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CONTENTS

GENERAL INFORMATION

THE FACULTY OF THE GRADUATE SCHOOL

The Faculty of the Graduate School has exclusive jurisdiction over all graduate work and advanced degrees and consists of three groups: (1) an *ex-officio* group, including the President of the University who is the presiding officer; the Provost of the University, who in the absence of the President is the presiding officer; the Deans of the several Faculties of the University; and the Directors of the New York State Experiment Stations; (2) a variable academic group consisting of those professors, assistant professors, and instructors who, as members of special committees, are actively engaged in supervising the work of graduate students; (3) a permanent academic group including those members of the University Faculty who, during five consecutive years, have been members of group (2).

Professors, assistant professors, instructors who hold the Doctor's degree, and such other members of the teaching staff of the University as the Faculty may authorize, are eligible for membership on the Special Committees in charge of the work of graduate students.

THE PURPOSE OF THE GRADUATE SCHOOL; DEGREES

It is the purpose of the Graduate School to offer to adequately trained students facilities for advanced study and for research, with the two-fold purpose (1) of providing each such student with a comprehensive view of a field of knowledge and (2) of training him for independent investigation in that field. A high grade of scholarly work, as distinguished from the fulfillment of routine requirements, is expected of every student.

The following degrees are offered:

Doctor of Philosophy (Ph.D.)
Doctor of the Science of Law[1] (J.S.D.)
Master of Arts (A.M.)
Master of Science (M.S.)
Master of Architecture[2] (M.Arch.)
Master of Landscape Architecture[2] (M.L.A.)
Master of Fine Arts[2] (M.F.A.)
Master of Science in Agriculture (M.S. in Agr.)
Master of Forestry (M.F.)
Master of Chemistry[3] (M.Chem.)
Master of Science in Education[4] (M.S. in Ed.)

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[1]Under the special jurisdiction of the Division of Law.
[2]Under the special jurisdiction of the Division of Architecture and Fine Arts.
[3]Under the special jurisdiction of the Division of Chemistry.
[4]Under the special jurisdiction of the Graduate School of Education.

Master of Civil Engineering[5] (M.C.E.)
Master of Mechanical Engineering[5] (M.M.E.)
Master of Electrical Engineering[5] (M.E.E.)
Master of Science in Engineering[5] (M.S. in Eng.)
Master of Laws[1] (LL.M.)

Correspondence about admission to the Graduate School, or registration for any of the degrees listed above, should be addressed to *The Graduate School, Cornell University, Ithaca, New York.* Inquiries about facilities for advanced study and research may also be addressed to the Department in which such work is done, or to the Division or School under whose jurisdiction the advanced technical degree in question is granted.

ADMISSION

To be admitted to the Graduate School, an applicant (1) must have received his baccalaureate degree from a college or university of recognized standing, or have done work equivalent to that required for such degree; and (2) as judged by his previous scholastic record, or otherwise, must show promise of ability to pursue advanced study and research.

Seniors in the colleges of Cornell University who have completed the academic requirements for the Bachelor's degree, and who qualify under (2), may, subject to the approval of the deans of their respective colleges, be admitted to the Graduate School.

Students admitted to the Graduate School are usually expected to pursue a course leading to one of the advanced degrees; but a properly qualified person who, for special reasons, does not wish to meet the requirements for a degree may arrange a program of graduate study suitable to his purposes.

An applicant who is not a graduate of Cornell University must submit complete official transcripts of all previous college studies.

Applications for admission, made on the proper forms, should be filed in the office of the Graduate School at the earliest possible date and, ordinarily, not later than August 10 and January 25 for entrance to the first and second terms, respectively; and not later than June 25 for entrance to the summer session.

Students may be admitted to the Graduate School in one of the following three classes:

(1) Candidates for degrees;
(2) Graduate students not candidates for degrees: "non-candidates";
(3) Resident Doctors.

Candidates for degrees:

Language requirements for admission. No student may be admitted to candidacy for any of the degrees A.M., M.S., M.F., M.Arch.,

[1]Under the special jurisdiction of the Division of Law.
[5]Under the special jurisdiction of the Division of Engineering.

M.L.A., M.F.A., M.Chem., M.M.E., M.C.E., M.E.E., or Ph.D., whose training has not included work in a foreign language equivalent to three units of entrance in one language or two in each of two languages, except that candidates for M.M.E., M.C.E., or M.E.E., may make up a shortage of one entrance unit in course. Two entrance units in one foreign language are required for admission to candidacy for M.S. in Eng.

Major and Minor Subjects. A candidate for an advanced degree must select within his field of study a branch to which he intends to devote the larger part of his time and which is called his Major Subject. In addition, a candidate for the doctorate must select two other subjects, called Minor Subjects, properly related to his Major Subject. Except in the case of a degree of Master of Laws[1] and Master of Science in Education,[2] a candidate for a Master's degree must select one such Minor Subject. A list of approved Major and Minor Subjects in each of the several fields of graduate study will be found below in the announcement of each department of instruction.

Special Committees. The work of each graduate student is in charge of a Special Committee. After the student has chosen his Major and Minor Subjects, he must select one or more members of the Graduate Faculty, to represent each subject and to serve as the members of his Special Committee, the representative of his Major Subject being the chairman. Their consent so to serve, together with a statement of the student's Major and Minor Subjects, approved by the members of his Special Committee, must be filed with the Dean of the Graduate School on the proper blank not later than two weeks after first registration in the Graduate School.

Changes in Special Committees. A student may change the membership of his Special Committee with the approval of all the members of the newly constituted Committee. Notice of such change must be filed *immediately* with the Dean of the Graduate School. A vacancy on a Special Committee, caused by the absence of a member from the University, may be filled by the Dean on joint recommendation of the absent member and the student.

Candidates for advanced professional degrees, given under the jurisdiction of the several special divisions of the Graduate School, should examine the special requirements for these degrees printed below at the beginning of the announcement for each division.

Graduate Students not Candidates for Degrees: A student admitted to the Graduate School but not a candidate for an advanced degree is required to select one or more advisers to direct his work. He must present to the Dean not later than two weeks after registration for each term a statement of the studies which he intends to pursue, approved by his adviser(s) and by each of the members of the Faculty under whom the work is to be done. Non-candidates are expected to pursue a coordinated program of graduate work.

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[1]See p. 150. [2]See p. 112.

Resident Doctors: Persons who hold a Doctor's degree or who have equivalent standing may, subject to permission from the Dean, register in the Graduate School as Resident Doctors, for the purpose of engaging in advanced study and research in a field in which they have had adequate previous preparation. On the recommendation of the Dean, Resident Doctors are exempt from the payment of tuition and all fees except laboratory charges.

REQUIREMENTS FOR DEGREES

The requirements for advanced degrees, with the exception of the professional degrees in Law[1] and in Education,[2] include (1) the satisfactory completion of a minimum period of residence, (2) the presentation of a satisfactory thesis or essay, and (3) the passing of a "final" examination.

Residence

No student will be awarded any degree by Cornell University unless he has spent at least one full academic year, or the equivalent, in residence and study at the University as candidate for that degree. For the Ph.D., a minimum of six terms of residence is required; for J.S.D. and for each of the master's degrees, a minimum of two terms. To receive credit for residence a student must be regularly enrolled in the Graduate School as a candidate for the degree in question; and the satisfactory completion of his work, term by term, must be attested by the members of his Special Committee.

A. **Work done in Cornell University.**

Residence credit may be received for work done in Cornell University in the following ways:

(1) For the satisfactory completion of a term, or portion thereof, in a regular session of the University. A graduate student who holds an appointment either as an instructor or as a teaching or research assistant may, upon recommendation of his Special Committee, receive a maximum of three-fourths residence credit for graduate work carried on during the period of such appointment.

Residence during the Summer Session may be counted at the rate of two summer sessions per term of residence. The credit that may be earned toward the doctor's degree by work in Summer Sessions is limited to two terms. Students who have demonstrated unusual ability in their graduate studies may, upon recommendation of their Special Committees and upon approval by the General Committee, earn a maximum of two more terms by work in the summer under personal direction. But the last year must be spent in residence at the University.

During the summer a graduate student must enroll both in the Summer Session and in the Graduate School. A statement of the graduate work offered during the summer will be found in the Announcement of the Summer Session.

Except on permission from the Dean in special cases, no student may earn more than two terms of residence credit in any given calendar year.

[1]See p. 150. [2]See p. 112.

(2) For the satisfactory completion of work done during the summer under the personal direction of a member of the Faculty of the Graduate School. To secure credit for such work the student must register in advance at the office of the Graduate School.

Work done under personal direction may be undertaken only with the approval, obtained in advance, of the student's Special Committee and of the Dean, and upon the latter's receipt from the member of the Faculty concerned of a statement with respect to the number of weeks during which he is prepared to supervise the work of the student. A student may not ordinarily register for work under personal direction until he has completed a full year of graduate work.

B. **Work done in other universities.**

Upon the recommendation of the student's Special Committee residence up to a maximum of four terms may be credited toward the doctor's degree for work done in other universities. Application for such credit should be made by the student as soon as possible after registration, and ordinarily not later than the end of the first term of residence at Cornell.

Work done elsewhere may not be credited toward a master's degree.

C. **Work in absentia.**

Under the following conditions a candidate for the doctor's degree may be credited with residence for work done away from the university.

(a) An applicant for this privilege must be regularly registered in the Graduate School as a candidate for the doctorate, and while not in residence shall receive no compensation except from the University.

(b) He 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, application 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.

The Thesis or Essay

The thesis, or essay,[1] must be acceptable to the candidate's Special Committee in respect both of scholarship and of literary quality.

The subject of the thesis, or essay, approved by the Chairman of the Special Committee, must be filed with the Dean at least six

[1]In the discretion of the student's Special Committee, a suitable essay may be substituted for the thesis in cases of candidates for the master's degree.

months before the candidate intends to complete all requirements for the degree for which he is a candidate.

A candidate intending to take his degree at the June commencement should complete his thesis not later than May 1, in order that it may be examined by all the members of the Special Committee.

Two bound typewritten copies (one of which may be a carbon copy) of the completed thesis, approved by the Special Committee, must be deposited at the office of the Graduate School at least five days before final examination C, or part B of the final examination,* for the degree.These copies become the property of the University Library.

The thesis should be typewritten, double spaced, on a durable rag bond, 8 x 10½ inches, with a left hand margin of at least an inch and a quarter. The carbon copy need not be on bond paper. The title page of the thesis should be set up according to the following form:

[TITLE OF THESIS]

A Thesis

Presented to the Faculty of the Graduate School of Cornell University for the degree of

[————————]

By

[Author's Name in Full]

[Date on which degree is to be conferred.]

Immediately following the title-page there shall be a biographical sketch of the author, in length not exceeding 150 words.

Before the doctor's degree will be conferred, a candidate must fulfill 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 with the two bound typewritten copies mentioned above, 100 printed copies of an abstract or description of the thesis, which abstract must be approved by his Special Committee; or

(3) He must deposit with the two bound typewritten copies mentioned above a typewritten abstract, not exceeding 1500 words in length, and approved by the chairman of the special committee and with the Treasurer of the University, the sum of $25 to defray the expenses of printing such abstract.

A candidate who intends to publish his thesis should obtain information regarding the format from the office of the Dean. The title-page of the printed thesis or abstract must include a statement that the thesis was presented to the Faculty of the Graduate School for the degree of Doctor of Philosophy, and must give the date when the

*See page 15.

degree was conferred. If a published thesis be a reprint, the place and date of the original publication must be given.

When the Major Subject for the degree of Master of Architecture or the degree of Master of 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.

Examinations

The following general examinations are required of candidates for advanced degrees:

Qualifying Examinations: required of candidates for the doctor's degree, see below under Examinations for the Doctor's Degree.

Examinations in Foreign Languages: required of candidates for the doctor's degree, see below under Examinations for the Doctor's Degree.

Final Examinations on the major field and on the minor field or fields of study and also on the thesis: required of all candidates for advanced degrees, see below under Examinations for the Master's Degree and Examinations for the Doctor's Degree.

Final examinations are conducted by the student's Special Committee and are open to all members of the Faculty. At the discretion of the Special Committee those under whom the student has had work may be invited to participate in the examination. But the Special Committee alone shall decide upon the merits of the candidate's performance.

Applications for final examinations, bearing the approval of the Special Committee, must be filed in advance in the office of the Graduate School.

Final examinations must be completed within four years after the minimum residence requirement for the degree in question has been satisfied.

A report on each qualifying or final examination shall be filed by the Special Committee in the office of the Graduate School.

For the Master's Degree.

After the thesis, or essay, has been completed and filed in the office of the Graduate School as provided on page 13, the candidate is required to present himself for the final examination, which covers the thesis and the Major and Minor Subjects. The examination may be written or oral, or both, at the option of the Special Committee. In the event of failure in the examination, no re-examination may be held until three months have elapsed.

For the Doctor's Degree.

Examination in languages. Each candidate for the Ph.D. degree must demonstrate his ability to read both French and German by passing in each of these languages an examination given by a member

of the Language Examination Board. This requirement must be satisfied before the beginning of the fourth term of residence; or before the beginning of the fifth term of residence in the case of a student admitted to candidacy with two terms or more of residence credit for previous work. Additional requirements in foreign language may be made at the discretion of the student's Special Committee.

Qualifying examination. The primary purposes of the qualifying examination are (1) to ascertain whether the student is qualified to continue work for the doctorate; and (2) to plan the student's work during the remainder of his candidacy. The examination is ordinarily given at the end of the first year of graduate study, if that year is at Cornell. If the student has had one year or more of graduate work elsewhere, the qualifying examination should be given as soon as possible after his entrance into the Graduate School. The qualifying examination may be oral or written or both.

Any member of the Special Committee may waive his part of the qualifying examination. The report on the qualifying examination shall, however, be made by the Special Committee as a whole, after consultation. If a candidate fails to pass the qualifying examination, no re-examination shall be allowed except on recommendation of the Special Committee.

Before presenting himself for Final Examination B or C (see next paragraph), each candidate must have earned at least two terms of residence credit after the passing or the waiving of the qualifying examination.

Final examinations. The final examinations, covering (1) the Major and Minor Subjects and (2) the thesis and related topics, may, at the discretion of the Special Committee, be given either separately or in combination.

When the two parts are given separately, an examination dealing mainly with the Major and Minor Subjects and designated as Final Examination A, may be given at the end of the fourth term of candidacy, or thereafter. Examination A may be both oral and written. The early completion of Examination A will leave the student free to devote his attention to the thesis and collateral studies during the remainder of his candidacy. Final Examination B, on the thesis and related topics and on such other work as the student may have done after completing Examination A, will be given after the residence requirement has been satisfied and the thesis has been completed and filed as provided on page 13. This examination may be oral, or both oral and written, at the discretion of the Special Committee.

When the two parts of the final examination are given in combination, the combined examination, designated as Final Examination C, will be given after the residence requirement has been satisfied and the thesis has been completed and filed, as provided on page 13. Examination C may be both oral and written.

A student who has failed in any Final Examination may not be re-examined within six months.

APPLICATION FOR DEGREES

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

A student desiring to receive his degree in June must file an application for his degree not later than May 15.

A degree will not be conferred unless all of the requirements have been completed by the last day of the term, except that the work for a degree granted in September may be finished not later than the day preceding the first day of instruction of the first term.

REGISTRATION

The rules of the University provide: "All students taking work in the Graduate School and/or work leading to, or in contemplation of, an advanced degree, shall at the beginning of each term or session, register both in the Graduate School and with the Registrar of the University."

Candidates for advanced professional degrees should register also with the division concerned.

A graduate student who has completed requirements of residence for his degree and who remains in residence while working on his thesis or while doing other work in contemplation of a degree, must register each term in which he is thus engaged. A student who returns to the University for the sole purpose of completing requirements for an advanced degree, and who is in residence less than two weeks, must register, paying the administration fee, but not tuition.

VACCINATION

Every student matriculating in the University for graduate study, whether in the Summer Session or during the regular terms, is required to present 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.

TUITION AND OTHER FEES

A Tuition Fee of $150 for the academic year is to be paid by all students registered in the Graduate School. It is payable in installments of $75 at the beginning of each term.

A member of the teaching or scientific staff registered in the Graduate School whose salary equals or exceeds $1,500 shall pay tuition at the rate of three-quarters of the tuition regularly charged full time students.

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, upon recommendation of the Dean.
3. In addition to students exempt under the charter of the University from the payment of tuition the following, to the extent herein mentioned, shall also be exempt from such payments of fees:

Upon recommendation by the appropriate college dean and by action of the Board of Trustees, for each appointment, waiver of tuition in the Graduate

School and of Laboratory and shop fees in the department or line of work in which he is employed, may be made to a member of the teaching or scientific staff whose salary is below $1,500, subject to the following limitations:

(a) In the case of a candidate for a master's degree or a J.S.D. degree, up to a maximum of four academic terms only, any credits toward residence earned prior to appointment to be included in the four terms.

(b) In the case of a candidate for the Ph.D., until by work here or elsewhere he has completed the minimum residence credit of six terms required by the Graduate School, and for not to exceed two academic terms thereafter.

(c) Whenever waiver of tuition in the Graduate School is involved in the making of any given appointment, said appointment shall not carry a salary in excess of $1,400.

(d) The above regulations shall be applicable to new appointees whose appointments take effect July 1, 1934, or thereafter.

(e) Irrespective of salary received the present practice of including automatically a waiver of tuition with each appointment shall be continued in the case of any student who has held an appointment to the teaching or scientific staff previous to July 1, 1934, who is (1) a candidate for the master's degree, for a total of four terms, any waivers previous to July 1, 1934, included; (2) a candidate for the doctorate, for a period of two terms more than the minimum number of terms of residence at Cornell required to complete the residence requirement for the degree in question, any waivers previous to July 1, 1934, included.

Members of the teaching or scientific staff taking work outside the department or line of work in which they are employed shall be charged tuition in proportion to the amount of work for which they are registered.

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 $11 is required of every student upon his first entrance into the University. It must be paid at the time of registration and is not refundable.

*A Health and Infirmary Fee** of $6 a term is required of all students (except Honorary Fellows, 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 in 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 $5 a term is required

*Teachers and others not on the University teaching staff taking four hours of work or less, whose tuition payments have been regularly prorated, and who reside and regularly commute to the University from without the area of the city and town of Ithaca, shall be exempt from the payment of the Infirmary fee upon the understanding that if they should be admitted to the Infirmary they will pay the regular daily rate. To such students, membership in Willard Straight Hall is optional.

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. Graduate students taking work in any of the summer courses must register both in the Graduate School and in the Summer Session and must pay a tuition fee of $50 and a Willard Straight Hall membership fee of $3 for each Summer Session; provided, however, that students registered as candidates for degrees in the Graduate School before April 1, 1935, may pay a tuition fee of $30, an administration fee of $6.25, and a Willard Straight fee of $3 for the Summer Sessions of 1936 and 1937. Graduate students registering for the first time as a candidate for a degree at Cornell must also pay the matriculation fee of $11. The usual laboratory fees and deposits are required.

Motor Vehicle Registration and Parking Fees. Students who wish to operate a motor vehicle in Ithaca or vicinity must register each term with the Committee on Traffic Control. The fee for such registration is $1 each term during the academic year and $.50 during the Summer Session. A fee of $2 a term during the academic year and $1.50 during the Summer Session is required of each student who has received permission from the Committee on Traffic Control to park a motor vehicle on the University Campus.

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 $6.25 and a Willard Straight Hall membership fee of $3.

Students registered under Personal Direction during the summer who desire residence credit for their work, must pay tuition for the credit desired pro rata at the rate charged for the regular academic year, such payment to admit them to the current Summer Session classes without additional tuition payments; provided that the amount of tuition paid is at least equal to that charged students registered in the Summer Session. Students registered under Personal Direction during the summer, not for credit, are exempt from the payment of tuition, but may not attend either as visitors or for subsequent credit, any of the classes or exercises of the Summer Session.

The privilege of taking work under Personal Direction during the summer without the payment of tuition shall be restricted to bona fide candidates for a degree at Cornell University.

Tuition and other fees become due when the student registers. The University allows twenty days of grace in 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 ex-

tension 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 five weeks in the short summer courses are required to pay tuition at the rate of twenty 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.

LIVING EXPENSES IN ITHACA

A student at Ithaca ought to have at least $700 for living expenses during the school year from September till June, exclusive of the tuition and other fees, clothing, and traveling expenses. One must expect to pay at least $500 for board and lodging for that period. There are no boarding houses near the University, and students get their meals in restaurants and cafeterias. If one is used to frugal living and is willing to take an inferior room and to budget as little as necessary for meals, one may be able to do with somewhat less than the above estimate. If the student is to live in Ithaca throughout the calendar year he had better estimate his living expenses at the rate of twenty dollars a week.

