobby, James	Winthrop	11 Phillips Street.
Dodge, Elizabeth Louise	Ashland	Abigail Adams House.
Domas, Leah Ruth	Roxbury	Draper Hall.
Domenici, Trento Joseph	Holyoke	6 North Hadley Road.
Donnelly, Dorothea Margaret	Chester	Abigail Adams House.
Driscoll, Howard Bernard	Holyoke	213 Lyman Street, Holyoke.
Dunphy, Esther Mae	South Hadley Falls	59 High Street, South Hadley Falls.
Entin, Moses Jacob	Boston	23 Sunset Avenue
Eshbach, Charles Edgar	Winchester	4 Chestnut Street.
Fargo, Alburn Lasell	Monterey	29 North Prospect Street.
Ferrell, Edson John	North Agawam	47 Bridge Street, North Agawam.
Ferrucci, Anthony Patrick	South Milford	Theta Kappa Gamma.
Filios, Angela Mary	Westfield	Alpha Lambda Mu.
Filipkowski, Frances Pola	Whately	East Whately.
Filipkowski, Sabin Peter	Whately	East Whately.
Fisher, Austin Wellington, Jr.	Auburndale	Theta Chi.
Fisher, Robert Bernard	Northampton	Kappa Epsilon.
Foerster, Frederick Henry	Holyoke	45 Lawler Street, Holyoke.
Freedman, Joseph	Holyoke	30 Charles Street, Holyoke.
Friedman, Hillel Henry	Roxbury	21 Paige Street.
Fun, Lois Isabelle	Holyoke	492 High Street, Holyoke.
Gale, Shirley	Marblehead	Abigail Adams House.
Gates, Ralph Bailey	Barre, Vt.	Kappa Sigma.
George, Murray Winter	Wrentham	Alpha Gamma Rho.
Gleason, Phyllis Ann	Springfield	Abigail Adams House.
Goldsmith, Sylvia Shirley	Springfield	Abigail Adams House.
Goodhue, Frederick Wells	Haydenville	84 Pleasant Street.
Gordon, Barbara Ramona	West Springfield	69 Beverly Hills, West Springfield.
Goulding, Estella Caroline	Leicester	13 Fearing Street.
Grant, Norman Wallace	Lynn	Kappa Sigma.
Gray, Guy Manning	Greenfield	81 Pleasant Street.
Gricius, Albert Joseph	Dorchester	Q. T. V.
Gulben, Sandra	Worcester	8 Snell Street.
Guralnick, Walter Charles	Roxbury	Alpha Epsilon Pi.
Hallowell, Elmer Winston	Greenfield	Birch Lawn.
Hanson, John Francis	Medford	Birch Lawn.
Hardy, Erving Douglas	Worcester	Kappa Sigma.
Harris, Lawrence Keith	Salem	11 Phillips Street.
Hart, Raymond Lewis	Lynn	53 Lincoln Avenue.
Healey, Emily Madeline	Easthampton	Abigail Adams House.
Hiersche, Thomas Anton	Ludlow	Moore Street, Ludlow.
Higgins, Kenneth Raymond	Fall River	Care of Miss Magee, Hillside Avenue.
Hodder, Walter James	Belmont	Lambda Chi Alpha.
Holdsworth, Robert Powell, Jr.	Amherst	49 Amity Street.
Hopkins, Sarah Huntington	Orleans	113 Main Street.
Houghton, Leroy Kingsbury, Jr.	West Roxbury	Care of Dr. Alexander, Old Town Road.
Howard, Harlan Arnold	Amherst	North Pleasant Street.
Iacovelli, Henry Nicholas	Milford	Q. T. V.
Ingalls, Allan Southworth	Methuen	Kappa Sigma.
Irvine, Kenneth Colwell	Worcester	Theta Chi.
Jackson, Edith Lillian	Middleboro	Lambda Delta Mu.
Jensen, Howard Theodore	Shrewsbury	Theta Chi.

Johnson, Byron Taylor	Danbury, Conn.	42 Lincoln Avenue.
Johnson, Lawrence Sterling	Springfield	7 Nutting Avenue.
Johnson, William Vialle	Kendall Green	81 Pleasant Street.
Joyce, Dorothy Mary	Amesbury	Abigail Adams House.
Karras, Morris	Malden	21 Paige Street.
Keck, Barbara Knox	Boylston	Abigail Adams House.
Kennedy, Joseph George	Quincy	Q. T. V.
Kewer, William Frank	Dorchester	4 Allen Street.
Kinsman, Ruth	Roxbury	3 Sunset Court.
Klibanoff, Samuel	Springfield	83 Pleasant Street.
Knowlton, Richard Berry	Malden	Kappa Epsilon.
Koch, Harry Fredrick	Greenfield	Sigma Phi Epsilon.
Kramer, Max Frank	Winthrop	11 Phillips Street.
Kue, Rudolph William	Holyoke	84 Pleasant Street.
Kuklewicz, Frank Peter	Turners Falls	179 Avenue A, Turners Falls
Kulya, Richard Alvah	Greenfield	135 Silver Street, Greenfield.
Kushlan, Henry Shoub	Dorchester	1 College Avenue.
Kyle, Laurence Harwood	Huntington	Kappa Epsilon.
Landers, John Edward	Holyoke	134 Westfield Road, Holyoke.
Lannon, Dorothy Elizabeth	Holyoke	Alpha Lambda Mu.
Lapham, Wendell Edward	Carlisle	Lambda Chi Alpha.
Layton, Philip Dumaresq	West Newton	81 Pleasant Street.
LeClair, Ivan Narcisse	Southbridge	66 Lincoln Avenue.
Leighton, William Ames	Auburndale	Theta Chi.
Lerner, Morris	Springfield	23 Sunset Avenue.
Lilly, Max	Malden	21 Paige Street.
Lipman, Leo David	Springfield	23 Sunset Avenue.
Ludwin, Isadore	Malden	10 Taylor Street.
Maguire, Thomas Joseph	Haverhill	72 Lincoln Avenue.
Marble, Henry Ward	Athol	Colonial Inn.
Marciniak, Emil	Easthampton	Sigma Phi Epsilon.
Martin, Justine Gordon	West Roxbury	27 East Pleasant Street.
McCorkindale, Janet	Ludlow	8 Allen Street.
McMahon, Helena Clare	Brighton	Phi Zeta.
McMahon, Thomas Francis	Brighton	Birch Lawn.
McNally, Edmund James	Palmer	36 Park Street, Palmer.
McNally, John Edmund	Palmer	36 Park Street, Palmer.
Meyers, Charles Harold	Greenfield	Birch Lawn.
Milne, George McLean	Lexington	31 Fearing Street.
Minott, Ivan Charles	Greenfield	3 Nutting Avenue.
Minzner, Raymond Arthur	Lawrence	31 Fearing Street.
Monroe, Lucille Amelia	Southbridge	Sigma Beta Chi.
Moody, Gordon	Amherst	30 Sunset Avenue.
Moore, Edwin Lewis	Amherst	R. F. D. 2, Amherst.
Moore, Joy Emma	Leeds	Draper Hall.
Morrison, John Roderick	Boston	45 Pleasant Street.
Moseley, Walter Benjamin	Agawam	Lambda Chi Alpha.
Moss, William Henry	Fairhaven	College Farm House.
Munson, Willard Squier	Amherst	101 Butterfield Terrace.
Newcomb, Elliott Houghton	Orange	Kappa Epsilon.
Nogelo, Anthony Joseph	Framingham	Strong Street.
Novick, Alfred Louis	Roxbury	Alpha Epsilon Pi.
Nowakowski, Joseph Conrad	Easthampton	31 Franklin Street, Easthampton.
O'Brien, George Edward	Northampton	148 Crescent Street, Northampton.
Okolo, Nellie Mary	Amherst	Care of Professor Goding, North Amherst.
Osborne, Lemuel	Tenafly, N. J.	Old Town Road.
Peckham, Robert Bishop	West Medford	42 McClellan Street.
Perriello, Robert Charles	Dorchester	72 Lincoln Avenue.
Perry, Walter Holden	North Andover	6 North Hadley Road.
Peterson, David Allen	Methuen	Alpha Sigma Phi.
Pickering, James Aaron	Boston	Theta Chi.
Pilat, Carl Wynne	Ossining, N. Y.	Care of Mrs. Allen, Old Town Road.
Planting, Alfred Herbert	Amherst	16 North East Street.
Powell, Alger Wheeler	Brookfield	15 Fearing Street.
Pratt, Roger Kingman, Jr.	Brockton	65 Lincoln Avenue.
Priest, Edith Evelyn	Maynard	64 Lincoln Avenue.
Provost, Rita Agnes	North Agawam	160 Walnut Street, Agawam.
Raynes, William Augustus, Jr.	Hyde Park	Lambda Chi Alpha.
Rice, Lee Wilson, Jr.	Wilbraham	4 Hallock Street.
Richards, Prescott Langdon	Florence	44 Maple Street, Florence.
Richason, George Robert	Turners Falls	Riverside, Turners Falls.
Roberts, Louis Everett	Lexington	31 Fearing Street.
Rogers, Caroline Rita	Medway	Phi Zeta.
Rosberry, Paul Hubbard	Erving	Kappa Epsilon.
Rosenburg, Robert Floyd	Williamstown	Pleasant Street.
Ross, Kenwood	Springfield	19 Fearing Street.
Rossiter, David Patrick	Malden	Old Town Road.
Ruffley, John, Jr.	New Bedford	Kappa Epsilon.
Ryan, James Marcus	Needham Heights.	26 Lincoln Avenue.
Ryer, Robert, III	South Hadley	1 Bridgman Lane, South Hadley.
Sampson, Henry James	North Westport	10 Nutting Avenue.
San Clemente, Charles Leonard	Milford	Q. T. V.

Santucci, Richard Thomas	Palmer	232 South Main Street, Palmer.
Sawinski, Gizela Caroline	Taunton	Sigma Beta Chi.
Schirch, Douglas Francis	Holyoke	81 Pleasant Street.
Sheffield, Norman Louis	Enfield	Kappa Sigma.
Shiff, Philip Burrell	Duxbury	56 Pleasant Street.
Simonsen, Walter	Everett	7 Nutting Avenue.
Sinclair, John Merrill	Northampton	33 Prince Street, Northampton.
Sleeper, Harold Anthony	South Groveland	63 East Pleasant Street.
Small, Saul	Springfield	66 Prospect Street, Springfield.
Smith, Esther Elizabeth	Easthampton	Abigail Adams House.
Smith, Rodger Chapman	Amherst	West Street.
Spear, Philip James	Charlemont	6 North Hadley Road.
Spiller, Robert LeRoy, Jr.	Beverly	Phi Sigma Kappa.
Stepath, Frances Elizabeth	Springfield	8 Allen Street.
Stepner, Bernard Samuel	Roxbury	23 Sunset Avenue.
Stone, Elinor Leola	Orange	64 Lincoln Avenue.
Suher, Abraham	Holyoke	6 North Hadley Road.
Swan, Edward Parsons, Jr.	Amherst	17 Cottage Street.
Swanson, Carl Pontius	Pigeon Cove	Sigma Phi Epsilon.
Symancyk, Clifford Ernest	Westfield	Kappa Sigma.
Talinski, John Joseph	Roxbury	67 Lincoln Avenue.
Taylor, Kenyon Yale	Shelburne	Theta Chi.
Thacker, Edward Jesse	Greenfield	Kappa Sigma.
Theriault, Frederic Russell	East Weymouth	Lambda Chi Alpha.
Thomas, Albert Stetson	Brattleboro, Vt.	26 Fearing Street.
Thomas, Francis Joseph	Turners Falls	47 Park Street, Turners Falls.
Thorndike, Robert William	Methuen	65 Lincoln Avenue.
Thurlow, Donald Frederick	Greenfield	Care of Mrs. Allen, Old Town Road.
Toder, Emanuel Irving	Malden	9 Phillips Street.
Todt, Ruth Elizabeth	West Springfield	3 Sunset Court.
Trask, Elinor Viola	Lexington	Phi Zeta.
Trombly, Everett Lawe	Indian Orchard	3 Hampden Street, Indian Orchard.
Tucker, Donald Kent	Foxboro	Lambda Chi Alpha.
Turner, Harvey Gay, Jr.	Andover	Q. T. V.
Vaill, Phila Kellogg	Monson	24 North Prospect Street.
Waldman, Jacob Saul	Springfield	322 Chapin Terrace, Springfield.
Warner, Helen May	Sunderland	Sunderland.
Warner, Louise Isabel	Sunderland	Abigail Adams House.
Watts, Harold Irving	Amherst	9 High Street.
Waxler, Beatrice Rivoli	Holyoke	Abigail Adams House.
Weaver, Donald Edward	Springfield	4 Nutting Avenue.
West, Eleanor Alice	Sheffield	13 Fearing Street.
White, Howard Eric	Worcester	Eames Avenue.
Whitmore, Edith Lillian	Forestdale	Abigail Adams House.
Whitney, Ira Bertram	Ludlow	Ludlow.
Whittemore, Frederick Winsor	Canton	87 Pleasant Street.
Widlansky, Myron Albert	Springfield	23 Sunset Avenue.
Wilcox, Sarah Clark	Hudson	Lambda Delta Mu.
Wildner, Carl Richard	Amherst	Belchertown Road.
Williams, Sidney	Peabody	7 Allen Street.
Wingate, Marian Kay	Fairhaven	Phi Zeta.
Wishart, Frederick Joseph	Turners Falls	13 Fourth Street, Turners Falls.
Wisnieski, Karol Stanley	South Deerfield	36 Hillside Road, South Deerfield.
Wood, Judith Gail	Weymouth Heights	Abigail Adams House.
Wood, Ruth Elizabeth	Holyoke	Abigail Adams House.
Wyman, Raymond	Westfield	President's House.
Zuckerman, Arthur Jacob	Pittsfield	10 Taylor Street.
Zukel, John William	Northampton	55 Fort Street, Northampton.

CLASS OF 1938.

Adams, Crawford William	Springfield	10 Nutting Avenue.
Adams, George Bruce, Jr.	Springfield	North College.
Alcorn, Robert Edward	West Springfield	North College.
Allaire, Royal Phillip	Northampton	26 Dickinson Avenue, Northampton.
Allen, Marshall Bigelow	North Grafton	Care of Mr. Everson.
Alpert, Myron	Chicopee Falls	56 Pleasant Street.
Anderson, Carl Edward	Rockport	24 Fearing Street.
Annis, Marjorie Delphine	Greenfield	Abigail Adams House.
Avery, Rexford Hanson	Shrewsbury	86 Pleasant Street.
Avery, William Blodgett	Shelburne Falls	North College.
Baker, Warren Sears, Jr.	Hanson	Care of Mrs. James Howard, North Pleasant Street.
Ball, Elinor Prescott	Boston	Abigail Adams House.
Ballard, Dorothy Veronica	Gilbertville	Abigail Adams House.
Bargfrede, John Frederick	Pearl River, N. Y.	7 Nutting Avenue.
Bartlett, Lewis Kingsley	Holyoke	81 Pleasant Street.
Barton, Elizabeth Sherwood	South Amherst	Middle Street, South Amherst.
Barton, Richard Wallace	Amherst	3 Fearing Street.
Bassett, Barbara Elizabeth	Greenfield	17 Nutting Avenue.

Beaumont, Davis Wortham	Amherst	51 Amity Street.
Beaumont, Edgar Sidney	Amherst	51 Amity Street.
Becher, Marion Rose	Longmeadow	Abigail Adams House.
Beckman, Wallace George	Springfield	31 North Prospect Street.
Belgrade, Harry Louis	Northampton	27 Wilson Avenue, Northampton.
Belgrade, Max	Northampton	27 Wilson Avenue, Northampton.
Beloin, Mederic Howard	Holyoke	83 Pleasant Street.
Benson, Kenneth Ellis	Winchester	12 Chestnut Street.
Bercovitz, Abraham	Winthrop	2 Allen Street.
Bergman, William Erving	Shelburne Falls	7 Phillips Street.
Betts, Nelson Benjamin	Valley Falls, N. Y.	Box 504.
Bialer, Joseph	Holyoke	North College.
Bieniek, Edwin Alexander	Holyoke	9 Ivy Avenue, Holyoke.
Binder, Irving	Roxbury	North College.
Bixby, Ruth Lydia	Sunderland	Sunderland.
Blaisdell, Harry Linwood, Jr.	Greenfield	North College.
Blake, Earl Clement, Jr.	Springfield	North College.
Blake, Norman Perkins	Malden	97 Pleasant Street.
Blomberg, Earl Alfred	Leominster	29 North Prospect Street.
Bode, Fred William	Lawrence	31 Fearing Street.
Bokina, Carl John	Hatfield	7 Prospect Street, Hatfield.
Bolton, James Henry	East Northfield	11 Phillips Street.
Boron, Bertha Barbara	South Deerfield	South Deerfield.
Bourdeau, Gerard Raoul	Turners Falls	16 Park Street, Turners Falls.
Bozek, Stanley Mieczyslaw	Easthampton	19 Franklin Street, Easthampton.
Bray, Richard Irving	Gloucester	North College
Brett, Pauline Jean	Duxbury	Abgail Adams House.
Broderick, Harold Matthew	Willimansett	83 Pleasant Street.
Brown, Elinor	Leicester	Abigail Adams House.
Brown, Herbert Earle	Ashland	North College.
Bullock, William Augustine	Arlington	97 Pleasant Street.
Burns, John Wesley	Union, Maine	56 Pleasant Street.
Burt, Gardner Langdon	Waltham	North College.
Bush, John George	Turners Falls	Stockbridge Hall.
Buzzee, Robert Daniel	Easthampton	North College.
Carew, Helen Virginia	Monson	Abigail Adams House.
Carpenter, Cynthia Ellen	Sterling Junction	16 Nutting Avenue.
Carr, Frank Fairfield	Newtonville	North College.
Casey, Arthur Daniel	Franklin	115 Butterfield Terrace.
Cederberg, Florence Mildred	Jamaica Plain	3 Cosby Avenue.
Chase, Philip Batcheller	Springfield	South College.
Chmura, Chester	Amherst	18 Sunset Avenue.
Clapp, Edward Theodore	Florence	North College.
Clark, Norman	Sharon	72 Lincoln Avenue.
Collin, Herbert Samuel	Dorchester	Care of Prof. Sears, Mount Pleasant.
Collins, Charles Wilson	Medford	North College.
Collins, William James	Salem	45 Fearing Street.
Cone, Leon Winston	North Brookfield	19 Fearing Street.
Cook, Vivian Ruth	Springfield	Abigail Adams House.
Corkum, Gladys Martha	Methuen	Abigail Adams House.
Couper, Henry Vincent	Littleton	North College.
Coutu, Vernon Francis	Erving	North College.
Crosby, Hilda Crathern	Belmont	3 Cosby Avenue.
Crowell, Stella Ida	Greenfield	Abigail Adams House.
Curtin, Kathleen Teresa	Tyringham	Abigail Adams House.
Curtis, Clifford Alvin	Hopkinton	South College.
Cushman, Frank Melvin	Malden	7 Nutting Avenue.
Davenport, Beatrice Louise	Mendon	13 Fearing Street.
Day, Edward Howard	Springfield	South College.
De Forest, Samuel Disbrow	Quincy	North College.
Devakul, Debriddhi	Bangkok, Siam	Care of Mrs. James Howard, North Pleasant Street.
Dinan, George Bernard	Wakefield	4 Allen Street.
Downing, Helen Anna	Holyoke	181 Park Street, Holyoke.
Downs, James Chandler	East Lynn	3 McClellan Street.
Dunlop, John Thistle	Chicopee	South College.
Dunn, Joseph Francis	Brighton	31 Fearing Street.
Eaton, William	Waltham	North College.
Eddy, Richard Allen	Ware	8 Elm Street, Ware.
Edson, Charles Grant	Springfield	North College.
Edson, Theodora Elizabeth	East Braintree	Abigail Adams House.
Eliopoulas, Nicholas Daniel	Haverhill	30 North Prospect Street.
Elkind, Henry Byron, Jr.	Belmont	South College.
Ellegaard, Lloyd Howard	Holyoke	17 Washington Avenue, Holyoke.
Elliott, Charles Edward	Beverly	North College.
Emery, Norman Alfred	Lynn	North College.
Epstein, Walter Nathan	Roxbury	South College.
Eramo, Alfred	Pittsfield	North College.
Estes, Carl Albert	Bellingham	North College.
Evans, Robert Earle	Northampton	21 Summer Street, Northampton.
Fagan, Virginia Mary	Holyoke	67 Westfield Road, Holyoke.
Fahey, Eleanor Dorney	Winthrop	Abigail Adams House.
Farnsworth, Albert Humphries	Worcester	North College.

Feinburg, Robert Sidney	Brighton	83 Pleasant Street.
Fitzpatrick, Richard James	Rochdale	North College
Fletcher, Kathleen Lurena	Lanesboro	Abigail Adams House.
Flower, Stanley Allen	Southbridge	North College.
Forbush, Alfred Merton	Longmeadow	8 Nutting Avenue.
Freedman, Herman Sumner	Brookline	83 Pleasant Street.
French, Cyrus Edwin	Boston	Care of H. R. Hobart, North Amherst.
Frost, Freeman Wood	Arlington	North College.
Gage, Robert Wilcox	Needham	30 North Prospect Street.
Gaskell, Elizabeth Frances	South Deerfield	Abigail Adams House.
Gaughan, Agnes Patricia	Holyoke	Abigail Adams House.
Gemme, Lillian Edith	Springfield	Abigail Adams House.
Geraghty, Elaine Gertrude	Holyoke	Abigail Adams House.
Gibbs, Berthier Lyman	Saugus	46 Pleasant Street.
Gibson, Joseph William	Canton	19 Phillips Street.
Giddings, Lane	Great Barrington	83 Pleasant Street.
Gieringer, Eugen Pierre	Cambridge	North College.
Gilbert, Ann Louise	Belmont	Abigail Adams House.
Gill, Joseph Stanley	Bondsville	North College.
Gillis, Francis Louis	Petersham	North College.
Glass, Edward Hadley	Lexington	North College.
Gleason, Robert Patrick	Northampton	82 Massasoit Street, Northampton.
Goldman, Abraham Bernard	Roxbury	56 Pleasant Street.
Golub, Samuel Joseph	East Longmeadow	105 Porter Road, East Longmeadow.
Goyette, Margaret Anne	Holyoke	Abigail Adams House.
Graham, William Butterworth	North Andover	30 North Prospect Street.
Graves, Julia Tice	Sunderland	16 Main Street, Sunderland.
Grimard, Laurence Herman	Turners Falls	Henry Street, Turners Falls.
Gruner, Saul George	Pittsfield.	56 Pleasant Street.
Guenard, George Henry	Dracut	North College.
Gunn, Kenneth Bradford	Southampton	Southampton.
Hadro, Gertrude Josephine	Easthampton	16 Nutting Avenue.
Halpern, Herbert Milton	Holyoke	6 North Hadley Road.
Handforth, Thomas Edward	West Medway	9 Fearing Street.
Handverger, Edward	West Medway	56 Pleasant Street.
Hanson, Elizabeth Leslie	State Farm	8 Allen Street.
Harris, John Henry	Beverly	North College.
Harrison, William Hughes	Methuen	North College.
Harry, Norma Irene	Holyoke	Abigail Adams House.
Haskins, Philip Hanley	Williamstown	North College.
Hauck, Russell John	Norwood	North College.
Hayes, Nancy	Cambridge	Abigail Adams House.
Heller, Saul	Roxbury	North College.
Hemond, Conrad Joseph, Jr.	Holyoke	43 Pearl Street, Holyoke.
Hemond, Harold Crean	Holyoke	43 Pearl Street, Holyoke.
Hennessy, Thomas, Jr.	Newton Highlands	83 Pleasant Street.
Higginbotham, Harold Garland	Worcester	101 Pleasant Street.
Higgins, Edward William	Arlington	Care of Mr. Everson.
Hirsch, Benjamin	Adams	6 North Hadley Road.
Hirst, Robert Gordon	Monson	86 Pleasant Street.
Hoar, John Sherman	Amherst	29 Main Street.
Hooker, Leland Worthington	Springfield	83 Pleasant Street.
Hughes, Dorothy Arline	West Springfield	Abigail Adams House.
Hurwitch, Benjamin Gordon	Dorchester	3 Nutting Avenue.
Ingram, Ralph	Falmouth	North College.
Irving, Richard Randlett	Methuen	45 Pleasant Street.
Jackson, Donald Bolles	Amherst	57 Lincoln Avenue.
Jackson, Mitchell Irving	Fairhaven	North College.
Jacobson, Seymour Theodore	Springfield	23 Sunset Avenue.
Jenkins, Doris Wynne	Shrewsbury	Abigail Adams House.
Johnson, Herbert Harry	Boston	Care of H. R. Hobart, North Amherst.
Judd, Kirtley Leverett	Springfield	North College.
Julian, Carol	Amherst	4 Farview Way.
Julian, Eleanor Burton	Amherst	4 Farview Way.
Kabat, John	Hatfield	Mathematics Building.
Kaplinsky, Martha Dorothy	Holyoke	Draper Hall.
Katzeff, Julian Herman	Brookline	2 Allen Street.
Kaynor, William Kirk	Springfield	53 Lincoln Avenue.
Kelley, Thomas Francis	Waltham	North College.
Kenyon, Marieta Gibson	East Douglas	Draper Hall.
King, Richard Coleman	Newtonville	15 Phillips Street.
Kingsbury, Frank William [1]	Sterling	Baker Lane.
Kingsbury, Helen	Sterling	8 Allen Street.
Kinsman, Jessie	Roxbury	Abigail Adams House.
Klaucke, Rowland	Worcester	North College.
Klayman, Maxwell Irving	South Boston	56 Pleasant Street.
Kneeland, Everett Leonard [1]	Sterling	Baker Lane.
Knight, Eva Mina	Ludlow	Abigail Adams House.
Knight, Walter Storrs	Ludlow	North College.
Kodis, Ruth Elinor	Leicester	Draper Hall.
Koehler, Dorothy Lillian	Greenfield	Abigail Adams House.
Kohn, Bernard Lester	Roxbury	North College.
Kreyssig, Hilda Rose	Melrose, Conn.	Abigail Adams House.
Kurnitsky, Sidney Joseph	Springfield	83 Pleasant Street.

[1] Candidate for degree of Bachelor of Vocational Agriculture.

Lamb, David Allison	South Hadley	15 Phillips Street.
Lavrakas, John	Watertown	North College.
Leavitt, Miles Joseph	Nahant	19 Fearing Street.
Lee, James Donovan	Chester	31 Fearing Street.
Levinson, Lawrence	Somerville	4 Nutting Avenue.
Lichtenstein, Parker Earl	Melrose	83 Pleasant Street.
Liljegren, Solveig Utne	Wollaston	2 Farview Way.
Linden, Norman Elliott	Everett	North College.
Lindstrom, Frederick Burgess	Palmer	14 Rockview Street, Palmer.
Little, Melvin Theodore	East Weymouth	North College.
Lombard, Elmer Ralph	Pittsfield	North College.
Lombard, Gardner Cromwell	Danvers	81 Pleasant Street.
Lonergan, William Francis	Springfield	Sigma Phi Epsilon.
Lovett, Anna Elizabeth	Hatfield	Abigail Adams House.
Lovett, Margaret Teresa	Hatfield	Abigail Adams House.
Luce, Clifford Norton	Worcester	83 Pleasant Street.
Lyman, Thomas Graves	Easthampton	8 High Street, Easthampton.
Lyon, Frank Merton	Hamden, Conn.	Theta Chi.
Lyons, Robert Stephen	Springfield	115 Butterfield Terrace.
Mabie, Richard Lockwood	Sharon	North College.
Macomber, Lois Rogers	Fairhaven	Abigail Adams House.
MacPhail, William Anderson	North Plymouth	North College.
Mann, Lillian Russell	Westfield	Abigail Adams House.
Marsh, Robert Kendall	Rutland	North College.
McGowan, Donald Sanford	Holyoke	320 Pleasant Street, Holyoke.
McKinney, William James	Saugus	46 Pleasant Street.
McMahon, John Francis	Greenfield	4 St. James Court, Greenfield.
Metaxas, Harry Louis	Greenfield	17 Kellogg Avenue.
Meyer, Frederick John	South Hadley	Hadley Street, South Hadley.
Mildram, David Elliot	Greenwood	4 Allen Street.
Milkey, Elaine Helen	Montague City	Abigail Adams House.
Millard, Carol Frances	Segreganset	Abigail Adams House.
Mish, Edward Theodore	South Hadley Falls	North College.
Mitchell, Walter Kimball, Jr.	Newton Highlands	33 Lincoln Avenue.
Morgan, Louise Dora	North Wilbraham	Abigail Adams House.
Morley, Frances Lillian	Amherst	23 Amity Street.
Morrison, Robert Karl	Pittsfield	North College.
Moult, Roy Hepworth	Lynn	86 Pleasant Street.
Munson, Edward Malcolm, Jr.	South Dartmouth	54 Lincoln Avenue.
NeJame, Mitchell Francis	North Adams	50 Pleasant Street.
Nelson, Phyllis Louise	Arlington	Abigail Adams House.
Newman, Edward George	North Brookfield	North College.
Nolan, Kenneth Gordon[1]	Danvers	St. Joseph's Rectory, Hatfield.
Noonan, William George	Haverhill	North College.
O'Connell, Mary Patricia	Wakefield	Abigail Adams House.
O'Donnell, William Gregory	Milford	2 Allen Street.
O'Hearn, Helen Esther	Cambridge	13 Fearing Street.
Olivier, James Barnes	Holyoke	North College.
O'Neill, Robert Thomas	Northampton	128 King Street, Northampton.
Osley, Donald	Hatfield	14 Chestnut Street, Hatfield.
Page, Alfred Sylvester	Springfield	86 Pleasant Street.
Parker, Evelyn Maude	Orange	Draper Hall.
Perkins, Robert Cowan	Worcester	North College.
Philip, Ruth Elizabeth	East Milton	Draper Hall.
Phillips, Barbara Sanborn	Greenfield	Abigail Adams House.
Phillips, Muriel	New Bedford	Abigail Adams House.
Podlenski, Pauline Elizabeth	Montague	Montague.
Pond, Virginia Mabel	Greenfield	Abigail Adams House.
Pratt, Harland Hohner	Greenfield	South College.
Pratt, Sally Logan	Fairhaven	8 Allen Street.
Putnam, Paul Sears	Greenfield	Care of Prof. Snyder, North Amherst.
Pyenson, Max	East Lee	North College.
Quast, Wentworth	Natick	4 Allen Street.
Randall, Sylvia Arline	Granby	North East Street.
Randlett, Horace Hillman	North Wilbraham	19 Fearing Street.
Rathbone, Frances Bullard	Haverhill	Abigail Adams House.
Rice, John Edward, Jr.	Marlboro	North College.
Rice, Theodore Albert	Wellesley	North College.
Richmond, Frances Stewart	East Bridgewater	Abigail Adams House.
Riel, Francis James	Turners Falls	7 Phillips Street.
Riel, Frederick Charles	Turners Falls	7 Phillips Street.
Riley, William Charles	Holyoke	45 Fearing Street.
Roberge, William Edward	Westfield	Sigma Phi Epsilon.
Rock, Viola Lucretia	Brighton	Abigail Adams House.
Rogers, Francis Joseph	Lynn	President's House.
Rosenberg, Hilliard	Roxbury	66 Lincoln Avenue.
Rounds, Dean Leonard	Reading	North College.
Rozwenc, George Stephen	Northampton	5 Franklin Court, Northampton.
Rudzki, Edward Stanley	Holyoke	408 Hillside Avenue, Holyoke.

[1] Candidate for degree of Bachelor of Vocational Agriculture.

Rustigian, Robert	Medford	North College.
Rutter, Louise Baldwin	Waltham	Abigail Adams House.
Ryer, George Isley	South Hadley	1 Bridgman Lane, South Hadley.
Savage, James Harvey	Lynnfield Center	Care of Mr. Shampo, North Amherst.
Scace, Elizabeth Terry	Pittsfield	Abigail Adams House.
Schopfer, Jane Elizabeth	Worcester	Abigail Adams House.
Seal, Ethel Frances	Worcester	Abigail Adams House.
Shaw, Marion	Belchertown	Abigail Adams House.
Sherman, Frank Richmond	Lanesboro	South College.
Sievers, Frederick John	Amherst	3 East Pleasant Street.
Silverman, Donald Lawrence	Roxbury	1 Phillips Street.
Silverman, Stephen Israel	Milton	86 Pleasant Street.
Slesinski, Frank Alphonse	Northampton	Box 27, North Amherst.
Slocomb, Jack Tibbets	Brockton	Sigma Phi Epsilon.
Smaha, Emil	South Deerfield	South Deerfield.
Smardon, Philip	Portland, Maine	30 North Prospect Street.
Smith, Russell Eaton	Lawrence	86 Pleasant Street.
Snow, Phyllis Maude	Brockton	Abigail Adams House.
Snyder, Harry Miles	Arlington	North College.
Soderman, Felix Evald	Gardner	North College.
Spaight, Kathryne Ida	Feeding Hills	North Street, Feeding Hills.
Sprague, Edna Angie	Hamilton	Abigail Adams House.
Stewart, Christine Alan	Boylston	Draper Hall.
Streeter, Mary Elizabeth	Holyoke	Abigail Adams House.
Strode, Barbara Jeanette	Marblehead	Abigail Adams House.
Swiren, Alfred Milton	Springfield	56 Pleasant Street.
Taft, Emma Mather	Mendon	13 Fearing Street.
Tannenbaum, Leo Wolf	Amherst	23 Sunset Avenue.
Taylor, Winnifred Hope	Pittsfield	Abigail Adams House.
Thayer, Edith Gwendolyn	West Bridgewater	Abigail Adams House.
Thompson, Elthea	Methuen	Abigail Adams House.
Tonkin, Maurice	Revere	34 McClellan Street.
Towle, Richard Washburn	Cohasset	South College.
Towne, Louisa Elsie	Norfolk	Abigail Adams House.
Townsley, Floyd Wayne	Ashfield	South College.
Tripp, Harvey Jerome	Westport	North College.
Tuttle, John Albert	Torrington, Conn.	Care of Mrs. Allen, Old Town Road.
Valvanis, Nicholas John	Haverhill	North College.
Villaume, Osgood Louis [1]	Malden	35 Lincoln Avenue.
Walker, Norman Earle	Upton	North College.
Walker, Ruth Evelyn	Easthampton	Abigail Adams House.
Walkey, Delia Roberta	South Hanson	Abigail Adams House.
Wastcoat, Elizabeth Jane	Wollaston	Abigail Adams House.
Welcker, William Fuller	Holyoke	North College.
Wheeler, James Francis	Natick	Care of Mr. Shampo, North Amherst.
White, Martha	Boston	Abigail Adams House.
Whitney, Jean	Worcester	Abigail Adams House.
Whitney, Walter Augustus, Jr.	Ashfield	South College.
Wiggin, Roy Merton	Needham	6 North Hadley Road.
Wiggin, Stanley Hopkins	Hyde Park	10 McClellan Street.
Wilcox, Edmund Gillette	Stockbridge	North College.
Williams, Edith Alberta	Whitinsville	Abigail Adams House.
Wilson, Margaret Dorothy	Holyoke	58 Congress Avenue, Holyoke.
Winblad, Frits Albert Sigfrid	Chelmsford	South College.
Wood, Douglas James	Florence	97 Chestnut Street, Florence.
Wood, Lois Virginia	West Upton	Abigail Adams House.
Wood, Ruth Elizabeth	Springfield	Abigail Adams House.
Youngren, Clare Pauline	Orange	Abigail Adams House.

SPECIAL STUDENTS.

Kennedy, Edward Luke	Holyoke	27 Taylor Street, Holyoke.
Marston, Mrs. George A.	Amherst	North College.

STUDENTS REGISTERED AFTER CATALOGUE FOR 1933–1934 WAS PUBLISHED.

1936.

Cleary, Joseph George		New London, Conn.
Lockhart, Janet Martha		Greenfield.
Warren, Thomas Larkin		Lawrence.

SPECIALS.

Chernick, Solomon E.		Brooklyn, N. Y.
Conant, Samuel Dimick		Greenfield.

[1] Candidate for degree of Bachelor of Vocational Agriculture.

SUMMARY BY UNDERGRADUATE CLASSES.

Class.	Men.	Women.	Total.
1935	147	56	203
1936	163	72	235
1937	194	66	260
1938	225	96	321
Specials	1	1	2
Totals	730	291	1,021

GEOGRAPHICAL SUMMARY.

Massachusetts	992	New Jersey	3
Maine	3	Siam	1
Vermont	3		
Connecticut	12	Total	1,021
New York	7		

STOCKBRIDGE SCHOOL OF AGRICULTURE.

Graduates, 1934.

