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THE GRADUATE SCHOOL

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1929-30

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THE DEAN, *Chairman ex officio*.

CALENDAR OF THE GRADUATE SCHOOL FOR 1929-30

1929

FIRST TERM

Sept. 23	}	Registration of new students.
Sept. 24		
Sept. 25		Registration of old students.
Sept. 26		Instruction begins.
Dec. 15		Last day for announcing titles of theses by candidates for advanced degrees in June.
1930		
Feb. 6		Last day for completing requirements for advanced degrees to be conferred in February.

SECOND TERM

Feb. 7	}	Registration for the second term.
Feb. 8		
Feb. 10		Instruction begins.
March 15		Last day for filing applications for fellowships and graduate scholarships.
June 11		Last day for completing requirements for advanced degrees to be conferred at Commencement.
June 16		Commencement.

THE GRADUATE SCHOOL

HISTORY AND ORGANIZATION

THE initiation of graduate studies at Cornell University was coincident with the establishment of the University; the first advanced degree was conferred at the second annual Commencement. Until 1896 there was no formal organization of graduate studies, which were intrusted to the direction of the University Faculty, although beginning with 1890 a standing Committee on Graduate Work of the University Faculty had general charge of graduate study. In 1896 graduate work was definitely organized as a Graduate Department under the immediate charge of the University Faculty. In 1909, on the recommendation of the Faculty, the Board of Trustees established the Graduate School, to have exclusive jurisdiction over all graduate work and advanced degrees.

The President of the University is *ex officio* Chairman of the Faculty of the Graduate School, which consists of all members of the University staff who are actively engaged in supervising the work of graduate students. The Dean of the Graduate School is the executive officer of the Faculty.

For the convenient discussion of questions which chiefly concern those engaged in related fields of work, the members of the Faculty of the Graduate School are divided into eight groups, as follows:

- A. Languages and Literatures.
- B. History, Political Science, Philosophy, Education.
- C. Mathematics, Astronomy, Physics, Chemistry, Geology, Physical Geography.
- D. Biological Sciences.
- E. Engineering, Architecture, Applied Physical Sciences.
- F. Science Departments of the Cornell University Medical College in New York City.
- G. Agricultural Sciences.
- H. Law.

The General Committee of the Graduate School consists of four members at large, elected by the Faculty; eight members elected, one by each group; and the Dean, who is *ex officio* chairman of the General Committee.

THE PURPOSE OF GRADUATE STUDIES

The purpose of the Graduate School is two-fold: it aims to provide the student with a comprehensive view of a field of knowledge and to train him for individual investigation in that field. The student who comes as a candidate for the master's degree will normally devote the larger part of his time to the first of these aspects; he will need to supplement and to correlate his understanding of his field, to study its background and its relationship to kindred fields, to gain a wider vision of its significance. The student who comes as a candi-

date for the doctor's degree will first secure this broader understanding and then push on to cast new light on some phase of it, to enlarge in some measure the knowledge of the field. But to all who come the Graduate School strives to furnish the technique of analyzing a body of information or observation and the power to express an independent and unprejudiced judgment.

In furnishing this opportunity for independent study and investigation, the Graduate School seeks to make the conditions such as will enable the student to devote himself wholly to his chosen field. Unhampered by restrictions that necessarily obtain in undergraduate work, he will come into freedom of association with older scholars, who will seek to make his work profitable to him by giving him such aid and directions as he may need. Inasmuch as subjects differ greatly, the requirements for all subjects cannot be stated in terms at once specific and uniform. In some departments of knowledge original research may begin with the student's entrance into the School; in other subjects much preliminary work may be necessary to fit the student for profitable research.

In carrying on studies in the Graduate School, the student is expected to assume the initiative and the responsibility. All courses of study offered in the University, and all the facilities for study and investigation afforded by its libraries, museums, and laboratories are open to graduate students in so far as they are qualified to make use of such facilities. It is important, however, to recognize from the beginning that graduate work does not consist in the fulfilment of routine requirements, and that the various opportunities for study, as well as the advice and assistance of teachers, are to be regarded simply as aids to the student in acquiring for himself the discipline and method of independent scholarship.

ADMISSION

Graduates of the following colleges of Cornell University, namely, the College of Arts and Sciences, the College of Architecture, the College of Engineering, the Medical College, the New York State College of Agriculture, the New York State Veterinary College, the New York State College of Home Economics, and the Law School, and also graduates of other institutions in which the requirements for the first degree are substantially equivalent, are eligible for admission to the Graduate School. In other cases studies pursued after graduation, and experience gained by professional work or otherwise, are taken into consideration in deciding whether the candidate's preparation as a whole is such as to justify his admission to the Graduate School.

In order to be admitted to the Graduate School, a student must furnish evidence that he has already received a first degree, by presenting either a diploma or a statement from some official source. The simplest procedure will ordinarily be to submit an official state-

ment from the registrar or dean that the degree has been conferred. In the case of graduates of Cornell University this is not necessary, since the records are conveniently accessible. Graduates of colleges which are not on the Approved List of the Association of American Universities should in every case submit with their applications for admission a transcript of their undergraduate studies.

To avoid delays at the beginning of the academic year, those who desire to enter the Graduate School are advised to make application for admission, either in person or by letter, in the preceding spring or summer. Correspondence should be addressed to the Office of the Graduate School, Morrill Hall, Cornell University, Ithaca, New York.

Seniors in the colleges of Cornell University who have completed all requirements for the Bachelor's degree except that of residence, may, with the approval of the deans of their respective colleges, be admitted to the Graduate School.

Ordinarily, a student admitted to the Graduate School is eligible for admission to candidacy for an advanced degree in any field for which he has had the necessary preparation. In every case he must receive the recommendation of his Special Committee that he is qualified to undertake such advanced work as the Faculty will accept for the degree. Candidates for one of the advanced technical degrees, M.C.E., M.M.E., M.E.E., M.Chem., M.S. in Agr., M.F., M.Arch., M.L.A., and M.F.A. must have had the equivalent of the corresponding first degree at Cornell University. No student, however, may be admitted to candidacy for an advanced degree whose training has not included work in a foreign language.

Graduates of colleges other than those of Cornell University whose training is regarded as less than one year short of that required for the first degree at Cornell, may be admitted to the Graduate School, but not to candidacy for an advanced degree. Graduates of colleges other than those of Cornell University whose training is regarded as a year or more short of that required for the first degree at Cornell, are required to enter an undergraduate college.

ADMISSION FOR GRADUATE STUDY IN LAW

One who has met the requirements for admission to the Cornell Law School, and who has received the degree of Bachelor of Laws or an equivalent degree from a law school qualified for membership in the Association of American Law Schools, may petition for admission to the Graduate School as a candidate for the degree Master of Laws (LL.M.), or for the degree Doctor of the Science of Law (J.S.D.). The petition should state the purpose for which graduate work is desired. Foreign students may be admitted to the Graduate School as candidates for these degrees, by the vote of the Faculty, if, in the opinion of the Faculty, they have had a training substantially equivalent to the requirements set forth in this paragraph.

REGISTRATION

Students who have been admitted to the Graduate School are required to register both in the office of the Graduate School and in the office of the Registrar of the University on the regular registration days of each term, unless special permission for later registration has been granted by the Dean.

Graduate students who have completed requirements of residence for the degrees for which they are candidates, and who remain in residence working on their theses or toward or in contemplation of a degree must register each term in which they are thus engaged. Any student whose residence requirement has been met and who completes his thesis elsewhere must register for the term in which he presents himself for his degree.

A CERTIFICATE OF VACCINATION REQUIRED
BEFORE MATRICULATION

Every student matriculating in the University for graduate study, whether in the Summer Session or during the regular terms, is required to present to the Registrar a satisfactory certificate of vaccination against smallpox. This certificate is considered satisfactory only if it certifies to a successful vaccination within the last five years or certifies that at least three unsuccessful attempts at vaccination have been made within that period.

THE CHOICE OF A FIELD OF STUDY

Each student, upon entering the Graduate School, must choose a field of study. Within that field, the branch of knowledge to which he intends to devote the larger part of his time is termed his Major Subject; the other subject or subjects, which will necessarily be more restricted in their scope and which should be selected with reference to their direct bearing upon the Major Subject, are termed the Minor Subjects.

The Graduate School does not prescribe the fields in which a student may pursue his work; any group of subjects, recognized as of graduate standing, which has a basic unity is considered a proper field for study. As a general principle, however, when the Major Subject is selected from the applied sciences, it is desirable that the theoretical science or sciences most directly involved should be chosen as Minor Subjects.

The work of each graduate student who is a candidate for an advanced degree is in charge of a Special Committee consisting of the teachers under whom his major and minor studies are pursued, a representative of his Major Subject being chairman. The student is expected to confer freely with the members of his Special Committee, both in regard to the general plan of his work and in connection with individual courses of study. A candidate for an advanced degree

must present to the Dean, not later than two weeks after registration in the Graduate School, a statement of his Major and Minor Subjects approved by the members of his Special Committee.

Changes in the personnel of his Special Committee may be made by a graduate student with the approval of the continuing members. Any vacancy on a Special Committee, due to the absence of a member on leave from the University, is filled by the Dean on recommendation by the member on leave and with the consent of the student and the added member. Any graduate student who desires an examination in the summer must arrange for any necessary examining substitute on his Special Committee and file with the Dean before the first of June preceding the examination notice of such arrangement together with written approval both of the substitute and of all the members of the Special Committee.

The work of each graduate student who is not a candidate for a degree is in charge of an Adviser selected by the student from the members of the Faculty representing his field of work. A student who is not a candidate for a degree must present to the Dean, not later than two weeks after registration, a detailed statement of the studies selected, approved by his Adviser.

RESIDENCE

Residence credit toward an advanced degree is granted to regularly enrolled students only upon the satisfactory completion of a term or other period of work, attested by the members of the student's Special Committee.

CREDIT FOR WORK DONE IN CORNELL UNIVERSITY

Residence credit for work *in the University* may be acquired in four ways:

- (1) By the satisfactory completion of a term or portion of a term of work during the regular sessions of the University.
- (2) By the satisfactory completion of work done in the Summer Session of Cornell University, in the Summer School in Agriculture, or in the Summer School of Biology.

Residence credit for this work may be counted toward the degrees of Master of Arts, Master of Science, and Master of Science in Agriculture, and, on recommendation of the student's Special Committee, toward the degree of Doctor of Philosophy; one term of residence may be acquired by two summer sessions, and one year (or two terms) of work by four summer sessions. All students pursuing graduate studies during one of the Summer Sessions are required to enroll both in the office of the Registrar of the University and in that of the Dean of the Graduate School before beginning work. Candidates for these degrees who are in residence during Summer Sessions only are required also to continue their studies during the year under the direction of the Chairman of the Special Committee in charge of their work. It should be noted that in some departments no graduate work is offered in the Summer Session. A statement of the graduate work offered will be found in the Announcements of the various Summer Sessions, which will be sent upon application to the Secretary of the University.

(3) By the satisfactory completion of a period of work during the summer under the personal direction of a member of the Faculty.

The general library and many of the laboratories and special libraries of the University are open during this period, and certain members of the instructing staff who remain in residence during the summer are willing to assume responsibility for the supervision of the work of students who are qualified to carry on investigations. It is impossible to make any announcement in advance as to what opportunities for graduate work may be found at any definite time in a particular subject; but such information may be obtained by correspondence. Residence credit towards an advanced degree for work carried on under personal direction during the summer will be granted only if the following conditions are complied with: (a) The student must have already completed at least a full year of graduate work as a candidate for an advanced degree, either in this University or in some institution whose graduate work is acceptable. In all cases graduate students are required to register both in the office of the Registrar of the University and in that of the Dean of the Graduate School. No candidate for the Doctor's degree may receive credit for more than two terms of residence during any twelve consecutive months. (b) The student must present to the Dean of the Graduate School a statement from the member of the Faculty under whose direction the student is to work, signifying his readiness to undertake such direction and also stating the number of weeks during which he will be prepared to supervise this work.

(4) By the satisfactory completion of work done in the Summer Session in Law, or of work done during the summer under the personal direction of a member of the Faculty.

Residence credit for this work may be counted toward the degree of LL.M. or of J.S.D. A summer session in law or such summer work under the personal direction of a member of the Faculty is equivalent to one-third of a year, and with the approval of the faculty in charge residence credit may be obtained in the summer. It is not possible to make any announcement in advance as to what opportunities for graduate work may be found at any definite time in a particular subject, but such information may be obtained by correspondence. All students pursuing graduate studies in law during the summer are required to enroll both in the office of the Registrar of the University and in that of the Dean of the Graduate School before beginning work.

CREDIT FOR WORK DONE ELSEWHERE

Ordinarily a student is expected to spend his full term of residence for an advanced degree at this University. For the Master's degrees no credit may be obtained for work done elsewhere. For the Doctor's degree, however, residence credit for work done elsewhere may be granted in the following cases:

(1) Residence as a graduate student in another university may, on recommendation of the student's Special Committee, be accepted as the equivalent of residence at Cornell University. No general statement can be made regarding the conditions under which this permission will be granted; each case will be decided on its merits. The last year of required residence must be in Cornell University.

(2) There are certain cases in which, in order to give the work of the Graduate School the greatest possible breadth, it is desirable, from the point of view both of the student and of the University, to take advantage of opportunities for study and research not found in university centers.

The conditions under which a candidate for the degree of Doctor of Philosophy may be allowed residence toward this degree for time spent in study away from the University have been stated in the following form by the legislation of the Faculty: (a) Applicants must be regularly registered in the Graduate School as candidates for the Doctorate, and while not in residence shall receive no compensation except from the University. (b) They shall have spent at least two terms in Cornell University in study towards the Doctor's degree. (c) Permission to count such time as residence may be given by the Dean of the Graduate School for a period not to exceed one term, when the application is unanimously approved by the members of the student's Special Committee. When a longer period of outside study is required, applications for an extension of time should be made to the General Committee, which may, at its discretion, extend the period to two terms. In no event, however, shall a student acquire a total of more than two terms' residence under these provisions. (d) A student who avails himself of this privilege shall continue to work under the general direction of his Special Committee. Whenever possible, however, the work should be carried on under the immediate supervision of a competent director, acting for the Special Committee and to be designated by that Committee. (e) Reports regarding the progress of the work shall be made as directed by the Special Committee at intervals not in excess of one month.

(3) Under conditions to be ascertained from the Dean, instructors in Cornell University who are also registered in the Graduate School may receive credit for work done without compensation during the summer months away from the University.

Graduate students who hold appointments as instructors or assistants in Cornell University may not receive more than three-fourths residence credit for graduate work carried on during the period of their appointment. Such students may, on recommendation of their Special Committee, obtain full graduate residence for the year by carrying on their studies during the summer provided they devote their whole time during this period to graduate study and do not hold a teaching appointment. An instructor or assistant who has completed at least one term of satisfactory graduate work at another university may, however, upon the recommendation of his Special Committee, satisfy the residence requirement for the master's degree by one year at Cornell.

Graduate students who are engaged in other outside work which reduces the time and thought which they are able to give to graduate study will be required to spend more than the minimum period of residence required of candidates for advanced degrees.

RESIDENCE CREDIT CONVERTIBLE

Residence, whether at Cornell University or elsewhere, in pursuance of work for a Master's degree, may be credited toward the residence required for the degree of Doctor of Philosophy provided the Special Committee in charge of the work approves, certifying the work done as forming an integral part of the work required for the Doctor's degree.

DEGREES

The requirements for advanced degrees are based, not upon courses or credits, but upon the completion of a definite period of residence, the presentation of a satisfactory thesis or essay, and the passing of an examination.

THE MASTER'S DEGREES

Cornell University confers the degrees of Master of Arts, Master of Science, Master of Architecture, Master of Civil Engineering, Master of Mechanical Engineering, Master of Electrical Engineering, Master in Forestry, Master in Landscape Architecture, Master of Chemistry, Master of Science in Agriculture, Master of Laws, and Master of Fine Arts.

The Master's degree is conferred upon a candidate who, after completing at least one year of residence devoted to the study of a field comprising a Major Subject and one Minor Subject, presents a satisfactory thesis, or essay, as the chairman of the candidate's Special Committee may decide, and passes an examination on his special field.

The degree of Master of Laws is conferred upon a candidate who has completed at least one year of residence and has obtained at least twenty credit hours or their equivalent with high merit in courses of special work chosen with the approval of the Faculty. A comprehensive examination on the work of the year may be required.

THE THESIS

The thesis, or essay, must demonstrate the candidate's ability to do independent work, and must be acceptable in style and composition.

A statement of the general subject of the thesis, or essay, with the written approval of the chairman of the Special Committee in charge of the candidate's work, must be filed in the office of the Dean at least six months before the candidate expects to present himself for examination.

The completed thesis, or essay, approved by the Special Committee, must be presented to the Dean at least five days before the examination for the degree, and must remain on file until the day preceding the examination. When the Major Subject for the degree of Master of Architecture or the degree of Master in Landscape Architecture is in Design, the candidate is required to deposit in place of the thesis, either the original drawings or a photographic reproduction of them.

Each candidate for a Master's degree is required to furnish a bound typewritten copy of this thesis, or essay, for the use of the University Library, and this copy is to be delivered to the Dean not less than five days before the degree is to be conferred. The paper on which the thesis is typewritten must be a durable rag bond; the size of the page of the typewritten thesis should be 8 x 10½ inches. This copy of the thesis becomes the permanent property of the Library.

EXAMINATIONS

After this thesis, or essay, has been duly presented and is accepted by the Special Committee, the candidate is required to present him-

self for examination on his Major and Minor Subjects and on the subject matter of his thesis.

Examinations for a Master's degree may be written or oral, or both, at the option of the examining committee, and are open to all members of the Faculty. The examination for the degree of Master of Architecture may be waived by the General Committee of the Graduate School in any case where, in the opinion of the student's Special Committee, the Major and Minor Subjects are of such a nature as to make an examination impossible or inexpedient.

THE DEGREE OF DOCTOR OF PHILOSOPHY

The degree of Doctor of Philosophy is conferred upon a candidate who, after completing not less than three years of resident graduate work devoted to the study of a field of work comprising a Major Subject and two Minor Subjects, presents a satisfactory thesis, and passes an examination on his chosen field and on the subject matter of his thesis.

The Doctor's degree is intended to represent, not a specified amount of work covering a specified time, but the attainment, through long study, of independent and comprehensive scholarship in a special field.

A candidate for the Doctor's degree will ordinarily be expected to have a working knowledge of French and German before beginning graduate work. In all cases he must, before beginning his second year of residence, show to the satisfaction of his Special Committee that he possesses a reading knowledge of these languages.

QUALIFYING EXAMINATIONS

Candidates for the degree of Doctor of Philosophy are required to pass a Qualifying Examination, to be held normally not later than the close of the second year of residence. The legislation of the Faculty on this subject is given in the following paragraphs:

(1) The qualifying examination or examinations required of a candidate for the degree of Doctor of Philosophy shall be held at such time as his Special Committee may determine, normally not later than the close of the second year of residence. No candidate may proceed to his final examination until two terms have been completed after he has passed the qualifying examination.

(2) The Special Committee shall pass upon the results of this examination as a whole, and shall report to the Dean whether the candidate has made satisfactory progress and is qualified to proceed in due order to complete the requirements for the degree.

(3) The Special Committee, in the case of any candidate, may waive the qualifying examination in whole or in part; but the Committee shall nevertheless report to the Dean whether the candidate has made satisfactory progress and is qualified to proceed in due order to complete the requirements for the degree.

(4) If a candidate fails to pass the qualifying examination, no re-examination shall be allowed except on the recommendation of the Special Committee.

THESIS

The thesis for the Doctor's degree must give evidence of the candidate's power to carry on independent investigation and must be satisfactory in style and composition. A statement of the general subject of the thesis, with the written approval of the chairman of the Special Committee in charge of the candidate's work, must be filed in the office of the Dean at least six months before the candidate expects to present himself for examination. The thesis of a candidate intending to take his degree at the June commencement should normally be completed by May 15, in order that ample time may be afforded for the inspection of the thesis by all members of the Special Committee. The completed thesis, approved by the Special Committee, is to be presented at the office of the Graduate School at least five days before the examination for the degree, and must remain on file until the day preceding the examination.

Each candidate for the Doctor's degree must meet one of the following requirements:

(1) He must deposit in the office of the Dean of the Graduate School one hundred printed copies of his thesis for the purposes of the University Library: *or*

(2) He must deposit in the office of the Dean of the Graduate School two bound typewritten copies of his thesis. At the same time he must present one hundred printed copies of an abstract or description of his thesis, which must be approved by his Special Committee, or a typewritten copy of the abstract, which in such a case shall not exceed fifteen hundred words, and the sum of twenty-five dollars to defray the expenses of printing. All students are recommended to publish their theses in full; and any successful candidate for the doctor's degree who before the end of one year after the granting of the degree shall have deposited one hundred printed copies of his thesis or presented evidence of the acceptance of the thesis for publication, shall, on receipt of the one hundred printed copies, have refunded to him the twenty-five dollars deposited for printing the abstract.

The paper on which the thesis is typewritten must be a durable rag bond; the size of the page of the typewritten thesis should be 8 x 10½ inches.

PUBLICATION OF THE THESIS

The candidate should consult with the Dean regarding the form of publication of the thesis. The thesis shall have both a cover and a title-page. The title-page shall include the printed statement that the thesis is presented to the Faculty of the Graduate School of Cornell University for the degree of Doctor of Philosophy. If the thesis is a reprint, the place and date of the original publication must be given.

The attention of present and former graduate students of Cornell University is called to an arrangement whereby theses which have been accepted in fulfilment of the requirements of the doctorate at

Cornell University may be published (at the expense of the authors) through the office of the Secretary of the University. The advantages of this arrangement to the writer of a thesis are: prompt and satisfactory publication, with the likelihood of moderate expense and the certainty of good printing; conformity of the individual thesis to a good style of typography and binding; ease of distribution, with the higher probability that a thesis will be sought and found when it is one of a series than when it is privately owned and separately published.

The writer whose thesis has been accepted by his Special Committee and who wishes to avail himself of the arrangement in question, should apply to the chairman of that Committee, who will make the necessary arrangements for publication through the chairman of the Editorial Committee of the Faculty. This consists, in each case, of three members; the Dean of the Graduate School, the chairman of the Special Committee, and Professor Lane Cooper, the chairman of the Editorial Committee.

FINAL EXAMINATIONS

The final examinations for the doctor's degree may be either oral or written, or both, at the option of the examining committee, and are open to all members of the Faculty. The Faculty has, however, expressed the opinion that a written examination should be required for the doctorate at some time during the student's candidacy. In the event of failure in final examination, no re-examination may be held until three months after the completion of the minimum period of residence.

It is not the policy of the Graduate School to divide the final examination for advanced degrees into parts, or to accept piece-meal fulfilment of the requirements for these degrees. In ordinary cases, examinations for advanced degrees are not held until after the candidate has completed the minimum period of residence and presented a thesis duly approved by the members of his Special Committee. But on recommendation of the Special Committee the general examination for the Doctor's degree may be held not earlier than two weeks before the end of the fourth term of residence. If this examination be passed, it must be followed by an examination on the subject matter of the thesis when the completed thesis is presented.

THE DEGREE OF DOCTOR OF THE SCIENCE OF LAW

To receive the degree of Doctor of the Science of Law, the candidate shall be in residence at least one year; shall pursue with distinction such graduate or advanced courses as shall be prescribed by the Law group; shall engage in such independent investigation in some field of law under the direction of a member or members of the Law group as shall be determined by that body, the results of such investigation to be embodied in one or more essays which shall

be creditable contributions to legal scholarship and a copy of which shall be deposited in the Law Library; and shall pass a comprehensive oral examination on the work of the year. It is desirable that candidates for this degree shall have had some practical or teaching experience after obtaining a first degree in law.

DATES FOR CONFERRING DEGREES

Advanced degrees are conferred in February, June, and September.

In February, degrees will be conferred on students who have made application for the degree on or before the first day of instruction after the Christmas recess, and who have completed the requirements not later than the last day of the final term examinations.

In June, degrees will be conferred on students who have made application for the degree not later than May 15, and who have completed the requirements not later than the last day of the final term examinations.

In September, degrees will be conferred on students who have made application for the degree not later than September 1, and who have completed the requirements not later than the day preceding the first day of instruction of the first term.

TUITION AND OTHER FEES

A Tuition Fee of \$75 for the academic year is to be paid by all students registered in the Graduate School. It is payable in installments of \$37.50 at the beginning of each term.

Certain classes of students are exempt from the payment of the tuition fee. They are:

(1) Graduate students holding certain appointments as University Fellows or Graduate Scholars, and holders of certain temporary fellowships and scholarships.

(2) Resident Doctors, i. e., students in the Graduate School who have the Doctor's degree and are not candidates for a degree.

(3) Graduate students holding appointments as assistants and instructors and having their major studies in the college or line of work in which they are instructing, are exempt from the payment of tuition fees and laboratory and shop fees in the department in which they are employed to give instruction during the regular first and second terms only; members of the instructing staff who take work for which they must pay tuition are required to pay in proportion to the amount of work for which they are registered.

No student may receive the Master's degree who has not paid the tuition fee for at least one year, and no one may receive the Doctor's degree who has not paid the tuition fee for at least three years, unless one or more of the years spent in study for the Doctor's degree have been spent in graduate study at another university, or unless payment of tuition has been waived under one of the foregoing heads.

Any student of the Graduate School who has completed the requirement of residence for the degree for which he is a candidate, whose studies have been satisfactory to the Faculty, and who during that time has satisfied the requirements as to tuition fees, is, on paying the annual administration fee, exempt from the further payment of tuition fees for a period not to exceed one year.

An *Administration Fee* of \$25 is to be paid by all students registered in the Graduate School except Honorary Fellows and Resident Doctors. It is payable in installments of \$12.50 at the beginning of each term.

A *Matriculation Fee* of \$10 is required of every student upon entrance into the University. It must be paid at the time of registration.

An *Infirmary Fee* of \$5 a term is required of all students (except Honorary Fellows and Resident Doctors and students registered in the Medical College in New York City) at the beginning of each term. For a statement of the privileges given in return for this fee, see the General Information Number.

A *Graduation Fee* of \$20 is required, at least ten days before the degree is to be conferred, of every candidate for an advanced degree. The fee will be returned if the degree is not conferred.

Laboratory Fees. Every person taking laboratory work or courses in which a fee is charged must pay to the Treasurer of the University the required fee or the required deposit for the materials *et cetera* that are to be used in the work.

A *Willard Straight Hall Membership Fee* of \$4 a term is required of all graduate students except those who are members of the instructing staff, for whom membership is optional. The use of the hall is restricted to those who have paid this fee.

Fees for the Summer Session. Students of the University Summer Session, the Summer Session of the Law School, the Summer School in Agriculture, and the Summer School of Biology who have been admitted to candidacy for an advanced degree are required to pay the regular tuition fee of the session, \$50, but are exempt from tuition and administration fees in the Graduate School. On registering for the first time as a candidate, a student who has not previously matriculated in Cornell University will be matriculated without payment of the usual matriculation fee on presenting a certificate that he has paid the tuition charges for the current Summer Session. When a graduate student has paid during summer sessions, or summer sessions and the academic year combined, an amount equal to the tuition and administration fees required of students who are candidates for the same degree during the regular year, he may on the recommendation of his special committee be absolved by the Dean of the Graduate School from the payment of additional tuition in summer sessions only, but will be required to pay an administration fee of \$6.25 for each subsequent summer session.

Personal Direction. Students carrying on studies during the summer as candidates for advanced degrees under Personal Direction are required to register with the Registrar as well as in the Graduate School and to pay an administration fee of \$10. No administration fee is required of persons who have been regularly appointed members of the instructing staff during the preceding academic year and who have during that year paid the full administration fee.

Tuition and other fees become due when the student registers. The University allows twenty days of grace each term, five days in the Summer Session. The last day of grace is generally printed on the registration coupon which the student is required to present at the Treasurer's office. Any student who fails to pay his tuition charges, other fees, and other indebtedness to the University, or who, if entitled to free tuition, fails to claim it at the Treasurer's office and to pay his fees and other indebtedness, within the prescribed period of grace, is thereby dropped from the University unless the Treasurer has granted him an extension of time to complete payment. The Treasurer is permitted to grant such an extension when, in his judgment, the circumstances of a particular case warrant his doing so. For any such extension the student is assessed a fee of \$5 for the first week and \$2 additional for each subsequent week in which the whole or any part of the debt remains unpaid, but the assessment in any case is not more than \$15. The assessment may be waived in any instance for reasons satisfactory to the Comptroller and the Registrar, when such reasons are set forth in a written statement.

Students registering at any time during the last ten weeks of either the first or the second term are required to pay tuition at the rate of ten per cent of the regular tuition of the term for each week or fraction of a week between the day of registration and the last examination day of the term. Students registering at any time during the last four weeks in the short summer courses are required to pay tuition at the rate of twenty-five per cent of the term's tuition for each week or fraction of a week between the day of registration and the last examination day of the term.

A tuition fee or other fee may be changed by the Trustees at any time without previous notice.

FELLOWSHIPS, SCHOLARSHIPS, PRIZES

HONORARY FELLOWSHIPS

Holders of the Doctor's degree or other persons of recognized standing as scholars who wish to continue work in a field in which they have already achieved distinction may, in the discretion of the Faculty, be appointed to honorary fellowships. These fellowships cover all fees except laboratory charges. Actual residence at the University and regular registration in the Graduate School are required of appointees.

RESIDENT DOCTORS

Holders of the Doctor's degree may register in the Graduate School as Resident Doctors and, on recommendation of the Dean, are exempt from the payment of all fees except laboratory charges.

FELLOWSHIPS

The following twenty-five fellowships are annually offered in the Graduate School:

1. The Cornell Fellowship in English.
2. The McGraw Fellowship in Civil Engineering.
3. The Sage Fellowship in Chemistry.
4. The Schuyler Fellowship in Animal Biology.
5. The Sibley Fellowship in Mechanical and Electrical Engineering.
6. The Goldwin Smith Fellowship in Botany, Geology, or Physical Geography.

7. The President White Fellowship in Physics.
8. The Erastus Brooks Fellowship in Mathematics.
9. The University Fellowship in Architecture.
10. The University Fellowship in Romance Languages.
11. The University Fellowship in German.
12. The University Fellowship in Agriculture.
13. The Charles Bull Earle Memorial Fellowship in Mechanical and Electrical Engineering.
14. The President White Fellowship in Modern History.
15. The President White Fellowship in Political and Social Science.
- 16, 17. The Susan Linn Sage Fellowships in Philosophy.
18. The Susan Linn Sage Fellowship in Psychology.
- 19, 20. The Fellowships in Political Economy.
- 21, 22. The Fellowships in Greek and Latin.
23. The Fellowship in American History.
24. The Edgar J. Meyer Memorial Fellowship in Engineering Research.
25. The George C. Boldt Fellowship in History.

The President White Fellowships in Modern History and in Political and Social Science have an annual value of \$500 each; the George C. Boldt Fellowship in History has an annual value of \$1,000; the others have an annual value of \$400 each. Some of the Fellows are also exempt from tuition. It is possible that, during the year 1929-30, some modifications may be made in the lists of fellowships and graduate scholarships and in certain cases the stipends attaching to them may be considerably increased. In cases where any such change is made applicants will be informed by correspondence.

The President White Fellowships in History and Political Science may, in the discretion of the Faculty of the Graduate School, be made traveling fellowships. The holders of these fellowships are by the terms of the gift called upon to be in attendance for a certain period each day in the President White Library, where they will naturally do a large part of their study. In the case of a student of very exceptional ability and promise in the fields of either of these fellowships, the two fellowships may, in the discretion of the Faculty, be combined for a single year into one.

SPECIAL TEMPORARY FELLOWSHIPS

In addition to the fellowships enumerated above, the income of the Susanna Phelps Gage Fund for research in physics may, by the decision of the professors in the Department of Physics, be devoted to the support of fellowships in Physics. At the present time the following special fellowships are also awarded by the Faculty of the Graduate School: The Grasselli Fellowship in Chemistry, supported by the Grasselli Chemical Company of Cleveland Ohio; the du Pont Fellowship, supported by the E. I. du Pont de Nemours and Company; the American Dry Milk Institute Fellowship; the Bayer Fellowship in Plant Pathology; the Oswego Farm Bureau Vegetable Growers' Fellowship in Plant Pathology; the Corning Glass Works Fellowship; the Champlain Valley Fruit Growers Association Fellowship; the International Agricultural Corporation Fellowship; the Morgenthau Fellowship in Home Economics; the Lily Disease Investigation Fellowship; the American Creosoting Company Fellowship in Chemistry. It is impossible at the present time to announce these fellowships as annually awarded to applicants. Information in regard to them may at any time be obtained by correspondence with the respective departments.

GRADUATE SCHOLARSHIPS

The following eighteen graduate scholarships are offered annually in the graduate school.

- 1-5. The Susan Linn Sage Graduate Scholarships in Philosophy.
6. The Susan Linn Sage Graduate Scholarship in Psychology.
7. The Graduate Scholarship in Mathematics.
8. The Graduate Scholarship in Chemistry.
9. The Graduate Scholarship in Physics.
10. The Graduate Scholarship in Civil Engineering.
11. The Graduate Scholarship in Latin and Greek.
12. The Graduate Scholarship in Archaeology and Comparative Philology.
13. The Graduate Scholarship in Animal Biology.
14. The Graduate Scholarship in Botany, Geology, or Physical Geography.
15. The Graduate Scholarship in English.
16. The Graduate Scholarship in History.
17. The Graduate Scholarship in Architecture.
18. The Graduate Scholarship in Veterinary Medicine.

The graduate scholarships, with the exception of the Scholarship in Architecture have an annual value of \$200 each. Some of the holders of graduate scholarships are also exempt from tuition. The Graduate Scholarship in Architecture grants only free tuition.

On the recommendation of the Faculty of the Graduate School a fellowship may be divided for a single year into two graduate scholarships, the value of each to be one-half of the divided fellowship. But no fellowship may be thus divided oftener than once in two years.

AWARD AND TENURE

Appointments to fellowships and scholarships for the ensuing year are made by the faculty, upon recommendation of the professors concerned, on April 1 of each year.

Official forms for making application for fellowships and graduate scholarships may be obtained from the Office of the Graduate School. All applications should be filed in the office of the Dean on or before March 15 of the academic year preceding the one for which application is made. Before this application is filed, the applicant should have convinced himself by correspondence that he is eligible for admission to the Graduate School of this University in full standing, since appointments are given only to those who are eligible for admission to candidacy for an advanced degree.

All other information, papers, and testimonials should be submitted on or before March 15 to the department in which the applicant desires to carry on the principal part of his work. Applicants are advised to submit any published or unpublished papers or reports showing the result of their study or research which might serve to indicate the extent of their knowledge of the subject, their command of the methods and tools of research, and their capacity generally for clear written expression. Candidates who are graduates of other colleges or universities should submit recommendations from the instructors best acquainted with their ability and attainments. It should be borne in mind that information cannot be too exact or detailed in the case of students not personally known to the appointing body.

The term of each fellowship and graduate scholarship is one year, but the term may under exceptional circumstances be extended to two years.

Students holding fellowships or graduate scholarships are not free to accept other appointments, but will be expected to devote their time uninterruptedly to the prosecution of their studies.

The moneys due on fellowships and graduate scholarships are paid at the office of the Treasurer of the University in six equal payments on October 15, December 1, January 15, February 15, April 1, and June 1.

THE GRADUATE PRIZE IN PHILOSOPHY

The Graduate Prize in Philosophy has an annual value of about twenty-five dollars, and is open for competition to all students registered in the Graduate School of Cornell University.

The prize will be awarded to the graduate student who submits the best paper embodying the results of research in the field of philosophy. To be acceptable, the paper must show independent scholarship and research in dealing with philosophical ideas. The subject of the paper may be either historical or critical and constructive in character. It may be concerned either with problems of pure philosophy or with the philosophical bearing of the concepts and methods employed in mathematics or in any of the natural or humanistic sciences.

Papers submitted in competition must be deposited in the office of the Dean of the Graduate School on or before the first of May. Each paper is to be typewritten, and must bear a fictitious signature and be accompanied by the name of the writer in a sealed envelope.

The prize will be awarded by a committee appointed by the President of the University. A copy of the successful paper is to be deposited in the University Library by the Dean of the Graduate School.

THE UNIVERSITY LIBRARIES

WILLARD AUSTEN, *Librarian*; E. R. B. WILLIS, *Assistant Librarian*; G. L. BURR, *Librarian Emeritus of the President White Library*; HALLDOR HERMANNSSON, *Curator of the Icelandic Collection*; G. L. HAMILTON, *Curator of the Dante and Petrarch Collections*; E. E. WILLEVER, *Librarian of the Law Library*; W. W. ELLIS, *Librarian of the Agricultural College Library*.

The University Libraries comprise the General Library of the University, the Seminary Libraries in the General Library Building, the Architectural Library, the Chemical Library, the Sibley Engineering Library, the Civil Engineering Library, the Law Library, the Flower Veterinary Library, the Barnes Hall Library, the Goldwin Smith Hall Library, the Van Cleef Memorial Medical Library, the Library of the New York State College of Agriculture, and the Library of the New York State Agricultural Experiment Station at Geneva. The total number of bound volumes in them is now about eight hundred thousand. The number of periodicals, transactions, and other serials, currently received, is over two thousand, and of most of these complete sets are on the shelves.

Among the more important special collections in the General Library are:

- THE ANTHON LIBRARY, of nearly seven thousand volumes, comprising works in classical languages and literatures, besides history and general literature.
- THE BOPP LIBRARY, of about twenty-five hundred volumes relating to the Oriental languages and literatures, and comparative philology, being the collection made by Professor Franz Bopp of the University of Berlin.
- THE GOLDWIN SMITH LIBRARY, of thirty-five hundred volumes, comprising chiefly historical works and editions of the English and ancient classics presented to the University in 1869 by the late Professor Goldwin Smith, and increased during later years by the continued liberality of the donor.
- THE WHITE ARCHITECTURAL LIBRARY, a collection of over twelve hundred volumes relating to architecture and kindred branches of science, given by the late President White, which is being added to from year to year.
- THE KELLY MATHEMATICAL LIBRARY, comprising eighteen hundred volumes and seven hundred tracts, presented by the late William Kelly, of Rhinebeck.
- THE SPARKS LIBRARY, being the library of Jared Sparks, sometime President of Harvard University, consisting of upward of five thousand volumes and four thousand pamphlets, relating chiefly to the history of America.
- THE MAY COLLECTION, relating to the history of slavery and anti-slavery, the nucleus of which was formed by the gift of the library of the late Rev. Samuel J. May of Syracuse.
- THE SCHUYLER COLLECTION of folk-lore, Russian history, and Russian literature, presented by the late Eugene Schuyler in 1884.
- THE PRESIDENT WHITE HISTORICAL LIBRARY, the gift of the late President White, received in 1891, and since largely added to by gift and purchase, especially rich in the primary sources of history, containing notable collections on the period of the Reformation, on the English and French Revolutions, on the American Civil War, and on the history of superstition.
- THE SPINOZA COLLECTION, numbering four hundred and fifty volumes presented in 1894, by the late President White.
- Four remarkably rich collections given by the late Willard Fiske, comprising the DANTE COLLECTION, containing over eight thousand volumes, the PETRARCH COLLECTION, containing over four thousand volumes, the RHAETO-ROMANIC COLLECTION, containing about thirteen hundred volumes, and the ICELANDIC COLLECTION, containing over fifteen thousand volumes.
- THE ZARNCKE LIBRARY, containing about thirteen thousand volumes and pamphlets, especially rich in Germanic philology and literature, purchased and presented in 1893 by William H. Sage.
- THE HERBERT H. SMITH COLLECTION of books relating to South America, purchased in 1896.
- A valuable collection of books on French and Italian Society in the 16th and 17th centuries, presented by Professor T. F. Crane in 1896.
- THE EISENLOHR LIBRARY, containing about one thousand volumes on Egyptology and Assyriology purchased and presented in 1902 by A. Abraham.
- THE BAYARD TAYLOR correspondence and journals and his collection of Goethe literature, presented to the Library, in 1905, by Mrs. Marie Taylor.
- THE ANGLO-SAXON COLLECTION and the COWPER COLLECTION formed by the late Professor Hiram Corson, bequeathed to the Library, and received in 1911.
- THE ENGLISH COLLECTION presented by Professor J. M. Hart in 1914.
- THE CHARLES WILLIAM WASON COLLECTION of books dealing with China and the Chinese, bequeathed to the University by C. W. Wason, '76, in 1918.
- THE JAMES VERNER SCAIFE COLLECTION dealing with the Civil War in the United States, given by J. V. Scaife, '89, in 1919.
- THE BERNARD A. SINN COLLECTION of naval biography and history, given by B. A. Sinn, '97, in 1919.
- THE ROLLIN A. HARRIS COLLECTION of mathematical books given for the use of the Department of Mathematics by Mrs. R. A. Harris.