LOANS

For the academic year 1936–37 there will be available a loan fund of about $400, for the use of women graduate students, provided by the Ithaca Branch of the Association of American University Women, and Mu Chapter of Pi Lambda Theta. Applications should be made in writing, to the Office of the Graduate School.

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 incumbents.

Fellowships and Graduate Scholarships

AWARD AND TENURE

Appointments to fellowships and scholarships for the ensuing academic 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, together with supporting letters, testimonials, and other pertinent information, shall be filed in the office of the Dean on or before March 1 of the academic year preceding the one for which application is made.

The Faculty of the Graduate School has the authority to combine the stipends of two or more scholarships or fellowships in order to increase the stipend of a single scholarship or fellowship.

The term of each fellowship and graduate scholarship is one academic year.

Students holding fellowships or graduate scholarships may not accept other appointments, but are expected to devote their time uninterruptedly to the prosecution of their studies, except that they may be called upon to assist in instruction for a maximum of six clock hours a week.

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.

Prospective graduate students who wish also to apply for positions as teaching or research assistants should address applications for such positions directly to the Department or College concerned, and not to the Office of the Graduate School.

Fellowships and Scholarships for 1937–38

For 1937–38 there are offered the following fellowships and scholarships carrying stipends as indicated and exemption from tuition unless otherwise noted:

Agriculture

The Clinton DeWitt Smith Fellowship in Agriculture. Stipend $400. Does not carry exemption from tuition.

The University Fellowship in Agriculture. Stipend $400. See also under Animal Biology and Botany.

Animal Biology

The Schuyler Fellowship in Animal Biology. Stipend $400.

The Graduate Scholarship in Animal Biology. Stipend $200.

Architecture

The University Fellowship in Architecture or Landscape Architecture. Stipend $400.

Three *Graduate Scholarships in Architecture, Landscape Architecture, or Fine Arts.* Free tuition only; no stipend.

Botany

The Graduate Scholarship in Botany, Geology or Physical Geography. Stipend $200. Awarded for work in Botany for 1937-38.

Chemistry

The Sage Fellowship in Chemistry. Stipend $600.
The duPont Fellowship in Chemistry. Stipend $750.

Classics

Two *Fellowships in Greek and Latin.* Stipend $600 each.

Economics

Cornell-Brookings Fellowship in Economics. Stipend $1,000. The Brookings Institution of Washington, D. C., and Cornell University are joint participants in offering this fellowship. It is awarded by the Graduate School of Cornell University to a graduate student previously in residence at Cornell. The fellow must be regularly registered in the Graduate School, but is in residence at the Brookings Institution.

The President White Fellowship in Political and Social Science.[1] Stipend $600. Awarded in alternate years in Government and Economics. Awarded in Economics, 1937–38.

The Fellowship in Political Economy. Stipend $600. Awarded in 1938–39 and alternate years.

Engineering, Civil, Mechanical, and Electrical

One or more of the following fellowships or scholarships may be combined if such combination be deemed desirable.

The McGraw Fellowship in Civil Engineering. Stipend $400.

The Graduate Scholarship in Civil Engineering. Stipend $200.

The Sibley Fellowship in Mechanical and Electrical Engineering. Stipend $400.

The Charles Bull Earle Memorial Fellowship in Mechanical and Electrical Engineering. Stipend $400.

The Edgar J. Meyer Memorial Fellowship in Engineering Research. Stipend $400.

See also the John McMullen Research Scholarships, listed below.

English

The Cornell Fellowship in English. Stipend $600.

Geology

The Goldwin Smith Fellowship in Botany, Geology, or Physical Geography. Stipend $400. Awarded for work in Geology in 1937-38.

German

The University Fellowship in German. Stipend $400.

Government

The President White Fellowship in Political and Social Science.[1] Stipend $600. Awarded in alternate years in Government and Economics. Awarded in Economics in 1937-38.

History

The President White Fellowship in Modern History.[1] Stipend $500. May at the discretion of the Faculty, be made a traveling fellowship, with a stipend of $650.

The Fellowship in American History. Stipend $400.

The George C. Boldt Fellowship in History. Stipend $1,000. Does not carry exemption from tuition.

The Graduate Scholarship in History. Stipend $200.

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[1]Holders of the President White Fellowships in Modern History and in Political and Social Science may be called upon to be in attendance for a certain period each day in the President White Library, where they will ordinarily do a large part of their study.

Home Economics

The Anna Cora Smith Fellowship in Home Economics. Stipend $400. Does not carry exemption from tuition.

Landscape Architecture

See Architecture.

Mathematics

The Erastus Brooks Fellowship in Mathematics. Stipend $600.

Philosophy

Three *Susan Linn Sage Fellowships in Philosophy.* Stipends $600 each.

One or more of the *Susan Linn Sage Fellowships in Philosophy* may, in the discretion of the Faculty, be divided to make two *Susan Linn Sage Graduate Scholarships in Philosophy*, stipends $300 each.

Physical Geography

See Geology.

Physics

The President White Fellowship in Physics. Stipend $600.
See also Special Temporary Fellowships, page 23.

Psychology

The Susan Linn Sage Fellowship in Psychology. Stipend $400.
The Susan Linn Sage Graduate Scholarship in Psychology. Stipend $200.

Romance Languages

The University Fellowship in Romance Languages. Stipend $400.

Veterinary Medicine

The Graduate Scholarship in Veterinary Medicine. Stipend $200.

Tuition Scholarships

For graduate students the Board of Trustees has established thirty tuition scholarships, twenty for work in the endowed colleges and ten for work in the state-supported colleges. They entitle the holder to exemption from payment of tuition fees, but not other fees, for the duration of the appointment. Awards are made from nominations by the professor or professors in whose field the nominee is working. Awards are made in May of each year.

The John McMullen Research Scholarships

The John McMullen Research Scholarships: Open to graduates in Civil, Mechanical, or Electrical Engineering. These scholarships were founded by a bequest of John McMullen, of Norwalk, Conn., to Cornell University "for the purpose of creating and maintaining free scholarship or scholarships for the education of young men as engineers, the details as to the amounts of said scholarships and the qualifications of the beneficiaries to be left to said institution to determine, said scholarships to be known as the John McMullen Scholarships." With the avails of this bequest the Board of Trustees

has established several research scholarships of an annual value varying from $1,500 to $2,400. The scholarships have not been assigned to any particular school of the College, but will be awarded as conditions dictate. Applications should be sent to the Dean of the College of Engineering.

The Eleanor Tatum Long Graduate Scholarship

The Eleanor Tatum Long Graduate Scholarship in Structural Geology is open to graduate students who are majoring in the branch of Geology named. Application for the scholarship should be made to the Department of Geology. The stipend is approximately $1,000 a year, and does not carry free tuition.

Special Temporary Fellowships

In addition to the fellowships enumerated above, the income of the Susanna Phelps Gage Fund for research in physics may, upon the recommendation 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 American Cyanamid Company Fellowship (Vegetable Crops).

The American Zinc and Chemical Company Fellowship (Agronomy).

The Anheuser-Busch Fellowship (Poultry Husbandry).

The Charles Lathrop Pack Fellowships in Nature Education (Nature Education).

The Corn Gluten Meal Fellowship (Poultry).

The Dairy and Ice Cream Machinery and Supplies Association Fellowship (Dairy).

The Frosted Foods Fellowship No. 2 (Foods Chemistry).

The Kraco Fellowship (Poultry).

The Lily Disease Investigation Fellowship (Plant Pathology).

The Nassau County Farm Bureau Association Fellowship (Plant Pathology).

The New York Florists' Club Fellowship for Floriculture Research (Floriculture and Ornamental Horticulture).

The New York Florists' Club Fellowship for the Investigation of Diseases of Roses Grown under Glass (Plant Pathology).

The New York Florists' Club Fellowship for the Study of Diseases of Cyclamens and Other Potted Plants, Lilies and Miscellaneous Plants (Plant Pathology).

The Niagara Sprayer and Chemical Company Fellowship for the Testing and Development of Fungicides (Plant Pathology).

The North Shore Disease and Insect Control Fellowship (Plant Pathology).

The Staten Island Growers' Fellowship (Plant Pathology).

The Texas Gulf Sulphur Company Fellowship (Entomology and Plant Pathology).

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.

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 Guilford Essay Prize

This prize was established in 1902 by the late James B. Guilford. It consists of the annual income on a fund of $3000.

The prize, not having been awarded to an undergraduate in 1935–36, is by the conditions of the gift open to graduate students for 1936–37. Each competitor must submit a specimen or specimens of his English prose totalling not more than 1500 words at the Office of the Graduate School on or before noon of November 30, 1936. For further particulars see "Prize Competitions", obtainable from the Secretary of the University.

THE UNIVERSITY LIBRARIES

Otto Kinkeldey, *Librarian;* E. R. B. Willis, *Associate 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;* Miss Gussie E. Gaskill, *Curator of the Wason Chinese Collection;* L. W. Morse, *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 nine 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.

In addition to the general store of books which a University Library of this size may be expected to contain, there are many special collections, assembled by scholars or with scholarly intent. Among the more noteworthy are:

THE PRESIDENT WHITE LIBRARY, received in 1891 as a gift from the first President of the University and largely increased by subsequent gifts and purchases. It includes special collections on the History of Superstition, the Age of the Reformation, and the French Revolution.

THE DANTE, PETRARCH, AND ICELANDIC COLLECTIONS, for which separate catalogues have been printed, were gathered by the first Librarian, Willard Fiske, who gave them to the University and bequeathed funds for their upkeep.

THE MAY COLLECTION relating to the history of slavery had as its nucleus the Library of the late Rev. Samuel J. May, long secretary of the American Anti-slavery Society.

THE WASON COLLECTION of books dealing with China and the Chinese was bequeathed to the Library by Charles William Wason, '76, with provision for its increase.

THE WORDSWORTH COLLECTION, formed by Cynthia Morgan St. John, presented to the University in 1925 by Mr. Victor Emanuel, '19, now includes more than 2,500 books by and about Wordsworth.

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 seminary 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, associate librarian, 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

The several fields of instruction of the Graduate School are described in the pages that follow hereafter.

Arrangement of Subjects. Subjects are grouped in broad fields as follows, and in the following order:

Architecture and the Fine Arts.
Languages and Literatures.
Philosophy.
History and the Social Sciences.
Animal Sciences.
Plant Sciences.
Physical Sciences.
Agriculture.
Education.
Engineering.
Home Economics.
Hotel Administration.
Law.
Veterinary Medicine.
Medical Sciences as presented in the Medical College, New York City.
New York State Agricultural Experiment Station at Geneva.

Approved Major and Minor Subjects. For each field there is given an approved list of titles from which candidates for advanced degrees may choose major and minor subjects. The boldface numerals (**1, 2, 3, 4**) have the following meaning:

1, approved as major subject for the Ph.D.
2, approved as major subject for the master's degree.
3, approved as minor subject when the major is in the same field.
4, approved as minor subject when the major is in another field.

Undergraduate and Graduate Courses. There is, in general, no sharp distinction, at Cornell University, between graduate and undergraduate courses. In this announcement courses intended primarily for graduate students are titled in **boldface** type. Courses intended primarily for undergraduates are titled in *italics*, and are given in skeleton outline only; for details see the respective college announcements.

ARCHITECTURE AND FINE ARTS

The Faculty of the Graduate School by its action of January 27, 1933, created the Division of Architecture and Fine Arts for the more effective administration of the work leading to the professional degrees of Master of Architecture, Master of Landscape Architecture, and Master of Fine Arts. Those primarily concerned with these professional degrees are the Professors and Assistant Professors of Architecture, of Landscape Architecture, of Painting and Sculpture, of Music, of Poetry, of Drama, and of Aesthetics.

Courses under the jurisdiction of the Division of Fine Arts are available to candidates for advanced degrees other than those mentioned above, subject to such conditions as may be imposed by the student's Special Committee.

Approved Major and Minor Subjects (key to symbols on p. 26)

(The combination of subjects chosen must be approved by the professors in the student's major field. Certain subjects outside the field of Fine Arts may be chosen for a minor with the approval of the professors concerned.)

Aesthetics **2,3,4**
Architectural Construction **2,3,4**
Architectural Design **2,3,4**
City and Regional Planning **2,3,4**
Composition Relative to Pictorial and Decorative Art **2,3,4**
Dramatic Production **2,3,4**
Dramatic Technique **2,3,4**
Drawing **2,3,4**
History of Architecture **1,2,3,4**
History of Landscape Architecture **2,3,4**
History of Music **2,3,4**
History of Painting **2,3,4**
History of Painting and Sculpture **1,2**
History of Sculpture **2,3,4**
Landscape Design **2,3,4**
Modeling **2,3,4**
Musical Composition **2,3,4**
Musicology **1,2,3,4**
Painting **2,3,4**
Planting Design **2,3,4**
Playwriting **2,3,4**
Poetry **2,3,4**
Sculpture **2,3,4**
Theory of Music **2,3,4**

AESTHETICS

Professors R. M. OGDEN and R. W. CHURCH.

The courses in Aesthetics offered by the Philosophy Department are:

Philosophy 8a, b. Three hours a week. Throughout the year.

Philosophy 19. Advanced readings in Aesthetics. Three hours a week. To be repeated in second term.

Philosophy 45. Seminar in Aesthetics. Assistant Professor CHURCH. Second term. Hours to be arranged

ARCHITECTURE

Professors F. H. BOSWORTH, A. C. PHELPS, GEORGE YOUNG, jr., L. P. BURNHAM, H. E. BAXTER, A. D. SEYMOUR, jr., W. McL. DUNBAR, G. D. CLARKE, J. A. HARTELL, and J. N. TILTON, jr.

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

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.

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. Professors PHELPS and DUNBAR.
Architectural Construction. Professors YOUNG, BAXTER, and TILTON.
City and Regional Planning. Professor CLARKE.

THE HISTORY AND PRACTICE OF THE FINE ARTS

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

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.

Drawing and Painting. Professors BRAUNER, MIDJO, STONE, and WASHBURN.
Composition. Professor MIDJO.
Sculpture. Professor CAMDEN.
History of Art. Professor FINLAYSON.
History of Architecture. Professor PHELPS.
Other members of the staff will cooperate as necessary.

LANDSCAPE ARCHITECTURE

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

Graduate work in Landscape Architecture is offered in design, history, and planting design.

Candidates for the degree of Master of 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. Professors MONTILLON and LAWSON.
History of Landscape Architecture. Professors MONTILLON and LAWSON.
Planting Design. Professors LAWSON and CURTIS.
Park and Parkway Design. Professor CLARKE.

MUSIC

Professors PAUL J. WEAVER, OTTO KINKELDEY, ANDREW C. HAIGH, RONALD INGALLS, and LUTHER M. NOSS.

1. *Theory and Practice of Music.* Assistant Professor NOSS. T 2-4, Th 2-3:30.
5. *The Art of Music.* Professor WEAVER. M W F 10.
10. *History of Music.* Professor WEAVER. T Th 11.
12. *Historical Survey of Piano Music.* Assistant Professor HAIGH. M W F 11.
13. *Historical Survey of Orchestral Music.* Assistant Professor INGALLS. M W F 2.
20. *Harmony.* Assistant Professor NOSS. M W F 9 and M W F 12.

22. and 23. *Harmonic Analysis and Musical Form.* Assistant Professor Noss. T Th S 12.

24. *Counterpoint.* Assistant Professor HAIGH. T Th 9.

25. *Double Counterpoint, Canon and Fugue.* Assistant Professor HAIGH. M W F 8.

30. *Instrumentation.* Assistant Professor INGALLS. M W F 8.

31. *Elementary Orchestration.* Assistant Professor INGALLS. T Th 10.

40. *Elementary Composition.* Assistant Professor HAIGH. T Th S 11.

41. *Advanced Composition.* Assistant Professor HAIGH. T Th S 9.

60. and 61. *Applied Music (organ, piano, violin).* Assistant Professors NOSS, HAIGH, and INGALLS, respectively. Hours to be arranged.

Seminary in Musicology. Professor KINKELDEY. **(Music 100.)** Primarily for graduates (and, by permission, for seniors) who have the requisite reading knowledge of one or more of the important foreign languages, a fair knowledge of musical theory, and some skill in practical music. The work is intended to make the student acquainted with the accomplishments of the past and with modern methods and aims in all fields, scientific, aesthetic, and historical, of musical research and investigation. Special topics or fields of study will be selected for each term after consultation with the class.

DRAMA AND THE THEATRE

Professors A. M. DRUMMOND, WILLIAM STRUNK, jr., W. H. STAINTON, EDWIN NUNGEZER.

The degree of Master of Fine Arts in Drama and Dramatic Production will be granted to candidates of special aptitude in the practical phases of Dramatic Production or Playwriting. Their program must include suitable studies in related Fine Arts; two years of residence after the A.B. will normally be required; and a major practical project in the second year will be the thesis.

THE CORNELL UNIVERSITY THEATRE provides, in its *Laboratory Theatre* division, for public presentations of the work of graduate students in Dramatic Interpretation and Acting; in its *Studio Theatre* productions, for presentation of the work in Playwriting; and in the *Summer Theatre*, an opportunity for intensive work in all phases of theatre practice. *Director of the University Theatre*, A.M. DRUMMOND; *Assistant Director*, W. H. STAINTON; *Technical Director*, J. COLBY LEWIS; *Rural Drama*, H. DARKES ALBRIGHT.

Dramatic Structure. Professor STRUNK. (*English* 90, T Th S 11).

The English Drama to 1642. Assistant Professor NUNGEZER. (*English* 42, M W F 11).

Shakespeare. Professor STRUNK. (*English* 46, M W F 10).

Dramatic Literature. Professor STRUNK. For graduates. (*English* 150. Supplementary to English 90. T 7:30).

Dramatic Interpretation. Assistant Professor STAINTON. (*Public Speaking* 41, first term, M W F 12).

Advanced Dramatic Interpretation and Acting. Professor DRUMMOND. For graduates. (*Public Speaking* 42, Th 2-4).

Stagecraft. Assistant Professor STAINTON. (*Public Speaking* 45, second term, M W 12, T 1:40-4).

Stage Lighting. Assistant Professor STAINTON. (*Public Speaking* 45*a*. First term, T 1:40-4 or as arranged).

History of the Theatre. Professor DRUMMOND. (*Public Speaking* 48. Not given in 1936-37).

Playwriting. Professor DRUMMOND. (*Public Speaking* 49*b*, T Th 12).

Dramatic Production; in relation to aesthetic principles. Professor DRUMMOND. (*Public Speaking* 66. Second term, W 2-4).

Dramatic Art. Professor DRUMMOND. For graduates. (*Public Speaking* 67. Not given in 1936–37).

Modern Theories of Stage Presentation. Assistant Professor STAINTON. For graduates. (*Public Speaking* 68. Second term, M 2-4, or as arranged.)

Theatre Practice. Professor DRUMMOND or Assistant Professor STAINTON. (*Public Speaking* 91. Correlated with the work of The University Theatre. Throughout the year and Summer Session. Hours to be arranged.)

POETRY

Professors W. C. DEVANE, WILLIAM STRUNK, jr., F. C. PRESCOTT, C. S. NORTHUP, B. S. MONROE, L. N. BROUGHTON, LANE COOPER, W. H. FRENCH, EDWIN NUNGEZER, and W. M. SALE.

See also courses listed under English Language and Literature, p. 34.

22. *Nineteenth Century Poetry.* Three hours a week, throughout the year.
37. *Chaucer.* Three hours a week, first term.
44. *Sixteenth Century Literature.* Three hours a week, throughout the year.
46. *Shakespeare.* Three hours a week, throughout the year.
50. *Seventeenth Century Literature.* Three hours a week, first term.
52. *Milton.* Three hours a week, second term.
54. *Eighteenth Century Poetry.* Two hours a week, throughout the year.
64. *Shelley.* Two hours a week, first term.
68, 69. *Victorian Literature.* Three hours a week, throughout the year.
70, 72. *American Literature.* Three hours a week, throughout the year.
80. *Contemporary Criticism.* Three hours a week, second term.

104. **Principles of Literary Criticism.** Professor COOPER. Throughout the year. W 11-12:50. Goldwin Smith 127.

A study of the chief theories of poetry, and chief kinds of literature, with illustrations drawn from writers both ancient and modern.

[105. **Dante in English.** Professor COOPER. Throughout the year. Not to be given in 1936-37.]

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.

108. **Elizabethan Seminary.** Assistant Professor NUNGEZER. Throughout the year. Room and hour to be arranged.

Studies in representative non-dramatic literature of the second half of the sixteenth century, with emphasis on significant problems.

110. **The Seventeenth Century.** Professor DEVANE. Throughout the year. Room and hour to be arranged.