Malcolm Henry Adams	Brockton.
Howard John Alvin	Lynn.
William Harding Aston	Peabody.
Milton Baron	Springfield.
Lawrence Howard Blackmer	Hardwick.
Adams Whitney Boutelle	Townsend.
Jarvis Cushing Burrell	East Bridgewater.
Arthur Loker Cannon	Marlboro.
Madeline May Cannon	Brockton.
Faxon Dayton Chapin	Springfield.
Prescott Wilbour Chase	Newport, R. I.
William Miles Collins	West Advocate, Nova Scotia, Canada.
David William Cosgriff	Sheffield.
Richard Joseph Danaher	Williamstown.
Charles Gerald Dolan	Worcester.
Charles Robert Dondero	Amesbury.
Howard Evans Drake	Brookline.
Stephen Austin Eldred	Weston.
Edward Clark Erlandson, Jr.	Roslindale.
Rollin Jewett Fernald	Waltham.
Thomas Edward Flanagan	Dorchester.
Harold Frank Fogg	Weymouth.
Robert Smith Fulton	North Amherst.
Thomas Francis Furze	Roslindale.
Herbert Weston George	Manchester, N. H.
Gianetto Francis Gianetti	Franklin.
Charles Alpheus Godin	Springfield.
Chester Edward Goodfield	Gilbertville.
Stephen Gosciminski	Indian Orchard.
Donald Grahn	Westminster.
Frank Clifton Grieves	Lexington.
Charlotte Louise Haartz	Winchester.
Robert Francis Hall	Medford.
Everett Milton Harvie	Leominster.
Roger Shepherd Henry	Waltham.
Roger Leavitt Hersey	Hingham.
Rollo Linnell Higgins	Orleans.
Harry Edward Hilton	Walpole.
Darius Weekes Horton	Wellfleet.
Harold Russell Hubbard	Sunderland.
Wolcott Turner Joslin	Webster.
John Kachadorian	Methuen.
George Preston Kelley	Brockton.
James Wilmot Leach	Anthony, R. I.
Langdon Seavey Moore	Springfield.
Robert Campbell Mossman	Roslindale.
Hector Ross MacLeod	Amherst.
Edson Coe MacMullen	Fitchburg.
Joseph Leo Norris	Salem.
Thomas James O'Connor	Malden.
John Weston Palmer	Center Lovell, Maine.
Edwin Newcomb Pierce	Orleans.
Kenneth Kirton Randall	Weymouth.
Marshall Josselyn Rice	Arlington.
William Gardner Richardson	Melrose.
Luigi Vincent Romano	West Lebanon, N. H.
Jarvis Nathan Russell	Southboro.
Edwin Miller Ryder	Middleboro.
Roger Voland Seacord	New Rochelle, N. Y.
Chauncy Thornton Simmons	Amherst.
James Smith	Sterling.
Robert Samuel Smith	Westboro.
Thomas Wighton Stuart, Jr.	Newton Center.
Donald Pilsbury Swan	Walpole.
Robert Arthur Sweeney	Springfield.
Joseph Clarence Tropeano	Lexington.
Edward Lewis Uhlman	Westboro.
James John Vanderzee	Whitinsville.
Sherwood Webster Webber	Springfield.
Thomas Raymond Wentzell	Worcester.
Sherwin Lester Williams	Rutland, Vermont.
Eino Walter Winter	Westminster.
Russell Gifford Wood	Westport.
John Milton Woodcock	Ripley, Maine.
Thomas Hughes Yeoman	West Roxbury.
Joseph Luis Zuretti	Lexington.

As of the Class of 1932.

William Frank Nye, Jr.	Springfield.

As of the Class of 1933.

Robert Francis Cross, Jr.	Osterville.
Chilton Mason Hastings	Lynnfield Centre.
Albert Hadden Knowles	West Newbury.
Donald James Newton	Montague.

REGISTRATION.
CLASS OF 1935.

Abbott, Hartwell Brown	Andover	75 Pleasant Street, A. T. G.
Bailey, Daniel Simpson, Jr.	Haverhill	6 Nutting Avenue.
Ball, Wesley Martin	Wakefield	75 Pleasant Street, A. T. G.
Barnes, Stanley Frank	Marlboro	4 McClure Street, care of Mrs. Barlow.
Barstow, Luther Henry, Jr.	Hadley	Baker Lane, care of Mrs. Webb.
Bemben, Michael Edward	North Hadley	Meadow Road, North Amherst.
Bobowiec, Walter John	Three Rivers	75 Pleasant Street, A. T. G.
Broughton, Richard Caton	South Wellfleet	73 Pleasant Street, Kolony Klub.
Campbell, Alexander Malcolm	South Boston	73 Pleasant Street, Kolony Klub.
Carter, Fred Nelson	Hanson	Farview Way.
Cassidy, George Charles	Framingham	8 Beston Street.
Chaney, Carl Stuart	Dunstable	73 Pleasant Street, Kolony Klub.
Clark, Gerald Lawson	Williamsburg	Williamsburg.
Clark, Robert James	Groton Long Point, Conn.	75 Pleasant Street, A. T. G.
Clark, Russell Sereno	Williamsburg	Williamsburg.
Crockett, James Underwood	Haverhill	7 East Pleasant Street.
Cunningham, Darrell Frayne	Medfield	30 North Prospect Street.
Davidson, Henry Willard	Longmeadow	45 Lincoln Avenue.
Dolan, Francis Paul	Brighton	75 Pleasant Street, A. T. G.
Douglas, Samuel Toby, Jr.	Waban	75 Pleasant Street, A. T. G.
Field, Harrison	Westwood	North Amherst, care of Mrs. H. H. Stowell.
Flint, Elizabeth Vileria	Westhampton	31 Bridge Street, Northampton.
Fobes, Malcolm Randall	Northampton	Northampton.
Forrest, Douglas Wilmont	Spencer	Baker Lane, care of Mrs. Dillingham.
Frink, Malcolm Dickinson	Northampton	Northampton.
Hanieski, Frank John	North Amherst	North Amherst.
Harlow, Allen Seely	Newport, R. I.	4 McClure Street, care of Mrs. Barlow.
Hochstrasser, George Emile	South Weymouth	15 Cottage Street.
Holt, Gordon Nelson	Worcester	30 North Prospect Street.
Hopkins, Hermeana Eleanor	Reading	8 Allen Street.
Hunt, Merrill, Jr.	Kendal Green	75 Pleasant Street, A. T. G.
Jacobs, Grace Arline	Dudley	61 Lincoln Avenue.
Johnson, Earl	Middlebury, Vermont	75 Pleasant Street, A. T. G.
Juhnevicz, Alphonse Paul	Worcester	73 Pleasant Street, Kolony Klub.
Kimball, Herbert Amos	Haverhill	75 Pleasant Street, A. T. G.
Lucas, Melvin Brown	North Dartmouth	East Pleasant Street, care of Mrs. Wentworth.
Macomber, William Penn, Jr.	Portsmouth, R. I.	73 Pleasant Street, Kolony Klub.
Mutter, Raymond Lawrence	Easthampton	Easthampton.
MacRobbie, Leslie Sumner	Patchogue, N. Y.	7 East Pleasant Street.
Newman, John Vincent	Roxbury	66 Lincoln Avenue.
Nichols, John Edmund	Greenfield	65 Lincoln Avenue.
Niles, Chester Howard	Bellows Falls, Vt.	Poultry Plant.
Noonan, Frederick William	Vergennes, Vermont	73 Pleasant Street, Kolony Klub.
Nourse, Ralph Boothby	Sterling Junction	North Amherst, care of Mrs. Newlon.
Pena, John	West Falmouth	101 Pleasant Street.
Pepi, Rocco	Framingham	Strong Street, care of Mrs. Keedy.
Pera, John Uno	Fitchburg	4 McClure Street, care of Mrs. Barlow.
Prentiss, Kenneth Frank	Hubbardston	Box 2, Enfield.
Putnam, George Osgood	Andover	5 Nutting Avenue.
Ratte, Albert Laurence	Andover	73 Pleasant Street, Kolony Klub.
Regan, Donald Arthur	East Boston	73 Pleasant Street, Kolony Klub.
Reid, Kenneth LeRoy	Noank, Conn.	42 Cottage Street.
Riley, Warren Alvan	Tyngsboro	73 Pleasant Street, Kolony Klub.
Ross, Guilbert Leon	Montague	Montague.
St. Jean, Lester Charles	Northampton	Northampton.
Sears, Russell Francis	Plymouth	East Pleasant Street, care of Mrs. Wentworth.
Shortsleeves, Gordon Harvey	Worcester	Baker Lane, care of Mrs. Webb.
Smith, Converse Burr	Waltham	83 Pleasant Street.
Sorblom, Gustaf	West Sterling	Box 2, Enfield.
Stocking, Wilbur Clark	Simsbury, Conn.	3 McClellan Street.
Thompson, Harry De Smet	Hathorne	116 Pleasant Street.
Thorndike, James Otis	East Bridgewater	6 Nutting Avenue.
Tripp, Ralph Waldo, Jr.	North Westport	3 Nutting Avenue.
White, Lawrence Alden	New Bedford	4 Hallock Street.

SPECIAL STUDENT.

Harris, William Allen	Springfield	Davenport Inn.

CLASS OF 1936.

Adams, Robert William	Housatonic	97 Pleasant Street.
Allen, Edward Howes	South Hadley	South Hadley.
Allen, Fred Henry	Sterling	West Street, Box 141, care of Ralph W. Haskins.
Alton, Kenneth Walker	Dudley	Chestnut Street, care of Mrs. Hauff.
Anable, Fred Asher	Westboro	10 Dickinson Street.
Bailey, Norman Sprague	Newton Centre	13 Hallock Street.
Barry, Lawrence Francis	Roslindale	10 McClellan Street.
Beekman, Fenwick, Jr.	Katonah, New York	75 Pleasant Street, A. T. G.
Bishop, Frank Sanford	Springfield, Vermont	10 McClellan Street.
Blackmer, Randolph Clayton	Hardwick	North Pleasant Street, care of Mrs. Jenks.
Bransford, John Emerson	Patchogue, New York	16 Hallock Street.
Brown, Edward Thomas	Marblehead	97 Pleasant Street.
Bryant, Walter Monroe	Hyde Park	157 Main Street.
Buell, Kenneth Hyland	Petersham	160 Hillside Avenue, care of Miss Magee.
Carlson, Harold Frederick	Portland, Conn.	Care of Mrs. Keogh, North Amherst.
Carlson, Hugo Ernest Theodore	Roslindale	8 Beston Street.
Chace, Alfred Martin	South Dartmouth	75 Pleasant Street, A. T. G.
Chapin, Robert Armstrong	Sheffield	73 Pleasant Street, Kolony Klub.
Charron, Edward Lincoln	Pelham	R. F. D., Belchertown.
Cheney, Paul Edward	Medfield	97 Pleasant Street.
Christensen, Nelson Christian	Wilson, Conn.	4 Hallock Street.
Clancy, Margaret Adele	Dedham	27 Fearing Street.
Coates, Harold Arthur	Bernardston	Baker Lane, care of Mrs. Dillingham.
Corkum, Harold Whitman	Sutton	17 Cottage Street.
Cornell, Pardon	North Dartmouth	4 Hallock Street.
Craig, Philip Adam	Barre, Vermont	10 Cosby Avenue.
Davenport, Alfred Mortomer, Jr.	Watertown	73 Pleasant Street, Kolony Klub.
Dexter, Arthur Harold	Winchester	43½ Sunset Avenue.
Dodge, Ellison Dwight	Belchertown	Belchertown.
Donovan, John Gerad	Cohasset	15 Cottage Street.
Doty, William Ely	West Springfield.	3 Allen Street.
Ellsworth, Wilson Brace	West Hartford, Conn.	Cottage Street Extension, care of Mrs. Mary Johnson.
Fischer, Albert Oswald, Jr.	Vineyard Haven	Baker Lane, care of Mrs. Webb.
Fish, Everette Richard	Gill.	Gill.
Forger, Arthur Carl	Norwood	North Pleasant Street, care of Mrs. Harold Hobart.
Fournier, Francis Edward	Dartmouth	11 North Prospect Street.
Friedman, Harry Falk, Jr.	Newton Centre	7 Allen Street.
Giebel, Jean Virginia	East Northfield	33 Northampton Road.
Gleize, Daniel Antoine	Stockbridge	66 Lincoln Avenue.
Gomes, August Joseph	Plymouth	East Pleasant Street, care of Mrs. Wentworth.
Goodwin, Thomas James	Newton Upper Falls	4 Hallock Street.
Graham, Malcolm Lawrence	Bradford, Penna.	12 Hallock Street.
Hall, Elliot Durkee	Dudley	5 Allen Street.
Hall, Roland	New Bedford	7 Allen Street.
Harrison, Donald	Boston	North Pleasant Street, care of Mrs. Harold Hobart.
Hartley, Edwin Hayden	Westfield	10 McClellan Street.
Haskell, Ann	Lynn	27 Fearing Street.
Healy, Charles Benedict	West Newton	83 Pleasant Street.
Hosmer, Hammond Chase	Arlington	30 North Prospect Street.
Howe, John Wadsworth, Jr.	Nashua, New Hampshire	Care of Mrs. George Cooley, North Amherst.
Huke, Albert Keigwin	New York City, N. Y.	43½ Sunset Avenue.
Hunt, Roger Archie	Leicester	17 Cottage Street.
Innes, Frank	Barre, Vermont	10 Cosby Avenue.
Jacobson, Nicholas Biel	New York City, N. Y.	11 Phillips Street.
Jacoby, Charles Wesley	Quincy	35 North Prospect Street.
Jekanoski, Carl William	Amherst	Amherst.
Jenkins, Paul	Wollaston	North Pleasant Street, care of Mrs. Cromack.
Jennings, John Henry	Shelton, Conn.	Cottage Street Extension, care of Mrs. Mary Johnson.
Jennings, William Joseph	South Natick	Care of Mrs. Stowell, North Amherst.
Johnson, Edward Simon	East Boston	Chestnut Street, care of Mrs. Hauff.
Johnson, Hugh Walker	Saugus	Chestnut Street, care of Mrs. Hauff.
Keefe, Charles Dennis, Jr.	Bellows Falls, Vermont	Box 5, Stockbridge Hall.
Kelley, Jason Torrey	Saxonville	7 Allen Street.
Kelley, Ransom Pingree	Brookline	75 Pleasant Street, A. T. G.
Kelly, Edward Richard	Gilbertville	North Pleasant Street, care of Mrs. Jenks.
La Broad, Frederic King	Palmer	Palmer.
Lawrence, Frederick Oscar	Weymouth	15 Cottage Street.
Loncar, John James	Worcester	101 Pleasant Street.
Macintosh, Pearson	Longmeadow	8 Nutting Avenue.

Mason, Kenneth Randall	Malden	73 Pleasant Street, Kolony Klub.
Mathews, George Newberry	Mount Vernon, New York	15 Cottage Street.
Mayo, James David Neal	Arlington	48 Pleasant Street.
Moore, Sherwood Arlington	Leeds	Leeds.
Morey, Earl Levi, Jr.	Sturbridge	Baker Lane, care of Mrs. Webb.
Morse, Robert Grosvenor, Jr.	Sharon	17 Cottage Street.
Offutt, Katherine Berry	Southboro	33 Northampton Road.
Olsen, Burton Oswald	Springfield	3 Allen Street.
Olson, Oscar Evald	Amherst	Box 641, Amherst.
Paquette, Nelson Louis	Northampton	Northampton.
Parker, Homer Leonard	Brimfield	5 Allen Street.
Parker, Warren Richmond	Braintree	16 Hallock Street.
Patten, James Warren, Jr.	Sterling	17 Phillips Street.
Payson, Vivian Lewis	North Dartmouth	11 North Prospect Street.
Peckham, Donald Wright	New Bedford	East Pleasant Street, care of Mrs. Wentworth.
Phaneuf, Vincent Eugene	Northampton	Northampton.
Powers, James Patrick	Wakefield	Cottage Street Extension, care of Mrs. Mary Johnson.
Pratt, Robert Ely	Florence	Florence.
Prentice, John Francis	Plymouth	42 Cottage Street.
Price, Merrick Barraud	South Weymouth.	15 Cottage Street.
Rantanen, David Edward	Northampton	Northampton.
Ready, Edwin William	Brighton	30 North Prospect Street.
Richardson, Raymond Willis	West Brookfield	North Pleasant Street, care of Mrs. Harold Hobart.
Robbins, Richard Alfred	South Natick	Care of Mrs. Stowell, North Amherst.
Robinson, John Nye	Littleton	73 Pleasant Street, Kolony Klub.
Rogers, Claude Arthur	Harding	14 Orchard Street.
Ross, William Cummings	North Quincy	North Pleasant Street, care of Mrs. Cromack.
Ruda, John Joseph	Dudley	Baker Lane, care of Mrs. Webb.
Samson, Donald Alexander	Florence	Florence.
Schulte, Barbara Eleanor	Lowell	33 Northampton Road.
Shea, James John	Amherst	10 High Street.
Sheldon, Willard Wheeler	Brookfield	12 Hallock Street.
Smith, Philip Firth	Methuen	55 Amity Street.
Sprague, John Davis	Weston	43½ Sunset Avenue.
Stevens, James Frederick	Andover	22 Dana Street.
Strong, Robert Francis	West Newton	15 Cottage Street.
Sturtevant, Richard Clinton	Halifax	4 McClure Street.
Sullivan, Joseph Peter, Jr.	Littleton	75 Pleasant Street, A. T. G.
Sutherland, John	Springfield	Springfield.
Taylor, Fred Leander, Jr.	Ashby	57 Pleasant Street.
Taylor, Gordon Munsing	Granby	Taylor Street, Granby.
Terrell, Clifford Henry	Cheshire	108 Pleasant Street.
Thomas, William Edward	Amherst	R. F. D. No. 3, Amherst.
Thorpe, Ernest Harry	Framingham	86 Pleasant Street.
Tick, Frank Joseph	Southbridge	97 Pleasant Street.
Timoshuk, Andrew	Whitestone, N. Y.	30 East Pleasant Street.
Tompkins, Frederick Joseph	Lowell	160 Hillside Avenue, care of Miss Magee.
Toth, Edwin Alexander	Wallingford, Conn.	108 Pleasant Street.
Trible, Arnold Victor	Worcester	101 Pleasant Street.
Waldecker, Herman, Jr.	Braintree	43½ Sunset Avenue.
Waldron, William Godolphin, Jr.	Pittsfield	43½ Sunset Avenue.
Whittaker, Arnold	Winchester	38 Cottage Street.
Williams, Walter Douglas	Stamford, Conn.	North Pleasant Street, care of Mrs. Harold Hobart.
Young, Wilbur Parmelee	Wallingford, Conn.	73 Pleasant Street, Kolony Klub.
Yukl, Grace Jeanette	Turners Falls	Riverside, Turners Falls.

SPECIAL STUDENTS.

Gidley, Elizabeth Eddy	North Dartmouth	33 Northampton Road.
Mellish, Eva	Malden	North Pleasant Street, care of Mr. Gaskell.
Tosi, Bruno Joseph	Beverly	55 Amity Street.
Young, James Thomas	Charles Town, W. Va.	Bates Inn, North Amherst.

SUMMER SCHOOL, 1934.

GRADUATE SCHOOL STUDENTS.

Connor, Daniel J.	South Hadley Falls.
Cook, Marjorie W.	Amherst.
Donley, Jessie E.	Plainfield, N. J.
Dudley, Walter Harry	Webster.
Flynn, Alan Foster	South Sudbury.
Gleason, Marian G.	Amherst.
Maclinn, Walter A.	Amesbury.
Mansfield, Eleanor F.	Haydenville.
Merriam, Oreana A.	Lyndonville, Vermont.
Naylor, Mary E.	West Springfield.
Pray, Francis C.	Amherst.
Purdy, Wilfred G.	Merrimac.
Spaulding, Leona J.	Amherst.

Enrollment—Not Graduate School.

Abbott, Charlotte L.	Quincy.
Andersen, Edward P.	Dalton.
Andrews, Frederick N.	South Weymouth.
Baker, Dorothy M.	Millers Falls.
Beals, Carrie B.	Boston.
Blanchfield, Alice	Easthampton.
Bliss, Walter D.	Attleboro.
Bower, William A.	North Andover.
Boynton, Willard H.	Groveland.
Brown, Grace F.	Milford.
Carmel, Alice M.	Holyoke.
Chase, Donald W.	Haverhill.
Cook, Florence M.	Amherst.
Cook, Janet M.	Amherst.
Cormier, Mary T.	Ludlow.
Davidson, James	Norwood.
Davis, Myron C.	Stafford Springs, Conn.
Ellis, Helen	Greenfield.
Everson, Laura V.	Amherst.
Ferguson, Herbert W.	Pittsfield.
Gendler, Minnie	Greenfield.
Giles, Elizabeth G.	Springfield.
Hankins, Orville L.	Northampton.
Harrington, Elizabeth K.	Ludlow.
Harrington, Jennie D.	Ludlow.
Hawley, Edna B.	Amherst.
Hayes, Margaret E.	South Deerfield.
Hodesh, Julian A.	Northampton.
Hoffman, Anne	Holyoke.
Hovey, Albert B.	Wakefield.
Hovey, Wendell R.	Wakefield.
Johnson, Walter O.	Haverhill.
Kellogg, Virginia K.	Amherst.
Kelly, Leslie M.	Amherst.
Lillie, Lucien B.	New Bedford.
Litchfield, Doris E.	Wayland.
Mallard, Douglas H.	Thompsonville, Conn.
Morland, Harold L.	Westwood.
Newman, Kenneth R.	Hoosac Tunnel.
Packard, Clarence A.	Amherst.
Parent, James M.	Westfield.
Peck, Elizabeth D.	Greenfield.
Perry, Marion L.	Holyoke.
Persons, Althea E.	Greenfield.
Powers, Helen L.	Hadley.
Prentiss, Edward L.	Upton.
Rohrssen, Marie Anne	Ruckeburg, Germany.
Sargent, Janet C.	Auburndale.
Scott, Ruth E.	North Hadley.
Siira, Impi E.	Centerville.
Stevens, Nelson P.	Haverhill.
Stewart, Donald M.	Arlington.
Sumner, James E.	Squantum.
Tani, Sulo John	Worcester.
Thompson, Wallace W.	Worcester.
Walker, Isabelle	South Hadley Centre.
Weeks, Mildred A.	South Gardner.

Utility Courses.

(Not offered for academic credit.)

Adams, Dorothy	Belmont.
Addis, Frances H.	Northampton.
Aiken, Carol	Granby.
Anton, Mary	Easthampton.
Bagg, Mrs. John L.	Greenfield.
Ball, Mrs. E. B.	Greenfield.
Barry, A. Esther	Holyoke.
Blanchfield, Mrs. Ellen	Easthampton.
Byam, Hazel E.	Ware.
Bourne, Hazel M.	Foxboro.
Cardinal, Mrs. Julia C.	Dwight.
Carpenter, Ruth M.	Amherst.
Carr, Mrs. Felix	Peabody.
Churchill, Mrs. Mabelle E.	Amherst.
Cook, Eveline B.	Jamaica Plain.
Cook, Mrs. J. O.	Amherst.
Cowan, Elizabeth B.	Amherst.
Davenport, Florence	North Amherst.
Davis, Mrs. Margerie E. N.	North Amherst.
Derby, Mrs. Edna H.	Amherst.
Desoe, Barbara E.	Belchertown.
Donovan, Mary J.	Lawrence.
Drohan, John J.	Worcester.
Dunham, Esther L.	Holyoke.
Dunn, Mrs. Luella C.	Gardner.
Elder, Mary B.	Amherst.
Everson, Laura	Amherst.
Fein, Martha	Revere.
Felton, Gladys E.	Bolton.
Foote, Norman H.	Farmingdale, L. I., N. Y.

Fuller, Helen B.	Foxboro.
Gatchell, Dana K.	Birmingham, Ala.
Greene, Bertha A.	Petersham.
Hancock, Esther R.	Vineyard Haven.
Hawley, Mrs. Edna B.	Amherst.
Hooks, Christine	South Hadley.
Hyland, Helen G.	Lawrence.
Jepson, Jennie B.	Belchertown.
Judd, Mrs. Philip M.	Holyoke.
Keep, Marion P.	Monson.
Kellogg, Claude R.	Amherst.
Kellogg, Mrs. Harry	Greenfield.
Kellogg, Mrs. Mary	Amherst.
Kelly, Gertrude E.	Jamaica Plain.
Kenney, Ivan L.	South Hadley Falls.
Knox, Joseph	Milford.
La Brecque, Elizabeth T.	Holyoke.
Levi, Sara	Revere.
Littlefield, Rojer H.	Belchertown.
Luther, Helene P.	Westfield.
Lynch, Elizabeth	Easthampton.
Lynch, Helen G.	Springfield.
Maclinn, Walter A.	Amesbury.
Maher, Mary A.	Westfield.
Mahoney, Anna S.	Northampton.
Mahoney, Margaret R.	Northampton.
Makepeace, Lucy	Monson.
Marshall, Eleanor M. S.	Amherst.
Marshall, Leon O.	Holden.
McCray, Mrs. C. C.	Monson.
Mellish, Mrs. M. H.	Malden.
Merriam, Oreana	Lyndonville, Vermont.
Merrick, Dorothy	Easthampton.
Moynihan, Ellen E.	Worcester.
Moynihan, Mary C.	Worcester.
Niedzielski, Josephine	Holyoke.
Peters, Mrs. C. A.	Amherst.
Radcliffe, Helen P.	Amherst.
Rice, Mrs. Cecil C.	South Hadley.
Richmond, Guilford H.	Northampton.
Roberts, Oliver C.	Amherst.
Roy, Pauline M.	Southbridge.
Ryan, Mrs. Henry E.	Sunderland.
Samson, Donald	Florence.
Santos, Caroline	New Bedford.
Sartwell, Julia V.	Northampton.
Sawyer, John A.	Danvers.
Severance, Charles D. (Mrs.)	Greenfield.
Shimkus, Albina E.	Worcester.
Shimkus, Veronica A.	Northampton.
Stansfield, Mrs. Maria	Monson.
Stomberg, Marion K.	Florence.
Stonina, Mrs. Mary	Chicopee.
Sturdy, Ruth R.	Chartley.
Tansey, Mrs. J. A.	Easthampton.
Trivedi, Jayanti Lal	Bombay, British India (N. W.)
Tutin, Celia H.	Cambridge.
Warren, Eleanor L.	Leicester.
Watson, Alma L. B.	Providence, R. I.
White, Mildred W.	Amherst.
White, R. Russell	North Amherst.
White, Mrs. R. Russell	North Amherst.

WINTER SCHOOL, 1934.

Adams, Charles I.	West Springfield.
Adams, Emory E.	New Britain, Conn.
Andersen, John A.	Goshen.
Asher, Alfred J.	Northampton.
Azevedo, Joseph P.	New Bedford.
Behan, John G.	Woods Hole.
Bell, Garland G.	South Weymouth.
Bliss, Eva P.	Attleboro.
Bliven, Raymond F.	Otis.
Boardman, E. Loring, Jr.	Sheffield.
Boyer, Ernest L.	Middlefield.
Boyle, James F.	Brighton.
Boyle, Ralph J.	Florence.
Bradley, Charles E., Jr.	Andover.
Bridges, Paul J.	Portland, Maine.
Brooks, Wayne O.	Erving.
Brown, George S.	Drury.
Bryant, Lloyd S.	Springfield.
Burnett, Harry	Southboro.
Burnham, Ernest S.	Athol.
Campbell, James P.	Lexington.
Chadwick, Howard A.	Vineyard Haven.
Charest, Raymond	Fall River.
Collins, James F.	Great Barrington.
Corey, Harold L.	Lafayette, R. I.
Cornish, Albert B.	Schenectady, N. Y.
Costello, John H.	Dorchester.

Covel, Nathan E., Jr.	Newtonville.
Damiano, Vincent F. J.	Somerville.
Daviau, Antonio	Easthampton.
Davidson, Amos J.	Baldwinsville.
DeCoste, James P.	Lenox Dale.
Dissel, Mary A.	Winchester.
Doescher, Mrs. J. Fred	Houlton, Maine.
Doescher, Mildred A.	Houlton, Maine.
Doherty, Thomas F.	Greenfield.
Drake, Francis J.	Springfield.
Dyer, Edwin M.	Fitchburg.
Eldridge, Hosmer B.	Amherst.
Ellis, Alex	Beverly.
Fernandes, Joseph F.	North Tiverton, R. I.
Findeisen, Wilfred A.	Methuen.
Flagg, A. Everett	Worcester.
Fleming, Daniel J.	Middlefield.
Foster, Frank R.	Bernardston.
Fraine, Harold S.	Boston.
Frye, Albert M.	Leominster.
Gibbons, Mary C.	Holyoke.
Ginsburgh, Sylvan J.	Holyoke.
Goodreau, Joseph P.	Palmer.
Graham, Norman	Palmer.
Grasse, Charles D. A., Jr.	Lowell.
Gravel, Romeo	North Andover.
Graves, Walter R.	Lenox Dale.
Gunn, Dustin E.	Bondsville.
Hadeka, Adolph	Pittsford, Vermont.
Hamel, John B.	Worcester.
Hamilton, Harry	Middleboro.
Harper, James W.	Wakefield.
Harrington, Burton B.	Winchendon.
Harthan, Harold C.	West Boylston.
Hatch, George F., Jr.	West Roxbury.
Hebert, V. Leslie	Weymouth.
Herbert, George E., Jr.	Brookfield.
Herlihy, James	Westfield.
Hilbourn, Tom R.	Kingston.
Hollis, Robert	Attleboro.
Hotkowski, Edward	Stafford Springs, Conn.
Houghton, James E.	Sandwich.
Hovey, Paul	Wakefield.
Isabelle, Mrs. Rene	South Hadley Centre.
Jones, Chesley C.	Swampscott.
Kane, Charles E.	Holyoke.
Keating, Joseph	Willimansett.
Kelliher, Lawrence G.	Holyoke.
Lally, Edward J.	Framingham.
Lane, Philip T.	Newton Center.
Lavin, John A.	North Andover.
Lawson, Arthur C.	Framingham.
Lovely, Richard	Cushman.
Mahan, Thomas F.	Beverly.
Maley, John A., Jr.	Sandwich.
Markert, Walter C.	Amherst.
Meacham, Duane B.	Adams.
Mellgren, Guy W., Jr.	Brighton.
Millard, Oliver L.	Northampton.
Moore, William W.	Ronceverte, West Virginia.
Moran, Edward L.	Marlboro.
Morin, Raymond	Amherst.
Munsell, Raymond	South Athol.
Murphy, William D.	Lynn.
McCarty, James O.	Housatonic.
McCrillis, George M., Jr.	East Brookfield.
McCullough, Casper M.	Banff, Alberta, Canada.
McGarry J. Allen	Holyoke.
McGrath, John C.	Kingston.
McNamara, Frank J.	Brookline.
Newbold, Joseph	Somerville.
Newton, Donald J.	Montague.
Nightingale, Frederick W., Jr.	Amherst.
O'Leary, Francis W.	Arlington.
O'Neil, Charles Everett	Salem.
Owen, Richard W.	Amherst.
Peters, Raymond R.	Uxbridge.
Pike, Philip E.	Cheshire.
Pimentel, Anthony F.	Chicopee Falls.
Pirosseno, Marie V.	North Wilbraham.
Powers, Patrick J.	Northampton.
Putnam, Howard A.	Springfield.
Redfern, Charles E.	Yarmouth, Maine.
Reid, Ernest F. D.	Belmont.
Rikert, Emory	Clinton Corners, N. Y.
Roberts, William B.	Amherst.
Robertson, James C.	Pittsfield.
Robinson, William	North Oxford.
Rommell, George J., Jr.	Greenfield.
Rooney, John A.	Boston.
Rynsaardt, Wybe N.	Westwood.
St. Armand, William	Waltham.

St. John, George	Lee.
Salo, Charles R.	Pittsfield.
Scharrett, John L.	East Taunton.
Scott, Alfred B.	Pittsfield.
Shaw, Charles D.	Westfield.
Shaw, Ezra I.	Amherst.
Shea, Maurice	Holyoke.
Sholes, William V.	South Pittston, Pa.
Sibel, J. Edward	Mt. Airy, Philadelphia, Pa.
Smith, George M.	Lake Forest, Ill.
Smith, James A.	Providence, R. I.
Sowerby, Clifton E.	Marlboro.
Spaulding, Harold W.	Winchendon.
Sponagle, Walter A.	Milford.
Stewart, Donald K.	Ballston Spa, N. Y.
Stewart, Ernest	North Andover.
Stockman, William L., Jr.	Providence, R. I.
Stone, Blanchard H.	Manchester Centre, Vt.
Sweet, Wendell N.	Andover.
Swenson, Harold	Otis.
Taylor, Albert	Lee.
Taylor, Gordon	Concord.
Tenney, Clinton A.	Shutesbury.
Thomas, Wolfgang R.	Cambridge.
Tick, Frank J.	Southbridge.
Tilton, Howard A.	Charlemont.
Toole, Frank P.	Amherst.
Tripp, Ralph W.	North Westport.
Trull, William H.	Westboro.
Turpie, Robert L.	Wollaston.
Vanderbrug, Aleck	Whitinsville.
Varner, Milton Y.	Amherst.
Varren, John P.	Cape Elizabeth, Maine.
Vashburn, S. Albert	Cheshire, Conn.
Vear, William H.	Medford.
Vebb, W. Kenneth	Oakham.
Viles, Frank L., Jr.	Marlboro.
Vinterbottom, Lawrence W.	Vineyard Haven.
Vright, John D.	North Wilmington.

Summary of Short Course Enrollment.

	Men.	Women.	Total.
Stockbridge School of Agriculture:			
Second year	62	3	65
First year	118	6	124
Winter School, 1934	151	7	158
Summer School, 1934 (exclusive of Graduate Students)	26	31	57
Specials	3	2	5
Totals	360	49	409

INDEX.

	PAGE
Admission to the College	34
Board	26
Buildings and equipment	20
Calendar, 1935–36	3
Campus	20
Collegiate course of instruction	41
Committees of Faculty	17
County Agents	15
Courses of instruction (summary)	24
Degrees conferred in 1934	102
Department assistants	11
Deportment	32
Description of Courses:	
Agricultural Economics	77
Agricultural Engineering	45
Agronomy	46
Animal Husbandry	47
Bacteriology	62
Beekeeping	71
Botany	64
Chemistry	67
Dairy Industry	49
Drawing	58
Economics (General)	82
Education	80
English	86
Entomology	69
Farm Management	50
Floriculture	55
Forestry	56
French	88
Geology	73
German	90
History	83
Home Economics	52
Horticultural Manufactures	57
Horticulture	60
Landscape Architecture	58
Languages and Literature	86
Mathematics and Civil Engineering	74
Military Science	91
Music	90
Olericulture	60
Philosophy	82
Physical Education	92
Physics	76
Physiology	64
Plant Breeding	62
Pomology	61
Poultry Husbandry	51
Psychology	81
Sociology	84
Spanish	89
Veterinary Science	77
Zoölogy	72
Division of Agriculture	44
Division of Home Economics	52
Division of Horticulture	55
Division of Physical and Biological Sciences	62
Division of Social Sciences	77
Employment of students	28
Expenses of students	25
Experiment Station Staff	12
Extension Service Staff	14
Faculty, members	6
Faculty, standing committees	17
Freshman registration	33
General information	19
Graduate School	97
Health Service	25
Historical sketch	19
Honors and awards	29
Legislation	2
Non-degree courses	100
Officers of the institution	6
Prizes	30
Registration 1934–35	105
Rooms	27
Scholarships and loans	28
Stockbridge School	100
Student activities and organizations	31
Summer School	98
Trustees of the College	4
Winter School	101

Gifts and Bequests

For the information of those who may wish to make a gift or a bequest to this College, the following suggestion is made as to a suitable form which may be used.

There are a number of worth-while activities of the College which are handicapped by lack of funds and for which small endowments would make possible a greater measure of service to our students and to the Commonwealth. The religious work on the Campus is an example. This is now carried on in a very limited way by current private contributions. Further information concerning this and other activities in similar need will be gladly furnished by the President.

Suggested Form

"I give (and bequeath) to the Trustees of Massachusetts State College at Amherst, Massachusetts, the sum of.....dollars, for use under their direction in promoting the following activities for the best interests of the said College and the Commonwealth.

(Statement of purpose)

Signed....."

MASSACHUSETTS
AGRICULTURAL EXPERIMENT STATION

BULLETIN NO. 315 MARCH 1935

Annual Report

For the Fiscal Year Ending November 30, 1934

The main purpose of this report is to provide an opportunity for presenting in published form, recent results from experimentation in fields or on projects where progress has not been such as to justify the general and definite conclusions necessary to meet the requirements of bulletin or journal.

MASSACHUSETTS STATE COLLEGE
AMHERST, MASS.