THE EMIL KUICHLING COLLECTION of works dealing with sanitary science given for the use of the Engineering College, by Mrs. Kuichling.

THE LAW LIBRARY of sixty-five thousand volumes containing an unusually complete collection of American, English, and Colonial reports with complement of text books and statutes, and complete sets of all leading periodicals in English.

THE FLOWER VETERINARY LIBRARY, the gift of Roswell P. Flower to Cornell University, for the use of the State Veterinary College, in 1897.

THE BENNO LOEWY COLLECTION of books in general literature, law, free-masonry, Shakespeariana and dramatic literature, autographs, and portraits.

These collections and others such as these, making possible an exhaustive study of certain fields, are of the greatest service in research work. A similar purpose is served by the seminary rooms of the University Library. Thus, for the study of English, of the classical languages, of the Germanic and Romance languages, of philosophy, of politics and economics, of American and of European history, there have been provided in the library building seven of these research rooms, each equipped with a carefully chosen body of reference books, to which advanced students in these fields have access. In connection with the scientific and technical laboratories similar collections have been formed and well supplied with reference books, standard works, and sets of periodicals, conveniently arranged for study and research.

Cards of admission to the shelves in the stackrooms and to the White Historical Library will be issued to graduate students for the purpose of consultation and research. The privilege of taking books for home use is granted to all students who comply with the library regulations.

LECTURES IN BIBLIOGRAPHY. As a part of the work of the General Library, Mr. Willis, assistant librarian in charge of the readers division, offers a series of informal talks to graduate students in the second term on the resources and facilities of the Library and on the employment as aids to research of the general bibliographical helps.

FIELDS OF INSTRUCTION

In the following pages are outlined the opportunities for graduate study in the various subjects taught in the University. The subjects are grouped in broad fields. An asterisk (*) preceding the title of a special field of study indicates that this is a field which may be chosen as a Major or Minor Subject. Under each subject there is usually given a statement of (1) the special facilities and encouragements for work in that subject, (2) the general prerequisites for advanced work in the subject, (3) courses of instruction for graduates and undergraduates or primarily for graduates, and opportunities offered for the direction of individual investigation in the subject.

More detailed information concerning any one of these various courses (time and place of meeting, and in the case of a few courses given in alternate years whether or not offered in 1929-30, etc.) will be found in the separate announcement of the college in which the particular course is given. The latest edition of any of these special announcements of the several colleges may be obtained by application to the Secretary of the University.

THE FINE ARTS

FINE ARTS

Professors O. M. BRAUNER, CHRISTIAN MIDJO, H. P. CAMDEN, D. L. FINLAYSON, A. C. PHELPS.

Committee: O. M. BRAUNER, W. A. HAMMOND, M. W. SAMPSON, and GEORGE YOUNG, jr.

Graduate work is offered in historical, theoretical, or creative work in the field of the fine arts.

Candidates for the degree of Master of Fine Arts must be holders of a baccalaureate degree and must spend at least one year in residence following the granting of such degree.

The History and Theory of the Fine Arts, Drawing, Painting or Sculpture may be selected as major subjects. Minor subjects may be selected as approved.

DRAWING AND PAINTING. Professors BRAUNER and MIDJO.

SCULPTURE. Professor CAMDEN.

HISTORY OF ART. Professor FINLAYSON.

HISTORY OF ARCHITECTURE. Professor PHELPS.

Other members of the staff will cooperate as necessary.

ARCHITECTURE

Professors F. H. BOSWORTH, C. A. MARTIN, A. C. PHELPS, GEORGE YOUNG, jr., L. P. BURNHAM, H. E. BAXTER, and A. D. SEYMOUR, jr.

Graduate work is offered in architectural design, in the history of architecture, and in advanced construction.

Candidates for the degree of Master of Architecture must have had preliminary training in the subjects elected for graduate work equivalent to that required in like subjects in this University for the degree of Bachelor of Architecture. Architectural Design, History of Architecture, and Architectural Construction are offered as major subjects for the Master's degree; Landscape Design; Drawing, Painting, Modeling, and approved courses in other departments of the University may be elected as minor subjects.

The facilities for graduate work in architecture are excellent. Large, well lighted drafting-rooms and studios are provided and a special architectural library, comprising several thousand books, photographs, lantern slides, and numerous original drawings, is situated in White Hall where it is easily accessible to the student.

Instruction is given by means of lectures, seminary discussions, and especially by direct personal criticism and advice.

- *ARCHITECTURAL DESIGN. Professors BOSWORTH, BURNHAM, and SEYMOUR.
- *HISTORY OF ARCHITECTURE. Professor PHELPS.
- *ARCHITECTURAL CONSTRUCTION. Professors MARTIN, YOUNG, and BAXTER.

LANDSCAPE ARCHITECTURE

Professors E. GORTON DAVIS, R. W. CURTIS, E. D. MONTILLON, and EDWARD LAWSON, and the Faculty of Architecture.

Graduate work is offered in landscape design, in history of landscape architecture, and the use of plants in design.

Candidates for the degree of Master in Landscape Architecture must have had preliminary training in the subjects elected for graduate work equivalent to that required in like subjects in this University for the degree of Bachelor of Landscape Architecture. Landscape Design, the History of Landscape Architecture, and Planting are offered as major subjects for the Master's degree; Architectural Design, Drawing, Painting, and Modeling, and approved courses in other departments of the University may be elected as minor subjects. A general seminary in Landscape Architecture is offered by Professor DAVIS.

*LANDSCAPE DESIGN. Professors DAVIS, MONTILLON, and LAWSON.

*PLANTING DESIGN. Professor CURTIS.

*HISTORY OF LANDSCAPE ARCHITECTURE. Professor DAVIS.

LANGUAGES AND LITERATURES

*SEMITIC LANGUAGES AND LITERATURES

Professor NATHANIEL SCHMIDT.

Special facilities for advanced work in these subjects are: (1) a collection of several hundred squeezes of inscriptions found in Syria and Arabia Petraea, chiefly in Arabic, Hebrew, Syriac, Assyrian, Nabataean, and Greek; (2) squeezes of Old Egyptian, Coptic, and Hittite inscriptions; (3) a collection of several thousand photographs taken in Syria and Arabia Petraea and slides taken from these photographs; (4) reproductions of inscriptions and objects of art in the Museum of Casts; (5) a valuable collection of Arabic, Hebrew, Samaritan, Ethiopic, and Coptic manuscripts secured in Syria; (6) the Eisenlohr Library, especially rich in Egyptology; (7) the Fiske collection of Arabic books; (8) a growing collection of Egyptian antiquities.

To the candidate for an advanced degree, opportunities are offered of studying every Semitic language and dialect, and also Sumerian, Old Egyptian, and Coptic. The student may, if he so chooses, specialize in Semitic literature or in Oriental history. A candidate for the Master's degree or the Doctor's degree, with Semitic languages as a major subject, must have had a year of elementary Hebrew or Arabic; and a candidate for either of these degrees, with Oriental history as a major subject, must have had one year of ancient history and one year either of the history of Asia or the history of Africa before entering upon the graduate course.

ADVANCED HEBREW. NEO-HEBRAIC. ETHIOPIC. ASSYRIAN. SUMERIAN. ARAMAIC (Mandaic, Babylonian Talmudic, Syriac, Nabataean, Palmyrene, Galilean, Samaritan, and Judean). ARABIC (Sabæan and Minaean, Classical, Modern). EGYPTIAN. COPTIC. COMPARATIVE SEMITIC PHILOLOGY. SEMITIC EPIGRAPHY (in Semitic Seminary). HEBREW LITERATURE (in Semitic Seminary).

See also ORIENTAL HISTORY.

THE CLASSICS

Professors C. L. DURHAM, E. P. ANDREWS, H. L. JONES, HARRY CAPLAN, and JAMES HUTTON.

Admission to graduate study in a subject included in the group of the Classics, except in archaeology, assumes a knowledge of the field selected equivalent in

general to that expected of a student who has pursued the subject concerned throughout four years of undergraduate study in a college of recognized standing.

Graduate work in the Classics is conducted in the main by the seminary system, the object of which is training in the methods, the principles, and the performance of independent research and criticism, and the work is therefore as far as possible put into the hands of the students themselves. Subjects other than those investigated in one of the seminaries of the year are ordinarily presented by courses of lectures.

Two seminary rooms in the Library Building are reserved for the exclusive use of graduate students in the Classics. In addition to the various complete sets of philological and of archaeological journals and standard works of reference in these rooms, the general University Library is at the disposal of the graduate students; stack permits are available when required, and special collections of books can be transferred from the general library to the seminary rooms when needed.

Two fellowships in Greek and Latin; a scholarship in Greek and Latin; and a scholarship in Archaeology and Comparative Philology are awarded annually.

The Charles Edwin Bennett Fund for Research in the Classical Languages yields an annual income of three hundred dollars which may be used each year in the way best suited to promote the object for which the fund was established.

*GREEK

Primarily for Undergraduates

HERODOTUS; DRAMATIC POETRY; PLATO; LYSIAS; DEMOSTHENES; LYRIC POETRY; THUCYDIDES; THE NEW TESTAMENT.

HOMER'S ILIAD OR ODYSSEY. Assistant Professor CAPLAN.

ADVANCED GREEK COMPOSITION.

THE MYTHS OF THE EPIC CYCLE. Professor JONES.

THE ODES OF PINDAR. Professor JONES.

LECTURES ON GREEK LITERATURE. Professor _____.

Primarily for Graduates

GREEK SEMINARY. Professor JONES. Lysias: the rise and development of Greek Oratory; Athenian legal procedure; a reading of all the extant speeches of Lysias with a study of special textual problems; or Greek Historical Geography: the geography of Homer in the Odyssey, a study based on Strabo's Geography and Bérard's *Les Phéniciens et L'Odyssee*: also special problems connected with the text of Strabo.

GREEK SEMINARY. Assistant Professor CAPLAN. The works of Homer.

CLASSICAL RHETORIC AND ORATORY. Assistant Professor CAPLAN.

GREEK ELEGIAC POETRY. Assistant Professor HUTTON.

See also PLATO'S REPUBLIC (under *PHILOSOPHY*), INDO-EUROPEAN PHILOLOGY (under *LATIN*), and METHODS OF LITERARY AND LINGUISTIC STUDY, and PRINCIPLES OF LITERARY CRITICISM (under *COMPARATIVE STUDY OF LITERATURE*).

*LATIN

Primarily for Graduates

LATIN SEMINARY. Professor DURHAM. The MS tradition of Cicero's oratorical works; Plautus; Cicero's Orator and the Doctrine of Prose Rhythm; problems in Latin pronunciation and versification; or Catullus and Alexandrianism.

LATIN SEMINARY. Assistant Professor CAPLAN. The works of Horace: their literary and historical significance with the textual and metrical problems presented.

INDO-EUROPEAN PHILOLOGY. Professor DURHAM. Phonetics; the principles, methods, and results of the comparative philology of the Indo-European family of languages.

HISTORICAL LATIN SYNTAX. Professor DURHAM. With special reference to the moods and tenses of the Latin verb.

LECTURES ON LATIN LITERATURE. Professor _____.

VULGAR LATIN. Professor DURHAM. The sounds, flexions, and syntax of informal Latin; the extension and the characteristics of the spoken language under the Empire. Primarily for students of Latin who are interested also in the history of the Romance languages.

LATIN EPIGRAPHY. Professor DURHAM. The earlier republican and the later imperial inscriptions (including Christian inscriptions) will be studied primarily for their linguistic value; the late republican inscriptions and those of the early Empire will be considered more particularly with reference to their historical content.

SOUNDS AND FLEXIONS OF LATIN; THE ITALIC DIALECTS. Professor DURHAM. The sounds and flexions of Latin from the earliest period down to the time of Augustus; the Oscan and Umbrian dialects.

MEDIEVAL RHETORIC. Assistant Professor CAPLAN.

*GREEK ART AND ANTIQUITIES

Professor E. P. ANDREWS.

The Museum of Casts furnishes abundant material for the study of Greek sculpture and for most branches of Greek archaeology. Several hundred squeezes bring the most important Greek inscriptions within reach for independent work in Greek epigraphy.

GREEK EPIGRAPHY, in Seminary. The Greek alphabets and illustrative inscriptions, working chiefly from squeezes.

GREEK ARCHAEOLOGY, in Seminary. The pre-hellenic civilization; Greek vases, coins, terracottas, gems, metal-work, painting, architecture.

HISTORY OF GREEK SCULPTURE, in Seminary.

MODERN GREEK, WRITTEN AND COLLOQUIAL.

PAUSANIAS AND THE TOPOGRAPHY OF GREECE, with especial reference to Athens.

*ENGLISH LANGUAGE AND LITERATURE

*Professors M. W. SAMPSON, WILLIAM STRUNK, JR., F. C. PRESCOTT, C. S. NOR-
THUP, J. Q. ADAMS, B. S. MONROE, L. N. BROUGHTON, F. M. SMITH, J. W.
HEBEL, and W. H. FRENCH, and Doctors MILTON MARX, MARCEL KESSEL,
and E. G. AINSWORTH.*

Among the books available to the student are complete sets of the publications of the Early English Text, Chaucer, Scottish Text, Percy, English Dialect, Shakespeare, New Shakspere, Spenser, Philological, Malone, and other societies; of the Arber, Bullen, Grosart, and Farmer reprints; and of all the important periodicals dealing with the English language and literature. Most of the American and foreign dissertations on English subjects, standard and other editions of individual authors, English and American, and several special collections are also in the Library, which is exceptionally rich in the field of Old and Middle English and in the Elizabethan and Victorian periods. The Hart Memorial Library, founded by the late Professor James Morgan Hart, contains about four thousand five hundred volumes and includes valuable collections in the bibliography of English philology. This library, in Goldwin Smith Hall, is for the use of graduate students and members of the Faculty. The Department has also a seminary room in the University Library. A fellowship and a scholarship are annually awarded. *The Cornell Studies in English*, a series of monographs issued by the Department, affords some opportunity for the publication of work accomplished by graduates as well as by members of the staff. Fourteen volumes have appeared.

Candidates for an advanced degree may take their major subject in literature or in language. In general, thirty-six hours (i. e., three full years) of college English are required before a student may enter upon candidacy for an advanced

degree. Work in philosophy, history, and languages, ancient and modern, may, at the discretion of the candidate's special committee, be counted against a shortage in undergraduate English. Training in the Greek and Latin literatures is especially desirable as preparation for graduate work in English. All candidates must have a reasonable familiarity with Old and Middle English; must have a general knowledge of English literature and English history; and must accomplish satisfactory work in research. Candidates for the Master's degree must have sufficient knowledge of French or German to make use of scholarly work in one of those languages, and candidates for the Doctor's degree must have a similar knowledge of both French and German, and a reading knowledge of Latin.

ADVANCED COURSES

HISTORY OF ENGLISH LITERATURE. Professor STRUNK. Lectures on English literature with reading and reports.

OLD ENGLISH. Assistant Professor MONROE. Old English grammar. Reading of selections from the *Old English Chronicle*, King Alfred, Aelfric, and other representative prose texts, and of the simpler poetry. Some study of Middle English will be included in the second term.

OLD ENGLISH LITERATURE. Assistant Professor MONROE. Reading of selected Old English works including *Beowulf* or some of the Cynewulfian poetry; studies in textual criticism and in style and metre; supplementary reading.

MIDDLE ENGLISH LITERATURE. Professor NORTHUP. Studies of the greater writers of the period and of the influences which helped to mold their work.

MIDDLE ENGLISH METRICAL ROMANCES. Assistant Professor FRENCH. A detailed study of a few romances, with rapid reading of examples from all cycles.

CHAUCER. Professor STRUNK. First term: preliminary study of Chaucer's life and times; the shorter poems and *Troilus and Cressida*. Second term: *The Canterbury Tales*.

THE ENGLISH DRAMA TO 1642. Professor ADAMS. First term: the origin of the drama; miracles; moralities; interludes; the first regular comedies and tragedies. Second term: the predecessors, contemporaries, and successors of Shakespeare.

[SHAKESPEARE. Professor ADAMS. The chief plays of Shakespeare, studied with reference to dramatic technique. To be given in 1930-31.]

SHAKESPEARE. Professor STRUNK. Textual and critical study of selected plays.

SPENSER. Assistant Professor HEBEL. A study of the poetry of Spenser with such a survey of his immediate predecessors and contemporaries as is necessary for an understanding of his historical position.

SEVENTEENTH CENTURY LITERATURE. Assistant Professor HEBEL. A study of English literature, history, and philosophy of the seventeenth century; among the authors studied are Jonson, Donne, Herbert, Herrick, Vaughan, Marvell, Burton, Browne, Walton, Pepys.

MILTON. Assistant Professor HEBEL. A study of Milton's poetry and selections from his prose.

EIGHTEENTH CENTURY POETRY. Professor PRESCOTT and Assistant Professor MONROE. English poets of the Restoration and the eighteenth century: Dryden, Pope, Thomson, Gray, Collins, Goldsmith, Cowper, and Burns; the lesser English and Scotch poets; beginnings of the English Romantic movement.

EIGHTEENTH CENTURY PROSE. Assistant Professor BROUGHTON. Defoe, Swift, Addison, Steele, Johnson, Goldsmith, and Burke.

BIOGRAPHY. Assistant Professor SMITH. Boswell's *Johnson*, Gibbon, Borrow.

THE ENGLISH NOVEL. First term: Assistant Professor BROUGHTON. The origin of the modern English novel and its development to the end of the eighteenth century; reading in Defoe, Richardson, Fielding, Smollett, Sterne, and others. Second term: Professor SAMPSON. A study of some of the representative works of Meredith, Hardy, Henry James, and Conrad.

WORDSWORTH AND HIS CONTEMPORARIES. Assistant Professor BROUGHTON. A detailed study of the works of Wordsworth; their influence on contemporary English thought and literature; and the works of several of Wordsworth's contemporaries. To each student will be assigned some problem or field of investigation.

BYRON AND SHELLEY. Professor PRESCOTT. In 1929-30: A study of Shelley's life, his principal works, and his influence. First term.

NINETEENTH CENTURY PROSE. Assistant Professor BROUGHTON. Extensive reading in nineteenth century prose, with some attention to the literary criticism and theories of style of the period.

VICTORIAN LITERATURE. Professor NORTHUP. Lectures on the chief literary tendencies and characteristics of the period; studies of the leading poets and the greater writers of prose.

AMERICAN LITERATURE. Professor PRESCOTT. American literature of the Colonial and Revolutionary periods; the growth of literary independence; Irving, Bryant, and Cooper. American prose and poetry of the nineteenth century.

THE ENGLISH LANGUAGE. Assistant Professor MONROE. The development of the English language, with consideration of language in general, including elementary phonetics.

ENGLISH USAGE AND STYLE. Professor STRUNK. The study of composition, the theory of good English, the study of words, idioms, and pronunciation, and related topics.

SHORT STORY WRITING. Assistant Professor SMITH.

PLAYWRITING. Professor SAMPSON.

ENGLISH POETRY. Professor PRESCOTT. A general course in the nature of poetry and of poetic forms with reading of illustrative poems.

PASTORAL POETRY. Assistant Professor BROUGHTON. A study of the sources, origin, and development of the appreciation of rustic life and landscape in English poetry. Among the authors considered are Theocritus, Virgil, Spenser, Shakespeare, Fletcher, Jonson, Milton, Pope, Thomson, Collins, Burns, and Wordsworth.

MODERN CRITICAL THEORIES. Professor STRUNK. A study of literary theory and criticism in authors of the nineteenth and twentieth centuries.

DRAMATIC STRUCTURE. Professor SAMPSON. A study of the principles of dramatic construction, based upon Greek, Elizabethan, classical French, and modern drama.

TEACHERS' COURSE. Professor NORTHUP. Lectures, readings, and conferences on the teaching of English in the secondary schools.

SEMINARY COURSES

OLD ENGLISH. Assistant Professor MONROE.

ENGLISH LITERATURE, 1500-1640. Professor ADAMS. A study of the non-dramatic literature of England from the beginning of the Renaissance to Milton, with emphasis on the earlier period. Members of the class will be expected to purchase as many available texts as possible; the rarer works will be placed on reserve in the Hart Memorial Library.

SEVENTEENTH CENTURY LITERATURE. Assistant Professor HEBEL. A study of the problems of research in seventeenth century literature, designed to introduce the student to various modes of literary investigation.

METHODS AND MATERIALS IN ELIZABETHAN RESEARCH. Professor ADAMS. Elizabethan handwriting; sixteenth-century printing and publishing; the important books of reference for the scholar; scientific bibliography; textual criticism; the editing of Elizabethan works; the general technique of research.

SHAKESPEARE. Professor ADAMS. Problems connected with Shakespearean study; Elizabethan theatrical conditions; censorship of plays; the making of playhouse manuscripts; the transmission of the text; *Hamlet* in modern scholarship.

THE DRAMA. Professor SAMPSON. Webster, Middleton, and Beaumont and Fletcher.

EIGHTEENTH CENTURY PROSE. Assistant Professor BROUGHTON. Swift, Burke, and others.

NINETEENTH CENTURY FICTION. Professor NORTHUP. Studies in the development of the novel from Scott to Meredith.

AMERICAN LITERATURE. Professor PRESCOTT. The literary relations of England and America. Provincial and national traits in American literature.

SHAKESPEARE. Professor STRUNK. Textual and critical study of selected plays.

BYRON AND SHELLEY. Professor PRESCOTT.

STRUCTURE OF THE LYRIC. Professor SAMPSON. A study of the short lyric in respect to the arrangement of its substance.

In addition to directing research beyond the limits of the courses listed above, the members of the instructing staff will supervise original work, either in seminars or by individual conferences, in the fields here noted:

The English Language; selected topics. Assistant Professor MONROE.

Eighteenth Century Literature. Assistant Professor BROUGHTON.

The Elizabethan Drama. Professor ADAMS.

The Theory of Poetry and Versification. Professor PRESCOTT.

English Philology. Professor STRUNK.

Poetry. Professor SAMPSON.

*COMPARATIVE STUDY OF LITERATURE

Professor LANE COOPER (Professor of the English Language and Literature); and Professor JAMES HUTTON.

Once the usual demands for entrance into the Graduate School are satisfied, no particular requirement but special fitness is made of candidates for an advanced degree who desire entrance into this field of work, which is closely related to English Philology in the broad sense of the term. Philology is here taken to mean the conjoint study of language and literature. The candidate must evince some special fitness for either the literary or the linguistic side of the work, but in any case must not be deficient in literary appreciation. He will have opportunity to prove his worth in the first year of graduate study. In general, one year of satisfactory graduate work is enough for the degree of Master of Arts. Students who are permitted to advance toward the doctoral degree commonly expect to receive it after two years more—but the attainment of the doctorate in three years must not be regarded as a fixed rule. The work for both degrees will be adapted to the needs and purposes of the individual candidate; great care will be taken to find a suitable subject for the "thesis." The work is in the main designed to develop good scholars and effective teachers for colleges and universities.

Apart from a broad culture, however attained, the best foundation for this work is undergraduate study of the classics. Those who wish to be candidates should use every opportunity to improve their acquaintance with Greek and Latin literature, whether in the original or through translations, and with mediæval literature—for example, in Old and Middle English, which had best be begun before the first year of graduate work. The graduate student must bring a love of good literature with him, and not expect to acquire it at a late date, for his special studies now presuppose that love. In general, a good candidate is one who has been drawn to read the best books, and has read them, from the age of eight or ten years on, and who has had a broad and sound course of study as an undergraduate. This course should have included one satisfactory year of French, at least two years of German, and a fair amount of Latin. For those who have not had Greek in the preparatory school, it is desirable to begin it as early as the Sophomore year in college; but it may be begun later; and candidates who have not studied the Greek language will not be rejected on that

account. A student who has had a broad general culture, and has done very well in classics, history, biology, or mathematics, may expect to succeed in the comparative study of literature.

Good doctoral dissertations will be accepted for publication in the *Cornell Studies in English*.

For Graduates and Undergraduates

OLD AND MIDDLE ENGLISH. Professor COOPER. A study of the foundations of the English language and literature, with emphasis upon literary aspects so far as a proper acquisition of linguistic knowledge will permit. This course is recommended to prospective teachers in the secondary schools.

MODERN WRITERS ON ART. Assistant Professor HUTTON. Ruskin, Tolstoy, and Nietzsche; a study of artistic principles and practice, with especial attention to the art of prose.

Primarily for Graduates

DANTE IN ENGLISH. Professor COOPER. Reading for the sake of literary and historical perspective, followed by a more intensive study of select cantos of the *Commedia*. A knowledge of Italian is not required.

PRINCIPLES OF LITERARY CRITICISM. Professor COOPER. A study of the chief ancient and modern theories of poetry, as in the *Poetics* of Aristotle and the critical treatises of Scaliger, Sidney, Jonson, Dryden, Lessing, and Shelley; with constant reference to literary masterpieces.

METHODS OF LITERARY AND LINGUISTIC STUDY. Professor COOPER. Reading in Boeckh's *Encyclopädie*, followed by a study of more recent treatises with special reference to the ancient classics and English.

CHAUCER SEMINARY. Professor COOPER. A study of essential books and topics, systematic reading of Chaucer's works, and a detailed study of special problems; with a view of the practical development, in the student, of the method of English scholarship.

*RHETORIC AND PUBLIC SPEAKING; DRAMATIC PRODUCTION

Professors A. M. DRUMMOND, G. B. MUCHMORE, H. A. WICHELNS, HARRY CAPLAN, W. H. STANTON, and R. H. WAGNER.

Candidates should have the background of a thorough undergraduate course centering in literature, history, and philosophy; should be able to speak and write good English; should have reasonable proficiency in public speaking and reading; and should be conversant with the literature of their chosen field. Candidates for the Master's degree must have a reading knowledge of French or of German; candidates for the Doctor's degree must, before admittance to candidacy, demonstrate their ability to make use of French and of German. Applicants are advised to enter into correspondence as to their qualifications well in advance of the date at which they propose to begin residence.

The chief aim of graduate work in rhetoric and in dramatic production, is to develop competent investigators and teachers for colleges and universities. To that end, all candidates must attain a reasonable knowledge of speech training and phonetics; must acquire a general knowledge of the literature and history of their chosen field, and must accomplish satisfactory work in research. Candidates for the Doctor's degree whose major interest is in Rhetoric, that is, in the principles, history and criticism of public address, will be advised to make English Literature one of their minor subjects; those whose major interest centers in Drama and the Theatre will be required to make Dramatic Literature one of their minors. In most cases the work will require more than the minimum periods of residence. For the Doctor's degree, residence during two academic years will be necessary. Candidates for the Master's degree in Dramatic Production will require at least one academic year and one summer session of residence, and will not proceed to the doctorate in Drama and the Theatre without two additional years and an additional summer.

For Graduates and Undergraduates

HISTORY OF RHETORIC AND ELOQUENCE. Assistant Professor WICHELNS.
 CLASSICAL AND MEDIEVAL RHETORIC. Assistant Professor CAPLAN.
 PUBLIC OPINION AND THE METHOD OF ARGUMENT: MODERN RHETORICAL
 THEORY. Assistant Professor WICHELNS.
 BRITISH ORATORS. Assistant Professor WAGNER.
 AMERICAN ORATORS. Assistant Professor WICHELNS.
 PHONETICS AND SPEECH TRAINING. Assistant Professor MUCHMORE.
 PROBLEMS AND METHODS. Professor DRUMMOND.
 DRAMATIC INTERPRETATION. Professor DRUMMOND.
 DRAMATIC PRODUCTION AND THEATRE PRACTICE. Assistant Professor STAIN-
 TON.

Primarily for Graduates

SEMINARY IN RHETORIC AND ELOQUENCE. Assistant Professors WICHELNS and
 WAGNER.
 SEMINARY IN SPEECH TRAINING. Assistant Professor MUCHMORE and Mr.
 THOMAS.
 ADVANCED DRAMATIC INTERPRETATION. Professor DRUMMOND.
 MODERN THEORIES OF STAGE PRESENTATION. Assistant Professor STAINTON.
 SEMINARY IN DRAMATIC PRODUCTION. Professor DRUMMOND.

GERMANIC LANGUAGES AND LITERATURES

*GERMAN

Professors A. B. FAUST, A. W. BOESCHE, P. R. POPE, and A. L. ANDREWS.

In the advanced courses in this subject the work is twofold, literary and philological. The history of German literature from the earliest period to the present day is sketched in outline lecture courses with collateral reading. Special topics are selected for detailed study such as the epic and lyric poetry of the Middle High German period, the literature of the Reformation, the classical period, the drama of the nineteenth century, and contemporary literature. The courses offered in philology include the study of Gothic and of Old and Middle High German. They also afford an introduction to the science of language.

The seminaries in German literature and philology aim to impart the principles and methods of investigation. A teacher's course deals with classroom methods and theories of instruction in the modern languages.

All the work in German is greatly facilitated by an exceptional library equipment. The nucleus was formed by the acquisition of the Zarncke library, one of the largest collections of rare books for the study of German literature and philology ever brought to America. With constant enlargements the library has become one of the most serviceable in the country. The German seminary room in the University Library contains books for ready reference, including philological journals and reviews.

Candidates for advanced degrees in German are expected to have an adequate knowledge of French and Latin. A fellowship in German is awarded annually.

For Graduates and Undergraduates

LESSING'S LIFE AND WORKS. Professor POPE.
 SCHILLER'S DRAMAS. Assistant Professor ANDREWS.
 SCHILLER'S LYRICS AND PROSE. Professor BOESCHE.
 GOETHE'S LIFE AND WORKS. Professor BOESCHE.
 GOETHE'S FAUST. Professor FAUST.
 HISTORY OF GERMAN LITERATURE. Professor FAUST.
 CONTEMPORARY GERMAN LITERATURE. Professor FAUST.
 NINETEENTH CENTURY DRAMA. Professor POPE.
 MIDDLE HIGH GERMAN. Professor POPE and Assistant Professor ANDREWS.
 HISTORICAL GERMAN SYNTAX. Professor BOESCHE.

Primarily for Graduates

TEACHERS' COURSE IN METHODS. Professor FAUST. Methods of teaching modern languages; examination and criticism of textbooks available for the study of German; requirements for teachers' examinations.

GOTHIC. Professor BOESCHE. Streitberg's *Gotisches Elementarbuch: Die gotische Bibel*, ed. by Streitberg. This course will serve as a general introduction to Germanic philology.

OLD HIGH GERMAN. Professor BOESCHE. Braune's *Althochdeutsche Grammatik* and *Althochdeutsches Lesebuch*. A study, mainly linguistic, of the oldest German texts. It should be preceded by the course in Gothic.

PRINCIPLES OF GERMANIC PHILOLOGY. Assistant Professor ANDREWS. A discussion of the fundamental principles of linguistic relationships within the old Germanic dialects. Lectures and illustrative problems. This course should be preceded by those in Gothic and Old High German.

SEMINARY IN GERMAN LITERATURE. Professors FAUST and POPE. A study of special literary problems, as: Der junge Goethe; Goethe's *Faust II*; Lessing's *Hamburgische Dramaturgie*; the Modern *Sturm und Drang* Period; German-American Literature; Problems in German Literature since 1880.

SEMINARY IN GERMAN PHILOLOGY. Professor BOESCHE. A detailed study of early German texts, such as the smaller Old High German poems, or of questions in Historical German Syntax.

*SCANDINAVIAN LANGUAGES AND LITERATURES

Professor HALLDOR HERMANNSSON.

The Fiske Icelandic Collection in the University Library, comprising about 19,000 books and pamphlets, offers excellent facilities for advanced work in Old Norse-Icelandic language and literature, Norse mythology and heroic legends, runology, and early Scandinavian history, as well as in Modern Icelandic language and literature. The Library also has a small collection of books on the other modern Scandinavian languages and literatures to which some additions are made annually.

OLD ICELANDIC. HISTORY OF THE OLD NORSE-ICELANDIC LITERATURE. NORSE MYTHOLOGY. EARLY SCANDINAVIAN HISTORY. MODERN SCANDINAVIAN LANGUAGES AND LITERATURES.

ROMANCE LANGUAGES AND LITERATURES

Professors J. F. MASON, G. L. HAMILTON, O. G. GUERLAC, LAURENCE PUMPELLY, G. I. DALE, and M. G. BISHOP.

The collection of French and Spanish books in the University Library is very large, and offers excellent facilities for advanced work. Objects of special pride are the unrivalled Dante and Petrarch collections, the gift of the late Willard Fiske, who likewise presented to the University a unique collection of Rhaeto-Romance works. Smaller collections of Portuguese, Provençal, and Catalan books are also to be found in the University Library. The seminary library contains several thousand volumes including many sets of bound periodicals. A university fellowship in Romance languages (of the value of \$400 and free tuition) is annually awarded.

The courses of study in this department are divided into three categories: those intended primarily for undergraduates, those intended alike for undergraduates and graduates, and those intended primarily for graduates. All candidates for advanced degrees in this department must possess a thorough reading knowledge of Latin, French, and German, before announcing their candidacy. A graduate student in Romance languages should have completed some formal course of study in the language and literature of the language which he intends to select as his major subject, and should have a reading knowledge at least of the languages which he selects as his minor subjects.

A candidate for the degree of Master of Arts whose major subject is in Romance languages is expected to present for the approval of the chairman of his Special Committee, within two weeks after registration day, an outline of the work planned for the year. The thesis must, before May 1, be submitted for the criticism of the chairman of the candidate's Special Committee. If not already taken, a course in the philology of the language which constitutes their major subject is required of graduate students in their first year of study.

Candidates for the degree of Doctor of Philosophy are expected to follow advanced courses given in the field in which their major subject lies and to take up such work as will give a comprehensive view of the fields in which their minor subjects lie. It is intended that the last year of preparation for this degree shall be spent chiefly upon the thesis. Further information may be obtained from the professors in this department.

*FRENCH

Professors MASON, GUERLAC, and PUMPELLY.

HISTORY OF FRENCH LITERATURE. Professor MASON and Professor GUERLAC.
 LITERATURE OF THE SIXTEENTH CENTURY. Professor MASON.
 LITERATURE OF THE SEVENTEENTH CENTURY. Professor GUERLAC.
 LITERATURE OF THE EIGHTEENTH CENTURY. Professor GUERLAC.
 LITERATURE OF THE NINETEENTH CENTURY. Professor MASON.
 FRENCH PHILOLOGY. Professor PUMPELLY.
 MEDIEVAL LITERATURE. Professor HAMILTON.
 MODERN FRENCH LITERATURE SEMINARY. Professor MASON.

*ITALIAN

Professor HAMILTON.

DANTE. LITERATURE OF THE RENAISSANCE. OLD ITALIAN.

*SPANISH

Professor DALE.

HISTORY OF SPANISH LITERATURE. SPANISH CLASSICAL LITERATURE. LITERATURE OF THE NINETEENTH CENTURY. OLD SPANISH. SEMINARY.

*ROMANCE PHILOLOGY

LOW LATIN. Professor HAMILTON.
 OLD PROVENÇAL. Professor HAMILTON.

HISTORY, AND POLITICAL, ECONOMIC, AND SOCIAL SCIENCE

The subjects of history, economics, and government have been united since 1887 in the President White School of History and Political Science, which bears the name of the first president of the University in especial recognition of the gift of his valuable collection of historical literature to the University Library.

The aims of the President White School are threefold: first, the advancement of knowledge by investigation and publication in the fields of history, economics, politics, jurisprudence, and social science; second, the training of scholars and teachers in these departments of study; third, the training of men and women for the public service, for business, and for professions such as law, journalism, and philanthropy.

The school has issued five volumes of *Cornell Studies in History and Political Science*:

1. *Money and Credit Instruments in their Relation to General Prices.* By Edwin Walter Kemmerer, Ph.D., now Professor in Princeton University. First edition, 1907. Second edition, 1909.
2. *Sargon of Assyria.* By Albert Ten Eyck Olmstead, Ph.D., now Professor of History in the University of Illinois. 1908.

3. *The Judicial Work of the Comptroller of the Treasury.* By Willard E. Hotchkiss, Ph.D., now Dean of the Graduate School of Business, Stanford University. 1910.
4. *Social Insurance: An Economic Analysis.* By Robert Morse Woodbury, Ph.D., now Director of Statistical Research, Children's Bureau, U. S. Department of Labor. 1917.
5. *The Liberal Republican Movement.* By Earle Dudley Ross, Ph.D., now Professor of History in the Iowa State College. 1919.

HISTORY

Professors NATHANIEL SCHMIDT, C. H. HULL, J. P. BRETZ, CARL BECKER, PRESERVED SMITH, M. L. W. LAISTNER, and F. G. MARCHAM.

A graduate student in history should have a sufficient knowledge of general history and of geography. He should be able to speak and write good English. He should have a reading knowledge of French, of German, and of any other language necessary for the thorough study of his special subject. For work in Medieval History he would need a knowledge of Latin, and for Ancient History both Latin and Greek. It is highly desirable that he should have had the necessary linguistic training as an undergraduate; but deficiencies in this respect may sometimes be made up after entering upon graduate work.

The University Library contains ninety or a hundred thousand volumes dealing with history. In large part these are to be found in the room known as the White Historical Library. Graduate students have immediate access to this rich group of books which, with its many special collections, offers every facility for training in the methods of minute and exhaustive research. The historical seminary rooms in the library building are amply furnished with atlases, cyclopedias, dictionaries, bibliographies, and other useful works of reference, and afford easy access to the shelves of the Library proper.

It has been from the outset the policy of the University, while providing adequately for the symmetrical growth of the Library, to acquire the richer private collections of books which eminent scholars have through a lifetime of study built up as their tools of research. Thus, for the study of Oriental History, Cornell has been endowed with the EISENLOHR COLLECTION on the history of Egypt, with the WASON COLLECTION on the history and the civilization of China, and with that of President White on the history of Palestine. For the study of the Graeco-Roman world, it acquired that of Charles Anthon. For the Middle Ages, it has notable bodies of books on the birth of the Papal state, on the rise of the Carolingian empire, and in general on the relations of Church and State. For the Renaissance, it can boast the unrivaled FISKE COLLECTIONS on Dante and Petrarch and the world of their time. For the age of the Reformation, for the history of superstition and persecution (notably for Inquisition and Index, for the story of witchcraft, for the beginnings of the sciences, for the rise of tolerance), it is equipped with the riches of the PRESIDENT WHITE LIBRARY; and for the study of the French Revolution that library has no equal on this side of the Atlantic, if anywhere outside of France. For the history of America, the University possesses the library of the historian Jared Sparks, with the MAY COLLECTION on American slavery and the SCAIFE COLLECTION on the Civil War. Professor GOLDWIN SMITH enriched it with his working library of English history; it obtained that of Professor Tuttle on Prussia; from Professor Fiske came one singularly complete on Iceland. In a multitude of narrower fields it has been found possible to gather for the special student materials for exhaustive research. Many of these collections are endowed with special funds for their increase; and all have been steadily built up with an eye to the needs of the mature student of history.

Three fellowships and a scholarship are annually awarded to graduate students of history. The President White Fellowship in Modern European History has a value of \$500. It may be granted as a travelling fellowship. The Fellowship in American History amounts to \$400. The stipend of the George C. Boldt Fellowship in History is \$1,000. The Graduate Scholarship in History amounts to \$200. Holders of fellowships and graduate scholarships are exempt from the payment of

tuition. There are nine assistantships in history, which are filled preferably by the appointment of graduate students.