A brief survey of Continental and English literature of the early Renaissance, followed by a detailed study of English literature from 1590 to 1660.

111. **A Survey of English Criticism.** Professor PRESCOTT. Throughout the year. Room and hour to be arranged.

A study of representative English writers, with special reference to the theory of poetry.

116. **Wordsworth and his Contemporaries.** Professor BROUGHTON. Throughout the year. M 4-6. Goldwin Smith 338.

First term: a detailed study of the works of Wordsworth and their influence on contemporary English thought and literature. Second term: the contemporaries of Wordsworth.

LANGUAGES AND LITERATURES

THE CLASSICS

Professors C. L. DURHAM, E. P. ANDREWS, H. L. JONES, HARRY CAPLAN, and JAMES HUTTON, Dr. C. C. GREENE, and Mr. F. O. WAAGÉ.

Approved Major and Minor Subjects (key to symbols on p. 26)

Latin Language and Literature **1,2**
Latin Literature **2,3,4**
Latin Language **3,4**
Vulgar Latin **3,4**
Mediaeval Latin Literature **3,4**
Classical Rhetoric (in translation) **3,4**
Greek Language and Literature **1,2**
Greek Literature **2,3,4**
Greek Language **3,4**
Comparative Indo-European Linguistics **1,3,4**
Classical Archaeology **1,2,3,4**
Greek Archaeology **2,3,4**
Roman Archaeology **2,3,4**

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 are awarded annually.

The income of the Charles Edwin Bennett Fund for Research in the Classical Languages is used each year in the way best suited to promote the object for which the fund was established.

Doctoral dissertations of an appropriate nature will be accepted for publication in the *Cornell Studies in Classical Philology.*

GREEK

1a. *Greek for Beginners.* Introduction to Homer's Iliad. Three hours a week, both terms.

1b. *Homer's Iliad.* Continuation of Greek 1a. Three hours a week, both terms.

2a. *Attic Greek. Plato, Selected Dialogues.* Three hours a week, both terms.

2b. *Euripides, Iphigenia in Tauris* and *Alcestis; New Testament, Selections.* Three hours a week, both terms.

5. *Greek Composition.* One hour a week, throughout the year.

7. *Greek Myths.* Illustrated lectures. First term, two hours a week.

8. *Illustrated Lectures on Ancient Greece and Greek Life.* Second term, two hours a week.

17. **Aristophanes, Clouds; Sophocles, Oedipus Rex, Antigone.** Throughout the year. Prerequisite, Greek 2b. First term, Dr. GREENE; second term, Professor JONES. T Th S 11. Goldwin Smith 120.

20. **Lyric Poetry; Aeschylus, Prometheus Vinctus; Theocritus; Demosthenes, Philippics.** Throughout the year. Prerequisite, Greek 17. Professor JONES. T Th S 10. Goldwin Smith 124.

[22. **Plato, the Republic; Pindar, Selected Odes; Thucydides.** Throughout the year. Prerequisite, Greek 20. For graduates and qualified undergraduates. Not given in 1936-37.]

25. **Advanced Greek Composition.** Second term. Prerequisite, Greek 5. Dr. GREENE. Th 2. Goldwin Smith 124.

[30. **The Ancient Epic.** Lectures and readings. Dr. GREENE. Not given in 1936-37.]

[33. **Classical and Mediaeval Rhetoric.** Professor CAPLAN. Not given in 1936-37.]

40. **Seminary. The Greek Anthology.** Development of the Epigram and of related literary forms; history of the collections. Assistant Professor HUTTON. First term. W 3. Library, Classical Seminary Room.

[41. **Seminary. Strabo; or Homeric Geography.** Professor JONES. Not given in 1936-37.]

See also readings in GREEK PHILOSOPHY (under PHILOSOPHY), INDO-EUROPEAN PHILOLOGY (under LATIN), METHODS OF LITERARY AND LINGUISTIC STUDY, AND PRINCIPLES OF LITERARY CRITICISM (under COMPARATIVE STUDY OF LITERATURE), and ANCIENT HISTORY (under HISTORY).

ARCHAEOLOGY AND ANCIENT ART

Professor E. P. ANDREWS and Mr. WAAGÉ.

1. *History of Greek Sculpture.* Three hours a week, either term.
2. *Art of the Roman Empire.* Three hours a week, second term.
3. *Ancient Art.* Three hours a week, first term.
4. *Ancient Painting.* Two hours a week, second term.
5. *History of Ancient Coins.* Two hours a week, first term.

101. **Pausanias and the Topography of Greece with special reference to Athens.** Goldwin Smith 35. Mr. WAAGÉ.

102. **Problems in Classical Archæology.** Goldwin Smith 35. Mr. WAAGÉ.

LATIN

1a. *Freshman Course: For Students Offering Three Units of Entrance Latin.* Ovid; Virgil; Horace, Odes and Epodes. Three hours a week, both terms.

1. *Freshman Course: For Students Offering Four Units of Entrance Latin.* Cicero, De Senectute; Martial, Epigrams; Horace, Odes and Epodes. Three hours a week, both terms.

3. *Sight Translation.* One hour a week throughout the year.

8. *Terence; Catullus; Horace, Satires and Epistles; Tacitus, Agricola; Livy; Seneca, Epistles.* Three hours a week throughout the year.

[11. *Survey of Roman Literature,* with interpretation of representative selections. Not given in 1936-37.]

[12. *Epic Poetry: Ennius; Virgil, Georgics, The Last Six Books of the Aeneid.* Not given in 1936-37.]

16. *The Greater Republican Writers.* Throughout the year. Plautus; Cicero; Lucretius. M W F 11. First term, Professor DURHAM. Goldwin Smith 128. Second term, Professor CAPLAN. Goldwin Smith 124.

[17. *Literature and History of the Early Empire.* Throughout the year. Not given in 1936-37.]

21. *Latin Writing, Elementary Course.* One hour a week throughout the year.

26. *Teachers' Training Course.* Professor DURHAM. Second term. W F 12. Goldwin Smith 128.

[27. *Topography and Architectural Remains of Rome.* Not given in 1936-37.]

41. **Seminary. Horace.** Professor CAPLAN. Throughout the year. T 2. Library, Classical Seminary Room.

[42. **Seminary. The MS. Tradition of Cicero's Oratorical Works.** Professor DURHAM. Not given in 1936-37.]

45. **Latin Writing, Advanced Course.** Throughout the year. M 12. First term, Assistant Professor HUTTON; second term, Dr. GREENE. Goldwin Smith 120. For graduates, and for undergraduates who have taken Latin 21.

47. **Historical Latin Syntax.** For graduate students. Two hours a week, second term. Professor DURHAM. T Th 10. Goldwin Smith 128.

48. **Vulgar Latin: Petronius, Cena Trimalchionis; Vulgar Latin Inscriptions, including Christian Inscriptions.** Professor DURHAM. First term. W F 12. Goldwin Smith 128. For graduate students and qualified undergraduates.

[49. **Indo-European Philology; Sounds and Flexions of Latin; Italic Dialects.** Professor DURHAM. Primarily for graduate students. Throughout the year. Not given in 1936-37.]

[50. **Latin Epigraphy.** Professor DURHAM. Not given in 1936-37.]

COMPARATIVE STUDY OF LITERATURE

Professor LANE COOPER (*Professor of the English Language and Literature*) and *Assistant Professor* JAMES HUTTON (*of the Department of Classics*).

Approved Major and Minor Subjects (key to symbols on p. 26)

Dante **1, 2, 3, 4**
English Language and Literature **1, 2, 4**
Literary Criticism **1, 2, 3, 4**
Old and Middle English **1, 2, 3, 4**
Writers on Art **2, 3, 4**

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 mediaeval 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.*

27. *Modern Writers on Art.* Throughout the year, three hours a term.

28. *English Translations of Greek and Latin Classics.* Throughout the year, three hours a term.

103. **Old and Middle English.** Professor COOPER. Throughout the year. M W F 10. Goldwin Smith 127.

A study of the foundations of the English language and literature. The work of the second term deals partly with Chaucer. Students may be admitted at the beginning of either term. The course will be of service to prospective teachers in the secondary schools.

104. **Principles of Literary Criticism.** Professor COOPER. Throughout the year. W 11-12:50. Goldwin Smith 127.

A study of the chief theories of poetry, and chief kinds of literature, with illustrations drawn from writers both ancient and modern. This and the following courses are mainly designed for prospective college and university teachers.

[105. **Dante in English.** Professor COOPER. Throughout the year. Given in alternate years, not in 1936-37.]

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.

106. **Methods of Literary and Linguistic Study.** Professor COOPER. Throughout the year. M 11-12:50. Goldwin Smith 127.

Reading in the *Encyklopädie* of August Boeckh, followed by a study of more recent treatises with special reference to the ancient classics and English.

107. **Chaucer Seminary.** Professor COOPER. Throughout the year. Tuesday, 7:30 p. m. English Seminary Room.

A survey of books and topics that are essential to the study of Chaucer and his age; systematic reading of his works; a detailed examination of significant problems.

ENGLISH LANGUAGE AND LITERATURE

Professors W. C. DEVANE, WILLIAM STRUNK, jr., F. C. PRESCOTT, C. S. NORTHUP, LANE COOPER, B. S. MONROE, L. N. BROUGHTON, F. M. SMITH, W. H. FRENCH, EDWIN NUNGEZER, E. A. TENNEY and W. M. SALE, and *Doctors* J. C. ADAMS, H. A. MYERS and R. W. SHORT.

Approved Major and Minor Subjects (key to symbols on p. 26)

American Literature **1, 2, 3, 4**
Chaucer and his Contemporaries **1, 2, 3, 4**
Dramatic Literature **1, 2, 3, 4**
Eighteenth Century Literature **1, 2, 3, 4**
Elizabethan Literature **1, 2, 3, 4**
English Prose Fiction **1, 2, 3, 4**
Literary Theory **1, 2, 3, 4**
Middle English **1, 2, 3, 4**
Old English **1, 2, 3, 4**
Seventeenth Century Literature **1, 2, 3, 4**
The English Drama **1, 2, 3, 4**
The English Language **1, 2, 3, 4**
The Romantic Period **1, 2, 3, 4**
Victorian Literature **1, 2, 3, 4**

The contents of these fields will vary, depending on whether they are chosen as majors or minors and for the master's degree or the doctor's degree.

For their first term of residence, students need only designate their fields as American Literature, English Literature, or English Language. In subsequent terms they will be required to designate them substantially as above.

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 seven hundred and fifty volumes, including 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. *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. Twenty-six numbers have appeared.

Candidates for an advanced degree may take their major subject in literature or in language. In general, thirty-three hours 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.

One fellowship of the value of $600 is awarded annually to a graduate student in English. The holder of the fellowship is exempt from the payment of tuition. The fellowship is ordinarily awarded only to an applicant who has had one year or more of graduate study.

22. *Nineteenth Century Poetry.* Three hours a week, throughout the year.
27. *Modern Writers on Art.* Three hours a week, throughout the year.
28. *English Translations of Greek and Latin Classics.* Three hours a week, throughout the year.
32. *Old English.* Three hours a week, throughout the year.
37. *Chaucer and his Age.* Three hours a week, throughout the year.
39. *Medieval Legend and Romance.* Three hours a week, second term.
42. *The English Drama to 1642.* Three hours a week, throughout the year
44. *Sixteenth Century Literature.* Three hours a week, throughout the year.
46. *Shakespeare.* Three hours a week, throughout the year.
50. *Seventeenth Century Literature.* Three hours a week, first term.
52. *Milton.* Three hours a week, second term.
53. *Drama of the Restoration and Eighteenth Century.* Three hours a week, second term.
54. *Eighteenth Century Poetry.* Two hours a week, throughout the year.
56. *Eighteenth Century Prose.* Three hours a week, throughout the year.
57. *The Eighteenth Century Novel.* Three hours a week, throughout the year.
58. *Biography.* Two hours a week, throughout the year.
64. *Byron and Shelley.* Two hours a week, first term.
66. *Early Nineteenth Century Novel.* Three hours a week, second term.
68, 69. *Victorian Literature.* Three hours a week, throughout the year.
70, 72. *American Literature.* Three hours a week, throughout the year.
74. *The English Language.* Two hours a week, first term.

76. *English Usage and Style.* Three hours a week, throughout the year.
78. *Short Story Writing.* Three hours a week, throughout the year.
80. *Contemporary Criticism.* Three hours a week, second term.
85. *Modern Poetry.* Two hours a week, throughout the year.
90. *Dramatic Structure.* Three hours a week, throughout the year.
95. *Myths in English Literature.* Two hours a week, second term.
99. *Oral Expression for Teachers.* Three hours a week, throughout the year.

100. **Bibliography and Method:** an introduction to Graduate Research in English. Professor NORTHUP. First term. T Th 12. Goldwin Smith 338.

A survey of the bibliography of the English language and literature; practice in compiling special bibliographies in the student's chosen field; some attention to paleography; the technique of textual study; critical study of scholarly articles and monographs; practice in assembling and organizing data for scholarly papers; values in evidence. Recommended for all students entering upon graduate study.

101. **Old English Literature.** Professor MONROE. Either term. T Th 3, or other hours to be arranged. Goldwin Smith 162.

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.

103. **Old and Middle English.** Professor COOPER. Throughout the year. M W F 10. Goldwin Smith 127.

A study of the foundations of the English language and literature. The work of the second term deals partly with Chaucer. Students may be admitted at the beginning of either term. The course will be of service to prospective teachers in the secondary schools.

104. **Principles of Literary Criticism.** Professor COOPER. Throughout the year. W 11-12:50. Goldwin Smith 127.

A study of the chief theories of poetry, and chief kinds of literature, with illustrations drawn from writers both ancient and modern. This and the following three courses by Professor COOPER are mainly designed for prospective college and university teachers.

[105. **Dante in English.** Professor COOPER. Throughout the year. Not given in 1936-37.]

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.

106. **Methods of Literary and Linguistic Study.** Professor COOPER. Throughout the year. M 11-12:50. Goldwin Smith 127.

Reading in the *Encyklopädie* of August Boeckh, followed by a study of more recent treatises with special reference to the ancient classics and English.

107. **Chaucer Seminary.** Professor COOPER. Throughout the year. Tuesday, 7:30 p. m. English Seminary Room.

A survey of books and topics that are essential to the study of Chaucer and his age; systematic reading of his works; a detailed examination of significant problems.

108. **Elizabethan Seminary.** Assistant Professor NUNGEZER. Throughout the year. Room and hour to be arranged.

Studies in representative non-dramatic literature of the second half of the sixteenth century, with emphasis on significant problems.

[110. **The Seventeenth Century.** Professor DEVANE. Throughout the year. Not given in 1936-37.]

111. **A Survey of English Criticism.** Professor PRESCOTT. Throughout the year. Room and hour to be arranged.

A study of representative English writers, with special reference to the theory of poetry.

115. **Eighteenth Century Literature.** Professor BROUGHTON. Throughout the year. W 2-4. Goldwin Smith 338.

A study of the influences, tendencies, literary criticism, thought, and life of the eighteenth century.

116. **Wordsworth and His Contemporaries.** Professor BROUGHTON. Throughout the year. M 4-6. Goldwin Smith 338.

First term: a detailed study of the works of Wordsworth and their influence on contemporary English thought and literature. Second term: the contemporaries of Wordsworth.

120. **The Age of Johnson.** Professor SALE. Throughout the year. Room and hour to be arranged.

A seminary in the literature of the late eighteenth century. Reports, discussions, and conferences.

135. **Nineteenth Century Fiction.** Professor NORTHUP. Throughout the year. Th 4-6. Goldwin Smith 220.

Studies in the development of the novel from Scott to Galsworthy.

136. **Victorian Poetry.** Professor DEVANE. Throughout the year. Room and hour to be arranged.

137. **Middle English Literature.** Professor NORTHUP. Throughout the year. M W 10. Goldwin Smith 338.

Studies of important poetry and prose from the Conquest to Malory and of leading problems needing research.

140. **American Literature.** Professor PRESCOTT. First term. Room and hour to be arranged.

Emerson, Thoreau, and Whitman, and their relation to New England Transcendentalism.

141. **The English Language.** Professor MONROE. Throughout the year. W 3, or other hours to be arranged. Goldwin Smith 162.

A study of selected topics either independently or in connection with other courses in language and literature.

146. **Shelley.** Professor PRESCOTT. Second term.

A study of Shelley's poetical and prose works in relation to his life and time.

150. **Dramatic Structure.** Professor STRUNK, first term; Dr. MYERS, second term. W 7:30. Goldwin Smith 156.

A study of dramatic history and theory, with reading of representative plays. This course is supplementary to English 90, Dramatic Structure, which should precede or accompany it.

GERMANIC LANGUAGES AND LITERATURES

GERMAN

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

Approved Major and Minor Subjects (key to symbols on p. 26)

German Literature **1, 2, 3, 4**
German Philology **1, 2, 3, 4**

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 teachers' course deals with class-room 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 in awarded annually.

11. *Schiller's Dramas.* Three hours a week, first term.

[12. *Schiller's Poems.* Three hours a week, second term. Not given in 1936-37.]

13. *Goethe's Life and Works.* Three hours a week, first term.

14. *Goethe's Faust.* Three hours a week, second term.

15. *Survey of German Literature.* Three hours a week, both terms.

17. *Ninteenth Century Drama.* Three hours a week, second term.

[18. *Lessing's Life and Works.* Three hours a week, first term. Given in alternate years, not in 1936-37.]

25. *Wagner's Life and Works.* Three hours a week, first term.

40. *Teachers' Course in Methods.* Three hours a week, first term.

16. **Contemporary German Literature.** Prerequisite, German 1–5, or the equivalent. Professor FAUST. First term. Credit three hours.

A study of the literature of Modern Germany since 1880, including foreign influences. Lectures in German, collateral readings, reports, and investigations.

30. **Der deutsche Einschlag in der Bevölkerung der Vereinigten Staaten. Geschichtliche Entwickelung und Bedeutung im Aufbau des amerikanischen Volkes. Kulturelle und literarische Beziehungen.** Prerequisite, German 15, or the equivalent. Professor FAUST. First term. Three hours a week. Given in alternate years.

Lectures in German; collateral reading in German.

37. **Middle High German.** Prerequisites, German 10 and six hours of literature. Professors ANDREWS and POPE. Three hours a week. Both terms.

42. **Gothic.** Professor BOESCHE. Three hours a week. First term. Streitberg's *Gotisches Elementarbuch: Die Gotische Bibel*, ed. by Streitberg. This course will serve as a general introduction to Germanic philology.

43. **Old High German.** Prerequisite, German 37. Professor BOESCHE. Three hours a week. Second term. 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.

[47. **Germanic Antiquities.** Prerequisite, Gothic. Professor ANDREWS. Second term. One hour a week. A consideration of the sources of knowledge of the Germanic people up to and including the migrations. Given in alternate years, not in 1936-37.]

48. **Principles of Germanic Philology.** Professor ANDREWS. Two hours a week. Second term. 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.

49, 50. **Seminary in German Literature.** Two hours a week, Thursday 3–5. First term, Professor FAUST; second term, Professor POPE. Goldwin Smith 181. 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; Methods of Approach in the Study of German Literature.

52. **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.

Approved Major and Minor Subjects (key to symbols on p. 26)

Danish, Norwegian, Swedish Literature **3, 4**
Modern Icelandic Literature **2, 3**
Old Norse-Icelandic Language and Literature **1, 2**
Old Norse-Icelandic Literature **2, 3, 4**

The Fiske Icelandic Collection of the University Library, comprising about 20,000 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.

1. **Old Icelandic.** Throughout the year. T Th S 11. Library, Greek and Latin Seminary.

2. **Modern Icelandic.** Second term. Three hours a week. Hours to be arranged.

[3. **Danish and Dano-Norwegian.** Given in alternate years. Not given 1936-37.]

4. **Swedish.** First term. Three hours a week. Given in alternate years.

5. **Old Norse-Icelandic Literature.** First term. Two hours a week. Given in alternate years.

[6. **Modern Scandinavian Literature.** Given in alternate years. Not given in 1936-37.]

7. **Early Scandinavian Civilization and History.** Second term. Two hours a week. Given in alternate years. Lectures dealing especially with Old Norse mythology and the Viking Age.

RHETORIC AND PUBLIC SPEAKING; DRAMA AND THEATRE

Professors A. M. Drummond, G. B. Muchmore, H. A. Wichelns, Harry Caplan, W. H. Stainton, R. H. Wagner, and C. K. Thomas.