MASSACHUSETTS AGRICULTURAL EXPERIMENT STATION

Trustee Committee on Experiment Station

	Term Expires
BUTTRICK, DAVID H., Arlington, *Chairman*	1939
CHANDLER, JOHN, Sterling Junction	1935
RUSSELL, HOWARD S., Waltham	1936
FROST, HAROLD L., Arlington	1938
MALCOLM, DAVID J., Charlemont	1939
WHITMORE, PHILIP F., Sunderland	1941

Experiment Station Staff, December 1934

HUGH P. BAKER, President of the College

SIEVERS, FRED J., Director — KENNEY, FRED C., Treasurer

GASKILL, EDWIN F., Assistant to the Director — CHURCH, LUCIA G., Secretary

BEAUMONT, ARTHUR B., Agronomy
*BOURNE, ARTHUR I., Entomology
*BRADLEY, LEON A., Bacteriology
*CANCE, ALEXANDER E., Agricultural Economics
*CHENOWETH, WALTER W., Horticultural Manufactures
DORAN, WILLIAM L., Botany
*EISENMENGER, WALTER S., Agronomy
FELLERS, CARL R., Horticultural Manufactures
*FRANDSEN, JULIUS H., Dairy Industry
†*FRANKLIN, HENRY J., Cranberries
*GASKILL, EDWIN F., Station Service
GIBBS, CHARLES S., Veterinary Science
*GRAHAM, JOHN C., Poultry Husbandry
*GUNNESS, CHRISTIAN I., Agricultural Engineering and Meteorology
*HASKINS, HENRI D., Fertilizer Law
HAYS, FRANK A., Poultry Husbandry
HOLLAND, EDWARD B., Chemistry
‡*KOON, RAY M., Vegetable Gardening
*LENTZ, JOHN B., Veterinary Science
LINDSEY, ADRIAN H., Agricultural Economics
LINDSEY, JOSEPH B., Chemistry (Professor Emeritus)
MORSE, FRED W., Chemistry
*OSMUN, A. VINCENT, Botany
*RICE, VICTOR A., Animal Husbandry
*RITCHIE, WALTER S., Chemistry
*SEARS, FRED C., Pomology
SHAW, JACOB K., Pomology
*SMITH, PHILIP H., Feed, Dairy and Seed Laws
*THAYER, CLARK L., Floriculture
VAN METER, RALPH A., Pomology
VAN ROEKEL, HENRY, Veterinary Science
*WOOD, BASIL B., Library

ARCHIBALD, JOHN G., Animal Husbandry
BAILEY, JOHN S., Pomology
[[BERGMAN, HERBERT F., Cranberries
BULLIS, KENNETH L., Veterinary Science
DeROSE, H. ROBERT, Fertilizer Law
‡DEMPSEY, PAUL W., Horticulture
*FELTON, F. ETHEL, Editor
FLINT, OLIVER S., Veterinary Science
FRANCE, RALPH L., Bacteriology
FULLER, JAMES E., Bacteriology
‡GUBA, EMIL F., Botany
JEFFERSON, LORIAN P., Agricultural Economics
JONES, CARLETON P., Chemistry
JONES, LINUS H., Botany
[[KIGHTLINGER, CLIFFORD V., Tobacco-Disease Investigations
KUZMESKI, JOHN W., Fertilizer Law
McLAUGHLIN, FREDERICK A., Seed Law
*MIGHELL, RONALD L., Farm Management
MUELLER, WILLIAM S., Dairy Industry
PRAY, F. CIVILLE, Chemistry
ROZMAN, DAVID, Agricultural Economics
SPELMAN, ALBERT F., Feed Law
‡WHITCOMB, WARREN D., Entomology
‡WHITE, HAROLD E., Floriculture
‡YOUNG, ROBERT E., Vegetable Gardening
*———, Home Economics Research

ALLEN, HARRY L., Feed, Fertilizer and Dairy Laws
BALL, ALYN S., Botany
BENNETT, EMMETT, Chemistry
BUCK, ROBERT E., Horticultural Manufactures
CLAGUE, JOHN A., Horticultural Manufactures
CLARKE, MIRIAM K., Veterinary Science
DONLEY, J. ELIZABETH, Agricultural Economics
‡DONNELLY, EDWARD B., Floriculture
ESSELEN, WILLIAM E., JR., Horticultural Manufactures
HOWARD, JAMES T., Feed, Fertilizer and Dairy Laws
HUGHES, MARY C., Pomology
ISHAM, PAUL D., Horticultural Manufactures
MERRIAM, OREANA A., Home Economics Research
MINER, GLADYS I., Botany
O'DONNELL, MARGARET H., Administration
ONSDORFF, THOMAS, Horticultural Manufactures
PARKINSON, LEONARD R., Station Service
ROBERTSON, DORIS W., Farm Management
SANBORN, RUBY, Poultry Husbandry
SHERBURNE, RUTH E., Agricultural Economics
SNELL, MOSES E., Agronomy
[[TRURAN, WALTON E., Cranberries
WATSON, VERNON K., Horticultural Manufactures
‡WILSON, HAROLD A., Vegetable Gardening
ZIMNOSKI, FELICIA, Veterinary Science
———, Seed Law

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*In charge — †At East Wareham — ‡At Waltham — [[With U. S. D. A.

CONTENTS

Page

Introduction 4

Department Reports:

Agricultural Economics 5

Agricultural Engineering 8

Agronomy 9

Animal Husbandry 18

Bacteriology 21

Botany 23

Chemistry 27

The Cranberry Station 31

Dairy Industry 35

Entomology 38

Farm Management 52

Feed Control Service 54

Fertilizer Control Service 56

Floriculture 58

Horticultural Manufactures 59

Olericulture 62

Pomology 65

Poultry Husbandry 74

Veterinary Science 75

Waltham Field Station 79

Cooperative Investigations:

Cranberry 32

Tobacco 16

Publications 81

ANNUAL REPORT OF THE MASSACHUSETTS AGRICULTURAL EXPERIMENT STATION--1934

INTRODUCTION

F. J. Sievers, Director

When the last annual report was in preparation, there was a genuine feeling on the part of a considerable portion of our citizenship that research in general and especially in the field of agriculture was so far in advance of its application to practice that a partial holiday in the promotion of further investigations might be justified. The pronounced interest in balancing budgets expressed itself very forcefully in a definite attempt to curtail Federal and also State support to the experiment stations. Although recommendations for curtailment did not prevail, they had the effect of subjecting the entire experiment station service to very close scrutiny. Since then developments in attempts to solve the problems of depression have been numerous and rapid, with the result that those administrative leaders of national, industrial, and political affairs who are giving constructive thought to this subject are becoming convinced that a sound solution requires a type of basic information that is not now available. The acquirement of such basic information is naturally dependent upon research, and nothing could be more treacherous than to be misled at this time by so-called facts coming from a prejudiced source. In other words it is becoming recognized that the solution of the profound social and economic problems confronting the country requires research emanating from a source free from bias.

While individual experiment station workers may have their prejudices, there is certainly no research agency in this country that should be as free from selfish, commercial, or political influence as the several experiment stations as now organized in every state in the Union. It is, therefore, reasonable to assume not only that service in social and economic adjustment is an obligation of the experiment stations, but that there will be a demand for these agencies to supply basic information in this field similar to the contribution that is being made to science in general and agriculture in particular.

To make sure that we shall not be found wanting, an effort is being made to reshape our program so that special consideration may be given to these significant problems with which our entire consuming public is concerned. Such modification in our program not only demands the best intellect available in the organization, but also justifies a degree of enthusiasm for service that can not fail to express itself in enlarged output.

Another matter in experiment station organization deserving preferred consideration is the encouragement of cooperation among members of the staff engaged in different but related services. In recent years so much emphasis has been placed on the importance of specialization that the old-time agriculturist or horticulturist who was conversant with the entire field of activities included under these designations has practically disappeared. He has been displaced in large part by the physiologist, geneticist, threpsologist, pathologist, etc., all highly specialized in their training and interest. While this has made for a pronounced advance in efficiency and in scientific quality of research, there is a danger that if encouraged beyond reasonable limits it may result in the loss of a sympathetic interest in agriculture as an industry or in a lack of ready respon-

siveness to the problems of the general consuming public. In order to supplement the efficiency of specialists, who due to the nature of their work have a tendency to become further and further isolated, some means should be provided that will make the need for cooperation so evident that more intimate contact among investigators will become automatic.

With this in mind the experiment station is setting up a central nutrition laboratory made possible through the remodeling and reconstruction of the Hatch barn formerly used for investigations in animal feeding. This laboratory when completed should offer facilities for investigational work in the entire field of nutrition both human and animal, and in this respect serve all of the departments having a natural interest in feeding problems. The proposed organization will influence the research of the following departments:

Agronomy	Chemistry	Home Economics
Animal Husbandry	Dairy Industry	Horticultural Manufactures
Bacteriology	Feed Control Service	Poultry Industry

In line with this new development one project is already organized where the departments of Agronomy, Chemistry, and Home Economics are cooperating in an effort to influence the nutritional composition of some of our natural plant products in the hope of supplying a partial solution for the problems of nutritional deficiency recognized but unsolved by the medical practitioner and dietitian. It is conceivable that similar projects may be developed in which animal products and processed foods may be given this same type of consideration. Whatever the development may be, it is quite evident that the soundest recommendations in such involved fields of research will be available only after the unprejudiced analysis and consultations possible under a liberal and flexible cooperative policy.

It would seem, therefore, that only a limited imagination is required to arrive at the realization that research in agriculture, instead of being credited with having fulfilled its mission, should be saddled with the solution of many of the profound and intricate problems that are developing and will continue to develop in a highly organized and much standardized society.

DEPARTMENT OF AGRICULTURAL ECONOMICS

Alexander E. Cance in Charge

Decentralization of Industry and Part-Time Farming in Massachusetts. (David Rozman.) The field work in connection with this project has been in the main completed and the data are being tabulated and analyzed for publication.

To determine the extent to which the location of industrial plants in smaller communities of Massachusetts has been productive of the combined use of labor in industry and agriculture, a general survey was made of all the industries of the State operating in the towns and cities of less than 10,000 population. Information was also obtained on the regularity of employment and seasonal character of operation in different industries as it might affect the practice of agriculture by employees.

In the towns of Charlton and Winchendon a detailed study was made of the standard of living and comparative advantages for homogeneous groups of employees engaged in part-time farming and those outside of it.

Marketing of Milk and Cream in Secondary Markets of Massachusetts. (David Rozman.) A detailed survey has been made of both demand and supply

of milk and cream in all the important secondary markets of the State, including 27 cities. Information was collected from every dealer and producer-distributor operating in the surveyed territory as to the daily receipts and sales of milk and cream, retail and wholesale prices for different grades, milk purchase plans in relation to producers, number and location of producers, and quality of product. All the data obtained in this survey were tabulated and summarized, and are now being used as a practical working basis in some operations of the State Milk Control Board.

Competitive Factors Influencing the Supply of Market Milk and Cream. (A. H. Lindsey and A. E. Cance.) A mimeographed report has been published of the sources and consumption of fluid milk in 27 secondary markets in Massachusetts.

Under this project a historical study of milk sources and quality was made in the Lowell market. Complete records were available for a 10-year period. There have been many changes in areas which furnish milk to Lowell. These, however, may be largely accounted for by changes in supply made by large dealers. Quality, as measured by bacterial count, sediment tests, and percentage of fat and solids, has constantly improved throughout the 10-year period.

Preliminary investigation, based on 25,000 samples over a 10-year period, indicates that the seasonality of fat and solids content of milk is not related to the quantity of milk produced by cows as affected by pasture and feed conditions. The low point in fat content is normally in August and not in May or June as commonly supposed. Fat and solids content appears to be more closely related to temperature than to pasture conditions or quantity of milk produced. The low point for solids may or may not coincide with the low point for fat. It is very important that producers know the true seasonal curves for fat and solids.

Further work remains to be done to establish an adequate basis for any conclusions to be made.

Sources and Uses of Credit in Massachusetts. (A. H. Lindsey.) The primary purpose of this study is to secure dependable data for the Farm Credit Administrators and for extension workers, so that the present credit facilities can be made more adequate, useful, and convenient. The survey was planned to determine the credit needs of different type-of-farming areas. Records for the Connecticut Valley are adequate, but a further study of dairy, poultry, and market garden areas in the eastern part of the State remains to be made.

A summary of the data gathered follows:

1. Of the 340 farmers included in the survey, only 5 were tenants; the remainder owned their own farms.

2. In the Connecticut Valley area the farmers who were less than 40 years of age borrowed, on the average, one and a third times the amount of short-term credit per farmer borrowed by farmers who were 60 or more years of age.

3. The average amount of short-term credit borrowed per farmer included in the survey was $774. The average amount borrowed per farmer who obtained short-term credit was $1,315.

4. Sixty percent of bank credit was due on demand, and 17½ percent due in six months.

5. Not quite one-half of the bank credit outstanding August 1934 had been renewed more than twice.

6. About 70 percent of the farmers who owned their farms owed mortgage credit.

7 Of the first mortgage credit, 42.9 percent bore 6 percent interest; the remaining 57.1 percent bore lower rates, 27.6 per cent of which was at 5 percent.

8. Seventy-eight percent of the first mortgage credit was payable on demand.

9. A little over half of the first mortgage credit was supplied by commercial banks.

10. The Federal Land Bank loaned the largest amounts per farmer, distant commercial banks the second largest, and Smith Charities the smallest.

11. Among the farmers of the Connecticut Valley area were 26 men who still had tobacco stored, and hence had no cash income from that source. Their average total indebtedness was $7,161, while the average total indebtedness for the entire group was $5,475.

A Study of Performance of Different Varieties of Apples and Market Value of Product. (Lorian P. Jefferson.) This project, held in abeyance for a time, is being reorganized with the intention of getting data from various growers throughout the State, not merely from growers in one section, as at first planned. It is also the intention to extend the period for which the data are to be secured to ten years.

Some of the growers who gave data earlier will be included in the study as now planned. Some it will be necessary to omit for one reason or another. Each of the county agents, except in the southeastern counties, has furnished a list of growers who probably have records of crops and sales from which desired information can be secured. In Berkshire County not one grower is known to have records for ten years. Of course, few apples are grown in commercial orchards in the southern part of the State.

The Changing Methods of Wholesale Distribution of Perishables. (Lorian P. Jefferson.) The motor truck has come to be a great factor in the marketing of fruits and vegetables, although the total volume which reaches the market by this means is not known. The effects are both good and bad: Good, in that fruit so shipped usually reaches the market in better condition than that shipped by rail; and bad, because of the effect on the market. The testimony of dealers indicates no pre-announcement of the arrival of truck-borne fruit, which leaves the market without protection against unknown receipts. A movement on foot throughout the large markets asks that information regarding volume, character and time of arrival of trucks be required.

More than one organization has expressed the opinion that the traveling jobbers should be placed under Federal control, in order that they may be as uniformly controlled as is their competitor, the railroad. Nothing has been done about this matter as yet, but there is a strong sentiment in favor of it among various people.

There is a general feeling in the market that something should be done about stopping wastes of foods. Studies are being made into the best means of avoiding the various wastes that are common in our present handling of perishable foods. Improved refrigeration, better freight service, and better loading practices have reduced transportation losses. Some of these depend upon proper chemical conditions, some upon economics and proper loading, all of which are being studied.

Market terminals are becoming more and more important. The one in Boston, conducted by the New York, New Haven and Hartford railroad, is handling an increasing proportion of perishable products entering the city. Beginning in April 1927, the terminal has handled much more than the stipulated volume of

these products and has now reached a total well above that amount. The cars are handled quickly, and the products are distributed as rapidly as possible and reach the retailer when fresh.

There are market terminals in twelve of our large markets, ranging in size from Atlanta, Georgia, to Washington, D. C. Some of these are owned by railroads and produce trade, and operated by the railroads and (or) a Terminal Company or market company.

In Boston, the buyers at the market terminal include several groups: (1) wholesalers from Boston and from other markets from Portland to New Bedford; (2) retailers who do a volume of business which warrants buying the units specified; (3) chain store systems; (4) regular jobbers; and (5) traveling jobbers whose business is sufficient so they can buy the required quantities.

DEPARTMENT OF AGRICULTURAL ENGINEERING

C. I. Gunness in Charge

Investigation of Apple Storages. (C. I. Gunness in cooperation with the Department of Pomology.) The study on holding apples at 45° F. during the time of loading and for a short period thereafter before reducing to 32° has been continued. The results are being reported by the Department of Pomology.

The test on the effect of humidity on the keeping of apples was continued. McIntosh were stored under three different humidities and two sets of temperature conditions, with the following results:

Temperature (°F.)	Humidity (Percent)	Percentage Loss in Weight by Feb. 15
*34	90	1.6
	80	3.3
	70	4.0
**45 to 35	90	2.8
	80	5.6
	70	6.7

*Throughout the season.
**Started at 45° Oct. 1 and gradually reduced to 35° by Feb. 1.

None of the apples held at 34° had shriveled badly, although those kept at the lower humidity showed slight shriveling. Those kept at the higher temperature showed shriveling at all humidities although much more noticeably at the low humidities. It is felt that the test on humidity at the high temperature is not significant as the high temperature was maintained too long for proper holding of the fruit. The experiment is being continued during the present season on a schedule which reduces the temperature to 32° by November 15.

Apple Washer. (C. I. Gunness.) The construction of an apple washer was reported in last year's annual report. Some further work has been done on this washer, and trials indicate that apples are handled with very little bruising, spray residue is removed satisfactorily, and the final rinsing removes the acid quite completely. A detailed report of the test is made by the Department of Entomology.

Pump Testing. (C. I. Gunness.) In former years mention has been made of the testing of low-lift pumps used by cranberry growers. During the past year a pump testing plant has been built at the college for the testing of pumps and for the study and development of efficient types of pumps suitable for cranberry bogs.

Rural Electric Survey. (C. I. Gunness.) During the past year a survey of the use of electricity on farms has been carried on. Records were obtained on 7131 farms or approximately one-half of the farms in the State now having electric service. A classification of these farms indicates that the so-called general farm uses 980 kilowatt-hours per year, the poultry farm 1480 kilowatt-hours, and the dairy farm 1726 kilowatt-hours. The average annual consumption on all farms is 1303 kilowatt-hours.

A detailed study was made of 1563 farms having at least 5 cows, or 100 hens, or a fruit or general business which would make them qualify as real farms. The use of current on these farms has increased from 976 kilowatt-hours in 1929 to 1735 kilowatt-hours in 1933. About 24 per cent of the dairy farms in this group are equipped with milking machines, and 30 per cent with electric milk coolers.

DEPARTMENT OF AGRONOMY

Walter S. Eisenmenger in Charge

Pasture Experiments. (A. B. Beaumont.) Lime and complete fertilizer were applied to permanent pasture plots in Worcester County in the fall of 1933 and spring of 1934. No yields were taken, but observations showed the usual marked response to nitrogen, potash, and lime. The response to potash was particularly outstanding in the latter part of the season, due to the abundance of white clover.

Since 1930 a test of the more important nitrogen fertilizers has been conducted on a strongly acid, depleted, upland pasture soil in Amherst. Judged by yield of grass, calcium nitrate and sodium nitrate have been distinctly superior to ammonium sulfate, ammonium chloride, calcium cyanamide, and urea when applied in addition to lime, phosphoric acid, and potash.

Legume Variety Tests. (A. B. Beaumont.) Cooperative tests of varieties of miscellaneous legumes were terminated in 1934 by the disastrous effects of the extremely cold winter of 1933-34. Seedings of alfalfa varieties ranging in age from one to five years were 90 to 100 percent killed. The injury appears to have been due primarily to the formation of an extensive ice sheet which persisted for a long enough time to smother the plants. There was little or no relation between killing and variety, but Hardigan showed somewhat more resistance to this condition than did other varieties.

Results of tests of varieties of soybeans were published in 1934 as Bulletin 309, entitled "Soybeans for Massachusetts." Results of tests of other legumes will be published in detail by the Bureau of Plant Industry of the U. S. D. A., which cooperated in the work. Since publication will be delayed somewhat, the following brief summary is given.

Alfalfa. Twenty-one varieties from many domestic and foreign sources were tested. The oldest seeding was 5 years old when terminated. During this period yield of varieties did not appear to be associated definitely with the latitudinal source of seed nor with factors commonly accepted as indicating hardiness, such as variegation of the blossoms. Hardigan was the most consistently high-yielding variety, but the yield of Grimm was about the average of the various lots tested. Both of these varieties have variegated blossoms. With the exception of common alfalfas from California, which were consistently among the lowest producers, all strains of common alfalfa, including those from Dakota, Kansas, Utah, Oklahoma, and New Mexico, were quite satisfactory and gave average or better than

average yields. Kansas and Utah common were generally the most productive of this group. Among the foreign varieties, Hungary, Argentine, and Italian were good yielders. Ladak, Turkestan, and Hairy Peruvian were definitely poor in these tests. Poor yields generally were associated with weak stands developed during the period of the experiment.

Red Clover. During the period 1930-1932, 43 lots of red clover strains were grown in three seedings. Results clearly show the supremacy of domestic over foreign varieties, and of eastern domestics over western domestics. The highest average yield for the strains of a given locality was 3.4 tons of cured hay.

Crimson Clover. Tests of crimson clover sown alone and with oats, and at different times from early May to the middle of July in 1932 and 1933, showed that when treated as a summer annual this legume is not well adapted to this (Connecticut Valley) section. The maximum yield when seeded alone was 1.3 tons of cured hay.

Field Peas and Vetches. Several varieties of field peas were grown alone or in combination with oats as a companion crop. In this section peas are subject to the attack of several insect pests and fungous diseases, of which aphids are the worst, and infestations of them occur with considerable regularity. Spells of hot weather usually occurring in May or June also are a deterrent to the best development of peas. Of several varieties of peas tested, Chang gave the highest average yield (1.33 tons of cured hay). The maximum yield in the best year was 1.75 tons when the crop was grown without a companion crop. The use of oats as a companion crop reduced the yield of peas, but increased the total yield, reduced insect and disease injury, and is recommended as a practical method. Vetches, likewise, did poorly. Of the spring-sown varieties, Oregon Pearl did best, and of the fall-sown varieties, Oregon Hairy was slightly superior. As with peas, this crop did best when sown with a companion crop; winter wheat was slightly better than winter rye for fall-sown vetch, and oats were satisfactory for the spring-sown crop. These tests have shown that field peas and vetches are not well adapted to such conditions as prevail in the Connecticut Valley. They should be regarded primarily as emergency forage crops, but not as permanent substitutes for red or alsike clover, alfalfa, or soybeans, which yield considerably more per acre.

Lespedeza. Two strains of Early Korean lespedeza were tested for seed production in 1932 and 1933. These were grown in cultivated rows on a soil of good fertility. Both strains set seed abundantly and matured them by the middle of September. The plants attained a maximum height of about 10 inches. No data on yield of forage were obtained. It has been suggested that this variety of lespedeza might be successfully grown on acid, upland pasture soils. In the spring of 1933 before the frost had come out of the ground, seed of both strains was sown at the rate of 20 pounds per acre on the surface of a permanent pasture which had been used for fertilizer experiments. The sod was quite thin in places. Early in the season and before grazing had begun, a fair stand of lespedeza plants was found on all plots, but at the end of the grazing season less than 1 percent of lespedeza could be found on any plot. Such plants as were found were very small, but had set seed. No differences were apparent in strain of seed, or fertilizer or lime treatments. By the end of the grazing season of 1934 lespedeza had virtually disappeared from the pasture. It seems that this legume cannot be established in this manner on upland pastures of this section.

Sweet Clover. Hulled and unhulled seed of biennial white sweet clover was sown on the surface of plowed and harrowed soil at monthly intervals from December to May. It was found that maximum stands and good yields were

obtained from seedings of December, January, and February. Results were progressively poorer from March to May. It appears that winter seeding of sweet clover in this manner may be very practical, and either unhulled or hulled seed may be sown. Some of the seedings were on the surface of deep snow.

Field Experiments with Tobacco. (W. S. Eisenmenger, A. B. Beaumont, and M. E. Snell.)

Cropping Systems. The tobacco experiments reported in 1933 have been continued. No lime was added to the soil during the past year, and the pH has remained at approximately 5.0. The soil, in addition to lending itself to attack of "brown root-rot" of tobacco, also contains *Thielavia basicola* (black root-rot organism) in sufficient quantities to be harmful to the crop.

The following are the yields that have resulted from different treatments under the same conditions of fertilization:

	Pounds per Acre
Check plots without lime	1732
Check plots with lime	1587
Red top cover crop	1832
Clover cover crop	1666
Spring wheat cover crop	1677
Oats cover crop	1690
Barley cover crop	1737
Manure (no cover)	1852
Manure and red top cover crop	1786
After clover hay (old animal husbandry plots)	1991
After clover hay (new animal husbandry plots)	1699
After timothy hay (old animal husbandry plots)	1217
After timothy hay (new animal husbandry plots)	2014
Corn stover applied to tobacco soil plots	1755
Check	1659
Corn stubble removed	1860
Check	1921
Corn soil treated with orthocresol	1772
Check	1553

Form of Nitrogen. In this experiment, one-half the nitrogen applied in fertilizers comes from cottonseed meal and the other half from one of five nitrogenous fertilizer materials. The experiment has now run three years. For the entire period of the experiment the highest mean yield of tobacco has been produced by the standard fertilizer mixture (nitrogen ½ from cottonseed meal, ¼ from calurea, and 1/8 each from nitrate of soda and nitrate of potash), followed closely by calcium cyanamide, nitrate of soda, sulfate of ammonia, and urea, in order. The differences obtained thus far are hardly significant, although rather consistently in the same direction.

Proportion of Organic Nitrogen. In this experiment, which has run three years, fertilizer mixtures containing different proportions of nitrogen from cottonseed meal and inorganic sources are compared with each other and with the standard mixture used in all experiments with tobacco at this station. In 1934 the highest yield (2127 lbs. per acre) was obtained from the standard mixture (containing ½ organic nitrogen), followed very closely by that from the mixture containing 1/8 organic nitrogen and 7/8 inorganic nitrogen. For the period of the experiment, the mixture containing 1/8 organic nitrogen has yielded the most tobacco, but differences among yields from all mixtures have been small. The

sorting quality of tobacco for 1932 and 1933 was slightly better from mixtures containing ½ organic nitrogen.

Method of Applying Fertilizer. This experiment was continued in 1934 with the same methods and equipment as were used in 1932 and 1933. The average yields were as follows:

Row Application	Pounds per acre	Broadcast Application (Check)	Pounds per acre
4/8 Standard amount.....	1737	Standard amount.....	2032
5/8 Standard amount.....	1759	Standard amount.....	2022
6/8 Standard amount.....	1798	Standard amount.....	1994

These figures show a greater advantage of the standard (full) amount broadcast than has been shown in the preceding four years of this experiment. The experiment should be continued to determine whether the differences obtained represent anything more than a seasonal variation. Such data as have been obtained on sorting quality of the crop grown under the two methods of fertilizer application show no significant difference.

Toxicity of Aluminum for Tobacco. (W. S. Eisenmenger.) As reported in 1933, tobacco plants were grown in aluminum citrate solution for two-day intervals and on the alternate two days in a complete nutrient solution. The decided toxicity begins at about 17 ppm. of aluminum.

Other plants were grown in solutions containing aluminum citrate and calcium nitrate in relative proportion of 0.006 M of each salt represented as follows in terms of percentage molecular proportions:

Aluminum Citrate	Calcium Nitrate
100	0
95	5
85	15
75	25
50	50
15	85
5	95
0	100

The results would indicate that the calcium ion was a decided factor in overcoming the toxic principle of the aluminum.

Distribution of Nitrogen in Soils Mixed with Different Plant Tissues and Allowed to React for Six Months. (W. S. Eisenmenger and W. J. Moore.) As a sequel to the determination of forms of nitrogen in infusions, an attempt is being made to perform similar determinations on plant tissue under more aerobic conditions. One part of chopped plant tissue was mixed with two parts of soil in crocks and allowed to stand in the greenhouse. Water was added to keep the soil approximately moist enough to grow plants. At the end of a six-month period the materials are being analyzed for nitrogen, total nitrate, ammonia, amide, alpha amino acid, protein, and humin. The plant tissues used were red clover, alfalfa, red top, timothy, corn, and tobacco.

The Relationship of Mineral Nutrients to the Nitrogen Content of Tobacco Plants. (W. S. Eisenmenger and H. R. Knudsen.) Tobacco plants were grown in different ratios of elements, according to the triangular system used earlier by Schreiner and others, to determine the approximate ratio at which plants thrive

best. Also the relationship of nitrogen, ammonia, and nitrate content of each plant to the relative abundance of either phosphorus, potash, and nitrogen in the medium is being determined.

Magnesium Requirement of Crops. (A. B. Beaumont and M. E. Snell.) Barley, Sudan grass, millet, rutabagas, turnips, mangels, spinach, peppers, sweet corn, and field corn were grown in this experiment in 1934. This experiment in its present form has now run 6 years. Including tobacco, grown in the previous experiment, and alfalfa and red clover, grown in pots in soil taken from the experimental field, 20 varieties of field and garden crops have been studied. These crops have differed to a marked degree in their reaction to magnesium deficiency, in yield as well as in physiological symptoms. Buckwheat and spinach were most affected; turnip, mangels, corn, and tobacco considerably; the small grains, grasses, clovers, alfalfa, and potatoes were only slightly affected; and others hardly or not at all. Plants sensitive to magnesium deficiency developed characteristic physiological symptoms which have diagnostic value. Chlorosis of the older leaves developed in the intervascular tissue. In leaves of plants with parallel veins this produced a striped appearance; while in leaves having netted venation, a mottled chlorotic pattern was produced. Results of this experiment for 6 years have been summarized for publication.

Onion Set Production. (M. E. Snell.) During the past summer two new phases of growing onion sets of desirable size for planting have been studied: first, the possibility of controlling the size of set by time of pulling; and second, the effect of later planting on development of desirable sets. It was found that within broad limits it was possible to control the size of sets by time of pulling. By this method one can seed quite heavily (50 or more pounds per acre) and fertilize heavily enough to get good strong growth (1000 pounds per acre on fair onion land), and by spreading the seed well over a broad row get very large yields of sets, with a high percentage of them of any desired size. The past season's results would indicate that good sets may ordinarily be produced by planting as late as May 20. This would sometimes be an advantage, as planting early while the ground is still cold and wet often gives very poor germination.

The sets grown during 1933 were stored for about six months to check the previous year's findings on keeping quality. The storage loss was somewhat less than for the 1932 sets. In respect to size of set, keeping quality compared favorably with the 1932 results. Different fertilizer treatments did not seem to make any material difference in keeping quality of sets.

Sets from each fertilizer treatment (with commercially grown sets as checks) were again planted to study influences on yield of first-grade bulbs and production of seed stalks and multiple bulbs. Marked difference between the two sizes planted was found in development of seed stalks and multiple bulbs, but the net yield of first-grade bulbs was nearly the same in all cases. None of the fertilizer treatments showed marked differences, however, in any respect.

Onion Breeding. (M. E. Snell.) The past summer was very favorable for breeding work. Seed production was particularly good with most of the selfed bulbs, but not so good with the crosses which were attempted. Many good groups of bulbs were grown from seed sown in the field, as well as a number of very good lots of sets for planting. For the first time seed from some of the inbred strains and crosses was planted in the greenhouse and later transplanted to the field, with very good results. This method permits a much greater number of bulbs

suitable for parent stock to be grown from limited amounts of seed than where planted directly in the field. It was interesting to observe the marked uniformity of top growth of these transplants from seed which had been inbred for several generations. There was also an opportunity to observe differences in time of normal maturity, which is very seldom possible with onions which are grown from seed sown in the field. The onions grown from sets were also very good in some cases, but frequently a strong tendency to develop seed stalks and multiple bulbs was observed. This is very good evidence that heredity plays an important part in this respect. Several of the strains were sufficiently lacking in one or both tendencies to indicate that much can be done by way of selection to reduce this undesirable though natural tendency of set onions.

Study of Base-Exchange Power and Base Content of Typical Connecticut Valley Soils as Influenced by Heavy Liming and Fertilization. (J. L. Haddock and H. H. Coyle, Jr.) It has been recognized for many years that soils differ in many ways and that all cannot profitably be handled in the same way. In spite of this rather universal understanding we diagnose the trouble and apply the remedy for all soils in a blanket manner regardless of the soil under consideration.

During the spring and summer of 1934, an investigation of three of the most prominent and intensively cultivated soil series of the Connecticut Valley was begun. The object of this investigation was to determine: (1) the possibility of characterizing each soil series as to its possible strength or weakness in available bases; (2) the effect of cropping and fertilization upon the base-exchange Ca, Mg, K, and Na, in the various horizons; (3) the degree of base-saturation in the various horizons of cropped and natural soils of the same series.

The study thus far has indicated that in spite of heavy fertilizer and lime treatment the exchange-bases remain remarkably constant, even on light, sandy soils. The greatest influence on the availability of these bases seems to be the total exchange power of the soil. This is, of course, influenced by texture and soil humus.

The Absorption by Food Plants of Chemical Elements of Importance in Human Nutrition. (A. B. Beaumont in cooperation with E. B. Holland.) A new project under this title was started in the spring of 1934. Spinach and white egg turnips were grown in succession in a fine sandy loam placed in cement tanks. In an attempt to increase the absorption by the plants of certain elements, increasing quantities of chemically pure compounds were applied to the soil in addition to a uniform application of a fertilizer containing N, P and K. Allowances were made in the fertilizer for K and P in the additional material. Aside from the uniform fertilizer treatment, the applications were as follows:

	Kg per hectare
Calcium sulfate ($CaSO_4.2H_2O$)	2000
	4000
	6000
Calcium phosphate, primary ($Ca(H_2PO_4)_2.H_2O$)	1464.5
	1929.0
	4393.5
Potassium iodide (KI)	8
	16
	24

Yields of the two crops from the several treatments were rather uniform. The medium application of potassium iodide increased the yield of turnips, but not of spinach, more than any other treatment, but the difference was not great enough to be considered statistically significant. Chemical analysis of these crops is being made.

In another experiment under the general project of absorption of chemicals, a preliminary pot experiment was conducted with the same type of soil as that used in the tanks mentioned above, for the purpose of determining the limits of tolerance of plants for iron and copper compounds. Ferric oxide, ferric sulfate, ferrous sulfate, and copper sulfate were applied to unlimed and limed soils having reactions of pH 4.4. and 5.4 respectively, at rates of 10, 20, 40, 80, 160, 320, 640, 1280, 2560, and 5120 pounds per acre. A marked difference was noted in the concentration of materials causing injury in soils of different reactions, toxic concentrations being lower in the more acid soil; but ferric oxide was not toxic in any concentration used. Spinach and turnips were grown in succession in the same soil. Concentrations at which toxicity definitely appeared were as follows:

Crop	Soil Acidity (pH)	Pounds per Acre Causing Injury		
		Ferrous sulfate	Ferric sulfate	Copper sulfate
Spinach	4.4	1,280	640	320
	5.4	5,120	2,560	1,280
Turnips	4.4	640	320	160
	5.4	...*	...*	1,280

*Not toxic in concentrations used.

Potato Variety Tests. (E. F. Gaskill, R. W. Donaldson, and W. S. Eisenmenger.) An increased interest in potato production in Massachusetts led to a yield test of several of the varieties considered adaptable to New England conditions. The results from plots one-eleventh acre in area showed the following yields calculated on an acre basis: Green Mountain, 635 bushels; Chippewa, 635; Russet Rural, 593; Katahdin, 506; and Golden, 456.

A compilation of results from quality tests indicates the following:

Green Mountain: Good flavor, dry and mealy when either boiled or baked, attractive white color. Many of these potatoes were too large for market, a few were hollow hearted, and they had a decided tendency to throw prongs.

Chippewa: Good flavor, dry and mealy, attractive white color, shallow eyes, smooth, and very even size.

Katahdin: Good flavor, dry and mealy, attractive white color, very smooth, seem to take a little more time to cook.

Russet Rural: Good flavor, dry and mealy, seem to require more time to cook than any of the preceding varieties. Too mealy when boiled, but very satisfactory when baked. Skin rough, dark, and not attractive. Size very even, very few large or pig potatoes.

Golden: Poor flavor, rather flat, the least mealy of the five varieties. Objectionable yellow color. This variety tends to sprout early, several potatoes having started to sprout as early as October 15.

Annuals as Emergency Hay or Green Manure Crops. (E. F. Gaskill, R. W. Donaldson, and W. S. Eisenmenger.) Plantings of summer annuals were made June 1 to determine their relative yields for emergency hay or green manure

crops. Soybeans were sown in 30-inch rows at the rate of 1 bushel per acre, and broadcast and drilled at the rate of 2 bushels per acre. Soybeans (2 bushels per acre) were mixed with either Japanese millet, Hungarian millet, or Sudan grass (10 pounds per acre) and sown broadcast. Soybeans were sown in 30-inch rows and the millets and Sudan grass seeded after the soybeans were 4 inches high. Results for this season indicated that the mixtures sown broadcast — soybeans and Japanese millet, soybeans and Sudan grass, soybeans and Hungarian millet — ranked first, in order named, as regards yield, weed control, and ease of harvest.

Fine Turf Grasses. (L. S. Dickinson.) On November 30, 1934 all field plots of fine turf grasses were discontinued, with the exception of a series of 32 plots repeated four times, and used to continue investigations concerning the need of pre-seeding fertilizers for lawns and fine turf areas.

The pre-seeding fertilizer studies were started in 1930, the grass beng grown in boxes in which heat, fertilizer, soil, and water were controlled. In 1931-1932 the studies were repeated but with only soil and fertilizer controlled; the boxes were placed out of doors and the grass was subjected to the daily weather conditions. In 1933-1934 the studies have been conducted on typical fine-turf soil, and with the grass growing under natural conditions. To date, the results obtained correlate very closely and it is becoming more obvious that on normal soils, a single phophorus carrier is all the pre-seeding fertilizer that is necessary or desirable for the fine turf grasses, Colonial bent and Kentucky blue grass.

Some progress was made in an attempt to classify the soils on the best and poorest putting greens, for the purpose of establishing definite soil standards; but lack of funds made it necessary to discontinue the work before definite results could be obtained.

Further tests were made with a non-mercuric fungicide for the control of certain fungous diseases of turf grasses. The tests showed the fungicide to be effective on laboratory cultures and against weak fungous attacks in the field.

COOPERATIVE TOBACCO INVESTIGATIONS

Conducted by the Bureau of Plant Industry, United States Department of Agriculture, in Cooperation with the Massachusetts Agricultural Experiment Station

C. V. Kightlinger, U. S. D. A., in Charge

Black Root-Rot. (C. V. Kightlinger.) In continued investigation, numerous strains of Havana Seed tobacco were tested comparatively in the field in 1933 (the fourth year of the investigation), in the attempt to find strains which will be satisfactory under Connecticut Valley conditions for resistance to black root-rot, type of plant, type and quality of leaf, and gross producing capacity.

One strain was Havana Seed of the sort that is grown commonly in the Connecticut Valley. When grown under favorable conditions, it is acceptable for type of plant, type and quality of leaf, and gross producing capacity, but it is susceptible to black root-rot. This strain was used as a standard for rating new strains for type and quality. Another strain was Havana Seed 142A3 which is satisfactorily resistant to black root-rot, and is ordinarily satisfactory for gross producing capacity under conditions favorable to the development of the disease. This strain was used as a standard for rating new strains for resistance to black root-rot and gross producing capacity under such conditions. Seventeen strains were tested in 1933, four of which had been grown for the first time in 1930, five in

1931, five in 1932, and three were first grown in 1933. In one case all of the strains were grown on land which was relatively free of black root-rot promoting conditions. In another case all of the strains were grown on land which was favorable to severe development of the disease. Twelve of these new strains were selected for further testing in 1934.