The teachers and graduate students of history have formed a History Club, which meets once a month for the reading and discussion of papers on historical topics and for social intercourse.

General courses, not enumerated here, are offered in oriental, ancient, medieval, modern European and English history and in American history, both political and economic. These are intended for undergraduates, but, if supplemented by individual work, one or another of them may sometimes serve the purposes of a graduate student whose previous studies have not given him a general knowledge of its field. A general seminary in historical method is also offered by the Professor of Medieval History.

Each of the professors of history is willing to direct research in his special field, provided the student comes with a topic on which he can work.

*ORIENTAL HISTORY

Professor NATHANIEL SCHMIDT.

THE HISTORY OF ASIA. A general survey of the political development and the cultural life from the earliest times to the present day, with especial attention to India, China, and Japan during the first term, and to Mesopotamia, Syria and Palestine, Anatolia, and Iran during the second term.

Graduates making Oriental History their major subject must have had a year of Ancient History and a year of either the History of Asia or the History of Africa.

*ANCIENT HISTORY

Professor M. L. W. LAISTNER.

For Graduates and Undergraduates

[THE ROMAN REPUBLIC, 133-30 B. C. Not given in 1929-30.]

[THE ROMAN EMPIRE, 30 B. C. to 180 A. D. Not given in 1929-30.]

A detailed study of the political history of the respective periods, with some consideration of social and economic conditions.

GREEK HISTORY, 500-323 B.C. The political, economic, and social history of Greece from the Persian Wars to the death of Alexander, with some study of the sources for the period (in translation).

THE HISTORY OF EDUCATION (Greek, Roman, and early Medieval). The theory and practice of education in the Greek and Roman world, and in the early Middle Ages in the west to the Carolingian revival.

Primarily for Graduates

SEMINAR IN ROMAN HISTORICAL INSCRIPTIONS. (A reading knowledge of Latin is essential.)

[THE GREEK AND ROMAN WRITERS OF HISTORY FROM HERODOTUS TO PROCOPIUS. Not given in 1929-30.]

*MEDIEVAL AND RENAISSANCE HISTORY

Professor PRESERVED SMITH.

For Graduates and Undergraduates

THE AGE OF THE REFORMATION. Lectures and readings on the political, religious, and social history of Europe during the period 1440-1600.

HISTORY OF CULTURE FROM THE RENAISSANCE TO THE ENLIGHTENMENT. The intellectual history of the sixteenth and seventeenth centuries.

Primarily for Graduates

SEMINARY IN CHURCH HISTORY. An investigation of the sources of ecclesiastical history from the beginning of the second century to the end of the sixteenth; a discussion of the problems involved; together with reading and interpretation of some of the principal documents in the original Latin.

SEMINARY IN LATIN PALAEOGRAPHY AND DIPLOMATICS. An introduction to the sciences of reading and criticizing medieval Latin manuscripts.

SEMINARY IN HISTORICAL METHOD. A study of historical method in the writings of the great historians of modern times and in the standard works on historiography.

*MODERN EUROPEAN HISTORY

Professor CARL BECKER.

For Graduates and Undergraduates

THE NAPOLEONIC ERA. A study of the organization of France under Napoleon, the establishment of the empire, the restoration of Europe in 1814-15, and the attempt to establish a European Federation or Concert of the Powers from 1815 to 1825.

THE FRENCH REVOLUTION. A study of French society before 1789, and of the Revolution from 1789 to 1795.

Primarily for Graduates

SEMINARY IN MODERN EUROPEAN HISTORY. Offers an opportunity to do research in the original sources for the French Revolution or in some closely related field of modern history.

*ENGLISH HISTORY

Professor F. G. MARCHAM.

For Graduates and Undergraduates

ENGLAND 1783 TO THE PRESENT. The study of English political, economic and social development, with special use of novels, diaries, letters, and plays. *Professor* F. G. MARCHAM and Mr. R. G. RAMSAY.

ENGLISH CONSTITUTIONAL HISTORY. The development of the English system of government from the earliest times to the present.

*AMERICAN HISTORY

Professors C. H. HULL and J. P. BRETZ.

For Graduates and Undergraduates

[CONSTITUTIONAL HISTORY OF THE COLONIES AND STATES. *Professor* HULL. The establishment of British colonial governments and their transformation into the governments of our States. Study of contemporary documents and correspondence and various interpretations thereof. Not given in 1929-30.]

[CONSTITUTIONAL HISTORY OF THE UNITED STATES SINCE 1860. *Professor* BRETZ. Constitutional questions of current interest with their historical background. Not given in 1929-30.]

FOREIGN RELATIONS OF THE UNITED STATES. *Professor* HULL. From 1775 through the Spanish War.

THE ESTABLISHMENT OF EUROPEAN EMPIRES IN AMERICA, 1493-1763. *Professor* HULL.

THE DISINTEGRATION OF EUROPEAN EMPIRES IN AMERICA, 1763-1823. *Professor* HULL.

THE SETTLEMENT OF THE MIDDLE WEST. *Professor* BRETZ. A survey of westward expansion from 1750 to 1848.

SELECTED TOPICS IN AMERICAN HISTORY. Professor BRETZ. Readings in a selected field during the first term with papers in the same field during the second term.

Primarily for Graduates

SEMINARY IN AMERICAN HISTORY. Professor HULL. Designed for practice in discovering, interpreting, and valuing sources and in casting the results of such study into narrative form. The particular topics of study are selected each year with reference to the attainments and needs of members of the class.

*GOVERNMENT

Professors R. E. CUSHMAN, G. E. G. CATLIN, and H. W. BRIGGS.

Graduate courses in government afford an opportunity to students to carry on research in that field. As preparation for such work a familiarity with the essentials of American political institutions and of the principal systems of European government is assumed, as well as at least an elementary knowledge of American and English or European history. For 1929-30 research in government will be directed primarily in the fields of American Constitutional Law, Political Theory and International Law and Relations, although topics relating more generally to American or European governmental institutions and political problems may also be selected.

The attention of students desiring to do graduate work in the various fields of public law is directed to the opportunities open to them in the Law School. The courses in that School in Administrative Law, Constitutional Law, International Law, Jurisprudence, Labor Law, Municipal Corporations, Public Service and Carriers, and Competition and Combination, may be elected by graduate students with the consent of the professors in charge. (See Announcement of the Law School.) The members of the faculty of the Law School are willing to cooperate in directing the researches of students in their several fields, and to serve as members of the special committees of such students.

For Graduates and Undergraduates

POLITICAL PHILOSOPHY AND SCIENCE. Professor CATLIN.

INTRODUCTION TO INTERNATIONAL LAW. Assistant Professor BRIGGS.

DEVELOPMENT OF INTERNATIONAL ORGANIZATION. Assistant Professor BRIGGS.

POLITICAL INSTITUTIONS. Professor CATLIN.

CONSTITUTIONAL LAW: THE AMERICAN FEDERAL SYSTEM. Professor CUSHMAN.

CONSTITUTIONAL LAW: FUNDAMENTAL RIGHTS AND IMMUNITIES. Professor CUSHMAN.

SOCIAL AND POLITICAL ETHICS, AND THE PHILOSOPHICAL THEORY OF THE STATE. (See *PHILOSOPHY*.)

THE STATE IN RELATION TO LABOR. (See *ECONOMICS*.)

PUBLIC REVENUES. (See *ECONOMICS*.)

Primarily for Graduates

SEMINARY IN CONSTITUTIONAL PROBLEMS. Professor CUSHMAN. Throughout the year. Problems of current interest in American Constitutional Law will be selected for individual research. Students will be admitted upon consultation with the instructor.

SEMINARY IN INTERNATIONAL LAW AND INTERNATIONAL ORGANIZATION. Assistant Professor BRIGGS. Throughout the year. Students will be admitted upon consultation with the instructor.

SEMINARY IN POLITICS. Professor CATLIN. Second term. Discussion of papers on problems of contemporary political theory and practice.

*ECONOMICS

Professors W. F. WILLCOX, DONALD ENGLISH, H. L. REED, S. H. SLICHTER, M. A. COPELAND, P. T. HOMAN, P. M. O'LEARY, and J. L. WOODWARD.

A student in economics should have as a preparation for graduate study at least the equivalent of elementary courses in economics, economic history, politics, and social science. If he has not this preparation, he should take such elementary courses as early as possible; he will not ordinarily be allowed to present this preliminary work as partial fulfillment of the requirement for a major or minor in any branch of economics.

The work in economics in the President White School of History and Political Science falls into four divisions: economic theory, finance, social science and statistics, and labor. These divisions aim to bring their work into close relationship with social, political, and business life. The members of the Faculty seek to keep in touch with the practical as well as with the purely scientific aspects of the problems treated, and have among their interests the preparation of students for positions in business and in public service.

Three fellowships are awarded annually to graduate students in economics and government. The President White Fellowship in Political and Social Science has a stipend of \$500 and each of the other fellowships has a stipend of \$400. In addition there are several assistantships, each yielding \$250, which are open to graduate students.

For Graduates and Undergraduates

- ECONOMIC THEORY. Professor HOMAN. First term. T Th S 10.
 WEALTH AND INCOME. Professor COPELAND. Second term. T Th S 10.
 POPULATION STATISTICS. Professor WILLCOX. First term. M W F 11.
 ECONOMIC STATISTICS. Professor WILLCOX. Second term. M W F 11.
 AMERICAN RACIAL PROBLEMS. Professor WILLCOX. Second term. T 2-4.
 HISTORY AND STATISTICS OF INTERNATIONAL MIGRATIONS. Professor WILLCOX. First term. T 2-4.
 ACCOUNTING. Professor ENGLISH. Throughout the year. M W F 8.
 ACCOUNTING THEORY AND PROBLEMS. Professor ENGLISH. Second term. M W F 9.
 MONEY AND BANKING. Professor REED. Either term. M W F 10.
 THE FEDERAL RESERVE SYSTEM. Professor REED. Second term. M W F 11.
 TRADE FLUCTUATIONS. Professor REED. First term. M W F 11.
 CORPORATION FINANCE. Professor ENGLISH and Assistant Professor O'LEARY. First term. M W F 9.
 [TRADE UNIONISM IN THE UNITED STATES. Professor SLICHTER. Not given 1929-30.]
 [THE STATE IN RELATION TO LABOR. Professor SLICHTER. Not given 1929-30.]
 [UNION SHOP RULES AND POLICIES. Professor SLICHTER. Not given 1929-30.]
 TRANSPORTATION AND COMMUNICATION. Assistant Professor COPELAND. First term. T Th S 9.
 INDUSTRIAL COMBINATIONS. Professor HOMAN. Second term. T Th S 9.
 FINANCIAL HISTORY OF THE UNITED STATES. Professor HOMAN. Second term. T Th S 10.
 THE RISE OF MODERN CAPITALISM. Professor HOMAN. First term. T Th S 11.

Primarily for Graduates

- THE PRICE SYSTEM. First term. Professor COPELAND.
 A tentative effort to treat economic value theory from an institutional standpoint, employing methods drawn from physical and biological science, including statistical technique.
 [SYSTEMATIC ECONOMIC THEORY. Professor COPELAND. Not given 1929-30.]
 [HISTORY OF ECONOMIC THOUGHT. Professor HOMAN. Not given 1929-30.]
 CONTEMPORARY ECONOMIC THOUGHT. Professor HOMAN.
 An analysis of recent types of economic theory.
 HUMAN NATURE AND THE SOCIAL ORDER. First term. Professor COPELAND.
 Theories of social psychology and of the relations between individual human nature and our present social and economic system.

SOCIAL THEORY. Second term. Professor COPELAND.

Theories of the evolution of human institutions and of social structure and process.

MONEY AND CREDIT. Throughout the year. Professor REED.

A discussion of some of the more intricate phases of monetary and banking theory.

[INDUSTRIAL GOVERNMENT. Professor SLICHTER. Not given 1929-30.]

[PROBLEMS IN INDUSTRIAL RELATIONS. Professor SLICHTER. Not given 1929-30.]

SEMINARY IN ECONOMICS. Required of all students registered for a major or minor in economics.

RURAL ECONOMY, FARM MANAGEMENT, AND MARKETING

Professors G. F. WARREN, G. N. LAUMAN, J. E. BOYLE, G. P. SCOVILLE, E. G. MISNER, W. I. MYERS, F. A. PEARSON, M. L. HOLMES, LELAND SPENCER, H. A. ROSS, V. B. HART, F. F. HILL, M. P. RASMUSSEN, M. S. KENDRICK, J. F. HARRIOTT, M. C. BOND, and L. M. VAUGHAN.

For graduate work in the various fields here represented, a knowledge of practical agriculture, scientific agriculture, and economics is usually required. For the Doctor's degree in these fields, a minor in economics is usually required.

All courses except those in accounting are primarily for graduates or for graduates and advanced students in the undergraduate courses.

*HISTORY OF AGRICULTURE

Professor LAUMAN.

HISTORY OF AGRICULTURE. First term. M W F 11.

HISTORY OF AGRICULTURE IN THE UNITED STATES. Second term. M W F 11.

AGRICULTURAL HISTORY SEMINAR. First and second terms. Th 2:30.

*RURAL ECONOMY

Professors LAUMAN, BOYLE, WARREN, and KENDRICK.

AGRICULTURAL ECONOMICS, GENERAL COURSE. Professor BOYLE. Second term. M W F 8.

RURAL ECONOMY, ELEMENTARY COURSE. Professor LAUMAN. First term. M W F 9.

RURAL ECONOMY, ADVANCED COURSE. Professor LAUMAN. Second term. M W F 9.

RURAL ECONOMY SEMINAR. Professor LAUMAN. First and second terms. T 2:30.

PUBLIC PROBLEMS OF AGRICULTURE. Professor WARREN. Second term. M W 12.

TAXATION. Assistant Professor KENDRICK. Second term. M W F 11.

*FARM MANAGEMENT

Professors WARREN, MYERS, MISNER, SCOVILLE, HARRIOTT, and other members of the staff.

FARM RECORDS AND ACCOUNTS. Assistant Professor HARRIOTT. First term. T Th 8, and M or T 1:40-4.

FARM MANAGEMENT. Professor MYERS. Second term. M W F 10 and Th or F 1:40-4.

BUSINESS ORGANIZATION AND MANAGEMENT OF SUCCESSFUL NEW YORK FARMS. Professor MYERS. First term. F 1:40-4 and S 8-1.

ADVANCED FARM MANAGEMENT. Professor MISNER. Second term. T Th 11-1.

THE APPRAISAL OF FARM LAND. Professor WARREN. First term. W 1:40-4.

RESEARCH METHODS IN FARM MANAGEMENT. Professor WARREN. First term. W 12.

SEMINAR. Professors WARREN, BOYLE, MYERS, MISNER, SCOVILLE, PEARSON, HOLMES, SPENCER, ROSS, HART, and HILL; and Assistant Professors RASMUSSEN, KENDRICK, HARRIOTT, BOND, and VAUGHAN.

*MARKETING

Professors MYERS, BOYLE, HOLMES, SPENCER, ROSS, and RASMUSSEN.

ACCOUNTING. Professor HOLMES. First term. T Th 9 and T or Th 1:40-4.

ACCOUNTING. Professor HOLMES. Second term. T Th 9 and T or Th 1:40-4.

BUSINESS ORGANIZATION AND MANAGEMENT. Professor HOLMES. First term. M W F 10.

SALES MANAGEMENT. Professor HOLMES. Second term. M W F 9.

COOPERATIVE MARKETING. Professor MYERS. First term. T Th 11 and Th 1:40-4.

COLLECTIVE BARGAINING. Professor BOYLE. Second term. T Th 8.

MARKETING. Professor BOYLE. First term. M W F 8.

MARKETING (FRUITS AND VEGETABLES). Assistant Professor RASMUSSEN. First term. M W 9 and W 1:40-4.

MARKETING (DAIRY PRODUCTS). Professor ROSS. Second term. T Th 10 and T 1:40-4.

AGRICULTURAL BUSINESS. (By non-resident Lecturers.) First term. F 11-1.

BUSINESS LAW. Mr. TREMAN. First term. M W 11.

ORGANIZED EXCHANGES AND SPECULATION. Professor BOYLE. First term. T Th 8.

*AGRICULTURAL PRICES AND STATISTICS

Professor PEARSON.

AGRICULTURAL STATISTICS. First term. M 8 and M 1:40-4.

AGRICULTURAL STATISTICS. Advanced course. Second term. M 8 and M 1:40-4.

AGRICULTURAL PRICES. Second term. T Th 8 and W 1:40-4.

*ECONOMICS OF THE HOUSEHOLD

Professors VAN RENSSLAER and ELISABETH V. LACEY.

For graduate work in the economic problems relating to the household, a knowledge of general economics is a prerequisite. For the Doctor's degree in this field a minor in economics is required.

DISTRIBUTION OF FAMILY INCOME AND EXPENDITURE IN THE UNITED STATES. Open to seniors and to graduate students. A survey of the source and the division of income of the people of the United States and of standards of living and their more general economic implications. Assistant Professor LACEY.

SEMINAR IN THE ECONOMIC PROBLEMS OF THE CONSUMER. Open to graduate students and especially qualified seniors. Readings and original investigation. Assistant Professor LACEY.

RESEARCH IN THE ECONOMIC PROBLEMS OF THE HOUSEHOLD. Professor VAN RENSSLAER.

*TEXTILES AND CLOTHING, AND HOUSEHOLD ART

Professors BEULAH BLACKMORE, MURIEL BRASIE, and D. W. ERWAY.

Graduate work for the Master's degree is offered in textiles and clothing and household art.

For graduate study in these departments a general knowledge of the field of textiles and clothing and household art is prerequisite. Students majoring in clothing and textiles must minor in household art. Before registering for graduate work in these departments, consent of the department must be obtained.

HOUSEHOLD TEXTILES. Professor BLACKMORE.

PROBLEMS IN COSTUME DESIGN. Assistant Professor BRASIE.

DESIGN. Assistant Professor ERWAY.

SPECIAL PROBLEMS IN DESIGN, TEXTILES, AND COSTUME DESIGN. Professor BLACKMORE and Assistant Professors BRASIE and ERWAY.

***HOTEL ADMINISTRATION**

Professors H. B. MEEK, F. H. RANDOLPH, R. S. UHRBROCK, and *Messrs.* LOUIS TOTH and JOHN COURTNEY.

Through its contacts with the American Hotel Association and its subsidiary associations and with member hotels the University has possession of and access to a wide range of research material.

Graduate work for the Master's degree is offered in Hotel Administration.

A foundation knowledge of hotel management is required of graduate students majoring in this field. Such students will choose a minor in a related or underlying field such as accounting, statistics, engineering, or one of the social sciences. Students majoring in the latter fields may find in the problems of the hotel industry a fertile field for research.

FOOD CONTROL AND COST ACCOUNTING. First term. T 2-5. Mr. COURTNEY.

HOTEL ACCOUNTING PROBLEMS. Second term. Th 2-5. Mr. TOTH.

INTERPRETATION OF HOTEL FINANCIAL STATEMENTS. Second term. Th 2-5. Mr. TOTH.

SPECIAL HOTEL PROBLEM. Hours to be arranged. Professor MEEK.

PSYCHOLOGY FOR STUDENTS OF HOTEL ADMINISTRATION. First term. M W F 8. Assistant Professor UHRBROCK.

PERSONNEL MANAGEMENT IN HOTELS. Second term. M W F 8. Assistant Professor UHRBROCK.

HOTEL AUXILIARY EQUIPMENT. First term. M W F 11. Laboratory hours to be arranged. Professor RANDOLPH.

HOTEL ENGINEERING PROBLEMS. Hours to be arranged. Professor RANDOLPH.

***RURAL SOCIAL ORGANIZATION**

Professors DWIGHT SANDERSON, BRUCE L. MELVIN, and ROBERT W. NAFE.

Graduate students who desire to register in Rural Social Organization as a major subject should have had a considerable personal experience with rural life and rural institutions, and a general knowledge of sociology, psychology, and economics. Elementary courses in general sociology, rural sociology, and economics are prerequisite to graduate courses.

THE FAMILY. Professor SANDERSON.

THE RURAL COMMUNITY. Professor SANDERSON.

RURAL COMMUNITY ORGANIZATION. Professor SANDERSON.

THE SOCIAL PSYCHOLOGY OF RURAL LIFE. Assistant Professor NAFE.

RURAL LEADERSHIP. Assistant Professor NAFE.

SOCIOLOGICAL THEORY. Professor SANDERSON.

THE VILLAGE. Acting Professor MELVIN.

SEMINAR. STRUCTURE AND CLASSIFICATION OF DIFFERENT TYPES OF SOCIAL GROUPS. Professor SANDERSON.

SEMINAR. ADVANCED RURAL SOCIOLOGY. Acting Professor MELVIN.

***LAW**

Professors C. K. BURDICK, L. P. WILSON, R. S. STEVENS, G. J. THOMPSON, H. E. WHITESIDE, H. W. EDGERTON, H. D. LAUBE, W. H. FARNHAM, and H. E. VERRALL.

Group H: C. K. BURDICK, L. P. WILSON, R. S. STEVENS, G. J. THOMPSON, H. E. WHITESIDE, H. W. EDGERTON, H. D. LAUBE, W. H. FARNHAM, H. E. VERRALL, CARL BECKER, FRANK THILLY, DONALD ENGLISH, and R. E. CUSHMAN.

Graduate work in Law is organized under the general direction of the Faculty of the Graduate School. Within that Faculty a Law Group (Group H) has been

set up, consisting of the members of the Faculty of the Law School and the Chairmen of the Departments of History, Philosophy, Economics, and Government, in which group is vested authority to establish and administer rules for admission and graduation of candidates for graduate degrees in Law.

Work for the Master's degree is intended primarily for those in practice or intending to enter practice, who desire to increase their knowledge of the law by intensive work in special fields. Work leading to the Doctor's degree is planned to train legal scholars, and to stimulate original investigation which shall constitute a contribution to the scientific study of law, and to the solution of problems in the fields of administration of the law, and of law reform. It is desirable that candidates for the Doctor's degree shall have had some practical or teaching experience after obtaining a first degree in law.

It is considered especially advantageous that graduate work in law is organized under the general direction of the Faculty of the Graduate School. This method of organization enriches the opportunities for graduate students in law by enabling them to correlate with their work in law work in allied fields in other departments of the University, such as those in philosophy, history, government, business and finance.

A limited number of offices will be available in the law building for assignment to graduate students.

The Library of the Law School contains 65,000 volumes. In reports of the federal courts, and of the several American State jurisdictions, and in English, Scotch, Irish, Canadian, Australian, and English colonial reports, the law library is practically complete to date. The Earl J. Bennett collection of Statute Law, provided for by the gift of Earl J. Bennett, LL.B., 1901, embraces about 4,800 volumes of the session laws of all the States to date, and is of unusual fullness and value. The library also possesses a similarly adequate collection of text books, complete sets of substantially all law periodicals in English, digests, annotations and law encyclopedias, Railroad and Public Service Commission Reports and Bar Association Reports of the various States. Several hundred volumes of the records and briefs of cases in the New York Court of Appeals and accounts of important foreign and domestic trials are also to be found in the library.

The University Library containing over 650,000 volumes (exclusive of the number of volumes in the Law Library) is accessible to law students in the same way as to students in the other colleges.

DIVISION OF EDUCATION

EDUCATION AND RURAL EDUCATION

Professors BAYNE, BINZEL, BUTTERWORTH EATON, FERRISS, FREEMAN, JORDAN, KRUSE, LAISTNER, MOORE, OGDEN, PALMER, SMITH, STEWART, and UHRBROCK, and Dr. BRUCE.

The formation of a University Division of Education at Cornell University was authorized by action of the Trustees on February 6, 1926. The Division has been formed by the affiliation of the Department of Education in the College of Arts and Sciences and the Department of Rural Education in the New York State College of Agriculture. This action did not discontinue the two departments but was designed to provide for a fuller coordination of their efforts than had previously existed. Each department maintains its autonomy and continues to perform such functions as are of primary concern to its college.

The offices of the Division are in Sage College. The Department of Education in the College of Arts and Sciences and the Department of Rural Education in the College of Agriculture have their offices, laboratories, and classrooms in Goldwin Smith Hall and in Caldwell Hall, respectively.

PURPOSES OF THE DIVISION. The University Division of Education provides, through the cooperation of the existing departments, a means for meeting the needs of the University or work in Education. The purposes of the Division are:

1. To offer undergraduates in Cornell University opportunity to obtain the professional preparation commonly required of those desiring to teach in the public schools. To this end a group of introductory courses designed for those who have had no teaching experience is offered.

2. To provide opportunity for advanced study for those who have had teaching experience. Persons engaged in teaching who desire to increase their professional equipment or to prepare themselves for more specialized positions than they are now holding will find courses designed to meet their needs.

3. To furnish opportunity for research and experimentation in educational theory and practice.

4. To satisfy the demand for extension courses on the part of teachers in service.

5. To maintain an adequate placement service for workers in Education.

FACILITIES. The educational museum contains collections illustrating the work done in various school grades, statistical charts, a full assortment of textbooks for American and German schools, including a relatively complete collection of the texts used for industrial training in the German continuation schools, an extensive high school and college exhibit of the raw materials of commerce, a kindergarten and a Montessori exhibit, and other appropriate material.

The educational laboratory has a collection of apparatus for demonstration and of instruments of precision for research in connection with school hygiene, the experimental study of school children (with special reference to the conduct of physical and mental tests), and the psychological phases of education in general. This equipment is constantly being enlarged and apparatus needed for special investigations is at once procured.

REQUIREMENTS. All graduate study in education presupposes a certain degree of familiarity with the field of education. This requirement may be met by the ordinary undergraduate requirements for certification as obtained in most states or by three or more years of teaching experience if the candidate gives evidence of having been a student of educational literature during that period. Candidates for advanced degrees whose preparation is inadequate with respect to these requirements must make up this deficiency by taking appropriate courses. In advance of registration prospective students should take up either by correspondence or by personal interview with some member of the Division the requirements they will be expected to meet.

COURSES OF INSTRUCTION. In the statement of courses given below the term "Education I," "Education 6," etc., given in parenthesis following the name of the course, indicates that the course is offered by the Department of Education. "Rural Education III," "Rural Education 114," etc., means that the course is offered by the Department of Rural Education.

All courses offered by the Department of Education require Psychology I as a prerequisite. In the Department of Rural Education courses numbered under 100 are intended primarily for underclassmen; those from 101 to 200 are primarily for upperclassmen and graduate students; while those numbered 201 and over are primarily for graduate students. It should be noted that courses carrying the same name are not necessarily equivalents. All courses offered by the Division are listed below. The undergraduate courses are included as suggestive to graduate students, who do not have all the requirements for graduate study, of the nature of the work that may be expected of them in meeting deficiencies.

GENERAL COURSES

SEMINARY IN EDUCATION (Education 20). First term. Professor OGDEN.
SEMINARY IN EDUCATION (Education 21). Second term. Professor JORDAN.

*PSYCHOLOGY

EDUCATIONAL PSYCHOLOGY (Education 1). Either term. Professors OGDEN and FREEMAN, and Dr. BRUCE.

PSYCHOLOGY FOR STUDENTS OF EDUCATION (Rural Education 111). Either term. Professors KRUSE and BAYNE, and Dr. WINSOR.

PSYCHOLOGY FOR STUDENTS OF HOTEL ADMINISTRATION (Rural Education 114). Second term. Professor UHRBROCK.

PSYCHOLOGY FOR STUDENTS OF CHILD TRAINING (Rural Education 116). Second term. Professor KRUSE.

PERSONNEL MANAGEMENT (Rural Education 119). Second term. Professor UHRBROCK.

PSYCHOLOGY FOR STUDENTS OF EDUCATION (Rural Education 211a). First term. Professor KRUSE.

[PSYCHOLOGY FOR STUDENTS OF EDUCATION (Rural Education 211b). Second term. Professor KRUSE.] Not offered in 1929-30.

[PSYCHOLOGY OF LEARNING (Rural Education 212). Second term. Professor KRUSE.] Not offered in 1929-30.

SEMINARY IN EDUCATIONAL PSYCHOLOGY (Rural Education 218). Second term. Professor KRUSE.

EXPERIMENTAL EDUCATION (Education 6). Second term. Professor FREEMAN.

MENTAL DEVELOPMENT (Education 17). First term. Professor OGDEN.

EXPERIMENTAL INVESTIGATION (Education 8). Either term. Professors OGDEN and FREEMAN.

READING OF GERMAN EDUCATIONAL PSYCHOLOGY (Education 9). First term. Professor OGDEN.

*EDUCATIONAL METHOD

METHOD AND PROCEDURE IN SECONDARY SCHOOL TEACHING (Rural Education 121). First term. Professor FERRISS.

METHOD AND PROCEDURE IN HIGH SCHOOL TEACHING (Education 4). First term. Professor JORDAN.

OBSERVATION AND PRACTICE IN HIGH SCHOOL METHOD (Education 4a). First term. Professor JORDAN and Dr. BRUCE.

PRACTICE IN HIGH SCHOOL METHOD (Education 4b). Second term. Professor JORDAN and Dr. BRUCE.

THE TEACHING OF SCIENCE IN THE SECONDARY SCHOOL (Rural Education 126). Second term. Professor PALMER.

THE TEACHING OF AGRICULTURE IN THE SECONDARY SCHOOL (Rural Education 131). Both terms. Professor STEWART.

DIRECTED TEACHING OF AGRICULTURE IN THE SECONDARY SCHOOL (Rural Education 133). Either term. Professor STEWART.

THE TEACHING OF HOME ECONOMICS IN THE SECONDARY SCHOOL (Rural Education 135). Second term. Professor BINZEL.

DIRECTED TEACHING IN HOME ECONOMICS (Rural Education 136). Either term. Professor BINZEL.

[PRINCIPLES OF METHOD (Rural Education 222). Second term. Professor STEWART.] Not offered in 1929-30.

THE TEACHING OF ELEMENTARY SCHOOL SUBJECTS (Rural Education 223). First term. Professor MOORE.

RESEARCH IN SCIENCE TEACHING (Rural Education 226). Either term. Professor PALMER.

SEMINARY IN ELEMENTARY EDUCATION (Rural Education 227). Second term. Professor MOORE.

SEMINARY IN SCIENTIFIC METHOD IN EDUCATION (Rural Education 234). First term. Professor BUTTERWORTH.

PROBLEMS OF EXTENSION TEACHING (Rural Education 239). First term. Professor EATON.

SEMINARY IN PROBLEMS OF EXTENSION WORK (Rural Education 240). Second term. Professor EATON.

*PREPARATION OF TEACHERS FOR NORMAL SCHOOLS AND COLLEGES

THE PREPARATION OF TEACHERS FOR NORMAL SCHOOLS AND COLLEGES (Rural Education 241). Second term. Professor BUTTERWORTH.

RESIDENT INSTRUCTION IN LAND-GRANT COLLEGES OF AGRICULTURE AND HOME ECONOMICS (Rural Education 243). Second term. Professor EATON.

COLLEGE TEACHING IN HOME ECONOMICS (Rural Education 244). Throughout the year. Professor EATON.

COLLEGE PREPARATION OF TEACHERS OF AGRICULTURE FOR SECONDARY SCHOOLS (Rural Education 245). Second term. Professor STEWART.

THE PREPARATION OF TEACHER TRAINERS IN HOME ECONOMICS (Rural Education 248). First term. Professor BINZEL.

SEMINARY IN AGRICULTURAL EDUCATION (Rural Education 250). Second term. Professor EATON.

*EDUCATIONAL MEASUREMENT

MENTAL AND EDUCATIONAL MEASUREMENT (Education 7). First term. Professor FREEMAN.

MENTAL AND EDUCATIONAL MEASUREMENT (Rural Education 251). Second term. Professor BAYNE.

CONFERENCES ON STATISTICAL METHODS (Rural Education 252). Throughout the year. Professor BAYNE.

[STATISTICS FOR STUDENTS OF EDUCATION (Rural Education 253). First term. Professor BAYNE]. Not offered in 1929-30.

*EDUCATIONAL ADMINISTRATION AND SUPERVISION

PRINCIPLES OF SCHOOL ADMINISTRATION AND SUPERVISION (Rural Education 161). First term. Professor BUTTERWORTH.

CITY SCHOOL ADMINISTRATION AND SUPERVISION (Education 10). Both terms. Professor JORDAN.

THE JUNIOR HIGH SCHOOL (Education 12). Either term. Professor JORDAN.

THE PRINCIPALSHIP OF THE CENTRALIZED AND VILLAGE SCHOOL (Rural Education 175). Second term. Professor FERRISS.

THE ADMINISTRATION OF RURAL SCHOOLS (Rural Education 261). First term. Professor BUTTERWORTH.

SPECIAL PROBLEMS IN SCHOOL ADMINISTRATION (Rural Education 262). Second term. Professor BUTTERWORTH.

PROCEDURES AND TECHNIQUES IN SUPERVISION (Rural Education 263). First term. Professor MOORE.

[SEMINARY IN RURAL SCHOOL ADMINISTRATION (Rural Education 264). Second term. Professor BUTTERWORTH.] Not offered in 1929-30.

ADMINISTRATION AND SUPERVISION OF AGRICULTURAL EDUCATION (Rural Education 267). First term. Professor STEWART.

THE ADMINISTRATION AND SUPERVISION OF HOME ECONOMICS EDUCATION (Rural Education 269). Second term. Professor BINZEL.

PRINCIPLES OF CURRICULUM BUILDING (Rural Education 276). Second term. Professor FERRISS.

SEMINARY IN RURAL SECONDARY EDUCATION (Rural Education 278). Second term. Professor FERRISS.

*HISTORY OF EDUCATION

HISTORY OF EDUCATION (Education 3). Both terms. Professors LAISTNER and SMITH.

HISTORY OF AMERICAN EDUCATION (Education 13). Either term. Dr. BRUCE.

READINGS IN THE HISTORY OF EDUCATION (Education 16). Second term. Dr. BRUCE.

*PRINCIPLES OF EDUCATION

PRINCIPLES OF SECONDARY EDUCATION (Education 2). Second term. Professor FREEMAN and Dr. BRUCE.

PRINCIPLES OF EDUCATION (Rural Education 181). Second term. Professor MOORE.

RURAL SECONDARY EDUCATION (Rural Education 281). First term. Professor FERRISS.

THE JUNIOR HIGH SCHOOL AND THE RURAL COMMUNITY (Rural Education 287). Professor FERRISS.

*PHILOSOPHY OF EDUCATION

PHILOSOPHY OF EDUCATION (Rural Education 294). First term. Professor EATON.

PHILOSOPHY OF EDUCATION (Education 5). Second term. Professor OGDEN.

*NATURE STUDY

NATURE STUDY (Rural Education 7). Second term. Professor PALMER.

NATURE LITERATURE (Rural Education 102). First term. Professor PALMER.

[THE NATURE STUDY MOVEMENT AND ITS MAKERS (Rural Education 109). First term. Professor PALMER.] Not offered in 1929-30.

*CHILD GUIDANCE

Professor ETHEL B. WARING.

The laboratory for graduate work in Child Guidance is situated in a separate building which was at one time a large residence and which is located in The Circle near the Home Economics building. One floor of the building is used for a nursery school. Child Guidance library, offices and laboratories, as well as the play, rest and work rooms are located in this building with complete nursery school equipment to direct the all-round development of 16 pre-school children, ranging in age from 2½ to 3½ years.

For graduate work in Child Guidance the following are prerequisites: Psychology for students of Child Guidance, undergraduate courses in Child Guidance, or their equivalent, and experience with children either as a teacher, social case worker, nurse, probation officer, or parent.

Graduate work is offered in Child Guidance for the Master's degree. The work may be arranged to allow the major or minor to be taken with the Department of Child Guidance, Foods and Nutrition, Educational Psychology, or Rural Social Organization. The opportunity in Child Guidance involves class work, seminar, and individual research problem.

PHILOSOPHY AND PSYCHOLOGY

The subjects of Philosophy and Psychology are grouped in the Susan Linn Sage School of Philosophy. This School owes its existence to the generosity of the late Henry W. Sage, who, in addition to endowing the Susan Linn Sage Philosophical Professorship, made a further gift of \$200,000 for the purpose of providing permanently at Cornell University for philosophical instruction and investigation of the most varied kind and of the highest order. The endowments of the School of Philosophy enable it to secure whatever material facilities are required for the successful prosecution of philosophical studies and research. The more important philosophical and psychological journals, American and foreign, are received by the Library, which is also well equipped with philosophical and psychological works, and is particularly rich in literature relating to Plato, Spinoza, and Kant.

The larger part of the work of the Sage School is adapted to the needs of graduates of this and other institutions, who are preparing themselves to be teachers or investigators in philosophy and in allied fields of study. A student who has made a special study of philosophy during his junior and senior years may still take a graduate course of three years' work with history of philosophy, logic and metaphysics, ethics, or psychology, as his major subject. For the encouragement of higher studies and research in every branch represented by the School of Philosophy, there have been established three fellowships of the annual value of \$400 each, and six scholarships of the annual value of \$200 each. Holders of fellowships and graduate scholarships are also exempt from the payment of tuition. Of these, one fellowship and one scholarship are regularly assigned to psychology. Applicants for fellowships and scholarships should therefore state definitely whether their major subject will be in one of the several branches of philosophy or in psychology.

The School is devoted to the free and unhampered investigation of truth in regard to all those questions of human inquiry which are embraced by logic, metaphysics, psychology, ethics, aesthetics, and the history and philosophy of religion. In the courses of instruction are represented the chief branches and problems of philosophy. Work devoted to the thesis for the doctorate is intended to secure the maximum of specialized training and the power of independent inquiry and statement of results. In all divisions of philosophy particular stress is laid upon the historical study of philosophical ideas as the best means of securing a comprehensive grasp of fundamental problems and values.

*PHILOSOPHY

Professors FRANK THILLY, Philosophy; W. A. HAMMOND, Philosophy; G. WATTS CUNNINGHAM, Philosophy; A. G. WIDGERY, Philosophy; HAROLD R. SMART, Philosophy; *Doctor* E. T. PAINE, Philosophy; *Mr.* RICHARD ROBINSON, Philosophy.

The philosophical seminary room in the University Library is provided with complete sets of the leading philosophical journals, lexicons, and other books of reference, and the more important works in the several branches of philosophy and psychology. The current numbers of the philosophical journals are also to be found in the room. Liberal provision is made for the constant growth of this special library.

The Philosophical Review, established by the University, is a bi-monthly journal devoted to the interests of philosophy, embracing under that title logic, metaphysics, ethics, psychology, aesthetics, and philosophy of religion. Although supported by private endowment, it is not the organ of any institution or of any philosophical school, but by the terms of the subsidy is an absolutely free organ of contemporary philosophy.

Under the title of *Cornell Studies in Philosophy*, a series of monograph studies is published from time to time as representative of the work done by graduate students in philosophy. These monographs are issued under the editorial supervision of the professors of philosophy, and consist mainly of studies undertaken originally as dissertations for the doctorate. The series furnishes also a channel for the publication of research other than that of the thesis. Seventeen monographs have been issued in the series.

A full description of the courses given by the Sage School of Philosophy will be found in the Announcement of the College of Arts and Sciences. While any of these courses may be utilized by graduates, attendance at lectures is to be regarded only as an aid to the independent development on the part of the student of critical scholarship and methods of investigation.

HISTORY OF PHILOSOPHY. Professor CUNNINGHAM and Assistant Professor SMART. The history of philosophical speculation from its origin among the Greeks to the present time.

SOCIAL AND POLITICAL ETHICS AND THE PHILOSOPHY OF THE STATE. Professor THILLY. A study of political and legal theories and institutions in their relation to ethics.

COMPARATIVE RELIGION. Professor WIDGERY.

PLATO AND ARISTOTLE. Mr. ROBINSON.

THE PHILOSOPHY AND HISTORY OF THE NATURAL SCIENCES. Assistant Professor SMART.

THE ETHICS OF MODERN UTILITARIANISM. Professor THILLY. A critical study of the development of modern English utilitarianism as represented by John Stuart Mill, Herbert Spencer, Henry Sidgwick, and G. E. Moore.