Approved Major and Minor Subjects (key to symbols on p. 26)

Division of Rhetoric and Public Speaking

Classical Rhetoric **3, 4**
History of Public Address **3**
Medieval Rhetoric **3, 4**
Principles of Public Address **3**
Rhetoric and Public Speaking **1, 2, 4**

Division of Dramatic Production

Drama and the Theatre **1**
Dramatic Production **2, 3, 4**
Playwriting **2, 3, 4**
Theatre Techniques **2, 3, 4**

Division of Phonetics

Speech and Phonetics **2, 3, 4**

The chief aim of graduate work in rhetoric and in dramatic production is to develop competent investigators and teachers for colleges and universities.

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 should 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.

All candidates must attain a reasonable knowledge of speech training and phonetics; must acquire a specialist's knowledge of the literature and history of their chosen field, and must accomplish satisfactory work in research. In most cases, the work will require more than the minimum periods of residence. For the Doctor's degree, residence in this University during two academic years will be necessary.

Properly qualified students may select Speech Training and Phonetics as a major subject for the Master's degree; as a minor subject for either degree.

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.

Candidates for the Doctor's degree whose major interest is in Drama and the Theatre will be required to take Dramatic Literature as a minor subject, unless they have already pursued systematic study in this field, and such candidates must expect to be in residence two years and one summer beyond the requirements for the Master's degree.

Candidates for the Master's degree in Dramatic Production will require at least one academic year and one summer session of residence.

The degree of Master of Fine Arts in Drama will be granted to candidates showing special aptitude in the practical phases of Dramatic Production or Playwriting. Their program must include suitable studies in related Fine Arts; two years of residence after the A.B. will normally be required; and a major practical project in the second year will be the thesis.

Opportunities for theatre practice of which students will be expected to avail themselves are afforded by various branches of THE CORNELL UNIVERSITY THEATRE, as follows: in the *Laboratory Theatre*, for public presentations of the work of graduate students in Dramatic Interpretation and Acting; in the *Studio Theatre*, for production of the work in Playwriting; and in the *Summer Theatre*, for intensive work in all phases of theatre practice. *Director of the University Theatre*, A. M. DRUMMOND; *Assistant Director*, W. H. STAINTON; *Technical Director*, J. COLBY LEWIS; *Rural Drama*, H. D. ALBRIGHT.

[15. **Advanced Public Speaking.** Assistant Professor MUCHMORE. First term. Not given in 1936-37.]

16. **Forms of Address.** Professor WICHELNS. Second term. M W F 10. Goldwin Smith 21.

21. **History of Rhetoric and Oratory.** Professor WICHELNS. Throughout the year. Hours to be arranged.

[23. **Classical Rhetoric and Literary Theory.** Professor WICHELNS. Not given in 1936-37.]

24. **Public Opinion and the Method of Argument.** Professor WICHELNS. Repeated in second term. T 11; Th 11–1. Goldwin Smith 134.

Public opinion and its formation studied with reference to the modern theory and practice of public address.

[25. **British Orators.** Assistant Professor WAGNER. Not given in 1936-37.]

[27. **American Orators.** Professor WICHELNS. Not given in 1936-37.]

30. *Phonetics and Speech Training.* Three hours a week, first term.

31. **Advanced Phonetics and Speech Training.** Assistant Professor THOMAS. Second term. M W F 10. Goldwin Smith 26.

Principles of general phonetics; regional variations and historical changes in standards of speech; methods of improving normal and defective speech.

41. **Dramatic Production: Direction.** Assistant Professor STAINTON. First term. M W F 12. Morse, Stage Laboratory.

Dramatic interpretation and the related principles of stage direction and production.

42. **Advanced Dramatic Interpretation and Acting.** Professor DRUMMOND. Throughout the year. Th 2-4. Goldwin Smith 242.

A practical course in direction, rehearsal, and acting, leading to public presentations in the Laboratory Theatre; special attention to oral interpretation.

45. **Dramatic Production: Stagecraft.** Assistant Professor STAINTON. Second term. M W 12. Laboratory, T 1:40-4, or as arranged. Morse, Stage Laboratory.

Stage production; problems and practice in construction and design.

45a. **Dramatic Production: Stage Lighting.** Assistant Professor STAINTON. First term. T 1:40-4, or as arranged. Morse, Stage Laboratory.

[48. **History of the Theatre.** Professor DRUMMOND. Not given in 1936-37.]

49. **Playwriting.** Professor DRUMMOND. Throughout the year. T Th 12. Goldwin Smith 242.

[51. **Problems and Methods.** Professor DRUMMOND. Not given in 1936-37.]

91. **Theatre Practice.** Professor DRUMMOND or Assistant Professor STAINTON. Throughout the year and Summer Session. Hours to be arranged.

Projects correlated with the work of the University Theatre.

Classical and Medieval Rhetoric. Professor CAPLAN. See Greek 33.

Dramatic Literature. See English 42, 46, 53; and especially English 90, Professor STRUNK.

Fine Arts. See especially Architecture 425, 072; Philosophy 4a, 4b; Music 5, 10.

Seminary Courses

[60. **Rhetorical Criticism.** Professor WICHELNS. Not given in 1936-37.]

61. **English and American Theories of Public Address.** Professor WICHELNS. Th 2-4. Goldwin Smith 235.

[62. **Philosophy of Rhetoric.** Professor WICHELNS. Not given in 1936-37.]

63. **Speech Training.** Assistant Professor THOMAS. W 2-4. Goldwin Smith 23.

General Phonetics; methods of speech improvement; theory of voice and speech.

66. **Theories of Dramatic Production.** Professor DRUMMOND. Second term. W 2-4. Goldwin Smith 242.

The chief theories of dramatic production in relation to aesthetic principles.

[67. **Dramatic Art.** Professor DRUMMOND. Not given in 1936-37.]

68. **Modern Theories of Stage Presentation.** Assistant Professor STAINTON. Second term. M 2-4, or as arranged. Morse, Stage Laboratory.

Dramatic Literature. See especially English 150. Professor STRUNK.

ROMANCE LANGUAGES AND LITERATURES

Professors J. F. MASON, G. L. HAMILTON, LAURENCE PUMPELLY, G. I. DALE, M. G. BISHOP, and A. P. PELMONT.

Approved Major and Minor Subjects (key to symbols on p. 26)

Contemporary French Literature **3, 4**
General History of French Literature **3, 4**
French Language **1, 2, 3, 4**
French Literature **1, 2**
French Philology **1, 2, 3, 4**
French Literature of the Sixteenth Century **3, 4**
French Literature of the Seventeenth Century **3, 4**
French Literature of the Romantic Period **3, 4**
Medieval French Literature **3, 4**
Modern French Literature **3, 4**
Italian **1, 2, 4**

Spanish Language **1, 2, 3, 4**
Spanish Literature **1, 2, 3, 4**
Spanish Philology **1, 2, 3, 4**
Spanish Literature of the Renaissance **1, 2, 3, 4**
Spanish Literature of the Golden Age **1, 2, 3, 4**
Modern Spanish Literature **1, 2, 3, 4**
Spanish Literature of the 18th Century **3, 4**
Spanish Literature of the 19th Century **3, 4**

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. This fellowship is ordinarily awarded only to an applicant who has had one year or more of graduate study.

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 the 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, HAMILTON, PUMPELLY, and BISHOP.

16. *History of French Literature.* Throughout the year.

[17. *Literature of the Seventeenth Century.* Throughout the year. Not given in 1936-37.]

18. *Literature of the Eighteenth Century.* Throughout the year.

19. *The Romantic Movement in French Literature.* Throughout the year.

[20. **Modern French Literature.** Throughout the year. Credit three hours a term. Not given in 1936-37.]

[21. **Contemporary French Literature.** Throughout the year. Credit three hours a term. Not given in 1936-37.]

[23. **French Historical Grammar.** First term. Prerequisite, one year of Latin. Professor PUMPELLY. T Th 10. Goldwin Smith 283. Not given in 1936-37.]

Lectures on the historical development of French from its origins to the present. Primarily for students intending to teach French.

24. **French Philology.** Throughout the year. Prerequisite, college entrance Latin or the equivalent. Professor PUMPELLY. T 10; Th 2. Goldwin Smith 277.

Lectures on the historical development of the French language, with a detailed phonological and morphological study of the *Chanson de Roland*.

[31. *Literature of the Sixteenth Century*. Throughout the year. Not given in 1936-37.]

[41. **Old French Texts.** First term. Hours and room to be arranged. Professor HAMILTON. Not given in 1936-37.]

43. **Old Provençal Philology and Literature.** Second term. Hours and room to be arranged. Professor HAMILTON.

47. **Modern French Seminary.** Throughout the year. Professor MASON. T 2:30. Library, French Seminary.

ITALIAN

Professor HAMILTON.

4. *Italian Poetry*. Throughout the year.
15. *The Literature of the Italian Renaissance*. Second term.

SPANISH

Professor DALE.

10. *History of Spanish Literature*. Throughout the year.
[15. *Drama of the Golden Age*. First term. Not given in 1936-37.]
[17. *Cervantes*. Second term. Not given in 1936-37.]
19. *Modern Spanish Literature*. Throughout the year.
[20. *Spanish Poetry*. Throughout the year. Not given in 1936-37.]

[41. **Old Spanish.** Throughout the year. Professor DALE. Library, Spanish Seminary. Not given in 1936-37.]

[42. **Calderón and Alarcón.** Throughout the year. Professor DALE. Not given in 1936-37.]

43. **The Picaresque Novel.** Throughout the year. Professor DALE. Th 2:15. Library, Spanish Seminary.

SUSAN LINN SAGE SCHOOL OF PHILOSOPHY

Professors G. WATTS CUNNINGHAM, GEORGE H. SABINE, E. A. BURTT, HAROLD R. SMART, RICHARD ROBINSON, RALPH W. CHURCH.

The Susan Linn Sage School of Philosophy was founded through the generosity of the late Henry W. Sage, who endowed the Susan Linn Sage Professorship and gave in addition $200,000 to provide permanently for instruction and research in philosophy.

The *Philosophical Review*, supported by the University and issued under the auspices of the Sage School, is a bi-monthly journal devoted to the interests of philosophy, including logic, metaphysics, ethics, aesthetics, the history of philosophy, and the philosophy of religion. By the terms of its establishment, the *Review* is an absolutely free organ of philosophical scholarship, not devoted to the propagation of any doctrine. The *Cornell Studies in Philosophy* are a series of monograph studies, published from time to time under the editorial supervision of the professors of the School. They offer a channel for the publication of studies begun as dissertations for the doctorate or of other research. Seventeen monographs have been issued.

The instruction offered to graduate students presupposes such undergraduate courses in the subject as would be taken by a student in the College of Arts and Sciences of Cornell University who had elected philosophy as a major subject. Those who have not had equivalent preparation are expected to make up their deficiencies outside the work required for an advanced degree.

The Sage School provides opportunity for advanced study to two classes of graduate students: (1) those whose chief branch of research is in allied fields but who desire to supplement this with a minor in philosophy; (2) those whose major interest is in some branch of philosophy.

1. Graduate students having a major interest in literature or the arts, in history or social studies, or in mathematics or a branch of experimental science, are permitted to choose a minor in philosophy with such emphasis as best suits their needs. For such students the School endeavors to outline a plan of philosophical study (in courses or directed reading) which will form a natural supplement to their field of research.

2. Students whose major interest is in philosophy are required (a) to gain a general knowledge of the whole subject including its history, and (b) to select some aspect or subdivision of it for intensive study and research. The following subjects may be chosen as majors and minors: aesthetics, ethics, history of philosophy, logic and epistemology, metaphysics, and philosophy of religion. Students are encouraged to choose one minor in a subject other than philosophy.

The Sage School offers a Graduate Prize in Philosophy, having an annual value of about twenty-five dollars, for the best essay embodying the results of research. See page 24 above.

The School offers also three Susan Linn Sage Fellowships in Philosophy, having an annual value of $600 each. It reserves the right, however, to divide one or more of these fellowships into two scholarships of $300 each. Both scholarships and fellowships carry free tuition in the Graduate School in addition to the stipend.

PHILOSOPHY

Approved Major and Minor Subjects (key to symbols on p. 26)

Aesthetics **1, 2, 3, 4**
Ethics **1, 2, 3, 4**
History of Philosophy **1, 2, 3, 4**
Logic and Epistemology **1, 2, 3, 4**
Metaphysics **1, 2, 3, 4**
Philosophy **4**
Philosophy of Religion **1, 2, 3, 4**

1. *Philosophical Classics.* Three hours a week, both terms.

1a. *Philosophical Classics* (second course). Three hours a week, both terms.

2. *Logic.* Three hours a week, second term.
3. *Problems of Philosophy.* Three hours a week, first term.
4. *Ethics.* Three hours a week, second term.
5. *History of Philosophy.* Three hours a week, both terms.
8a. *Aesthetics: Psychology of Aesthetic Perception.* Three hours a week, first term.
8b. *Aesthetics: Philosophy of Art.* Three hours a week, second term.
9. *Religious Problems in Contemporary Thought.* Two hours a week, first term.
10a. *History of Political Theory: Ancient.* Three hours a week, first term.
10b. *History of Political Theory: Modern.* Three hours a week, second term.
13. *The Philosophy of Religion.* Three hours a week, second term.
14. *History of Religions.* Three hours a week, first term.
15. *Philosophy of Science.* Three hours a week, both terms.

19. **Advanced Readings in Aesthetics.** Assistant Professor CHURCH. First term, repeated in the second term.
Readings to be selected in accordance with the interests and preparation of the student.

20. **Contemporary Philosophy.** First term, Professor BURTT; second term, Assistant Professor SMART. Throughout the year. M W F 11. Goldwin Smith 220.
Main tendencies of contemporary philosophy, especially British and American.

25. **Plato and Aristotle.** Assistant Professor ROBINSON. Throughout the year. Hours to be arranged. Goldwin Smith 220.

[28. **Ethical Theory.** Professor SABINE. First term. T Th S 11. Goldwin Smith 220. Not given in 1936-37.]
A rapid reading of examples of the main types of modern ethical theory.

[29. **The Philosophy of Value.** Assistant Professor CHURCH. Second term. M W F 12. Goldwin Smith 220. Not given in 1936-37.]
A study in Naturalist, Realist, and Idealist theories of value.

30. **Empiricism and Rationalism.** Assistant Professor CHURCH. Throughout the year. M W F 10. Goldwin Smith 220.
The general history of the two schools with a critical analysis of the main works of Hume and Leibniz.

32. **The Critical Philosophy of Kant.** Professor SABINE. Throughout the year. F 2:30, or hours to be arranged. Goldwin Smith 220.
A reading of the principal works of the Critical Period.

33. **The Philosophy of Hegel.** Professor CUNNINGHAM. Second term. W 10–12. Goldwin Smith 220.
A critical analysis of the philosophy of Hegel with special emphasis on the *Phenomenology* and the *Logic.* These two books are studied in alternate years. The *Logic* is to be studied in the year 1936-37.

39. **Seminar in Contemporary Philosophy.** Professor CUNNINGHAM. Throughout the year. M 3, or hours to be arranged. Goldwin Smith 220.
Topic for the year 1936-37: Fact and Meaning.

40. **Seminar in Logic.** Assistant Professor SMART. Throughout the year. T 2, or hours to be arranged. Goldwin Smith 220.
Topic for the year 1936-37: Some problems in Modern Logic.

42. **Seminar in Ancient and Medieval Philosophy.** Assistant Professor ROBINSON. Throughout the year. Hours to be arranged. Goldwin Smith 220.
Topic for the year 1936-37: St. Thomas.

[43. **Seminar in Political Theory.** Professor SABINE. Throughout the year. W 2, or hours to be arranged. Goldwin Smith 220. Not given in 1936-37.]

44. **Seminar in Epistemology.** Professor BURTT. Throughout the year. W 3:30, or hours to be arranged. Goldwin Smith 220.
Topic for the year 1936-37: Truths of Reason.

45. **Seminar in Aesthetics.** Assistant Professor CHURCH. Second term. Hours to be arranged. Goldwin Smith 220.

HISTORY AND THE SOCIAL SCIENCES

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.

ECONOMICS

Professors DONALD ENGLISH, P. T. HOMAN, E. A. J. JOHNSON, M. S. KENDRICK, R. E. MONTGOMERY, P. M. O'LEARY, H. L. REED, F. A. SOUTHARD, J. L. WOODWARD.

Approved Major and Minor Subjects (key to symbols on p. 26)

Economic History **1, 2, 3, 4**
Economic Theory and Its History **1, 2, 3, 4**
Note. Every candidate for the Ph.D. or M.A. degree who does not elect Economic Theory and Its History as a major or a minor subject will be held for certain required work in that subject.
Labor and Industrial Relations **1, 2, 3, 4**
Money, Banking, and International Finance **1, 2, 3, 4**
Organization and Control of Industry **1, 2, 3, 4**
Public Finance **1, 2, 3, 4**

Requirements for the Degree of Ph.D. in the Several Fields of Study

ECONOMIC THEORY AND ITS HISTORY.—When offered as a major: (1) a good general knowledge of the history of economic thought including the classical school and its critics, the more recent important schools of thought, and the principal contemporary theorists; (2) familiarity with the methods of economic analysis and with controversial areas of thought; (3) a detailed knowledge of some period or school together with necessary historical and intellectual background thereto; (4) a knowledge of social and intellectual history sufficient to form a background for an understanding of the development of economic thought.

When offered as a minor: Parts 1, 2, and 4 of above requirement.

MONEY, BANKING, AND INTERNATIONAL FINANCE.—When offered as a major: (1) a detailed understanding of the theory and history of money; monetary system of the U. S.; theory and history of banking; present banking system of the U. S.; foreign exchange; monetary aspects of cyclical fluctuations; (2) an understanding of leading monetary systems of the world; modern central banking theory and practice; banking systems of Canada, England, France, and Germany; international movement of capital.

When offered as a minor: Part 1 of above requirement.

ECONOMIC HISTORY.—When offered as a major: (1) a comprehensive knowledge of the evolution of agriculture, industry and commerce in ancient and medieval times together with an understanding of contemporaneous economic ideas; (2) a comprehensive knowledge of economic history of modern times (in Western World) together with an understanding of intellectual and political movements which have influenced the development of modern economic institutions; (3) a detailed knowledge of at least one special phase of economic history; (4) a knowledge of the bibliography of economic history and ability to appraise the more important generalizations of economic history.

When offered as a minor: Parts 2 and 3 of above requirement.

LABOR AND INDUSTRIAL RELATIONS.—When offered as a major: A good general knowledge of the following divisions of the field of Labor and Industrial Relations and the literature pertaining to each: (1) trade unionism, collective bargaining and industrial arbitration; (2) history, theory and application of labor law; (3) labor management and personnel problems; (4) the national income, its sources and distribution; (5) labor movements and dissenting or protesting economic thought; (6) social insurance. As a background the candidate should have a grasp of the general field of labor conditions and problems, evolution of the wage system, basic material with respect to wage trends, physical production trends, distribution of wealth and income, and the general field of social legislation, together with demonstrated ability to apply quantitative and theoretical methods to problems in the field of industrial relations.

When offered as a minor: two or three of the divisions listed above.

ORGANIZATION AND CONTROL OF INDUSTRY.—When offered as a major: (1) a good general knowledge of the organization of industry; (2) an understanding of the problems of control arising in connection with transportation, public utilities and industrial combinations; (3) a detailed knowledge of organization and problems of control in one of the above three general areas of industry; (4) a knowledge of accounting and corporation finance and, in specific cases, of statistics; (5) a knowledge of constitutional law.

When offered as a minor: Part 1 and a knowledge of corporation finance, accounting, and the problems of control in one general area of industry; and a *detailed* knowledge of accounting *or* corporation finance *or* the problems of control in one general area of industry.

PUBLIC FINANCE.—When offered as a major: (1) a thorough knowledge of the principles and problems of public expenditures and revenues, and of governmental financial policies; (2) an adequate grasp of the facts concerning federal, state, and local public finance in the U. S.; (3) an understanding of these facts in terms of the problems which arise out of them; (4) ability to evaluate ways and means of solving these problems; (5) a broad understanding of the place of public finance in the economic and political order; (6) such specialized knowledge as may be needed for the preparation of a thesis. [Candidates should be grounded in accounting, statistics, finance, and government. Knowledge of the law of taxation, comparative systems of public finance, financial history, and social and political ethics is desirable.]

When offered as a minor: Parts 1 and 5 of the above requirements.

Requirements for the Degree of A.M. in the Several Fields of Study

Graduate students offering any of the several fields in economics as a major or minor for the A.M. degree should consult with members of the Department of Economics to ascertain the exact requirements. In general, the major requirements for the A.M. degree are substantially the equivalent of the minor requirements for the Ph.D. degree.