The production of these twelve new strains and the controls in 1933 was as follows:

Strains of Havana Seed Tobacco	Grown on land relatively free of black root-rot promoting conditions			Grown on land favorable to severe development of black root-rot		
	Yields per acre Pounds	Grade index	Crop index	Yield per acre Pounds	Grade index	Crop index
Common strain	2077	.394	818	1445	.352	509
142A3	2159	.415	896	2012	.383	771
New strains No. 13	2203	.412	908	1974	.437	863
New strains No. 18	2148	.414	889	1890	.403	762
New strains No. 22	2112	.408	862	1854	.431	799
New strains No. 23	2006	.418	839	1944	.428	832
New strains No. 25	2169	.414	898	2210	.444	981
New strains No. 27	2128	.417	887	2066	.431	890
New strains No. 29	2379	.406	966	2236	.429	959
New strains No. 30	1895	.416	788	1743	.410	715
New strains No. 31	2345	.411	964	2168	.415	900
New strains No. 32	2135	.392	838	1947	.411	800
New strains No. 33	1879	.438	823	1658	.408	676
New strains No. 34	1933	.418	808	1881	.389	732

The grade index is a number expressing the grading quality produced by a strain of tobacco under the conditions of the experiment. It is based upon the percentage yield of each grade of tobacco and the relative values of the different grades, which are as follows:

Light wrappers	1.00	Long darks (19″ and longer)	.30
Medium wrappers	.60	Dark stemming (17″ and shorter)	.20
Long seconds (19″ and longer)	.60	Fillers	.10
Short seconds (17″ and shorter)	.30	Brokes	.10

The grade index is arrived at by multiplying the percentage yield of each grade by its respective rating given above, and adding the products. The crop index is a number expressing relative crop value. It is derived by multiplying the total production of tobacco in pounds per acre by the grade index value. Grade index and crop index, and the adopted relative values of the different grades of tobacco given above, do not necessarily represent current commercial values and prices.

All of these new strains of Havana Seed tobacco have proved to be satisfactorily resistant to black root-rot. With respect to type, some of these strains closely resemble certain good strains of common Havana Seed tobacco; and with respect to yield and quality, they almost always surpass the common strains.

Strains 13, 22, and 29 have proved to be sufficiently promising in small plot tests to justify trial on a considerably larger scale in numerous localities in the Connecticut Valley, in order to determine their worth in practical culture. Strain 13 was grown on larger acreage in one locality in 1933 and in this instance proved to be highly satisfactory. Strains 13 and 22 were grown in larger acreages in several localities in 1934. Strain 13 proved to be satisfactory in all cases, and strain 22 in all cases except one. Arrangements have been made for testing strains 13, 22, and 29 on a larger scale in 1935.

DEPARTMENT OF ANIMAL HUSBANDRY

Victor A. Rice in Charge

As noted elsewhere (see report of Chemistry Department), the work in animal nutrition formerly carried on by that department was transferred during the year to the Department of Animal Husbandry. One old project has been brought to completion and another is being continued in cooperation with Chemistry (see report of that department), and two new projects have been organized.

The Proper Supplementary Ration for Milking Cows on Pasture. (J. G. Archibald, V. A. Rice, R. C. Foley, and C. H. Parsons.) This project is a further development of work done in 1931 and 1932 on the possibilities of greatly reducing the grain fed to cows on pasture. The abnormally dry season and consequent short pasturage interfered somewhat with the progress of the work but some results were secured that appear significant.

One group of cows receiving only 43 percent as much grain as did another group gave 93 percent as much milk, maintained their weight, and did not show a markedly higher shrinkage in milk flow (37.3 percent contrasted with 34.9 percent). The ratio of grain fed to milk produced in this group was 1: 10.7 for the entire season, while in the other group it was 1: 4.3. From May 21 to July 20 it averaged 1:12.8 for the low grain group and at one time in June was as wide as 1:14.8, some of the cows receiving no grain at all. The tentative conclusion has been drawn that "the necessity for even moderate grain feeding when pastures are good is not apparent." The work will be repeated next season.

The Relative Efficiency for Milk Production of Proteins from Animal and Vegetable Sources. (J. G. Archibald, V. A. Rice, and C. H. Parsons.) This project has only recently been started. This season the relative value for milk production of dry rendered tankage versus a mixture of soybean meal and cottonseed meal is being investigated. Twenty-four cows are included in the trial, being divided into two groups of twelve each, which are fed identically except that about half of the protein for one group is obtained from tankage, and a similar amount for the other group is from soybean and cottonseed meals. The cows are being fed by the double reversal method, feeding periods being thirty days in length with a preliminary period of ten days. The experiment will continue to the close of the barn feeding season in April, 1935.

The Comparative Efficiency of Dairy Cattle in Converting Feed into Milk. (V. A. Rice and W. T. Smith.) This study was divided into three phases. First, a preliminary study was conducted with six Holstein Advanced Registry Class A test cows in the Massachusetts State College dairy herd. These animals varied from two to ten years in age, and from nearly fresh to eleven months along in lactation. An accurate record was kept of all feed consumed and all milk produced for one week.

For purposes of computation and comparison, the milk of each cow was reduced to a 4 percent fat corrected basis according to Gaines and Davidson's formula (4/10 M.+15 F. where M.=Milk and F.=Fat). The amount of T. D. N. ingested was ascertained and the amount of T.D.N. yielded in the milk. The latter figure divided by the former gave the average efficiency of converting feed into milk, which for this group was 32.22 percent.

Second, a number of records as compared in the Guernsey Advanced Register, volumes 18 to 21, were studied by similar methods, and an average efficiency of 31.20 percent was found.

Third, the records of the mixed Holstein and Jersey herd of the Massachusetts Agricultural Experiment Station for the years 1920 to 1933 inclusive were studied by similar methods. They included a total of 42 cows with 136 lactations. The results gave a range of efficiency from a low of 18.12 percent to a high of 39.60 with an average of 29.35. That is to say, on the average, these cows returned 29.35 pounds of total digestible nutrients in the form of milk for every 100 pounds of total digestible nutrients fed.

The following four points seem well established.

1. There was a gradual rise in efficiency of feed conversion with age from two years to about nine years.
2. The cows that showed a low efficiency at two years were low all through their lives, and those high at two years were high throughout their lives.
3. Percentage efficiency of feed conversion is apparently an inherited quality.
4. As would be expected, there was a positive correlation between amount of production and efficiency; that is, the higher producing cows were the more efficient converters.

Inheritance of High Milk Production in the May Rose Family of Guernsey Cows. (V. A. Rice.) A study was made of all the direct male offspring of the Guernsey bull, May Rose King, through his 15 sons, their sons, grandsons, etc. In this way it is possible to trace the lines of high production back to their source, and to ascertain which lines of breeding at the present time are the more homozygous for high milk production.

Further studies along this line will reveal the methods of breeding which have given rise to these more homozygous strains.

A Study of Bull Indexes and the Formulation of the Intermediate Bull Index. (V. A. Rice.) The Mount Hope Index, based on the theory of partial dominance of high milk production and low fat percentage, the Gifford Index, using merely the daughters' records, and the Intermediate Index, suggested by the author, with the offspring placed halfway between the cows' level of production and the assumed index, both for amount of milk and percentage of fat, were studied for their accuracy and reliability from the standpoint of prognosticating the production of future daughters of a bull after his index has been achieved through the production records of his first ten daughters. The results showed that all three methods were remarkably accurate, but that the Intermediate method was the best.

Further studies were made to determine the value of the Intermediate Index in foretelling the production of the daughters of young untried bulls. The method was to obtain indexes on the sire and two grandsires of the young bull, which were used as the transmitting level of these male animals. The transmitting level for the dam and two granddams was the average of (1) the cow's own record, (2) the index of her sire, and (3) the cow's own index calculated from her daughters' records and the indexes of the sires of said daughters. It was found that a figure comprised of 6/10 of the average of the parental indexes and 4/10 of the average of the grandparental indexes was, on the average, within 6 percent of accuracy.

The Comparative Efficiency of Lambs in Utilizing Feed. (Ralph W. Phillips.) Ten lambs were fed individually for four months and accurate records and analysis of all feeds consumed were obtained, the object being to determine what individual differences exist in the efficiency with which lambs transform feed into meat. The lambs were approximately seven months old when the feeding trial began, and all received the same ration.

Striking variations in efficiency were noted, the most efficient lamb requiring 6.09 pounds T. D. N. per pound of gain and the least efficient 11.63 pounds T. D. N. per pound of gain, an increase of 90.9 percent in the cost of a pound of gain.

The above figures indicate an obvious advantage in developing a more efficient strain of sheep. Plans for the continuation of this work include the testing of the efficiency of offspring of the lambs mentioned above, and of future offspring of the dams of the lambs already used, to determine whether or not the ability to utilize feed efficienctly is inherited.

The Development of the Tunica Dartos Muscle in Rams. (Ralph W. Phillips.) Recent experimental work has demonstrated conclusively that the scrotum has a thermo-regulatory function maintaining the testes at a temperature below that of the body cavity, and that the tunica dartos muscle provides the mechanism for this temperature regulation, functioning very much as a thermostat to maintain a fairly constant temperature.

The reaction of isolated strips of the tunica dartos to temperature changes was observed in ram lambs at 3, 6, 9, 12, 15, 18, 21, 24, and 27 weeks of age. The first marked reaction to a temperature change was observed at 12 weeks of age. In lambs castrated before 12 weeks of age the tunica dartos had not developed a sensitivity to temperature changes; and in lambs castrated after this sensitivity developed, there was a tendency for the sensitivity to be lost after a period of time.

The above results indicate that the development of the temperature sensitivity is dependent upon some substance, probably the testes hormone. The stage of development of testes removed at the time of studying the dartos strips is being studied, and further work is being planned to test the above hypothesis.

Progeny Performance in Sheep. (Clarence H. Parsons.) A cooperative project with the U. S. D. A. was started in 1932 using the Southdown and Shropshire flocks of sheep in order to determine the inherent capacity of specific families or strains of sheep for the utilization of feed and the production of meat and wool, and to improve them by a study of the manner in which they transmit these characters.

A specialist from the Bureau of Animal Industry of the U. S. D. A. visits the college each fall to counsel with a committee from the college in grading the type and body characteristics of all lambs born that year. He also visits the college each spring at shearing time to assist in grading and sampling the wool from all the sheep. The carcasses of all sheep slaughtered at the college are graded. The sheep are weighed regularly and accurate feed records kept.

This work provides a definite and complete record of each sheep which may be used for comparing daughters with their dams, etc., and which is on file after the individual is no longer available for inspection. The contact with a specialist of the Bureau of Animal Industry helps to keep the records uniform and comparable with similar records at other institutions. The records of this work will be of increasing value as time goes on and more records are available. Already much valuable information has been secured regarding the offspring of a few rams, and the present Southdown ram was secured on the basis of similar records kept on his lambs at the Morgan Horse Farm, Middlebury, Vermont.

DEPARTMENT OF BACTERIOLOGY

Leon A. Bradley in Charge

The Azotobacter Soil Plaque Test for Determining Soil Nutrient Deficiencies. (James E. Fuller.) This was a continuation of an investigation previously reported (Mass. Agr. Expt. Sta. Bul. 305, p. 15, 1933). The technique of Sackett (Colo. Agr. Expt. Sta. Bul. 375, 1931) was employed in setting up the soil plaque tests. Because the presence of Azotobacter in the soils tested could not be depended on, all plaques were inoculated with Azotobacter. In addition all plaques were treated with calcium carbonate, and mannite was used as a source of energy. Chemical tests for available phosphorus were made according to the technique of Truog (Jour. Amer. Soc. Agron. 22:874, 1930). The soils examined were from ten of the college farm and experiment station plots and from three private garden plots. The soil plaque tests indicated that all of the soils were deficient in available phosphorus, in spite of the fact that all of the plots represented produced satisfactory crops. The Truog tests revealed a rather wide variation, but no actual deficiency in the available phosphorus of the soils. The study indicated that the Azotobacter soil plaque test is not a dependable indicator of the available phosphorus content of the rather acid sandy loam soil which is common in this region. Our results agreed with those published by Walker and associates (Jour. Amer. Soc. Agron. 22:642, 1930). Details and data will be furnished on request.

Calcium Metabolism of Nitrogen-Fixing Bacteria. (James E. Fuller.) This study was undertaken on the premise that calcium might exert some stimulating influence, aside from the neutralization of acids, on the metabolism of Azotobacter. Twelve strains of Azotobacter, freshly isolated from soil at the beginning of the experiment, were cultivated on a medium free from calcium (the medium was composed of K_2HPO_4, mannite, and distilled water). Nitrogen-fixation on the medium was determined and compared with nitrogen-fixation on the same medium to which varying quantities of calcium carbonate were added. As much nitrogen was fixed on the calcium-free medium as in the presence of any of the quantities of calcium carbonate, and as the concentration of calcium carbonate was increased the amount of nitrogen fixed was apparently decreased. Cultures grown on Ashby's medium gave the smallest amount of nitrogen fixed in the study. The twelve Azotobacter strains, after being cultivated for two years on the calcium-free medium, appeared to have unimpaired nitrogen-fixing power. Results were the opposite of those anticipated, and lime appeared to be unimportant in the nitrogen-fixing metabolism of the organism. The medium employed contained no demonstrable calcium except that purposely added.

The Influence of Bile and Bile Salts on Bacterium Aerogenes. (James E. Fuller.) The purpose of this study is to investigate the possibility that *Bacterium aerogenes*, generally regarded as a non-fecal organism, may acquire characteristics of *Bacterium coli* of fecal origin. Twenty-five strains of *Bacterium aerogenes* isolated from water were chosen. These strains were proved, by repeated tests, to be negative for the methyl red test and positive for the Voges-Proskauer, sodium citrate, and uric acid tests. These strains have been cultivated for three months in a fluid medium composed of one percent each of Difco peptone, Difco lactose, and K_2HPO_4, in distilled water. The strains were set up in three series of cultures: to one was added one percent of sodium taurocholate; to another one percent of sodium glycocholate; and to the third one percent of ox bile. Incubating temperature was 37°C. Cultures were transferred once each week, and once each month

they were tested for their methyl red, Voges-Proskauer, sodium citrate, and uric acid reactions. To date the cultures have shown a tendency to give variable reactions to the Voges-Proskauer test. The reactions to the other tests have not changed. This study is a part of the project on the biological studies of bacteria of the Coli-Aerogenes group.

The Bacteriostatic Action of Dyes with Gram Positive Cocci. (James E. Fuller and Morrison Rogcsa.) It is common practice to employ one or more dyes in a presumptive medium for water analysis, to inhibit the growth of gram positive bacteria which might interfere with the tests for the Coli-Aerogenes group. This study was undertaken to determine the concentrations of gentian violet, crystal violet, basic fuchsin, and acid fuchsin which would prevent the growth of gram positive cocci (staphylococci, hemolytic and non-hemolytic streptococci, sarcinae, and micrococci). Basic fuchsin exerted the most pronounced bacteriostatic effect, crystal violet and gentian violet following in the order named. Acid fuchsin had little bacteriostatic effect under the conditions of the experiment. Streptococci were more resistant to the dyes than were the other organisms studied. Acid production by the various organisms was studied, and it appeared that organisms which produced more acid were more resistant to the dyes employed. Excellent and extensive studies of bacteriostatic action of dyes have been reported by Churchman and by Stearn and Stearn. The present study was carried out in more specific detail than their work. This was related to the project on the biological studies of the Coli-Aerogenes group.

The Indol Tolerance of the Coli-Aerogenes Group of Bacteria. (Ralph L. France.) The results of this investigation indicated: (1) that the indol tolerance of the various strains under investigation cannot be used as a basis for differentiating the fecal forms from the non-fecal forms; (2) that a dilution of 1:2,000 of indol inhibited the growth of all the strains studied; and (3) that there was a greater variation in the indol tolerance of the non-fecal aerogenes strains than in the fecal coli strains.

A Study of the Voges-Proskauer Test. (Ralph L. France.) The results of this investigation indicated: (1) that the Leifson's and O'Meara's reagents for indicating the presence of acetyl-methyl-carbinol in liquid media were equally satisfactory, and that both were more satisfactory than the Standard Methods technique or Werkmann's modification of the technique; (2) that the majority of strains of *Bacterium aerogenes* studied produced acetyl-methyl-carbinol in 24 hours' incubation at 37°C.; (3) that a single incubation period of four days resulted in errors, due to the fact that some strains produce acetyl-methyl-carbinol in one, two and three days, but give negative tests thereafter; and (4) that the more accurate method of testing for acetyl-methyl-carbinol production by members of the Coli-Aerogenes group is to set up sufficient tubes to make the test on each of five successive days.

A Comparative Study of Brilliant Green Bile Broth and Dominick-Lauter Broth with the Standard Lactose Broth in Testing Raw Waters. (Ralph L. France.) The results of this investigation indicated: (1) that the Dominick-Lauter broth did not compare favorably with the brilliant green bile broth or the standard lactose broth when used as a presumptive medium; (2) that the brilliant green bile broth was a more satisfactory presumptive medium than the standard lactose broth; and (3) that the so-called "parallel-tubing" method of confirming the lactose broth tubes by inoculation from them into brilliant green bile broth

tubes was no more satisfactory than the use of the brilliant green bile broth in place of lactose broth as a presumptive medium.

A Comparison of Several Media for Determining the Bacterial Content of Milk by the Plate Count Method. (Ralph L. France and Bernard E. Supowitz.) The results of this investigation indicated: (1) that the Devereux "yeast extract" agar was not a satisfactory medium for plating raw and pasteurized milk; (2) that an exhaustive study of the nutritive requirements of the common milk organisms is needed; and (3) that an incubation temperature of 32°C. is more satisfactory than the present standard temperature of 37°.

Laboratory Service. (Ralph L. France.) Following is a list of the number and types of examinations made in the laboratory during the past year:

Milk (bacteria counts)	997
Water	80
Miscellaneous:	
*Butter Fat (Milk)	48
*Total Solids (Milk)	1
Sediment (Milk)	7
Added Water (Milk)	1
Throat Swabs	10
Smears	2
Total	1,146

*Analyses made by the Feed Control Laboratory.

DEPARTMENT OF BOTANY

A. Vincent Osmun in Charge

Downy Mildews of Cucumber and Lettuce. (W. L. Doran.) Greenhouse cucumbers were sprayed with resin 1:135[1] or Bordeaux mixture 3:3:50, four times at intervals of one week, and inoculated with *Peronoplasmopara cubensis* after the first and third applications. Resin was of some benefit, but was inferior to the Bordeaux mixture in preventing infection. Resin injured the foliage slightly, but more than did Bordeaux mixture.

Cucumbers were grown in soil to which the following salts of copper in these amounts per square foot had been applied: cupric aceto–arsenite (1 to 4 grams), cupric carbonate (2 to 4 grams), cuprous cyanide (2 to 4 grams), copper–lime dust 80-20 (10 to 30 grams), copper sulfate (3 to 5 grams), or copper sulfocarbolate (3 to 6 grams). No protection against infection of the cotyledons of the seedlings by *P. cubensis* resulted.

The dates of the first appearance of downy mildew of cucumber in the fields here (as on September 4 in 1934) have been noted and recorded for the past ten years. Years in which the disease has appeared early (August 4 to 15) have averaged 72 percent more inches of rain and 57 percent more rainy days in July than have years in which the disease appeared late (August 18 to September 4). The weather of August seems to have less effect than does the weather of July.

Infection of lettuce by *Bremia lactucae* was prevented, well and equally well, by Bordeaux mixture 4:4:50, 2:2:50, and 1:1:50, applied 6 times at intervals

[1]For method of preparation, see Mass. Agr. Expt. Sta. Bul. 293, p. 16, 1933.

of one week. Resin 1:125 similarly applied was slightly less effective, and there was very poor control with a 0.35 percent solution of soap. The only one of these materials by which the growth of plants was significantly retarded was Bordeaux mixture 4:4:50.

Forty strains of lettuce[2] were grown in the greenhouse and inoculated with *B. lactucae* when they were one, two, and three weeks old. Only the following strains seemed markedly resistant to infection: Blonde Pionnel (Clause), Merveille d'Hiver (Clause), Batavia Beau Jolaise (Clause), Batavia White Paris (Bulleri), and May Wonder (Benary).

Eggplant Wilt. (E. F. Guba, Waltham.) Study has substantiated recent published reports that seed carriage of the causal fungus (*Verticillium albo-atrum* R. & B.) may occur. Infected seed was obtainable only from fruit showing the characteristic brownish discoloration of the fibrovascular bundles in the blossom or distal half. A water-bath temperature of 117.5°F. for 30 minutes was lethal to the fungus, while 115° for the same period was not lethal. Preliminary tests indicate that the former hot-water treatment is not injurious to eggplant seed.

Control of Greenhouse Vegetable Diseases. (E. F. Guba, Waltham.) The Bewley tomato hybrids which were crossed with Norduke (Mass. Agr. Expt. Sta. Bul. 305, p. 18) show only partial resistance to the leaf-mold fungus *Cladosporium fulvum* Cke. This partial resistance is considered of some value under conditions permitting only light infection and slow development of the disease. Under conditions extremely favorable for infection, this type of resistance is insufficient to make these hybrids suitable for further consideration. It is evident that limited or partial resistance to the disease is all that may be expected from hybridizing varieties within the species *Lycopersicon esculentum* Mill. The hybrids resulting from crossing *L. pimpinellifolium* Mill., a species of tomato immune to the fungus, with three varieties of *L. esculentum* showed in the F_1, a homozygous condition for all characters and immunity; and in the F_2, a heterozygous condition for all characters. Immunity appeared to exist in the ratio of 3:1. Selections from immune individuals are now being grown (F_3 generation) to establish resistant lines and to back cross with the parent varieties of *L. esculentum*, i. e., Belmont, Break O'Day, and Success, for desirable fruit size.

Vegetable Seed Treatments. (E. F. Guba, Waltham.) In a series of trials to determine the value of dry chemical seed treatments on stand of seedlings, the best results were obtained with Cuprocide, Cure-Damp, copper carbonate 18 per cent and 50 percent, zinc oxide, and basic copper acetate. Semesan was generally less efficient. Red oxide compound, Corona P D 7, and basic copper sulfate 52 percent, showed even poorer results. Sanoseed was distinctly unfavorable.

In these tests the dry powders were added to the seed in excess and the surplus removed by screening before sowing.

Causes and Control of Decay of Winter Squash in Storage. (E. F. Guba, Waltham.) Further study has sought to find an efficient, practical method of disinfecting squash prior to storage. Formaldehyde gas generated from 40 percent formaldehyde solution, chlorine from bleaching powder, and sulfur dioxide from burning sulfur were considered. Burning of brimstone at the rate of 5 pounds to 10,000 cubic feet of storage, while possessing excellent disinfecting properties, was injurious to squash. Further work with sulfur dioxide is in progress. Chlorine generated from bleaching powder with hydrochloric acid in in-

[2]Furnished by Dr. O. H. Pearson of Eastern States Farmers' Exchange.

creasing ratios up to 2 pounds of powder to 1 pound of acid to 1500 cubic feet was ineffective. Formaldehyde gas generated from 9 ounces of 40 percent formaldehyde solution with 6 ounces of potassium permanganate in 1500 cubic feet for 12- to 24-hour periods in any number of treatments was efficient for all practical purposes.

The optimum temperature for growth of the causal organisms in general is approximately 78°F., with a few exceptions having a higher or lower optimum within the range of 75° to 85°. The maximum temperature for growth is in the range of 92° to 97°, and the minimum generally at approximately 40°, the exceptions at 33° to 35°.

Infection at the blossom end and particularly at the stem end of the squash is of major importance in loss from decay. Injuries in the rind at harvest become overgrown with a firm, thick callus. Inoculations with decay-producing fungi at injuries in the rind during the harvesting season rarely were followed by decay.

The curcurbit wilt bacterium (*Bacillus tracheiphilus* E. F. S.) outranked all other causes of decay combined.

Tests were conducted to determine the relation of seed inoculation with decay organisms and seed disinfection with chemicals to yield and keeping quality of squash, but results do not warrant a report at this time. The trend of the work suggests the importance of insecticidal and fungicidal treatments in the field and cold storage of the harvested crop, study of which is planned in the future.

Strawberry Gold Leaf or Yellows. (E. F. Guba, Waltham.) One and one-half acres of land were planted to yellows-free and otherwise disease-free Howard 17 for plant production. A supply of more than 100,000 plants for distribution to Massachusetts growers will be available in 1935, all of which appears to be engaged.

Carnation Blight. (E. F. Guba, Waltham.) The following are some of the newer varieties of carnations studied for their reaction to the blight fungus (*Alternaria dianthi* S. & H.):

Slightly Susceptible	Resistant
Scarlet Monarch	Orchid Beauty
Light Pink Abundance	Bonanza
Donna Lee	Mrs. M. Beuerlein
	Ocean Spray
	Joy
	Chief Kokomo
	Mary E. Sim

Oxymethylene dusts (6 percent), mixed with sand in the bench in the proportion of 1.5 ounces per square foot, were injurious to the cuttings even after a delay of 72 hours in planting. Potassium permanganate solution 1-1000, applied as a drench to bench sand inoculated with Alternaria and Fusarium sp., was not a satisfactory treatment for controlling infection of the cuttings although the results are not to be considered final. Old solutions of potassium permanganate appeared to be as satisfactory as new solutions for disinfecting carnation cuttings and on root action, although the results are considered indicative rather than final.

Diseases of Herbaceous Ornamental Plants Caused by Soil-Infesting Fungi. (W. L. Doran.) Work has been continued on the effects of certain soil treatments

on damping-off and on germination and growth of plants.[3] Liquid treatments were applied to soil (3 inches deep in flats) at the rate of 2 quarts per square foot. The number of grams applied per square foot is indicated below. Reference is here made to post-germination damping-off only. Effects on growth as here mentioned are confined to young plants. Conclusions are tentative, not final.

There was no control of damping-off by betanaphthol 4 gms., calcium sulfite 5 to 30 gms., calcium sulfate 15 to 45 gms., charcoal (wood, powdered) 25 to 100 gms., cupric carbonate 2 to 4 gms., naphthalene 20 to 40 gms., o-cresol 10 gms., pentachlorethane or tetrachlorethane 5 to 12 gms.

There was partial, but not always satisfactory control of damping-off by acetone 1:20, aluminum sulfate 30 but not 25 gms., ammonium acetate 40 but not 25 gms., ammonium sulfocyanate 8 but not 6 gms., calcium acetate 20 to 60 gms., calcium chloride 20 to 25 gms., calcium hypochlorite 12 to 16 gms., calcium sulfocarbolate 25 to 50 gms., metallic copper (powdered) 8 to 12 gms., copper acetoarsenite 2 to 4 gms., cuprous cyanide 1 to 4 gms., copper sulfate 3.5 to 5.5 gms., copper sulfocarbolate 6 but not 5 gms., copper-lime dust (80-20) 20 to 30 gms., potassium permanganate 30 to 50 gms., sulfuric acid (sp. gr. 1.84) 6 to 15 gms., zinc oxide 20 to 25 but not 15 gms., and zinc sulfate 10 to 16 gms.

Damping-off was well controlled by ammonium hydroxide 1:30 to 1:50 (but not 1:60), calcium cyanamide 12 to 16 gms., and raw pyroligneous acid 4:100.

Certain treatments injurious to some species were harmless or even beneficial to other species.

Growth of the following species was improved by the treatments indicated: *Campanula medium* and *Digitalis purpurea* by acetone 1:60 and 1:70; Dianthus (9 species) by aluminum sulfate 20 gms.; *Erysimum asperum*, beet, and cucumber by ammonium hydroxide 1:50 (10 days before seeding); *Reseda odorata* and beet by calcium chloride 15 gms.; *Brunnera macrophylla*, *Scabiosa atropurpurea*, *Alyssum argenteum* and beet by calcium cyanamide 10 gms. (10 days before seeding); sweet pea by calcium sulfate 20 to 30 gms.; *Verbena hortensis* by calcium sulfocarbolate 5 to 10 gms.; *Tropaeolum majus* by charcoal 25 to 100 gms.; *Althaea rosea* by cupric carbonate 4 to 6 gms. and by cuprous cyanide 2 to 3 gms.; sweet pea and *Ageratum Houstonianum* by copper sulfocarbolate 3.5 to 4 gms.; *Arabis albida*, *Gypsophila repens*, *Althaea rosea*, beet and cucumber by potassium permanganate 25 to 40 gms.; and *Lupinus polyphyllus* by zinc oxide 15 to 20 gms.

Apple Rust. (E. F. Guba, Waltham.) In cooperation with Dr. J. H. Faull of Harvard University, a small test was conducted to determine the effectiveness of fungicides in controlling apple rust (*Gymnosporangium juniperi-virginianae* Schw.) on Wealthy apple. The results indicate that sulfur fungicides have some value in reducing the amount of infection, but the best of the five materials tested, namely, liquid lime-sulfur and a colloidal paste called Linco, did not reduce infection more than 50 percent of that shown by the controls.

Plant Containers. (L. H. Jones.) An effort is being made to develop a plant container suitable for growing young trees and shrubs in nurseries. The adoption of pot culture in nurseries would lessen the care required in establishing the plant in its permanent location.

The non-toxic effect of copper containers was confirmed by using barley as an indicator plant. Barley is said to be susceptible to small concentrations of copper, the effect being noticed by the lack of formation of grain heads. Tests showed

[3]For earlier work, see Mass. Agr. Expt. Sta. Bul. 305, pp. 19-21, 1934.

that the barley seed formed on plants grown in copper containers was not only viable but also produced good barley seed; i. e., seed of the second generation was not affected by the copper container in which seeds of the first generation were grown.

Absorption of Nutrients by Clay Pots. (H. D. Haskins and L. H. Jones.) Special clay pots without drainage holes were used to ascertain the amount of nutrients absorbed by clay pots in contact with soil. Empty pots on a bench soil absorbed more nutrients than soil-filled pots in glass saucers. Soil-filled pots kept fallow showed a greater gain in nutrients than similar pots containing plants. Evidently some of the nutrients that move from the soil to the pot may be recovered by a growing plant. Quantitative determinations were made in terms of nitrogen, phosphoric acid, potassium oxide, calcium oxide, magnesium oxide, and sulfates.

DEPARTMENT OF CHEMISTRY

W. S. Ritchie in Charge

The Effect of Fertilizer and Cultural Treatment on the Composition of Havana Seed Tobacco. (E. B. Holland and E. Bennett.) Havana seed tobacco has been raised experimentally on the station plots for many years and the web from the various grades of leaf has been analyzed for a sufficient portion of the time to establish positive trends. The results are being summarized and presented in a series of articles covering various phases of the investigation. The first two papers are entitled "Yield and Grades of Havana Seed Tobacco and Seasonal Influences" and "Analyses of Smoking and Cigarette Tobaccos." The immediate continuation of the project will depend on whether any aspects of the work appear to warrant additional study.

Nitrogen Intake of Havana Seed Tobacco in Relation to Nitrogen Synthesis and Quality of Leaf. (E. B. Holland and A. B. Beaumont.) This is a cooperative project with Agronomy and may be considered as embracing two distinct phases i. e., the effect of different amounts of nitrogen and of different forms of nitrogen on the yield and quality of leaf.

The total yield of cured leaf increased with the nitrogen applied, due largely to the increase in the size and weight of dark wrappers and to some of the seconds. The production of light and medium wrappers and long seconds reached the maximum on 164.50 pounds of nitrogen. Higher applications obviously increased the risk of producing a leaf of poorer burning qualities. Seasonal influences had a decided influence on the grades.

Systematic Study of Oil Sprays. (E. B. Holland.) The cooperative study with Entomology of the stability and effectiveness of various miscible oils in controlling orchard insect pests has been continued. In 1933 the miscibles were prepared from special oils containing more unsaturated hydrocarbons than those formerly employed, together with triethanolamine and oleic acid as the emulsifying agent. The oils were supplied by three different manufacturers. A portion of these miscibles, after standing a year, was applied the past season (1934) and proved equal in control to one of the best commercial products used as a standard and did not injure the buds or retard growth. In general a spindle oil requiring only a moderate amount of emulsifier seems preferable for spraying purposes.

The Copper, Iron, Manganese, and Iodine Content of Fruits and Vegetables Used as Human Foods. (E. B. Holland, C. P. Jones, and W. S. Ritchie.) One hundred and twenty-five samples of fruit and vegetables, suitable for human consumption, have been collected and prepared for analysis. The actual work of analyzing the samples has been started and will be continued through the coming year.

Absorption by Food Plants of Chemical Elements of Importance in Human Physiology and Nutrition. (A. B. Beaumont and E. B. Holland.) Under this cooperative project, Agronomy raises food crops under special fertilization to supply samples for the determination of copper, iron, manganese, and iodine in nutritional studies. Samples of spinach and turnips, fertilized with varying amounts of potassium iodide, have been taken and prepared for analysis. These samples will be analyzed during the coming year as part of the preceding project.

Cooperative Analytical Service. (The Department.) Additional cooperative investigations embrace a variety of substances and consume a great deal of laboratory time. Milk and eggs were analyzed for certain ash constituents. Additional samples have been taken to study "dark centers" in turnips. Iron and manganese were determined in greenhouse sands, for flower raising, in cooperation with the Waltham Field Station.

Testing Analytical Methods. (The Department.) The accepted methods for the determination of small amounts of iron, copper, iodine, and manganese in organic materials have been studied and adapted to the needs of the above investigations.

An electrically heated dryer with a forced circulation of air has been constructed during the past season for the preparation of fruit and vegetable samples at a moderate heat and has proved very efficient and time-saving.

Nitrogen Fixation in the Presence of or as a Result of the Growth of Legumes versus Non-legumes Under Certain Defined Agronomic Conditions. (F. W. Morse.) Alfalfa as the legume and barley as the non-legume were sown August 5, 1933, with the intention of continuing the alfalfa for at least two years. The alfalfa was not cut but was allowed to develop as much top-growth as possible for winter protection. The barley was also left to serve as winter cover for the soil and as a store of organic matter for the soil bacteria.

In the spring of 1934, the alfalfa was observed to have been nearly all winter-killed except a narrow strip along the western border of the plots where snow remained longest. The whole field was plowed and prepared for Hungarian millet which was planted on all plots. Nitrogen was withheld from Plots 5, 8, and 10. The results permit a comparison of the effects of leguminous residues with those of non-leguminous residues on the growth of a non-legume, Hungarian millet, together with the effects of the residual nitrogen from 1933 with that of the continuous withholding of nitrogen from Plots 6, 7, and 9. Hungarian millet was seeded on June 9 and cut on August 6, 7, 8, and 9 when in full bloom. During this period there was 6.88 inches of rainfall, which is one of the smallest in our records. The eastern half of the field is more moist than the western half. The millet following barley on the eastern half was superior to that following alfalfa, but on the drier western half the millet on alfalfa residue was superior. These differences observed throughout the growing period are definitely shown in the table of production of dry matter.

PRODUCTION OF DRY MATTER, POUNDS PER ACRE.

	Plots 5, 8, 10 With Residual Nitrogen*		Plots 6, 7, 9 Without Residual Nitrogen	
	Western Half	Eastern Half	Western Half	Eastern Half
Legume sections	4,051	3,988	4,267	3,937
Non-legume sections	3,395	4,729	3,343	4,349

NITROGEN IN SURFACE SOIL, PERCENT.

Legume sections	.139	.156	.137	.162
Non-legume sections	.149	.176	.145	.172

*Nitrogen at the rate of 45 pounds per acre was applied in 1933, and in the preceding years 1924, 1926, 1928, 1930, and 1932.

The plots with residual nitrogen were definitely ahead of those without it on the non-legume sections, but on the legume sections the residual nitrogen was without effect.

Hungarian millet was previously grown in 1932 as the non-legume. In that season the average production on the non-leguminous sections without nitrogen was 3464 pounds of dry matter per acre, and on the similar sections with applied nitrogen it was 5385 pounds of dry matter per acre. This year the average production on the eastern and western sections taken together was 3846 pounds of dry matter per acre without nitrogen, and 4062 pounds per acre with the residual nitrogen from previous applications. These two crops contained respectively 32.76 pounds and 36.59 pounds of nitrogen as determined by analysis of their samples. Application of 45 pounds per acre of nitrogen in 1933 and plowing under the crop grown upon it gave but 216 pounds more dry matter and 3.83 pounds increase in recovered nitrogen over the plots that have been without nitrogen or legumes since 1923.

Soil samples were secured from all the plot sections on August 23 and 24, representing the surface soil to the depth of 8 inches. Total nitrogen was determined in each sample. The results are tabulated in the same manner as dry matter in the crops.

The figures for the non-legume sections are positively higher than for the legume sections, showing no tendency toward exhaustion of soil nitrogen in the continued absence of legumes.

Chemical Study of Cranberries. (F. W. Morse.) A method for the determination of quinic acid in cranberries has been developed and applied to numerous samples of leading varieties.

Citric, malic, benzoic and quinic acids are found in the cranberry. A water solution of cranberry pulp or of cranberry juice is exactly neutralized with barium hydroxide. To the neutralized solution is added three times its volume of 95 percent alcohol. After thoroughly mixing the alcohol with the cranberry solution, the barium citrate and barium malate are precipitated, while barium benzoate and barium quinate remain in solution. Enough more alcohol is added to make a definite volume, as 250 cc. or any other convenient volume. The precipitate is removed by filtration and a measured volume of solution is used for quinic acid measurement by precipitating the barium with potassium sulfate. From the amount of barium, its equivalent quinic acid is calculated. Barium benzoate cannot be separated from the barium quinate. Benzoic acid may be determined by a special method in another portion of cranberry and deducted from the

quinic acid percentage. Since no one has found more than .1 percent of benzoic acid in cranberries, and more commonly .05 percent is reported, one may deduct one of those quantities from the percentage of quinic acid calculated from the barium and be close to the truth for any sample of cranberry.