MODERN IDEALISTIC THEORIES OF ETHICS. Professor THILLY. A critical study of Kant's Fundamental Principles of the Metaphysics of Ethics and Critique of Practical Reason, and Hegel's Philosophy of Right.

COMPARATIVE ETHICS. Professor WIDGERY.

THE REPUBLIC OF PLATO. Mr. ROBINSON. Reading of Greek text. This course is intended for students of Greek literature as well as of Greek philosophy.

CONTEMPORARY PHILOSOPHY. Professor CUNNINGHAM.

MODERN FRENCH PHILOSOPHY.

EMPIRICISM AND RATIONALISM. Assistant Professor SMART. Lectures and discussions. The empirical movement as represented by Locke, Berkeley, and Hume, and the rationalistic movement as represented especially by Leibniz.

THE CRITICAL PHILOSOPHY OF KANT. Professor CUNNINGHAM. Lectures and discussions. A study of the *Critique of Pure Reason* and the *Critique of Judgment*, with frequent references to standard commentaries and to more recent interpretations.

EARLY RATIONALISM: SPINOZA AND LEIBNIZ. Assistant Professor SMART. A critical study of early Rationalism with special reference to the divergent tendencies represented by Spinoza and Leibniz.

THE PHILOSOPHY OF HEGEL. Professor CUNNINGHAM.

SEMINARY IN THE THEORY OF KNOWLEDGE.

SEMINARY IN ETHICS. Professor THILLY. Fundamental concepts of Ethics.

SEMINARY IN LOGIC. Assistant Professor SMART.

SEMINARY IN METAPHYSICS. Professor CUNNINGHAM.

SEMINARY IN ANCIENT AND MEDIAEVAL PHILOSOPHY. Professor HAMMOND.

SEMINARY IN AESTHETICS. Professor HAMMOND.

SEMINARY IN THE PHILOSOPHY OF RELIGION. Professor WIDGERY.

*PSYCHOLOGY

Professors M. BENTLEY, H. P. WELD, K. M. DALLENBACH; *Doctors* S. FELDMAN, G. KREEZER, and E. FREEMAN.

The research department possesses a separate laboratory in Morrill Hall with rooms for general and individual research, for apparatus, for the library of periodical literature and for meetings of the seminaries. This laboratory also includes a workshop for the construction and assemblage of apparatus, and it contains the editorial offices of the *American Journal of Psychology* and the *Journal of Experimental Psychology*.

With the exception of the seminaries, graduate study in psychology is generally informal. For the technical training of the student stress is laid upon observational practice, and candidates for advanced degrees are urged to observe in at least three experimental investigations; so far as possible this observational practice is provided in subjects which are remote from the candidate's individual research.

No formal list of prerequisites for graduate study in psychology can be laid down. It is assumed, however, that the candidate for an advanced degree will have had, at the least, a good general course in psychology as well as fundamental training in the laboratory.

The Department of Psychology offers the following courses.

ELEMENTARY PSYCHOLOGY. Professor WELD, Assistant Professor DALLENBACH, Dr. FELDMAN, Dr. KREEZER, Dr. FREEMAN.

GENERAL PSYCHOLOGY: Problems and Points of View. Professor WELD, Dr. FELDMAN, Dr. FREEMAN.

INTRODUCTORY LABORATORY. Dr. FELDMAN, Dr. KREEZER.

ADVANCED LABORATORY. THE PSYCHOPHYSICAL AND CORRELATIONAL METHODS. Assistant Professor DALLENBACH, Dr. KREEZER.

PERCEPTION. Dr. FELDMAN.

READING OF GERMAN PSYCHOLOGY. Dr. FELDMAN.

READING OF FRENCH PSYCHOLOGY. Dr. FELDMAN.

TECHNIQUE OF EXPERIMENTATION. Assistant Professor DALLENBACH.

SOCIAL PSYCHOLOGY. Professor BENTLEY.

PHYSIOLOGICAL PSYCHOLOGY. Assistant Professor DALLENBACH.

LEGAL PSYCHOLOGY. Professor WELD.

HISTORY OF PSYCHOLOGY. Professor BENTLEY.

GRADUATE SEMINARY. Professor BENTLEY.

PSYCHOLOGICAL RESEARCH, HISTORICAL AND EXPERIMENTAL. Professors BENTLEY and WELD, Assistant Professor DALLENBACH.

Graduate courses in ANIMAL BEHAVIOR are offered in the Department of Physiology.

MATHEMATICS

Professors J. I. HUTCHINSON, VIRGIL SNYDER, F. R. SHARPE, ARTHUR RANUM, W. A. HURWITZ, W. B. CARVER, D. C. GILLESPIE, C. F. CRAIG, C. F. ROOS, and F. R. BAMFORTH.

The graduate work provides instruction in the principal branches of mathematics and furnishes preparation and material for independent investigation. Only a portion of the whole field can be covered by the courses given in a single year. The courses are changed, therefore, from year to year in order to meet the needs of students.

In addition to the regular instruction, individual guidance and advice are offered to any student who wishes to follow a particular line of inquiry.

Students who take mathematics as a major subject for an advanced degree must have completed previously the equivalent of the elementary course in analytic geometry and calculus, and further study in at least one more advanced subject, as for example, differential equations, advanced calculus, modern algebra, or projective or advanced analytic geometry.

The Oliver Mathematical Club, composed of teachers and advanced students, meets weekly, and has for its object the systematic presentation by the members of some specified mathematical theory of recent development, and of reports on noteworthy articles in current journals and on results of special reading and investigations.

The equipment consists of a collection of about three hundred surfaces, including the various forms of the cyclides, the Kummer surface, the surface of centers, and minimum surfaces; plaster models illustrating positive, negative, and parabolic curvature, and constant measure of curvature; plaster models illustrating the theory of functions, among them models of simply and multiply connected surfaces, and of several forms of Riemann surfaces, and models representing the real parts of algebraic, exponential, logarithmic, and elliptic functions; wooden and glass models of crystals and polyhedra, wire and thread models of twisted curves and ruled surfaces, and skeleton frames for minimum surfaces.

The library has a large collection of books on pure and applied mathematics, including collected works of mathematicians, complete sets of all the important mathematical journals, transactions and other publications of scientific societies, and doctoral theses from the leading American and European universities.

The following courses are offered. The courses mentioned in brackets will not be given in 1929-30, but are usually given at intervals of two or three years.

*ALGEBRA

THEORY OF EQUATIONS. Second term. Professor SHARPE. Cubic and bi-quadratic equations, invariants and covariants, determinants and eliminants.

[MODERN ALGEBRA. Not given in 1929-30.]
 [THEORY OF NUMBERS. Not given in 1929-30.]
 [THEORY OF GROUPS. Not given in 1929-30.]

*ANALYSIS

ELEMENTARY DIFFERENTIAL EQUATIONS. Given each term. Professor CARVER.

ADVANCED CALCULUS. Professor GILLESPIE. Introduction to advanced work in analysis and applied mathematics.

THEORY OF FUNCTIONS OF A REAL VARIABLE. Professor BAMFORTH. Real number system, series of continuous functions, Lebesgue integrals.

THEORY OF FUNCTIONS OF A COMPLEX VARIABLE. Professor HUTCHINSON. A first course, based on a German text.

FUNCTIONALS AND THEIR APPLICATIONS. Professor ROOS. Linear functionals, functional equations, and applications.

[INFINITE SERIES. Not given in 1929-30.]
 [ELLIPTIC INTEGRALS AND FUNCTIONS. Not given in 1929-30.]
 [CALCULUS OF VARIATIONS. Not given in 1929-30.]
 [INTEGRAL EQUATIONS. Not given in 1929-30.]
 [THEORY OF ENTIRE FUNCTIONS. Not given in 1929-30.]

*GEOMETRY

PROJECTIVE GEOMETRY. Professor CRAIG. Elements of projective geometry, treated synthetically.

ADVANCED ANALYTIC GEOMETRY. Professor SHARPE. Homogeneous coordinates, properties of curves and surfaces.

ALGEBRAIC GEOMETRY. Professor SNYDER. Linear systems of algebraic curves and surfaces, birational transformations and projective mapping.

DIFFERENTIAL GEOMETRY. Professor RANUM. Curves and surfaces studied by means of the calculus.

[GEOMETRY OF HYPERSPACE. Not given in 1929-30.]
 [LINE GEOMETRY. Not given in 1929-30.]
 [NON-EUCLIDEAN GEOMETRY. Not given in 1929-30.]

*APPLIED MATHEMATICS

DIFFERENTIAL EQUATIONS OF MATHEMATICAL PHYSICS. Professor HURWITZ. Derivation, solution, and interpretation of differential equations in problems of physics.

VECTOR ANALYSIS. First term. Professor SHARPE. Algebra and calculus of vectors, with applications; dyadics.

[PROBABILITY AND STATISTICS. Not given in 1929-30.]
 [FOURIER'S SERIES AND POTENTIAL FUNCTIONS. Not given in 1929-30.]
 [PRINCIPLES OF MECHANICS. Not given in 1929-30.]
 [HYDRODYNAMICS AND ELASTICITY. Not given in 1929-30.]

THE ENGINEERING SCIENCES

Graduate work in Engineering will be limited presumably to one field. This may be chosen in any one of the three larger subdivisions or schools of Engineering, i. e., Civil, Mechanical, or Electrical, although further subdivision will always be required. It is, however, always possible to elect work and to pursue research in two or more schools, provided one *field* only is involved, as, for example, in hydro-electric power or in hydro-electric traction.

For better teaching facilities, some duplication exists, both in subject matter and in equipment, and a student should therefore select in such a case the school naturally making the same applications that he himself desires to make. For example, in the School of Mechanical Engineering, hydraulics naturally leads towards, and is developed with a view to, pump design or hydraulic power plants.

In Civil Engineering, on the other hand, hydraulics looks forward to water power installations, to canal and harbor construction, to sewerage and waterworks.

In some cases, as for example in studies on cement or steel specifications, further training in chemistry might be found imperative, though that might involve work in still another school. Such additional study is desirable, sometimes essential for successful pursuit of many kinds of graduate work in Engineering. It is particularly desirable that a thorough knowledge of all fundamental theory be in hand before any attempt is made to carry out its applications into Engineering Design or Construction.

*MECHANICS

In Civil Engineering

Professors S. G. GEORGE, E. W. RETTGER, and E. V. HOWELL.

An extensive departmental library in Lincoln Hall, in addition to the University Library, affords facilities for advanced work in the field of applied mechanics, especially in applications such as occur in structural engineering.

The prerequisite training for graduate work in this subject should cover the fundamental principles and applications in mathematics, physics, materials, mechanics and structural design required for graduation in civil engineering at Cornell University. Many of the advanced treatises are in French or German, and an ability to read technical works in these languages is extremely valuable.

ADVANCED MECHANICS. Linear arches; curved beams; special cases of flexure; problems in the mathematical theory of elasticity; thick hollow cylinders and spheres; plates variously supported; Castigliano's theorem of least work with extensive applications to deflections, beams, arches, and statically indeterminate cases of trusses, beams, frames, and arches.

SPECIAL RESEARCH AND SEMINAR COURSES IN ADVANCED MECHANICS.
TOPICS AND METHODS OF INVESTIGATION, individually arranged.

*MATERIALS OF CONSTRUCTION

Professor H. H. SCOFIELD.

The library of the School of Civil Engineering is well supplied with reference works of various kinds on the subject of structural materials, their properties, specifications, and tests. Especial effort is made to add continually the most recent investigations and researches as the results find their way into print.

The equipment is selected to make all ordinary and many special tests and investigations of the materials of construction. The testing machines range in capacities from 400,000 pounds in tension, compression, and flexure on long span beams, to 1,000 pounds. The tests of toughness, abrasion, and wear may be made upon rock, paving brick, and similar materials. Core drills, diamond saws, lap grinders, and other apparatus for the proper preparation of these test pieces are available.

The cement and concrete laboratories are equipped to make all the standard tests upon cement and the various other ingredients entering into concrete. A specialty is made in the tests and investigations of the finished concrete under various conditions, as to proportion, manufacture, and design.

MATERIALS LABORATORY. Professor SCOFIELD. Open to graduates who lack fundamental laboratory experience.

ENGINEERING RESEARCH IN MATERIALS. Professor SCOFIELD. Special investigations of an advanced nature of the properties of structural units and the materials of construction. Proper investigational methods are insisted on so that the results shall be of the caliber and scope deemed essential for publication.

HYDRAULICS AND HYDRAULIC ENGINEERING

In Civil Engineering

Major work in Experimental Hydraulics, Theoretical Hydraulics, or Hydraulic Engineering may consist in part (subject to the thesis requirement) of advanced courses selected from the subjoined list, or the entire minor work may consist of such courses accompanied by such special work and reports as may be arranged with the faculty members of the special committee.

A candidate for the degree of Master of Civil Engineering (or of Science), or Doctor of Philosophy who desires to take either a major or a minor subject in these fields of study must ordinarily have completed, preliminary to graduate work, courses in Hydraulics, Municipal Sanitation (including sewer design and construction and sewage disposal), and Water Supply, substantially equivalent to these courses as required of all undergraduates in the School of Civil Engineering. If a graduate student lacks one or more of these preliminary courses or considerable portions of any of them, more than the minimum period of residence may be necessary.

Ordinarily for major work in Hydraulic Engineering the thesis requirement of the Graduate School must be satisfied by work involving original designs, estimates, or analyses based on actual engineering data, these to be gathered by the student himself as an essential part of advanced work in this field, and the requirement may not be satisfied by the so-called descriptive type of thesis with only rather vague design based on assumed data.

For major work in Experimental (or Theoretical) Hydraulics the thesis requirement may be satisfied by individual experimental (or theoretical) investigation and a thesis based thereon. The department can usually suggest interesting subjects for investigation on some of the numerous topics of hydraulics on which scientific information is both needed and demanded by the engineering profession. Ordinarily fully half of the student's total time should be devoted to the thesis investigation. The tendency is to underestimate the time required for preliminary work and that necessary for a thorough digestion of results in preparation of the thesis. Consequently the work should be begun, if possible, early in the first term of residence.

*HYDRAULICS

Professor E. W. SCHODER.

The unique situation and construction of the Hydraulic laboratory render practicable investigations requiring a steady gravity water supply for long periods using relatively large flows of water.

Prospective graduate students should bear in mind that only under very rare circumstances can a candidate for the Master's degree, or even the Doctor's degree, hope to carry out an experimental investigation in hydraulics involving large flows of water up to the capacity of the laboratory or involving extensive constructions. The limitations of seasonal availability of water and of weather conditions, as well as of time, labor, and expense, are such that the graduate student in this subject should look forward to investigations of lesser apparent magnitude, but often of greater scope and value.

HYDRAULIC MEASUREMENTS. In addition to more thorough experimental investigations on some of the laboratory topics mentioned under course 241, e. g., weirs, Pitot tubes, pipes and current meters, the work includes fire hose and nozzles, ordinary water meters, floats in open channels, actual measurement of river discharge (on a week-end trip) and such occasional tests as opportunity offers in the laboratory or the immediate neighborhood of Ithaca.

EXPERIMENTAL HYDRAULIC INVESTIGATION. The subject and scope of the investigation should be selected by conference at the beginning of the term if not previously arranged. It is often permissible and desirable for two students to work together on the same investigation. Written reports are required but the text need not be typewritten in thesis style; these reports are kept by the department. In most cases it is necessary to arrange a definite schedule for work in the laboratory to avoid conflicts.

HYDRAULIC ENGINEERINGIn Civil Engineering*

Professor F. J. SEERY.

HYDRAULIC CONSTRUCTION. The course is devoted largely to a study of water storage and the engineering investigations and design of structures associated with stream regulation for public water supplies, water power, irrigation or navigation. Extensive problems are worked out involving the preliminary investigation of a project, exploration of dam sites, surveys of reservoir sites, the economics of storage, manipulation of storage and pondage, the preparation of an estimate of quantities, costs, plan of progress in construction, etc., for a particular project. The stability of weir dams by graphics, and the analytic design of high masonry dams by Wegmann's method, together with a study of all the factors affecting the stability and form of section of a dam, and the methods of construction are fully covered by text and in problems. Earthen dams and embankments, timber weirs, movable dams, and flashboards are also considered.

WATER-POWER ENGINEERING. Recitations from assigned text and the working of lengthy problems. The course is devoted to a general study of the problems of water power development, the factors affecting the economics of a project, the engineering and commercial feasibility of developing power and the value of a mill site. A detailed study of the characteristics of modern turbine types, the selection of mechanical equipment suited to the conditions of installation and operation, the effects of load factors, pondage, storage and steam auxiliary on the capacity and cost; together with an analysis of the power capacity of a low head mill site, the speed regulation of a plant under medium head fed by a long penstock, and a thorough study of the phenomena of unsteady flow and surging, with and without surge tanks, are covered by the text and incorporated into numerical problems taken from existing plants.

In Mechanical Engineering

Professor F. G. SWITZER.

Arrangements can sometimes be made for experimental work in the University hydro-electric plant. This plant contains a reaction turbine built by the I. P. Morris Department of the Wm. Cramp and Sons Ship and Engine Building Co., rated at 550 h.p., 600 r.p.m. at 142 ft. head. There are also four impulse turbines of the Pelton-Doble type, two of which are rated at 280 h.p., 124 r.p.m. at 135 ft. head, and the other two are rated at 50 h.p., 300 r.p.m. at 135 ft. head. The three large machines are directly connected to 60-cycle alternators; the two smaller machines are directly connected to d.c. generators. There is also a separate d.c. generator driven by a synchronous motor and the usual switchboard and control apparatus.

The hydraulic laboratory, under the direction of the Department of Experimental Engineering, is also available for the investigation of turbine and draft tube problems, centrifugal pump performance, measurement of water, etc.

The libraries of the University have a very complete collection of treatises relating to mechanics, hydraulics, hydro-electric engineering, and to similar subjects. In addition, these libraries contain the more representative engineering periodicals and the transactions of the leading engineering societies of the world.

HYDRAULIC POWER PLANTS. Professor SWITZER. A brief survey of the problem of the consulting engineer in water power work. Considerable emphasis is placed upon the financial problems of construction and operation of the water power plant, alone, and as part of a large power system.

HYDRAULIC POWER PLANT PROBLEMS. Professor SWITZER. Applications of the work given in the preceding course to the investigation of problems of a water power plant. Problems will be chosen to meet the needs of each student.

*MACHINE DESIGN

Professors C. D. ALBERT, F. S. ROGERS, C. E. TOWNSEND, E. F. GARNER, and S. J. KOSHKIN.

Under this head is included advanced work in descriptive geometry, kinematics and dynamics, machine design and design methods, and special design problems and investigational work.

There are nine well equipped drawing rooms and a very complete collection of Kinematic models. The Department Library, the Library of the School of Mechanical Engineering, and the University Library have a very complete collection of books on drawing, kinematics, machine design and construction, mechanical technology, structural design, and other books on related subjects.

The department offers the following elective courses suitable for students pursuing graduate work:

GEARING. Assistant Professor GARNER. History and development. Form, strength, and wearing characteristics of gear teeth. Types, proportions, manufacture, and operation of gears.

ADVANCED KINEMATICS AND KINETICS. Assistant Professor KOSHKIN. Graphical and semi-graphical treatment of linear and angular velocities and accelerations and of the resulting forces and stresses due to the form, loads, and masses of the moving parts of mechanisms and machines. Vibration and balancing are treated so far as time permits.

MATERIAL HANDLING. Professor ALBERT and Assistant Professor KOSHKIN. Treatment and analysis of the known methods of handling different kinds of materials and of the principles and considerations governing a proper choice of the method of handling any kind of material in a given situation.

*HIGHWAY ENGINEERING

Professors W. L. CONWELL and J. E. PERRY.

The laboratory for testing rocks, aggregates, and other non-bituminous highway materials is in the basement of Lincoln Hall. It is equipped with a Deval machine, Page impact machine for the toughness test, impact machine for the cementation test, ball mill, core drill, rock saw, grinding lap, Dorry machine, briquette molding machine, rattler for testing paving brick, sieves, etc.

The laboratory for testing bituminous highway materials and subgrade soils is housed in a separate building. This laboratory is equipped with facilities for making the standard tests of specific gravity, consistency, ductility, distillation, evaporation, flash and burning points, fixed carbon, melting point, etc., on bituminous materials and also with apparatus for testing subsoils for volumetric change, moisture equivalent, bearing value, capillarity, water capacity, mechanical analysis, etc.

The other laboratories of the School of Civil Engineering equipped for the purpose of investigating the properties of engineering materials and the Ceramic Laboratory of the Department of Geology, which is equipped with kilns and a brick machine, are also available for students specializing in highway engineering.

The Library of the School of Civil Engineering and the University Library contain a comprehensive collection of books on highway engineering, periodicals, publications of technical societies, while the office of the Department of Highway Engineering has on file city and state specifications and reports, government bulletins and reports, reports on highway engineering research, standard plans and plans of highway projects, and catalogues of equipment, all of which are available to students.

HIGHWAY ENGINEERING. This course will not be accepted as part of a major or minor subject in graduate work.

ADVANCED HIGHWAY ENGINEERING. Study of research data, economics of location, design of highways, contractor's organizations, etc.

HIGHWAY LABORATORY. Standard tests of bituminous and non-bituminous materials, and subgrade soils and tests of paving mixtures.

ADVANCED HIGHWAY LABORATORY. Investigation of special problems in the field of highway research.

HIGHWAY ENGINEERING DESIGN. Design of highways, highway structures, estimates of cost, etc.

HIGHWAY ENGINEERING RESEARCH. Laboratory investigations and collection and analysis of data referring to the field of highway economics.

In the fall of the year trips are made from time to time to investigate the actual condition of roads and various phases of highway work; in the spring numerous field inspections are made of drainage and subsoil conditions; later, when work on highway contracts begins, particular attention is paid to contractor's equipment and organization.

Note. For the larger highway structures, see *STRUCTURAL ENGINEERING*.

*RAILROAD ENGINEERING

Professors F. A. BARNES, J. E. PERRY, and CARL CRANDALL.

The library of the School of Civil Engineering contains an excellent and up-to-date collection of books, periodicals, and publications of railway and other technical societies on the location, construction, maintenance, and operation of railways and on transportation. Specifications, standard plans, and maps and profiles are available for use in the study of economics of location, railway structures, signaling, yard and terminal design, etc. Instrumental equipment is available for securing additional data for special problems in relocation and in design of structures.

The following elective courses supplemented by problems as required, may be taken as part of a major or minor subject by those who may not have covered such work in their undergraduate courses:

LOCATION. Professor BARNES.

MAINTENANCE OF WAY AND STRUCTURES. Assistant Professor PERRY.

OPERATION AND MANAGEMENT. Assistant Professor PERRY.

ENGINEERING DESIGN. Professor Barnes and Assistant Professor CRANDALL.

ENGINEERING RESEARCH. Professor BARNES.

The first two consist of recitations and lectures; the latter two involve individual work on special problems or investigations. The field is so broad that the interest of the student is considered in the assignment of work.

In addition to the above courses, the student may take courses in other departments if time permits; such as courses in transportation in the College of Arts and Sciences, or in the applications of electricity to railway work in the School of Electrical Engineering.

Note. For the larger railway structures, see *STRUCTURAL ENGINEERING*.

*SANITARY ENGINEERING

Professors H. N. OGDEN and C. L. WALKER.

The courses offered to graduate students may be divided into two classes: those dealing with the design, construction, and operation of sewage-disposal plants and water purification plants; and those fundamental studies in chemistry, biology, and bacteriology, which the undergraduate student in civil engineering may not have been able to pursue.

A sewage-disposal plant in the city of Ithaca offers opportunity for experimental study of septic action and of sedimentation. Within a short distance from Ithaca are five other plants, well adapted for critical examinations of efficiencies. Numerous other opportunities are offered for the study of similar questions.

The laboratories in all the related subjects are open to graduate students in sanitary engineering. The courses in organic chemistry are well adapted to the study of the disposal of trade wastes. The courses in mycology and botany afford excellent opportunity for studying the life history of algae and other water plants which affect both stream pollution and purification. The courses in bacteriology deal not only with water bacteria and the colon types but also with pathogenic forms interesting from the point of view of epidemiology. The courses

in the Medical College enable the student to trace the effect of the pollutions of water supply and to acquire a working knowledge of the water-borne diseases. Finally, a well-equipped sanitary laboratory established in the College gives an opportunity for students to acquire not merely laboratory technique in water analysis, but also a practical training in the forms of interpretation. This laboratory is also available for experimental studies of the efficiency of water and sewage plants and of methods of dealing with the refuse from factories. The library is well provided with the literature of the various subjects bearing on municipal sanitation.

The following courses in other subjects in the University may profitably be taken by graduate students in sanitary engineering: Economics 76; Government and Public Law 7; Chemistry 305; Chemistry 615; Botany 12; Entomology 30; Veterinary College, Course 43.

In order to take advanced work in this department, the student must have had an equivalent of the following preliminary courses described in the Announcement of the College of Engineering:

Sanitary Biology; Municipal Engineering; Purification and Control of Water Supplies; Sewage Works; Sanitary Laboratory.

Primarily for Graduates

PURIFICATION OF WATER. Professor OGDEN. Specific problems in water purification; control of watersheds; effect of sedimentation on waters of different compositions; treatment of waters for particular requirements, such as removal of hardness sediment, bacteria, etc. A report on some existing water system will be required from each student.

CONFERENCE ON PRESENT METHODS OF SEWAGE DISPOSAL. Professor OGDEN. A critical study of the construction and operation of plants now in existence. Inspections and reports.

LABORATORY COURSE. Professors OGDEN and WALKER. Devoted to some special problem of sewage or water, such as the operation of a water-filtration plant, a sewage-disposal plant, the purification of trade wastes, the value of disinfection, etc.

*HEAT-POWER ENGINEERING

Professors W. N. BARNARD, F. O. ELLENWOOD, M. C. ERNSBERGER, R. E. CLARK, W. H. HOOK, and C. O. MACKEY.

The graduate work conducted under this heading includes original investigations in engineering thermodynamics, problems in power plant economics, the selection and arrangement of the equipment of power plants and the design of such equipment. The library is liberally provided with reference books, periodical literature, and transactions of engineering societies relating to these subjects.

As prerequisites for the graduate work in this field the student should have had the equivalent of the fundamental courses in machine design, experimental engineering, and heat-power engineering that are required of undergraduates in mechanical engineering. These courses are described in the Announcement of the College of Engineering. Those lacking the full equivalent of this training may be required to take one or more of these undergraduate courses or to do specially assigned work to make up the deficiency.

The following courses, which are described in the Announcement of the College of Engineering, are open to both undergraduate and graduate students:

HEAT-POWER ENGINEERING. Mainly Thermodynamics. Professor ELLENWOOD.

HEAT-POWER ENGINEERING. Chiefly Plant Equipment. Professor ERNSBERGER.

STEAM POWER PLANTS. Professor BARNARD.

INTERNAL COMBUSTION ENGINES. Assistant Professor CLARK.

STEAM TURBINES. Assistant Professor CLARK.

STEAM BOILERS AND BOILER PLANTS. Assistant Professor HOOK.

PUMPING AND PNEUMATIC MACHINERY. Professor ELLENWOOD.

DESIGN AND SPECIAL PROBLEMS IN HEAT-POWER ENGINEERING. Professors BARNARD, ELLENWOOD, and ERNSBERGER.

*STRUCTURAL ENGINEERING

Professors L. C. URQUHART, E. N. BURROWS, and C. E. O'ROURKE.

In this subject instruction is offered in the determination of loading and stresses and the design of roofs, buildings, bridges, arches, foundations, piers, retaining walls, and other structures of timber, steel, and concrete.

A collection of detail plans of American structures is available, together with a large number of photographs of bridges and buildings.

The library contains practically all the important books on bridge and structural engineering. It also contains a valuable collection of theses, those on original investigations relating to arch bridges and secondary stresses being especially noteworthy. These investigations have been conducted so as to form an extended and closely related series. Their results constitute an important addition to previous knowledge of the relative strength, stiffness, and weight of different types of construction and of the method for their investigation and design. Special facilities are available for the study of secondary stresses in bridge trusses.

To qualify for graduate work in structural engineering, a knowledge of theoretical mechanics, of strength of materials, of engineering construction, and elementary courses in stresses and design in timber, steel, and concrete are required.

The following regularly scheduled courses are open only to seniors and graduates but satisfactory work in any of them will not be considered as completing the requirements of a minor, and further study in some related field is expected.

HIGHER STRUCTURES. Professor URQUHART and Assistant Professor O'ROURKE. Statically indeterminate structures, and the theory of two- and three-hinged arches and of continuous beams and bridges. (Required of all graduate students whose major or minor is in Structural Engineering.)

STEEL BUILDINGS. Assistant Professor BURROWS. Design of a typical modern mill building.

BRIDGE DESIGN. Assistant Professor BURROWS. Design of a modern railroad or highway bridge of moderate span.

INVESTIGATION OF EXISTING BRIDGES. Assistant Professor BURROWS. Examination of and stress analysis of some of the local bridges.

FOUNDATIONS. Professor URQUHART and Assistant Professor O'ROURKE. A study of the various types of foundations for bridges and buildings, including pile foundations, caissons, and cofferdams.

REINFORCED CONCRETE DESIGN. Professor URQUHART and Assistant Professor O'ROURKE. Design of retaining walls, footings, bins, tanks, and towers.

REINFORCED CONCRETE BUILDING DESIGN. Professor URQUHART and Assistant Professor O'ROURKE. Design of a modern reinforced concrete building.

REINFORCED CONCRETE ARCH. Professor URQUHART. Design of a railroad or highway reinforced concrete arch bridge.

CONCRETE HIGHWAY BRIDGE DESIGN. Assistant Professor O'ROURKE. Design of short span concrete bridges and abutments.

ENGINEERING DESIGN. Professor URQUHART. Special problems of design or investigation not covered in the above courses.

*EXPERIMENTAL ENGINEERING AND MECHANICAL
ENGINEERING RESEARCH

Professors H. DIEDERICHS, W. M. SAWDON, G. B. UPTON, V. R. GAGE, and A. C. DAVIS.

THE MATERIALS TESTING LABORATORY. This laboratory is equipped for tension and compression tests with an Olsen 300,000,000-lb. machine, a Riehle 100,000-lb. machine, a 200,000,000-lb. Emery hydraulic machine, an Olsen 150,000-lb. three-screw machine, an Amsler 100,000-lb. hydraulic machine, together with several other machines varying in capacity from 10,000 to 100,000 pounds. For transverse test there is a Riehle machine of 200,000 pounds capacity and a Fairbanks machine of 10,000 pounds capacity. There are one Thurston autographic torsion machine, one Olsen torsion machine of 200,000

inch-pounds capacity, and two Upton-Lewis fatigue testing machines, an Amsler-Charpy-Izod impact testing machine. The equipment includes extensometers, a cathetometer, gas furnaces, tempering baths, and all other apparatus required for the determination of the physical qualities of engineering materials under tensile, compressive, transverse, and torsional stress, and under different kinds of heat treatment.

THE STEAM LABORATORY. In this laboratory there is a 150-HP triple expansion Allis-Corliss engine so fitted up that it may be operated as a simple, compound or triple expansion engine, condensing or non-condensing. There are also several smaller engines, including a Russel, a Harris-Corliss, a Payne, a Fitchburg Uni-flow, and a Troy steam engine. There are three surface condensers and one jet condenser which may be connected with these engines as desired. There are two 35-kw, horizontal Curtis turbines and a 15-kw. De Laval turbine which drive electric generators and may be run condensing or non-condensing, and a Lee turbine driving a Gould centrifugal pump. A two-stage Worthington air compressor driven by a Uni-flow engine and one airbrake pump, together with meters, nozzles, and other instruments, may be used for routine tests. This part of the laboratory also has several fans that can be arranged and equipped for testing. The apparatus and instruments used for engine testing comprise about eighty indicators of different types, about seventy-five steam gauges, a number of calorimeters for determination of the quality of steam, speed counters, tachometers, planimeters, etc., besides a number of dynamometers of various kinds. The boiler section of this laboratory has one 150-HP Babcock and Wilcox water-tube boiler of the marine type, one 100-HP Babcock and Wilcox water-tube boiler of the standard type both of which are fitted with internal superheaters, and an 80-HP Heine water-tube boiler. The auxiliary apparatus consists of a Cochrane open heater, a Wainwright closed heater, steam pumps, traps, injectors, etc. A full set of scales, measuring tanks, gauges, flue gas apparatus, separating and throttling calorimeters, pyrometers, etc., complete the boiler equipment.

THE GAS ENGINE LABORATORY. The equipment in this laboratory is chosen with a view to providing a great variety of types as to fuel used, governing, etc. It includes an 8-HP Fairbanks gasoline engine, an 8-HP Olds gasoline engine, a 6-HP Ingeco oil engine, a 6-HP and a 15-HP Hornsby-Akroyd oil engine, a 30-HP Westinghouse gas engine with gas producer, a 25-kw. General Electric Co. gas motor set, and a 45-HP Diesel engine. High speed engines are represented by a variety of auto and airplane engines. The testing equipment includes a full set of indicators and a Midgley indicator. Dynamometers are represented by a 150-HP Sprague Electric, a 60-HP Diehl Electric, and two Wheeler hydraulic good for 100-HP at 4000 r.p.m.

THE HYDRAULIC LABORATORY. This laboratory contains the following machines and apparatus: a 6-inch single-stage De Laval centrifugal pump; a 2½-inch two-stage Worthington centrifugal pump; a 16-inch Goulds centrifugal pump direct connected to a variable speed motor; a 12-inch Doble water wheel; a 15-inch S. Morgan Smith turbine with Lombard governor; sets of weir boxes with various types of weirs and nozzles for the determination of coefficients of discharge; various types of water meters and other apparatus for measuring the flow of water, such as Pitot tubes, Venturi meters, current meters, etc.

THE OIL TESTING LABORATORY. This laboratory contains a Cornell oil-testing machine, and a Thurston standard railway-testing machine, and several smaller testing machines. The rest of the equipment consists of several viscosimeters of different types, flash and burning test apparatus, together with the necessary hydrometers and thermometers.

THE REFRIGERATION LABORATORY. For the study of refrigeration the mechanical laboratory possesses a 2-ton York absorption machine and a very complete York refrigerating compression plant having a capacity of 15 tons of ice.

THE CEMENT LABORATORY. This laboratory not only contains the ordinary apparatus for the testing of cement and concrete, but in addition is equipped with crushing and grinding machinery and a small vertical kiln for making investigations on the manufacture of cement from raw material.

THE FUEL TESTING LABORATORY. This laboratory contains a complete equipment of fuel calorimeters and other apparatus needed for the determination of the composition and calorific value of fuel, whether gaseous, liquid, or solid.

For the major work in this department the graduate student is required to select a subject in the field of mechanical engineering research. This work is in charge of officers of instruction who devote practically their entire time to it and give advice and assistance to graduate students who are carrying on investigations in the various branches of mechanical engineering. Much of the work in this subject is conducted in the several laboratories described under Experimental Engineering. The equipment and resources of all other departments of the Sibley School are likewise available, and in most instances arrangements can be made to use the equipment of the scientific and engineering departments of the other colleges of the University.

In addition to the well-equipped Sibley library containing reference books, periodical literature, bulletins and transactions of bureaus and societies, relating to mechanical engineering and allied branches of learning, the graduate student has access to the University Library and to the special libraries of the other engineering and scientific departments of the University. In the University Library is a large collection of research theses, and the Department of Engineering Research has on file the results of many investigations.

As minor subjects the department offers the following courses open to both graduate and undergraduate students:

MECHANICAL LABORATORY—EXPERIMENTAL ENGINEERING. First term. Efficiency tests of gas and gasoline engines, steam injectors, steam turbine, blowing fan, hydraulic turbine, and centrifugal pump. Reports are required to be full and complete; and to include data and results of each test under consideration, and all information necessary to understand completely the machine tested and the methods used.

MECHANICAL LABORATORY—EXPERIMENTAL ENGINEERING. Second term. A written report is required on each experiment. Detailed study of methods of testing and methods of computation in the following subjects: testing of engines and boilers, air compressors, ice machines; measurement of flow of water, etc.

MOTOR CAR CONSTRUCTION. Professor UPTON.

HEATING AND VENTILATING. Professor SAWDON. The methods of design and of construction of various forms of ventilating and heating apparatus.

APPLIED METALLOGRAPHY. Professor UPTON. Covers in historical sequence the development of knowledge of the internal structure of metals, and the relation of structure and properties; the technique of metallographic research, study of application of the laws of physical chemistry to interpretation and correlation of results. Study of stable and metastable conditions; heat treatment theory and practice. The practical aim of metallography is constantly emphasized.

*ELECTRICAL ENGINEERING

Professors P. M. LINCOLN (Absent on leave, 1929-30), V. KARAPETOFF, W. C. BALLARD, R. F. CHAMBERLAIN, G. F. BASON, E. M. STRONG, and L. A. BURCKMYER.

THE LECTURE EQUIPMENT. The lecture room is exceptionally well provided with display apparatus and with apparatus especially designed for demonstration purposes. All types of electrical machinery may be operated on the lecture table, and a 60,000-volt transformer is provided for insulator testing.

A HIGH-TENSION LABORATORY is being equipped, with particular reference to the needs of graduate students, the equipment being designed for moderate voltages and accurate measurements.

THE ELECTRICAL LABORATORY. This laboratory is provided with a great variety of standard and special machines for both direct and alternating-current work, along with the necessary meters and control equipment. Among the special pieces of equipment are a street-car truck with motors and also a complete outfit for exhibiting in actual operation the multiple-unit system of electric car control.

The laboratory has been provided with a large number of new machines, including an alternating-current generator which may be connected as a two-phase, three-phase, or six-phase, machine; a modern synchronous converter provided with brush-lifting device; a squirrel-cage and phase-wound induction motor; a sine-wave generating set; also a constant-current transformer and a high voltage testing transformer with a kenotron tube from which 100,000 volts d.c. may be obtained.

THE STANDARDIZING LABORATORY. This laboratory is equipped with the necessary potentiometers, galvanometers and standards for the calibration of instruments, and the testing of materials used in electrical work. An equipment of oscillographs, both G. E. and Westinghouse, is available for work on wave form and other work of a similar nature.

THE COMMUNICATION LABORATORY. This laboratory is provided with representative telegraph and telephone equipment including a complete machine-switching exchange. The radio section includes several transmitters and a number of tube sets operating as telephone and telegraph transmitters. For work with receiving circuits, an assortment of condensers and inductance coils are available in addition to the usual receiving apparatus. Precision measurements are made possible by primary standards of inductance, capacity and frequency.

Special facilities are provided for research in connection with electron tubes; complete equipment for the manufacture and exhaustion of the same, including condensation pumps, is provided.

ALEXANDER GRAY MEMORIAL LIBRARY. The new library of the School of Electrical Engineering in Franklin Hall has recently been made ready for the use of students and Faculty, in addition to the facilities of the main University Library.

THE UNIVERSITY POWER PLANT. The power for the various laboratories is obtained from the University Hydro-electric Plant, which contains large three-phase alternators, direct-driven by both impulse and reaction water-wheels. This plant is complete in every respect and is used for inspection.

A graduate student working for the M.E.E. degree is expected to possess a knowledge of electrical theory and laboratory substantially equivalent to that required for the degree of E.E. at Cornell University. Graduates of other institutions with somewhat lesser preparation can, however, be admitted to the Graduate School for a term or two as "non-candidates," to take some of the fundamental senior courses and to demonstrate their fitness for graduate work.

A considerable amount of advanced theoretical investigations by the members of the faculty is going on at all times, the subjects studied in the past having been: the general properties of electric, magnetic, and electrostatic circuits, theory of machinery and lines, dielectrics, electron theory, relativity, electric waves, etc. Graduate students are not only invited but expected to participate in these researches. Some of the above topics are taken up in the courses mentioned below, especially in the Seminar and in Engineering Mathematics.

Students intending to do experimental research will be given all the available resources and assistance by the faculty and by the college mechanics. Resources of the other departments of the University are also available when needed. Those intending to study a special topic or phenomenon are advised to communicate with the Director in advance, in order that they may know what facilities are available along those particular lines.