1. *Modern Economic Society.* Five hours a week, either term.
2a. *Modern Economic Society.* Three hours a week, first term.
2b. *Modern Economic Society.* Three hours a week, second term.
3. *Introduction to Economics.* For students in Engineering and Chemistry. Three hours a week, either term.
11. *Money and Banking.* Three hours a week, either term.
12. *Financial History of the United States.* Three hours a week, second term.
13. *Corporation and Investment Finance.* Three hours a week, first term.
14. *The Federal Reserve System.* Three hours a week, first term.
15. *Trade Fluctuations.* Three hours a week, second term.
16. **Money and Credit.** Professor REED. Prerequisite, Economics 11, 14, 15. Throughout the year, Th 2–4.

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

21a. *Accounting.* Three hours a week, either term.
21b. *Accounting.* Three hours a week, either term.
25. *Cost Accounting.* Two hours a week, first term.

26. **Accounting Theory and Problems.** Professor ENGLISH. Prerequisite, Economics 21b, or its equivalent. Throughout the year. T Th 10.

A critical study of the fundamental principles underlying accounting procedure. The solution of typical problems in corporate consolidation, reorganization, and liquidation, and in other special fields.

31. *Corporation Finance.* Three hours a week, first term.
32. *Public Regulation of Business.* Three hours a week throughout the year.
34. *Transportation.* Three hours a week, first term.
36. *Taxation.* Three hours a week, second term.
41. *Labor Conditions and Problems.* Three hours a week, first term.
42. *Trade Unionism and Collective Bargaining.* Three hours a week, second term.
43. *Quantitative Measurements of Economic Phenomena.* Two hours a week, first term.
44. *Labor Management and Personnel Problems.* Two hours a week, second term.
45. *The Economics of Dissent.* First term.
46. *Legal and Constitutional Aspects of Labor Problems and Welfare Legislation.* Second term. Given in alternate years.

47. **Seminar in Wage Theory.** Assistant Professor MONTGOMERY.

An historical and analytical study of the theory of wages.

49. **Special Problems in Industrial Relations.** Assistant Professor MONTGOMERY.

Discussion and individual investigation of current and theoretical problems in the field of industrial relations. Among the topics for individual study: collective bargaining in selected industries, the application of quantitative methods to the study of labor problems, restatements of traditional wage theory, methods in field research, problems in the field of labor law.

50a. *Introduction to Social Science.* Three hours a week, first term.
50b. *Introduction to Social Science.* Three hours a week, second term.
51. *Population Problems.* Three hours a week, first term.
54. *The Family.* Three hours a week, second term.
71. *International Trade.* Three hours a week, first term.
72. *International Finance.* Three hours a week, second term.
81. *Economics of Enterprise.* Three hours a week, first term.
[82. *The Distribution of Income.* Three hours a week, second term. Not given in 1936-37.]
[83a. *The Development of Economic Institutions.* Three hours a week, first term. Not given in 1936-37.]
83b. *The Development of Economic Institutions.* Three hours a week, second term.
84a. *The Development of Economic Ideas.* Three hours a week, first term.
84b. *The Development of Economic Ideas.* Three hours a week, second term.

85. **Problems in Economic Theory.** Professor HOMAN. Second term. Hours to be arranged.

86. **History and Literature of Economic Thought.** Assistant Professor JOHNSON. Throughout the year. F 2-4. Given in alternate years. An inquiry into the development of economic ideas and methods of analysis as related to the changing intellectual and institutional content of western civilization.

[87. **Contemporary Economic Thought.** Professor HOMAN. Throughout the year. Given in alternate years. Not given in 1936-37.]

Seminary in Economics. Required of all students registered for a major or minor in economics.

AGRICULTURAL ECONOMICS AND FARM MANAGEMENT

See under AGRICULTURE, p. 94.

ECONOMICS OF THE HOUSEHOLD

See under HOME ECONOMICS, p. 144.

GOVERNMENT

Professors R. E. CUSHMAN, H. W. BRIGGS, and M. A. SHEPARD.

Approved Major and Minor Subjects (key to symbols on p. 26)

American Governmental Institutions **1, 2, 3, 4**
Constitutional Law **1, 2, 3, 4**
International Law and Relations **1, 2, 3, 4**
Political Theory **1, 2, 3, 4**

Note. Other subjects may be chosen in consultation with members of the department.

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 1936-37 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, Municipal Corporations, Law of Public Utilities, and Trade Regulations, 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.

1. *American Government.* Three hours a week. Throughout the year.
2. *Comparative Government.* Three hours a week. First term.
9. *Introduction to International Relations.* Three hours a week. First term.

10. **Recent and Contemporary Political Theory.** First term. Credit three hours. Assistant Professor SHEPARD. T Th S 12. Boardman A.

Recent and contemporary political theory; authority, liberty, and obedience; aristocracy and representative government; dictatorship; pluralistic, communistic, and fascistic theories.

11. **Comparative Political Institutions.** Second term. Credit three hours. Assistant Professor SHEPARD. T Th S 10. Boardman C.

A functional study of various institutions and processes of government such as administration and bureaucracy, legislative systems, functional representation and the corporative state, one-, two-, and multi-party systems.

14. **International Law.** First term only in 1936–37. Credit three hours. Assistant Professor BRIGGS. M W F 12. Boardman D.

The nature and basis of international law; the application of international law in municipal and international courts; the general principles of the law of nations. Cases, readings, and discussions.

[15. **International Organization.** Second term. Credit three hours. Assistant Professor BRIGGS. M W F 9. Boardman A. Not given in 1936-37.]

International administrative agencies; collective political intervention; international legislation; the organization and working of the League of Nations; the Permanent Court of International Justice.

18. **Introduction to Legal Philosophy.** First term. Credit three hours. Assistant Professor SHEPARD. T Th S 10. Boardman.

An analysis of various conceptions of the nature of law, historical, analytical, philosophical, and sociological; the problem of the relation between law and the state.

20. **Constitutional Law: The American Federal System.** First term. Credit three hours. Prerequisite, both terms of Government 1 or the consent of the instructor. Professor CUSHMAN. T Th S 11. Boardman C.

Judicial interpretation of the constitution: the nature of judicial review; separation of governmental powers; relations between state and national government; construction of national powers.

21. **Constitutional Law: Fundamental Rights and Immunities.** Second term. Credit three hours. Prerequisite, Government 20 or the consent of the instructor. Professor CUSHMAN. T Th S 11. Boardman C.

Privileges and immunities of citizenship; protection of civil and political rights; the obligation of contracts; due process of law and the equal protection of the law.

12a. **History of Political Theory: Ancient** (See Philosophy 10a).

12b. **History of Political Theory: Modern** (See Philosophy 10b).

26. **Legal and Constitutional Aspects of Labor Problems and Welfare Legislation** (see Economics 46).

28. **American Political and Constitutional Theory.** Second term. Credit two hours. Open to qualified seniors and graduates. Consult the instructor before registering. Professor CUSHMAN. T Th 9. Boardman.

The philosophical background and evolution of American constitutional doctrines.

135. **Local Government** (see Agricultural Economics 135).

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. First term only in 1936–37. Students will be admitted upon consultation with the instructor.

Seminary in Political Theory. Assistant Professor SHEPARD. Throughout the year. Problems of recent and contemporary political theory.

Seminary in Political Theory. Professor SABINE. Throughout the year.

HISTORY

Professors J. P. BRETZ, CARL BECKER, PRESERVED SMITH, M. L. W. LAISTNER, A. P. WHITAKER, CARL STEPHENSON, and F. G. MARCHAM.

Approved Major and Minor Subjects (key to symbols on p. 26)

American History **1, 2, 3, 4**
Ancient History **1, 2, 3, 4**
English History **1, 2, 3, 4**
History of Renaissance and Reformation **1, 2, 3, 4**
Medieval History **1, 2, 3, 4**
Modern European History **1, 2, 3, 4**

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 to which graduate students have immediate access.

The historical seminary rooms in the library building are furnished with atlases, dictionaries, bibliographies, and other works of reference, and afford 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 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 other 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, with the exception of the Boldt Fellowship, exempt from the payment of tuition. There are several assistantships in history, which are filled preferably by the appointment of graduate students.

Fellowships are ordinarily awarded only to applicants who have had one year or more of graduate study. It will hardly be worth while for persons who have not had a year of graduate study to apply unless they can submit written work of superior quality.

A seminary is conducted in each of the major fields of history and each professor is willing to direct research in his special field.

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.

AMERICAN HISTORY

Professors J. P. BRETZ and A. P. WHITAKER.

82. *American History, 1775-1850.* First term. Three hours a week.
83. *American History, 1850-1935.* Second term. Three hours a week.
86. *American History, 1787-1848.* Second term. Three hours a week.
87. *American History, 1848-1914.* First term. Three hours a week.

89. **American History, 1750-1848:** The Settlement of the Middle West. Throughout the year. Two hours a week. Prerequisite, History 82, 83, or the equivalent. Upperclassmen and graduates. Professor BRETZ. T Th 9. Boardman E.

90. **American Foreign Relations, 1776-1920.** Throughout the year. Credit two hours a term. Prerequisite, History 82, 83, or the equivalent. Upperclassmen and graduates. Professor WHITAKER. T Th 11. Boardman E.

[91. *Social and Intellectual History of the United States, 1775-1860.* Throughout the year. Two hours a week. Prerequisite, History 82, 83, or the equivalent. Upperclassmen and graduates. Professor WHITAKER. T Th 11. Boardman E. Not given in 1936-37.]

99. **Seminary in American History.** Throughout the year. Two hours a week. Professor BRETZ. Hours to be arranged. First meeting, Monday, Oct. 5, 4 p.m.

ANCIENT HISTORY

Professor M. L. W. LAISTNER.

1. (14) **Seminary in Roman Historical Inscriptions.** Throughout the year. M 2-4. University Library, Classical Seminary. A reading knowledge of Latin is essential.

[2. (8) **Seminary in Greek and Roman Historiography.** Throughout the year. M 2-4. Boardman 4. Not given in 1936-37.]

[2. (2) *Greek History, 500-323 B. C.* First term. M W F 11. Boardman E. Not given in 1936-37.]

[3. (3) *The Hellenistic Age.* Second term. M W F 11. Boardman E. Not given in 1936-37.]

4. (4) *The Roman Republic, 133-30 B. C.* First term.

5. (5) *The Roman Empire, 30 B. C.-180 A.D.* Second term.

6. (7) *The History of Education (Greek, Roman, and Early Medieval).* First term.

Note. The figures in parenthesis are the numbers of the courses and seminars in the Announcement of the College of Arts and Sciences.

ENGLISH HISTORY

Professor F. G. MARCHAM.

61. *English History.* Three hours a week, throughout the year.

[65. **English Constitutional History since 1485.** Throughout the year. Not given in 1936-37.]

[66a and b. *History of England under the Tudors and Stuarts.* Three hours a week, throughout the year. Given in alternate years. Not given in 1936-37.]

67 and 68. *History of England from the Eighteenth Century to Present.* Three hours a week, throughout the year. Given in alternate years.

69. **Seminary in Tudor and Stuart History.** Professor MARCHAM. First term. Study of materials for research in Tudor and Stuart history and some of the leading historical problems of the period.

MEDIEVAL HISTORY

Professor CARL STEPHENSON.

21. *Medieval History.*

[22. *Medieval Civilization.* Throughout the year. T Th 10. Boardman D. Not given in 1936-37.]

24. **English Constitutional History to 1485.** Throughout the year. T Th 10. Boardman C.

25. **Seminary in Medieval History.** Throughout the year. Prerequisite: reading knowledge of Latin; German and French desirable. Hours to be arranged.

MODERN EUROPEAN HISTORY

Professor CARL BECKER.

42. *Modern History,* 1600-1930.

The Napoleonic Era. A study of the organization of France under Napoleon, the establishment of the empire, and the restoration of Europe in 1814-15.

The French Revolution. A study of French society before 1789, and of the Revolution from 1789 to 1795.

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.

Renaissance and Reformation History

Professor Preserved Smith.

Though Professor Smith offers courses only during the second term of each year, he resides at Ithaca most of the time, and is glad to give conferences and to supervise the preparation of theses even while not teaching.

32. *The Age of the Renaissance and Reformation.*
36. *History of Education (Late Medieval and Modern).*
[33. *History of Christianity.* Not given in 1936-37.]

34. **Historical Method.** Second term. Prerequisite, a reading knowledge of either French or German. S 10-12. Boardman 2. A study of historical method and of the development of modern historiography.

[35. **Church History.** Second term. Prerequisite, a reading knowledge of Latin. S 10-12. Boardman 2. Not given in 1936-37.]

RURAL SOCIAL ORGANIZATION

See under Agriculture, p. 109.

ANIMAL SCIENCES

ANATOMY

Professors A. T. KERR and J. W. PAPEZ.

Approved Major and Minor Subjects (key to symbols on p. 26)

Anatomy **1, 2, 3, 4**
Neuroanatomy **1, 2, 3, 4**

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. In this room are also the X-ray outfit and a dark room with a fluorscope. 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, 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 cooperation with the department of Physiology, there is suitable provision for operative and experimental work on animals.

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 biology, comparative and human anatomy. A reading knowledge of German and French is essential for successful research in anatomy.

221. *Structure of the Human Body.* Three lectures and one demonstration a week. Second term.

222. *Anatomical Methods.* One lecture and eight hours of laboratory a week. First term.

224. *Artistic Anatomy.* One lecture and six hours of laboratory a week throughout the year.

229. *Kinesiology.* One lecture and six hours of laboratory a week. First term.

225. **Comparative Neurology.** Second term. Credit three hours. Prerequisite, nine hours of Animal Biology. Assistant Professor PAPEZ. T Th 8-11. Stimson 52.

A comparative study of the vertebrate nervous system based on dissections of brains of shark and dog, and sections of cat brain stem; of the chief nerve mechanisms that determine the form and structure of the nervous systems, their evolutionary and functional significance. One recitation and two laboratory periods.

1. **Anatomy of the Head and Neck.** Prerequisites, courses in Zoology, and or, Comparative Anatomy. Professors KERR and PAPEZ. First term. Twenty-four hours a week for six or more weeks, anatomy laboratory, Stimson Hall.

Daily except Saturday, 8 a.m. to 4 p.m. A detailed study of the structures in the head and neck of man, including the eye, ear, nose, pharynx, larynx and cranial nerves, but not the brain. Demonstrations, dissection, and conferences.

2. **Anatomy of the Thoracic Walls and Viscera.** Prerequisites, courses in Zoology and or, Comparative Anatomy. Professors KERR and PAPEZ. First term, twenty-four hours a week for two or more weeks. Anatomy laboratory, Stimson Hall. Daily except Saturday, 8 a.m. to 4 p.m. A detailed study of the human chest walls and of the heart, lungs, vessels, and nerves of the thoracic cavity. Demonstrations, dissections, and conferences.

3. **Anatomy of the Abdominal and Pelvic Walls and Viscera.** Prerequisites, courses in Zoology, and or, Comparative Anatomy. Professors KERR and PAPEZ. First term, twenty-four hours a week for six or more weeks. Anatomy laboratory, Stimson Hall. Daily except Saturday, 8 a.m. to 4 p.m. A detailed study of the human abdominal walls and of the organs of the digestive, urinary, and reproductive systems together with the vessels and nerves of the abdominal cavity. Demonstration, dissection, and conferences.

4. **The Nervous System.** Anatomy. Histology and functional systems. Prerequisites, Anatomy and Histology. Assistant Professor PAPEZ. Second term. Nine hours a week, M W F, 1-4 p.m., anatomy laboratory, Stimson Hall. Dissection of the human spinal cord and brain. Microscopic structure and development of the nervous system of man. Laboratory with demonstrations, conferences, and recitations.

6. **Anatomy of the Living Body.** Prerequisites, courses in Zoology, and or, Comparative Anatomy. Professor KERR. First term. Three lecture demonstrations a week. Interpretation of dissecting room material by means of the living body, frozen sections, and special preparations. Supplementary to the work of Courses 1, 2, and 3.

7. **Anatomy of the Upper Extremity.** Prerequisites, courses in Zoology, and or, Comparative Anatomy. Professors KERR and PAPEZ. Second term. Four hours a week for seven weeks, anatomy laboratory, Stimson Hall. M 8-12:30. A detailed study of the bones, joints, muscles, and nerves of the upper extremity of man.

8. **Anatomy of the Lower Extremity.** Prerequisites, courses in Zoology, and or, Comparative Anatomy. Professors KERR and PAPEZ. Second term. Four hours a week for eight weeks. A detailed study of the bones, joints, muscles, and nerves of the lower extremity of man.

9. **Topographical Anatomy.** Prerequisites, anatomy courses 1, 2, 3, 7, or 8. First and second terms. Professors KERR and PAPEZ. Anatomy laboratory, Stimson Hall. The detailed study and dissection of any region of the human body with particular reference to the arrangement of the parts and their variations.

250. **Advanced and Research Work in Human Anatomy and Neurology.** Throughout the year. Professors KERR and PAPEZ. Hours to be arranged. Anatomy laboratory, Stimson Hall. Two or more laboratory periods a week. The study and investigation of some special topic with training in methods of research in anatomy. For those who have taken the necessary preliminary courses and are otherwise prepared. Primarily for graduates, but undergraduates properly qualified may be admitted.

ANIMAL PATHOLOGY, BACTERIOLOGY, AND IMMUNOLOGY

See under VETERINARY MEDICINE, p. 153.

BACTERIOLOGY

Professors J. M. SHERMAN, OTTO RAHN, C. N. STARK, and GEORGES KNAYSI.

(See also under VETERINARY MEDICINE, p. 153)

Approved Major and Minor Subjects (key to symbols on p. 26)

Agricultural Bacteriology **4**
Bacteriology **1, 2, 3, 4**

Dairy Bacteriology 4
General Bacteriology 4

Before taking up graduate work in bacteriology, it is desirable that the student have general chemistry, qualitative and quantitative analysis, organic chemistry, and introductory courses in the biological sciences.

Formal courses open to undergraduate and graduate students are given in the following subjects:

1. **General Bacteriology.** First term. Credit six hours. Lectures, recitations, and laboratory practice, M W F 1:40-5. Dairy Building 119 and 301. Professor STARK and Mrs. STARK.

An introductory course; a general survey of the field of bacteriology, with the fundamentals essential to further work in the subject. Laboratory fee, $15.

105. **Higher Bacteria and Related Microorganisms.** First term. Credit three hours. Prerequisite, course 1. Lectures, recitations, and laboratory practice, T Th 1:40-4:30. Dairy Building 119 and 323. Assistant Professor KNAYSI.

A study of the higher bacteria together with the yeasts and molds which are of especial importance to the bacteriologist. Laboratory fee, $15.

106. **Dairy Bacteriology.** Second term. Credit four hours. Prerequisite, course 1. Lectures, recitations, and laboratory practice, M W 1:40-5. Dairy Building 119 and 323. Professor SHERMAN and Mr. YAWGER.

An advanced course for students in bacteriology or dairy industry. The relation of microorganisms to milk and milk products. The subject is treated from the standpoint of economic dairy bacteriology and also from the standpoint of milk hygiene and sanitary control. Laboratory fee, $15.

210. **Physiology of Bacteria.** Second term. Credit two hours. Prerequisite, course 1 and at least one additional course in bacteriology. Lectures, M W 8. Dairy Building 120. Professor RAHN.

An advanced course in the physiology of bacteria and the biochemistry of microbic processes.

210a. **Physiology of Bacteria, Laboratory.** Second term. Credit three hours. Must be preceded or accompanied by course 210. Time to be arranged. Dairy Building. Professor RAHN and Mr. HEGARTY.

An advanced laboratory course dealing with the biological principles of growth, fermentation, and death of bacteria. Laboratory fee, $15.

211. **Taxonomy of Bacteria.** First term. Credit two hours. Prerequisite, course 1 and at least one additional course in bacteriology. Lectures, T Th 8. Dairy Building 120. Professor RAHN.

An advanced course, dealing with the natural groups and variability of bacteria, with a study of the systems of nomenclature and classification.

212. **Bacteriological Literature.** Throughout the year. Credit one hour a semester. For seniors and graduate students. F 8. Dairy Building 120. Professor RAHN.

Presentation and discussion of current literature in bacteriology.

213. **Morphology and Cytology of Bacteria.** First term. Credit two hours. For seniors and graduate students. Lectures, W F 5. Dairy Building 119. Assistant Professor KNAYSI.

The morphology, cytology, and microchemistry of microorganisms.

221. **Seminary.** Throughout the year. Without credit. Required of graduate students specializing in the department; open to undergraduate students taking advanced work. Hours to be arranged. Dairy Building. Professor SHERMAN.

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 pathogenic bacteriology, see Animal Pathology and Bacteriology; for soil bacteriology, see Agronomy.)

BIOLOGICAL CHEMISTRY

Professor SUMNER, *Doctor* HAND, and *Doctor* HOWELL.