Leading varieties of cranberries analyzed by this method have shown the following percentages of quinic acid corrected by deducting .05 for benzoic acid.

	Percent
Early Black	.81 — .96
Howes	1.05 — 1.20
Centennial	.88 — 1.00
McFarlin	.91 — 1.00
Holliston	.74 — .86
Chipman	.82 — 1.02

These varieties constitute the bulk of the cranberries on the market as Cape Cod cranberries.

A Study of the Availability of Soil Potash with the Object of Developing a System of Diagnosis for the Soils of the State. (F. W. Morse.) The project has been brought to the final stage of preparation for publication as a bulletin. The soils of the State are naturally strong in potash, but vary widely in their ability to supply it to crops. Heavy, natural grass soils with normal rainfall do not respond to potash fertilizers. Light, easily tilled soils require additional soluble potash to reenforce the soil potash dissolved in the limited supply of water held by them.

Mineral Requirements for the Growth of Dairy Heifers. (J. G. Archibald and E. Bennett.) During the year the work in animal nutrition was transferred from the Department of Chemistry to the Department of Animal Husbandry. This change made available the much larger college herd for nutrition studies and involved the dispersal of the small experiment station herd and the conversion to other purposes of the building in which this herd had been housed. This project was therefore brought to completion and results from it will be published during the year.

Studies in the Chemistry of Pasture Grass. (J. G. Archibald and E. Bennett.) Results of a three-year study of the composition of six species of grass and one species of legume, all grown without fertilizer other than that residual in the soil, have been submitted recently for publication in the *Journal of Agricultural Research.*

The project was continued this season to note differential effects (if any) of a complete fertilizer on the composition of the several species. The work has been seriously interfered with this year by winter-killing and re-seeding difficulties, and it will be necessary to repeat it during at least one more season.

This project is now being conducted in cooperation with the Department of Animal Husbandry, due to transfer of the project leader to that department.

THE CRANBERRY STATION
(East Wareham, Massachusetts)

H. J. Franklin in Charge

Injurious and Beneficial Insects Affecting the Cranberry. (H. J. Franklin.)

Control of the Cranberry Root Grub (*Amphicoma vulpina*). Flooding to control this pest, described in the last two annual reports of the station (Bulletins 293 and 305) was tried on four different bogs this season with practically complete success on three and partial failure on the fourth.

Dust Insecticides. Extensive tests of dust mixtures containing high grade pyrethrum, low grade pyrethrum, rotenone, and nicotine were conducted to determine their relative value as controls for the blunt-nosed leafhopper and the blackheaded fireworm. The high grade pyrethrum mixture proved much more satisfactory against both these pests than the others, cost and effectiveness both considered. The nicotine dusts, though prepared especially for these tests by the chemists of a large corporation dealing in tobacco products, proved nearly worthless. The rotenone dusts were effective when used in sufficient strength and quantity, but they were much more expensive than the high grade pyrethrum mixture. Low grade pyrethrum was not very effective.

The Grape Anomala (*Anomala errans* Fab.[1]). Grubs of an unknown kind were found abundant in the turf of Mr. Royal Turner's bog in Sharon, Mass., on April 10 and May 10, 1934. They had very seriously damaged three or four acres of the bog by devouring the finer roots of the vines much as the cranberry root grub (*Amphicoma*) does. Large areas had become rather bare of vines on this account. Many of the grubs were dug out of the soil on May 10 and placed in sand in cans. Some of these cans were opened on June 1 and nearly all the grubs were found to have pupated. More of the cans were opened on June 15, and nearly all the pupae had then changed to beetles. Only one pupa remained, this being reddish brown and about a third of an inch long. It wriggled actively when disturbed. The beetles varied in color from pale yellow to black, the yellow ones being far more numerous than the darker forms. They could fly but did so but little. They were clever at feigning death and did so very often. They commonly proceeded to bury themselves in dirt or sand when they were placed on it. They would not eat cranberry or apple foliage but ate grape leaves very freely in confinement. On June 25, they were found to have laid many eggs in the sand in the cans in which they were confined. The eggs were scattered singly through the sand. They were milk white, smooth, shiny, oval, and about one and a half millimeters long. Some of the beetles were alive and some dead in the cans on July 2. All were dead July 6. The eggs had not begun to hatch July 6, many had hatched July 8, and all were hatched on the morning of July 9. There seems to be no record of a previous appearance of this insect as a cranberry pest. The infestation of Turner's bog was probably made easy by the considerable growth of grape vines around it.

The flooding treatment now advocated for the control of the cranberry root grub (see above) was applied and almost entirely eradicated the *Anomala* infestation.

The Chain-spotted Geometer (*Cingilia catenaria*). In July 1934, there was a serious outbreak of the caterpillars of this insect in Falmouth, Mashpee, Sandwich and Barnstable. It was most harmful in East Falmouth, Mashpee, the south part

[1]Identified by H. C. Fall.
Generally named *Anomala lucicola* Fab. in entomological literature.

of Sandwich, and the west part of Barnstable. It was so severe in places in Sandwish, Mashpee and around Cotuit that all forest undergrowth was completely defoliated and turned brown. The worms were abundant for only a mile or two east of Hyannis and were not found much west of the main highway running from Bourne to Falmouth. They did considerable injury on some cranberry bogs around Waquoit and in Mashpee and seriously harmed some strawberry patches in East Falmouth. They usually defoliated withe-rod (*Viburnum cassinoides*) and wild indigo (*Baptisia tinctoria*), evidently being especially fond of them. The following plants were seriously attacked generally: Black huckleberry, dangleberry, scrub oak, willow, wild lupine (*Lupinus perennis*), beach plum (*Prunus maritima*), wild black cherry, and locust (*Robinia* sp.).

Datanas. Datana caterpillars were so abundant on small patches of a bog in Plympton that they defoliated the vines. They were fully grown on the bog on July 20, 1934. A lot of them pupated in confinement on July 30 and 31. The species was identified from the caterpillars by Mr. Carl Heinrich of the Bureau of Entomology, U. S. D. A., as *Datana drexelii* Hy. Edw.

COOPERATIVE CRANBERRY INVESTIGATIONS

Conducted by the Bureau of Plant Industry, United States Department of Agriculture, in cooperation with the Massachusetts Agricultural Experiment Station

H. F. Bergman, Senior Pathologist, U. S. D. A., in Charge

Development of Strains of Cranberry Resistant to False Blossom. (H. F. Bergman and W. E. Truran.) Nearly 500 cross pollinations were made during the past season. These include Early Black x Shaw's Success, Centennial x Early Black, Paradise Meadow x Early Black, and reciprocal crosses between Early Black and McFarlin and between Shaw's Success and McFarlin. Although the season was very unfavorable, 25 to 50 percent of the pollinated flowers produced fruit. The best results were secured in crosses of McFarlin by Early Black, in which 48.4 percent of the pollinated flowers developed fruit. Only 24.5 percent of the flowers of Centennial pollinated by Early Black matured fruit.

Oxygen Content of Flooding Water in Relation to Injury to Cranberry Vines. (H. F. Bergman and W. E. Truran.) Observations were made on a number of bogs to determine the extent of injury to vines in relation to the depth of the winter flood. On some of these bogs the winter flood was let off in April and on others it was held until May 20 to 23. No differences were observed in the extent of injury to vines on bogs on which the water was held late as compared with those on which it was let off in April. The amount of injury is directly related to the depth of the winter flood, but depends also upon the character of water supply, density of vine growth, and amount of organic matter in the substratum. Injury ranged from mere retardation in development to death of a large proportion of terminal buds with severe defoliation. On one bog where the winter flood was held until May 23, 60 to 70 percent of the terminal buds were killed on the most deeply flooded areas where the water was 3 to 4 feet deep. On the same bog where the water was not more than 6 to 8 inches deep, only 3.3 percent of the terminal buds were killed. On plots in the most deeply flooded area, which had been sprayed with Bordeaux two or three times during the preceding summer, the vines came through in much better condition than the vines

on adjacent unsprayed plots. Only 22 to 27 percent of the terminal buds on vines on the sprayed plots were killed and very little defoliation occurred.

Determinations of the oxygen content of flooding water in relation to bud and tip injury were made on a few bogs which were flooded in June. Low oxygen content of the water was found on one bog only. On this bog the oxygen content was below 1.5 mls. per liter over a period of 12 to 14 hours. On most parts of the bog flower buds were not sufficiently developed to be injured, but where more advanced about half of the buds were injured.

Regeneration of Bogs Infected with False Blossom. (H. F. Bergman.) About 0.2 acre of bog planted with Howes, with a moderate infection of false blossom and very weedy, was sprayed July 31 with a solution of sodium arsenite containing 8 pounds of this chemical dissolved in 100 gallons of water and applied at the rate of 1000 gallons per acre. Another part with an area of 0.3 acre was sprayed with a sodium arsenite solution of the same strength but containing 12½ pounds of sodium bisulfite per hundred gallons of solution. Both solutions killed vines and weeds down to the ground but failed to penetrate into underground portions and kill them. New growth from underground parts of cranberry vines and weeds was observed in September.

Spraying and Dusting Experiments. (H. F. Bergman and W. E. Truran.) Bordeaux made up by the 4-4-50 formula, with chemically hydrated lime, and applied at the rate of 350 to 400 gallons per acre was used on three bogs. Two mercurial sprays were used on one bog. Both mercurials were made up in two strengths: ½ pound and 1 pound to 50 gallons of water. The rate of application was the same as with Bordeaux. Only two applications of any of these sprays were made during the season. The amount of rot in berries from sprayed plots, with few exceptions, was reduced to half or less of that in berries from unsprayed plots. On one bog of Howes, two applications of Bordeaux had no apparent effect in reducing rots. The mercurial sprays reduced rots to about the same extent as Bordeaux.

An experiment on the use of mercurial dusts mixed with pyrethrum dust as a combined fungicide and insecticide was carried out in cooperation with Dr. H. J. Franklin. The mixtures were made up to give two different strengths of fungicide: one containing 1 pound of mercurial, 4 pounds of pyrethrum, and 9 pounds of gypsum; the other containing 2-4-8 pounds, respectively, of these ingredients. Two replications of two plots each were dusted with 7 pounds of dust of each strength for both mercurials. A check plot alternated with each dusted plot. The dust was applied June 21, at which time the earliest flower buds were just ready to open. Within two to three days after the dust was applied the leaves of vines on the dusted plots began to turn yellow. This was most marked on plots which had been dusted with mixtures containing two pounds of mercurial. The yellowing of the leaves reached a maximum in about a week, thereafter diminishing gradually, but was noticeable as late as September 1. On two plots, each dusted with two pounds of one of the mercurials, a considerable number of buds, flowers, young fruits, and tips of vines were killed. The yield of these two plots was reduced to one-third to one-half that of check plots. The amount of loss due to fungous rots in berries from plots which had been dusted with two pounds of mercurial was materially reduced as compared with that of berries from adjacent check plots. Some reduction in the amount of rot was effected by dusting with a mixture containing one pound of mercurial but this was not as effective as that containing two pounds.

Storage Tests of Cranberries. (H. F. Bergman and W. E. Truran.) The loss of berries from all plots which had been sprayed twice during the season, either with Bordeaux or with a mercurial spray, was only one-fourth to one-half that of berries from unsprayed plots up to December 1 to 15. Thereafter the difference in the amount of loss in berries from sprayed and unsprayed plots diminished due to the extensive development of late storage rots which had not been controlled by the two applications of spray. The amount of loss due to fungous rots in berries from plots which had been sprayed only once was not as great as that in berries from unsprayed plots but was greater than that in berries from plots sprayed twice.

An experiment to test the usefulness of a commercial preparation sold under the name of "Trioxo PH42"as a preventive of storage rots was also carried out. It is claimed by the manufacturers of this product that if cranberries are exposed to the gas liberated from it (formaldehyde) for 48 hours in a confined space, loss due to rots in storage will be prevented. Tests were made on 54 boxes of Early Blacks from the State Bog, of which 27 were treated with "Trioxo" as directed and the other 27 held as controls. After the treatment it was observed that many of the berries in the treated lot were injured. An examination of berries taken from the top and bottom of each of four boxes of the treated lot showed that the percentage of gas-injured berries at the top of three boxes varied from 20.0 to 23.4 percent, in the other box it was 11.1 percent; the injured berries at the bottom of the boxes varied from 0.5 to 2.0 percent. As a result of identification of fungi isolated in cultures made from 50 rotten berries from the treated lot and from 50 berries picked out from the controls, it was found that no difference existed either as to the kind or number of fungi present in berries of the treated and untreated lots. The berries were allowed to stand until December 19, when the final examination was made. The percentage of rotten berries in the treated lot varied from 16.7 to 27.7 with an average of 20.5; in the controls from 9.8 to 20.3 with an average of 14.6. In the treated lot the greatest amount of spoilage usually occurred in berries at the top of boxes, amounting to 25.0 to 45.0 percent. This was probably due mostly to the greater amount of gas injury as a result of higher gas concentration at these places.

Studies on Production and Dispersal of Spores of Fungi Causing Fruit Rots of Cranberries. (H. F. Bergman and M. S. Wilcox.) These studies have been carried on to secure information as to the probable time and method of infection of cranberries by rot-producing fungi in relation to the control of rots by spraying or other methods. The results are as follows. All the rot-producing fungi have been isolated from cranberry flower buds in all stages of development, even those much preceding the stage at which the first application of spray is made. The percentage of infected buds is greatly increased following a June reflow, and the increase is greater on unsprayed plots than on sprayed. The same fungi have been isolated from berries from the very earliest stages up to maturity. Differences in the percentage of infection of flower buds and of green fruits due to a particular fungus have been observed on different bogs and even on different plots on the same bog. The percentage of infected buds or green fruits is promptly reduced following an application of spray.

DEPARTMENT OF DAIRY INDUSTRY

J. H. Frandsen in Charge

A Method for the Determination of the Relative Stiffness of Cream During the Whipping Process. (W. S. Mueller.) The purpose of this study was to find a simple method for measuring the relative stiffness of cream throughout the whipping process and to show the importance of such measurements. It was found that, by the use of a mechanical whipper and sensitive wattmeter, a continuous record of the stiffness of the cream throughout the whipping process could be obtained by simply recording the input of the motor in watts at intervals of ten seconds, or less if desired. It was found that this method of measuring relative stiffness of cream could not be used with all mechanical whippers. The wattmeter method for measuring the stiffness of cream while it is being whipped should be useful in studies of cream whipping made either by the scientist or by the commercial dairyman. The results of this investigation have been prepared for publication in the *Journal of Dairy Science.*

Some Factors Affecting the Properties of Whipped Cream. (W. S. Mueller, M. J. Mack, and H. G. Lindquist.) This investigation was continued by studying the effect of the following factors:

1. Separation temperature.
2. Standardization with various dairy products.
3. Pasteurization temperature.
4. Homogenization.
5. Rate of cooling.
6. Addition of gelatin and other stabilizers.
7. Addition of sugar.

In the study of these various factors the keeping quality of the whipped cream received considerable attention as this is important to the dairyman selling cream already whipped. Further studies are necessary before any conclusions can be drawn.

Use of Gelatin in Ice Cream Specialties. (W. S. Mueller and J. H. Frandsen.) The results of this investigation have been published in *The Ice Cream Trade Journal* for July 1934. The following summary and conclusions were made:

1. The addition of fruit-flavored gels to ice cream specialties seems desirable from the standpoint of attractiveness, palatability, and greater variety.
2. Fruit-flavored gelatin will remain clear, even at ice cream storage temperatures, when the correct amount and kind of sugar is used in making the gel.
3. A gelatin-sugar mixture which contained 30 percent cane and 30 percent corn sugar proved most satisfactory.

Effect of Aging Treatment on the Bacterial Count of Ice Cream Mixes. (W. S. Mueller and R. L. France, Department of Bacteriology.) A report of this investigation has been published as Bulletin 314.

The Effect of Aging Treatments on the Tyndall Phenomenon of Gelatin-Water Solutions. (W. S. Mueller.) In this study gelatin-water solutions were subjected to the same aging treatments as the ice cream mixes (as reported in Bulletin 302) and the effect on the Tyndall phenomenon noted. It is hoped that these observations will aid in explaining the effect of the high (68°F.) initial aging temperature on ice cream mixes containing gelatin.

Stabilizers for High Fat Ice Cream. (W. S. Mueller.) Only a small amount of time has been given to this study during the past year. Some new or improved stabilizers appearing on the market are being tried out.

A Study of Ice Cream High in Fat Content. (M. J. Mack.) Work on comparatively rich ice creams, which are being sold in increasingly larger amounts, was continued throughout 1934. Previous studies revealed that when ice cream mixes of high fat content (18 and 20 percent fat) are made under usual processing conditions they are excessively viscous and produce crumbly ice cream with an undesirable melting appearance. The use of butter, frozen cream, or plastic cream in place of all or a part of the sweet cream needed to supply the butter fat markedly increases these three defects.

The use of three successive stages of homogenization entirely eliminates the problem of excessive viscosity and decreases the other defects already named. Pressures of 2,000, 500, and 150 pounds are suggested as satisfactory maximum pressures for the first, second, and third valves, respectively, when homogenizing an 18 percent butter fat mix. With a 20 percent fat content, somewhat lower pressures of 1500, 500, and 150 pounds are suggested as maximum pressures.

A crumbly body may be prevented in high butter fat ice creams by increasing the sugar content to 16 to 17 percent, depending somewhat on the fat content of the mix. If the use of cane sugar alone produces an excessively sweet taste, the substitution of corn sugar for 3 or 4 percent of the cane sugar is recommended.

Increasing the sugar content to 16 to 17 percent improves the melting appearance and reduces the melting resistance of high fat ice creams.

The use of three different stages of homogenization entirely eliminates excessively high viscosity which invariably occurs in chocolate ice cream mixes of high solids content.

The Utilization of Frozen Fruits in Ice Cream. (M. J. Mack and C. R. Fellers, Department of Horticultural Manufactures.) This project was revived after a lapse of two years to study more thoroughly the practice of slicing strawberries before freezing for later use in ice cream. About 500 pounds of whole and sliced frozen strawberries were furnished by the R. D. Bodle Company and Dr. H. C. Diehl of the United States Frozen Pack Laboratory, both of Seattle, Washington.

The frozen whole and sliced strawberries were thawed, examined, and used in ice cream. The practice of slicing the berries before freezing seems desirable. The packs consisting of sliced fruit contained less undissolved sugar than whole-fruit packs, showed less surface discoloration, contained firmer pieces of fruit of better flavor and color, and appeared to contain less syrup. To the fruit packer, slicing strawberries before freezing seems to be another means of improving his product.

Frozen sliced strawberries impart more flavor to strawberry ice cream than do frozen whole berries of the same run. However, the difference is not marked. Such factors as variety and degree of ripeness of the fruit and the sugar content of the pack were found to affect the flavor of strawberry ice cream to a greater extent than slicing the fruit before freezing.

Ice Cream Frozen Without Stirring. (M. J. Mack.) A large number of bulletins, pamphlets, and recipe books have been published which contain directions for freezing ice cream without agitation. These recipes are primarily designed for use with the electric refrigerator. Several commercial preparations are now on the

market for use in making ice cream in the freezing tray of the home refrigerator. This project was organized with the purpose of studying ice creams frozen without stirring, as well as the various commercial preparations now available for use in ice cream of this type. Considerable progress has already been made in the study.

A Study of the Changes that Occur in the Storage of Frozen Sweet Cream. (H. G. Lindquist.) Cans of raw and pasteurized cream of varying fat content were frozen and stored at 0° to −10°F. for a period of 4 to 6 months. The raw cream developed more of the storage or tallowy flavor than did the pasteurized cream.

Subjecting cream to fast freezing conditions, such as freezing in a small ice cream freezer with the beater removed, appeared to partially prevent the fat from oiling off, when the cream was thawed after a storage period of 4 months.

Thawing cream slowly by immersing the cans in water at a temperature of less than 90°F. did not prevent oiling off when the cream was later pasteurized.

The work will be continued in an attempt to find a suitable means of preventing the oiling off of the fat when stored frozen cream is thawed.

A Study of the Comparative Efficiency of Electrically Operated Tanks versus Ice in the Cooling of Milk. (J. H. Frandsen.) During the year a study has been made of the comparative efficiency of a number of the newer electrically operated cooling tanks on the market, and of milk temperatures as affected by the water level in the cooling tank.

Presumably to hold down expenses, there is a practice on certain dairy farms where electric cooling units are used of not keeping the tank full of water when it contains only a half-capacity load of milk cans. Thus, for example, if the tank contains only the cans of evening milk and these cans are full, much of this milk is left above the water line until such time as the cans with the morning milk are placed in the tank next day.

To obtain definite information as to just what happens regarding the rate of cooling where some of the milk is above the water line, an experiment was planned whereby the temperature and samples for bacterial analysis of milk in all cans were carefully taken above the water line, at the water line, and near the bottom of the cans, as well as of the ice water in which the cans were immersed. These tests were made using a tank without agitator and also one with agitator, when the tank contained plenty of ice.

The results would indicate that the water in the tank should be as high as the milk line. This can be accomplished by the addition of more water to make up for the absence of some cans or by providing some arrangement whereby weighted empty cans may be placed in the tank so as to raise the water line to the height of the milk in the cans.

The results of this investigation are published in Department of Dairy Industry Circular No. 12, which contains graphic illustrations of the data gathered in the experiment.

A Study of the Possibilities of Milk, Cream, and Plastic Cream in the Development of New Products such as Combinations with Honey, Fruits, and Flavors of Various Kinds. (J. H. Frandsen and T. Marcus.) A few pieces of special equipment which can now be secured make possible the skimming of a specially rich sweet cream containing from 70 to 80 percent butter fat and generally known as "Plastic Cream." This plastic cream can be used as a basis for many delicious dairy spreads. Just now when dairy products are cheap and there is a surplus on the market seems the time to give them a trial in the home.

A mixture of 40 percent clover honey (heated to 142°F. for 30 minutes) and 60 percent of plastic cream testing about 80 percent butter fat was found popular. This mixture is easily prepared and keeps fairly well. In our opinion a little stick cinnamon placed in the hot honey for a few minutes adds to the desirability of the flavor. A combination of 57 percent plastic cream and 43 percent strawberry jam made a very good spread and was a favorite among many people who were consulted.

Although the above-mentioned spreads are well liked, other flavor combinations are more popular among some people. The best liked is a spread that might be termed a "plastic cream cheese-like spread." It is prepared by adding from 5 to 20 percent of lactic acid culture to the plastic cream spread, the mixing being accomplished while the cream is still soft and warm from the separator. Approximately 1 percent of salt is added. This finished dairy spread is then placed in a final package and held at a temperature of about 70°F. for 12 hours, after which it is placed in cold storage. Care should be exercised against the development of too much acidity. There seems to be a growing demand for sour cream products in our large cities, particularly those with foreign populations, and it is thought that this product will appeal to those nationalities who look with favor on acid-flavored products. The addition of 10 percent ground olives, pimentos, or sweet pickles adds a distinct flavor as well as aiding in masking the acid flavor. The ingredients of these various formulas are mixed with the warm cream direct from the separator, and the mixture is stirred until partly cool to prevent settling. The salt and other flavoring substances mentioned may be varied according to individual taste.

All the dairy spreads mentioned are easily made, keep fairly well, and provide something new and toothsome in the way of spreads for sandwiches, waffles, and biscuits, and should provide an additional outlet for some of our dairy products. The dairy spread can also be used in a variety of ways in cooking and baking and as a foundation for white sauce.

Department of Dairy Industry Circular No. 23 gives complete formulas and directions for the making of Honey Cream Spread, Strawberry Cream Spread, Strong Flavored Sour Cream Spread, Mild Flavored Sour Cream Spread, Olive Cream Spread, Pimento Cream Spread, and Cream Spread Relish.

Milk Drinks. In an effort to find and develop new uses for milk, several formulas for milk drinks were developed or collected. These have been published in Department of Dairy Industry Circular No. 21.

DEPARTMENT OF ENTOMOLOGY

A. I. Bourne in Charge

Investigation of Materials which Promise Value in Insect Control. (A. I. Bourne, and W. D. Whitcomb, Waltham.)

Oil Sprays for Scale and Red Mite in Orchards. The severe winter of 1933-34 with its long periods of very low temperatures necessitated changes in the season's program in most of the orchards in the State. Many growers who observed the extensive damage to their trees during late winter and early spring doubted the safety of following their usual program of delayed dormant applications of oil sprays, and chose to allow scale and red mite to go unchecked rather than face the possibility of further injury, by the application of the oils to their already weakened trees. Some growers, however, followed their usual schedule and

applied the oil sprays, and it is worthy of note that no direct injury resulted nor was there any apparent increase in the winter injury due to the use of the oils. This was true of both the commercial petroleum oil sprays and the recently developed tar distillate washes.

In the tests at the college the number of overwintering red mite eggs was moderately large, and there was no significant winter mortality. Consequently the infestation that developed proved serious when unchecked.

The standard brands of commercial oil sprays, Kleenup, Sunoco, Peninsula Oil Emulsion, etc., gave their usual high degree of control. In addition a new type of soluble wool oil prepared by the Colonial Oil Company proved very effective in its first season's test, giving 98 to 99 percent control. Trees sprayed with this oil showed 88 percent of the leaf clusters free from young mites, and infested leaf clusters averaged 12 mites per cluster of 6 to 7 leaves as compared with 1,968 per cluster on the unsprayed checks.

Tar Distillate Washes for Overwintering Eggs of Plant Lice in Orchards. Field tests were made with six different types of tar distillate washes and one cresylic acid oil emulsion. These represent a new development in oil sprays and are designed primarily for use in *dormant* applications, for the control of overwintering eggs of different species of plant lice. The tar oils alone have not proved very efficient against European red mite so that many of the samples on the market today are a combination of tar oil emulsion and petroleum. The samples tested included the following:

Tar-Petro-Emulsion, Ansbacher-Siegle Corporation,
a coal tar creosote–mineral oil combination;
Tar-O-Emulsion, Ansbacher-Siegle Corporation,
a coal tar creosote oil;
Cres.-Emulsion, Ansbacher-Siegle Corporation,
a mineral oil–cresylic acid combination;
Kleenup-Tar Oil Emulsion, California Spray Chemical Co.,
a coal tar creosote oil with Kleenup;
Tarolene, Central Chemical Company,
a coal tar creosote–mineral oil combination;
Tar Oil Wash, Niagara Sprayer and Chemical Co., Inc.,
a coal tar creosote oil;
Tar E. Mul, Niagara Sprayer and Chemical Co., Inc.,
a coal tar creosote–mineral oil combination.

In spite of the severe winter and the possible ill effects upon the trees, careful observation failed to discover injury following any of the above sprays nor was the seasonal development of sprayed trees retarded. The heavy winter mortality of the overwintering eggs of plant lice on these trees caused such an irregular and insignificant hatch on the unsprayed checks that no accurate results from the use of the oils could be obtained.

Rotenone and Pyrethrum Sprays for Gladiolus Thrips. In tests against gladiolus thrips Cubor spray gave excellent results. This is a rotenone compound in the form of a dry powder. Care must be taken to thoroughly dissolve the powder in water. Considerable agitation was necessary to do this; otherwise the material showed a tendency to collect into drops on drying, leaving large areas of the plant surface uncovered. However, if carefully prepared, this spray appeared to be one of the best of the rotenone group. Ku-ba-tox spray, another rotenone compound, gave fine coverage with no indication of the defects mentioned above. A combination of lead arsenate, molasses, and water caused no injury to plants

and gave good control of thrips. Similar combinations in which Paris green and calcium arsenate were used to replace lead arsenate caused serious injury to the plants. Laboratory tests of different strengths of two rotenone sprays and one pyrethrum–rotenone spray against adult and young-stage thrips gave the following results:

Material	Adult Thrips		Young Thrips	
	Exposure (hours)	Percentage of Kill	Exposure (hours)	Percentage of Kill
Cubor.....1 lb.—50 gal.....	24	60		
Ku-ba-tox 1—400.....	24	75	18	90
Cubor.....2 lbs.—50 gal.....	24	100		
Ku-ba-tox 1—200.....	24	100		
Red Arrow 1—200.....	24	90		
Red Arrow 1—400.....	24	80	18	85
Red Arrow 1—400 +Dipest 1—400.....	24	100		
Kaloil.....1—400.....			18	90

Rotenone Sprays and Dusts for Mexican Bean Beetle. Rotenone sprays and dusts both gave excellent control of larvae of the Mexican bean beetle. The sprays also gave a high percentage of kill of adult beetles. Although in many cases the killing action of the rotenone compounds was not as rapid as that of arsenicals, yet following rotenone applications the insects quickly ceased feeding and dropped to the ground and very few, if any, revived sufficiently to resume feeding. The value of rotenone compounds lies chiefly in the fact that these could be employed after an attack had developed and also could be applied much nearer the time of harvesting the crop than would be possible with arsenicals or fluorine compounds.

Wettable Sulfurs as Substitutes for Lime-Sulfur in Post-Blossom Orchard Sprays. Tests of these materials were continued in cooperation with the Department of Pomology. The tests in the station orchard were duplicated in a commercial orchard near-by. Five standard types of wettable sulfurs were tested in combination with lead aresenate, and their relative values compared with the standard combination of lead arsenate–lime-sulfur solution on both McIntosh and Baldwin. In the pre-blossom and calyx sprays, the lime-sulfur–lead arsenate combination was used. The wettable sulfurs were applied in the first, second, and third cover sprays, and lead arsenate alone in the fourth cover. In addition to the commercial sulfur sprays, a product composed of 300-mesh sulfur and a slight amount of wetting agent was used with lead arsenate in the first three cover sprays.

While on the whole the season was not of a type to induce severe burning and at the same time was not particularly favorable for scab, yet unmistakable and general burning of foliage was noted following the lead arsenate–lime-sulfur applications. No russeting of fruit was noted. The wettable sulfur sprays in no case caused any foliage injury following any of the three applications. The degree of control of insect pests and diseases from the use of these sprays was measured chiefly on McIntosh, a variety particularly susceptible to scab, and are as follows:

Treatment	Percentage of Clean Fruit	Percentage of Fruit Showing Injury From:		
		Curculio	Codling Moth	Scab
Apple Dritomic	88.2	4.0	5.7	1.1
Magnetic sulfur	91.7	3.0	4.3	0
Mulsoid sulfur	70.5	16.5	13.6	0.2
300 mesh sulfur + wetting agent	85.8	5.6	4.5	3.2
Sulcoloid	94.5	0.4	2.2	1.1
Lime-sulfur	78.1	1.3	15.7	3.5
Flotation sulfur	88.4	0.9	8.9	0.3
Check	10.4	52.0	34.4	50.4

All the products controlled scab very satisfactorily. In the summer sprays after the calyx, a casein spreader was added to the lime-sulfur–lead arsenate sprays. It should be noted that the commercial wettable sulfurs held scab to a lower figure than did lime-sulfur to which the spreader had been added. These results were also noted in the tests in the commercial orchards. Apparently the efforts to lessen the danger of burning from the lime-sulfur–lead arsenate combination also materially reduced its efficiency against scab. The combination of finely divided sulfur and wetting agent was not quite as effective against scab as were the commercial products but it gave very satisfactory control, and this product with lead arsenate held insect pests to as low a figure as did the more expensive commercial products.

Control of Striped Cucumber Beetle with Derris and Pyrethrum Dusts. When both commercial and home-made dusts containing the derris equivalent of .4 to .6 percent rotenone, and a pyrethrum–sulfur dust with a .05 percent pyrethrin content were applied directly to the beetles in the laboratory, all were dead or dying 4 hours after application. Copper–arsenate–lime dust (20-10-70) killed 60 percent of the beetles in 44 hours, while all untreated beetles lived 10 days or longer. When untreated beetles were confined with dusted plants, the dusts protected the plants from injury and the majority of the beetles were dead after 15 days. Copper–arsenate–lime was slow in becoming effective but was very satisfactory at the end of the experiment. Pyrethrum–sulfur dust was the least effective material. Undusted plants were killed in three days.

In the field 7 applications of these dusts were made to melons, cucumbers, and summer squash. Fresh applications of dust killed many of the beetles and protected the plants from injury until they were washed off, although the greatest interval between rains during this period was 5 days. Derris–sulfur dust and copper–arsenate–lime dust caused slight injury to melon vines during exceptionally hot weather, and this caused a slight decrease in the yield. Yield records of melons and cucumbers indicated that the application of these dusts did not noticeably interfere with pollination.

Control of White Apple Leafhopper with Pyrethrum and Derris Dust. A 20-80 pyrethrum–clay dust applied from both sides at the approximate rate of 1 pound per tree of medium size on August 30 reduced the second generation of the white apple leafhopper on McIntosh from an average of 18.66 per leaf to 3.07 per leaf.

On September 10 in another orchard where the infestation averaged 10.18 hoppers per leaf, an application of derris–pyrethrum–clay dust (10-15-75) reduced the average number of hoppers to 7.08 per leaf; derris–clay dust (12½-87½), to 4.21 per leaf; and pyrethrum–clay dust (30-70), to 2.16 hoppers per leaf. The number of dead hoppers per square foot on cloth spread under representative trees was: derris–pyrethrum dust, 10.45; derris dust. 45.43; and pyrethrum dust,

59.12. These trees were very large and required from 1½ to 2½ pounds of dust per tree for satisfactory coverage. It is apparent that a pyrethrum dust containing .2 to .3 percent pyrethrins gives better control than a derris dust containing .5 percent rotenone, but their practical and economical value is not yet determined.

Control of Squash Vine Borer with Oils, Soap, and Nicotine. In field experiments where the borer infestation in unsprayed Hubbard squash was 2.25 tunnels per vine, oil emulsions diluted to contain 2 percent oil failed to give satisfactory control and caused slight injury to the vines. Lead arsenate and nicotine sulfate combined with soap and pine tar soap (1 pound in 10 gallons of water) gave only moderate protection. A spray consisting of 1 percent white lubricating oil emulsion and 40 per cent nicotine sulfate 1-500 was most effective, showing 26 percent more reduction of borer than the standard treatment of 40 percent nicotine sulfate 1-250. This formula costs ½ cent per gallon less than the standard spray and promises to develop a practical value.

Control of Cabbage Maggot with Calomel Dust. When 4 percent calomel–lime dust was applied to 14 plats so that all possible combinations from 4 applications were made beginning May 7 when first eggs were found and continuing at weekly intervals, a single application at any of the treatment periods was not effective. Applications at the first and second intervals gave 82 percent commercial control of maggots and 88 percent large or medium heads. In general, two or more treatments which included the first and second applications were satisfactory but others were not. Of the untreated plants, 84 percent suffered moderate or severe injury, although 43 percent reached satisfactory size. Corrosive sublimate solution 1-1000 continued to prove its superiority and if applied when the eggs were first found yielded 80 percent commercially clean plants and 82 percent satisfactory heads. Three applications of naphthalene flakes were equally effective.

Applications of similar materials to radishes were less effective and although two applications of corrosive sublimate solution gave moderate control the plants were stunted by the treatment.

Control of Onion Thrips. (A. I. Bourne.) Thrips were late in appearing this past season and were much less abundant than for several years. There were few fields in the Valley that showed any appreciable injury by these insects, although the hot weather and long period of drought in midsummer offered conditions very favorable for thrips. In the experimental plots the average number of thrips per plant did not reach 20 until July 16. Their numbers reached the peak of abundance July 30 to August 1 and dropped rapidly from that point. Set onions did not show a heavy infestation, so that as they matured the migration of thrips to seed onions was not serious. This condition was unusual in a summer so hot and dry as that of 1934.

None of the sprays or dusts used in the field tests gave as high a degree of control as did the nicotine sulfate–soap combination, although rotenone sprays (Ku-ba-tox) proved nearly as effective and appeared to have a considerable residual effect which prevented rapid reinfestation. Grandpa's Wonder Pine Tar soap proved fully as efficient a spreading and wetting agent as fish oil soap, although its cost is higher. Rotenone dusts and a pyrethrum dust did not give as good control as sprays, due chiefly to the mechanical difficulties in forcing a dust into the tight axils of the inner leaves where most of the thrips are located. A combined spray of nicotine sulfate and wettable sulfur gave only moderate control, the sulfur proving inferior to soaps as a spreader and distributing agent.

Because of the mechanical difficulties involved in applying insecticides for the

control of the onion thrips and also because of the fact that a resistant strain of onions would probably offer an excellent means of control of this pest, investigations were begun on several thrips-resistant varieties of onions this year. Through the courtesy of investigators at Cornell University, six varieties of onions were secured, including Utah Experiment Station Sweet Spanish, Winegar Strain Sweet Spanish, Harris 597 Riverside Sweet Spanish, Harris No. 58, Ohio Yellow Globe, and Ebenezer. The onions were planted in 13-inch rows about May 15. Due to the late development of thrips, counts were taken first on July 16 and at weekly intervals thereafter. The average number of thrips per plant is recorded in the following table.

Variety	Average number of thrips per plant					
	July 16	July 23	July 31	Aug. 6	Aug. 14	Aug. 20
Utah Exp. Station Sweet Spanish	14.2	18.6	14.6	9.0	13.0	14.0
Winegar Strain Sweet Spanish	4.2	12.4	12	9.2	12.0	15.4
Harris No. 597 Riverside Sweet Spanish	10.4	14	23.4	14.0	18.0	49.0
Harris No. 58 Prizetaker	17	20.6	53.6	35.4	47.0	41.0
Ebenezer or Japanese	23.6	44.4	77.8	52.0	62.0	71.0
Ohio Yellow Globe	14.4	40	74.4	57.6	91.0	70.0

It is quite apparent that all of the Sweet Spanish type of onions consistently showed the smaller number of thrips. The population curve of the Ohio Yellow Globe was very similar to that obtained over a period of years for the Danvers Yellow Globe so commonly grown here in the Connecticut Valley.