THEORY OF ELECTRICAL MACHINERY. Professor KARAPETOFF.

CHARACTERISTICS OF ELECTRICAL MACHINERY. Professor KARAPETOFF.

FUNDAMENTALS OF ELECTRICAL ENGINEERING. Assistant Professor E. M. STRONG.

ELECTRIC POWER PLANTS. Professor LINCOLN.

ELECTRICAL DESIGN. Professor LINCOLN.

ELECTRICAL COMMUNICATION. Professor BALLARD.

ELECTRICAL LABORATORY. Professor CHAMBERLAIN and Assistant Professor BASON.

ELECTRIC RAILWAY PRACTICE. Professor CHAMBERLAIN.

CURRENT ELECTRICAL TOPICS. Assistant Professor BURCKMYER.

ENGINEERING MATHEMATICS. Professor KARAPETOFF.

THE GRADUATE SEMINARY IN ELECTRICAL ENGINEERING. Professors LINCOLN and KARAPETOFF. A topic is selected each year to suit the range of interests and the preparation of the students taking it. The primary purpose is to acquaint the students with modern research on the border line between physics and electrical engineering, in topics which are expected to become of practical importance within the next few years.

*INDUSTRIAL ENGINEERING

Professors D. S. KIMBALL, A. E. WELLS, and M. A. LEE.

Under this heading is included the consideration of the organization, administration, and equipment of industrial enterprises. The library of the college is well supplied with literature relating to the various branches of this field of engineering, and access may be had to the special libraries on economics in the University Library and in the Department of History and Political Science. Attention is directed to the courses in History and Political Science which may be profitably pursued in conjunction with work in industrial engineering.

In order to take the advanced course in this department, the student must not only have had the equivalent of the undergraduate course in mechanical engineering, but must also have taken the courses in industrial engineering and economics required of seniors who elect the special work of this branch.

No regular courses of instruction are offered to graduate students; but the regular courses required of seniors taking the industrial engineering option in the College of Engineering are open to graduate students as courses suitable for their minor subjects. The instructing staff in this department is prepared to direct study and investigation in Industrial Organization, Industrial Management, Plant Design, and Safety Engineering and Fire Protection.

INDUSTRIAL ORGANIZATION AND ADMINISTRATION. Professors KIMBALL, WELLS, and LEE.

DRAWING AND DESIGN. Professor LEE.

*RURAL ENGINEERING

Professors H. W. RILEY, B. B. ROBB, J. C. MCCURDY, F. L. FAIRBANKS, and F. H. RANDOLPH.

Students desiring to undertake graduate work in Rural Engineering should have, first of all, first-hand knowledge of farm life and of rural conditions generally. Adequate grounding in the engineering fundamentals of the phase studied and ability to perceive the applications of these fundamentals are most essential, since the applications of engineering practices to agriculture, though of great economic importance, are usually successful in proportion as they are direct and simple. Whether a student's preparation is adequate for any given line of advanced study can be determined only by special consideration of each case. Country life experience, alertness, originality, and interest are important factors for success. If the technical engineering phases of the proposed work largely predominate over the agricultural, the student should normally major in the appropriate school of the College of Engineering with a minor in Rural Engineering. If economic or pedagogical problems predominate, the major work should normally be taken in the department of Agricultural Economics or of Rural Education.

FARM MECHANICS; FARM POWER MACHINERY; HOUSEHOLD MECHANICS; FARM ENGINEERING; DRAINAGE; FARM CONCRETE; FARM STRUCTURES; FARM SHOP WORK; MECHANICAL DRAWING; MECHANICAL PERSPECTIVE; INSTITUTIONAL ENGINEERING.

FARM POWER MACHINERY. An advanced course in farm tractors, power plows, and tractor plowing, with plenty of actual work with modern equipment. Knowledge of single cylinder engine principles and electric ignition theory and practice is prerequisite.

DRAINAGE. The course offers opportunity for advanced study of drainage methods through the many actual problems to be found on the college farms and in connection with the large amount of extension work in drainage which is being constantly carried on by the extension force. Superior surveying instruments are available. Knowledge of drawing, surveying, soils, and crops is prerequisite.

FARM STRUCTURES. The course offers opportunity for drawing room work on structures in addition to special studies made in connection with the department extension work. Ventilation is of prominent interest and is being investigated by staff members. Knowledge of drawing, engineering principles, animal requirements and barn practices is prerequisite.

RESEARCH IN RURAL ENGINEERING. Professors RILEY, ROBB, McCURDY, FAIRBANKS, and RANDOLPH.

THE PHYSICAL SCIENCES

*ASTRONOMY AND GEODESY

*TOPOGRAPHIC AND GEODETIC ENGINEERING

Professor S. L. BOOTHROYD, Astronomy and Geodesy; Professor P. H. UNDERWOOD, Topographic and Geodetic Engineering.

A graduate student may select a major or minor subject in Astronomy or in Topographic and Geodetic Engineering.

A major in Astronomy will be required to take Modern Astronomy, Geodetic Astronomy and Geodesy and Practical Astronomy. He must offer as preliminary to his graduate study, General Astronomy, Engineering Astronomy and such courses in Mathematics and Physics as will be determined by the nature of the graduate work which he proposes to follow in Astronomy. He is further advised to take his minors in Mathematics or Physics.

Those majoring in Topographic and Geodetic Engineering must offer as preliminary training the regular course in Civil Engineering or its equivalent, electing General Astronomy and Engineering Astronomy in that course. They will be required to take Geodetic Astronomy, Least Squares and Adjustment of Observations and Geodesy as well as advanced courses in Calculus and Mechanics.

A graduate student who desires either Astronomy or Topographic and Geodetic Engineering as a minor subject will be held to substantially the same preliminary requirements as those majoring in these lines except that the requirements in Mathematics or Physics may not be quite so rigid.

For the practical work at the Observatory the equipment includes, besides the Irving Porter Church Memorial Telescope, a superb 12-inch equatorial; an astronomical transit by Troughton and Simms; an astronomical transit and a zenith telescope by Fauth, altazimuths by Troughton and Simms and Fauth; a Howard Siderial Clock; and other necessary equipment.

The geodetic equipment is one of the most extensive in the country and includes among other things a Mendenhall Half-second Pendulum Apparatus of the pattern used in the United States Coast and Geodetic Survey, also comparators and other equipment for the investigation of standards of length.

For Graduates and Undergraduates

(For fuller description see the Announcement of the College of Engineering)

MODERN ASTRONOMY. Professor BOOTHROYD.

GEODETIC ASTRONOMY. Professor BOOTHROYD.

PRACTICAL ASTRONOMY. Professor BOOTHROYD.

LEAST SQUARES: ADJUSTMENTS OF OBSERVATIONS. Professor UNDERWOOD.

ADVANCED TOPOGRAPHIC SURVEYING. Professor UNDERWOOD.

GEODESY. Professor UNDERWOOD.

Primarily for Graduates

GEODETIC ASTRONOMY. Professor BOOTHROYD. In this course the student undertakes a critical study of the astronomical transit, the zenith telescope, and the altazimuth instrument, determining the instrumental constants for as many of the instruments as time permits, besides making observations for time, latitude, and azimuth, such observations to be of the highest degree of refinement attainable.

GEODESY AND GEODETIC LABORATORY. Professors BOOTHROYD and UNDERWOOD. Special topics such as isostasy and the figure of the earth and advanced problems involving the application of the theory of least squares to the solution of geodetic problems may be considered; laboratory investigation such as the determination of the intensity of gravity or the study of standards of length or of special geodetic instruments may also be undertaken. The amount of work and the investigations undertaken will be arranged for each student.

PRACTICAL ASTRONOMY. The study of planetary detail, including micrometrical measurements on moon and planets as well as measurement of double stars, may be undertaken; also measurements of spectrograms for determination of stellar radial velocities. Complete series of spectrograms for the determination of the orbits of spectroscopic binaries may always be obtained so that such a problem may be carried through to completion.

The Department of Astronomy is not at present prepared to conduct advanced courses in Celestial Mechanics and Theoretical Astronomy or advanced work in Astronomical Spectroscopy other than that mentioned in connection with the course in Practical Astronomy. Study along these lines may be undertaken by students under the direction of the head of the department. Students contemplating an astronomical career are advised to arrange, in consultation with the head of the department, for courses in Mathematics, Physics, and Astronomy which will fit them to prepare for fellowships in some of the research observatories which give full opportunities for the development of the student's research abilities.

***PHYSICS**

Professors ERNEST MERRITT, FREDERICK BEDELL, F. K. RICHTMYER, R. C. GIBBS, E. H. KENNARD, J. E. TREVOR, H. E. HOWE, C. C. MURDOCK, J. R. COLLINS, G. E. GRANTHAM, and H. A. BARTON.

Opportunities are offered for study and investigation in both theoretical and experimental physics. More complete information than that given below can be obtained through correspondence addressed to the Department of Physics or to individual members of the staff.

About forty rooms in Rockefeller Hall are set aside for research. This work is organized separately with its own equipment, stock, and apparatus room, special workshop for the use of graduate students, appliances for the production, handling and liquefaction of air and other gases, X-ray apparatus, spectroscopic apparatus including three vacuum spectrographs, a refrigerating plant, and a dynamo laboratory well equipped with various sorts of direct and alternating current apparatus. An instrument maker's shop with three mechanics and an experienced glass blower are available for the construction and repair of apparatus.

Members of the staff will be especially interested in directing research as follows: Professor Barton in ionization in gases, photo-electricity, and related topics; Professor Bedell, in electricity and magnetism, theoretical and experimental, particularly in alternating current phenomena, and in aerodynamics; Professor Collins, in spectroscopy, particularly in the infra-red; Professor Gibbs, in spectroscopy and luminescence; Professor Howe, in optics; Professor Kennard, in theoretical physics, especially in the theory of radiation and in quantum mechanics; Professor Merritt, in experimental physics, particularly in electricity and magnetism and problems connected with luminescence; Professor Murdock in electrolytic polarization, X-rays, and crystal structure; Professor Richtmyer, in X-rays and properties of thin metallic films; Professor Trevor, in the theory of thermodynamics.

Members of the staff who are in residence in Ithaca during the summer often stand ready to consult with investigators.

Students desiring to undertake graduate work as candidates for a degree must ordinarily have completed not less than two years of undergraduate work in physics.

As a major or minor subject in physics it is usual to name either a particular aspect of physics,—as general physics, theoretical physics, experimental physics, applied physics,—or some particular field in physics,—such as mechanics, heat, light, electricity. One aspect or field may be combined with another, or with a subject outside of physics, to form a single subject. *Physics* may be named as a subject when the other subjects are outside of physics.

The courses listed below, for graduates and undergraduates, require as preparation, for the most part, a knowledge of calculus and either thorough textbook work in general physics, or laboratory work in physical measurements, or both. For an exact statement of these prerequisites and for a description of the elementary courses see the Announcement of the College of Arts and Sciences.

For Graduates and Undergraduates

GENERAL COURSES

ADVANCED LABORATORY PRACTICE. Professor MURDOCK. Individual work intended for those wishing to investigate special topics, or to develop technique in preparation for research work. Lectures will include an introductory discussion of the theory of measurements and its laboratory applications.

[MECHANICS. Professor MURDOCK. Analytical mechanics, based upon Jeans' *Theoretical Mechanics*. Not given in 1929-30.]

[PROPERTIES OF MATTER. Professor MURDOCK. A study of gravitation, elasticity, surface tension, viscosity and the flow of fluids. Not given in 1929-30.]

ELECTRICITY AND MAGNETISM. Professor MURDOCK. A study of the fundamentals, based upon Starling's *Electricity and Magnetism for Advanced Students*.

LIGHT. Professor COLLINS. Geometrical and physical optics.

HEAT. Professor BARTON. A general survey of the experimental facts and an elementary discussion of thermodynamics and kinetic theory and their applications.

WAVE MOTION AND SOUND. Professor COLLINS. The general properties of plane elastic waves, waves on the surface of liquids, and plane electromagnetic waves, and a study of sound based upon Barton's *Textbook on Sound*.

[INTRODUCTION TO MODERN PHYSICAL THEORIES. Professor RICHTMYER. A summary of the development and present interrelations of such subjects as electromagnetic theory, photoelectricity, spectrum phenomena, electron theory, X-rays, radio activity, and quantum theory, and the bearing of these on the structure of the atom and on other problems of modern physics. Not given in 1929-30.]

SPECIAL TOPIC COURSES

AERODYNAMICS AND THE MECHANICS OF FLIGHT. Professor BEDELL. A study of horizontal flight, climbing, gliding, propellers, airplane characteristics and condition for stability.

ELECTRIC WAVES AND OSCILLATIONS. Experimental lectures. Professor MERRITT.

ELECTRIC WAVES AND OSCILLATIONS. Including the experimental study of thermionic tubes. Laboratory. Professor MERRITT and Mr. WEBB.

[ELECTRICAL CONDUCTION IN GASES. Experimental lectures. Professor MERRITT. Not given in 1929-30.]

ELECTRIC CONDUCTION IN GASES. Photoelectricity and related topics. Professor BARTON.

SPECIAL TOPICS IN RECENT EXPERIMENTAL PHYSICS. Experimental lectures. Professors MERRITT, RICHTMYER, MURDOCK, GIBBS, COLLINS, and BARTON.

Primarily for Graduates

GENERAL COURSES

MECHANICS. Professor KENNARD. The mechanics of systems of particles and of rigid bodies in three dimensions; generalized coordinates and Hamilton's Principle; the fundamental theory of fluid motion and of elasticity.

[**ELECTRICITY AND MAGNETISM.** Professor KENNARD. The classical theory and its interpretation in terms of electrons, omitting some parts that involve specialized mathematics; the modern theory of radiation and of the electromagnetic field. Not given in 1929-30.]

PHYSICAL OPTICS. Professor HOWE. The wave theory of interference, diffraction, and polarization; the electromagnetic theory of dispersion and absorption. Second term.

[**APPLICATIONS OF THERMODYNAMICS IN PHYSICS.** Professor MERRITT. Not given in 1929-30.]

PHYSICS SEMINARY. Professor MERRITT. In addition to the Seminary, other groups are usually formed for the discussion of current problems and literature.

SPECIAL TOPIC COURSES

SPECIAL TOPICS. Reading in any branch of physics, experimental or theoretical, under the guidance of some member of the staff, supplemented by reports and regular conferences. In theory, possible topics among many are elasticity, fluid motion, theory of sound, the electromagnetic field; or a narrower field, including its recent developments, may be chosen.

[**SPECIAL TOPICS IN RECENT THEORETICAL PHYSICS.** Professor KENNARD. Not given in 1929-30.]

QUANTUM THEORY. Professor KENNARD. Introduction to the quantum theory, with illustrations from thermal radiation, specific heats, photoelectricity, X-rays, and optical spectra.

QUANTUM MECHANICS. Professor KENNARD. Intended primarily for students majoring in theory.

[**KINETIC THEORY OF MATTER.** Professor KENNARD. The kinetic theory of gases and the methods of statistical physics, with applications to solids and the electron theory, based upon Loeb's *Kinetic Theory of Gases*. Not given in 1929-30.]

THERMODYNAMICS. Professor TREVOR.

SPECTROSCOPY AND LUMINESCENCE. Lectures, assigned reading, and laboratory. Professor GIBBS.

[**ATOMIC STRUCTURE.** Professor GIBBS. The development of modern atomic theory and its application in the explanation of spectral series, resonance and ionizing potentials, fine structure, luminescence, and chemical combinations; the structure of the nucleus as revealed by radioactive and isotopic phenomena and the effects of high-speed bombardment. Not given in 1929-30.]

X-RAYS AND THE STRUCTURE OF MATTER. Professor RICHTMYER. The production and measurement of X-rays, including gamma rays; laws of emission, scattering, and absorption; the bearing of these phenomena on atomic structure, crystal structure, quantum theory, and similar problems.

X-RAY LABORATORY. Primarily for students specializing in Physics. Enrollment limited. Professor RICHTMYER.

ALTERNATING CURRENTS. Professor BEDELL. A study of the underlying principles of alternating electric currents; the development of graphical methods of analysis as a basis for testing and for the solution of practical problems.

ELECTRICAL LABORATORY. Professor BEDELL and Mr. REICH. Testing of direct and alternating-current apparatus, and the investigation of special problems.

ADVANCED ALTERNATING CURRENTS. Professor BEDELL. A seminary on the theory and measurement of alternating currents.

GRADUATE WORK IN THE SUMMER SESSION

Several courses suitable for graduate study are being given with appropriate rotation in successive Summer Sessions. In addition to courses given by regular members of the Cornell staff, courses will be given in the Summer of 1929 by Professor A. H. Compton of the University of Chicago, and in the summer of 1930 by Professor E. C. Kemble of Harvard University. For further details see Summer Session Announcements.

GEOLOGY

Professors H. RIES, G. D. HARRIS, A. C. GILL, O. D. VON ENGELN, and C. M. NEVIN.

Under the general title of geology are included dynamic and structural geology, physical geography, mineralogy, crystallography, petrography, paleontology and stratigraphic geology, economic geology.

Graduate work in Geology may include, in addition to work done in Ithaca, the opportunity of spending part of the time in investigation under approved direction in the field away from Ithaca.

The University Library has a most extensive collection of private publications, magazines, and geological society transactions, as well as files of North American, European, and other Geological Survey reports. In the Geological Department there is the entire library of the late Professor H. S. Williams, and a collection of over 30,000 author's separates.

Special rooms are also available for graduate students for carrying on research work.

The department is provided with apparatus for different kinds of photographic work, and for polishing and sectioning ores, minerals, and rocks.

A seismograph station is situated in McGraw Hall.

*DYNAMIC AND STRUCTURAL GEOLOGY

Professor NEVIN.

Under this branch is also included work in metamorphism and sedimentation. A student taking a major in this branch of geology must first have had at least elementary work in such other branches of geology as the professor in charge may prescribe.

For Graduates and Undergraduates

STRUCTURAL GEOLOGY.

GEOLOGIC SURVEYING.

Primarily for Graduates

METAMORPHIC GEOLOGY. Devoted chiefly to the study of the principles of rock alteration such as contact, hydrothermal, and regional metamorphism, and weathering. Lectures and laboratory. Laboratory consists of making calculations of rock alterations and study of specimens and slides.

SEDIMENTATION. A study of the formation of sedimentary rocks both physically and chemically and the interpretation of sediments in the geologic column. Lectures and laboratory. Laboratory work consists of actual experimentation with sediments in specially arranged tanks, of an examination of sands of various origins, and field work.

SPECIAL WORK IN STRUCTURAL GEOLOGY. For advanced students and graduates. Original investigation adapted to the needs of the student.

*PHYSICAL GEOGRAPHY

Professor VON ENGELN.

The region around Ithaca affords exceptionally excellent and varied illustrations of physiography and glaciology. For many years the teachers and advanced students of physical geography have been engaged in an investigation of the local field problems, and there is further opportunity of this kind. There are also

excellent facilities for indoor work. The main laboratory is well equipped with topographic maps and photographs; the collection of relief models is notably complete, and there is an experimental laboratory with apparatus and facilities for carrying on a variety of experiments in the development of land forms, etc.

A candidate for an advanced degree whose major subject is in physical geography should have completed, during his undergraduate training, elementary study in physics, chemistry, mathematics, and economics, in addition to introductory courses in physical geography and geology.

For Graduates and Undergraduates

GEOGRAPHY OF NORTH AMERICA.
COMMERCIAL GEOGRAPHY.

Primarily for Graduates

GLACIERS AND GLACIATION. This consists of a study of living glaciers and the phenomena of the glacial period. Lectures, readings, laboratory and field work. Mapping and interpretation of glacial deposits.

ADVANCED PHYSIOGRAPHY. Particular problems, reading or field investigation, to suit needs of students. In general graduate students with a minor in Physical Geography are expected to undertake work in this course.

SEMINARY. Reviews of current literature or the original literature on some phase of the subject.

*MINERALOGY, CRYSTALLOGRAPHY, AND PETROGRAPHY

Professor GILL.

The laboratory equipment is relatively good as regards petrographic microscopes, apparatus for chemical and physical investigations of rocks, and apparatus for special crystallographical determinations. There are also collections of rocks and study collections of minerals. The largest of the latter include the Benjamin Silliman, Junior, collection.

Special graduate courses in this division are not offered, but advanced work is adapted to the needs of the individual. Two of the less special courses are, however, so dependent on a rather advanced knowledge of physics or of chemistry or of both that they are to be considered as requiring the maturity of graduates, although open also to undergraduates with sufficient preparation. These are the courses in optical determination of minerals and petrography. For graduate work in these subjects a student should have chemistry including quantitative analysis and a good knowledge of general physics. For petrography he should have also not less than a year of general geology.

For Graduates and Undergraduates

CRYSTALLOGRAPHY.
MINERALOGY.
CRYSTAL MEASUREMENT AND DRAWING.
OPTICAL DETERMINATION OF MINERALS.
PETROGRAPHY.

Primarily for Graduates

SEMINARY IN MINERALOGY AND CRYSTALLOGRAPHY. This course is devoted chiefly to comment on current literature, with occasional discussion of classical treatises. Original investigations by members of the class are also sometimes considered.

ADVANCED WORK IN MINERALOGY OR PETROGRAPHY. This is planned to suit the requirements of individual students.

*PALEONTOLOGY AND STRATIGRAPHIC GEOLOGY

Professor HARRIS.

The University is so situated that excellent exposures of Devonian formations are at its very door, and the typical sections of New York State which are of fundamental importance in American Paleozoic geology are within short excursion range. The most important of these are the Rochester and Niagara gorges, Trenton Falls and the Helderberg escarpments, the Chemung Valley, and the coal fields of northern Pennsylvania.

Excellent facilities are afforded to those desiring to study the later formations, since the department owns extensive collections made in the West Indies, Central and South America, as well as different parts of the United States and Europe. There is also the Newcomb collection (10,000 species) of recent shells; and an exceptional wealth of conchological literature in the geological and the general library. The *Bulletins of American Paleontology* and *Palaontographica Americana* are published in the department.

For Graduates and Undergraduates

INVERTEBRATE PALEONTOLOGY.

Primarily for Graduates

GENERAL STRATIGRAPHIC GEOLOGY. An attempt is made during each year to look over the general geographic distribution of the geologic systems throughout the world (using English, French, German, and Spanish literature), noting the broader structural features and the fossil contents of the rocks. Considerable attention is paid to the historic development of stratigraphic geology and paleontology with emphasis on the rôle played by each great leader in these phases of geologic science.

SPECIAL AND RESEARCH WORK. The field is so broad and the topics so various that no description can be given adequately covering desirable courses of investigation. Suffice it to say that materials are being brought together, in the form of field notes, extensive collections, and library facilities, so that this Department is justly regarded as the mecca for those desiring to work in the Cenozoic geology of the Western Hemisphere.

*ECONOMIC GEOLOGY

Professor RIES.

The work in economic geology is designed to familiarize the student with the origin, occurrence, and distribution of the mineral products of economic value, and also with the practical application of geological principles. The laboratory contains an excellent study collection of economic materials from the United States, Canada, Mexico, and Europe, including ores, fuels, clays, abrasives, building stones, etc., most of these representing suites of material collected by members of the staff of instruction on geological trips. This collection is supplemented by maps and models.

In addition to the collections, the economic geology laboratory has facilities for general work and research on economic materials; the equipment for metallographic work on ores and for clay investigation is excellent.

The work of graduate instruction consists in part of lectures and in part of special work arranged to suit the needs of the individual student. Students who are registered for a major subject in economic geology are expected to engage in research, which should preferably be based on field work.

Excursions may readily be taken to the anthracite regions of Pennsylvania; to the iron, slate, cement, and talc region near Easton, Pa.; to the magnetite mines of the Adirondacks, etc. Field trips of greater or less length are taken to some of these localities every year.

For Graduates and Undergraduates

ECONOMIC GEOLOGY. Professor RIES.

OIL GEOLOGY. Assistant Professor NEVIN.

Primarily for Graduates

CLAY INVESTIGATION. Laboratory work and lectures. A study of the geology of clays and the laboratory methods for determining their properties and uses.

ADVANCED WORK IN ECONOMIC GEOLOGY. Chiefly laboratory work, but also lectures and reading on the geology and distribution of both non-metallic and metallic deposits.

OIL GEOLOGY. Research work is offered in this branch of Economic Geology.

SEMINARY IN ECONOMIC GEOLOGY. This course takes up a review of the current literature in economic geology, or in some years there may be substituted for this review a discussion by members of the class of the mineral resources of certain countries, or certain groups of mineral deposits.

*METEOROLOGY

Professor R. A. MORDOFF.

A broad field for investigation and research is offered in meteorology. The weather and climatic factors, in their relation to crop distribution and production and to engineering, transportation, economic and social problems, are suitable subjects for graduate study.

The library of the Weather Bureau observatory, which is located in Roberts Hall, contains the meteorological data for such correlation studies. In addition, the library of the U. S. Weather Bureau at Washington, D. C., may be drawn upon for works of reference under proper restrictions.

A graduate student in meteorology should have completed the elementary courses in meteorology and climatology, physics, mathematics, geology, and preferably elementary statistics.

CLIMATOLOGY. *Professor MORDOFF.* A course covering general climatology, and the various climates of the United States with emphasis on those of New York State.

RESEARCH. *Professor MORDOFF.* Original investigations in meteorology and climatology.

SEMINARY. *Professor MORDOFF.* Preparation and reading of reports on special topics. Abstracts and discussions of papers dealing with the current literature of meteorology and climatology.

CHEMISTRY

Professors L. M. DENNIS, W. D. BANCROFT, G. W. CAVANAUGH, E. M. CHAMOT, A. W. BROWNE, F. H. RHODES, T. R. BRIGGS, M. L. NICHOLS, JACOB PAPISH, J. R. JOHNSON, C. W. MASON, and A. W. LAUBENGAYER; Doctors E. B. JOHNSON, H. A. BEDIENT, I. T. BEACH, and C. W. MORSE.

A graduate student who desires to take either a major or a minor subject in chemistry may select any one of the following eight branches: inorganic chemistry, analytical chemistry, organic chemistry, physical chemistry, optical chemistry, sanitary chemistry, industrial chemistry, agricultural chemistry. Under the present procedure, both the major subject and the one minor subject, required for the degree of Master of Arts, Master of Science, or Master of Chemistry, and both the major subject and the two minor subjects required for the degree of Doctor of Philosophy may be selected from the eight divisions mentioned above, but it is desirable that candidates for the degree of Doctor of Philosophy select at least one minor subject outside of chemistry.

A graduate student who desires to take a minor subject in chemistry with some field other than chemistry as the major subject, will be required to offer introductory courses in inorganic chemistry, qualitative analysis and quantitative analysis as preliminary to his graduate study. The work upon his minor subject in chemistry may be taken in any branch of the subject that he is qualified to pursue, and may comprise advanced courses selected from the subjoined list, with the approval of his special committee.

Candidates for the degree of Master of Arts or Master of Science with major in chemistry will be required to offer, as preliminary to their graduate work, introductory courses in the following prerequisite subjects: inorganic chemistry, qualitative analysis, quantitative analysis, and organic chemistry. They will be required to take, either in connection with their major or minor work, or in addition to it, the course in introductory physical chemistry, unless the substantial equivalent of this work has been offered at entrance.

Before admission to candidacy for the degree of Master of Chemistry, students must have completed the requirements for the degree of Bachelor of Chemistry at Cornell University, or must offer the full equivalent of these requirements if they enter from other institutions.

Candidates for the degree of Doctor of Philosophy with major in chemistry will be expected to offer, as preliminary to their graduate work, introductory courses in inorganic chemistry, qualitative analysis, quantitative analysis, organic chemistry, and physical chemistry, as well as courses in chemical spectroscopy, chemical microscopy, gas and fuel analysis, and advanced quantitative analysis. Graduate students entering from approved universities may take, during their residence for the advanced degree, such of these prerequisite courses as they have not already pursued. If a graduate student lacks at entrance several of these preliminary courses, more than the minimum period of residence may be necessary. Every candidate for the Degree of Doctor of Philosophy, who has a major subject in Chemistry, is required to pass a general qualifying examination before he is allowed to begin actual experimental work on his thesis problem. One general qualifying examination is given at the beginning of each regular term and at the end of the second regular term of the university year. Each candidate should present himself for the qualifying examination not later than the beginning of the term in which he expects to begin actual laboratory work on his thesis problem.

After the candidate has passed the Qualifying Examination, and has completed his minor subjects, he will be required to pass a general examination on his major and minor subjects. Upon the recommendation of the candidate's Special Committee, this examination may be taken toward the end of the term preceding his last year of residence. This procedure makes it possible for the candidate to devote his last year of residence to uninterrupted research on his thesis. In no case may the general examination be taken before the completion of the entire list of prerequisite courses.

At the close of his period of residence, and after the acceptance of his thesis, the candidate will be required to pass a final oral examination on the thesis and on related subjects.

All graduate students in chemistry are required to register at the Record Office of the Department of Chemistry, at the beginning of each term of residence, and to file at this office all records of changes in registration, or in major and minor subjects, of completion of language requirements, and of the passing of qualifying examinations.

*INORGANIC CHEMISTRY

Professors DENNIS and BROWNE; Assistant Professor LAUBENGAYER.

INTRODUCTORY INORGANIC CHEMISTRY. Lectures, recitations, and laboratory. Professor BROWNE and Assistant Professor LAUBENGAYER.

ADVANCED INORGANIC CHEMISTRY. Lectures and laboratory. Professors DENNIS and BROWNE, and Assistant Professor LAUBENGAYER.

*ANALYTICAL CHEMISTRY

Doctor MORSE; Mr. MURRAY; Mr. FLOYD.

INTRODUCTORY QUALITATIVE ANALYSIS. Lectures, recitations, and laboratory. Doctor MURRAY.

ADVANCED QUALITATIVE ANALYSIS. Laboratory. Doctor MURRAY.

INTRODUCTORY QUANTITATIVE ANALYSIS. Lectures, recitations, and laboratory. Mr. FLOYD.

ADVANCED QUANTITATIVE ANALYSIS. Lectures and laboratory. Dr. MORSE and Mr. FLOYD.

ELECTROCHEMICAL ANALYSIS. Laboratory. Mr. FLOYD.

GAS AND FUEL ANALYSIS. Lectures and laboratory. Dr. MORSE.

ADVANCED GAS ANALYSIS. Lectures and laboratory. Dr. MORSE.

*ORGANIC CHEMISTRY

Assistant Professor JOHNSON; *Doctor* BEACH.

INTRODUCTORY ORGANIC CHEMISTRY. Lectures and laboratory. Assistant Professor JOHNSON and Dr. BEACH.

ADVANCED ORGANIC CHEMISTRY. Lectures and laboratory. Assistant Professor JOHNSON and Dr. BEACH.

METHODS OF ORGANIC ANALYSIS. Laboratory. Assistant Professor JOHNSON and Dr. BEACH.

*PHYSICAL CHEMISTRY

Professors BANCROFT and BRIGGS.

INTRODUCTORY PHYSICAL CHEMISTRY. Lectures and laboratory. Professor BRIGGS.

ADVANCED PHYSICAL CHEMISTRY. Lectures and laboratory. Professors BANCROFT and BRIGGS.

APPLIED COLLOID CHEMISTRY. Lectures. Professor BANCROFT.

APPLIED ELECTROCHEMISTRY. Lectures and laboratory. Professor BRIGGS.

THEORETICAL ELECTROCHEMISTRY. Lectures. Professor BANCROFT.

*OPTICAL CHEMISTRY

Professors CHAMOT and PAPISH; *Assistant Professor* MASON.

INTRODUCTORY CHEMICAL SPECTROSCOPY. Lectures and laboratory. Assistant Professor PAPISH.

ADVANCED CHEMICAL SPECTROSCOPY. Laboratory. Assistant Professor PAPISH.

SPECTROGRAPHIC METHODS. Laboratory. Assistant Professor PAPISH.

INTRODUCTORY CHEMICAL MICROSCOPY. Lectures and laboratory. Professor CHAMOT and Assistant Professor MASON.

ADVANCED CHEMICAL MICROSCOPY. Laboratory. Professor CHAMOT and Assistant Professor MASON.

SPECIAL METHODS IN CHEMICAL MICROSCOPY. Lectures. Professor CHAMOT and Assistant Professor MASON.

SPECIAL METHODS IN CHEMICAL MICROSCOPY. Laboratory. Professor CHAMOT and Assistant Professor MASON.

MICROSCOPY OF COMMERCIAL ALLOYS. Laboratory. Assistant Professor MASON.

MICROSCOPY OF FOODS AND BEVERAGES. Laboratory. Professor CHAMOT and Assistant Professor MASON.

*SANITARY CHEMISTRY

Professor CHAMOT and *Doctor* BEDIENT.

INTRODUCTORY SANITARY CHEMISTRY (FOODS). Lectures and laboratory.

INTRODUCTORY SANITARY CHEMISTRY (WATER). Lectures and laboratory.

ADVANCED SANITARY CHEMISTRY. Lectures and laboratory.

*INDUSTRIAL CHEMISTRY

Professor RHODES; *Doctor* JOHNSON.

INDUSTRIAL CHEMISTRY. Lectures and laboratory. Professor RHODES and Dr. JOHNSON.

SELECTED TOPICS IN CHEMICAL ENGINEERING. Lectures. Professor RHODES.

THE CHEMISTRY OF FUELS. Lectures. Professor RHODES.

CHEMICAL PLANT DESIGN. Conferences and calculation periods. Professor RHODES and Dr. JOHNSON.
 CHEMISTRY OF PULP AND PAPER. Lectures. Dr. JOHNSON.

*AGRICULTURAL CHEMISTRY

Professor CAVANAUGH.

INTRODUCTORY AGRICULTURAL CHEMISTRY (FERTILIZERS, INSECTICIDES, SOILS). Lectures and laboratory. Professor CAVANAUGH.

INTRODUCTORY AGRICULTURAL CHEMISTRY (FOODS AND FEEDS). Lectures and laboratory. Professor CAVANAUGH.

ADVANCED AGRICULTURAL CHEMISTRY. Laboratory. Professor CAVANAUGH.
 ELEMENTARY CHEMISTRY OF FOOD PRODUCTS. Lectures.

NON-RESIDENT LECTURES

The George Fisher Baker Non-Resident Lectureship in Chemistry at Cornell University was established early in the year 1926 by a gift of \$250,000 from Mr. Baker, the income to be used by the University for the benefit and advancement of teaching and research in Chemistry and allied sciences. Under this plan the University invites eminent men of science to come to Cornell, each for one or two semesters, to present the most recent advances, and the methods and results of their own investigations, in the fields in which they have won distinction. A private office and a research laboratory are placed at the disposal of the Non-Resident Lecturer and he is thus enabled to carry forward investigational work while in residence at Cornell.

The Non-Resident Lecturers under the George Fisher Baker Foundation deliver two lectures a week, and hold a colloquium. In some cases they also conduct experimental research with a few advanced students.

The program for these lectures through the year 1931-32 is as follows:

FIRST TERM, 1929-30

Professor G. P. THOMSON, University of Aberdeen, Aberdeen, Scotland.
 Topic of Lectures: Electron Waves.

SECOND TERM, 1929-30

Professor K. FAJANS, University of Munich, Germany.

Topics of Lectures:

- I. Radio Elements and Isotopes.
- II. Chemical Linkage in Relation to the Structure of Atoms and Crystals and to the Optical Properties of Substances.
- III. Strong Electrolytes.
- IV. Adsorption of Ions by Salt-like Compounds and Its Photochemical and Analytical Applications.

FIRST TERM, 1930-31

Professor G. HEVESY, University of Freiburg in Baden, Germany.

Topics of Lectures:

- A) Chemical Analysis by X-rays and Its Application.
- B) Rare Earth Elements and Atomic Structure.
- C) Chemistry of Hafnium.
- D) Electrolytic Conduction and Diffusion in Solids.
- E) Separation of Isotopes.

SECOND TERM, 1930-31

Doctor N. V. SIDGWICK, Lincoln College, Oxford, England.

Topic of Lectures: Molecular Structure and the Periodic Classification.

FIRST TERM, 1931-32

Professor W. L. BRAGG, University of Manchester, England.
Topic of Lectures: To be announced later.

SECOND TERM, 1931-32

Professor ALFRED STOCK, Technische Hochschule, Karlsruhe, Germany.
Topic of Lectures: To be announced later.

THE BIOLOGICAL SCIENCES

BOTANY AND PLANT PHYSIOLOGY

Professors K. M. WIEGAND, LEWIS KNUDSON, A. J. EAMES, L. W. SHARP, O. F. CURTIS, W. C. MUENSCHER, L. C. PETRY, and E. F. HOPKINS.

Graduate work is offered in physiology, anatomy, morphology, cytology, taxonomy and economic botany.

The laboratories of the department are in Stone Hall, one of the buildings of the College of Agriculture, and are well equipped with the necessary apparatus and collections for research. The herbarium contains abundant local and foreign material for taxonomic study.

The very rich flora about Ithaca and its accessibility make the location especially advantageous for all phases of botany, as material may be easily obtained. Gardens and green-houses are also available for the growing of experimental material.

The University Library and the library of the College of Agriculture are well equipped with special works and periodicals dealing with all phases of botanical science. A department library in which are kept the books in more constant use has been established in connection with the laboratories.

A seminary in plant physiology offers to graduate students opportunity to become familiar with current work in plant physiology and to consider the relations of this work to agricultural practices. At these meetings there are also held general conferences and discussions of opinions or methods not conveniently or appropriately dealt with in the general courses. Seminars are conducted in morphology and frequently also in the taxonomy of vascular plants. The purpose of these various seminars is not only to keep abreast of the literature of the subject, but to furnish to the student an opportunity to gain experience in presenting the results of his own research or in developing opinions respecting the work of others. Graduate students are expected to attend the seminars dealing with their special fields of work.

As a prerequisite for work in general botany, anatomy, cytology, and comparative morphology, the student will be expected to have a knowledge of the fundamental features of botanical science.

A fundamental training in botany and chemistry is required of any student who expects to major in plant physiology. If it is not possible to obtain this training before entering upon graduate work at Cornell, then the student will be expected to broaden his knowledge in botany and chemistry after beginning graduate work. The advanced courses in plant physiology are required of all graduate students in plant physiology and preferably should precede research work in this field. Those students whose interests are in the science of crop production will find plant physiology of especial value.

The University conducts a Summer School of Biology in which there is opportunity for graduate study and research in botany. The school is in session for six weeks in July and August, but a longer period of study can be arranged. A prospective student contemplating summer work in botany and plant physiology should correspond with Professor Wiegand before coming to Ithaca.

In addition to various courses in the different fields of botany that are designed primarily for undergraduate students the following courses are provided and are especially conducted for graduate students.

***PLANT PHYSIOLOGY**

Professors KNUDSON, CURTIS, and HOPKINS.

PLANT PHYSIOLOGY. Professors KNUDSON, CURTIS, and HOPKINS. Advanced lecture course. This is a comprehensive course covering the entire field of plant physiology. Emphasis is placed not only on the fundamentals of the subject but also on research methods, and the literature of the subject is critically considered.

PLANT PHYSIOLOGY. Professors KNUDSON, CURTIS, and HOPKINS. Advanced laboratory course. This course supplements the lecture course and is designed to enable the student to acquire by laboratory work the fundamental facts of plant physiology and to enable him as well to acquire the methods and technique needed in physiological research work.

SEMINARY IN PLANT PHYSIOLOGY. Professors KNUDSON, CURTIS, and HOPKINS.

RESEARCH IN PLANT PHYSIOLOGY. Professors KNUDSON, CURTIS, and HOPKINS.

***PLANT ANATOMY**

Professors EAMES, PETRY, and *Dr.* McCLINTOCK.

ANATOMY. Professor EAMES. First term. A course designed to give working acquaintance with the internal morphology of vascular plants. Emphasis is placed on practice in interpretation and determination of material. It is planned primarily for advanced students in pathology, pomology, genetics, and other lines of applied botany.

METHODS IN HISTOLOGY AND CYTOLOGY. *Dr.* McCLINTOCK. First term. Designed to acquaint the student with methods employed in preparing material for histological and cytological investigation.