Approved Major and Minor Subjects (key to symbols on p. 26)

Biochemistry **1, 2, 4**

The Biochemical laboratories on the second floor of Stimson Hall include a student laboratory, a research laboratory, a stockroom, and two offices. The laboratories are well-equipped for work in biological chemistry. The principal periodicals, monographs, and textbooks dealing with the biological sciences are to be found in the Van Cleef Library on the ground floor of Stimson Hall.

FACILITIES FOR WORK IN ENZYME CHEMISTRY

Unusual opportunity is offered the graduate student for advanced and research work with enzymes. The Laboratory of Biochemistry has been equipped for this express purpose and it is safe to say that practically every type of apparatus required for enzyme experiments is available.

314. *Biochemistry for Undergraduates.* Three lectures a week. First term.

314a. *Biochemistry Laboratory for Undergraduates.* Two afternoons a week. First term.

315. **General Biochemistry.** Second term. Credit seven hours. Intended for Medical and Graduate Students. Lectures, T 8-9, Th F S 9-10; Laboratory, Th 1-4, F S 10-1. Professor SUMNER, Dr. HAND, Dr. HOWELL.

316. **Physical Biochemistry.** Second term. Credit 2 hours. The applications of physical chemistry to biological problems. For students of biology and medicine. Can be taken together with Biochemistry 315 or separately. Lecture, W 9. Laboratory, W 10-12:30. Dr. HAND.

317. **Enzymes.** First term. Credit two hours. Lectures, T Th 10. Alternates with Biochemistry 318. To be given in 1936-37. Professor SUMNER.

[318. **Advanced Biochemistry.** Biological oxidations, plant metabolism, plant pigments, photosynthesis, vitamins, proteins, and immuno-chemistry. First term. Credit 2 hours. Lectures, T Th 10. Alternates with Biochemistry 317. To be given in 1937-38. Dr. HAND.]

320. **Advanced Work and Research in Biochemistry.** Throughout the year. Professor SUMNER.

ENTOMOLOGY AND LIMNOLOGY

Professors O. A. JOHANNSEN, G. C. EMBODY, J. C. BRADLEY, ROBERT MATHESON, C. R. CROSBY, E. F. PHILLIPS, P. W. CLAASSEN, P. A. READIO, G. F. MACLEOD, and D. L. COLLINS

Approved Major and Minor Subjects (key to symbols on p. 26)

Insect Ecology **1, 2, 3**
Insect Morphology **1, 2, 3**
Insect Embryology **1, 2, 3**
Insect Physiology **1, 2, 3**
Insect Taxonomy **1, 2, 3**
Economic Entomology **1, 2, 3**
Medical Entomology **1, 2, 3**
Parasitology **1, 2, 3**
Apiculture **1, 2, 3**
Limnology **1, 2, 3**
Aquiculture **1, 2, 3**
Entomology **4**

Facilities in the way of material and equipment are placed at the disposal of the student desiring to investigate in the following fields: taxonomy, morphology, embryology of insects, ecology, limnology, aquiculture, parasitology, medical entomology, apiculture, economic zoology and entomology.

The laboratories in Comstock Hall are equipped with modern compound, binocular, and dissecting microscopes, microtomes and accessories, paraffine and constant temperature ovens, projection and drawing apparatus, cameras and dark rooms.

Connected with the laboratory of Insect Taxonomy in Comstock Hall 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. In assembling these collections, efforts have been made to obtain material from all parts of the world illustrating biological principles.

An 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 opportunities for investigations in the biology of fresh water organisms. An apiary is maintained for work in Apiculture.

The Cayuga basin, with its diversified topography, its extensive fauna, and its mingling of life zones, offers unusual opportunities for ecological field work. Within the basin are three state parks and three wild life preserves; the former established on account of the beauty of their scenery, the latter on account of their interesting fauna and flora.

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 on entomology in Comstock Hall, 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 and should have a reading knowledge of French and German.

In the summer 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.

The following undergraduate courses are accounted a part of a preparation for graduate study in entomology:

12. *General Entomology.* Credit three hours. First term.
15. *Wing Venation and Evolution.* Credit one hour. First or second term.
21. *Elementary Morphology of Insects.* Credit three hours. First or second term.
30a. *Elementary Taxonomy of Insects.* Credit one hour. Second term.

These also are recommended for certain phases of the work:

30b. *Entomotaxy.* Credit two hours. Second term, completed first term of following year.
41. *General Economic Entomology.* Credit three hours. Second term.
43. *Forest Insects.* Credit two hours. Second term.
61. *General Beekeeping.* Credit three hours. Second term.
73. *Aquiculture.* Credit three hours. First term.
74. *Fish Culture.* Credit two hours. Second term.
75. *Laboratory Methods in General Biology.* Credit two hours. Second term.

Descriptions of these courses will be found in the Announcement of the College of Agriculture.

31. **Taxonomy of Insects.** This course extends through three terms, but the work of any term may be taken independently. Credit three hours. Prerequisite, courses 12, 21, 15, and 30a. Lecture, W 10. Comstock Hall 145. Laboratory, T Th 1:40-4. Comstock Hall 300. Professor BRADLEY and Mr. PATE.

A survey of the classification of the orders of insects. For the year 1936-37 the orders to be treated are: First term, Coleoptera, Lepidoptera; second term, Orthoptera, Diptera and minor orders. For the year 1937-38 the orders to be

treated are: first term, Hymenoptera, Hemiptera; second term, Orthoptera, Diptera, minor orders. Laboratory fee, $4.50.

122. **Insect Morphology.** Both terms. Credit two hours each term. Prerequisite, courses 21, and 12 or 30a. Lectures, assigned reading, and reports. T Th 10. Comstock Hall 145. Professor JOHANNSEN.

This course deals with the anatomy, histology, embryology and post-embryonic development of insects.

124. **Histology of Insects.** First or second term. Credit two hours. Must be preceded or accompanied by course 122. Laboratory, two periods a week, by appointment. Comstock Hall 170. Professor JOHANNSEN and Dr. BUTT.

Technique in histological methods as applied to insects. Laboratory fee, $3.

241. **Advanced Economic Entomology.** Throughout the year. Credit two hours a term. Open to qualified juniors and graduate students. Lecture, M 11. Conference, W 2-4. Professor READIO.

Given in cooperation with the Division of Entomology of the New York State Agricultural Experiment Station at Geneva, and the extension and research staffs of the Department of Entomology at Cornell University.

A course for the student intending to work in the field of economic entomology, including such subjects as: Principles of insect control by natural agencies, biological control methods, inspection and quarantine regulations, cultural practices, physical methods, and use of insecticides; methods of planning and conducting experiments in insect control; insectary methods of rearing and studying insects; literature of economic entomology, etc.

[51. **Parasites and Parasitism.** Second term. Credit two or three hours. Prerequisite, Biology 1 or Zoology 1. Lecture, T 9. Comstock Hall 200. Practical exercises, M or T 1:40-4. Professor MATHESON, Mr. MILLER, and Mr. HURLBUT. Not given in 1936–37.]

A consideration of the origin and biological significance of parasitism, and of the structure, life, and economic relations of representative parasites. A limited number of well prepared students will be permitted to take the extra hour's credit. The work will occupy one afternoon a week and will be devoted to the technique of the diagnosis of parasitic infections, preparation of material from post-mortem examinations, and advanced work in Parasitology. Laboratory fee, $2 or $4.

52. **Medical Entomology.** Second term. Credit two or three hours. Prerequisite, Zoology 1 or Biology 1. Lecture, T 9. Comstock Hall 200. Practical exercises, T, W or Th 1:40-4. Professor MATHESON, Mr. MILLER, and Mr. HURLBUT.

This course deals with insects and other arthropods that are the causative agents of disease in man and animals, or are the vectors, or intermediate hosts, of disease-producing organisms. A limited number of well prepared students will be permitted to take the extra hour's credit. The work will occupy one afternoon a week and will consist of detailed studies of selected groups of insects in their relation to disease causation or as vectors of pathogenic organisms of animals. Laboratory fee, $2 or $4.

261. **Advanced Beekeeping.** First and second terms. Credit four hours a term. Open only to qualified seniors and graduate students. M F 11-12:50. Comstock Hall 12. Professor PHILLIPS.

A technical course covering investigations, especially those of a scientific character, in all phases of apiculture. Special consideration is given to the study of beekeeping regions, with particular reference to conditions in New York.

Designed for advanced students preparing to teach or to do research in apiculture.

118. **The Technics of Biological Literature.** First term. Credit three hours. Lectures, M F 11. Comstock Hall 300. Library work by assignment. Professor BRADLEY.

A critical study of the biologists' works of reference. Practice in the use of generic and specific indices and of bibliographies, and in the preparation of the latter; methods of preparing technical papers for publication; zoological nomen-

clature. This course is of a technical nature, and is intended to aid students specializing in zoology or entomology in their contact with literature.

119. **Entomological Reading in Foreign Languages.** French first term, German second term. Two hours a week, by appointment. Without credit. Open to advanced students in entomology who have an elementary knowledge of the language. Professor JOHANNSEN.

RESEARCH

300. **Research.** Throughout the year. Prerequisite, permission to register from the professor under whom the work is to be taken. Comstock Hall.

300a. **Insect Ecology and Limnology.** Professor CLAASSEN.

300b. **Insect Morphology and Embryology.** Professor JOHANNSEN.

300c. **Taxonomy.** Professors BRADLEY (all orders), JOHANNSEN (Diptera) and Dr. FORBES (Lepidoptera).

300d. **Economic Entomology.** Professors MATHESON, CROSBY, PARROTT, GLASGOW, CHAPMAN, CLAASSEN, and READIO and Assistant Professor MACLEOD.

300e. **Medical Entomology and Parasitology.** Professor MATHESON.

300f. **Apiculture.** Professor PHILLIPS.

300g. **Aquiculture.** Professor EMBODY.

300h. **Arachnology.** Professor CROSBY.

300i. **Insect Physiology.** Professors PHILLIPS and MATHESON, and Assistant Professor MACLEOD.

SEMINARIES

Jugatae. Throughout the year. M 4:30–5:30. Comstock Hall 145.
The work of an entomological seminary is conducted by the Jugatae, an entomological club that meets for a discussion of the results of investigations by its members.

Seminary in Insect Physiology. Throughout the year. M 6:30-8. Comstock Hall 50. Open to qualified graduate students. Assistant Professor MACLEOD.

FOODS AND NUTRITION

See under HOME ECONOMICS, p. 145.

HISTOLOGY AND EMBRYOLOGY

Professors B. F. KINGSBURY and H. B. ADELMANN.

Approved Major and Minor Subjects (key to symbols on p. 26)

Histology and Embryology **1, 2, 3, 4**
Histology **3, 4**
Embryology **3, 4**

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 photomicrographic laboratory and dark room, and a drawing and projection room. A museum of embryological models occupies the center of the advanced laboratory.

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.

The Department of Histology and Embryology offers the following courses.

6. *Histology* (*Veterinary*). Four hours a week, throughout the year.
9. *Embryology* (*Veterinary*). Two hours, second term.
10. *Histology* (for medical students). Eight hours. First term.
101. *The Tissues: Histology and histogenesis.* Four hours, first term.
102. *The Organs: Histology and development.* Four hours, second term.
104. *Vertebrate Embryology.* Five hours, second term.

107. **Advanced Histology and Embryology.** Through the year. Credit three hours or more a term. Prerequisite, Animal Biology 101, and 102 or 104, or equivalent courses. Professor KINGSBURY, Assistant Professor ADELMANN, and instructor. Day and hours to be arranged. Stimson 43.

115. **Experimental Embryology.** First term. Credit two hours. Assistant Professor ADELMANN. Primarily for graduates and specially qualified undergraduates. The course will be conducted as a seminar. Lectures with reports by students dealing with the experimental analysis of developmental processes. Hours to be arranged. Stimson.

[120. **The Theory of Development.** First term. Credit two hours. Assistant Professor ADELMANN. Hours to be arranged. Stimson 8. Not given in 1936-37.]
Primarily for graduates. One lecture with collateral reading and reports. A series of lectures upon some important phase of Development.

108. **Seminary.** First and second terms. One hour each week. Thursday, 4:30 p.m., or time to be arranged. For the discussion of problems in the field of histology, or embryology; for the review of current literature; for the presentation of original work by the members of the staff and those doing advanced work in the department.

Undergraduate courses 101, 102, and 104 (College of Arts and Sciences) may often be attended with advantage by graduate students. Satisfactory work in these obviates the requirements of the Qualifying Examination.

HUMAN PHYSIOLOGY

Professors H. S. LIDDELL and J. A. DYE, and *Doctor* G. H. MAUGHAN.

Approved Major and Minor Subjects (key to symbols on p. 26)

Physiology **1, 2, 4**

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. Special facilities are available for the pursuance of research in the fields of tissue respiration, metabolism, the endocrine glands, and ultra-violet radiations.

In connection with this laboratory there is a workshop with a skilled mechanician who is capable of making and modifying any kind of apparatus which may be required for special research.

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.

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.

FACILITIES FOR BEHAVIOR STUDY

Cornell University offers exceptional facilities for the experimental study of behavior. The Physiological Field Station provides accommodation for large and small animals under ideal conditions. A special laboratory with sound-proof rooms is equipped for conditioned reflex experiments and a comprehensive program of investigation has been in progress for a number of years. Provision has also been made at the Field Station for other methods of behavior study. In Stimson Hall another laboratory for the study of motor or salivary conditioned reflexes in the dog is available for advanced study and research. An extensive collection of standard physiological apparatus is also available and an instrument maker can construct equipment for special investigations.

ADVANCED WORK AND RESEARCH IN BEHAVIOR

Opportunities for experimental investigation of behavior will be available to properly qualified students. Detailed study of the experimental literature can also be pursued under supervision.

It is possible to pursue work under the personal direction of members of the Faculty during the summer.

31. **Neuro-Physiology.** Muscle, nerve, central nervous system, and organs of special sense. Second term. Lectures and laboratory. Professor LIDDELL.

34a. **Advanced Physiology.** Digestion, absorption, the fate of the absorbed food, excretion, and heat regulation. Second term, 4 weeks. Two hours credit. Assistant Professor DYE and Dr. MAUGHAN. Lectures, W Th F S 8. Laboratory, T 9-4 and Th 10-1:30. Stimson.

34b. **Physiology of the Endocrine Glands.** Second term, 4 weeks. Two hours credit. Assistant Professor DYE and Dr. MAUGHAN. Lectures, W Th F S 8. Laboratory, T 9-4 and Th 10-1:30. Stimson.

Courses 31, 34a, and 34b are those offered to first year medical students. They may be taken separately or as a group.

303. *Elementary Human Physiology.* Either term. Three hours a week.

305. *Physiology of the Vitamins, Ultra-Violet Radiations, and Internal Secretions.* Second term. Three hours a week.

306. *Physiology of Exercise.* First term. Three hours a week.

307. **The Physiology of the Conditioned Reflex.** First term. Credit three hours. Prerequisites, Psychology 1 and Animal Biology 300 or 303. Professor LIDDELL. M W F 9. Amphitheatre, Stimson.

A systematic review, with demonstrations, of methods for establishing conditioned reflexes of glands and muscles. The development of the theory of behavior based upon the conditioned reflex method will be critically presented. A general survey of the work of the nervous system derived from conditioned reflex experiments. This course should be preceded or followed by Animal Biology 225.

308. **Advanced Work and Research in Physiology.** Either term. Two or more hours credit.

309. **Physiology of Circulation, Respiration, and Metabolism.** First term. Lectures, recitations, and laboratory. Assistant Professor DYE and Dr. MAUGHAN. W F 11; W F 1:40-4.

310. **Seminary in Physiology.** Second term. Credit one hour. For graduate students and others properly qualified. Day to be arranged. Stimson, 4:15.

Reports on recent advances in physiology.

MEDICAL SCIENCES

See under MEDICAL SCIENCES AS PRESENTED IN THE MEDICAL COLLEGE, NEW YORK CITY, p. 155.

PSYCHOLOGY

Professors MADISON BENTLEY, H. P. WELD, K. M. DALLENBACH, J. G. JENKINS, *Doctor* SAMUEL FELDMAN.

Approved Major and Minor Subjects (key to symbols on p. 26)

Applied Psychology **2, 3, 4**
Experimental Psychology **1, 2, 3, 4**
History of Psychology **3**
Physiological Psychology **3**
Psychology **1, 2, 4**
Systematic Psychology **3**

The Sage Professorship of Psychology and the Laboratory of Psychology were established in 1890 as a part of the Susan Linn Sage School of Philosophy, a foundation of the late Henry W. Sage.

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.*

Facilities for graduate studies in animal behavior are provided by the Department of Physiology, with which the Department of Psychology stands in close cooperation.

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 awards one Sage Fellowship and one Sage Scholarship in Psychology. The Fellowship is usually awarded to a candidate who has com-

pleted at least two years of graduate study. The Scholarship may be awarded to first-year or second-year graduates.

Seminaries for graduate students are conducted each semester by the senior members of the departmental staff.

1. *Elementary Psychology.* Three hours a week, either term.

2. *General Psychology.* Three hours a week, second term.

3a and 3b. *Introductory Laboratory.* Six hours a week, either term, or both terms.

4. **Intermediate course in Psychology.** Prerequisite, consent of the instructor. Dr. FELDMAN. First term. M W F 9. *Morrill* 41.

[5. **Perception.** Dr. Feldman. First term. M W F 9. Morrill 41. Not given in 1936-37.]

[6. **Memory, Skills and Work.** Professor DALLENBACH. Second term. M W F 9. Morrill 42. Not given in 1936-37.]

[7. **Reading of German Psychology.** Dr. FELDMAN. Second term. Hours to be arranged. Seminary Room, Morrill. Not given in 1936-37.]

The accurate reading and translation of psychological texts and articles. The course presupposes a knowledge of grammar.

9. **Experimental, Theoretical, and Historical Problems.** Professors BENTLEY, WELD, and DALLENBACH, and Assistant Professor JENKINS. Morrill, Psychological Laboratory.

10. **Social Psychology.** Prerequisite, consent of the instructor. Professor WELD. Second term. M W F 11. Morrill 41.

11. **Physiological Psychology of the Senses.** Prerequisite, consent of the instructor. Professor DALLENBACH. First term. M W F 11. Morrill 42.

A systematic review and criticism of the experimental literature of sense psychology. Lectures, discussions, and demonstrations.

12. **Legal Psychology.** Dr. WELD. First term. M W F 11. Boardman B.

Psychological aspects of the origin and growth of the law, and of legal theory; psychological problems of evidence and responsibility.

13. **History of Experimental Psychology.** Prerequisite, consent of the instructor. Dr. FELDMAN. First term. T Th S 11. Morrill 41.

[14. **Contemporary Psychology.** Dr. FELDMAN. First term. T Th S 11. Seminary Room, Morrill. Not given in 1936-37.]

A comparative study of current psychological theory; existential psychology, behaviorism, Gestalt psychology, psychoanalysis, and hormic psychology.

15. **Psychology of the Abnormal.** Prerequisite, consent of the instructor. Professor BENTLEY. First term. M W F 10. Morrill 59.

16a. **Introduction to Psychotechnology.** Prerequisite, consent of the instructor. Assistant Professor JENKINS. First term. T Th S 10. Morrill 59.

A study of the results of experimental and statistical analyses of psychological problems in vocational guidance, medicine, law, athletics, and problems of everyday existence.

16b. **Psychotechnology in Business and Industry.** Prerequisite, consent of the instructor. Assistant Professor JENKINS. Second term. T Th S 11. Goldwin Smith A.

A study of experimental and statistical analyses of psychological problems in vocational selection, industrial production, personnel, advertising, selling, and market research.

[17. **Animal Psychology.** Prerequisite, consent of the instructor. Professor BENTLEY. Second term. M W F 10. Morrill 41. Not given in 1936-37.]

The comparative psychology of vertebrate and invertebrate forms. Lectures, discussions, and demonstrations.

18. **Genetic Psychology.** Prerequisite, consent of instructor. Professor BENTLEY. Second term. M W F 10. Morrill 41.

20. **The Correlational and Psychophysical Methods.** Professor DALLENBACH. First term. M W F 2-4. Morrill, Psychological Laboratory.

21. **Technique of Experimentation.** Professor BENTLEY. Second term. T Th 2. Morrill, Psychological Laboratory.

A study of the principles and processes of psychological research.

24. **Theory of Behavior.** (See Education 5.) Professor OGDEN.

VERTEBRATE ZOOLOGY

Professors A. H. WRIGHT, G. C. EMBODY, and A. A. ALLEN; *Doctor* W. J. HAMILTON, Jr.