The type of growth of the different varieties would appear to have a direct correlation with the abundance of thrips. The varieties Ohio Yellow Globe and Ebenezer, both of which show a marked susceptibility to thrips injury, seem to offer the most favorable condition for protection of the thrips from adverse conditions. In the case of the variety Ebenezer, it was noted that the leaves have a strong tendency to curl, thus offering much more protection to the thrips than the markedly upright type of growth shown by Winegar Strain Sweet Spanish. The type of growth in the variety Ohio Yellow Globe is such that the growing tip (the chit) is more or less completely enclosed by the older leaves. In some strains grown by the Department of Agronomy of this station, it was noted, in an examination of three strains which otherwise had the same characteristics, that two of the three plots had an open chit. The average number of thrips per plant for these plots was as follows:

Date	Plants with Open Chit		Plants with Tight Chit	
	Plot	Average number of thrips	Plot	Average number of thrips
Aug. 1	B1+B2	16	B3	103
Aug. 8	B1+B2	26	B3	95
Aug. 14	B1+B2	40	B3	119

From these data it would seem that the open type of growth is a character to be sought for in breeding strains of onions resistant to thrips. Whether or not the character of an open chit is of value in a thrips-resistant strain, however, it is apparent that this type of growth is desirable if the thrips are to be controlled by either a dust or a spray. With the open type of growth, the growing tip (where the majority of young thrips are usually found) can be kept covered with an in-

secticide much more readily than can the chit which is partly or completely enclosed by the older leaves. It would appear from the above figures that if the varieties were of equal commercial value the resistant strains, such as the Sweet Spanish types, would do much to solve the problem of thrips control.

The disease attacking thrips, which was so prevalent in 1932 and to a lesser degree in 1933, again appeared in considerable abundance throughout onion fields in the Connecticut Valley. The relative scarcity of thrips and the severe check to the seed onion crop caused by the prolonged drought did not allow it to develop as rapidly as in the more favorable season of 1932. Attempts are being made to produce cultures of the fungus, with the hope of introducing it artificially in onion fields so that its presence would coincide more nearly with the peak of thrips abundance.

The Spray Residue Problem. (A. I. Bourne.) The limits of tolerance of both lead and arsenic residue on sprayed fruit at harvest were still further reduced for the shipping season of 1934, with the immediate prospect that within one or two years the final limits of .014 grains per pound for lead and .01 grains per pound for arsenic would be required.

Through the cooperation of the State Office of the Food and Drug Administration, analyses were made for both lead and arsenic on samples of McIntosh and Baldwin, to determine the latest point in the present spray schedule when fruit can be sprayed with reasonable assurance of safety and beyond which the danger of residues over the tolerance is encountered. Samples of fruit as taken from the orchard, samples which had been run through a commercial wiping machine, and samples which had been subjected to washing in an acid bath were submitted for analyses. The results of the analyses are as follows:

Last Spray	McINTOSH Spray Residue—Grains per Pound		BALDWIN Spray Residue—Grains per Pound	
	Arsenic	Lead	Arsenic	Lead
	Orchard-run Fruit			
1st Cover	Trace	.004	Trace	.002
2d Cover	.006	.017	.002	.016
3d Cover	.008	.018	.008	.018
4th Cover	....	....	.008	.019
	Wiped Fruit			
1st Cover	.002	.005	Trace	.005
2d Cover	.004	.017	.003	.013
3d Cover	.006	.016	.004	.007
4th Cover	....	....	.008	.019
	Fruit Washed in Acid Bath			
1st Cover	Trace	.002	Trace	.002
2d Cover	.002	.004	Trace	.005
3d Cover	Trace	Trace	.002	.003
4th Cover	....	....	Trace	.003

The analyses indicated that in a summer such as 1934 McIntosh could not be sprayed later than mid-July without showing undue amounts of arsenic, and that lead residue was excessive on fruit sprayed in mid-June. Because of the persistence of the lead residue, Baldwins were in approximately the same position. Wiping the fruit gave no appreciable relief in the case of either variety, although the amount of visible residue on wiped fruit was noticeably less, and this treatment resulted in a marked improvement in appearance and finish. Samples

treated to an acid bath in a washing machine were in all cases so cleared of spray residue that even when the complete schedule of four cover sprays (the last one applied in late July) was followed, the fruit showed only traces of either lead or arsenic.

The season of 1934 was particularly favorable for the retention of sprays on fruit and foliage. Throughout June, July, and early August the rainfall was unusually light and there were no hard driving rains to wash the spray materials from the fruit. Throughout September and early October the rainfall was heavy and consequently late varieties showed somewhat less residue. In a season of more normal rainfall in late July and August the danger from the third cover spray would be materially lessened.

Results of the present season's tests show that lead is much more persistent than arsenic and constitutes the real problem. Lead residues were in many cases three to four times those of arsenic and were almost always higher than the ratio of lead to arsenic in lead arsenate. It is evident that running fruit through a wiping machine does not remove sufficient residue. Apparently the brushes become more or less covered with the spray material and consequently may transfer the residue from one sample to another. This was definitely proved in the case of a sample of fruit which, although sprayed with calcium arsenate throughout the season, nevertheless showed .002 grains per pound of *lead* present after being passed through the wiper. Frequent cleaning or replacement of the brushes would be necessary to avoid objectionable accumulations of spray material. Greater emphasis on reduced dosage in the late cover sprays or the substitution of a dust schedule for the late application offers the best solution of the difficulty as long as lead arsenate continues to be used.

Systematic Study of Oil Sprays. (A. I. Bourne in cooperation with the Department of Chemistry.) The three oils used in the 1934 field tests were samples which had been prepared the previous season and held in storage for approximately a year. The results obtained furnished data on the insecticidal value of these oils and also demonstrated their stability. All the samples were found to be in perfect physical condition, with no trace of breakdown of the emulsion. They offered no difficulty in preparation and showed no trace of separation and appearance of free oil when once diluted with water. They were applied, at a strength of 3 percent basic oil, to a block of young plum trees heavily infested with overwintering eggs of European red mite, at the delayed dormant stage of bud development. No trace of injury was noted nor was any check to seasonal development observed. All the samples proved very effective against red mite, as shown in the following table.

Sample	Percentage of Clusters Free from Mites	Number of Mites per 100 Leaf Clusters	Percentage of Control
F	85	15	98–99
G	80	36	98
H	77	33	98+
Check	0	1,968	—

Apple Maggot Control. (A. I. Bourne.) The appearance and seasonal abundance of the insect were watched with considerable interest throughout the season to note the influence of the severe weather conditions of the previous winter upon the insect and the effect, upon the infestation in commercial orchards, of the extensive CWA program of removal of neglected trees in pastures, fence rows, etc., closely adjoining such blocks.

Efforts were continued to stimulate community action on the part of growers within well-defined maggot control areas. Results again demonstrated the difficulty of securing concerted action on the part of all the growers in any large area, and that failure of any grower to carry out his assignment not only led to failure to control the insect in his own orchard but did much to neutralize the efforts of neighboring growers.

There were several orchards where apple maggot appeared the past season for the first time as a serious pest, in spite of thorough and supposedly well-timed spraying. In most of these cases the trouble was directly attributable to the removal of large numbers of neglected trees adjoining the orchards. Fruit from these trees was badly riddled by maggot the previous season and led to the appearance of thousands of flies which necessarily moved into the commercial orchards. In cases of such wholesale removal of neglected trees, it is essential that in commercial orchards the complete spray program be carried out, at least for the first season. Disposal of such trees, however, removes permanently a very serious source of danger.

In general there were three main factors which tended to increase the danger of infestation of fruit in commercial blocks.

1. A short crop, especially of Baldwins, due to winter injury and to the heavy Baldwin crop of the previous year.
2. The CWA project of removal of neglected trees adjoining orchards.
3. The tendency on the part of many growers to apply a complete spray program only to the trees in fruit.

A combination of any or all of these factors rendered the control of apple maggot particularly difficult this past season. Most of these, however, were peculiar to the past season and would not normally be expected to exert so much influence in 1935.

Valuable data on the influence of different soil conditions and of exposure upon the emergence of the adult flies were secured from cage experiments at the Waltham Field Station by Professor Whitcomb. These are summarized as follows:

Date of Emergence of Apple Maggot Flies, Waltham, 1934

	In Sun		In Shade	
	Cultivated	Sod	Cultivated	Sod
Light Soil				
1st fly	June 22		July 3	July 6
25% flies	July 9		July 15	July 16
50% flies	July 15		July 20	July 22
75% flies	July 18		July 25	July 27
Heavy Soil				
1st fly	July 1	July 14	July 9	July 10
25% flies	July 16	July 23	July 20	July 23
50% flies	July 19	July 26	July 24	July 26
75% flies	July 22	July 29	July 28	July 30

These results show the difference to be expected in the emergence of the flies in cultivated orchards and those in sod, and in heavy soil as compared with light. Flies appeared earlier from soil exposed to direct sunlight than from soil in shade. These figures do much to explain the very uneven appearance of flies in commercial orchards because of the removal of near-by neglected trees during the pre-

vious winter and consequently the extended period during which fruit was exposed to infestation.

Introduction of Parasites of Oriental Fruit Moth. (A. I. Bourne.) Through the cooperation of the Federal Bureau of Entomology the program of introducing larval parasites of the oriental fruit moth was continued throughout the peach-growing sections of the State. The extremely low temperatures of the winter resulted in a total loss of the peach crop throughout the State. This, however, offered a rather unique opportunity to combat the fruit moth. Although the fruit buds were killed and the chances of a crop were destroyed, a very considerable percentage of the insects which attack the fruit survived and were forced to remain in the twigs even in late summer when normally they would have entered the fruit. Their failure to find fruit in which to develop in itself led to a heavy mortality of the fruit moth larvae, while the extended period of twig infestation gave better opportunity for the larval parasites to attack the pest.

More than 18,000 larval parasites (*Macrocentrus*) were liberated in the State during early July, and in addition many growers purchased colonies of the egg parasites to release in their orchards.

Twig collections showed a very considerable winter mortality of the parasites, especially in orchards where colonies had been released for the first time the previous summer. In Hampden County, where the work of introducing parasites had been carried on for several years, and where they are becoming well established, the percentage of survival was higher.

Late summer twig collections showed parasites again building up successfully. In the western counties, records of 70 to 90 percent parasitism were made in orchards where releases had been made for several years in succession; and of 45 to 70 percent where colonization had been attempted for shorter periods. In the eastern orchards, where the parasites had been reduced to very low numbers by winter mortality, the degree of parasitism was found to average 20 to 30 percent in the larger orchards, while in some of the smaller orchards it ranged from 50 to 70 percent.

Potato Spraying Experiments. (A. I. Bourne.) In appreciation of the present interest in potato growing, in western Massachusetts especially, and of the annually increasing acreage devoted to that crop, field tests of various insecticides were begun the past summer for the control of the more outstanding insect pests attacking that crop. Two types of rotenone sprays and dusts, a pyrethrum dust, and a commercial preparation containing calcium arsenate and a small amount of calcium arsenite, were tested in a complete season's program of weekly applications from early June, when the plants were but two to three inches high, through September when many plants had reached a length of nearly four feet. The variety grown was Green Mountain.

The different materials were used in combination with 5-5-50 Bordeaux, in all applications from June to late August, after which time flea beetles had passed their second peak of abundance and any danger of aphid or leafhopper attack was past. From late August to October five applications of Bordeaux mixture alone were made. The vines continued growing until mid-September, and remained green until killed by frost on October 9. The plots sprayed with the calcium arsenate–arsenite combination were the only ones where any injury to vines was noted. Plants in these plots began to show injury by late July and were dying down in considerable numbers by mid-September.

Against flea beetles, all the rotenone products gave excellent protection. They

appeared to exert a considerable repellent effect in addition to their direct killing action. The sprays were slightly superior to the dusts. The pyrethrum dust was effective for a short time after application but appeared to have very little residual effect. No opportunity was allowed for the development of any aphid or leafhopper infestation in the rotenone or pyrethrum plots, but in order to control incipient attacks of aphids nicotine sulfate had to be added in two applications of the Bordeaux mixture in those plots where Bordeaux alone had been applied.

Excellent yields were secured in all the plots and particularly in those where rotenone compounds had been applied. The yield record of the different plots is as follows:

Material	Yield (Bushels per Acre)
Cubor spray (rotenone)	647.99
Cubor dust (rotenone)	579.
Ku-ba-tox spray (rotenone)	573.75
Ku-ba-tox dust (rotenone)	601.38
Pyrethrum dust	489.57
Calcium arsenate–arsenite mixture	519.12
Bordeaux mixture	560.3

The high yields in the rotenone-treated plots confirmed the superior appearance of the plants in those plots throughout the season, and indicate the correlation between heavy yields and the protection of the growing plants from diseases and insect pests.

Value of Electric Light Traps against Orchard Insect Pests. (A. I. Bourne.) During the past summer, through the cooperation of the New England Rural Electrification Committee and the Western Counties Light and Power Company, this department began a series of tests with electric light traps at the Bay Road Fruit Farm orchards in South Amherst.

Five bulb and pan and five electrocutor traps were installed in parallel rows. Electric power was supplied from wires running from a take-off from the main power line at the edge of the orchard. On the outer pole was placed an automatic time clock, fuse-box, and cut-out switch, and on the pole in the orchard was placed a recording thermograph. The electrocutor traps consisted of a 75-watt bulb suspended inside of a screen charged with about 1100 volts from a transformer in the top of the trap. Beneath the circular screen was suspended a wire basket to catch the insects which were electrocuted while flying through the charged screen toward the light. The bulb and pan traps consisted merely of a 75-watt bulb suspended over a pan of water, the surface of the water acting as a reflector to which the insects were attracted and drowned.

The lights were operated from June 18 until August 28, under control of an automatic time clock in series with the power line to the traps. The lights were on from one-half hour before sunset until about one-half hour before sunrise, corresponding to the flight period of the insects present in the orchard. Lights were turned off on rainy nights when insect flight was very slight. Each day the insect catch of the night before was counted and identified. A total of 42,857 insects was counted and identified, of which 1,498 were beneficial species. Orchard pests were counted as follows: codling moth, 321; apple tent caterpillar, 684; forest tent caterpillar, 52; bud moth, 43; cherry leaf roller, 35; plum curculio, 1; and apple maggot, 1. These numbers are undoubtedly only indicative of the actual numbers caught in the traps as the electrocutor traps completely burned the insects entering them.

The primary purpose of the experiment was to determine the relative numbers of codling moth, the time of emergence, and the possible control of the pest by means of the light traps. Seasonal catches of this insect showed that the stragglers from the first brood were present in the orchard until July 14. The second brood appeared a few days later and reached a peak of moth emergence on August 10, then receded slowly to the last night the light traps were operated, August 28. A comparison of these figures with emergence cage figures in 1924 (Massachusetts Agricultural Experiment Station Bulletin No. 233) shows that emergence from the cages was a few days slower than in the orchard, as indicated by the light traps, making allowance for any differences in seasonal emergence in the two years in which the records were taken. This seems to indicate that the light traps are perhaps more valuable than the emergence cages in determining the correct timing of orchard sprays for codling moth control, and that their chief usefulness lies in the accurate data they furnish on the seasonal abundance of the insect rather than in its actual destruction.

Counts of all kinds of insect injury on McIntosh apples in the orchard gave the following results: The row of electrocutor traps had 93.1 percent clean fruit while the bulb and pan row had 92.5 percent clean fruit. On the unlighted row adjoining the first-named row 95 percent was clean, whereas the third row adjoining contained 86.1 percent clean fruit. Codling moth injury in the row trapped by the electrocutor traps was .4 percent and in the row trapped by the bulb and pan traps, 1.35 percent. In one row adjoining the first-named traps injury was 2.9 percent; in the third row adjoining, 7.5 percent. Band catches of codling moth larvae furnished a definite indication of the value of light trapping. In the electrocutor trapped row 21 larvae were caught in the bands, whereas 19 were caught in the bulb and pan trapped row. A ring of 12 trees in a circle one row outside the two light rows contained 160 larvae, while the circle formed by 22 trees in the third row outside the lighted rows contained 537 larvae. In the 44 banded trees, 737 larvae were present, even after the regular spray and dust schedule.

As an aid in the supplementary control of orchard pests when combined with the regular spray program, as a means of timing the spray schedule according to the emergence of the different orchard pests, and as a means of securing a record of the occurrence of the various insects both harmful and beneficial, insect light traps seem to have a value to the commercial fruit grower.

Apple Leaf-Curling Midge. (W. D. Whitcomb, Waltham.) The early infestation by the apple leaf-curling midge (*Dasyneura mali* Kieffer) in 1934 was heavy, but midsummer drought and decreased leaf growth reduced the abundance of the later generations below that of 1933. No new infestations were discovered outside the area established last year.

At Ipswich, emergence and oviposition by the first generation began about May 25 and continued to June 8, the first larvae hatching about June 1. Maggots emerged from rolled leaves from June 19 to about July 1, and adults of the second generation were present from July 3 to 15, laying eggs from which mature maggots developed July 27 to August 3. After this date no regular cycle was noticeable but scattering infestations developed irregularly until October.

Population counts on representative infested trees showed an average of 345.7 eggs per bud, an average of 277.4 maggots per bud in rolled leaves, an average of 484 infested tips per small tree, and an average of 174.66 to 361.8 maggots per square foot collected under the tree. Since most of the trees spread 80 to 100 square feet, the estimated number of maggots is 15,000 to 25,000 per tree.

For the first time it was observed that some of the maggots crawled down the

branches and trunk of the trees and spun cocoons under the bark and in crotches rather than dropping to the ground. This migration down the tree took place mostly during rain, partly because the rain softened the rolls and facilitated emergence and partly because they were not exposed to hot sun and dry wind at that time. After the maggots have become mature, their emergence is greatly influenced by rain. Only a small number of the maggots appear to transform into the succeeding generation, and the majority hibernate.

Practically all infested leaves dried and fell before August 10.

Cyanogas and naphthalene applied under the trees as soil insecticides reduced the number of adult midges collected in cloth cages from 11.5 to an average of 1.83 per square foot, but in spite of this reduction, migration and emergence from cocoons on the tree produced a heavy infestation on the treated trees.

Sprays containing sulfur, nicotine, and rotenone killed exposed eggs and newly hatched maggots in the laboratory but when applied to infested potted apple trees the results were disappointing.

Plum Curculio. (W. D. Whitcomb, Waltham.) The practical application of the relation of temperature to control of the plum curculio by spraying was attempted by spraying one row of heavily infested trees with lead arsenate and fish oil each second day for twelve days beginning May 22, four days after the calyx application. Based on the maximum daily temperature, the most timely sprays would have been applied May 27 to 29. The results showed that, except in one row which yielded only 81 apples, the amount of curculio-injured fruit decreased regularly from 48.92 percent on May 22 which was too early, to a minimum of 18 percent on May 28 which was the estimated most effective date, and again increased to 44.66 percent on June 1 which was too late for satisfactory protection.

Adaptability of Cryptolaemus to the Control of Mealybugs in the Greenhouse. (W. D. Whitcomb, Waltham.) After having practically eliminated a heavy infestation of the citrus mealybug in the greenhouse of the Waltham Field Station soon after being introduced, the colony of the mealybug predator, *Cryptolaemus montrouzieri* Muls., nearly died of starvation; but the few survivors developed in sufficient numbers to keep the pest under commercial control without the aid of insecticides for eighteen months, and they are now in a position to accomplish practical control of the mealybug whenever the pest should increase.

Introductions of this predatory insect were supervised in two commercial greenhouses, one growing gardenias infested by the citrus mealybug, *Pseudococcus citri* Risso, and the other growing chrysanthemums infested with the Mexican mealybug, *Phenacoccus gossypii* T. & Ckll. In both cases control almost to the point of eradication resulted when a second generation of the ladybird larvae developed. In each case, however, the mealybug developed so rapidly during the inactive and developmental periods of the ladybird beetles that considerable injury resulted to the plants or the use of insecticides was necessary before the predators controlled the pest.

These records show definitely that both *P. citri* and *P. gossypii* can be practically and economically controlled by *Cryptolaemus montrouzieri* when the beetles are properly manipulated, and that the successful establishment of these beetles is dependent on, (1) the comparative rate of reproduction of the pest and the predator, (2) the abundance of the pest at the time of introduction, (3) the number of predators introduced, (4) the season when the predators are introduced as it affects the relation of temperature to development, and (5) the type of plants infested by the mealybugs.

Naphthalene as a Fumigant for the Control of Greenhouse Insect Pests. (W. D. Whitcomb, Waltham.) When naphthalene was used in experimental fumigations at a rate of 2 ounces per 1000 cubic feet for 6 hours, the vaporization of the total amount in the first 3 hours and none in the last 3 hours killed 85 percent of the red spiders in a 3-hour exposure; three-fourths of the total amount in the first 3 hours and one-fourth in the last 3 hours killed 85 percent in a 4-hour exposure; and the total amount in 6 equal hourly applications required an exposure of 5 hours to kill 85 percent or more of the red spider.

These experiments indicate that an exposure of at least 3 hours to an atmosphere saturated with naphthalene is necessary to cause an appreciable mortality of red spider, and since saturation exists when 0.64 ounces of naphthalene are vaporized in 1000 cubic feet of air at 77°F., it is apparent that about twice as much vapor is lost and absorbed as is retained in the air during a 6-hour fumigation.

A homemade naphthalene fumigator has been developed in which warm air is blown over trays of naphthalene crystals by an electric fan. The air is heated to 165°F. by being blown over a resistance heating unit, and the dosage is regulated by the amount of crystals in the trays or by the time the apparatus is in operation. Experimental fumigations with this apparatus indicate that sensitive plants are less likely to be injured than when the application is made with lamps.

Typical injury in the form of blindness which occurs in some varieties of chrysanthemums following naphthalene fumigation appears to occur only during the bud formation stage, and buds which have developed to 1/8 inch diameter or larger are not blasted or otherwise injured by the treatment. In addition to the standard varieties which have been susceptible to this type of injury, Yellow Frost, Garnet King, Olivette, and Pride of Tokio were found to be moderately susceptible this year.

Biology and Control of the Carrot Rust Fly. (W. D. Whitcomb, Waltham.) The field infestation of the carrot rust fly in 1934 was closely related to the weather. Dry, hot weather in early summer was so unfavorable to the development of this pest that early planted carrots were practically uninjured while late planted carrots which were exposed to the favorable cool, wet weather of late August and September suffered from 10 to 27 percent moderate and severe injury.

It was apparent from control experiments that seed treatments with calomel mixed in varying quantities with inert clay are not active long enough to give protection from the attack of the second or third generation, even though they have shown many beneficial results on the early plantings.

Influence of Temperature on Development and Control of Red Spider. (W. D. Whitcomb, Waltham). Preliminary studies of the influence of temperature on the effectiveness of sprays used for combating the red spider have shown that the number of spiders killed usually varies between 60° and 80° F., and that this difference may be as great as 60 percent. The effectiveness of some materials varied directly with the increase in temperature and others inversely. Out of 34 materials or types of materials so far observed, 16 were consistently more effective at 60° than at 80°.

Heavy lubricating oil emulsions were more effective at the higher temperature probably due to the greater spreading and penetrating action, while light oil emulsions were distinctly superior at 60°F., evidently due to suppressed volatility and longer contact. Soaps were rather inconsistent in their response to temperature but showed a tendency toward greater effectiveness at 60°. Soluble sulfurs as represented by liquid lime-sulfur and carbon disulfide–sulfur emulsion were

increasingly effective as the temperature increased, while the suspended sulfurs such as colloidal and wettable sulfur were more active at 60°.

Pyrethrum extracts showed a very decided decrease in effectiveness as the temperature was increased and although the concentrate contained approximately 2.15 percent pyrethrins the resulting kill of red spider was surprisingly low.

Extracts of derris containing about 1 percent rotenone showed a definite increase in effectiveness at the higher temperatures and when diluted 1-200 gave excellent control of red spider. Combinations of pyrethrum and derris reflected the influence of the derris by producing an excellent control with increased effectiveness at 70° and 80°F.

Additional studies showed that apparently the water miscible solvent used with pyrethrum and derris extracts, either alone or in combination, influenced the effectiveness. In preliminary experiments extracts in camphor oil, acetone, and alcohol were most effective in the order named.

DEPARTMENT OF FARM MANAGEMENT

R. L. Mighell in Charge

Bank Service Charges and National Recovery Policy. (R. L. Mighell and R. H. Barrett.) A stormy chapter in NRA history was terminated on November 28, 1934, when Article VIII containing the rules governing fair trade practices was deleted from the Bankers' Code of Fair Competition by official amendment. This marked the end of a year-long controversy over bank service charges and definitely removed the NRA from the field of price-fixing for bank services. Article VIII had provided that clearing house associations should adopt, subject to the approval of the Administrator, rules fixing uniform service charges "whereby services rendered by banks shall be compensated for either by adequate balances carried or by a scale of charges."

The Banking Code Committee of the American Bankers' Association originally set January 1, 1934, as the effective date for such uniform schedules of charges throughout the nation, and in December 1933 preliminary announcements of the new charges were sent to customers by some banks in Massachusetts and elsewhere.

An early part of this study consisted in a rapid examination of the schedules of charges thus announced. This analysis indicated that such a program if permitted to become universal might have dangerous deflationary effects. The increased charges particularly on small accounts seemed likely to lead to many withdrawals, increased hoarding, and possible credit contraction.

Careful statements of the proposed charges and their probable effects were prepared and sent to the Banking Code Committee, the National Recovery Administrator, and the Secretary of the Treasury with the request that the effective date for these charges be postponed until the matter could be studied more fully. As a consequence of these statements and protests from other sections of the country, the National Recovery Administrator did postpone the effective date. It was later decided that local clearing house schedules should be submitted individually for approval. A large number of these had been pending for some time before the recent deletion of Article VIII.

During the year many individual banks and clearing house associations adopted service charges on their own initiative as in the past. Apparently this process

will continue. In most cases these charges are less burdensome than those first submitted to the NRA. The current tendency to impose and increase such charges, however, appears to be a reversal of the long-time trend. The past history of deposit currency has been one of gradual elimination of exchange and other charges on checks in the interest of the general welfare.

Study of the various measured service schedules and systems of activity cost analysis commonly used by banks reveals several fundamental weaknesses. In banking as in many other lines of business joint and overhead costs constitute a grave obstacle to any kind of cost determination. The attempt to arbitrarily separate such costs is likely to lead to false conclusions.

A number of popular articles giving the results of this study were prepared during the year. Detailed analysis of the cost and historical aspects of the problem were stressed. Emphasis was laid on approaching the problem from the point of view of public welfare and the banking system as a whole rather than from that of the individual bank. It may well be that accounts which appear unprofitable to a single bank are in the aggregate important to the whole banking system. Furthermore, as a matter of sound social policy it is doubtful whether checking facilities ought to be placed beyond the economic reach of large numbers of people.

National Recovery Research—Special Studies with Emergency Funds. (R. L. Mighell.) This project was set up to include all the professional and technical studies carried on with CWA and ERA funds under the direction of the Massachusetts Agricultural Experiment Station at the Massachusetts State College, during the six-months' period March 3, 1934, to August 30, 1934. An average of about 100 and a total of nearly 200 different persons were employed during this period.

The project was divided into forty-three sub-projects covering studies in nearly all departments of the college. As far as possible these studies were designed to supplement and fill in gaps in the normal research program and to accomplish results capable of immediate application to the problems of recovery. Since much of this work is reported elsewhere in this bulletin, only a few of the studies will be mentioned here. A primary objective of the project was to secure normal employment for the personnel. With the aid of the college placement service and other members of the staff, about sixty persons were assisted in finding permanent or semi-permanent positions before the project ended.

With the cooperation of the New England Crop Reporting Service, an acreage census of cranberries, asparagus, and strawberries was completed. Likewise a checkup of onions, tobacco, and potatoes in the Connecticut Valley was made. These studies fill a serious gap in crop reporting statistics and will improve the official estimates for several years to come.

Results from a study of farm production credit needs are being used by the Farm Credit Administration in Springfield in developing a sound production credit policy.

A preliminary economic study of the Worcester and Boston produce market areas was completed to the point of furnishing a quantitative description of the sources of supply and the marketing channels for local fruits and vegetables. Tentative plans for a number of new alternative regional market sites and layouts were made.

The development and construction by the psychology department of several pieces of scientific apparatus for testing the ability of automobile drivers promises to be of great practical value in the present effort to attain greater highway safety.

The plan followed, of supplementing the regular program and spreading the responsibility for the project among the several departments, led to much greater accomplishment than would otherwise have been possible.

Farm Tax Delinquency and Farm Real Estate Values. (R. L. Mighell.) This supplements the nationwide CWA Farm Tax Delinquency Study carried on by the Federal Bureau of Agricultural Economics. About 9000 tax delinquency records, 230 tax sale records, and 4000 real estate transfer records were obtained from 37 selected Massachusetts towns. The six-year period 1928-1933 was covered in most of these towns. Only preliminary local summaries were made before the records were required in Washington for tabulation and analysis in the national study.

These first summaries show that farm tax delinquency in Massachusetts, as measured on the penalty date, increased steadily during the six-year period, but very little delinquency continued to the point of a tax sale. In many cases of mortgaged property, real delinquency is doubtless concealed as mortgage holders have frequently paid the taxes rather than permit the property to be sold. Likewise abatements and exemptions have sometimes been allowed in cases of old age and relief.

Many of the farm real estate transfers consisted of transfers to public and semi-public uses such as schools, reservations, and summer resorts. The actual level of land values is difficult to determine since the true consideration was shown in only about 10 percent of the transfers.

As a matter of interest, several large areas of "lost" land were found in southeastern Massachusetts. No legal record or description exists and this land is therefore untaxed although in some cases occupied.

Enterprise Relationships and Farm Organization on Selected Dairy Farms in Massachusetts. (R. L. Mighell.) Due to civil works and emergency relief activities the work on this project was largely suspended. The study is concerned with the economics of the combination of farm enterprises and of cost factors within each enterprise. Studies of efficient labor routine in regular daily work and specific farm tasks on dairy farms will be continued. The budget method of approach with typical farm cases is being used in determining the most profitable combinations.

Labor Saving Methods and Technique on Vegetable Farms. (R. L. Mighell and R. H. Barrett.) The limited time available for this study in 1934 did not permit much new work. Continued analysis of motion pictures and records secured in 1933, however, confirmed previous conclusions as to the significant savings in time and effort possible through the application of "scientific management" methods to vegetable production. Improved methods of harvesting, bunching and packing asparagus, for example, are being adopted by growers on the basis of recommendations resulting from this study.

FEED CONTROL SERVICE

Philip H. Smith in Charge

The Feed Control Service comprises not only feed inspection, but several other activities, as listed below:

Feed Control (General Laws, 1920, Chapter 94)

Seed Control (General Laws, 1927, Chapter 94)
Dairy Law (General Laws, 1920, Chapter 94)
Advanced Registry Testing
Miscellaneous Work

Feed Control. (P. H. Smith, A. F. Spelman, J. W. Kuzmeski, F. A. McLaughlin, J. T. Howard.) During the fiscal year, 1,641 samples of feeding stuffs were officially collected and examined in the control laboratories. The results show that at least 94 percent of the samples collected varied less than 1 percent from stated guarantees in protein, fat and fiber content. The gross receipts from the registration of feeding stuffs in 1934 (calendar year) were $21,400, derived from 1,070 brands at $20 each.

Seed Control. (P. H. Smith, F. A. McLaughlin, Margaret E. Nagle.) From October 1, 1933, to October 1, 1934, the seed laboratory analyzed 1,627 samples of seed, of which 768 were collected by the State Commissioner of Agriculture, 482 sent in by dealers and farmers, 185 received from the Rhode Island Commissioner of Agriculture, and 192 purchased from wholesalers for special tests. Classification of these analyses is shown by the following summary.

	Massachusetts Official	Massachusetts Non-Official	Rhode Island	Totals
Purity analysis only	41	40	36	117
Purity and germination	160	32	148	340
Laboratory germination only	567	410	1	978
Field germination*		192		192
				1,627

*Samples germinated in the field are duplications of 192 samples of corn germinated in the laboratory.

Field tests to determine trueness to type were again conducted in cooperation with the Department of Vegetable Gardening which tested 192 samples of sweet corn and 187 samples of vegetable seed.

Dairy Law. (P. H. Smith, J. T. Howard, H. L. Allen.) During the year ending December 1, 1934, 6,227 pieces of Babcock glassware were tested. Condemned glassware consisted of one milk-test bottle and one pipette. One hundred and nine certificates of proficiency were awarded.

Two hundred and nineteen creameries, milk depots and milk inspectors' laboratories were visited in order to check methods and pass upon equipment in use. As a result of this inspection, two machines were condemned, and repairs were ordered on nineteen. Seven plants were re-inspected to approve repairs.

This act has been amended to give to the Commissioner of Agriculture concurrent power in its enforcement. Through an arrangement with his office the experiment station will continue to test glassware, issue certificates of proficiency, and make the annual inspection of machines and apparatus. The Commissioner through his deputies will conduct all check tests where methods or accuracy are in question.

Advanced Registry Testing. (P. H. Smith.) Advanced registry testing has been supervised by this department since its beginning in 1902. There are now on yearly test 321 cows located on 42 different farms. This does not include the herd tests where all animals in each herd are placed on test. Of these there

are twenty-two, six of which are supervised by men sent out from this office and sixteen by cow-test association supervisors.

Miscellaneous Work. (P. H. Smith, A. F. Spelman, J. W. Kuzmeski.) Numerous analyses have been made for residents of the State and other departments of the college.

Summary of Miscellaneous Work, 1934

Materials sent in:	
Milk and cream, butterfat only	140
Milk, solids and fat	5
Feeds, from farmers and dealers	78
Feeds, from State Institutions	53
For other departments of Experiment Station and College:	
Milk, for butterfat	244
Dry matter, forage crops	769
Complete fodder analyses	59
Dry matter and nitrogen	57

FERTILIZER CONTROL SERVICE

H. D. Haskins in Charge

Fertilizer Inspection. (H. D. Haskins, H. R. DeRose, A. F. Spelman, J. W. Kuzmeski, Chemists; J. T. Howard, C. L. Whiting, A. G. Brigham, G. E. Taylor, Sampling Agents; Harry L. Allen, Laboratory Assistant.) Records for the year show that 118 firms have registered for sale in the State of Massachusetts 439 brands of mixed fertilizer and fertilizing materials and 46 brands of agricultural lime and gypsum. Results of analysis show that about 72 percent of the fertilizer brands and 84 percent of the lime brands showed no deficiencies. The gross receipts from the registration of the fertilizer and lime products and from fertilizer tonnage fees for the year 1934 were $13,029.

For ten weeks beginning April 1, four experienced men employed to draw samples for inspection purposes sampled 19,086 sacks or containers, representing 7,751 tons of material; 920 agents were visited. The following summary shows the character of these substances, as well as statistics with reference to their inspection.

	Brands Registered	Brands Collected	Samples Drawn	Number of Analyses	Number of Determinations*
Mixed fertilizers	269	273	1,027	464	6,227
Ground bone, tankage and fish	47	47	157	72	535
Nitrogen products, mineral and organic	44	44	179	92	186
Phosphoric acid products	20	20	94	31	124
Potash products	12	12	59	25	71
Dried pulverized natural manures	25	26	102	40	255
Nitrate of potash	5	5	12	8	36
Peat products	9	9	20	11	40
Wood and cotton hull ashes	3	3	8	8	59
Miscellaneous	7	7	17	11	70
Lime products	46	45	98	48	404
Totals	487	491	1,773	810	8,007

*Not counting check tests or repeats, which amounted to 962.

During the period July 1, 1933, to July 1, 1934, the tonnage of fertilizer and plant food, and lime products as soil amendments, sold in Massachusetts was as follows:

		Plant Food Elements (Tons)		
	Fertilizer (Tons)	Nitrogen	Available Phosphoric Acid	Potash
Mixed fertilizers	40,160	2,028	3,438	2,745
Unmixed fertilizer chemicals and materials	15,870	1,144	1,344	484
Pulverized natural manures	1,614	33	24	44
Totals	57,644	3,205	4,806	3,273
Lime products (as soil amendments)	40,433			

Full details of the fertilizer and lime inspection will be found in Control Bulletins 74 and 76.

Miscellaneous Analytical and Diagnostic Work. (H. D. Haskins, H. R. DeRose, A. F. Spelman, J. W. Kuzmeski.) Chemical studies of a cooperative nature have been carried on, as has been the custom in the past, with the several departments of the institution, Field Station and County Agents. The character and extent of this work is shown in the following summary:

Calcium and magnesium superphosphates	2	Hay, cured	55
Chicken mash	3	Leg bones of chickens	10
Clay pots (plant food absorption experiment)	4	Manures	2
Copper sulfate	5	Milk ash	8
Greenhouse soils (complete analysis)	3	Plants from greenhouse	4
		Sphagnum moss	3

Other chemical work of the department has included service to community organizations, State institutions, and individuals interested in agriculture. This group includes the following materials:

Animal tissue for arsenic	1	Manures	2
Carnation soils(complete analysis)	3	Midrib of tobacco leaves	2
Complete fertilizers	3	Peat products	6
Compost	1	Sewage sludge	1
Fertilizer by-products	7	Spent mushroom soil	1
Fertilizer chemicals	9	Soils	11
Grain ration for chickens	1	Tobacco leaves cured	2
Irrigation waters	2	Tobacco leaves damaged	2
Lime products	4	Water for poultry plant	2

Research work on methods of potash determination in fertilizers has been done in cooperation with the Association of Official Agricultural Chemists of North America; other service of an advisory and executive nature has also been rendered to this organization during the year.