RESEARCH IN ANATOMY. Professors EAMES and PETRY.

***CYTOLOGY**

Professor SHARP.

CYTOLOGY. Professor SHARP. Second term. An advanced course dealing with the subject matter, literature, and problems of cytology. The course is inclusive and is of special value to the geneticist. The course is intended to bring the critical knowledge of the student down to date. Round-table discussions on topics suggested by the laboratory observations and by readings, and the review of literature are important features of the course.

RESEARCH IN CYTOLOGY. Professor SHARP.

***MORPHOLOGY**

Professors EAMES, SHARP, and PETRY.

[MORPHOLOGY OF VASCULAR PLANTS. Professor EAMES. First term. An advanced course in the comparative morphology and life histories of vascular plants. Not given in 1929-30.]

(Comparative Morphology of Fungi is offered in the Department of Plant Pathology.)

SEMINARY IN MORPHOLOGY. Professor EAMES.

RESEARCH IN MORPHOLOGY. Professors EAMES, SHARP, and PETRY.

***TAXONOMY**

Professors WIEGAND and EAMES.

TAXONOMY OF VASCULAR PLANTS. Professor WIEGAND. First and second terms. A study of the kinds of plants, including a study of the more prominent families of the higher plants and the principles of classification. Field work, herbarium methods and the use of keys and special terms are also given attention.

ADVANCED TAXONOMY. Professor WIEGAND.

RESEARCH IN TAXONOMY. Professors WIEGAND and EAMES.

*PALEOBOTANY

Professors PETRY and EAMES.

RESEARCH.

*ECONOMIC BOTANY

Professor MUENSCHER.

WEEDS AND WEED SEEDS. *Professor* MUENSCHER. First term. Identification, importance, range, soil and climatic requirements, control.

RESEARCH. Weeds and weed control.

*PLANT PATHOLOGY

Professors L. M. MASSEY, H. H. WHETZEL, M. F. BARRUS, H. M. FITZPATRICK, F. M. BLODGETT, CHARLES CHUPP, W. H. BURKHOLDER, H. E. THOMAS, D. S. WELCH, K. H. FERNOW, and D. REDDICK.

The laboratories of the department are fully equipped for teaching and research in this subject. Many pieces of apparatus for use in connection with specialized research problems are available and additional apparatus can be supplied whenever it is needed. Greenhouses having about 2,500 square feet of floor space afford facilities for experimental work and for the culture of diseased and healthy plants for class use. These houses are divided into compartments so that various artificial conditions of temperature and moisture can be maintained for diverse types of plants and kinds of experimental work. A garden near the laboratories is available for the use of graduate students. Field laboratories in important crop sections of the State are maintained through co-operation with growers. These laboratories provide certain graduate students who receive fellowships (several of which are usually available each year) with an opportunity of pursuing investigations on a large scale under most favorable commercial conditions.

The pathological herbarium includes a local collection of fungi and pathological materials and sets of well-known fungous exsiccati. The library contains most of the important works on plant pathology, mycology, and bacteriology, complete sets of the more important journals, many monographs, and practically all the experiment station literature on these subjects.

Candidates for the Doctor's degree should spend at least one season in the field in order to come into contact with the practical aspects of control problems. Students preparing for graduate work in plant pathology are urged to obtain a thorough knowledge of elementary physics and chemistry, including organic and physical chemistry, and of general botany, plant histology, and plant physiology. A reading knowledge of French and German is indispensable in phytopathological research and must be acquired before the beginning of the second year of graduate work. Candidates for advanced degrees must have fundamental training in the subjects enumerated above. Opportunity is afforded for further study in these subjects after entering the Graduate School, but a student availing himself of this opportunity can not expect to receive a degree in the minimum amount of time required for residence. Members of the staff are prepared to direct investigation in the various sub-divisions of the broader field, including that of bacterial diseases of plants.

Courses in plant pathology and mycology are offered in the six-weeks special Summer School of Biology conducted by the University. Opportunity for graduate study and research is provided as a feature of this school. Arrangement for a longer period of study than six weeks with residence credit in the Graduate School is possible. Before coming to Ithaca, prospective students should correspond with a member of the staff concerning work contemplated.

GENERAL PLANT PATHOLOGY. *Professor* WHETZEL. First or second term. A fundamental introductory course treating of the nature, cause, and control of plant diseases. Designed especially for undergraduates but required of all graduate students who have not had its equivalent. This course is also offered during the six-weeks summer session.

PRINCIPLES OF PLANT DISEASE CONTROL. Professor WHETZEL. Second term. A consideration of principles and methods in plant disease control. Designed for advanced undergraduate and graduate students.

ADVANCED PLANT PATHOLOGY. Professor MASSEY. First and second terms. A presentation and analysis of the experimental and empirical knowledge of plant diseases. The phenomena of infection, susceptibility, host reactions, and symptomatology will be critically considered. Primarily for graduate students.

ELEMENTARY MYCOLOGY. Professor FITZPATRICK. First term. A synoptical course designed to acquaint the student with the general field of mycology. Emphasis will be placed on morphology and phylogeny, rather than on taxonomy. This course is also offered during the six-weeks summer session.

[**MYCOLOGY.** Professor FITZPATRICK. First and second terms. An intensive study of the morphology, taxonomy, and phylogeny of the fungi (Phycomycetes and Ascomycetes). Primarily for graduate students. Not given in 1929-30.]

MYCOLOGY. Professor FITZPATRICK. First and second terms. Alternating with the course just named, and dealing with the Basidiomycetes and Fungi Imperfecti. Primarily for graduate students.

HISTORY OF PLANT PATHOLOGY. Professor WHETZEL. First and second terms. Requires a reading knowledge of French and German. Designed especially for graduate students specializing in Plant Pathology.

[**GERMAN PHYTOPATHOLOGICAL READING.** Professor WHETZEL. First and second terms. For graduate and advanced students. Designed to assist graduate students in preparing for their language examination requirements in German. Not given in 1929-30.]

RESEARCH. Professors MASSEY, WHETZEL, BARRUS, FITZPATRICK, CHUPP, BURKHOLDER, and REDDICK, and Assistant Professors BLODGETT, THOMAS, WELCH, and FERNOW.

SEMINARY. Members of the staff.

LITERATURE REVIEW. Members of the staff.

*PLANT BREEDING

Professors R. A. EMERSON, H. H. LOVE, C. H. MYERS, F. P. BUSSELL, A. C. FRASER, R. G. WIGGANS and R. D. LEWIS; Doctor ERNEST DORSEY.

The laboratories of this department are supplied with calculating machines necessary for statistical investigations, and are equipped with cameras and accessories for photographic work. The departmental library contains the principal books and periodicals dealing with plant breeding, evolution, and genetics. The department has greenhouse room approximating 2000 square feet of floor space, a part of which is available for the use of graduate students. A garden near the laboratories affords the necessary room for most of the plant material used by graduate students. For more extensive plantings, room is provided on the University farms.

In order to enter upon graduate work in plant breeding, the student should have had the equivalent of the following courses: genetics, plant breeding, general botany, general plant physiology, elementary zoology or biology, introductory inorganic chemistry, and elementary organic chemistry. In case a student has not had all these elementary courses, he should take them early in the period of his graduate study, and since he will not be permitted to present them as partial fulfillment of the requirements for a major or a minor in plant breeding, he will ordinarily find it impossible to complete his graduate work in the minimum time.

In addition to the prerequisites listed above, it is desirable that upon entering his graduate work the student should have had the equivalent of the following courses: plant taxonomy, plant cytology, advanced plant physiology, plant pathology, and courses in either farm crops, pomology, floriculture, or vegetable gardening.

Students majoring in plant breeding will ordinarily find it necessary to remain in Ithaca during the summer, or to make satisfactory arrangements for growing and studying elsewhere the plant materials used in connection with their research problems. Since the department has accommodations for only a limited number,

prospective students will find it to their advantage to correspond with a member of the departmental staff some months prior to entering upon their work.

Primarily for Graduates

BIOMETRY. Professor LOVE. A discussion of statistical methods as applied to problems in biology and genetics. The course is designed primarily to develop methods for the study of variation, correlation, curve fitting, and probable error.

GENETICS. Assistant Professor FRASER. A course primarily for the study of methods of genetical testing and analysis. Particular attention will be given to the formulation of hypotheses to explain genetical phenomena, and to the development of tests of such hypotheses. A critical study will be made of a number of the best examples of genetical analysis to be found in the periodical literature. The discussions will involve a consideration of newer principles of genetics. Laboratory analyses of experimental data, and of an "unknown" stock of *Drosophila*. Laboratory fee, \$3.

RESEARCH. Professors EMERSON, LOVE, MYERS, and BUSSELL, and Assistant Professors FRASER, WIGGANS, and LEWIS.

SEMINARY. Professors EMERSON, LOVE, MYERS, and BUSSELL, and Assistant Professors FRASER, WIGGANS, and LEWIS.

ZOOLOGY, ENTOMOLOGY, AND LIMNOLOGY

Professors J. G. NEEDHAM, H. D. REED, G. W. HERRICK, O. A. JOHANSEN, J. C. BRADLEY, R. MATHESON, C. R. CROSBY, G. C. EMBODY, E. F. PHILLIPS, P. W. CLAASSEN, A. H. WRIGHT, A. A. ALLEN, and B. P. YOUNG.

Every facility possible in the way of material and equipment is placed at the disposal of the student desiring to investigate in the following fields: General and experimental zoology, taxonomy, morphology, embryology of insects, ecology, limnology, aquiculture, parasitology, medical entomology, economic zoology and entomology, apiculture.

The laboratories are equipped with modern compound, binocular, and dissecting microscopes, microdissecting and injecting apparatus, eusscopes, microtomes and accessories, paraffine and constant temperature ovens, projection and drawing apparatus, facilities for modeling in wax, work shop, fully equipped preparation rooms, cameras and dark rooms.

Connected with the laboratory of Insect Taxonomy are extensive collections of both indigenous and exotic insects of all orders. These have been determined by specialists and are accessible to properly prepared students for comparison. The collection includes many sets of specimens illustrative of the metamorphoses and habits of insects. There is also an extensive collection of other invertebrates, fishes, amphibia, reptiles, birds and mammals as well as more than 12000 specimens of fixed material for developmental and structural studies. In assembling these collections, efforts have been made to obtain material from all parts of the world illustrating biological principles.

A modern insectary is available for advanced work in the biology of insects, the rearing of parasites, and the study of aquatic insects, and also offers facilities for photographing insects and examples of their work.

A fish culture experiment station on the University farm affords exceptional opportunities for investigations in the biology of fresh water organisms.

The Cayuga basin, with its diversified topography, its extensive fauna, and its mingling of three life zones, offers unusual opportunities for ecological field work. Within the basin are three state parks and three wild life preserves, all within walking distance of the University; the former established on account of the beauty of their scenery, the latter on account of their interesting fauna and flora. There is also a woodland bird preserve in Ithaca.

The University library, together with the special libraries of the Agricultural and Medical Colleges, the Flower Library of the Veterinary College, and the Comstock Memorial Library (entomology), and the Cornell Beekeeping Library afford unusually rich resources for the investigator in any field of zoological research. They are particularly complete in the serial literature of zoology.

In order to undertake graduate study the student should not only be prepared in the fundamentals of Animal Biology but also have or acquire a foundation in the particular phase of this subject which he intends to pursue.

The members of the staff are prepared to direct the research work of graduate students in connection with the summer School of Biology of Cornell University.

Supplementing the major divisions of work indicated below, practice in entomological reading is given by Professor JOHANNSEN in French and in German; a course is given in the technics of the literature of entomology and zoology by Professor BRADLEY; in entomotaxy by Professor BRADLEY; and in insectary methods by Professor MATHESON.

*MORPHOLOGY

Professors JOHANNSEN and REED and *Assistant Professor* YOUNG.

MORPHOLOGY, HISTOLOGY AND EMBRYOLOGY OF INSECTS, including research. Professor JOHANNSEN.

MORPHOLOGY AND COMPARATIVE ANATOMY OF INVERTEBRATES AND VERTEBRATES, including research. Professor REED and Assistant Professor YOUNG.

For HISTOLOGY AND EMBRYOLOGY OF VERTEBRATES, see page 78.

*TAXONOMY

Professors BRADLEY, WRIGHT, ALLEN, CROSBY, *Assistant Professor* YOUNG and *Doctor* FORBES.

TAXONOMY OF INSECTS, including research. Professor BRADLEY; (Lepidoptera) Dr. FORBES.

TAXONOMY OF INVERTEBRATES, other than ARTHROPODS. Assistant Professor YOUNG. Arrangements may be made for the study of Protozoa, Vermes, and other groups.

ICHTHYOLOGY, HERPETOLOGY, MAMMALOGY, including research. Professor WRIGHT.

ORNITHOLOGY, including research. Professor ALLEN.

ZOOGEOGRAPHY. Professor WRIGHT.

*EXPERIMENTAL ZOOLOGY

RESEARCH. Professor REED and Assistant Professor YOUNG.

*ECONOMIC ENTOMOLOGY AND ZOOLOGY

Professors HERRICK, MATHESON, C. R. CROSBY, PARROTT (Geneva), ALLEN, PHILLIPS and WRIGHT, and *Doctor* WEHRLE.

ECONOMIC ENTOMOLOGY, including research. Professors HERRICK, MATHESON, PARROTT (Geneva), and Dr. WEHRLE.

PARASITES AND PARASITISM, including research. Professor MATHESON.

MEDICAL ENTOMOLOGY, including research. Professor MATHESON.

APICULTURE, including research. Professor PHILLIPS.

ECONOMIC ORNITHOLOGY AND MAMMALOGY, including research. Professor ALLEN.

ECONOMIC ICHTHYOLOGY AND HERPETOLOGY, including research. Professor WRIGHT.

*ECOLOGY AND LIMNOLOGY

Professors NEEDHAM, EMBODY, CLAASSEN, and WRIGHT.

RESEARCH IN ECOLOGY OF INSECTS. Professors NEEDHAM and CLAASSEN.

RESEARCH IN THE ECOLOGY OF VERTEBRATES. Professor WRIGHT.

RESEARCH IN LIMNOLOGY. Professors NEEDHAM, EMBODY, and CLAASSEN.

GENERAL LIMNOLOGY. Professor NEEDHAM.

RESEARCH IN AQUICULTURE. Professor EMBODY.

SEMINARS

SEMINAR IN SYSTEMATIC VERTEBRATE ZOOLOGY. Professor WRIGHT.
THE JUGATAE. An entomological club functioning as a departmental seminar.

*ANATOMY

Professors A. T. KERR and J. W. PAPEZ.

The laboratories for this subject are situated on the third floor of Stimson Hall and are admirably lighted and thoroughly ventilated. For gross dissection there is a large general laboratory, and adjoining the dissecting room is a smaller laboratory for special work, fitted with a hood and other facilities for digestion, maceration, corrosion, etc. At the end of the main dissecting room is a large dark room with a projection outfit and facilities for drawing sections for making reconstructions. Upon this floor also is situated a dark room with a complete outfit for taking photographs of special preparations for illustrating research. In the basement is a compressed air apparatus for embalming and making special injections.

There is an abundance of anatomical material, which is embalmed and kept in cold storage so as to be ready for use when needed. The refrigerating apparatus is also used for freezing specimens for sections. In addition to the undissected material, there is an ample supply of special parts, such as bones, brains, the various abdominal and thoracic organs, special sense organs, etc.

The equipment includes microscopes, dissecting microscopes, microtomes, a portable X-ray outfit, glassware, reagents, and other necessities of an anatomical laboratory.

In collaboration with the department of Histology and Embryology, every facility is offered for studying anatomical problems from both the gross and the developmental points of view.

In the library are to be found complete sets of practically all the important periodicals dealing with anatomy, and the proceedings and transactions of the learned societies. In addition, the library is well supplied with the most important anatomical monographs and books.

Graduate work in anatomy should be preceded by courses in general biology and comparative or human anatomy. A reading knowledge of German and French is essential for successful research in anatomy.

ANATOMY. Dissection of the upper extremity; of the head and neck; of the thorax; of the lower extremity; of the abdominal and pelvic walls and viscera. Thoracic and abdominal viscera, section demonstrations.

CENTRAL NERVOUS SYSTEM AND ORGANS OF SPECIAL SENSE. Laboratory work on gross and microscopic preparations.

DETAILED TOPOGRAPHICAL DISSECTION AND STUDY OF ANY REGION
RESEARCH AND ADVANCED WORK.

*HISTOLOGY AND EMBRYOLOGY

Professors B. F. KINGSBURY and H. B. ADELMANN.

The equipment for this subject comprises a supply of modern microscopes, camera lucidas, polariscopes, microspectroscopes, photomicrographic cameras, and other special apparatus, in sufficient number to give each student opportunity for learning to use them, and for applying them to any special study in which they are needed. Two projection microscopes are available for blotting paper and wax plate reconstructions. The general and research laboratories are large and are equipped with microtomes, incubators, aquaria, etc. The collection of specimens is large and constantly increasing, and comprises preserved material and embryos, as well as embryological and histological series of microscopic preparations of man, mammals, and the lower vertebrates.

In addition to the general laboratory, preparation room, and private laboratory rooms for the staff, there are for this subject a large and well-lighted advanced laboratory with three small rooms for individual workers, a photomicro-

graphic laboratory and dark room, and a drawing and projection room. A museum of embryological models occupies the center of the advanced laboratory. The rich and varied fauna of the Cayuga Lake region affords favorable opportunity for investigation in the histology and embryology of all the main groups of vertebrates; material for the study of the development of the sheep, cow, and pig, is also available. Advanced work in histology and embryology is of necessity individual and is abundantly provided for. In addition advanced students are sometimes recommended to take some one or more of the general courses in the subject. As preliminary to graduate work, students are expected to have had the courses in the tissues and one of the following: the organs, special histology, embryology. A year's work in zoology, biology, anatomy, or physiology may with advantage precede advanced work in this subject.

ADVANCED WORK IN HISTOLOGY AND EMBRYOLOGY. Professors KINGSBURY and ADELMANN.

EXPERIMENTAL EMBRYOLOGY. Assistant Professor ADELMANN.

[THE THEORY OF DEVELOPMENT. Assistant Professor ADELMANN. Not given in 1929-30.]

SEMINARY IN HISTOLOGY AND EMBRYOLOGY.

*HUMAN PHYSIOLOGY AND BIOCHEMISTRY

Professors J. B. SUMNER, H. S. LIDDELL, and J. A. DYE, and an instructor.

For advanced and graduate work in experimental physiology two large laboratories and several smaller rooms are available. Laboratory A, on the first floor of Stimson Hall, is provided with electro-motor-driven shafting and Palmer recording drums of the most recent pattern, capable of giving wide ranges of speed. All necessary apparatus is available for graphic work in muscle and nerve physiology, for the investigation of problems in connection with the circulatory and respiratory systems, where objective records are desirable (for example, movements of the excised amphibian and mammalian heart), and for the experimental study of the special senses and the central nervous system. Pendulum and spring myographs are available and several forms of ergograph for the study of muscular and nervous fatigue. Each table is supplied with chronographs and time-recording tuning-forks, induction machines, keys, switches, commutators, etc. Adjoining this laboratory are two smaller rooms; one is being equipped for experimental work on animal heat and body temperature, the other contains a Ludwig kymograph with accessories, and is used primarily for experimental physiology. There is also a dark room for photographic and optical work.

Laboratory B is devoted mainly to research. The equipment includes haemomanometers and blood-pressure apparatus of the most recent type, and six large Brodie kymographs for continuous smoked paper. A time-recording clock and artificial respiration and chloroform apparatus have just been added. Plethysmographs for recording volume changes in the various bodily organs are provided and several clock-driven drums are available.

In connection with this laboratory there is a workshop with a skilled mechanic who is capable of making and modifying any kind of apparatus which may be required for special research.

In the basement, on a solid concrete floor, a room has been equipped with galvanometers, capillary electrometers, shunts, rheocords, bridges, and all the other apparatus required in electrophysiology.

The biochemical laboratories on the second floor of Stimson Hall include a general laboratory, and a smaller laboratory for research, both fitted throughout with water, gas, suction pumps, and draught cupboards. Adjoining these are a room for metabolic work, a balance room, a constant temperature room, and store rooms for chemicals and apparatus.

The equipment, which is being steadily increased along many special lines, is suited to the investigation of problems connected with the chemistry and functions of the animal body, and includes, besides a stock of glass apparatus and the ordinary fittings of a chemical laboratory, several metabolism cages, large and small balances, polarimeter, large centrifuge, Buchner press, incubators, ap-

paratus for measurement of H-ion concentration, Hilger wave lengths spectrometer, and a selection of the most important works of reference. The principal periodicals dealing with physiology and biochemistry are also kept in the building.

Recently a field station has been added to the department within two miles of the Medical College. This consists of two fenced fields, each of about five acres of orchard and pasture land, together with barn and housing for large animals such as sheep and goats. Another fenced field of twenty acres adjacent to the station has been leased for five years and is available for pasture. On this station, which is entirely devoted to research in physiology and biochemistry, many problems are under investigation and as much of this work can be carried out by graduate students, under supervision, it may be considered as an important asset to the Graduate School.

Two laboratories have recently been equipped for the investigation of conditioned reflexes, both salivary and motor. They are available for the use of graduate students.

A problem demanding original investigation is prescribed for each student, who is guided in his choice of a subject by one of the professors in charge, due consideration being given to his previous training and to the line of work in which he desires to specialize. Having selected a subject the student will be expected to concentrate his efforts upon it. While the work is done under the supervision of some one of the members of the teaching staff, and every facility provided in the way of apparatus, etc., the student is encouraged to rely on his own resources as far as possible, especially in planning and carrying out his experiments. Any special apparatus which he may require or which he may himself design, will be made for him by the laboratory mechanic. It is expected that the results of his work will be embodied in a thesis, and if this is judged to be of sufficient merit it will be published in full or in abstract in some accredited scientific journal.

The prerequisites necessary for a student intending to major in biological chemistry are inorganic chemistry, qualitative and quantitative analysis, physical chemistry, advanced organic chemistry, and physiology.

In addition to original investigation, which may be undertaken by students who have the necessary preparation, the following systematic courses are offered to graduate students:

BIOCHEMISTRY FOR MEDICAL AND GRADUATE STUDENTS. Second term. Lecture T 8-9; W Th F S 9-10, laboratory W 2-5, F 10-1, 2-5, and S 10-1. Professor SUMNER, Mr. HAND, and Mr. KIRK.

ANIMATIVE PHYSIOLOGY. Muscle, nerve, central nervous system, and organs of special sense. Second term. Lectures and laboratory. Assistant Professor LIDDELL.

ADVANCED PHYSIOLOGY. The mechanisms of alimentation, excretion, heat regulation, and functions of the endocrine glands. Second term. Lectures and laboratory. Assistant Professor DYE.

PHYSIOLOGY OF RESPIRATION, VITAL DYNAMICS, CIRCULATION, AND MUSCULAR ACTIVITY. First term. Lectures, recitations, and laboratory. Assistant Professor DYE.

PHYSIOLOGY AND BIOPHYSICS OF RADIATION. Second term. Open to graduate students and qualified seniors. Dr. MAUGHAN. M W 2-4. Discussions and demonstrations.

EXPERIMENTAL ANALYSIS OF BEHAVIOR. First term.

This will consist of a critical review of the principal methods employed in the observation of behavior and the results obtained, preceded by a brief discussion of nerve conduction, receptors and effectors, the nature of reflex action, etc. Particular attention will be given to conditioned reflexes. Primarily for graduate students of psychology and animal biology. Seminary and laboratory T Th 2-5. The seminary may be elected separately, T Th 2-3. Assistant Professor LIDDELL.

*FOOD AND NUTRITION

Professors HELEN MONSCH, ADELAIDE SPOHN, MARY HENRY, and MARION PFUND.

The laboratories for graduate work in food and nutrition are situated in the Building of the College of Home Economics. Three laboratories are available for

the work, an animal laboratory, adequately equipped for nutrition work with small animals, and two chemical laboratories, provided with apparatus for work in the application of chemistry to the study of food and nutrition. There is also special equipment for energy metabolism studies and a diet kitchen for use in the preparation of food for the work in human metabolism, and a nursery school for the study of feeding problems with pre-school children.

In order to take up graduate work in the chemistry of food and nutrition the student should have had the equivalent of the following courses: quantitative chemical analysis, biological chemistry, physiology or biology, nutrition and dietetics. In addition to the courses listed, a knowledge of physics and physical chemistry is highly desirable.

For Graduates and Undergraduates

NUTRITION OF CHILDREN. Professor MONSCH.

DIET IN RELATION TO THE TREATMENT OF DISEASE. Professor HENRY.

SPECIAL PROBLEMS. Instruction by members of the departmental staff.

Primarily for Graduates

FOOD AND NUTRITION. Professor SPOHN. Advanced lecture course. First term. Primarily for graduate students, but open also to seniors with the permission of the instructor. A critical study of recent advances in food and nutrition. The purpose of the course is to acquaint students with the methods and results of recent investigations in the field.

LABORATORY METHODS IN FOOD AND NUTRITION. Professor SPOHN. First term. An introduction to methods in investigation in foods and nutrition. Opportunity is offered for the study of methods used in feeding experiments with small animals. Laboratory fee, \$20.

HUMAN CALORIMETRY. Professor SPOHN. Second term. Primarily for graduate students but open also to seniors with the permission of the instructor. The laboratory work in this course will consist of energy metabolism determinations using the Benedict portable metabolism apparatus. Laboratory fee, \$5.

RESEARCH IN FOOD AND NUTRITION. Professor SPOHN, Professor MONSCH, Assistant Professor PFUND, and other members of the staff. This course offers opportunity for individual research in animal nutrition, human nutrition and metabolism, food chemistry, chemical changes taking place in the process of food preparation. Laboratory fee, \$25.

SEMINARY IN NUTRITION. Professor SPOHN.

SEMINARY IN FOOD. Assistant Professor PFUND.

*ANIMAL PATHOLOGY AND BACTERIOLOGY

Professors W. A. HAGAN, PETER OLAFSON, and E. L. BRUNETT.

The laboratories of animal pathology and bacteriology are well equipped for research in general pathological morphology, the pathology of infectious diseases and for bacteriological work, especially in connection with experimental pathology and immunology, but also with problems associated with the morphology and physiology of bacteria.

Candidates for advanced degrees electing pathology or bacteriology as their major subject must have had the corresponding general course given in this department, or its equivalent. Candidates electing a minor subject in this department may take up a research problem, if they possess sufficient preliminary training, or may pursue regular undergraduate course work, the courses taken to be subject to the approval of their committee. All graduate students electing work in this department are required to attend the seminar.

For a list of courses, with descriptions, see the Announcement of the New York State Veterinary College.

RESEARCH IN PATHOLOGY AND BACTERIOLOGY. Professors HAGAN, OLAFSON, and BRUNETT.

SEMINARY. Professors HAGAN, OLAFSON, and BRUNETT.

(For dairy bacteriology, see Dairy Industry and Bacteriology; for soil bacteriology, see Agronomy.)

***VETERINARY PHYSIOLOGY**

Professors P. A. Fish and C. E. HAYDEN.

The department has a suitable equipment for the study of physiological problems in connection with the domesticated animals. The laboratories situated in the Veterinary College, are ample and are provided with modern apparatus for such research as can best be conducted in the laboratories. In the same building there is a well-assorted collection of recent books and periodicals on comparative physiology, which may be supplemented by the many works on general physiology in the University Library.

The Veterinary Experiment Station, controlled by the College, and not far distant, can be utilized for field observations and the study of those problems outside of the scope of the laboratory. This unusual combination of field and laboratory research should be conducive to important results.

As a preparation and aid in this research, attendance at the general lecture and laboratory courses in veterinary physiology is recommended.

PHYSIOLOGY RECITATIONS. THE PHYSIOLOGY OF THE NUTRITION AND SECRETION OF THE DOMESTICATED ANIMALS. THE PHYSIOLOGY OF THE MUSCULAR AND NERVOUS SYSTEMS. PHYSIOLOGICAL LABORATORY. COURSE IN URINE ANALYSIS.

ADVANCED PHYSIOLOGY. Professor FISH and Assistant Professor HAYDEN.

***VETERINARY MEDICINE, AMBULATORY CLINIC, AND OBSTETRICS
INCLUDING DISEASES OF THE GENITAL ORGANS**

Professor D. H. UDALL, Doctors M. G. FINCHER and W. J. GIBBONS.

Opportunity for the clinical study of internal diseases of animals is afforded by material in the ambulatory clinic. This clinic has gradually developed until it demands a large part of the time of two clinicians. Especially abundant are affections of dairy animals. Students are required to report their observations, and files of notes on completed cases are available for additional information. Special and research students will be given individual instruction to meet their requirements, and may supplement their clinical experience with further study in the various laboratories and museums of the College.

***DISEASES OF BREEDING CATTLE**

Professors R. R. BIRCH and H. L. GILMAN.

The department has available for research in connection with the diseases of cattle a herd with a complete history of each animal. There is also an extensive collection of material illustrating various morbid conditions of the genital organs of cattle. Ample facilities are at hand for the study of the clinical and bacteriological aspects of this group of diseases.

Extensive researches are being conducted on the diseases of the genital organs of cattle, with special reference to abortion, sterility, and kindred phenomena.

***VETERINARY PHARMACOLOGY AND DISEASES OF SMALL ANIMALS**

Professors H. J. MILKS and H. C. STEPHENSON.

The laboratories of the department are well equipped for research in veterinary pharmacology. The clinic supplies abundant material for research both in external and internal diseases of small animals.

There is an operating room with modern equipment and facilities for handling approximately sixty animals. The library facilities are good.

***VETERINARY SURGERY**

Professor J. N. FROST.

The laboratory in surgery is well equipped for research and special study along surgical lines especially in connection with diseases of the bones, tendons, and tendon sheaths.

Candidates for advanced degrees should have as preliminary preparation, general pathology, physiology, general and special surgery.

SPECIAL SURGERY. Professor FROST.

RESEARCH IN SURGICAL DISEASES. Professor FROST.

THE AGRICULTURAL SCIENCES

AGRONOMY

Professors T. L. LYON, J. A. BIZZELL, H. O. BUCKMAN, J. K. WILSON, L. G. ROMELL, B. D. WILSON, and H. P. COOPER.

Special laboratories are provided for graduate students; they are equipped for chemical and bacteriological investigations of soils and of crop production. Greenhouses provide opportunity for conducting crop and soil tests during the winter, and for experiments with nutrient solutions and sand cultures. A field for plant experiments gives ample facility for work on a larger scale. In this field a series of lysimeters, each holding between three and four tons of soil have been built. Pipes from these tanks carry the drainage water into a tunnel where it is collected for measurement and analysis. These varied and extensive facilities afford opportunity for students trained in any one or more of the several sciences to investigate soil or plant nutrition problems.

A complete set of the soil maps of the United States is arranged in form for ready reference. The University Library is well supplied with the publications in which the literature of soil science is to be found.

A graduate student who desires to make agronomy his major subject should have had sufficient training in analytical chemistry and in bacteriology to give him a command of the technique as well as the principles of the subject. It is also desirable that he should have had enough technical agriculture to enable him to see the agricultural bearing of the work.

SEMINARY. Members of the department.

*AGRICULTURAL SOILS

Primarily for Graduates

SOILS, ADVANCED COURSE. Professor BIZZELL. First term. Students must consult Professor Bizzell before registering for the course. An advanced course designed particularly for students specializing in soil technology. The lectures deal with the important properties of soils from the theoretical and technical standpoints. Review of the literature and preparation of papers are important parts of the work.

SOILS, ADVANCED LABORATORY COURSE. Professor BIZZELL. First term. A course designed primarily for special training in methods used in soil investigation.

SOIL BACTERIOLOGY. Professor J. K. WILSON. Second term. A course in biological soil processes designed primarily for graduate students. The laboratory work will be supplemented by reports and by abstracts of important papers on the subject. Laboratory fee, \$5.

RESEARCH. Professors LYON, BIZZELL, BUCKMAN, and J. K. WILSON, and Assistant Professors B. D. WILSON and COOPER.

*FOREST SOILS

RESEARCH. Professor ROMELL.

*FLORICULTURE AND ORNAMENTAL HORTICULTURE

Professors E. A. WHITE, R. W. CURTIS, J. P. PORTER, and C. J. HUNN.

The field of investigation and research in floriculture and ornamental horticulture is a broad one, and there are excellent opportunities for original work in these subjects. Studies in variation, nutrition, or in regard to the culture and improvement of plants may be undertaken. Monographic studies on the various genera of ornamentals offer an important field of research. Summer work is of

special importance in studying plant materials, and it is desirable that candidates for the Master's degree spend at least one summer at the University. This is required of all candidates for the Doctor's degree.

Every candidate for an advanced degree must have had a thorough training in general biology, botany, economic entomology, soils, fertilizers, and genetics. A student who takes his major subject in the department must already have had the courses noted below or their equivalent, excepting only the advanced courses. A student who takes his minor subject for the Master's degree in this department of study may register for these courses. Each student is required to deposit a typewritten copy of his thesis with the department.

In addition to the classroom and laboratory equipment, a range of greenhouses, aggregating sixteen thousand square feet of glass, is now available for instructional purposes. The department has about thirty acres of land devoted to nurseries of ornamental plants and to field experiments with peonies, gladioli, irises, roses, asters, and other perennial plants. This area also furnishes material for laboratory exercises.

The library equipment consists of a large and steadily increasing collection of works of reference, comprising a number of the rarer books of the ancients, and an unusually full assortment of the garden herbals of the sixteenth, seventeenth, and eighteenth centuries, and the leading monographs and manuals of modern times, supplemented by complete sets of a large number of the horticultural journals of Europe and America. The largest bound collection of seed, plant, and nursery catalogues in the United States is in the library of the department. This collection is very useful to students monographing horticultural plants. Students have access to an herbarium comprising about thirteen thousand cultivated plants.

The University campus affords an excellent collection of woody plants in mature condition, and an arboretum is rapidly being developed which exhibits all the useful plant forms in arrangement for type study and also in their grouping for various uses.

Graduate students who have been trained in general horticulture and who have not had specialized courses in Floriculture and Ornamental Horticulture may be required to take certain undergraduate courses. The following courses are required of all graduate students:

THE HISTORY AND LITERATURE OF ORNAMENTAL HORTICULTURE. Professor

SEMINARY. Professor WHITE and staff.

FORESTRY

Professors R. S. HOSMER, S. N. SPRING, A. B. RECKNAGEL (Absent on leave), E. FRITZ, JOHN BENTLEY, jr., C. H. GUISE (Absent on leave), J. N. SPAETH, and F. I. RIGHTER.

Students who wish to do graduate work in forestry, either for a Master's degree or for a Doctor's degree, are offered opportunity for advanced study or research in silviculture, forest management, forest policy, forest protection, and forest utilization.

The Matthias H. Arnot Forest of 1730 acres, recently conveyed to Cornell University for the use of the Department of Forestry, offers exceptional opportunities for graduate work in Forestry. The Arnot Forest is, over the greater part of its area, made up of second growth hardwoods, and hemlock. It lies within twenty miles of Ithaca.

Candidates for the Master's degree register for one major and one minor subject and pursue either advanced study or research along these lines. This year is not devoted to undergraduate class work taken by graduate students, although in special cases a part of the student's time may be spent in such work.

Candidates for the degree of Master in Forestry must show adequate preparation in the following fundamental subjects or their equivalents: English, inorganic chemistry, solid geometry, trigonometry, plain and topographic surveying, introductory physics, dynamic geology, general botany, plant physiology, general

biology, zoology, general entomology, economics. They must also have satisfactorily completed forestry courses the equivalent of those offered in the four-year undergraduate course in the Department of Forestry, New York State College of Agriculture, leading to the degree of Bachelor of Science. (See the Announcement of the New York State College of Agriculture at Cornell University.) In addition they must have had at least three months' experience in forestry work, satisfactory proof of which is to be a signed statement, or an examination in woodsmanship, or both. Students who enter as graduates without having had undergraduate instruction in forestry should be able to complete the work for the Master's degree in two years, if they have had satisfactory training in fundamental sciences. If they lack this, it will require a correspondingly longer time to get the Master's degree. Prospective students should write to the Department of Forestry for information regarding the special lines of graduate work which they desire to follow.

A student entering the Graduate School as a candidate for the degree of Master in Forestry should enter at the beginning of the first (autumn) term. Otherwise it will be difficult to arrange his work satisfactorily. The student will be advised whether he should attend the forestry summer camp.

In connection with the recently established Professorship in Forest Soils, excellent opportunity is available for research work in this subject. Students interested in graduate work in the field of forest soils, should consult the Department of Agronomy.

Advanced Work and Research

Advanced work and research may be done in the following sub-fields:

*SILVICULTURE. Professor SPRING, Professor BENTLEY, and Professor SPAETH.

*FOREST MANAGEMENT. Professor BENTLEY and Assistant Professor RIGHTER.

*FOREST POLICY. Professor HOSMER.

*FOREST PROTECTION. Professor HOSMER.

*FOREST UTILIZATION. Professor FRITZ, Professor BENTLEY, and Assistant Professor RIGHTER.

Graduate Courses

ADVANCED FOREST MANAGEMENT. Assistant Professor RIGHTER. Advanced work in organizing a forest property for management. An important part is the critical study of working plans.

FOREST FINANCE. Assistant Professor RIGHTER. Economics of Forest Finance, including the problems of compound interest; costs of growing and holding timber; valuation of forests devoted to sustained yield; stumpage appraisal; appraisal of damages to forest property; financial aspects of taxation of forests, and insurance of standing timber.

SEMINARY. Field and classroom conferences on important phases of forestry. Conducted by members of the forestry staff.

*POMOLOGY

Professors A. J. HEINICKE, L. H. MACDANIELS, D. B. CARRICK, G. W. PECK, and JOSEPH OSKAMP.

The large experimental and varietal orchards of different fruits at Ithaca and at Geneva are available for graduate use. Representative varieties of all domesticated species that grow in this climate may be found in these orchards. Each year a large collection of exotic fruit is brought together at the College; herbarium and preserved material is also available. Modern apparatus for research work on pomological problems involving chemical, histological, and physiological technique is available in the departmental laboratories. Special opportunity for investigation of fruit storage problems is afforded by a modern cold storage plant which is equipped for experimental purposes. The important pomological literature required for research is found in the libraries at Cornell and at the State Station.

In order to enter upon graduate work in Pomology, the student should have the equivalent of the following courses: General Botany, Elementary Plant

Physiology, Economic Entomology, Elementary Plant Pathology, Introductory Inorganic and Elementary Organic Chemistry, Elementary Pomology and Systematic Pomology. In addition, students are required as part of their graduate work in Pomology to take advanced courses in Plant Physiology and Chemistry, unless minors are chosen in those subjects. They are urged, however, to choose a minor in some phase of Botany, particularly Plant Physiology.

On account of the nature of the work, it is very desirable that graduates studying for the Master's degree should spend one summer at Ithaca or in the field investigating their special subject. This is expected of graduates working for a Doctor's degree.

ECONOMIC FRUITS OF THE WORLD. Professor MACDANIELS. A study of all species of fruit-bearing plants of economic importance not considered in previous courses, such as the date, the banana, citrus fruits, nut-bearing trees, and newly introduced fruits, with special reference to their cultural requirements in the United States and its insular possessions. Emphasis is placed on botanical relationships and fruit structure.

ADVANCED POMOLOGY. Professor HEINICKE. A systematic study of the sources of knowledge and opinion as to practices in pomology; methods and difficulties in experimental work in pomology, and results of experiments that have been concluded or are being conducted.

SPECIAL TOPICS IN POMOLOGY. Professor HEINICKE, Professor CARRICK, or Professor MACDANIELS.

Different topics will be considered each term, the aim being to cover the entire field in two years. In this course the student is expected to review critically and evaluate the more important original papers relating to pomological practice and research. Interpretation of the literature will be made on the basis of the fundamental principles of plant biology and recent experimental methods.

RESEARCH PROBLEMS IN POMOLOGY. Varietal and taxonomic, Professor MACDANIELS; nutritional, Professor HEINICKE; histological and morphological, Professor MACDANIELS; winter injury of fruit tree tissues, and cold storage of fruits, Professor CARRICK; various phases of general fruit culture, members of the staff.