Approved Major and Minor Subjects (key to symbols on p. 26)

Animal Ecology **1, 2, 3, 4**
Aquiculture **1, 2, 3, 4**
Fish Culture **1, 2, 3, 4**
Herpetology **1, 2, 3, 4**
Ichthyology **1, 2, 3, 4**
Mammalogy **1, 2, 3, 4**
Ornithology **1, 2, 3, 4**
Vertebrate Ecology **1, 2, 3, 4**
Vertebrate Zoology **1, 2, 3, 4**

8. *Elementary Taxonomy and Natural History of Vertebrates.* Credit three hours each term.

9. *General Ornithology.* Credit three hours. Second term.

73. *Aquiculture.* Credit three hours. First term.

74. *Fish Culture.* Credit two hours. Second term.

Descriptions of these courses will be found in the Announcements of the College of Arts and Sciences and the College of Agriculture.

[22. **Ichthyology, Advanced Systematic and Field Zoology.** Throughout the year. Credit three hours a term. Professor WRIGHT and Dr. HAMILTON. Not given in 1936-37.]

In the lectures, special emphasis is laid on the principal phases of animal life; the taxonomy, origin, and evolution of fossil and living groups; geographical distribution; and the literature and institutions of zoology. Laboratory periods are devoted to the identification of exotic and indigenous forms.

[23. **Herpetology (Amphibia).** First term. Credit three hours. Professor WRIGHT and Dr. HAMILTON. Not given in 1936-37.]

[24. **Herpetology (Reptilia).** Second term. Credit three hours. See announcement for course 23. Professor WRIGHT and Dr. HAMILTON. Not given in 1936-37.]

25. **Mammalogy.** Throughout the year. Credit three hours a term. Lectures, T Th 8. McGraw 7. Laboratory, F 1:40-4 or Sat. 8-10:30. Professor WRIGHT and Dr. HAMILTON.

Discussion of principal phases of mammalian life: origin, distribution, habits and literature. Laboratory periods are devoted to methods of field collecting, census taking, life history studies, preparation of skins and skeletons, and identification of North American species. Laboratory fee, $3.

112. **Literature of Economic Zoology, Conservation, and Ecology.** Second term. Credit one hour. Th 7:30 p.m. McGraw 7. Professor WRIGHT, Dr. HAMILTON, and others.

The literature of economic zoology, ecology, limnology, oceanography, and kindred fields; fish and fisheries (for profit and pleasure); amphibians and reptiles, their uses; small and big game (commercial and sport); aquaria; zoological gardens; preserves; game farms; animals in relation to recreation, settlement, forestry, agriculture, and other industries; biologic resources, their exploration, conservation, utilization, and management.

[126. **Advanced Ornithology.** First term. Credit three hours. Prerequisite, course 8 or 9. Lecture, W 11. McGraw, South Museum. Laboratory and

field work, T Th 1:40-4. Professor ALLEN and Mr. KELLOGG. Not given in 1936-37.]

The structure and classification of birds; geographical distribution; the literature and institutions of ornithology; identification of representative birds of the world. The first part of the term is devoted to field work on the fall migration and the identification of birds in winter plumage. Designed primarily for students specializing in ornithology or animal biology. Laboratory fee, $3.

131. **Applied Ornithology.** First term. Credit three hours. Should be preceded by course 8 or 9, and presupposes an elementary knowledge of botany and entomology. Lecture, W 11. McGraw 5. Laboratory and field work, T Th 1:40-4. Professor ALLEN and Mr. KELLOGG.

This course is intended primarily for students planning to teach biological science or to engage in professional work in ornithology. Field collecting, preparation of specimens, and natural-history photography are emphasized, together with the food and feeding habits of birds; game management; classroom, museum, and Biological Survey methods. Laboratory fee, $3.

300a. **Research in Vertebrate Taxonomy and Natural History.** Professor WRIGHT and Dr. HAMILTON.

300b. **Research in Ornithology.** Professor ALLEN.

300g. **Research in Aquiculture.** First and second terms. Professor EMBODY. Hours, credit, and laboratory fees to be arranged. Should be preceded or accompanied by Course 74.

Laboratory, field work, and conferences on problems related to the fisheries.

67. **Seminary in Systematic Vertebrate Zoology.** First and second terms. Hours to be arranged. Professor WRIGHT.

Life-zone plans of North America, 1817-1936. Distribution and origin of life in North America. Zoogeography of the Old World. Animal coloration. Other topics, to be announced.

VETERINARY SCIENCES

See under VETERINARY MEDICINE, p. 152.

ZOOLOGY

Professors H. D. REED and B. P. YOUNG.

Approved Major and Minor Subjects (key to symbols on p. 26)

Zoology **1, 2, 3, 4** (may be chosen as a major subject for the master's degree when the minors are in other sciences)
Experimental Zoology **1, 2, 3, 4**
Invertebrate Zoology **1, 2, 3, 4**
Morphology **1, 2, 3, 4**

Every facility 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, ecology, economic zoology, protozoology, and ornithology.

The laboratories are equipped with modern compound, binocular, and dissecting microscopes, microdissecting and injecting apparatus, euscopes, 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.

The collection includes an extensive collection of invertebrates, fishes, amphibia, reptiles, birds and mammals as well as more than 15,000 specimens of fixed material for developmental and structural studies as well as an extensive collection of prepared microscopical slides of serial sections. In assembling these collections, efforts have been made to obtain material from all parts of the world illustrating biological principles.

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 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.

1. *Introductory Zoology.* Three hours a week. Throughout the year.

1a. *General Zoology.* Four hours a week, first semester.

11. *Comparative Anatomy.* Three hours a week. Throughout the year.

16. **Invertebrate Zoology.** Prerequisite course 1 or equivalent. Assistant Professor B. P. YOUNG. Throughout the year. Lecture, M 12, Laboratory, T and Th 1:40-4. McGraw 102. A comprehensive consideration of the morphology, classification, development and phylogeny of the invertebrates.

99. **Zoological Problems.** Professor HUGH D. REED, Assistant Professor B. P. YOUNG, and Dr. SENNING.

An introduction to research.

Graduate Work in General Zoology, Morphology, Experimental Zoology and Protozoology. Professors HUGH D. REED and B. P. YOUNG. Throughout the academic year and summer period.

PLANT 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.

Approved Major and Minor Subjects (key to symbols on p. 26)

Botany **2, 4**
Cytology **1, 2, 3, 4**
Economic Botany **1, 2, 3, 4**
Plant Ecology **1, 2, 3, 4**
Plant Morphology (including Anatomy) **1, 2, 3, 4**
Paleobotany **1, 2, 3, 4**
Plant Physiology **1, 2, 3, 4**
Plant Taxonomy **1, 2, 3, 4**

The laboratories of the department are in the Plant Science Building, 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 greenhouses 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. Seminaries are conducted in cytology and frequently also in the taxonomy of vascular plants and plant morphology. The purpose of these various seminaries 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 critically evaluating the work of others. Graduate students are expected to attend the seminaries 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. For work in paleobotany a knowledge of the fundamental features of both botany and geology is prerequisite.

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 University conducts a Summer Session in which there is opportunity for graduate study and research in botany. The Summer Session is six weeks in length, 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 or others of the staff before coming to Ithaca.

A fellowship carrying a stipend of $400 and a scholarship with a stipend of $200 are awarded in alternate years to graduate students in Botany. Holders of these are exempt from the payment of tuition. In 1936-37 the fellowship will be awarded.

Plant Physiology

Professors Knudson, Curtis, and Hopkins.

31. *Introductory Plant Physiology.* First or second term. Two lectures and two laboratories.

231. **Plant Physiology, Advanced Lecture Course.** Throughout the year. Credit three hours a term. Prerequisite, training in botany and chemistry, to be determined in each case by the department. Lectures, M W F 10. Plant Science 143. Professors Knudson and O. F. Curtis.

Lectures and discussions on physiological processes of plants and the factors influencing them and the relations of these processes to plant behavior.

232. **Plant Physiology, Advanced Laboratory Course.** Throughout the year. Credit three hours a term. Prerequisite or parallel, course 231. Laboratory, M 1:40-4, S 8-12:30. Plant Science 241. Professors Knudson and O. F. Curtis, and Assistant Professor Hopkins. Laboratory fee each term, $10; breakage deposit, $5.

Principally a quantitative study of various phases of plant physiology. The student will apply chemical, physical, and bacteriological methods in the study of plant physiological processes. Special attention will be given to technique.

233. **Seminary in Plant Physiology.** Throughout the year. Required of graduate students in Plant Physiology. Conference, F 11. Plant Science. Professors Knudson and O. F. Curtis, and Assistant Professor Hopkins.

The presentation and discussion of current contributions to plant physiology; reports on the research problems of graduate students and members of the staff.

Research in Plant Physiology. Professors Knudson, Curtis, and Hopkins.

Plant Anatomy

Professors Eames and Petry.

[123. **Plant Anatomy.** Prerequisite, course 1 or the equivalent. Professor Eames. First term, T 9-12:30; Th S 9-11:30. Given in alternate years. Not given in 1936-37.]

A detailed study of the internal structure of vascular plants with emphasis on determination and interpretation.

Research in Anatomy. Professor Eames.

Cytology

Professor Sharp.

124. **General Cytology.** First term. Credit four hours. Prerequisites: Botany 1 or Zoology 1 or equivalent. Lectures, M W 9. Plant Science 233. Laboratory, M W or T Th 10-12:30 or T 1:40-4, F 10-12:30. Plant Science 219. Assignment to laboratory section must be made at time of registration. Professor L. W. Sharp.

The principal topics considered are cells and their components, nuclear and cell division, meiosis and fertilization, and the relation of these to problems of development, reproduction and the life cycles in various groups of plants. Both plant and animal materials are used. Microtechnic is not included. Laboratory fee, $5.

125. **Microtechnic.** Second term. Credit three hours. Prerequisite, permission to register. Lectures and demonstrations, T 11-1. Other hours to be arranged. Plant Science 219. Professors Eames and L. W. Sharp.

For advanced students who require training in the preparation of plant materials for histological and cytological study. Laboratory fee, $5. The cost of additional materials is likely to be from $10 to $20.

224. **Advanced Cytology.** Second term. Credit two hours. Prerequisites: Botany 124, Plant Breeding 101, and permission to register. Lecture, W 9. Plant Science 233. Laboratory, Th 9-11:30. Plant Science 228. Professor L. W. Sharp. Laboratory fee, $3.

An advanced course dealing mainly with the physical basis of heredity and recent researches in cytogenetics.

Research in Cytology. Professor SHARP.

MORPHOLOGY

Professors EAMES, SHARP, and PETRY.

(**Comparative Morphology of Fungi.** Given in the Department of Plant Pathology.)

126. **Morphology of Vascular Plants.** Prerequisite, Course 1 or its equivalent, and permission to register. Professor EAMES. First term. T Th 9-12:30. Given in alternate years.

An advanced course in the comparative morphology, life histories, and phylogeny of vascular plants.

Research in Morphology. Professors EAMES and PETRY.

TAXONOMY

Professors WIEGAND, MUENSCHER, and EAMES.

13. *Trees and Shrubs.* Three hours a week. First term. Assistant Professor MUENSCHER.

117. **Taxonomy of Vascular Plants.** Second term. Credit four hours. Prerequisite, course 1 or its equivalent. Professor WIEGAND. Lecture, M 9. Laboratory, M W F 1:40-4. Plant Science 211.

A study of the kinds of seed plants and ferns, their classification into genera, families, and orders, and field work on the local flora. Emphasis is placed on wild plants, but the more commonly cultivated varieties receive some attention. Those desiring advanced work on special groups or problems may follow this with course 145. Laboratory fee, $4; deposit, $5.

219. **Advanced Taxonomy of Vascular Plants.** Second term. Credit one or two hours. Prerequisite, course 117 or its equivalent. Hours to be arranged. Plant Science 211. Professor WIEGAND.

Special round-table discussion of topics of particular interest to the taxonomist. One hour may be devoted to practical work on some group of plants.

Research in Taxonomy. Professors WIEGAND and EAMES.

PALEOBOTANY

Professors PETRY and EAMES.

Research.

ECONOMIC BOTANY

Professor MUENSCHER.

3. *Poisonous Plants.* One hour a week, second term.

15. *Weed Identification and Control, Seed Analysis.* Three hours a week, first term. Plant Science 353. Assistant Professor MUENSCHER.

215. **Seminar in Economic Botany.** First term. Hours to be arranged. Open to qualified students. Assistant Professor MUENSCHER.

The general subject for 1936–1937 consists of a discussion of problems and contributions relating to the biology of aquatic plants.

Research. Economic Botany.

GENERAL BOTANY

Professor PETRY and instructors.

1. *General Botany.* Throughout the year. Two lectures and one laboratory period a week.

OTHER COURSES

141. **History of Botany.** Second term, without credit. A course of lectures given by various members of the staff with the purpose of acquainting advanced students of botany with the historical development of their science.

145. **Special Problems in General Botany, Ecology, Economic Botany, Taxonomy, Morphology, Anatomy, Paleobotany, Cytology, and Physiology.**

Throughout the year. Credit not less than two hours a term. By appointment. Professors WIEGAND, KNUDSON, EAMES, L. W. SHARP, O. F. CURTIS, and PETRY, and Assistant Professors MUENSCHER and HOPKINS.

Students engaged on special problems may register in this course. They must satisfy the instructor under whom the work is taken as to preparation for the problem chosen. The laboratory fee depends on the nature of the work and on the number of credit hours.

PLANT BREEDING

Professors R. A. EMERSON, H. H. LOVE, C. H. MYERS, F. P. BUSSELL, A. C. FRASER, R. G. WIGGANS, and J. R. LIVERMORE; *Doctor* ERNEST DORSEY.

Approved Major and Minor Subjects (key to symbols on p. 26)

Genetics **1, 2, 4**
Plant Breeding **1, 2, 4**
Statistical Methods of Analysis **1, 2, 4**

Students who are chiefly interested in the application of genetical principles to crop improvement will doubtless prefer to register in *plant breeding*. Problems for research will involve studies of such characters as yield, quality, disease and insect resistance, and the like. Those students for whom the theoretical aspects of genetics hold the greater appeal, will register in *genetics*. Their research problems will usually stress gene analyses and chromosomal relationships. Statistical methods include the analysis of data from any field of research, and a study of experimental methods and field plot technique.

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.

It is advisable that the student, before entering upon graduate work, should have had the following courses or their equivalent: genetics, plant breeding, general botany or elementary zoology or biology, elementary plant, animal or human physiology, introductory inorganic chemistry, and elementary organic chemistry. A student who has not had most of these subjects will ordinarily find it impossible to complete his graduate work in the minimum time.

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.

101. *Genetics*. Four hours a week. Second term.

103. *Plant Breeding*. Three hours a week. Second term.

150. *Special Problems*. One or two hours. First or second term. For properly qualified seniors.

201. **Advanced Genetics.** Prerequisite, course 101 and Botany 124. Professor FRASER. Second term. Given in 1936-37, only for those graduate students who are completing work for advanced degrees in June. Registration by special permission. Hours to be arranged.

Group discussions of advanced principles of genetics, with special attention to methods of analysis. Laboratory studies of experimental data and of genetical "unknowns" in Drosophila. Laboratory fee, $3. Deposit, $2.

211. **Statistical Methods of Analysis.** Second term. For graduate students only. Th 1:40-4. Plant Science 146. Assistant Professor LIVERMORE.

A discussion of statistical methods for the study of variation, correlation, curve fitting, experimental error, and the analysis of variance; and the application of these methods to problems in biology and related fields. Laboratory fee, $2.

Seminary. Second term. W 11. Plant Science 146. Professors EMERSON, LOVE, MYERS, BUSSELL, FRASER, WIGGANS, and LIVERMORE, and Dr. DORSEY.

PLANT PATHOLOGY

Professors L. M. MASSEY, H. H. WHETZEL, DONALD REDDICK, M. F. BARRUS, H. M. FITZPATRICK, CHARLES CHUPP, W. H. BURKHOLDER, F. M. BLODGETT, D. S. WELCH, K. H. FERNOW, A. G. NEWHALL, W. D. MILLS, C. E. F. GUTERMAN, A. B. BURRELL, E. M. HILDEBRAND, P. P. PIRONE, and K. G. PARKER.

Approved Major and Minor Subjects (key to symbols on p. 26)

Mycology **1, 2, 3, 4**
Plant Pathology **1, 2, 3, 4**

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 third semester 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.

1. **General Plant Pathology.** Professor WHETZEL. First or second term. Lecture, W 8. Practice and conferences, any two periods, T W Th F 1:40-4. Plant Science Building 341, 343, and 362.

A fundamental introductory course treating of the nature, cause, and control of plant diseases. Required of all graduate students. This course is also offered during the six-weeks summer session.

2. **Principles of Plant Disease Control.** Professor WHETZEL. First term. Lecture, Th 8. Practice, Th 1:40-4; S 8-10:30. Plant Science Building 342.

A consideration of the principles and methods in plant disease control. Required of all graduate students.

201. **Advanced Plant Pathology.** Professor MASSEY. First and second terms. Lecture, T 9. Plant Science Building 336. Practice, T F 10-12:30. Plant Science Building 304.

A presentation and analysis of the experimental and empirical knowledge of plant diseases. The phenomena of infection, susceptibility, host reactions, and symptomatology are critically considered. Primarily for graduate students.

111. **Forest and Shade-tree Pathology, and Tree Surgery.** Prerequisite, course 1. Assistant Professor WELCH. Second term. Lecture, M 10. Plant Science Building 336. Practice, T 10-12:30. Plant Science Building 362.

A course designed especially for students in forestry and ornamental horticulture, dealing with the recognition and control of diseases of forest, shade, and ornamental trees and shrubs, and the principles of tree repair.

[121. **Comparative Morphology of Fungi.** Prerequisite, Botany 1 or the equivalent. Professor FITZPATRICK. First term. Lecture, T Th 11. Practice, M W 1:40-4. Plant Science Building 333. Given in alternate years. Not given in 1936-37.]

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.

221. **Mycology.** Prerequisite, Botany 1 or the equivalent. Professor FITZPATRICK. First and second terms. Lecture, M W 11. Practice, T Th 1:40–4. Plant Science Building 329. Given in alternate years.

An intensive study of the morphology, taxonomy, and phylogeny of the fungi (Phycomycetes and Ascomycetes). Primarily for graduate students.

[222. **Mycology.** Prerequisite, Botany 1 or the equivalent. Professor FITZPATRICK. First and second terms. Lecture, M W 11. Practice, T Th 1:40-4. Plant Science Building 329. Not given in 1936-37.

Alternating with course 221, and dealing with the Basidiomycetes and Fungi Imperfecti. Primarily for graduate students.]

In the six-weeks summer session the groups of the fungi are studied in successive summers in the following order, (1) Phycomycetes, (2) Ascomycetes, (3) Basidiomycetes, (4) Fungi Imperfecti. By repeating the course, the student may obtain in four summers the equivalent of Plant Pathology 221 and Plant Pathology 222. He may begin with any one of the four groups, and need not take them in unbroken sequence. In the 1936 Summer Session, group (1) will be given.

231. **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.

241. **Research.** Professors MASSEY, WHETZEL, REDDICK, BARRUS, FITZPATRICK, CHUPP, BURKHOLDER, BLODGETT, WELCH, FERNOW, NEWHALL, MILLS, GUTERMAN, BURRELL, HILDEBRAND, P. P. PIRONE, and K. G. PARKER.

242. **Seminary.** Members of the staff. Weekly.

243. **Literature Review.** Members of the staff. Bi-weekly.

PHYSICAL SCIENCES

ASTRONOMY AND GEODESY

Professor S. L. BOOTHROYD.

Approved Major and Minor Subjects (key to symbols on p. 26)

Theoretical Astronomy **2, 4,**
Geodetic Astronomy **2, 3, 4**
Spectroscopic Binary Orbits **2, 4**
Geodesy **1, 2, 3, 4**
Astrophysical Research **1, 2, 3, 4**

Those electing a major in Astronomy will be required to take courses 184, 185, 186 and 187 and those electing a major in Geodesy will be required to take courses 186 and 188 and Surveying 216. In either case the candidate must present evidence that his training in Mathematics and Physics and in Civil Engineering for majors in Geodesy is sufficiently thorough to warrant undertaking the advanced courses. Those selecting Astronomy or Geodesy as a minor may select such courses as meet their requirements provided the necessary prerequisites are offered.

For work in Practical Astronomy, the Observatory equipment includes a superb 12-inch equatorial; an astronomical transit by Troughton and Simms; an astronomical transit and zenith telescope by Fauth; altazimuths by Troughton and Simms and by Fauth; a Howard Sidereal Clock; chronographs and photographic equipment as well as smaller instruments.

The Geodetic equipment, besides that mentioned above, also includes a Mendenhall Half-second Pendulum Apparatus of the pattern once used in the United States Coast and Geodetic Survey; also equipment for the investigation of standards of length.