DEPARTMENT OF FLORICULTURE

Clark L. Thayer in Charge

Breeding Snapdragons for Varietal Improvement and Disease Resistance. (Harold E. White, Waltham.) Breeding and selection work is being continued with strains now in the F_5 generation. Some ten to fifteen strains of the F_4 generation were grown in the field during the summer, for resistance under field conditions; and, while many of the lines have continued to segregate for resistance, two strains have been selected which are uniformly resistant to rust. These strains are yellow and white flowered types which have bred true for color for three generations. During the past season both strains were tested under greenhouse and field conditions at the University of Michigan by Dr. E. B. Mains, where they were found to be uniformly resistant to rust.

Further breeding and selection work will be carried on to develop 100 percent rust resistant strains in other flower colors.

Propagation Studies on Geraniums. (Harold E. White, Waltham.) Short cuttings, four to five nodes in length, rooted 10 to 20 percent better than long cuttings of six to eight nodes. On six- to eight-node cuttings the rooting response was in favor of the cut being made through or below the node, whereas in the case of four- to five-node cuttings the rooting response was good irrespective of the location of the cut.

Sand and peat as a rooting medium was 10 to 15 percent better than sand only. A mixture of three-fourths sand and one-fourth German peat was found to be the best rooting medium. Soaking the cuttings for one hour in potassium permanganate solution, one ounce to five gallons of water, prior to placing the cuttings in the medium, gave more favorable results than treating the medium with potassium permanganate solution, one ounce to two gallons of water, applied at the rate of one pint per square foot.

Starch was found to be much more abundant near the nodes on soft-wood cuttings than between the nodes. Less starch was found to have accumulated at the nodes in cuttings of older wood.

Study of the Effect of Plant Nutrients, Soil Reaction, and Light on Gardenias. (Harold E. White, Waltham.) A definite growth response in gardenias was observed when nitrogen and phosphorus were used in increasing ratios. The response was more pronounced in sand than soil, particularly with phosphorus, due to the probable high degree of fixation of the soil over sand. Increasing amounts of potash had no visible effect on growth either in soil or in sand, which would indicate a low potash requirement for gardenias. Definite growth response to nitrogen and phosphorus in the soil was manifest only after the higher planes were reached, chiefly with phosphorus.

Low nitrogen was indicated by uniform chlorosis of the foliage and dwarfing of the plants. Interveinal chlorosis was severe on plants fed with calcium nitrate as a source of nitrogen and plants showing interveinal chlorosis became green again after being sprayed with a solution of iron sulfate. Plants that received nitrogen from an ammonia source showed less interveinal chlorosis.

On the basis of soil pH studies it would seem that soil reaction alone is not a safe basis on which to judge the possibility of interveinal chlorosis occurring on gardenia plants, since experimentally chlorosis appeared on plants when the pH readings with a potentiometer ranged from pH 5.0 to 6.1.

From the data obtained it appears that gardenias require more iron for normal

growth than the average ornamental crop or, at least, they are very sensitive to any condition that may tend to reduce the amount of available iron in the soil.

Propagation Studies on Gardenias. (Harold E. White, Waltham.) Work on this project has been delayed due to the fact that repairs on the greenhouse were not completed in time to permit propagation work to start on the date specified.

Study of the Effect of Plant Nutrients on Carnations Under Glass. (Harold E. White, Waltham.) This investigation has been completed and the results will soon be brought together for publication.

DEPARTMENT OF HORTICULTURAL MANUFACTURES

W. W. Chenoweth in Charge

Technological and Nutritional Investigations of New England Apples. (C. R. Fellers, J. A. Clague and P. D. Isham.) Studies were continued on ten varieties of apples for cider making qualities. Blends made from combinations of the varieties were compared with the straight ciders.

A comparison of methods of clarification and filtration showed that the enzymic clarification with Pectinol was the simplest and most effective for general use. The gelatin-tannin treatment produced a clear cider, but removed much of the original color. The filter developed at the Michigan Agricultural Experiment Station was tried out and found to be an inexpensive, simple and satisfactory means of filtering the cider.

Preservation of cider may be successfully accomplished by pasteurization, by filtration through asbestos and germ-proof filter or by chemical preservatives such as sodium benzoate. Pasteurization, if carefully controlled, is probably the best method for the small manufacturer to use for filtered cider. Some preliminary work was done with the electro-silver ionic method of preservation with not very encouraging results. The manufacture and sale of cider affords a very effective outlet for the cull apples of Massachusetts. Now that a simple method of clarification has been developed, clarified cider should create a demand for this product from those people who objected to the "muddy" appearance of the unclarified juice.

Twenty-one varieties of Massachusetts-grown apples have been assayed for vitamin C content during the past two years. These results are presented in a paper in the *Proceedings of the American Society for Horticultural Science*, Volume 31, 1934, and briefly in the *Annual Report of the Massachusetts Fruits Growers' Association* for 1934. There is no apparent correlation between vitamin C content of an apple variety and the chromosome number of that variety. Seasonal or other variation except storage caused little change in vitamin C content in the same variety. The varieties richest in vitamin C are Baldwin, Northern Spy, Ben Davis and Winesap.

When apples were made into apple pie less than 20 percent of the vitamin C was retained. On the other hand, baked apples retained from 80 to 90 percent of their original vitamin C. Sulfured evaporated apples lost approximately 65 percent of their vitamin C content.

Cranberry Products. (C. R. Fellers, J. A. Clague and P. D. Isham.) A paper on the relation of benzoic acid content and other constituents of cranberries to keeping quality was published in *Plant Physiology* 9:631-636 (1934). The mean

benzoic acid content of 24 varieties of cranberries was 0.065 percent. The varieties with the best keeping qualities did not always have a high benzoic acid content; hence other factors are largely responsible for the differences in keeping quality. Unlike benzoic acid, quinic acid exerted no appreciable preservative action against molds, yeasts or bacteria. Neither pectin nor soluble solids of cranberries showed any correlation with keeping quality. In general, the most acid varieties were the best keepers.

The malic acid content of both immature and mature Howes cranberries was 0.26 percent. The citric acid content of immature Howes averaged 1.31 percent and of mature Howes 1.07 percent. Over 0.5 percent quinic acid was positively isolated from cranberries and possessed the same chemical and physical properties as quinic acid obtained from cinchona bark. The isolation was accomplished through the formation of the basic copper salt of quinic acid. This proof of the presence of quinic acid in cranberries aids greatly in explaining the effects observed in the urine and blood after the ingestion of large quantities of cranberries.

Several popular articles were published dealing with the nutritive value of cranberries.

Utilization of Cull Onions. (C. R. Fellers.) This project has remained inactive except for the occasional examination of experimental packs of canned, dried (powder), and pickled onions prepared during the past two years. A start has been made on some studies of the nutritive value of Connecticut Valley onions.

Tomato Juices. (C. R. Fellers, J. A. Clague, and M. J. Mack.) For the second season, homogenization of tomato juices had only a very slight injurious effect on their vitamin C content, and greatly enhanced their attractiveness because it prevented separation of solids. Six commercial brands of canned tomato juice varied in vitamin C potency from 2 to 8.5 grams as the daily protective dose for guinea pigs. Home-prepared juices compared favorably with commercially manufactured ones in vitamin C content.

Effect of Freezing, Cooking, Canning, and Fertilizer Treatment on the Vitamin A and C Content of Green Asparagus. (C. R. Fellers, R. E. Young, and J. A. Clague.) The research under this project has been completed and a paper is now in press. Fresh and frozen asparagus are excellent sources of vitamins A and C. Fertilization with nitrogen and potash had but little influence on the vitamin A or C content. Both cooking and canning green asparagus resulted in a 60 to 80 percent loss of vitamin C. No loss in vitamin A was noted.

Red Squill Research. (R. E. Buck and E. M. Mills.) This study is financed by the U. S. Biological Survey and has for its purpose the perfecting of red squill rat baits. Methyl and ethyl alcohol extracts of red squill have proved to be very toxic in laboratory and field tests on rats. Unlike the powder, the squill extract when mixed with meat, fish, or cereal baits is palatable to rats. If a sub-lethal portion is eaten by rats, they will continue to eat baits containing squill extracts. This is not true in the case of squill powder. Work has been started on the isolation of the toxic principle of red squill.

Nutritive and Technological Studies on Fishery Products. (C. R. Fellers, J. A. Clague and F. P. Griffiths.) The Atlantic whiting was successfully canned by brining, pre-cooking, boning, exhausting, and sterilizing at a temperature of 240°F. for 60 minutes for one-half pound cans. The whiting also made satisfactory canned fish cakes and chowder.

The fish meal studies have been continued in a limited way. There is very little difference in the nutritive value of extracted and non-extracted fish meals as supplementary sources of protein for chicks or laying hens. Vacuum-dried meals were significantly superior to flame-dried ones for both rats and chicks.

Work is now under way to determine the biological value of the proteins of the mackerel and crab by rat feeding experiments. Mackerel oil was found to be a poor source of vitamins A and D.

The preparation and use of waste fish products as dog foods has been given some attention.

Home Canning Research. (W. A. Maclinn, Pearl Haddock, C. R. Fellers and W. W. Chenoweth.) A simple new method for the determination of partial pressures in sealed glass containers was perfected. The method of processing fully sealed glass jars of canned food has been successful for all fruits and for most vegetables when processed in the water bath. However, at the present time the method cannot be recommended for canning meats, fish, or vegetables processed in the pressure cooker or oven. Many new data on pressure, headspace, vacuum, venting, heat penetration, and cooling of glass containers during and after heat treatment have been collected. When fully collated these data will help to explain what actually occurs in the jar of food during processing. Oven canning studies show that while this method cannot be recommended for general home use, the type of oven and container are important factors. Small oven loads are sterilized much more rapidly than large ones. The optimum temperature range for the oven is 250° to 300°F. The presence of a pan or tray of water in the oven during processing definitely retards heat transfer in the jars of food.

Maple Products. (C. R. Fellers.) A paper on the content of vitamins A and C in maple products is in press. The results were all negative. Maple syrup was successfully canned in sealed tin cans and the experimental packs have maintained their original quality for over a year. This method of preserving maple syrup should have wide use.

Microbiology of Dried Foods. (J. A. Clague in cooperation with the Department of Bacteriology.) Preliminary studies show that yeasts are destroyed by the usual methods of dehydrating prunes and grapes. Using *Esch. coli* as an index of intestinal contamination, dehydration effectively destroyed this type of organism. The principal contamination of bulk dried foods is at the surface of the mass.

Blueberry Investigations. (C. R. Fellers and Oreana Merriam.) Chemical and vitamin C studies were conducted on six cultivated and one wild variety of *Vaccinium corymbosum* and on wild *V. pennsylvanicum* from Massachusetts and from Maine. Blueberries are fair to good sources of vitamin C. Little difference in potency was noted among the cultivated varieties, though marked variations in chemical composition were found. Commercial and home methods of canning conserved to a considerable degree the vitamin C of blueberries. Freezing had practically no effect on vitamin C in blueberries.

DEPARTMENT OF OLERICULTURE

Ralph A. Van Meter in Charge

Packet Seed Studies. (G. B. Snyder.) One hundred and seventy-two lots of packet seeds representing beans, beets, cabbage, carrots, cauliflower, celery, cucumbers, lettuce, onions, parsnips, radish, turnips, spinach, and squash were obtained by State inspectors and planted in the trial plots. Field germination of the seed was recorded and the results obtained listed half of the lots as having a germination of 70 percent or better and half as having a germination below 70 percent. Sixteen percent of the lots germinated less than 30 percent.

In general the varieties ran fairly true to the name printed on the seed packet. The carrots were very much off type, and in lettuce and spinach there was mixture in some of the varieties.

This project was carried in cooperation with the Seed Laboratory.

Studies in Sweet Corn, Including Seed Germination, Seed-Borne Diseases, Variety Characters, and Factors of Quality. (A. P. Tuttle and G. B. Snyder.) In cooperation with Professor F. A. McLaughlin, Seed Analyst, and Dr. O. C. Boyd, Plant Pathologist, the Department of Vegetable Gardening studied the field performance of some 245 lots of sweet corn. While there was some variation in plant characters and in the performance of strains within varieties, practically all the strains fell within their respective variety range and were true to name.

Some 70 so-called hybrid varieties were included in the trials and compared with the standard varieties grown. In general the hybrids were slightly later in maturity, had larger plants and ears, produced a slightly heavier yield, and the kernels were sweet and of good quality. Some of these hybrids are of outstanding commercial value.

Studies of kernel toughness of such varieties as Sunshine, Golden Gem, and Spanish Gold indicated that, while kernel toughness tended to increase with age of the kernel, other conditions not within the scope of these investigations were perhaps more important than age in determining toughness. Harvesting of the ear did not materially affect the rate of increase in toughness of the kernel.

Systematic Studies of Turnips and Rutabagas. (G. B. Snyder.) This project was carried in cooperation with the Federal Division of Fruit and Vegetable Crops and Diseases. Thirty lots comprising fourteen varieties of rutabagas and eighty-five lots comprising seventeen varieties of turnips were gown in the trial plots. Detailed records were taken of the plants during the growing season and of the roots at the time of their prime market stage of maturity. This is at least a two-year project.

Systematic Studies of Onions. (G. B. Snyder.) This project was carried cooperatively with the Federal Division of Fruit and Vegetable Crops and Diseases. Thirty-nine lots comprising twenty-three of the more important commercial varieties of onions were grown in the trial plots. Detailed records were taken of the plants during the growing season and of the matured bulbs. This material will be used as a part of the Federal bulletin describing the types of American varieties of onions.

Asparagus Investigations. (Robert E. Young, Waltham.)

Fertilizers. It has been necessary to curtail part of the asparagus fertilizer work because of lack of funds. The plots located at Concord were relinquished early in the spring before the cutting season; the plots located at North Eastham

on Cape Cod were given up at the end of the cutting season. The plots at Waltham will probably be continued until more conclusive results have been obtained.

The plots at North Eastham have been cut for three full cutting periods. The soil on which these plots are located is classified as Merrimac coarse sand. The organic matter content is very low. Although harvest records have been obtained from these plots for only three full years, fertilizer has been applied for the past five years, the roots having been set in 1929. While the results under these conditions are not conclusive, they do give some very definite trends, as follows:

1. Fertilizer containing 8 percent nitrogen applied at the rate of 1 ton per acre gave the best results in the nitrogen series. Nitrate of soda was the best nitrogen carrier.

2. A fertilizer mixture containing 12 percent phosphoric acid, where the phosphorus was derived from superphosphate, gave the best results in the phosphorus series.

3. A fertilizer containing 6 percent potash gave an average increase of 31.6 percent as compared to a fertilizer containing no potash. The results indicate that muriate of potash is the best form.

4. The substitution of salt (NaCl) for muriate of potash resulted in reduced yields. Salt added to a complete fertilizer did not increase yields.

5. The indications are that the nitrogen fertilizer should not all be applied at once, but that one-half should be applied at the end of the cutting season and the remainder one month later. Apparently, some of the nitrogen is lost from this very sandy soil at Eastham when it is all applied at once.

6. One of the most outstanding results of the experiment was the increase in yield obtained by the use of organic matter in the form of seaweed plus 350 pounds of superphosphate per acre.

7. Asparagus was greatly benefited by an application of lime to the acid soil. The limed soil gave an increase of 21.8 percent as compared with the unlimed.

The Waltham plots continued to increase in yield in 1934, although the increase was not as great as that obtained last year. The yield records show about the same results as last year, and about the same as those obtained at the North Eastham plots. One of the differences is that increased yields may be obtained by 12 and 18 percent potash in the fertilizer mixture, provided the nitrogen in the fertilizer is raised from 8 to 12 percent. Better results were obtained when the fertilizer was applied May 1. Although the soil at Waltham is well supplied with organic matter, the plot which receives manure and superphosphate continues to give high yields. A very good kill of weeds was again obtained by the use of Cyanamid in both powdered and granular form.

Depth of Planting and Height of Cutting. The results of this experiment have not changed greatly from those of last year. The plots where roots were planted shallow (2 and 4 inches deep) continue to give the greatest yield, the difference in yield being due mainly to the loss of plants where the roots were planted deeper than 4 inches.

The plots where the asparagus is cut with 12 inches of green seem to be losing some of the advantage in yield that they had at the beginning of the experiment. Cutting the asparagus with only 4 inches of green did not result in an increased yield as compared to the plots cut with 8 inches of green. The results of this experiment to date indicate that cutting asparagus with a full 8 inches of green does not reduce the total yield and does result in an increased market value of the asparagus.

Varietal Improvement. During the past two years, individual records of 278 selected asparagus plants have been kept. These plants were selected in an attempt to obtain a high-yielding strain. Of the 278 plants, 131 are females and 147 males. In 1934, the females produced 9.37 stalks per plant and the males 13.82. The average yield per plant was 12.22 ounces for the females and 13.48 ounces for the males. Of the 10 highest yielding plants, 5 were female and 5 male. Six plants that ranked in the high 10 in yield in 1934 were in the high 10 in 1933. From these indications, it should be possible to obtain consistently high-yielding parents which should produce high-yielding progeny.

Seed Improvement. (Robert E. Young, Waltham.) Progress has been made in the improvement of the French Horticultural bean and samples of the seed will be distributed to bean growers throughout the State. The stock seed crop proved to be a highly colored bean, a large proportion of which was ready for harvest at the same time. In comparison with one of the best commercial strains, the Field Station strain produced larger beans and a greater total yield by 10 percent. The bean crop this past season was remarkably free from the bacterial blight disease that was so prevalent a year ago.

Sixty-six samples of Waltham Beauty pepper seed were distributed to growers last year. In response to a questionnaire sent these growers, 54 returned cards giving information regarding the crop. Analyses of these results show that 43 growers considered the yield of the pepper satisfactory, and 38 considered the pepper better than any commercial variety they had grown. Samples of seed will be available in 1935. Arrangements will be made for a commercial crop of seed since most of the growers trying it felt that it was a definite and desirable addition to the pepper variety list. The pepper was exhibited at the Fall Vegetable Show of the Massachusetts Horticultural Society and was given an Award of Merit.

Selfing strains of Blue Hubbard Squash for the past few years has resulted in a very uniform strain this past season. During this selfing it seemed impossible to maintain the roughness of the skin that is so desirable in squash for Massachusetts markets. The color, hardness of rind, thickness and color of flesh, and yield, were satisfactory. The shape was approximately desirable. Crossing will be necessary to produce the exact type desired.

Considerable improvement was noticed in the stock seed of the Field Station strain of Hutchinson carrot. The particular character on which improvement is being attempted is the interior color. Crosses with darker varieties were made in the greenhouse in the spring of 1934. The seed was planted outside for a fall crop. The majority of these F_1 roots showed a much darker color than the regular strain. Excellent individual roots from regular stock seed were selfed during the past season in an attempt to further improve the uniformity of the roots. There continues to be a strong demand for seed of the Field Station strain of Hutchinson carrot from the local market gardeners association.

At the request of some of the local market gardeners, selfed selections of Bel-May lettuce have been made and grown to improve the appearance of the lettuce. Since the lettuce is packed for market with the head down, it is necessary for the bottom leaves to completely overlap. If the leaves do not overlap where attached to the stem, the head will not have the appearance of solidity regardless of how solid it may really be. Selfed lines now being grown show considerable improvement in regard to this character, as compared with the regular strain of this lettuce.

The Field Station strain of Comet tomato for greenhouse culture has gained in popularity in the past year. Both selection and crosses have been made to

improve the size of this tomato. Samples of seed are available at the Field Station. The seed is being merchandized by the local market gardeners association.

Some progress is being made in improving the color of the Wyman Crosby beet. In trials at the Field Station it compared very favorably with commercial strains as regards uniformity, shape, size, and top growth. Work will be continued for improvement in color before the seed is offered for trial.

Cucumber seed of the Belleville variety has been increased from seed produced by one of our leading cucumber growers. Samples are available.

Pascal Celery Storage. (Robert E. Young, Waltham.) Preliminary work was conducted last year to determine the effect of temperature on the keeping of Pascal or Boston Market celery. This experiment was not fully under way until late in the season due to the fact that the storage plant was not completed until late in December. As was expected, the celery held at low temperature kept longer than celery maintained at a temperature of 40° to 45°F. Celery was taken from storage in marketable condition two weeks after most of the local produce had disappeared from the Boston Market.

DEPARTMENT OF POMOLOGY

F. C. Sears in Charge

The outstanding characteristic of the past year was the unusually severe winter and the resulting damage to orchards and fruit crops. There were two periods of severe cold, one the last week in December and the other in the first half of February. Full records of the winter temperatures are shown in the monthly meteorological bulletins of this station.

The peach crop was a complete failure and many trees over ten years old were killed or very badly injured; trees under five years old suffered somewhat but not severely. Pear trees showed severe browning of the pith and xylem especially in the spurs, and some trees were killed or badly injured. Considering this severe browning, pear trees generally recovered better than was expected and the total permanent injury is believed to be small. The sweet cherry orchard planted in 1927 showed injury to some varieties such as Napoleon and Lambert, while Windsor, Seneca, Schmidt, Stark Gold, and Gov. Wood suffered little injury and bore fair to good crops. Sour cherries showed little injury. The injury to cherry trees was confined to crotches, trunk, larger limbs, and fruit buds.

Because of the size of the industry apple orchards suffered the greatest damage. Many trees of the more tender varieties were killed or badly injured. Injury was worst in Franklin and Plymouth and least in Hampden counties. Four different types of injury could be distinguished: (1) killing of the pitch and xylem, weakening or killing certain branches or the whole tree, (2) loosening and splitting of the bark on the trunk, (3) injury to the spurs and weakening or death of the flowers, (4) killing of patches of bark generally on the larger branches but without loosening from the wood.

The first type was common on the Baldwin and caused the greatest damage. It was most severe on older trees weakened from any cause, frequently the temporary weakness from a heavy crop in 1933. Leaf area was severely reduced, both in size and number of leaves. Usually low branches suffered more than those in the upper part of the tree but this was not always the case. Some trees or branches thus injured recovered more or less during the summer, but others died.

The second type, bark loosening, was most common on McIntosh but occurred also on Wealthy, Wagener, Gravenstein, Red Astrachan, and Baldwin. Some trees were completely, but most of them only partially, girdled. This type of injury appeared only on trees ten to twenty years old and seemed most common in orchards in cold locations exposed to the sweep of winds. It was almost always on the northwest side of the tree. There seemed to be no correlation with tree vigor and there was but little injury to the foliage. In many orchards the loose bark was tacked down and the wound waxed. Where a careful job was done, using nails long enough to hold the bark firmly, recovery seems to have been favored. Possibly the full amount of damage to the injured trees has not yet appeared.

The third type of injury resembled the first but was confined to the spurs. It was generally associated with the first type and confined almost entirely to Gravenstein and Baldwin. Sometimes the flower buds failed to start, or they might get as far as the pink stage and then perish. The damage from this type is mostly from the reduction or loss of the 1934 crop, though some spurs were entirely killed.

The fourth type was like the second but found generally on the larger branches and in the crotches, not the trunk, and the bark remained tight to the wood. The injured area soon became clearly demarked and sunken. It was confined almost entirely to the Baldwin. The permanent damage will be least of any of the four types except when rot is allowed to enter. Where there was crotch injury, a serious weakening of the tree may be expected.

It was estimated that of the Baldwin trees in the State 5 percent were killed, 5 percent too severely injured to be worth retaining, 20 percent severely injured but most of which will recover, while 50 percent were slightly injured but will suffer little permanent damage. This leaves 20 percent of the trees free from visible injury. It is difficult to estimate the damage from bark injury to the McIntosh. Only future years will disclose, but at present it is not considered to be disastrous. There was some permanent damage to Gravenstein in addition to reduction of the 1934 crop. Minor varieties suffered more or less according to their hardiness or lack of it. The principal unusual injury was the bark loosening on the McIntosh.

All varieties of grapes except Concord and Worden suffered more or less winter injury. Vinifera varieties were badly killed even though they were given the usual winter protection.

The apple crop in the station orchards was 17 percent below that of 1933. Injury to the trees was not severe and only a few Baldwins and some trees top grafted two years ago were killed. An old peach orchard already weakened from arsenic injury occurring several years ago was mostly killed. The trees also seemed to be suffering from the new disease reported from Connecticut.

The Interrelation of Stock and Scion in Apples. (J. K. Shaw.) Interest in this orchard centered around the apparent cause of poor growth, a lack of potash. The entire orchard except four rows received, in addition to sulfate of ammonia, about 3 pounds of muriate of potash per tree. Little if any improvement in growth was noted though the two rows that had been fertilized with potash in previous years continued to present a better appearance.

Preliminary work with the Thornton test for potash in plant tissues showed more or less abundant potash in the leaf petioles of the trees that had had three annual applications of potash, but the trees having potash in 1934 only showed little, if any, more than those having no potash. There seemed to be little potash

in these last trees. There appeared to be much difference between individual trees and but little between varieties, except that Wagener seemed very low in potash. This variety has performed very poorly in this orchard. No relation between potash content of the trees and the root stock was shown but this deserves further study.

Some work has been done in tabulating and studying the data accumulated during the 18 years of the life of this orchard and a publication will be made as soon as the study is completed.

Excavations were made around the stumps of trees cut out to study the root distribution. This will be reported later. It was concluded that the stock influenced the type while the scion controlled the size of the root system.

Studies of the Malling types of clonal roots were continued. Surplus wood of several types was grafted on short pieces of seedling roots in April and at once planted. Results were as follows:

Malling Type Number	Number of grafts planted	Percentage Living	Percentage Rooted
1	221	58	84
4	135	53	80
6	16	0	—
8	68	0	—
9	105	0	—
10	97	60	81
12	110	64	60
13	70	61	52
15	50	54	37
16	149	60	77

This method of nurse root grafting may be used for propagating these stocks. If allowed time to callus before planting, better results might be obtained. The nurse roots were cut off and the rooted scions replanted.

The first crop from a stool bed planted in 1933 was harvested. Rooted layers per 100 stool plants were as follows:

Malling Type Number	With Strong roots	With Weak roots	Total
1	54	84	138
2	48	128	176
3	207	243	450
4	150	211	361
5	57	205	262
6	64	152	216
8	150	132	282
9	95	79	174
10	18	130	148
12	14	111	125
13	60	200	260
15	25	138	163
16	53	225	278

There is considerable variation in the yield of the several stocks. Yields should be larger as the plants become older.

An orchard of 344 trees, mostly Baldwin, McIntosh, Starking, Red Spy, and Macoun budded on several Malling stocks, was set on the fruit farm of R. S.

Schoonmaker in Amherst for a study of the behavior of these varieties on these stocks. More than 2,000 Malling stocks were budded to several commercial varieties for further studies of this relationship.

The young orchard set in 1928, known as Block D, consisting of McIntosh and Wealthy on Malling stock, bore its first real crop. Following are yields per tree, and trunk diameter:

Stock Type	Trunk Diameter (mm.) November 1933		Average Total Shoot Growth (in.) 4 yrs.		Yield 1933-34 (lbs.)	
	Wealthy	McIntosh	Wealthy	McIntosh	Wealthy	McIntosh
1	29	80	—	60	10	69
2	37	24	—	27	24	0
3	27	23	—	—	10	0
4	77	96	28	62	149	135
5	60	66	24	64	39	52
6	46	67	56	66	34	19
8	23	18	27	30	0	0
9	21	27	—	49	6	4
10	65	84	64	73	40	64
12	83	98	66	80	77	37
13	69	75	63	69	46	55
15	68	77	62	68	32	18
16	81	94	62	78	76	94
Own roots	71	93	67	72	49	86
Seedling roots	71	88	61	72	62	71

With these two varieties the dwarfing stocks, Types 1 to 9 inclusive, do not seem to have hastened production, except in the case of Type 4. Trees on this stock are large and productive but the root anchorage is somewhat weak. McIntosh does well on Type 1 while Wealthy does poorly. Types 12 and 16 are promising as stocks for standard trees. Types 2 to 9 inclusive are represented by fewer trees than are the others and the averages are less dependable.

Some studies of root distribution were made by digging semi-circular trenches partially around the trees. The trees are twenty feet apart, and the roots almost meet across this space but seem to have gone down only about two to three feet.

Tree Characters of Fruit Varieties. (J. K. Shaw and A. P. French.) Photographic records of bloom clusters on about one hundred varieties of apples were made. Flowers and flower clusters are characteristic of the variety and are of value in identifying varieties for the few days that they are available. Some time was given to the study of new varieties in connection with nursery variety inspection and the certification work of the Massachusetts Fruit Growers' Association, which was continued on the smaller scale of recent years. Occasional mixtures still appear but are very much fewer than formerly. Several hundred thousand nursery apple trees in eight different nurseries in New England and New York were examined for trueness to name. Trees of several seedlings of Rome Beauty grown from buds received from the Ohio Station, including Gallia Beauty and Rome, were available for study. Only one of these was found to differ from the others enough for possible identification in the nursery row of yearling trees. This is the first case we have met of seedling varieties that could not be identified.

Further efforts were made to establish a cherry nursery for the study of varieties. It has proved very difficult to get a sufficiently good stand of buds for study.

Some progress has been made and another effort to grow a cherry variety nursery is planned for next year.

The Genetic Composition of Peaches. (J. S. Bailey and A. P. French.) During the severe winter of 1933-34 all peach buds in the college orchard and a number of the older trees were killed so that no crossing could be done in the spring of 1934. Seedlings raised from pits obtained from crosses made in 1933 were set in the nursery to the number of 1158. Because of limitation of space only 1122 of the 2415 seedlings ready for planting in the orchard in the spring of 1934 were set. Although all of these seedlings had been injured more or less severely during the winter of 1933-34, only fourteen died. The rest recovered and made a very good growth.

Effect of Pruning Bearing Trees. (J. K. Shaw and O. C. Roberts.) Work on this project is drawing to a close and the results are nearly ready for publication. The old orchard used in this work has been partially removed to make room for building purposes and the remainder is of little value for the experiment and will probably be soon cut down. Some work in other orchards may be continued for a time.

Comparison of Cultivation and Sod in a Bearing Orchard. (J. K. Shaw.) This experiment has now continued for fourteen years though with some changes in soil treatment. The yields of the several plots over this period present a rather interesting picture. Computed by two-year periods in average pounds per tree they are as follows:

Plot	Treatment	1921–22	1923–24	1925–26	1927–28	1929–30	1931–32	1933–34
				BALDWIN				
	CULTIVATED:							
3	No fertilizer....	39	76	8	126	484	179	450
5	N 1927.....	179	66	54	600	923	692	466
7	Complete 1930..	82	382	674	345	725	359	928
1	Complete 1930..	11	170	434	841	765	272	1485
	SOD:							
2	N 1921.....	380	510	668	694	950	345	974
4	N 1921.....	331	553	662	292	887	183	932
6	K 1927.....	354	483	567	471	737	145	862
				McINTOSH				
	CULTIVATED:							
3	No fertilizer....	427	242	117	283	415	545	545
5	N 1927.....	473	27	279	462	568	938	717
7	Complete 1930..	263	413	547	532	648	537	1266
1	Complete 1930..	34	379	383	506	679	724	1171
	SOD							
2	N 1921.....	477	634	242	393	796	630	714
4	N 1921.....	461	575	327	314	656	473	533
6	K 1927.....	559	734	483	680	1003	1064	1019

The odd-numbered plots have always been cultivated (except parts of plots 1 and 7 before 1921), and the even-numbered plots were cultivated before but have been in sod since 1921.

Plot 3 has had no fertilizer since 1921 and little, if any, before. Yields are very low.

Plot 5 was unfertilized until 1927 when annual applications of 300 pounds per acre of nitrate of soda were begun. The trees quickly responded with increased crops but this has not been maintained, at least with Baldwin.

Parts of Plots 1 and 7 were in sod from about 1914 to 1921 when the whole was put under cultivation. No fertilizer was applied until 1930 but since that

time a complete fertilizer has been applied annually. These two plots produced rather better than the other cultivated plots in the earlier years of the test, then showed signs of a decline. The crop of both varieties for 1933-34 shows remarkable gains. If continued for a few years more it will be an argument for complete fertilizer.

Plot 2 in sod has had nitrate of soda 300 pounds per acre and a supplemental application of about 200 pounds in July. Plot 4 has had the same treatment but without the summer application. The additional nitrogen seems to have increased yields. Plot 6 had the same treatment as Plot 4 until 1927 when sulfate of potash 150 pounds per acre annually was added. McIntosh seems to have responded after a year or two with increased yields, while Baldwin has not. The appearance of the trees on Plot 6 is better than that of those on Plot 4 and the potash content of the leaf petiole is higher.

Comparison of Clover Sod and Grass in a Sod Mulch Orchard. (J. K. Shaw.) This project is closed. Results have been meager, but it is concluded that white clover cannot be easily maintained in orchards with phosphorus–potash–lime fertilization under our conditions. There has been some evidence that the white clover when present does supply some nitrogen to the trees but not an adequate amount. The conditions favoring the clover seem also to favor blue grass and it tends to crowd the clover out. However, it is felt that the trees grew and produced better than they would have done without fertilizer.

Tests of Different Amounts of Nitrate of Soda. (J. K. Shaw.) The practice of fertilizing in the off years only has been continued. Yields in the on year have not been maintained but in the off year, when the fertilizer has been applied, they have increased. In other words there is evident some tendency toward more regular bearing. The net result, however, is a lower total yield.

Comparison of Cultivation and Heavy Mulching for Apples. (J. K. Shaw.) Fertilization of the cultivated plots with nitrate of soda was continued and additional mulch applied to the mulched plots as it was available. Mulching has been very heavy, enough to suppress nearly all the grass beneath the trees. The lower layer of the mulch, which has accumulated for twelve years, is well decayed and filled with a mat of fine rootlets. No injury from the severe winter was noticed. The yields by two-year periods in pounds per tree since 1926 are as follows:

McINTOSH	1927–28	1929–30	1931–32	1933–34
Mulched	1452	2550	2272	2154
Cultivated	785	1220	1437	1461
Difference	667	1330	835	693
WEALTHY				
Mulched	447	752	836	896
Cultivated	323	474	676	597
Difference	124	278	160	299

The nitrate applied to the cultivated plots beginning in 1930 has apparently increased production of McIntosh, but Wealthy trees have increased in yield no more than those mulched. Perhaps the Wealthy trees are deriving some nitrogen from the seepage waters from the mulched plot located adjacent on higher ground. The filler trees on Doucin stock in these plots were cut out in 1932 and this may have been to the advantage of the trees on seedling stocks remaining. The stocks under these Doucin trees prove to be Malling Type 5 and not 6 as reported last year.

The Effects of Fertilizer Limitation on Fruit Plants. (J. K. Shaw.) Fertilizer applications were continued on these plots as for the past forty-five years. A subsoil plow was run along the borders of each plot to cut any roots seeking to trespass on an adjoining plot. This leaves a space of three feet between the plots across which it is doubtful if the roots will pass in one season. Leaf burn was, as in past years, severe on some plots, especially the unlimed potash plots. Tree growth is closely correlated with the amount of leaf burn.

Some work was done with the Thornton test for potash in the trees. This test indicated that the potash in the leaf petioles was high on all the plots receiving potash fertilizers with the exception of the phosphorus–potash plots; it was low to medium on the unfertilized plots; on the unlimed part of the phosphorus and nitrogen–phosphorus plots it was rather high, while on the limed part it was very low; on the plots receiving nitrogen only, potash was very low.

Role of Potash and Lime in Fruit Tree Nutrition. (J. K. Shaw.) Work on this project was resumed after one year. Peach seedlings homozygous for vigor factors were grown in pots in soil from the unfertilized limed plots of the preceding project. They were variously treated with sulfur and different nitrogen-carrying fertilizers, including peat and manure. Not enough sulfur was used to acidify the soil so as to seriously interfere with growth. Nevertheless some interesting results were secured.

Effect of Potash and Lime on Apple Trees. (J. K. Shaw.) The McIntosh filler trees were removed in the spring that they might not interfere with the Wealthy trees, the entire orchard being now of that vareity. The orchard has been in sod and the appearance of the trees rather poor. The sod between the trees was cut with a heavy disc harrow in the spring, improving growth and foliage color of the trees. Yields were not larger than in 1932.

Yields are higher on nitrogen plots than on phosphorus–potash plots. The addition of potash to nitrogen seems to have increased yields after a year or two following the first application, and these increases have been greater during the past two years. There is as yet no indication that the addition of phosphorus to nitrogen and potash has improved yields.

Study of Varieties of Tree Fruits. (J. K. Shaw and O. C. Roberts.) The single tree of Macoun produced its first real crop at the age of nine years. The fruit is of excellent quality and less subject to scab than McIntosh; not so attractive in appearance, but of good size. The variety will probably prove an annual bearer and is promising for trial, but may not prove as productive as might be wished. It is possible that other more desirable candidates for the place of the much desired "Winter McIntosh" may appear. One of these possibilities is Kendall of which several trees were planted and a considerable number budded in the nursery.

Golden Delicious fruited well and is regarded as a promising variety. The quality of the fruit is unsurpassed among winter varieties and the yellow color should not prove a serious handicap. It may be recommended for plantings in a limited way for local markets, but will be more successful in regions where the season is longer and the atmosphere less humid, and this may prevent it from becoming an important variety in New England. It is quite resistant to most insects and diseases. The fruit russets easily from spraying, is easily bruised, and must be stored in high humidity.

Milton has proved to be often of undesirable shape and we now regard Early McIntosh as more desirable than Milton.

Richared is more attractive in appearance than Starking and may prove more desirable when a red type of Delicious is desired.

The early red varieties of Yellow Transparent season from the United States Department of Agriculture bore light crops. Further trial is necessary to indicate which ones are best, but it is felt that among these there are some that will prove desirable as early varieties for Massachusetts.