SEMINARY. Members of the staff.

*VEGETABLE GARDENING

Professors H. C. THOMPSON, PAUL WORK, and E. V. HARDENBURG.

Opportunity is offered for research in such lines of vegetable growing and handling as the student may select. There are excellent opportunities for original work in this subject.

The facilities available include the regular classrooms and laboratories; a small research laboratory with chemical equipment; greenhouse space of approximately 7,500 square feet; hot beds and cold frames and about fifteen acres of land devoted to research and teaching. Special equipment is secured as needed for students majoring in vegetable gardening.

In order to enter upon graduate work in vegetable gardening, the student should have the equivalent of the following courses: Botany I and 3I, Plant Pathology I, Entomology 12, Agronomy I, Vegetable Crops, I, 2, 11, and 12. These courses are outlined in the Announcement of the College of Agriculture. In case a student has not had all of these courses he should take them early in his period of graduate study. Students taking either a major or a minor in vegetable gardening are required to take the course in Systematic Vegetable Crops and the course in Advanced Vegetable Crops and to attend the seminar.

Students majoring in vegetable gardening will ordinarily find it necessary to spend one summer in Ithaca, in order to grow and study plant materials used in their research work.

SYSTEMATIC VEGETABLE CROPS. Professor WORK. First term. This course deals with the taxonomy, origin, history, characteristics, and adaptation of kinds, varieties, and strains, of vegetables, with special emphasis upon the principles and methods of systematic study. Attention is devoted to identification, to

classification, and to exhibition and judging. The leading varieties of the vegetable crops are grown each year, and there is opportunity to gain first hand acquaintance with the characteristics of the crop plants in considerable detail. The class assembles in advance of regular instruction (Sept. 19, 1929) for a week of study in the field while outdoor plantings are still available. See regular college announcement for details.

ADVANCED VEGETABLE CROPS. Professor THOMPSON. Second term. This course is devoted to a systematic study of the sources of knowledge and opinions as to practices in vegetable production and handling. Results of experiments that have been concluded or are being conducted are studied and their application to the solution of practical problems are discussed.

SEMINARY. Professors THOMPSON, WORK, and HARDENBURG. Recent literature is taken up for general study and discussion. All graduate students in vegetable gardening are required to take part in this seminary.

RESEARCH. Members of the staff are prepared to direct investigations in the various lines of vegetable production and handling.

*ANIMAL HUSBANDRY

Professors F. B. MORRISON, M. W. HARPER, E. S. SAVAGE, L. A. MAYNARD, R. B. HINMAN, and C. M. McCAY.

Among the herds and flocks belonging to the College of Agriculture are a dairy herd of one hundred cows, a herd of beef cattle, studs of draft horses, a flock of about 150 sheep, and a herd of breeding swine. The equipment for animal husbandry includes a very full collection of the herd and flock registries of all the breeds of domestic animals kept in this country, amounting to more than one thousand volumes, and affording excellent facilities in heredity and genetics.

The animals of the herds and flocks and their records provide opportunity for studying problems of nutrition, breeding and production.

Colonies of white rats and rabbits are available for research in the principles of animal nutrition and animal genetics.

Laboratories are provided adequately equipped for the study of the chemistry and physiology of nutrition, the chemistry of feeding stuffs and of animal products and the histology of animal tissue. Slaughter and meat laboratories are available for the study of the relation of breeding and nutrition to anatomical structure and to chemical composition and food value. The college animals are available for studies relating to production and the processing, sale, grading, and measuring of their various products such as milk, meat, and horse power including animal mechanics.

Graduate students may elect animal husbandry as the major field and select a problem dealing with the breeding, feeding or management of one of the classes of farm animals or they may elect animal breeding or animal nutrition or some branch of production as a major or minor.

SEMINARY. Members of the staff.

RESEARCH.

*ANIMAL BREEDING

Professors HARPER and HINMAN.

In order to enter upon graduate study in animal breeding the student should have had the equivalent of the following courses. Elementary human or veterinary physiology, elementary biology, elementary genetics, principles of animal feeding and breeding, and production courses in dairy and beef cattle, horses, sheep and swine.

PROBLEMS IN ANIMAL GENETICS. Professor HARPER.

SPECIAL TOPICS IN ANIMAL BREEDING. Professors HARPER and HINMAN.

RESEARCH.

*ANIMAL NUTRITION

Professors MAYNARD, McCAY, MORRISON, and SAVAGE.

In order to enter upon graduate work in animal nutrition the student should have had the equivalent of the following courses: introductory inorganic chem-

istry, elementary organic chemistry, introductory physics, elementary zoology or biology, elementary human or veterinary physiology, an introductory course in the feeding of animals and an introductory course in animal breeding or genetics.

ANIMAL NUTRITION. Professors MAYNARD and McCAY.

SPECIAL TOPICS IN ANIMAL NUTRITION. Professors MAYNARD and McCAY.
RESEARCH.

*ANIMAL PRODUCTION

Professors MORRISON, HARPER, HINMAN, and SAVAGE.

In order to enter upon graduate study in animal production, the student should have the equivalent of the following courses. Elementary feeds and feeding, elementary breeding and the elementary production courses in dairy and beef cattle, horses, sheep, and swine.

SPECIAL TOPICS IN ANIMAL PRODUCTION. Professors MORRISON, HARPER, HINMAN, and SAVAGE.
RESEARCH.

DAIRY INDUSTRY AND BACTERIOLOGY

Professors J. M. SHERMAN, H. E. ROSS, H. C. TROY, P. F. SHARP, OTTO RAHN, E. S. GUTHRIE, and C. N. STARK.

The laboratories of the department are well equipped for special work and offer excellent opportunities to graduate students for research.

Before taking up graduate work in bacteriology or dairy industry, it is desirable that a student have general chemistry, qualitative and quantitative analysis, organic chemistry, and general bacteriology, in addition to the elementary courses in the particular field in which he wishes to do his graduate work.

For detailed descriptions of the courses in bacteriology and dairy industry see the Announcement of the College of Agriculture.

Formal courses open to undergraduate and graduate students are given in the following subjects:

DAIRY INDUSTRY

For Undergraduates and Graduates

ANALYSIS AND CONTROL OF DAIRY PRODUCTS. Professor TROY.

MARKET MILK AND MILK INSPECTION. Professor ROSS.

MILK PRODUCTS. Professors SHARP and GUTHRIE.

DAIRY CHEMISTRY. Professor SHARP.

SEMINARY. Professor SHERMAN.

BACTERIOLOGY

For Undergraduates and Graduates

GENERAL BACTERIOLOGY. Professors SHERMAN and STARK.

DAIRY BACTERIOLOGY. Professor SHERMAN.

MICROBIOLOGICAL METHODS. Dr. KNAYSI.

PHYSIOLOGY OF BACTERIA. Professor RAHN.

TAXONOMY OF BACTERIA. Professor RAHN.

*DAIRY INDUSTRY

For Graduates

Graduate students may elect research problems in any of the various fields of dairy industry: the analysis of milk and its products; the sanitary production and control of market milk; the manufacture and technology of milk products; dairy chemistry.

*BACTERIOLOGY

For Graduates

Research problems may be selected in various phases of pure and applied bacteriology: taxonomy; physiology; technique; dairy bacteriology; food bacteriology; water and sanitary bacteriology; industrial fermentations. (For patho-

genic bacteriology, see ANIMAL PATHOLOGY AND BACTERIOLOGY; for soil bacteriology, see AGRONOMY.

*POULTRY HUSBANDRY

Professors J. E. RICE, G. F. HEUSER, H. E. BOTSFORD, L. C. NORRIS, and G. O. HALL; *Messrs.* J. C. HUTTAR and A. L. ROMANOFF.

This department of study is well equipped with facilities for carrying on advanced work. The equipment includes special appliances and a flock of over 2,000 fowls with which to conduct investigations in feeding, breeding, housing, incubation and artificial illumination. Laboratories provide means for doing the anatomical and analytical work required in poultry experiments.

In addition to a very complete set of bulletins in the poultry library, assembled from the various experiment stations in the United States and Canada, numerous books on poultry husbandry are available in the University Library, the library of the College of Agriculture, and the special departmental library. The department is also provided with a topical card index, with cross references, of the principal poultry books, bulletins, and magazines; a large mass of data from research; 6,000 negatives, a large number of which have to do with poultry investigations; and more than 3,000 lantern slides.

The Poultry Husbandry Building and auxiliary buildings furnish facilities for graduate work along many lines of instruction and research. These buildings have been constructed at a cost of approximately \$150,000, and include the administration building, laying pens, the fattening house, breed exhibition house, and long brooder house. Over thirty varieties of poultry are kept for class use, and facilities are now available for the study of the adaptation of the various breeds, feeds, equipments, methods, etc., to the needs of the various locations and types of poultry farming.

Owing to the fact that many colleges do not give the undergraduate courses in poultry husbandry which are prerequisite to graduate work in the subject, students coming from other institutions cannot in all cases enter immediately upon graduate study. Many students will find it necessary or desirable to spend a year in preliminary study taking undergraduate courses before beginning graduate work. The preliminary courses include Poultry Nutrition; Poultry Incubation and Brooding; the Breeds of Poultry and Judging; Poultry Breeding; Poultry House Design and Construction; Marketing Poultry Products; Poultry Farm Management; the Field of Poultry Husbandry.

Instruction of an advanced nature and investigation may be taken along the lines of poultry nutrition, illumination, poultry farm management, house construction, breeding, and marketing; in co-operation with the Staff of the Veterinary College, in poultry disease investigations; and in co-operation with the staff in histology and embryology, in incubation experiments.

Primarily for Graduates

SEMINARY. Professors RICE, HEUSER, and BOTSFORD; Assistant Professors NORRIS and HALL.

RESEARCH. Professors RICE, HEUSER, and BOTSFORD; Assistant Professors NORRIS and HALL; Messrs. HUTTAR and ROMANOFF.

ADVANCED POULTRY NUTRITION. Professor HEUSER and Assistant Professor NORRIS.

THE NEW YORK STATE AGRICULTURAL EXPERIMENT STATION AT GENEVA

Professors U. P. HEDRICK, J. J. WILLAMAN, R. S. BREED, D. C. CARPENTER, R. C. COLLISON, H. J. CONN, A. C. DAHLBERG, H. GLASGOW, G. J. HUCKER, J. G. HORSFALL, M. T. MUNN, P. J. PARROTT, W. H. RANKIN, F. C. STEWART, L. R. STREETER, G. P. VAN ESELTINE, RICHARD WELLINGTON, H. B. TUKEY.

Since July 1, 1923, the State Agricultural Experiment Station at Geneva has been under the administration of Cornell University, the research workers of its

staff are eligible to membership on the faculty of the Graduate School, and its facilities for research are available to graduate students.

The Station has a farm of approximately two hundred acres which is used almost exclusively for field experimental work with fruit and vegetable crops and certain special soil studies. It has laboratory buildings devoted exclusively to research in agricultural bacteriology, agricultural chemistry, agronomy, agricultural botany, dairying, economic entomology, horticulture, and poultry raising. It has also a research reference library, permanent exhibits and records of progress of its research, suitable conference rooms, and adequate facilities for publication and distribution of results of station work.

Certain phases of the investigations now being conducted at the Station and other problems for which the facilities of the Station are suitable may be used as thesis problems by graduate students.

There is opportunity at the Station for graduate research in the following lines, under the direction of members of the staff as indicated:

AGRICULTURAL BACTERIOLOGY

DAIRY BACTERIOLOGY. Professors BREED and HUCKER.

SOIL BACTERIOLOGY. Professor CONN.

BIOLOGICAL STAINS. Professor CONN.

AGRICULTURAL CHEMISTRY

CHEMISTRY OF MILK AND ITS PRODUCTS. Professor CARPENTER.

CHEMISTRY OF PLANT TISSUES. Professor WILLAMAN.

CHEMISTRY OF INSECTICIDES AND FUNGICIDES. Professor STREETER.

AGRICULTURAL BOTANY

PLANT DISEASE. Professors STEWART, RANKIN, and HORSFALL.

SEED CONTROL AND IMPROVEMENT. Professor MUNN.

DAIRYING

DAIRY PRODUCTS. Professor DAHLBERG.

ECONOMIC ENTOMOLOGY

ORCHARD INSECTS. Professors PARROTT and GLASGOW.

CANNING CROPS INSECTS. Professor GLASGOW.

HORTICULTURE

GENETICS OF FRUIT BREEDING. Professors HEDRICK and WELLINGTON.

FRUIT PROPAGATION AND MANAGEMENT. Professors HEDRICK and TUKEY.

SYSTEMATIC BOTANY OF HORTICULTURAL PLANTS. Professor VAN ESELIN.

THE MEDICAL SCIENCES

AS PRESENTED IN THE MEDICAL COLLEGE IN NEW YORK CITY

For a full description of the work in the Medical College in Ithaca and in New York City, see the Announcement of the Medical College. Students desiring to enter the Graduate School for work in the medical sciences can obtain application blanks at the office of the Dean of the Medical College. Professor C. R. STOCKARD, Chairman of the Group, may be consulted for additional information.

The Medical College in New York City comprises the main building on First Avenue opposite Bellevue Hospital and the adjacent Loomis Laboratory on Twenty-sixth Street.

THE MAIN BUILDING occupies the entire block between Twenty-seventh and Twenty-eighth Streets, on First Avenue, extending back one hundred feet, thus affording an available space of nearly 20,000 square feet on each of its seven floors.

The Department of Anatomy occupies the entire fifth floor. In addition to a commodious and well lighted dissecting room there are numerous smaller rooms for investigation and research in anatomy, histology and embryology, preparation rooms, storage rooms, etc. The fourth floor is devoted entirely to pathology, bacteriology, and the College Library. There are several rooms for investigators and assistants, preparation rooms, classrooms, a teaching museum, and a library containing current numbers and many back files of the important journals devoted to medical sciences, in English, French, and German. The facilities offered by the departmental libraries in the medical school are readily amplified by use of the various libraries in New York City, several of which are within easy reach of the college buildings. Among these the library of the New York Academy of Medicine, the second largest medical library in the country, is worthy of special mention. The departments of Physiology and Chemistry occupy the third floor of the Main Building and are equipped with laboratories devoted to the problems of research, in addition to those used by students in the course leading to the M.D. degree. Organic chemistry, physiological chemistry, and chemical pathology are thus especially provided for. One large room is set aside for calorimetry and another has been equipped as an operating room in connection with the work in experimental physiology. The lower floors of the Main Building contain the college offices, the dispensary, lecture rooms, classrooms, and a power plant.

THE LOOMIS LABORATORY, besides the pharmacological laboratories for medical students, contains laboratories for research on bacteriology, hygiene, physiological chemistry, experimental medicine, and pharmacology. Facilities are thus furnished to graduates who may desire to pursue further study or research in the various departments of laboratory investigation. The second floor of this laboratory is devoted entirely to pharmacology and its allied sciences; the first and third floors provide accommodations for the Department of Experimental Medicine with research laboratories for physiological chemistry and chemical pathology. The fourth and fifth floors are devoted to research in pathology, bacteriology hygiene, serology, and immunology; they also provide ample accommodations for photomicrography.

BELLEVUE HOSPITAL, whose gates open directly opposite the college buildings, furnishes ample opportunity for extending the problems of the laboratory to the bedside, besides offering many intricate problems for solution in the laboratory. The Hospital is organized in four divisions, one of which has, by the Trustees of the Hospital, been placed at the disposal of the Faculty of the Cornell University Medical College for medical research and instruction. The services thus intrusted to the College include, continuously, ninety medical beds, ninety surgical beds, sixty beds to genito-urinary diseases, a neurological service, and, for one-half the year, fifty-four obstetrical beds. Moreover, the College has general privileges in the other divisions, which afford it continuous opportunity for instruction and research in the wards devoted to the treatment of alcoholic diseases, tuberculosis, gynecology, and the psychopathic diseases.

NEW YORK HOSPITAL. The Medical College, through the courtesy of the Governors of the New York Hospital, had long been accorded certain privileges for instruction in its wards, but on the 1st of January, 1913, a definite arrangement was established between Cornell University and the New York Hospital, through the donation to the hospital of a generous fund which was presented by Mr. George F. Baker, one of the governors of the hospital, upon the condition that thereafter half the entire medical, surgical, and pathological services of the institution should be definitely assigned to the Cornell University Medical College for the advancement of its teaching and research. By this most advantageous arrangement the University nominates the visiting staff and laboratory staff of its division and secures the admission of its students to the wards as clinical clerks, which enables the college to make a definite provision in its courses of instruction and research for work in the New York Hospital, and this is now closely correlated in the curriculum with the similar work which had hitherto been done in Bellevue Hospital. Furthermore, the laboratory staffs of the different departments of the Medical College are placed at the service of the hospital for the purposes of extending its scientific works. The hospital service thus assigned to the

college comprises 100 beds. This service is exceedingly active. It includes several thousand acute and emergency cases brought in annually from a large ambulance and dispensary district. The services thus supplied to the College are ample for advanced research as well as for undergraduate instruction.

MEMORIAL HOSPITAL. Through the generosity of the late Dr. James Douglas, who gave this Hospital an endowment for the study and treatment of cancer and allied diseases, the Memorial Hospital became affiliated in 1914 with the Cornell University Medical College. The conditions under which this union was consummated place upon Cornell University Medical College the responsibility for the medical and surgical activities of the Hospital, subject however, so far as administrative action is concerned, to the approval of its Board of Managers. The Cornell University Medical College is required to approve the five medical members of the Board of Managers of the Memorial Hospital and to nominate their successors in case of vacancies, and to name the medical and surgical staff, subject to the approval of the Board of Managers of the Hospital.

THE JOHN E. BERWIND MATERNITY CLINIC. An affiliation having been consummated between the John E. Berwind Maternity Clinic and Cornell University Medical College, the medical direction of the clinic is placed under the control of Cornell. The medical staff, including the resident and house staffs, are appointed by the clinic only on nomination by the Medical College. Cornell students are definitely assigned to the clinic for practical instruction under the direction of the Professor of Obstetrics. Cornell students having been provided for, vacancies in the student staff are filled by appointment. Application for such assignments should be made to the Superintendent of the Clinic at 125 East 103rd Street, New York City.

THE RUSSELL SAGE INSTITUTE OF PATHOLOGY. The Russell Sage Institute of Pathology has been affiliated with the Second Medical (Cornell) Division of Bellevue Hospital since 1913. Endowed by Mrs. Russell Sage in 1907, it has provided funds for research work in pathology and medicine. Laboratory space has been generously given by the trustees of Bellevue Hospital and clinical facilities have been furnished by the Cornell Medical Division. The Institute has constructed and equipped a respiration calorimeter and has maintained a metabolism ward adjacent to the general wards of the division. The research workers have been members of the hospital staff and have assisted in the care of patients and the instruction of students. The metabolism ward, chemical laboratories, and calorimeter furnish unusual facilities for teaching the diseases of metabolism

*ANATOMY

Professors C. R. STOCKARD, C. V. MORRILL, G. PAPANICOLAOU, J. F. NONIDIZ, and P. B. ARMSTRONG.

Abundant material and sufficient apparatus are available for advanced study and work in the various branches of anatomy, embryology, histology, comparative morphology, descriptive anatomy, and experimental anatomy. Students desiring to pursue graduate work in any of these branches must have had in their college courses preliminary training in general zoology and comparative anatomy. A reading knowledge of German and French is essential.

New York City offers exceptional advantages for obtaining fresh human materials. The large slaughter-houses are accessible for comparative mammalian tissues and organs. The extensive collections of specimens and models in the city museums are extremely helpful and instructive to the advanced student.

The members of the staff offer courses in the various phases of anatomy in which they are especially engaged. The courses offered for the medical students appear in the Announcement of the Medical College, and are particularly recommended to those students who have not pursued work of this kind. Technical and practical anatomical work are fully provided.

Preliminary Requirements: Physics, Chemistry, and Biology as required for admission to the Medical College.

MORPHOLOGY, EMBRYOLOGY, HISTOLOGICAL TECHNIC, GENERAL HISTOLOGY, MICROSCOPIC ANATOMY AND ORGANOLOGY, DESCRIPTIVE ANATOMY, including

courses in dissection of the human body, DEMONSTRATIONS ON THE CADAVER, LIVE ANATOMY, TOPOGRAPHICAL ANATOMY, NEURO-ANATOMY AND NEURO-HISTOLOGY, APPLIED ANATOMY, ORGANS OF SPECIAL SENSE, ANATOMICAL RESEARCH.

ANATOMY OF THE LIVING BODY. Professor STOCKARD.

SPECIAL AND TOPOGRAPHICAL STUDIES OF DIFFERENT REGIONS. Professors STOCKARD and MORRILL.

HUMAN HISTOLOGY AND HISTOGENESIS. Professor NONIDEZ.

EXPERIMENTAL MORPHOLOGY. Professor STOCKARD.

ANATOMY OF THE INFANT AND POSTNATAL DEVELOPMENT. Professor STOCKARD.

*PHYSIOLOGY

Professors GRAHAM LUSK, D. J. EDWARDS, MCKEEN CATTELL, and W. H. CHAMBERS.

Students desiring to elect physiology as a major course, in addition to completing the course in general physiology given to medical students, will be required to undertake some special problems, preferably dealing with aspects of nutrition or circulation. Students electing physiology as a minor course may select either the work in general physiology given to medical students or may select only a portion of this course (e. g., nutrition, circulation, etc.) provided an additional amount of special work in these subjects is undertaken.

A preliminary knowledge of chemistry—analytical, organic and physiological—as well as of physics, is requisite for those who select physiology as a major.

GENERAL PHYSIOLOGY. Comprising nerve muscle physiology, central nervous system, special senses, respiration, circulation, secretion, digestion, metabolism.

PHYSIOLOGY OF NUTRITION. Professor LUSK and Assistant Professor CHAMBERS.

PHYSIOLOGY OF CIRCULATION. Professor EDWARDS.

PHYSIOLOGY OF MUSCLE AND NERVE. Assistant Professor CATTELL.

*PHYSIOLOGICAL CHEMISTRY AND CHEMICAL PATHOLOGY

Professor S. R. BENEDICT.

The laboratories available for advanced work and research in physiological chemistry and chemical pathology include those of the Department of Chemistry, in the Main Building, and a research laboratory in the General Memorial Hospital. These laboratories provide adequate equipment for investigation in a great variety of special problems in the chemistry of the plant, animal, or human organism in health or disease, by chemical, physical, or optical methods. In the college library the principal journals relating to these subjects are on file.

Students expecting to pursue investigation in physiological chemistry or chemical pathology should have adequate preliminary training in inorganic, analytical, and organic chemistry, as well as in physics, physiology, and physical chemistry, though a study of these latter subjects could be pursued at the College, together with more advanced work in special lines.

ORGANIC AND PHYSIOLOGICAL CHEMISTRY: RESEARCH.

PHYSIOLOGICAL CHEMISTRY.

CHEMICAL PATHOLOGY.

*PATHOLOGY, BACTERIOLOGY, AND DEPARTMENT OF PUBLIC HEALTH AND PREVENTIVE MEDICINE

Professors JAMES EWING, W. J. ELSER, O. H. SCHULTZE, J. C. TORREY, E. S. L'ESPERANCE, JAMES DENTON, L. W. SMITH, and A. F. COCA, and Doctor M. C. KAHN.

The laboratories of pathology, bacteriology, and the Department of Public Health and Preventive Medicine occupy the fourth floor of the main building and the third and fourth floors of the Loomis Laboratory. The equipment includes all the means commonly employed in research in these fields and much

new and original apparatus. These laboratories are provided with suitable quarters for the care of animals. The library includes about 8,000 bound volumes and a large and valuable collection of monographs and reprints. There is an extensive collection of specimens illustrating pathological histology, much material for histological study, and a museum containing about 3,000 specimens. The recent material from the autopsies at several hospitals is constantly available for study, and furnishes a supply of problems in many fields, which is practically inexhaustible. Applicants who have been admitted to the Graduate School are urged to present the degree of Doctor of Medicine for admission to these courses.

Preliminary requirements: Anatomy, including Histology and Embryology.

GENERAL PATHOLOGY, SPECIAL PATHOLOGY, PATHOLOGICAL ANATOMY, MEDICO-LEGAL PATHOLOGY, AUTOPSY TECHNIQS, EXPERIMENTAL PATHOLOGY, BACTERIOLOGY, IMMUNOLOGY, PUBLIC HEALTH AND PREVENTIVE MEDICINE.

*PHARMACOLOGY

Professor R. A. HATCHER.

The Department is well equipped for general work and research in both the chemical and pharmacodynamic aspects of Pharmacology. Special opportunities will be afforded for the investigation of the action of drugs on the circulation. An electrocardiograph and other special apparatus are available. Arrangements can be made in special cases for correlating laboratory and clinical results of pharmacologic studies.

The departmental library is sufficient for the immediate needs of workers and its facilities are readily amplified by that of the College, and others nearby, which furnish every opportunity for extending the work.

A knowledge of chemistry and physiology is required.

MATERIA MEDICA and PHARMACY; PHARMACOLOGY.

RESEARCH IN PHARMACODYNAMICS.

TOXICOLOGY.

FELLOWS: SCHOLARS: ROSTER OF DEGREES

FELLOWS AND GRADUATE SCHOLARS IN 1928-29

RESIDENT DOCTORS

- Abraham Jacobus Beyleveld, B.S. (Stellenbosch) 1925, Ph.D. (Cornell) 1929.
Hans Heinrich Boysen, Ph.D. (Kiel) 1927.
Newton Charles Jones, A.B., A.M. (Western Reserve) 1925, 1926, Ph.D. (Cornell) 1929.
Georges Abdalla Knaysi, B.S., M.S., Ph.D., (Cornell) 1924, 1925, 1929.
Alexis Lawrence Romanoff, B.S., M.S.A., Ph.D. (Cornell) 1925, 1926, 1928.

UNIVERSITY FELLOWS

- The Sage Fellow in Chemistry*: William Seaman, A.B., M.S. (Brown) 1922.
The Fellows in Political Economy: Joseph Weinstein Hathcock, A.B., A.M. (Trinity) 1921, 1923; Gladden Albert Pugh, A.B. (Missouri) 1926.
The President White Fellow in Modern European History: Dorothy Reed Burnett, A.B. (Cornell) 1926.
The Fellow in American History: Mary Catherine Kennard, A.B. (Pomona) 1926.
The Goldwin Smith Fellow in Botany: Ethel Grace Stiffler, A.B. (Goucher) 1922, A.M. (Pennsylvania) 1924.
The University Fellow in German: Merle Chandler Cowden, B.S., M.S. (Worcester Polytechnic Institute) 1920, 1923.
The Cornell Fellow in English: Joseph Addison Giddings, A.B. (Western Reserve) 1926.
The Schuyler Fellow in Animal Biology: Janet Agnes Williamson, A.B. (Brown) 1918, A.M. (Cornell) 1923.
The Susan Linn Sage Fellows in Philosophy: George Nicholas Belknap, A.B. (Oregon) 1926; Sven Axel Nilson, A.B. (Minnesota) 1925, A.M. (Cornell) 1927.
The University Fellow in Agriculture: Hsien-Wen Li, B.S.A. (Purdue) 1926.
The Erastus Brooks Fellow in Mathematics: Ethel Isabel Moody, A.B. (Wells) 1926, A.M. (Cornell) 1927.
The Charles E. Bennett Fellow in Classical Philology: Whitney Tucker, A.B. (Cornell) 1926.
The Fellow in Greek and Latin: Leanora Reilly, A.B., A.M. (Washington) 1926, 1928.
The University Fellow in Architecture: Thaddeus Baker Hurd, B.Arch. (Cornell) 1927.
The McGraw Fellow in Civil Engineering: James Bernard Baty, B.S. in C.E. (Texas A. & M. College) 1927 (first term); Dalzell Melvin Griffin, B.S. in C.E., M.S. in C.E. (Bucknell) 1923, 1926 (second term).
The Sibley Fellow in Mechanical Engineering and the Edgar J. Meyer Memorial Fellow in Engineering Research: Edward Rupert Becker, B.S. (Rochester) 1928.
The President White Fellow in Physics: Arne Wikstrom, E.E. (Chalmers University of Technology, Gotenberg, Sweden) 1925.
The Charles Bull Earle Fellow in Mechanical and Electrical Engineering: Leonard Herman Gussow, E.E. (Cornell) 1928.

SPECIAL TEMPORARY FELLOWS

- The American Dry Milk Institute Fellow*: Dwight Leonard Espe, B.S. (Iowa State) 1922.
The DuPont Fellow in Chemistry: Walter Joseph Jebens, B.S. (Iowa State) 1927.
The Grasselli Fellow in Chemistry: Robert Edwin Hulse, B.S. (Rutgers) 1927.
The Armstrong Fellow for the Investigation of Diseases of Shade Trees: Eugene Theorin Erickson, B.S. (Minnesota) 1926.
The American Rose Society Fellow: Leslie John Meyer, B.S. (Michigan Agricultural) 1929.
The Nassau County Farm Bureau Association Fellow: Patsy Pompey Pirone, B.S. (Cornell) 1929.

- The Niagara Sprayer Company Fellow in Plant Pathology*: Cyril Galloway Small, B.S. (Cornell) 1928.
- The Charles Lathrop Pack Fellows in Nature Study and Forestry*: Karl Snyder Hazeltine, B.S. (California) 1914, A.M. (Stanford) 1927; Robert Anthony Johnson, B.S. (Purdue) 1925, M.S. (Syracuse) 1926.
- The N. V. Potash My. Fellow in Agronomy*: Francis Ralph Dreibilbis, B.S. (Pennsylvania State) 1924, M.S. (Ohio State) 1928.
- The Laura Spelman Rockefeller Scholars in Home Economics*: Ella Everett Paulus, B.S. (Ohio) 1924, M.S. (Cornell) 1928; Jennie Aileen Reece, B.S. (Utah Agricultural) 1922.

GRADUATE SCHOLARS

- The Graduate Scholar in Chemistry*: Manson Benedict, B.Chem. (Cornell) 1928.
- The Graduate Scholar in History*: Helen Iva Sullivan, A.B., A.M. (Cornell) 1927, 1928.
- The Graduate Scholar in Geology*: Beatrice Edith Bolton, A.B., A.M. (Syracuse) 1926, 1927.
- The Graduate Scholar in English*: Earl Charles Smith, A.B., A.M. (Cornell) 1926, 1928.
- The Graduate Scholar in Animal Biology*: Harrison Flint Lewis, A.B. (Acadia) 1917, A.M. (Toronto) 1926.
- The Graduate Scholar in Physics*: Leah Irene Wells, A.B. (Mount Holyoke) 1927.
- The Susan Linn Sage Graduate Scholars in Philosophy*: Howard Kent Davies, A.B. (Kenyon) 1928; Everett Wesley Hall, A.B., A.M. (Lawrence) 1923, 1925; Ku Jen Huang, A.B. (Yenching) 1927; Bunji Tagawa, A.B. (Kansas) 1926; Mary May Barkaloo Roos, A.B. (Texas) 1925.
- The Graduate Scholar in Archaeology and Comparative Philology*: Anna Thompson Winecoff, A.B., A.M. (Wyoming) 1926, 1928.
- The Susan Linn Sage Graduate Scholars in Psychology*: Albert Douglas Glanville, A.B. (Cornell) 1927; Graydon LaVerne Freeman, B.S. (Syracuse) 1925, A.M. (Cornell) 1928; Emeline Rebecca Moul, A.B. (Wilson) 1920.
- The Graduate Scholar in Civil Engineering*: James Bernard Baty, B.S. in C.E. (Texas A. & M. College) 1925 (first term); Charles Lun Chou, B.S. (Peiyang) 1919 (second term).
- The Graduate Scholar in Veterinary Medicine*: Gerald Roderick Dowd, D.V.M. (Kansas State) 1925.

ADVANCED DEGREES CONFERRED IN 1927-28

MASTERS OF ARTS

CONFERRED SEPTEMBER 28, 1927

- Charles Lee Ackley, B.S.: Experimental Physics, Theoretical Physics. Thesis: *A Study of Change in Mass of Ultra-Microscopic Drops of Olive Oil*.
- Olive Fern Braham, A.B.: English Dramatic Literature, American Literature. Thesis: *The Dramas of Sir Henry Taylor*.
- Mary Gilchrist Cooley, A.B.: French, English. Thesis: *Aspects of Character Study in the Work of Marcel Proust*.
- Ethel Doreen Frost, A.B.: English, French. Thesis: *Scenic Atmosphere in Shakespeare*.
- Naomi Doan Furnas, A.B.: Zoology, Plant Physiology. Thesis: *An Annotated Index of Protozoa Parasitic in Man*.
- Frieda Almira Gillette, A.B.: American History, Modern European History. Thesis: *Calhoun and the Election of 1844*.
- Mildred Antoinette Johnson, A.B.: Victorian Literature, American Literature. Thesis: *A Study of Ruskin in Italy*.
- Anita Louise Krantz, A.B.: Dramatic Production, Public Speaking. Thesis: *The History of the Theory of Direction in the Theatre*.
- Margaret Ann Lonergan, A.B.: Education, English. Thesis: *High School Publications*.

- Hazel Mary Lyon, A.B.: Zoology, Limnology. Thesis: *The Aquatic Population of a Rocky Gorge.*
- Margaret Dorothy Meyer, A.B.: Labor, Educational Psychology. Thesis: *A Study of the Works Council of the General Electric Company at Schenectady.*
- Emily Elizabeth Moore, Ph.B.: American History, Political Science. Thesis: *The Attitude of the American People Towards the English Reform Bill of 1832.*
- Edith Marie Lowe Ober, B.S.: Education, Nineteenth Century English. Thesis: *A Study of Method in Teaching Spelling.*
- Andrew Prosper Pelmont, A.B.: French Literature, English Literature. Thesis: *Les Idées Politiques et Religieuses de Stendhal.*
- Cornelia Bell Roach, B.S.: Education, Psychology. Thesis: *The Development of Arithmetic as a School Subject.*
- Lura Josephine Sawdon, A.B.: Zoology, General Biology. Thesis: *The American Alligator Fact and Fiction in North American Travels and Historical Sources before 1860.*
- John Victor Shankweiler, B.S.: Structural Zoology, Ecological Zoology. Thesis: *The Function of the Cutaneous Glands of the Toad.*
- Marcellus Henry Stow, A.B.: Sedimentary Petrography, Micropaleontology. Thesis: *An Occurrence of Oriskany Sandstone with Celestite Cement.*
- Mildred Watt, A.B.: Geometry, Analysis. Thesis: *Linear Construction of Conics Partially Determined by Pairs of Conjugate Points.*
- Lillian Alice Wilcox, B.S.: Education, Psychology. Thesis: *An Analysis of Recent Trends in Geography in the Elementary Schools.*
- Mildred Fay Wilson, A.B.: Music, Elizabethan Literature. Thesis: *The English Lute Ayre and its Monodic Forerunners.*

CONFERRED FEBRUARY 8, 1928

- Ruth Englof Carlson, A.B.: Labor, Government. Thesis: *The Railway Employees Department of the American Federation of Labor.*
- Vincent Cioffari, A.B.: Italian Literature, Spanish Literature. Thesis: *Dante's Use of Lapidaries.*
- Leah Almira Day, B.S.: Education, Child Training. Thesis: *The Education of the Five-Year Old Child.*
- William John Hamilton, jr.: Vertebrate Zoology, Aquiculture. Thesis: *A Contribution to the Life History of the Short-tailed Shrew (Blarina brevicauda) Say.*
- Frederick Rudolf Hirsh, jr.: General Physics, Alternating Currents. Thesis: *The Effect of Light on the Dielectric Constant of Selenium.*
- Dorothy Rossman Hunt, A.B.: American History, English History. Thesis: *Missions Among the Indian Tribes in the Mississippi Valley, 1789-1860.*
- James Russell Jenness, B.S.: Experimental Physics, Theoretical Physics. Thesis: *The Effect of Temperature upon the Fluorescence Spectra of Organic Solutions.*
- Mary Veronica McAllister, Ph.B.: Victorian Prose Literature, Early Nineteenth Century Poetry. Thesis: *Wordsworth's Ideal in Education.*
- Mary Ruth Michael, A.B.: Literary Criticism, Elizabethan Literature. Thesis: *A Theory of Poetry.*

CONFERRED JUNE 18, 1928

- Charles Edward Francis Baker, A.B.: Literary Criticism, Old and Middle English. Thesis: *Milton's Studies in the Period of Old and Middle English.*
- Burton H. Belknap, B.S.A., LL.B.: Rural School Administration, Rural School Supervision. Thesis: *The Training and Function of the Rural School Superintendent of Michigan.*
- Mary Elizabeth Bohannon, A.B.: English History, Modern European History. Thesis: *The Influence of London on Political Events in 1640.*
- Roland Bassett Botting, B.S. in Ed.: Chaucer, Literary Criticism. Thesis: *Aristophanes in English Literature.*
- Evelyn Mercer Bristow, A.B.: Modern European History, 19th Century English. Thesis: *Court Ladies of the Second Empire and their Influence on Politics.*
- Mary Helen Burriss, A.B.: Elizabethan Literature, Literary Criticism. Thesis: *The Amorous War.*

- Victor Lloyd Butterfield, A.B.: Literary Criticism, Old and Middle English. Thesis: *Longinus and the Psalms in the Authorized Version*.
- Margaret Leslie Canby, A.B.: Botany, Zoology. Thesis: *Some Features of the Morphology and Anatomy of the Crucifer Flower*.
- Harold Godfrey Carlson, A.B.: German Literature, German Philology. Thesis: *Edouard Dorsch, his Life and Works*.
- Guinevere Carolyn Christman, A.B.: Zoology, Histology and Embryology. Thesis: *Morphology of the Primary and Accessory Genital Organs of Certain Poeciliidae*.
- Lou Wilson Conklin, A.B.: Classical Rhetoric, Latin and Greek. Thesis: *The Fifth Book (De Rhetorica) of the De Nuptiis Philologiae et Mercurii et de Septem Artibus Liberalibus of Martianus Capella*.
- Tyreeca Elizabeth Stemple Davis, A.B.: Geometry, Analysis. Thesis: *Periodic Quadratic Transformations and Quartic Curves Left Invariant by them*.
- Elizabeth Donald, A.B.: English, Philosophy. Thesis: *American and Foreign Elements in the Works of Irving, Cooper, and Hawthorne*.
- Georgianna Hawley Duncan, A.B.: Structural Geology, Economic Geology. Thesis: *Geologic Structure between the Catskills and the Berkshires in the Region of Hudson, N. Y.*
- Elizabeth Lavina Dunster, A.B.: Education, History. Thesis: *The Influence of the Academy Movement on Secondary Education in N. Y. State with respect to State Curricular Revision*.
- Eliot Gilbert Fay, A.B.: French Literature, English Literature. Thesis: *The Philosophy of Albert Samain*.
- Graydon LaVerne Freeman, B.S. in Ed.: Psychology, Neurology. Thesis: *An Experimental Study of the Perception of Objects*.
- Helen Gretchen Funnell, A.B.: Elizabethan Literature, Literary Criticism. Thesis: *English Quantitative Verse, Sir John Cheke to Thomas Campion*.
- Anna Gasool, A.B.: French, History of Philosophy. Thesis: *The Greek Tradition in the Work of Albert Samain*.
- Joseph Addison Giddings, A.B.: Nineteenth Century English, Old English. Thesis: *Some Influences of Shakespeare upon the plays of Alfred, Lord Tennyson*.
- William George Gordon, A.B.: Industrial Chemistry, Inorganic Chemistry. Thesis: *The Alizarin Industry*.
- Regina Gottfried, A.B.: German Literature, German Philology. Thesis: *Udo Brachvogel-Memorabilia*.
- Christine Nellie Hardy, A.B.: Zoology, Entomology. Thesis: *The Natural History of the Sullivan Expedition*.
- Caroline Ella Heminway, A.B.: Paleontology, Structural Geology. Thesis: *Devono-Carboniferous Differentia*.
- Wilbur Samuel Howell, A.B.: Literary Criticism, Rhetoric and Public Speaking. Thesis: *A Translation of Alcuin's "Disputatio de Rhetorica et Virtutibus" with introduction and notes*.
- Leona Helen Jacobs, A.B.: English, Philosophy. Thesis: *Keats's Relations with his Greater Contemporaries*.
- Helen Louise Jenkins, A.B.: English History, Modern European History. Thesis: *"Mercurius Politicus" and its Political Theory*.
- Caroline Avery Lester, A.B.: Mathematics, Mathematics. Thesis: *Generalized Trigonometric Functions*.
- Louise Joanne Lienemann, A.B. in Ed.: Zoology, Organic Chemistry. Thesis: *A Review of the Origin and Migration of the Primordial Germ Cells and the Multicellular Animals*.
- Dorothy Helen McClay, A.B.: Elizabethan Literature, English Drama. Thesis: *Two Lamentable Tragedies by Rob. Yarlington 1601. Edited with Introduction and Notes*.
- Helen Winifred McManus, A.B.: Modern Novelists, Modern Victorian Literature. Thesis: *A Study of DeMorgan's Novels*.
- Harvey Claffin Mansfield, A.B.: Government, Modern European History. Thesis: *Authority in the Economic and Political Spheres*.
- John Henry Marchant: Physics, Mathematics. Thesis: *The Change in the Capacity of a Condenser Having a Solid Dielectric with Pressure*.

- Lulu Farleigh Miller, A.B.: American Literature, Drama. Thesis: *English and American Traits in Early American Fiction.*
- Ethel Margaret Mohr, A.B.: Experimental Physics, Theoretical Physics. Thesis: *On Contact Rectification by Copper Oxide.*
- Virginia Kathryn Morris, A.B.: Victorian Literature, 18th Century Literature. Thesis: *The Life of the Peasant in the Wessex Novels.*
- Greta Louise Osborne, A.B.: Comparative Literature, English Literature—1500–1640. Thesis: *The "Tractatus Coislinianus" applied to the Works of Chaucer.*
- Chester Baldwin Pond, A.B.: Economics, Philosophy. Thesis: *Recent Open Market Operations of the Federal Reserve System.*
- Wilma Jennings Pugh, A.B.: Modern European History, English History. Thesis: *Provisioning Paris in 1789.*
- Elizabeth Kathryn Ruhnka, A.B.: Literary Criticism, Dante. Thesis: *Wordsworth's Theory of Poetry.*
- Earl Leslie Sasser, B.S.: English, Education. Thesis: *Carlyle's Influence on Ruskin.*
- Mary Elizabeth Smith, A.B.: Latin, Philosophy. Thesis: *Seneca's "De Vita Beata."*
- Mary Margaret Smith, A.B.: French, Spanish. Thesis: *Symbolism of Nature in the Poetry of Albert Samain.*
- Kathleen Morris Sofley, A.B.: Latin, Archaeology. Thesis: *Catullus LXVIII.*
- John Hall Stewart, A.B.: Modern European History, Government. Thesis: *Introduction to the Life and Works of Jean Paul Rabant de Saint Etienne, the Huguenot Patriot.*
- Helen Iva Sullivan, A.B.: Modern European History, Economic Theory. Thesis: *Federalism and the French Revolution.*
- Margaret Anna VanWinkle, A.B.: Nineteenth Century English, Literary Criticism. Thesis: *The Celtic Element in the Novels of Charlotte and Emily Brontë.*
- Clark Warburton, A.B.: Economic Theory, Mathematics. Thesis: *The Mathematical Theory of Price.*
- Elizabeth Virginia Warren, A.B.: Literary Criticism, Old and Middle English. Thesis: *Poetic Art in Samson Agonistes.*
- Maude K. Weeks, A.B.: French, English. Thesis: *A Critical Annotated Edition of Polyphème, by Albert Samain.*
- Gilbert Marcy Weeks, A.B.: 17th Century English, Modern Novels. Thesis: *The Art of Biography in Renaissance England.*
- Duncan Whitehead, A.B.: Neuro-Anatomy, Physiology. Thesis: *Central Connections of the Lingual Nerve in the Cat, An Experimental Research.*
- Virginia Middleton Wildey, A.B.: American History, Government. Thesis: *The Bank War.*

MASTERS OF SCIENCE

CONFERRED SEPTEMBER 28, 1927

- Ruth Alice Boak, B.S.: Bacteriology, Physiology: Thesis: *The Longevity of Brucella Abortus in Dairy Foods.*
- Hazel Bratley, B.S.: Rural Education, Foods and Nutrition. Thesis: *A Study of the Problems and Difficulties of Student Teachers of Home Economics of Cornell University.*
- Charlotte Becker Culver, B.S.: Household Economics, Rural Education. Thesis: *A Study of the Quantities of Food Purchased by Farm Families in Selected Localities of New York State.*
- Stanley Smith Greene, B.S.: Rural Education, Agricultural Economics and Farm Management. Thesis: *A Study of Time and Cost Standards in Performing Farm Shop Jobs.*
- Lotti June Greiff, A.B.: Physical Chemistry, Physics. Thesis: *On the Existence of Solid Metal Polyhalides.*
- Paul Edmond Hering, A.B.: Aquiculture, Economic Entomology. Thesis: *A Study of the Reproductive Capacity of Simocephalus Serrulatus "Koch."*
- Elton Brainard Hill, B.S.: Farm Management, Rural Education. Thesis: *Agriculture in Michigan.*

- Verey G. Martin, A.B.: Rural Education, Agricultural Economics. Thesis: *Tenure of Agricultural Teachers in Mississippi.*
- Peter Olafson, D.V.M.: Veterinary Pathology and Bacteriology, Histology. Thesis: *Lesions in Guinea Pigs Produced by Brucella Abortus Strains, of Human, Bovine, and Porcine Origin.*
- George Edgar Ritchey, B.S.: Plant Breeding, Agronomy. Thesis: *A New Factor Pair for Aleurone Color in Maize Complementary to Aa, Cc, Rr, and Ii.*
- Arthur Rowlands, B.Sc.: Dairy Industry, Statistics. Thesis: *Sanitary Control of Market Milk Supplies.*
- Willis Rowland Skillman, B.S.: Rural Education, Education. Thesis: *The Discovery of High School Problems Facing Cumberland County, Pennsylvania.*
- Hans Theiler, M.R.C.V.S.: Bacteriology, Veterinary Medicine. Thesis: *Necrobacillosis: A Review of the Literature and a Study on Experimental Immunization in the Rabbit.*
- George Ripley Tracy, B.S.: Organic Chemistry, Education. Thesis: *6-Nitro Fluorescein, 2', 4'-Dihydroxy-Benzoyl-6-Nitro Benzoic- 2- Acid, and some of their Derivatives.*
- Ralph Newcomb Van Arnam, E.E.: Astronomy, Physics. Thesis: *The Velocity Variation of the Cepheid Variable, Beta Cephei.*

CONFERRED FEBRUARY 8, 1928

- Ray Bender, B.S.: Genetics, Animal Breeding. Thesis: *Color Inheritance in the Horse.*
- Helen Canon, A.B.: Household Economy, Agricultural Economics. Thesis: *Sizes of Purchasing Centers of New York State Farm Families.*
- W. Storrs Cole, B.S.: Paleontology, Structural Oil Geology. Thesis: *A Forminiferal Fauna from the Guayabal Formation in Mexico.*
- Derrill McCollough Daniel, B.S.: Economic Entomology, Insect Morphology. Thesis: *The Biology and Control of the Blackberry Leaf-Miner.*
- Alejandro Morales de Mesa, B.S.: Economic Entomology, Ecology. Thesis: *The Insect Oak-Galls in the Vicinity of Ithaca.*
- Vivian Virginia Drenckhahn, B.S.: Foods and Nutrition, Biochemistry. Thesis: *Some Quantitative Studies on the Fat-Soluble Vitamins: The Calcium Content of Rats on a Diet Lacking in the Fat Soluble Vitamins.*
- Nancy Kritser Masterman, B.S.: Household Management, Rural Education. Thesis: *Economic Possibilities for the Rural Women and Girls of New York State.*
- Christoffel Hermanus Neveling, A.B.: Farm Management, Marketing. Thesis: *Variations in the Consumption of Ice Cream.*
- Albert Oliver Rhoad, B.S.: Animal Husbandry, Animal Nutrition. Thesis: *A Statistical Study of Pulling Power in Horses.*
- Norman Edward Weisbord, A.B.: Paleontology and Stratigraphy, Dynamic and Structural Geology. Thesis: *Venezuelan Devonian Fossils.*

CONFERRED JUNE 18, 1928

- Janet Watson Bump, B.S.: Home Economics, Farm Economics. Thesis: *A Scale for the Measurement of the Cost of Food for a Family.*
- Forrest Glover Burd, B.S.: Agricultural Education, Agricultural Economics. Thesis: *A Method of Determining Courses of Study in Vocational Agriculture Based on Analysis of the Business of Selected Farmers in Kentucky.*
- Helen Allen Burd, B.S.: Rural Education, Rural Social Organization. Thesis: *A Study of Extra-Class Activities in the High Schools of Kentucky.*
- John Carroll, B.S.: Economic Entomology, Insect Morphology. Thesis: *A Study of the Biology of the Cycad Scale Furchadaspis Zamiae MacGillivray.*
- Harrison Levi Chance, B.S., B.S. in Agr.: Plant Physiology, Plant Pathology. Thesis: *The Relation Between the Catalase Activity of Inbred Strains in the Crosses of Inbred Strains of Corn Seedlings to the Vigor of the Seedlings.*
- James Kirk Coggin, B.S.: Agricultural Education, Agricultural Economics. Thesis: *Factors to be Considered in Locating Departments of Vocational Agriculture in the High Schools of North Carolina.*

- William Earle Cole, B.S. in Agr.: Rural Education, Secondary Education. Thesis: *The Development of Supervision of Instruction.*
- Otto Clement Croy, B.S. in Agr.: Rural Education, Rural Social Organization. Thesis: *An Evaluation of 4-H. Club Activities in Terms of Educational Objectives.*
- Ella Mary Cushman, B.S.: Household Management, Farm Management. Thesis: *Organization of the Sewing Center in the Home.*
- Vartkes Sarkis Dakessian, B.S.: Poultry Husbandry, Apiculture. Thesis: *The Relation of the Rate of Growth to the Protein Requirements of Chicks.*
- George Webster Derrick, D.V.M.: Genital Diseases, Poultry Diseases. Thesis: *A Report on the Application of a Plan for the Control of Bang Abortion Disease.*
- Gerald Roderick Dowd, D.V.M.: Bacteriology, Genital Diseases. Thesis: *A Review of Histology of the Tubercle with a Comparative Study of the Avian, Bovine, and Human Types in Rabbits.*
- William Wallace Dowdy, A.B.: Zoology, Ecology. Thesis: *A Study of Physiological States in *Asellus Communis* Say, through *Rheotaxis*.*
- Clair Dufford, B.S.: Rural Education, Rural Social Organization. Thesis: *Some Problems of Training Teachers of Broad-leaf Tobacco Production.*
- Percy H. Easom, A.B.: Rural Education, Rural Social Organization. Thesis: *A Study of the Per-pupil Costs of Education in the City Schools of Mississippi.*
- Frank Vernon Evans, B.S.: Industrial Chemistry, Physical Chemistry. Thesis: *The Chemistry of Paints.*
- Bower Forward, B.S.A.: Plant Breeding, Agronomy. Thesis: *The Development of New Types of Sunflowers by Inbreeding.*
- Walter Joseph Gibbons, D.V.M.: Veterinary Medicine, Diseases of Cattle. Thesis: *The Pathology of Sterility in a Cow.*
- A. Wright Gibson, B.S.: Rural Education, Marketing. Thesis: *The Elimination of Students in the New York State College of Agriculture at Cornell University.*
- Edson Jorge Hambleton, B.S. in Agr.: Morphology of Insects, Ecology. Thesis: *On the Anatomy and Histology of the Reproductive Organs of the Worker Bee "*Apis Mellifica* L."*
- Leslie Rushton Hawthorn, B.S.: Vegetable Gardening, Plant Physiology. Thesis: *The American Varieties of the Cultivated Radish.*
- Edgar Harold Hinman, A.B.: Limnology, Entomology. Thesis: *Ecological Studies of a Spring-fed Chara Pool.*
- Thomas Eldredge LaMont, B.S.: Farm Management, Pomology. Thesis: *Costs of Producing Apples, Newfane Township, Niagara County, N. Y., in 1926.*
- Dean Richmond Marble, B.S.: Poultry Husbandry, Farm Management. Thesis: *The Application of the Molting Factor in Judging Fowls for Egg Production.*
- John Marshall, jr., B.S.: Farm Management, Marketing. Thesis: *A Study of Membership Relations and Field Service Problems of the Milk Marketing Organizations in the New York Milk Shed.*
- Rheua Vaughn Medden, A.B.: Zoology, Entomology. Thesis: *Historical Accounts of the Rattlesnake taken from the Works of Early Travellers in America.*
- Gerrard Ritchie Megathlin, A.B.: Economic Geology, Structural Geology. Thesis: *The Pegmatite Dikes of the Gilsum Area, New Hampshire.*
- Blanche Maxwell Melvin, B.S.: Rural Social Organization, Rural Education. Thesis: *A Study of the Urban and Rural Divorce Rates in Four New York Counties,—Tompkins, Cortland, Schuyler, and Tioga.*
- Eleanor Newcomer, A.B.: Physical Chemistry, Sanitary Chemistry. Thesis: *Breaking Emulsions by Freezing.*
- Maganbhai Dahyabhai Patel, B.S.: Animal Breeding, Animal Nutrition. Thesis: *Inheritance of Milk Yield and Butter Fat Percentage in Dairy Cattle.*
- Albert Joseph Paulus, B.S. in Agr.: Rural Education, Farm Management. Thesis: *An Evaluation of the References Used in the Farm Management Course as Taught in the Trumansburg High School Based upon the use of a Score Card.*
- Ella Everett Paulus, B.S.: Child Training, Psychology. Thesis: *A Study of Status and Growth of Selected Infants Nine to Fourteen Months of Age.*
- William Davis Pritchard, B.S.: Economic Entomology, Ecology. Thesis: *A Study of Certain Leaf Rollers on Apple with Special Emphasis on the Oblique-Banded Leaf Roller (*Archips Rosaceana*), and the Insect Inhabitants of the Turtle Head Flower (*Chelone Glabra*).*

- Olive Janet Robison, N.D.A., N.D.D., B.D., F.D.: Animal Husbandry, Farm Management. Thesis: *A Comparison of Dairy Farming in New York State and England and Wales.*
- George Thomas Sargent, B.S.: Agricultural Education, Agricultural Economics. Thesis: *A Study of Certain Cotton Growing Operations in Alabama as a Guide in Determining Content in Cotton Production Courses in Agriculture.*
- Benjamin Martin Shaub, M.E.: Economic Geology, Physical Chemistry. Thesis: *A Unique Feldspar Deposit near DeKalb Junction, St. Lawrence Co., N. Y.*
- Richard Ellis Sherrill, B.S.: Structural Geology, Paleontology. Thesis: *Post-Mississippian Folds and Faults in North Central Oklahoma.*
- Frank Marcellus Staley, A.B., B.S.: Rural Education, Dairy Industry. Thesis: *Suggestions for Curriculum-Making in Agriculture for the Negro Agricultural and Technical College of N. C. Based upon a Study of Agriculture in N. C. and the Experience of the Teachers of Agriculture.*
- Pauline Whitson Stark, B.S.: Bacteriology, Household Economy. Thesis: *Certain Streptococci which Grow at High Temperatures.*
- Lorraine McNeil Van Wagenen, B.S.: Nutrition, Physiology. Thesis: *A Quantitative Study of Various Methods of Administering Vitamin B.*
- Lal Chand Verman, B.S. in E.E.: Physics, Mathematics. Thesis: *Determination of Polarization of Short Radio Waves.*
- Hobart Greenwood White, B.S.: Agricultural Economics, Animal Husbandry. Thesis: *Wool and Wool Marketing in the United States.*
- Lemmie Lee Williams, B.S.: Economic Entomology, Zoology. Thesis: *The Biology and Control of the Harlequin Cabbage Bug.*
- Alexander Zeissig, B.S., D.V.M.: Pathogenic Bacteriology, Plant Breeding. Thesis: *Bracken Poisoning of Cattle.*

MASTERS OF SCIENCE IN AGRICULTURE

CONFERRED SEPTEMBER 28, 1927

- Georgia Eugenia Piland, B.S.: Ornamental Horticulture, Rural Social Organization. Thesis: *A Survey of Landscape Extension in the Improvement of Home Grounds and Public Properties that is being conducted by the State Agricultural Colleges of the United States.*
- Solomon Bernard Williamson Taylour, B.S.: Agronomy, Plant Breeding. Thesis: *The Effect of Limestone and Dolomite on Plant Growth.*

CONFERRED FEBRUARY 8, 1928

- Dwight Leonard Espe, B.S.: Animal Nutrition, Dairy Production. Thesis: *The Use of Dry Skim Milk in the Rearing of Dairy Calves.*

CONFERRED JUNE 18, 1928

- Keith Bissell, A.B.: Animal Husbandry, Farm Management. Thesis: *Some Production Studies of the Cornell University Dairy Herd.*
- Milo Crowe McFeeters, A.B.: Farm Management, Agronomy. Thesis: *The Monopoly of Agricultural Land: Some Causes, Results, and Attempted Reforms.*
- Alfred Melville Stewart Pridham, B.S.A.: Floriculture, Plant Breeding. Thesis: *A Study of Variation, Correlation, and Classification with Reference to Floricultural Crops.*
- Hugh Fairfield Smith, B.S. in Agr.: Plant Breeding, Cytology. Thesis: *A Biometrical Study of Rod Row Plots in Timothy.*
- Yu Ming Tung, B.S.: Rural Economy and Agricultural History, Agricultural Economics. Thesis: *The Relation Between the Development of the Public Domain and Agricultural Production.*

MASTERS IN FORESTRY

CONFERRED JUNE 18, 1928

- Francis Irving Righter, B.S.: Forest Organization, Plant Breeding. Thesis: *Cornell University Wood Lots Working Plan.*

Austin Horatio Wilkins, B.S.: Forest Management, Forest Pathology. Thesis: *Diameter Growth of Commercial Trees with Special Reference to Current Annual Increment.*

MASTERS OF ARCHITECTURE

CONFERRED JUNE 18, 1928

Edward Henry Abbuehl, B.Arch.: Architectural Design, Architectural Construction, History of Architecture. Thesis: *A Graduate School of Fine Arts.*
 Burton Ashford Bugbee, B.Arch.: Architectural Design, Fine Arts. Thesis: *Studies in Design.*

MASTERS OF CIVIL ENGINEERING

CONFERRED SEPTEMBER 28, 1927

Hsiao Wei Lo, B.S. in C.E.: Railroad Engineering, Structural Engineering. Thesis: *A Study of Electrification of Steam Railways.*
 Tshang Sung, B.S.: Hydraulics, Sanitary Engineering. Thesis: *Flow in Open Channels including New Experiments on Wing Wall Obstructions.*

CONFERRED FEBRUARY 8, 1928

Hsien-chiang Hsia, B.S.C.E.: Railway Engineering, Highway Engineering. Thesis: *A Study of the Economics of Railroad Operation.*
 Chia Yang Shih, B.S.: Hydraulics, Hydraulic Engineering. Thesis: *Experiments on the Characteristics of a Fall Increaser.*
 Chu Chien Wang, B.S.C.E.: Railway Engineering, Structural Engineering. Thesis: *A Study of Methods for Increasing the Traffic Capacity of a Single Track Railroad.*
 Yang Tseng Wang, B.S.C.E.: Structural Engineering, Hydraulics. Thesis: *Design of Reinforced Concrete Arch by Different Methods.*
 Edwin Puchu Wu, B.S. in R.C.E.: Railroad Engineering, Structural Engineering. Thesis: *A Study of Track and Track Materials.*

CONFERRED JUNE 18, 1928

Chin Shung Chen, B.S. in C.E.: Railway Engineering, Highway Engineering. Thesis: *The Planning of a National Railway System for China.*
 Lawrence Max Friedrich, B.S. in C.E.: Sanitary Engineering, Highway Engineering. Thesis: *A Study of Sewage Sludge Digestion.*
 En Kou Huang, B.S.: Railroad Engineering, Structural Engineering. Thesis: *A Study of Modern Tunneling.*
 Yu Hsien Huang, B.S.: Hydraulic Engineering, Highway Engineering. Thesis: *An Experimental Investigation on Fall Increaser.*
 Arthur Nelson Vanderlip, C.E.: Structural Engineering, Hydraulic Engineering, Hydraulics. Thesis: *A Design and Comparison of the Flat Slab and Combination Floors.*

MASTERS OF MECHANICAL ENGINEERING

CONFERRED FEBRUARY 8, 1928

Sung Choa Yew, B.S. in M.E.: Heat Power Engineering, Hydraulic Engineering. Thesis: *The Modern Railroad Locomotive.*

CONFERRED JUNE 18, 1928

Sih-van Chang, B.S. in M.E.: Internal Combustion Engines, Industrial Management. Thesis: *Fuel and Detonation.*
 Shen-How Fong, B.S. in M.E.: Internal Combustion Engines, Industrial Management. Thesis: *An Investigation of Automobile Fuels.*
 Shih Ji Ho, B.S. in M.E.: Steam Power Plants, Industrial Management. Thesis: *Design of Riverside Steam Power Plant for Wu Sie.*

- Dexter Simpson Kimball, jr., M.E.: Economics of Production, Labor Problems. Thesis: *Economics of Production*.
- Chia Yu Ren, B.S. in M.E.: Steam Power Plants, Industrial Engineering. Thesis: *Design of a Steam Power Plant for Hang Chow, China*.
- Ken Yon Whang, B.S. in M.E.: Steam Power Plants, Industrial Engineering. Thesis: *Design of Steam Power Plant for Shanghai, China*.

MASTERS OF ELECTRICAL ENGINEERING

CONFERRED FEBRUARY 8, 1928

- Yoshitaro Fujikawa: Electrical Engineering, Physics. Thesis: *Wave Form of Current and the Power Factor in the Primary of a Transformer Supplying a Mercury-Vapor Rectifier*.
- Juan Lopez Tiongson, B.S. in M.E., M.S. in M.E.: Power Generation, Transmission, and Distribution, Radio Communication. Thesis: *Electric Power Generation and Sale in the Philippines*.

DOCTORS OF PHILOSOPHY

CONFERRED SEPTEMBER 28, 1927

- Helen Browder Barber, A.B., A.M.: English History, American History, Sociology. Thesis: *The Journal of Sir Simonds D'Ewes*.
- Annie Webb Blanton, B.L., A.M.: Rural Education, School Administration, Sociology. Thesis: *A Study of the County as a Factor in School Control*.
- Arthur Geoffrey Bruun, A.B., A.M.: Modern European History, Intellectual History, Elizabethan English. Thesis: *Robespierre and the Committee on Public Safety*.
- Peter Pangiotes Carodemos, B.S. in Chem.: Agricultural Chemistry, Sanitary Chemistry, Agronomy. Thesis: *Relation of Salts and Gases of Milk to the Electrical Resistance and Solvent Action of Milk on Copper*.
- Herbert Leroy Davis, A.B.: Physical Chemistry, Inorganic Chemistry, Industrial Chemistry. Thesis: *Osmotic Pressures of Concentrated Solutions*.
- Wallace Klippert Ferguson, A.B., A.M.: Mediaeval History, Modern European History, Literary Criticism. Thesis: *Opuscula Erasmi quae in Operibus a Clerico Editis desiderantur*.
- Dilman Walter Gotshalk, A.B.: History of Philosophy, Ethics, English. Thesis: *The Problem of Mind and Objects in the Philosophies of Samuel Alexander and Ernst Cassirer*.
- Henry Clayton Harris, A.B.: Soils, Plant Physiology, Physical Chemistry. Thesis: *The Effect of Lime on the Availability of Acid Phosphates*.
- Luther Goodrich Jones, B.S.: Agronomy, Chemistry, Bacteriology. Thesis: *The Disappearance of Nitrates under Timothy*.
- Delbert Ernest Keenan, A.B., A.M.: French, Italian, English Literature. Thesis: *Pierre Louys*.
- Raymond Eller Kirk, B.S., M.S.: Inorganic Chemistry, Physical Chemistry, Engineering. Thesis: *A Contribution to the Chemistry of Hydrazine*.
- Lawrence Gane Knowlton, A.B.: Physical Chemistry, Sanitary Chemistry, Organic Chemistry. Thesis: *Some Experiments on Iron*.
- Milton David Marx, A.B., A.M.: English Drama, Elizabethan Literature, History of Architecture. Thesis: *Nineteenth Century English Closet Drama*.
- Frank Wallace Notestein, B.S.: Social Sciences and Statistics, Finance, Economic Theory. Thesis: *Vital Statistics of Cattaraugus County*.
- Gayle Benjamin Pickwell, A.B., A.M.: Ornithology, Limnology and Ecology, Arachnology. Thesis: *The Prairie Horned Lark*.
- Hanson Durham Powers, A.B.: Psychology, Physiology, Education. Thesis: *The Apparent Size of Familiar Objects in Relation to Distance*.
- Archie Hunt Robertson, B.S., M.S.: General Bacteriology, Biochemistry, Organic Chemistry. Thesis: *Thermophilic and Thermoduric Microorganisms, with Special Reference to Species Isolated from Milk*.

- William Mitchell Rogers, B.S.: Histology and Embryology, Anatomy, Physiology. Thesis: *The Development of the Pharynx and the Pharyngeal Derivatives in the White Rat (Mus. Norvegicus Albinus)*.
- Howard Conway Shaub, A.B., A.M.: Geometry, Analysis, Astronomy. Thesis: *Rational Involutorial Transformations in S_4 which Leave Invariant 004 Quadric Varieties*.
- Clifford Nicks Stark, B.S., M.S.: Bacteriology, Dairy Industry, Dairy Chemistry. Thesis: *The Effect of Toxins on the Growth of Bacteria and the Destruction of Toxins through Bacterial Growth*.
- Howard John Steere, Ph.B., A.M.: School Administration, Educational Psychology, Rural Education. Thesis: *A Study of Character Traits as Related to Scholastic Achievement*.
- Vladimir Prokopovoch Timoshenko, Ph.D.: Marketing, Farm Management, Economics. Thesis: *Wheat Prices and the World Wheat Market*.
- Wesley Gabriel Vannoy, B.S., M.S.: Physical Chemistry, Optical Chemistry, Inorganic Chemistry. Thesis: *Induced Reactions*.
- George Paul Vincent, A.B., M.S.: Physical Chemistry, Inorganic Chemistry, Industrial Engineering. Thesis: *The Detergent Action of Soaps, II*.
- Roy Alfred Waggener, A.B., A.M.: Histology and Embryology, Zoology, Physiology. Thesis: *An Experimental and Histological Study of the Parathyroids in the Anura*.
- Leva Belle Walker, A.B., A.M.: Mycology, Plant Pathology, Plant Histology. Thesis: *The Development of Some Basidiomycetous Fungi*.
- Wen Chen Wu, B.S. in Agr.: Pomology, Floriculture, Taxonomy. Thesis: *Some Studies in Catalase Activity of Apple Leaf Tissue*.

CONFERRED FEBRUARY 8, 1928

- Alfred Aslander, B.S., M.S.: Botany, Soil Bacteriology, Physical Chemistry. Thesis: *Experiments on the Eradication of Canada Thistle, *Cirsium arvense* (L) Scop., on Arable Land*.
- Nicholas Bacon, B.Chem.: Physical Chemistry, Organic Chemistry, Sanitary Chemistry. Thesis: *Vulcanization of Rubber*.
- Paul Jones Chapman, B.S.: Economic Entomology, Insect Morphology, Plant Pathology. Thesis: *A Revision of the Suborder Isotecnomera of the Order Corrodentia in North America*.
- Grace Edna Cornelius, A.B., A.M.: Elizabethan Literature, English Literary Criticism, Mediaeval History. Thesis: *Shakespearean Characters and Situations in Beaumont and Fletcher, Ford, Massinger, and Marston*.
- Howard Adams DoBell, A.B., A.M.: Geometry, Analysis, Industrial Organization. Thesis: *On the Geometry of the Triangle*.
- Edith Anna Farnham, A.B., A.M.: English History, American History, Modern European History. Thesis: *The Parliamentary Career of Sir Robert Phelps, 1604-1624*.
- Harry Marion Fridley, B.S., M.S.: Physical Geography, Stratigraphy, Soil Technology. Thesis: *Identification and Correlation of Erosion Surfaces in South Central New York*.
- Pallempati Gopala Krishna, B.S.: Agronomy, Pathogenic Bacteriology, Plant Breeding. Thesis: *Azotobacter and Nitrogen Fixation Studies*.
- William Thomas MacCreadie, B.S., A.M.: Analysis, Geometry, Physics. Thesis: *On the Stability of the Motion of a Viscous Fluid*.
- Frank Paden McWhorter, B.S., M.S.: Plant Pathology, Mycology, Plant Physiology. Thesis: *The Diseases of *Carica Papaya**.
- Lytel Raymond Parks, B.S.C.E., M.S.: Physical Chemistry, Industrial Chemistry, Micro-Chemistry. Thesis: *Turkey Red Dyeing*.
- William Marion Pierce, A.B., M.S.: Experimental Physics, Spectroscopy and Luminescence, Alternating Currents. Thesis: *The Electrolytic Capacitance of Cells Containing Platinum Electrodes in a Solution of Sulphuric Acid*.
- Paul Patrick Rogers, B.S.: Spanish, Italian, French. Thesis: *The Pre-Romantic Drama of Spain, an Introductory Study*.

- Charles Albert Rouse, Ph.B., A.M.: Elizabethan Literature, English Language, Nineteenth Century English. Thesis: *Thomas Haywood, his Life and Works*.
- Theodore Edward Sexauer, B.S.A., B.S. in Ed., M.S.A., A.M. in Ed.: Rural Education, Rural Social Organization, Agricultural Economics. Thesis: *A Determination of the Major Activities of Dairy Farmers of New York as a Basis for a Curriculum in Dairy Husbandry*.
- Caspar Shapiro, B.Chem.: Organic Chemistry, Physical Chemistry, Theoretical Physics. Thesis: *Hydroquinolsulfonephthalein and Some of its Derivatives. The Absorption Spectra of Hydroquinolphtalein and Hydroquinolsulfonephthalein*.
- Tsunghan Hunt Shen, B.S., M.S.A.: Plant Breeding, Agronomy, Plant Physiology. Thesis: *The Inheritance of Earliness and its Relation to Height of Plant in Winter Wheat Crosses*.
- Ethel Drever Simpson, A.B., A.M.: Physiology, Biochemistry, Parasitology and Medical Entomology. Thesis: *Further Experimental Studies on the Thyroid Gland*.
- John Leslie Tennant, B.S.A., M.S. in Agr.: Farm Management, Rural Education, Economics. Thesis: *The Economic Relationships between Roads and Agriculture in New York*.
- Mather Francis Thurston, A.B.: Marketing, Economics, Farm Management. Thesis: *The Outlook for Market Hay in New York State*.
- Lawrence Root Waldron, B.Sc., A.M.: Practical Plant Breeding, Theoretical Plant Breeding, Comparative Vertebrate Anatomy. Thesis: *Inheritance of Dwarfness in Certain Crosses of Common Wheat, especially between Marquis and Kota*.
- CONFERRED JUNE 18, 1928
- Seymour Wilson Brainard, B.S.: Industrial Chemistry, Analytical Chemistry, Physical Chemistry. Thesis: *The Detergent Action of Soap*.
- Thomas Bregger, B.S.: Plant Breeding, Plant Physiology, Soils. Thesis: *Variation in Chlorophyll Development of Maize Seedlings at Sub-Normal Temperatures and its Inheritance*.
- Reece Lawrence Bryant, B.S., M.S.: Poultry Husbandry, Marketing, Bacteriology. Thesis: *The Effects of Various Washing Solutions on the Keeping Quality of Eggs*.
- Howe Symonds Cunningham, B.S.A., M.S.A.: Plant Pathology, Plant Physiology, Plant Anatomy. Thesis: *Studies in Pathological Histology of Leaf Lesions*.
- Hannibal Albert Davis, A.B., A.M.: Geometry, Analysis, Physics. Thesis: *Involutorial Transformations belonging to a Linear Complex*.
- Corwin D. Edwards, A.B., B.J., B.L.: Labor, Economic Theory, Industrial Organization: Trusts and Combinations. Thesis: *The First International Workingmen's Association*.
- Erwin Graue, B.S.: Rural Economy, Financial Economics, Economic Theory. Thesis: *The Balance of Agricultural and Urban Industrial Enterprise*.
- Lillian Maynard Hatfield, A.B., A.M.: Psychology, Physiology, French. Thesis: *Mechanisms Employed in Determining the Nature of Colors*.
- French Leo Haynes, A.B., A.M.: Elizabethan English, Philosophy, 19th Century English. Thesis: *The Troy Story in English Literature to 1640*.
- Hugh Bayard Hodge, jr., B.Chem.: Industrial Chemistry, Physical Chemistry, Industrial Organization. Thesis: *Viscosity Relationships in the System Sulphuric Acid: Nitric Acid: Water*.
- Donald Aubrey Holt, B.Chem.: Optical Chemistry, Inorganic Chemistry, Organic Chemistry. Thesis: *Persistence and Sensitivity of Arc Spectral Lines*.
- Jen Hsien Hsu, M.S.: Physics, Astronomy, Spectroscopy. Thesis: *The Fine Structure of the Absorption Band of Water Vapor of 0.94*.
- John Carl Huttar, B.S.: Poultry Husbandry, Agricultural Economics, Economics. Thesis: *A Study of Poultry House Ventilation for Laying and Breeding Houses*.
- Ralph Lent Jeffery, A.B., A.M.: Analysis, Geometry, Physics. Thesis: *The Sequences of Functions which Define a Definite Integral Containing a Parameter*.
- Leon E. Jenks, B.S., M.S.: Physical Chemistry, Analytical Chemistry, Inorganic Chemistry. Thesis: *Plasticity of Clay*.

- George Kreezer, A.B.: Psychology, Physiology, Education. Thesis: *A Phenomenological Study of Luminosity including Glow and Related Modes of Visual Appearance.*
- Harold William Landin, A.B., A.M.: Modern European History, American Constitutional Law, Ancient History. Thesis: *Thomas Jefferson and the French Revolution.*
- Louis Leonard Larson, B.S.: Physical Chemistry, Industrial Chemistry, Organic Chemistry. Thesis: *Physico-Chemical Studies on Gelatin.*
- Fred Fouse Lininger, B.S. in Agr., M.S.: Marketing, Farm Management, Economics and Finance. Thesis: *The Relation of the Basic-Surplus Marketing Plan to Milk Production and Shipping-station costs in the Philadelphia Milk Shed.*
- Gladys Kathryn McCosh, A.B., M.S.: Vertebrate Morphology, Entomology, Invertebrate Zoology. Thesis: *A Study of the Germ Cell Gonad, and Fat-Body in Ambystoma Maculatum.*
- George Harrison Maughan, B.S.A., A.M.: Physiology, Anatomy, Public Health. Thesis: *Some Phases of Ultra-violet Ray Treatment.*
- Julian Howell Miller, B.S.A., M.S.: Mycology, Systematic Botany, Cytology. Thesis: *Biological Studies in the Sphaeriales.*
- Jack Miscall, B.S., M.S.: Agricutlural Chemistry, Physical Chemistry, Biological Chemistry. Thesis: *Physico-Chemical Study of the Effects of the Gases Dissolved in Fresh Milk, especially Carbon Dioxide upon the Reactions in Milk during Processing.*
- Robert Page Myers, B.S., M.S.: Dairy Industry, Bacteriology, Physical Chemistry. Thesis: *Germicidal Properties of Alkalies with Special Reference to the Influence of Hydroxyl Ion Concentration, Buffer Index and Osmotic Pressure.*
- Paul Robert Needham, B.S., M.S.: Limnology, Entomology, Apiculture. Thesis: *Drift and Bottom Organisms of Cold Water Streams, A Quantitative and Qualitative Study.*
- Johann Christiaan Neethling, A.B.: Farm Management, Rural Economics, Economics. Thesis: *An Economic Study of Dairy Farming in the Chenango Valley, N. Y.*
- Henry Edward Nettles, A.B., A.M.: English History, Modern European History, American History. Thesis: *Chartered Companies in Overseas Trade from Mary to Charles I.*
- Robert Logan Nugent, B.S. in Chem., M.S., A.B.: Physical Chemistry, Inorganic Chemistry, Organic Chemistry. Thesis: *Concentration Effects with Selective Membranes.*
- Everett Oertel, B.S.: Apiculture, Morphology, Economic Entomology. Thesis: *Metamorphosis in the Honey Bee.*
- Earl Walter Phelan, B.Chem.: Inorganic Chemistry, Physical Chemistry, Industrial Organization. Thesis: *A Contribution to the Chemistry of Hydroxylamine.*
- Ivan Francis Phipps, B.S.: Plant Breeding, Plant Physiology, Agronomy. Thesis: *The Inheritance and Linkage Relations of Virescent Seedlings in Maize.*
- Miles David Pirnie, B.S.: Ornithology, Vertebrate Zoology, English. Thesis: *The Plumage Changes of Certain Water Fowl.*
- Paul Smith Prickett, B.S., M.S.: Bacteriology, Biochemistry, Sanitary Chemistry. Thesis: *Certain Thermophilic and Thermoduric Organisms Associated with Milk.*
- Herbert Joseph Reich, M.E.: Experimental Physics, Theoretical Physics, Mathematics. Thesis: *The Photo-Electric Effect in Glow-Discharge Tubes.*
- Alexis Lawrence Romanoff, B.S., M.S.A.: Poultry Husbandry, Animal Husbandry, Biochemistry. Thesis: *An Effect of Humidity on the Growth and Calcium Metabolism of Chick Embryo.*
- Charles Hamilton Saylor, B.Chem.: Physical Chemistry, Optical Chemistry, English Language and Literature. Thesis: *Calcite and Aragonite.*
- Joseph Theodore Schultz, A.B.: Latin, Greek, English Literary Criticism. Thesis: *Thesaurus Servianus necnon Donatianus.*
- John Vertrees Starr, A.B.: Industrial Chemistry, Physical Chemistry, Inorganic Chemistry. Thesis: *Reflection Factors of White Paint.*

- Anastasio Lalota Teodoro, B.Agr., M.S.: Rural Engineering, Heat-Power Engineering, Rural Education. Thesis: *Primary Power for the Philippines*.
- Charles Ketchum Tucker, B.S., M.S.: Agricultural Economics, Dairy Industry, Economics. Thesis: *An Economic Study of the Cost of Handling Fluid Milk and Cream in Country Plants*.
- Romulus Seitz von Hazmburg, B.Chem.: Inorganic Chemistry, Optical Chemistry, Organic Chemistry. Thesis: *Equilibrium in Certain Binary Systems with one Volatile Component*.
- Cyril James Watson, B.S.A., M.A.: Agricultural Chemistry, Organic Chemistry, Physical Chemistry. Thesis: *A Study of the Reactions Involved in the Determination of Minute Traces of Iodine and an application to some Feeding Experiments with Fish Meal*.
- George Baker Welch, B.S., A.M.: Experimental Physics, Theoretical Physics, Psychology. Thesis: *Photoelectric Thresholds and Fatigue*.
- Estelle Frances Wells, A.B.: Psychology, Physiology, Oriental History. Thesis: *An Experimental Study of Affective Experience*.
- James Stewart Wiant, B.S.: Plant Pathology, Plant Physiology, Physical Chemistry. Thesis: *The Rhizoctonia Damping-off of Conifers and its Control by Chemical Treatment of the Soil*.
- Arthur Lensen Woehl, A.B., A.M.: Dramatic Art, Rhetoric and Public Speaking, Literary Criticism. Thesis: *Burke's Reading*.
- William Frederick Zimmerman, A.B., A.M.: European History, English History, American History. Thesis: *Barnave the Monarchist*.

MEMBERS OF THE STAFF OFFERING GRADUATE WORK

- Adams, J. Q., 25, 26, 27, 28.
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