Diadem, a red winter apple from New Zealand bore a good crop of attractive apples of good quality and may prove worthy of further trial.

As the severe winter killed all the peach buds no further notes on the new peach varieties are available. There were no outstanding differences in hardiness of the wood though Golden Jubilee, Primrose, and Cumberland seemed a little less hardy and Halehaven and New Jersey No. 71 a little more hardy than other varieties.

Wright's Early Plum, a hybrid received from the United States Department of Agriculture proved hardier than Red June and Beauty, two other similar varieties of practically the same season. A good crop was produced and this variety is considered promising as an early plum of good quality. It ripens with us during the last ten days of July.

Several varieties of grapes originated at the New York Station are under observation. Fredonia continues promising as a substitute for Moore's Early. It is productive and early with well filled bunches. Seneca was severely injured by the unusual cold, though it has proved hardy in ordinary winters. It is early, of excellent quality, and keeps well in storage.

Portland and Ontario are both valuable varieties of early white grapes. Berries of Portland are larger but we consider those of Ontario of better quality. Both varieties shell rather badly.

The Newburgh raspberry continues practically free from mosaic though growing near other varieties badly infected. The plants are moderately vigorous and the berries large, attractive, firm, and of good quality.

Monroe is a good plant maker, early and productive. The berries are medium in size, attractive, and of excellent quality. It is somewhat subject to mosaic diseases.

The plants of Chief are healthy and very vigorous, resistant to mosaic, early, and produce heavily. The berries are rather small but of good quality.

Viking suffers from mosaic and winter injury but healthy plants produce heavily. The berries are of good size and quality, and attractive in appearance.

Lloyd George shows some tendency to be everbearing but is not reliable in this characteristic. It is subject to mosaic and blight. The berries are very large, of good quality, and of attractive appearance.

A considerable number of new strawberry varieties are under observation but further trial is desirable before comments are made.

Fruit Bud Formation in the Strawberry. (R. A. Van Meter.) This project has been concluded and data are being prepared for publication. It was undertaken six years ago to study the effect of nitrogen applications on the formation of fruit buds, particularly when applied near the time of fruit bud formation.

No consistent effect has been found in repeated trials involving hills, placed runners with plenty of room, and moderately filled matted rows; and no consistent effect has been found either on a good strawberry soil or a soil that needed fertilization to produce satisfactory grain crops. All plots were duplicated five times and all plots received phosphorus and potassium.

Bud Mutation. (J. K. Shaw and W. H. Thies.) The trees topworked to various suspected bud sports made a satisfactory growth and should begin to bear in a year or two and show to what extent the variations shown in the original tree are transmitted.

Storage of Apples Under Various Conditions. (O. C. Roberts cooperating with Agricultural Engineering Department.) The two projects on storage reported on last year were continued, namely:

1. *A study of the effect of humidity on the keeping quality of apples at 32° and 45°F.* Additional data tend to support the assumption that the maintenance of high humidity at the lower temperature is less important than at the higher.

2. *The storage of McIntosh apples above 32°F.* Repeated tests indicate rather conclusively that if McIntosh apples are held at 45°F. for a period of two weeks after harvesting and are then subjected to decreasing temperatures until 32° is reached about November 1, the apples will be superior in flavor to those held at 32° continously and can be expected to keep satisfactorily until January 1 or a little later.

Tests of Various Spray Materials. (O. C. Roberts cooperating with Entomology and Botany Departments.) For another season tests of various spray materials have been made in the college orchards to determine their efficiency and safety to the trees and fruit. Results for the past season are given in the report of the Entomology Department.

Removal of Arsenic and Lead Residues from Apples. (O. C. Roberts and J. K. Shaw cooperating with Entomology and Agricultural Engineering Departments.) Apples which had been sprayed with lead arsenate were washed three to five minutes in the washer designed by Prof. Gunness, using a solution containing 1.3 percent HCl at 50° to 55°F. The removal of both arsenic and lead residues was highly satisfactory and the fruit suffered no apparent injury because of this washing process.

Blueberry Culture. (J. S. Bailey.) The half-acre planting set for cultural experiments is situated in a relatively low spot. During the winter of 1933-34 all of the bushes were killed practically to the snow line. The dead parts of the bushes were removed in the spring of 1934. This required very heavy pruning. However, the plants recovered and made an excellent growth during the summer.

In the spring of 1934 an experiment was started in Wagner pots using a sandy loam soil which had received no fertilizer for forty-five years. Treatments consisted of varying amounts of lime, 0 to 40 grams per pot, and varying amounts of sulfur, 0 to 40 grams per pot, both with and without peat added to the soil. Plants made the best growth in the pots receiving 5 grams of sulfur. Growth was increasingly poorer with increased amounts of both sulfur and lime until with the higher amounts the plants died. The soil used in this experiment is known to be deficient in potash. Tests of the soils in the pots revealed little or no available potash where lime was applied but relatively large amounts where sulfur was used.

The propagation work was continued. A test of German peat and a 50-50 mixture of sand and German peat indicated the German peat to be the better propagating medium. A higher percentage of rooted cuttings was obtained under burlap shade alone than under burlap shade and glass sash.

DEPARTMENT OF POULTRY HUSBANDRY

J. C. Graham in Charge

Broodiness in Poultry. (F. A. Hays.) Particular attention is now being given to the problem of deferred broodiness beyond the first laying year. Data published in Bulletin 301 indicate that genetically non-broody strains can not be established without testing both males and females for genetic purity for the recessive non-broody genes. A few aged males and a number of aged females are now on hand that are believed to breed true for non-broodiness. Progress is also being made in the study of inherited degree of broodiness. The flock as a whole has fallen to a new low level for broodiness.

Breeding Poultry for Egg Production. (F. A. Hays and Ruby Sanborn.) Such physical defects as light plumage color, white ear lobe, stubs, and wavy or lopped comb are being given special consideration in the flock. Broodiness has fallen to a new low level, and egg size has reached a level above 24 ounces for the year. Range mortality is low, but laying-house mortality runs high. The production-bred birds are very heavy in weight and exceed standard requirements for the breed. Fecundity characters are being maintained and production is high with good hatchability.

Statistical Study of Heredity in Rhode Island Reds. (F. A. Hays and Ruby Sanborn.) Data have been prepared under this project and published as follows: "Breeding for Egg Production," Bulletin 307; "Character of Female Offspring of Rhode Island Red Inbred Males Compared with Female Offspring of Non-Inbred Males," *Poultry Science* (in press); "Effects of Inbreeding on Fecundity in Rhode Island Reds," Bulletin 312; and "Time Interval to Standard Egg Weight in Rhode Island Red Pullets," Bulletin 313.

A Genetic Study of Rhode Island Red Color. (F. A. Hays.) A report on a five-year study of crosses between production and exhibition birds in relation to plumage color and fecundity characters is ready for publication. Birds are being bred for color alone, and a line of exhibition-bred birds is being bred for high fecundity. More detailed study is now being given to the component parts of Rhode Island Red plumage color.

Determination of Genetic Laws Concerning Results of Inbreeding. (F. A. Hays.) This project has been terminated and the results published in Bulletin 312.

Factors Affecting Egg Weight and Shell Character in Domestic Fowl. (F. A. Hays.) For the mating season of 1934, breeding females were selected on the following bases: Line 1, pullets reaching 24-ounce egg weight in 61 to 90 days; Line 2, pullets reaching 24-ounce egg weight in 31 to 60 days; Line 3, pullets reaching 24-ounce egg weight in 0 to 30 days. Previous to this the selection of breeding pullets was on the ability to lay 52-, 57-, or 59-gram eggs, respectively, for the month of December. Full brothers are still used in the three mating pens. Characteristic size, shape, and color of eggs has been studied in the three lines and the results will soon be interpreted and published.

Rate of Feathering in Rhode Island Reds. (F. A. Hays.) Preliminary studies have been carried on, on all pedigreed chicks since 1931. In the spring of 1934 two males that were completely feathered in the back region at eight weeks of age and two males with backs bare at eight weeks were used for breeding. All

progeny was classified at eight or nine weeks of age for early or late feathering. Results to date indicate that autosomal genes are concerned in the rate of feathering in Rhode Island Reds.

Breeding for Low Mortality. (F. A. Hays.) An attempt is being made to establish by selective breeding a line of birds with very low mortality rate in the laying houses and a second line with very high mortality. In the spring of 1934 one male was selected from a family with low mortality and another male from a family having extremely high mortality. These two males were each mated to a pen of females, part of which were classed as low in mortality and part as high in mortality on the same basis that was used in selecting the males. Resulting progeny are now being carried through the year.

Breeding for High and Low Resistance to Fowl Paralysis. (F. A. Hays, C. S. Gibbs, W. C. Sanctuary and J. H. Vondell.) This is a cooperative project between the Departments of Poultry Husbandry and Veterinary Science, and was undertaken in the spring of 1933 to discover whether inheritance plays a part in resistance to fowl paralysis. Selection of breeding stock was based either on the incidence of paralysis in the family or on its incidence in the offspring. Three lines were established using two males with high incidence and one with low incidence. On the female side each line included both hens and pullets with high or low incidence of paralysis.

The first generation progeny hatched in 1933 was carried as a whole up to December when part of the males were discarded and the females retained. All sick or dead birds were carefully studied for pathological symptoms. The second generation hatched in 1934 was sired by cockerels from the three lines mated in part to the original females and in part to first generation females. Progeny are being handled in the same way as the first generation.

General results indicate the more frequent occurrence of paralysis from the high incidence matings.

DEPARTMENT OF VETERINARY SCIENCE

J. B. Lentz in Charge

Poultry Disease Control Service. (H. Van Roekel, K. L. Bullis, D. M. Yegian, O. S. Flint, and M. K. Clarke.)

1. *Pullorum Disease Eradication.* During the past year the Massachusetts poultrymen have shown an interest in pullorum disease testing and eradication which is equal to that of the previous season. This fact is encouraging, since economic conditions were markedly unfavorable to the poultry industry.

During the past testing season 262 flocks were tested, representing 263,241 tested birds, 284,848 tests, 0.53 percent positive tests, 229 negative flocks, and 33 positive flocks. As the result of testing over a period of years, great progress is revealed by the fact that the number of flocks which had been tested for three or more consecutive years was equal to 178, representing approximately 86 percent of the tests, of which 0.34 percent were positive. Only 11 of the 178 flocks were classified as infected, which shows that, through annual testing supplemented by effective preventive measures, flocks can be maintained free from pullorum disease. The primary object is to maintain the flocks free of the disease and to establish additional clean flocks through closely supervised testing and supervised replacements from known free flocks.

2. *Pullorum Disease Investigations.* Investigations to determine the role which feces from positive reacting birds may play in transmitting pullorum disease have revealed interesting results. Adult birds from a pullorum disease free flock, which were negative to the agglutination test, failed to contract pullorum infection when feces from infected birds were added to the litter at frequent intervals for a period of approximately one year. However, when non-infected birds were force-fed feces from infected birds evidence of transmission was obtained. While some phases of the complex problem of dissemination of pullorum infection have been studied, the transmissibility of this disease among adult stock requires further study in order that certain types of outbreaks may be prevented. Due to the lack of knowledge concerning this particular subject, poultrymen may not be exercising sufficient care in establishing and maintaining a free flock.

The ability of *S. pullorum* to remain viable on a dry piece of cloth is being studied. At the present writing the organism has remained alive for 855 days.

Investigations mentioned here are still in progress and will be reported in detail elsewhere.

3. *Laboratory Diagnoses.*

(a) Personal calls at the laboratory were recorded 127 times. The number of cases handled was 369. The classification of 1393 specimens follows:—1279 chickens, 30 turkeys, 28 ruffed grouse, 20 ducks, 16 pheasants, 6 canaries, 6 cattle, 3 sheep, 3 swine, 1 cat, and 1 mink. The diseases encountered most frequently were pullorum disease, parasitism, reproductive system disorders, so-called "range paralysis," tumors, kidney disorders, and proventriculitis. The diagnoses of diseases which are believed to be rather rare in Massachusetts were paratyphoid, fowl cholera, fowl typhoid, intestinal capillariasis, and pullorum disease in turkeys.

(b) Paratyphoid infections were encountered in chicks, ducks, and canaries. The outbreak in chicks received considerable study, which has not been completed.

(c) The pullorum disease in turkeys was traceable to hatching eggs in an incubator with eggs from an infected flock of chickens.

(d) *Dispharynx spiralis* infestation of ruffed grouse was noted in one young, wild bird. The other grouse were all young birds and came from one small flock. Kidney disorders and "slipped tendons" were prominent in necropsies.

(e) An acute condition affecting high-producing pullets came to our attention. Sporadic cases have been noted annually for the past few years. The histories of outbreaks in flocks present the following: condition excellent when housed two to four weeks previously, production 30 to 50 percent, feed consumption high, one or two dead birds found on roosts, a few birds depressed and weak on legs, and production drops markedly. Many of the depressed birds improve and resume production in two to four weeks, while others go into a neck molt. Approximately 10 percent was the highest mortality reported. Necropsy findings include a slightly enlarged liver with numerous yellowish foci, petechia on abdominal fat, pericardium, and pleura, and slightly enlarged pale kidneys. Aerobic and anaerobic bacteriological examination and transmission trial with liver emulsions and with blood were negative.

4. *Farm and Station Bang Disease.* In assisting this project, the laboratory tested 1,545 blood samples by the standard tube agglutination method.

Experiments on the Vaccination of Baby Chicks Against Infectious Laryngotracheitis. (C. S. Gibbs.) Practical poultrymen have frequently asked about the possibility of vaccinating chickens against infectious laryngotracheitis at the

time they are removed from the incubator. An attempt has been made to do this experimentally, and it has been found that when the regular field vaccine was used 80 percent of the chickens died of acute infection of the cloaca and Bursa of Fabricius. For the successful vaccination of baby chicks, an attenuated virus of uniform virulence must be used; and since no practical way of producing such a standard virus has been discovered, it is impossible to successfully vaccinate baby chicks on a large scale against infectious laryngotracheitis.

Experiments with chickens at other ages indicated that they were not able to withstand the field vaccine until they were two months of age, and the best results were secured at three and four months of age.

Serological Experiments with Infectious Laryngotracheitis Virus. (C. S. Gibbs.) The elementary bodies occurring in the epithelial cells of the larynx and trachea of birds sick or dying of infectious laryngotracheitis may be liberated to a limited extent by grinding the exudate in 10 percent NaOH solution in an unglazed mortar with an unglazed pestle for half an hour or longer. After allowing the cellular debris to settle, the supernatant fluid is decanted into a centrifuge tube and centrifugalized at 3200 revolutions per minute until a clear, supernatant fluid is obtained. The supernatant fluid is carefully pipetted off, the tube refilled with carbolyzed saline, and shaken. The washing is repeated three or four times, after which the tube is centrifugalized at a moderate speed of 1200 or 1500 revolutions per minute to throw down as much of the cellular material as possible without interfering with the free elementary bodies. Unless an opalescent fluid is obtained the grinding, washing, or both have not been properly done. By adding an appropriate amount of immune serum to a properly prepared suspension of elementary bodies a flocculation test may be obtained which is specific for infectious laryngotracheitis, and not for normal serum, or the serum ot birds suffering from pullorum disease, fowl typhoid, chicken pox, avian paralysis, or leukosis. Sometimes a slight flocculation occurs in the first supernatant fluid after the first washing, but it has never been found in the fluids of the other washings.

The elementary body suspension will bind complement, when it is properly prepared and balanced in a hemolytic system consisting of sheep's corpuscles, rabbit serum amboceptor, and guinea pig complement. Because of technical difficulties in preparing the antigen, these serological tests have not found any practical use in the control of infectious laryngotracheitis, but they are of scientific interest, because they support the view of Seifried and Burnet that these bodies are the virus of this disease.

Infectious Laryngotracheitis Virus in Eggs. (C. S. Gibbs.) Infectious laryngotracheitis virus has been passed through a series of graded acetic cellodion filters, and the filtrate inoculated into eggs. It has been found that the chorio-allantoic membrane of the egg may be affected by the virus and the embryo killed in three to five days. In no instance has the virus been carried through the incubation period of the egg. Virus introduced into eggs at the beginning of the incubation period, before the chorio-allantoic membrane is formed, does not live longer than 24 hours in the incubator, but may live longer than 24 hours if the egg is kept in cold storage. Small quantities of the virus-filtrate introduced into the air sac during the last week of incubation do not infect the embryo. Large quantities of the liquid kill the embryo, but it appears to die of causes other than infectious laryngotracheitis. It is believed that these studies have been advanced far enough to indicate that the danger of transmitting infectious laryngotracheitis through the egg is remote.

Comparative Studies of Toisson's Fluid and Hayem's Fluid Containing 2 percent Eosin for Counting Erythrocytes and Leukocytes in Avian Blood. (C. S. Gibbs, R. F. Sturtevant, K. W. Chapman, and C. G. Johnson.) Hayem's fluid containing 2 percent eosin is superior to Toisson's fluid in that there is less clumping of the cells, and less danger of the stain precipitating during a count and thus making it necessary to repeat the process with fresh stain. A higher leukocyte count is obtained with Hayem's fluid than is secured with Toisson's fluid with the same blood under the same conditions. Therefore, Hayem's fluid is preferable to Toisson's fluid in counting avian blood cells.

The Oxydase Test in Avian Pathology. (C. S. Gibbs and K. W. Chapman.) Oxydase tests on representative samples of leukemic and normal avian blood were made by the Graham, Goodpasture, Washburn, and Sato and Sekiya's techniques. The method of Sato and Sekiya was found superior to the others from the standpoint of the keeping qualities of the stain, and the rapidity of staining. If the sole object is to determine the number of cells containing oxydase granules in a given smear of avian blood, then Sato and Sekiya's technique should receive first choice. But if it is desired to make a complete differential count of all cells in a smear, then Washburn's technique should be selected on the basis of this study, because it is the only stain that will answer the purpose. The oxydase test was found to be of value in differentiating leukemic from non-leukemic avian blood.

Leukosis and Avian Paralysis. (C. S. Gibbs and C. G. Johnson.) Myeloleukosis and to a lesser extent erythroleukosis may be transmitted by direct inoculation of affected blood into healthy chickens, by contact infection, and by inoculation into eggs in which the bone marrow cells of the embryo have been formed. Lympholeukosis, monoleukosis, and neurolymphomatosis are not readily transmitted by inoculating either affected blood or diseased tissues into healthy chickens and fertilized eggs. The experimental data thus far indicate that neurolymphomatosis in particular is transmitted naturally through the egg. Direct transmission from fowls having diseased ovaries has been observed in a few instances, but in most cases the method of transmission is obscure, indicating that further work must be done before the pathology of this disease is understood.

Field experiments indicate that mortality from both leukosis and avian paralysis may be reduced by removing diseased birds from the flock as soon as symptoms are noticed and so disposing of them that they can never get into the flock again. For reasons which are not understood at present, this method of control is more effective for neurolymphomatosis than it is for myeloleukosis and erythroleukosis.

Proventriculitis and Ventriculitis. (C. S. Gibbs and K. L. Bullis.) A necrotic disease of the tissues lining the proventriculus and the ventriculus has been noted at this station for some time. Attempts to determine the cause of this condition have been unsuccessful in that significant microorganisms have not been isolated. Finally, one of us suspected that it might be due to paralysis of the nerves supplying these organs. Since then considerable data have been collected, indicating that one cause, if not the sole cause, is paralysis of important branches of the vagus and coeliac nerves which supply these organs. Apparently, proventriculitis and ventriculitis are but further manifestations of avian paralysis.

Infectious Coryza. (C. S. Gibbs and K. L. Bullis.) Next to leukosis and avian paralysis, infectious coryza is the most baffling of any of the diseases of poultry

from the standpoint of etiology and control. If the disease occurred as a filterable virus or a bacterial infection alone, the problem of differential diagnosis and control would be greatly simplified. But the investigations at this station and others thus far indicate that infectious coryza is invariably complicated,—filterable viruses of the common cold, infectious laryngotracheitis, and chicken pox of low virulence, and avitaminosis being the primary factors, which lower the resistance to bacterial infection of varying character to complicate the disease picture and the method of treatment. Furthermore, the bacterial factors in different outbreaks appear to vary in kind and virulence, and with respect to locality, season, and breed. In some instances, as in the case of *Hemophilus coryza gallinarum* and some forms of streptococci, they have been found to assume a primary etiological role, independent of viruses and deficiency diseases.

The greatest need at the present time is for practical diagnostic tests by which the various forms of infectious coryza may be differentiated and specific treatments applied. Attempts to discover such tests have been pursued throughout the year in connection with the Diagnostic Service. The serological tests for infectious laryngotracheitis reported above, the adaptation of the Nelson technique for the isolation and study of *H. coryza gallinarum*, and the use of Rosenheim's and Drummond's test for vitamin A deficiency in cases of infectious coryza are some of the methods that have been used in the attempt to solve this problem.

WALTHAM FIELD STATION
(Waltham, Massachusetts)

Ray M. Koon in Charge

For reports on approved projects conducted at this station, in addition to those listed under this caption, see reports of the Departments of Botany, Entomology, Floriculture and Olericulture.

Along with its function as a research unit of the college, this station has continued to develop and advance in its usefulness as a center of information because of its proximity to a dense population of varied horticultural interests. During the past year there has been a marked increase in the number of telephone inquiries, requests for printed information, and visitors who have come to consult the several members of the staff.

The Boston Market Gardeners Association has continued to use the station as headquarters for their monthly executive committee conferences and have contributed much in the way of suggestions for worth-while projects. The Field Station staff has, as usual, arranged the program of seven educational meetings which the Market Gardeners Association holds during the winter months.

The Sixteenth Annual Field Day was held on August 1 with a record attendance. Over 1100 farmers and others engaged in activities relating to farming visited the Field Station during the day, testifying to the interest in progressive horticultural practices. Despite the exceptionally dry season, the demonstration and experimental plots were in good condition for inspection.

The Plant Houses. (P. W. Dempsey.) Continued interest in this project is evidenced by the number of visitors who come to the Field Station especially to examine the plant houses, and the steady demand for plans by mail. Both houses were successfully operated during the past severe winter, proving them practical for operation the year around if desired.

Electricity as a Source of Heat in the Hotbed and Propagating Bench. (P. W. Dempsey.) Very little interest in electrical heat has been shown during the past year by commercial growers or amateurs. Growers have been very slow even to give the method a trial, perhaps because of a prevailing belief that electricity as a source of heat is excessively expensive. It may also be due to the possibility of failure of continuous service because of storm or breakdown. Even in places where power companies have supplied equipment and current free of charge for demonstration, growers are still using their former methods.

Users of this equipment cannot afford to pay more than 3 cents per kwh. for electricity either in the hotbed or propagating bench. At this rate, the cost of the Field Station hotbeds has averaged $1.75 per sash (3 ft. x 6 ft.), March 1 to May 15; and the cost of the propagating benches has averaged 1 cent for each running foot of bench (3 feet wide) for each 10° above air temperature each 24 hours.

Vegetable Variety Trials. (P. W. Dempsey.) The sweet corn trials this year were associated mainly with the new hybrid, topcrossed, and inbred strains, especially regarding their resistance to the Stewart's Disease so threatening last year. Owing to the absence of the disease this year no resistance records could be taken, but a good opportunity was afforded for observation of other variety characteristics. These new crosses are superior to their parents in yield and uniformity and all are of excellent quality. Unfortunately, they are considerably later than the original varieties. The future alone will determine to how great an extent these new strains will replace the older varieties.

Although the tomato trials each year include a number of new strains, there is still need of a good early tomato. Marglobe has its place as a standard midseason and late variety, but growers are still looking for a satisfactory early variety. Abel, Bestal, Lincoln, Harkness, and Early Lightening were tried this year for the first time and will require another season's trial before definite recommendations can be made. As many Massachusetts growers are particularly interested in trellis tomatoes now, an earnest effort is being made to produce a superior strain for this purpose. The Field Station Comet has proved satisfactory in the hands of growers throughout the State both in the greenhouse and on the trellis outside.

Ornamental Display and Test Gardens. (Harold E. White.) Public interest in the ornamental gardens since they were established in 1931 has increased to such an extent that it has become necessary to have an attendant on duty in the evenings from 5 to 8 o'clock during June, July, August, and September. Records kept of evening visitors alone through these months show a total of 1425. The best of the new perennials and many of the worthy older ones are added from time to time. All the plants are clearly labeled and a list of sources from which the plants may be obtained is available at the office.

Horticultural Schools. (Harold E. White.) The horticultural schools initiated four years ago are of two types. The one is designed to provide florists with cultural information derived particularly from research. The other is an answer to a request from home gardeners who desire instruction regarding the beautification of their home environment. Each school is held for two days, and the continuing interest can be gauged by the attendance of 150 commercial florists and 483 home gardeners this year.

Consultation Service. The demand for information on the part of the general public has become so pressing that it has been necessary to appoint one member

of the staff to take care of this work and to some extent relieve the other members of the extra burden of constant interruption by visitors and telephone calls. Paul W. Dempsey, who has been in charge of the field work of the station since its establishment in 1917, has been appointed Assistant Research Professor of Horticulture to take care of this important part of the work. This service includes interviews with commercial vegetable growers and amateur gardeners, testing of soil and making recommendations, giving talks on horticultural subjects to organizations which request them, guiding visitors about the Field Station, and consulting with representatives of commercial concerns and other individuals seeking information about their products.

PUBLICATIONS

Bulletins

305 Annual Report for the Fiscal Year Ending November 30, 1933. 68 pp. March, 1934.

The main purpose of this report is to provide an opportunity for presenting in published form, recent results from experimentation in fields or on projects where progress has not been such as to justify the general and definite conclusions necessary to meet the requirements of bulletin or journal.

306 Fertilizer Tests on an Important Pasture Soil Type. A. B. Beaumont. 12 pp. illus. January, 1934.

In order that the results from previous investigations regarding the use of commercial fertilizers on permanent pastures might find more specific and wider application, the work was carried into other sections of the State for trial and demonstration on a different soil type. This bulletin presents results from that work.

307 Breeding for Egg Production. F. A. Hays and Ruby Sanborn. 28 pp. April, 1934.

During the past twenty years the Poultry Husbandry Department has conducted numerous investigations to determine the influence of various factors, controllable through breeding, on the egg-producing ability of Rhode Island Reds. This bulletin is a compilation of results obtained up to the present date, and is intended as a guide to assist the poultry breeder in directing his operations.

308 Preliminary Studies on Neurolymphomatosis and Some More or Less Related Diseases. Charles S. Gibbs. 32 pp. illus. May, 1934.

Neurolymphomatosis, generally referred to as "fowl paralysis" has been recognized in Massachusetts for many years. All breeds of chickens are susceptible. The clinical course of the disease varies in individual cases, usually extending over a period of several weeks or months. Complete recovery is rare. Temporary improvement may occur followed by relapse and death. The pathological cell appeared to be the same in neurolymphomatosis and lymphocytomatosis, but the former is primarily a disease of young birds from 3 to 10 months of age, while the latter is more common in birds 10 months of age or older. On the basis of the experimental data secured in these studies, these diseases may be controlled by eradicating affected birds from the flock as soon as noticed, adopting the best sanitary procedures, and increasing the vigor of the birds by judicious breeding.

309 Soybeans for Massachusetts. A. B. Beaumont and R. E. Stitt. 16 pp. illus. May, 1934.

The greatest promise of the soybean in New England lies in its possibilities as a forage crop. It can hardly compete with the grasses, clovers, and alfalfa as a principal source of forage, but as a more or less temporary or emergency leguminous forage crop, it has distinct advantages. Twenty varieties were tested for yield of hay for the three-year period 1929-1931, and in two of the years yield of seed was also obtained. The bulletin describes the varieties and the results obtained with each, and also includes a discussion of the uses of soybeans and the best methods of culture.

310 Supplementary Mid-Morning Feeding of Rural School Children. Bernice Wait, Oreana Merriam, and Madaline V. Cowing. 48 pp. illus. June, 1934.

The effects of giving a mid-morning lunch to children have been studied in four rural elementary schools which involved some 760 children. The lunches consisted of pasteurized milk, reconstituted evaporated milk, tomato concentrate, and a mixture of evaporated milk and tomato juice. There is included a full description of the methods used and the difficulties encountered in trying to measure the effect of the various lunches on the condition of the children. A definite though not marked improvement in the children seemed evident with the feeding of milk, whether pasteurized or evaporated, or a mixture of milk and tomato. Much less improvement was indicated with the feeding of the tomato concentrate, though the difference would probably have been less had as much tomato as milk been given. Improvement was noted in the children who were in good condition as well as in those who were in fair or poor condition at the beginning of the study.

311 Infectious Laryngotracheitis Vaccination. Charles S. Gibbs. 20 pp. illus. July, 1934.

The loss from infectious laryngotracheitis in poultry flocks in the State of Massachusetts is a matter of much economic concern. An interest in the control of this disease has resulted in field and laboratory experiments to develop a satisfactory method of producing immunity through vaccination. This bulletin reports a method of preparing and using autogenous vaccines which has proved satisfactory in both laboratory and field tests. It should be understood that this method of vaccination will save the flock if properly applied, but cannot be depended upon to eliminate carriers, and it should therefore be followed by complete eradication and sanitary control of the disease. Vaccination for infectious laryngotracheitis merely enables the poultryman to choose the time for disposing of the birds and cleaning and disinfecting the premises occupied by them. When accepted in this light, vaccination is a valuable contribution to the control of infectious laryngotracheitis.

312 Effects of Inbreeding on Fecundity in Rhode Island Reds. F. A. Hays. 8 pp. October, 1934.

Inbreeding has been used extensively for establishing uniformity in herds and flocks. This report covers the results of inbreeding poultry for high fecundity characters when rigid selection of female breeding stock was practiced. In no respect were the inbreds or inbreds crossed found to be superior to the general flock. Apparently nothing is to be gained from the standpoint of fecundity by inbreeding.

313 Time Interval from First Egg to Standard Egg Weight in Rhode Island Red Pullets. F. A. Hays. 12 pp. October, 1934.

In breeding for egg size an important consideration is the time required by pullets to attain 24-ounce egg weight. This report is concerned with a number of factors that vitally influence this time interval. Analysis of the data showed that about 58 percent of the variation in time to standard egg weight was due to variation in the following: hatching date, age at first egg, weight at first egg, winter clutch size, winter pause, broodiness, and persistency; while the other 42 percent was probably due to unknown hereditary factors. In breeding to increase egg size, it seems advisable to select breeding females exclusively from those which attain standard egg weight in less than 75 days after the first pullet egg.

314 Effect of Aging Treatment on the Bacterial Count of Ice Cream Mixes. W. S. Mueller and R. L. France. 8 pp. October, 1934.

This investigation was undertaken to determine whether the aging temperature of 68°F., considered desirable when gelatin is used in the manufacture of ice cream, has an unfavorable effect on the bacterial count of the product. The following results were secured:

The aging of pasteurized ice cream mixes for 6 hours at 68°F., whether followed by aging for 18 hours at 38° or not, did not result in a significant increase in the number of bacteria present; but similar aging of unpasteurized mixes did materially increase the number of bacteria. When a pasteurized ice cream mix was aged for 24 hours at 68°, a definite increase in the bacterial count did not occur until after the tenth hour; and when held for 24 hours at 38°, no material increase occurred.

Control Bulletins

72 Seed Inspection. F. A. McLaughlin and Margaret E. Nagle. 47 pp. February, 1934.

73 Fourteenth Annual Report on Eradication of Pullorum Disease in Massachusetts. Poultry Disease Control Laboratory. 8 pp. October, 1934.

74 Inspection of Commercial Fertilizers. H. D. Haskins. 54 pp. November, 1934.

75 Inspection of Commercial Feedstuffs. Philip H. Smith. 55 pp. December, 1934.

76 Inspection of Agricultural Lime Products. H. D. Haskins. 8 pp. December, 1934.

Meteorological Reports

541-552, inclusive. Monthly reports giving daily weather records, together with monthly and annual summaries. C. I. Gunness. 4 pp. each.

Reports of Investigation in Journals

(Numbered Contributions[1])

168 Variability in Development of Fresh-Laid Hen Eggs. F. A. Hays and Costas Nicolaides. Poultry Sci. 13:74-80. March, 1934.

176 Control of the Verticillium Wilt of Eggplant. E. F. Guba. Phytopath. 24:906-915. August, 1934.

178 The Absorption and Evaporation of Moisture from Plant Containers. Linus H. Jones. Jour. Agr. Research 48:511-516. March 15, 1934.

179 The Relation of "Dark Center" to the Composition of Rutabagas. E. B. Holland and C. P. Jones. Jour. Agr. Research 48:377-378. February 15, 1934.

181 Some Observations on Long Distance Dispersal of Apple Maggot Flies. A. I. Bourne, W. H. Thies, and F. R. Shaw. Jour. Econ. Ent. 27:352-355. April, 1934.

182 The Apple Leaf-Curling Midge, a New Pest of Apples. W. D. Whitcomb. Jour. Econ. Ent. 27:355-361. April, 1934.

183 An Unusual Leaf Variation of the Apple. A. P. French. Amer. Soc. Hort. Sci. Proc. 30:143-146. 1933.

184 Preliminary Report on Breeding Rust Resistant Snapdragons. Harold E. White. Amer. Soc. Hort. Sci. Proc. 30:589-590. 1933.

185 The Relation of the Carbon-Nitrogen Ratio of a Mulch to the Accumulation of Nitrates in Soil. W. J. Moore, Jr., and A. B. Beaumont. Jour. Amer. Soc. Agron. 26:252. March, 1934.

187 Corynebacterium Infection in Poultry. Diran M. Yegian. Jour. Amer. Vet. Med. Assoc. 85 (n. s. 38):220-223. August, 1934.

189 Sexing Baby Chicks. Charles S. Gibbs. Poultry Sci. 13:208-211. July, 1934.

190 The Forms of Nitrogen in Infusions of Corn, Timothy, Red Clover, Tobacco, and Red Top. Walter S. Eisenmenger. Jour. Agr. Research 49:375-378. August 15, 1934.

191 A Proposed Classification of the Chemical Elements with Respect to Their Functions in Plant Nutrition. R. W. Thatcher. Science 79:463-466. May 25, 1934.

192 Why Dandelions? Emmett Bennett. Science 80:142. August 10, 1934.

193 Gelatin in Ice Cream Specialties and How It Should Be Used. W. S. Mueller and J. H. Frandsen. The Ice Cream Trade Journal, July, 1934.

195 Relation of Benzoic Acid Content and Other Constituents of Cranberries to Keeping Quality. J. A. Clague and C. R. Fellers. Plant Physiol. 9:631-636. 1934.

196 Controlling Physical Properties of High Solids Mixes. M. J Mack. Jour. Dairy Sci. 17:781-789. December, 1934.

201 The Evolution of Nutrition. J. G. Archibald. Jour. Chem. Ed. 11:601-608. November, 1934.

206 Using Frozen Sliced Strawberries in Manufacturing Ice Cream. M. J. Mack and C. R. Fellers. The Ice Cream Trade Journal, December, 1934.

207 The Effect of Some Forms of Nitrogen on the Growth and Nitrogen Content of Wheat and Rice Plants. Guy Thelin and A. B. Beaumont. Jour. Amer. Soc. Agron. 26:1012-1017. December, 1934.

[1]Nos. 169-174 were listed in the last Annual Report; Nos. 175, 177, 180, 186, 188, 194, 197, 198, 199, 200, 202, 203, 204, 205 have not yet been printed.

Other Contributions to Journals
(Unnumbered)

Apple Rust Up-to-Date. E. F. Guba. Mass. Fruit Growers' Assoc. Ann. Rpt. 40:48-52. 1934.

Slime Flux. E. F. Guba. Tenth Natl. Shade Tree Conf. Proc. 56-60. 1934.

Acidity of Potting Soil not Affected by Type of Container. Linus H. Jones. Florists' Review 74 (1904):9. May 24, 1934.

Advocate Use of Jardinieres over Pots to Conserve Moisture. Linus H. Jones and George A. Bourgeois. Florists' Review 74 (1915):9-10. August 9, 1934.

Plastic Cream, a New Dairy Product, is on the Market. M. J. Mack and C. R. Foskett. Food Industries 6:156-157. April, 1934.

How to Make High-Butterfat Ice Cream. J. H. Brockschmidt, M. J. Mack, and J. H. Frandsen. Ice Cream Field, January, 1934. pp. 16-18.

Orchard Insect Pests of 1933 in Massachusetts. A. I. Bourne and W. D. Whitcomb. Mass. Fruit Growers' Assoc. Ann. Rpt. 1934.

Notes on a Fungus Attacking Onion Thrips. A. I. Bourne and F. R. Shaw. Jour. Econ. Ent. 27:860. August, 1934.

The Economics of Bank Service Charges and Other Phases of National Recovery. R. L. Mighell and R. H. Barrett. (This is a mimeographed circular made up of 16 articles published in the Springfield Republican from December, 1933 to April, 1934.)

Banking "Cost Analysis." R. L. Mighell and R. H. Barrett. Consumers' Research General Bulletin. April, 1934.

The Bankers' Code and Service Charges on Checking Accounts. R. L. Mighell and R. H. Barrett. Consumers' Research General Bulletin. October, 1934.

Fundamental Nutritive Values of Apples. C. R. Fellers. Mass. Fruit Growers' Assoc. Ann. Rpt. 1934. pp. 181-184.

Sea Scallops—A Neglected Food Product. C. R. Fellers. Glass Packer 13:330-331. May, 1934.

Fermentation of Citron. C. R. Fellers and E. G. Smith. Jour. Bact. 27:63. January, 1934. (Abstract of paper before the Society of American Bacteriologists, December, 1934.)

Food Value of Cranberries and Cranberry Sauce. C. R. Fellers. Forecast 47 (No. 2). 1934.

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