Study along the lines of Celestial Mechanics and Theoretical Astronomy or advanced work in Astronomical Spectroscopy 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.

180. *Introduction to Astronomy.* Three hours a week, either term.

181. *The Solar System.* Three hours a week, second term.

182. *The Elements of Field Astronomy.* Two hours a week, either term.

184. *The Sun, Stars, and Nebulae.* Three hours a week, first term.

185. *Theoretical Astronomy.* Prerequisites, Math. 4a and 4b, Physics 61 and 62 and Astronomy 184. Professor BOOTHROYD. Throughout the year. Credit two hours a term. Hours and special work to be arranged.

186. *Geodetic Astronomy.* Credit three hours, either term.

187. **Spectroscopic Binary Orbits.** Professor BOOTHROYD. Prerequisites, Astronomy 184, or equivalent. Throughout the year. Credit two hours a term. Hours to be arranged. Study of the theory of Spectroscopic Binary Orbits and measurement and reduction of a suitable series of spectrograms and computation of the orbital elements from the resulting radial velocities.

188. **Geodesy.** Professor BOOTHROYD. Throughout the year. Credit two hours a term. Hours to be arranged. Prerequisites, Astronomy 186, Surveying 213 and 216 or the equivalent. Laboratory involving the determination of the intensity of gravity, the investigation of the errors of graduated circles and of other geodetic equipment. Assigned reading and discussion of articles in current geophysical literature.

189. **Astrophysical Research.** Professor BOOTHROYD and Dr. R. W. SHAW. Prerequisites, Astronomy 184 and 187 and Physics 130. Throughout the year. Credit two hours a term. Hours and research problem to be arranged in consultation with Professor BOOTHROYD and Dr. SHAW.

CHEMISTRY

Professors W. D. Bancroft, G. W. Cavanaugh, E. M. Chamot, A. W. Browne, F. H. Rhodes, T. R. Briggs, Jacob Papish, J. R. Johnson, C. W. Mason, M. L. Nichols, A. W. Laubengayer, and J. G. Kirkwood; *Doctors* M. G. Burford, W. F. Bruce, R. P. Ferguson, F. H. Spedding, and C. C. Winding.

Approved Major and Minor Subjects (key to symbols on p. 26)

Inorganic Chemistry **1, 2, 3, 4**
Analytical Chemistry **1, 2, 3, 4**
Organic Chemistry **1, 2, 3, 4**
Physical Chemistry **1, 2, 3, 4**
Chemical Microscopy and Metallography **1, 2, 3, 4**
Industrial Chemistry **1, 2, 3, 4**
Agricultural Chemistry **1, 2, 3, 4**

A graduate student who desires to take either a major or a minor subject in chemistry should select any one of the above seven branches.

A prospective graduate student is strongly advised to communicate, when applying for admission, with a member of the faculty in the branch of Chemistry in which he wishes to have his major subject. In general, members of the Special Committee should be chosen from different fields of Chemistry. 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, Master of Science, or Doctor of Philosophy, with major in Chemistry will be required to offer for admission the equivalent of Introductory Inorganic Chemistry 101 and 105; Qualitative Analysis 205 and 206, or 210; Quantitative Analysis 220 and 221, or 225; Introductory Organic Chemistry 305, and 310 (one term); Introductory Physical Chemistry 405, and 410 (one term); they must also present the equivalent of two units of German.

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 must have completed, before the beginning of the last year of residence, the equivalent of Advanced Quantitative Analysis 230, Gas and Fuel Analysis 250, Introductory Organic Chemistry Laboratory 310 (second term), Introductory Physical Chemistry Laboratory 410 (second term), and Introductory Chemical Microscopy 530. Graduate students entering from approved universities may take, during their residence for the advanced degree, such of these required 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 is required to pass a departmental Qualifying Examination before he is allowed to begin actual experimental work on his thesis problem. This examination will comprise tests in the following four Divisions of Chemistry: (A) Inorganic and General, (B) Analytical, (C) Organic, and (D) Physical. The individual tests, each consisting of a written examination covering a period of two or three hours, will be given in succession at intervals of one week.

One such Qualifying Examination is given at the beginning of each regular term, and at the end of the second regular term of the University year, on days set by the Committee on Qualifying Examinations. The 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. In the light of the candidate's achievement in this examination, his Special Committee may further examine his qualifications for graduate study.

After the candidate has passed the Qualifying Examination, and has completed his minor subjects, he will be required to pass a general examination, both written and oral, on his major and minor subjects. Upon 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. 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.

As an alternative procedure, the general examination on major and minor subjects and on the thesis may be taken after the acceptance of the thesis.

Graduate students are required to register with the Department of Chemistry on the registration days at the beginning of each term. Entering students must consult with the chairman of the departmental Graduate Scholarship Committee at this time.

For a more detailed description of the courses in the various branches of chemistry, see the Announcement of the Department of Chemistry.

All courses in Chemistry are open to properly qualified graduate or undergraduate students. It may be necessary for a graduate student in chemistry to take one or more of the courses designated by italics as primarily for undergraduates, either as prerequisite to his graduate work or as an essential part of his major and minor subjects.

Fellowships and scholarships are ordinarily awarded only to students who have had at least a year of graduate study.

All courses listed below are to be given in the Baker Laboratory of Chemistry.

Inorganic Chemistry

101. *Introductory Inorganic Chemistry.* Lectures. Repeated in the second term. Credit three hours.

103. *Introductory Inorganic Chemistry.* Lectures. Throughout the year. Credit three hours, first term; two hours, second term.

105. *Introductory Inorganic Chemistry.* Recitations and laboratory practice. Repeated in the second term. Credit three hours.

106. *General Chemistry.* Lecture, recitation, and laboratory. Throughout the year. Credit three hours a term. For students of Engineering.

130. **Advanced Inorganic Chemistry.** Throughout the year. Credit three hours a term. Prerequisite or parallel courses, Chemistry 405 and 410. Assistant Professor Laubengayer. M W F 11. Baker 107.

Lectures. The chemical elements are discussed in the order in which they occur in the Periodic Table of Mendeléeff, with special attention to the group properties of the elements and to the relations of the groups to one another. The rare elements are treated in detail.

135. **Advanced Inorganic Chemistry.** Either term. Credit one to six hours. Prerequisite, Chemistry 305 and 310. Professor Browne, Assistant Professor Laubengayer, and assistants. Day and hour to be arranged. Baker 178 and 122.

Laboratory practice. The preparation, purification, properties, and reactions of inorganic compounds including those of the rarer elements.

Chemistry 135 is designed to accompany Chemistry 130, but either course may be taken separately.

140. **Selected Topics in Advanced Inorganic Chemistry.** Second term. Credit two hours. Prerequisite Chemistry 405, and 410, or special permission. Professor Browne. W F 9. Baker 107. Given in alternate years.

[150. **The Chemistry of Glass.** Second term. Credit one hour. Assistant Professor Laubengayer. M 9. Baker 107. Open to students who have had or are taking course 405, and to others by special permission. Not given in 1936-37.]

A discussion of the development and manufacture of glass and related ceramic ware, such as pottery and porcelain, with special emphasis on the relations between constitution and physical and chemical properties. Inspection trips to nearby ceramic plants will be arranged.

160. **Chemistry of the Rare Elements.** Throughout the year. Credit two hours. Prerequisite, first term of Chemistry 130, or by special permission. Professor PAPISH. T Th 9. Baker 302.

Lectures. Occurrence, distribution and associations of the rare elements; chemical reactions of the rare elements and of their salts, including analytical reactions.

165. **Chemistry of the Rare Elements.** Throughout the year. Credit two or more hours. Prerequisite or parallel course, Chemistry 160. Fee variable. Professor PAPISH and assistant. Hours to be arranged. Baker 318.

Laboratory practice. Extraction, recovery and purification of the rare elements, and preparation of their salts. Chemical analysis of the rare elements.

195. *Research for Seniors.* Throughout the year. Credit two or more hours a term.

ANALYTICAL CHEMISTRY

201. *Introductory Analytical Chemistry.* Either term. Credit four hours.
203. *Introductory Qualitative Analysis.* Second term. Credit five hours.
205. *Introductory Qualitative Analysis.* First term. Credit three hours.
206. *Introductory Qualitative Analysis.* First term. Credit three hours.
210. *Introductory Qualitative Analysis.* Shorter course. Repeated in the second term. Credit three hours.

220. *Introductory Quantitative Analysis.* Repeated in the second term. Credit three hours.

221. *Introductory Quantitative Analysis.* Repeated in the second term. Credit three hours.

225. *Introductory Quantitative Analysis.* Shorter course. Repeated in the second term. Credit three hours.

230. *Advanced Quantitative Analysis.* Repeated in the second term. Credit three hours.

235. **Advanced Quantitative Analysis.** Second term. Credit two hours. Prerequisite, first term of Chemistry 405. Professor NICHOLS. M W 12. Baker 207. Given in alternate years.

A theoretical discussion of selected topics in quantitative analysis including sampling, indicators, potentiometric and conductometric titrations, together with the development and present status of various analytical methods.

250. *Gas and Fuel Analysis.* Second term. Credit three hours.

270. **Special Methods of Quantitative Analysis.** Either term. Credit two or more hours. Prerequisite, Chemistry 230 and 235. Professor NICHOLS and assistants. Day and hour to be arranged. Baker 277.

Laboratory practice in the application of special methods such as indirect analysis, conductometric and potentiometric titrations, etc., to quantitative analysis and the analysis of special materials. The study of the important methods and special forms of apparatus used in scientific gas analysis. Electrochemical methods for the determination of silver, lead, copper, tin, nickel, cobalt, zinc, iron, etc.; the analysis of alloys and ores.

Within certain limits the work may be selected to suit the requirements of the individual student.

275. **Quantitative Microanalysis.** First term. Credit three or more hours. Prerequisite, course 230 and special permission. Professor NICHOLS. Hours to be arranged. Baker 282.

Laboratory practice in typical methods of both organic and inorganic quantitative microanalysis.

280. **Emission Spectroscopy in Chemical Analysis.** Either term. Credit three hours. Prerequisite, Chemistry 225 or 220, and Physics 21 and 22, or by special

permission. Fee, $15. Professor PAPISH and assistant. Laboratory hours to be arranged. Baker 396. Conference, hour to be arranged.

The construction and use of spectroscopic equipment; spectrum excitation; qualitative and quantitative spectrochemical analysis.

295. *Research for Seniors.* Throughout the year. Credit two or more hours a term.

ORGANIC CHEMISTRY

305. *Introductory Organic Chemistry.* Throughout the year. Credit three hours a term.

310. *Introductory Organic Chemistry.* Throughout the year. Credit three hours a term.

315. **Advanced Organic Chemistry.** Throughout the year. Credit two hours a term. Prerequisite, Chemistry 305 and 310. Professor JOHNSON. T Th 9. Baker 177.

Lectures. A presentation of important chapters of organic chemistry and a discussion of classical researches in this field. Primarily for students specializing in organic chemistry.

Students may register for any term separately. Not given in second term 1936–37. Students are advised to substitute Chemistry 1000.

320. **Advanced Organic Chemistry.** Either term. Credit two to six hours a term. Prerequisite, Chemistry 305 and 310. Professor JOHNSON, Dr. BRUCE, and assistants. Day and hour to be arranged. Baker 208. Conference, F 12. Baker 206.

Laboratory practice. An advanced course in the preparation of organic compounds. The original literature is consulted, and the student is required to repeat some extended and important piece of work, and to compare his results with those published.

340. **Identification of Organic Compounds.** Second term. Credit four hours. Prerequisite, Chemistry 305 and 310. Dr. BRUCE and assistants. Lectures and conferences, T Th 10. Baker 206. Three laboratory periods, M T W or Th 1:40-4. Baker 350. With the permission of the instructor, students may register for three hours credit (two laboratory periods).

The classification reactions of organic compounds and the preparation of solid derivatives are applied to the identification of unknown organic substances.

365. *Elementary Organic Chemistry.* Second term. Open only to students in the College of Home Economics. Lectures and laboratory, four hours credit.

375. *Elementary Organic Chemistry.* First term. Lectures and laboratory, six hours credit. For students preparing for the study of medicine.

395. *Research for Seniors.* Throughout the year. Credit two or more hours a term.

PHYSICAL CHEMISTRY

401. *Principles of Physical Chemistry.* Throughout the year. Credit three hours a term. Lectures and laboratory. Primarily for students in the biological sciences.

405. *Introductory Physical Chemistry.* Throughout the year. Credit three hours a term. Lectures.

It is advisable, but not obligatory that course 410 accompany this course.

410. *Introductory Physical Chemistry.* Throughout the year. Credit three hours a term. Prerequisite or parallel course, Chemistry 405. Laboratory practice and recitations.

If one term only is taken, registration for the second term is advised.

420. **Advanced Physical Chemistry.** First term. Credit three hours. Prerequisite, Chemistry 405. Assistant Professor KIRKWOOD. Lectures and recitations. M W F 12. Baker 7.

Exposition of the principles of physical chemistry from the mathematical standpoint, with emphasis on the solution of simple problems.

[425. **Applications of the Phase Rule.** First term. Credit two hours. Prerequisite, Chemistry 405. Professor BRIGGS. Lectures: M W 11. Baker 7. Not given in 1936-37.]

The study and interpretation of typical phase diagrams in systems of one, two, three and four components. Special attention will be paid to equilibria in saturated salt solutions and to the problem of indirect analysis.

430. **Applied Colloid Chemistry.** Throughout the year. Credit two hours a term. Open to candidates for the degree of Bachelor of Chemistry if they have completed Chemistry 405, to others only by special permission. Professor BANCROFT. T Th 10. Baker 7.

Lectures. The theory of colloid chemistry and its application in the arts.

435. **Chemistry of Solids.** First term. Credit two or three hours. Prerequisite or parallel courses, Chemistry 405, and Chemistry 530 or 545, or special permission. Hours to be arranged. Professor MASON, Assistant Professor KIRKWOOD, and Dr. ————.

A general discussion of the formation and growth of metallic and chemical crystals, their physical and chemical behavior, and the relationships between lattice structure and chemical constitution. In the last third of the course, the physical chemistry of crystal lattices is covered in some detail.

445. **Introductory Electrochemistry.** Second term. Lectures, informal recitations, and laboratory. Credit three hours. Prerequisite, Chemistry 405. Professor BRIGGS and assistants. Lectures: M W 12. Baker 7. Laboratory, T W Th or F 1:40-4. Baker 1-A.

Theory of electrolysis and the voltaic cell, including the theory and practice of determining transference numbers, the activities of ions, oxidation-reduction potentials, solubility by electrometric methods, and similar subjects.

450. **Applied Electrochemistry.** First term. Credit two hours. Prerequisite, Chemistry 445. Professor BRIGGS. M W 11. Baker 7. Given in alternate years.

Lectures. The electrolytic refining and extraction of metals; the electrolytic manufacture of organic and inorganic compounds; the theory and practice of storage cells; the electric furnace.

By taking Course 465 (2 or more hours), the student may supplement this course with laboratory practice dealing with the various topics presented in the lectures. The experiments include the measurement and study of decomposition voltages; current and energy efficiencies in electrolysis; the deposition of metals; the preparation of chemical compounds by electrolysis; and the testing of storage cells.

465. **Advanced Laboratory Practice in Physical Chemistry.** Either term. Credit variable, but not to exceed six hours a term. Prerequisite, determined in each case by the professor in charge. Professors BANCROFT and BRIGGS, Assistant Professor KIRKWOOD, and assistants. Hour and place to be arranged.

Students may elect in mass law, reaction velocity, or efficiency measurements, with special reference to course 415; in photochemistry, photography, or colloid chemistry, with special reference to course 430; in conductivity, or electrometric determinations, with special reference to course 460; in electrolytic products, with special reference to course 450, in the application of physical chemical methods to organic chemistry.

470. **Thermodynamics.** Throughout the year. Credit three hours a term. Prerequisite, Chemistry 405 and 420, or special permission. Assistant Professor KIRKWOOD. M W F 9. Baker 18.

Development of the general equations of thermodynamics from the first and second laws. Exposition of the concepts of entropy and free energy. Applications to the study of physico-chemical equilibria in gases, liquids, solids, and liquid solutions. Problems.

480. **Statistical Mechanics.** Second term. Credit three hours. Prerequisite, first term Chemistry 470. Assistant Professor KIRKWOOD.

Exposition of the equilibrium theory of statistical mechanics from the standpoint of the Gibbs canonical ensemble. Mechanical interpretation of the prin-

ciples of thermodynamics, with application to simple thermodynamic systems. Given in alternate years.

[490. **Introductory Quantum Mechanics with Chemical Applications.** Second term. Credit three hours. Open to qualified students by permission. Assistant Professor KIRKWOOD. Hours to be arranged. Given in alternate years, not in 1936-37.]

Elementary presentation of the principles of quantum mechanics. Development of the basic ideas underlying the quantum mechanical theory of the chemical bond.

495. *Research for Seniors.* Throughout the year. Credit two or more hours a term.

CHEMICAL MICROSCOPY AND METALLOGRAPHY

530. *Introductory Chemical Microscopy.* Repeated in the second term. Credit three hours.

Graduate students are advised to take this course the first term.

535. **Microscopic Qualitative Analysis (Inorganic).** Either term. Credit two or more hours. Prerequisite, Chemistry 530. Professor MASON and assistants. Laboratory periods, to be arranged. Baker 378.

Laboratory practice in the examination and analysis of inorganic substances containing the more common elements with special reference to rapid qualitative methods and to the analysis of minute amounts of material.

540. **Microscopical Methods in Organic Chemistry.** Either term. Credit two or more hours. Prerequisite, Chemistry 530, and special permission. Professor MASON and assistants. Day and hour to be arranged. Baker 378.

Laboratory practice. General manipulative methods applicable to small amounts of material, crystallization procedures, determination of melting points and molecular weights; chemical tests and reactions for elements, radicals, and various types of organic compounds. Preparation of simple derivatives.

545. **Metallography.** First term. Credit two hours. Prerequisite, Chemistry 530, or special permission. Professor MASON and assistants. Th F 1:40-4. Baker 384.

Laboratory practice and conferences. An introduction to the principles and methods involved in the study of the structure of metals. The relation of microscopical appearances to thermal history and mechanical properties. Preparation of specimens for macroscopic and microscopic study. Metallographic microscopes and their use.

550. **Advanced Metallography.** Second term. Credit variable. Prerequisite, Chemistry 545, and consent of the instructor. Fee variable. Professor MASON. Hours to be arranged. Baker 384.

Laboratory practice and reports. The work may be selected in accordance with the interests of the student, from topics such as heat treatment and structures of various ferrous or non-ferrous alloys, special methods of polishing, etching, and photomicrography, or minor research problems.

565. **Special Methods in Chemical Microscopy.** Either term. Credit one or more hours. Prerequisite, special permission. Professor MASON. Day and hour to be arranged. Baker 378 and 382.

Laboratory practice may be elected in various fields such as photomicrography, ultramicroscopy, crystal studies, micro-manipulations, quantitative determinations, and the microscopy of industrial materials, textiles, papers, and foods.

595. *Research for Seniors.* Throughout the year. Credit two or more hours a term.

CHEMICAL ENGINEERING AND INDUSTRIAL CHEMISTRY

705. *Unit Operations of Chemical Engineering.* Throughout the year. Credit three hours a term.

710. **Unit Operations of Chemical Engineering.** Laboratory. Throughout the year. Credit two hours a term. Professor RHODES and Dr. WINDING.

715. **Unit Processes of Chemical Engineering.** Second term. Credit three hours. Prerequisite or parallel course, Chemistry 705. Professor RHODES. M W F 11. Baker 177.

Lectures. A discussion of the important typical unit processes of chemical engineering, as, for example, nitration, sulphonation, esterification, caustic fusion, chlorination, etc.

725. **The Chemistry of Fuels.** First term. Credit three hours. Prerequisite, or parallel course, Chemistry 705. Professor RHODES. M W F 11. Baker 177.

Lectures. The chemistry of coal, coke, petroleum, tars and the fuel gases. Particular stress is laid upon the theoretical chemistry involved in the carbonization of coal, the gasification of coal, and the distillation and refining of petroleum and tar.

730. **Chemical Plant Design.** Throughout the year. Credit three hours a term. Prerequisite, Chemistry 705. Professor RHODES and Dr. WINDING. Day and hour to be arranged.

One conference and two laboratory periods. Practice in the calculation and design of chemical plant equipment.

740. **Chemical Engineering Computations.** Throughout the year. Credit two hours. Dr. WINDING.

750. **Furnace Metallurgy.** Second term. Credit two hours. Prerequisite or parallel course Chemistry 405. Professor RHODES. Hours to be arranged.

Lectures. A discussion of the reactions involved in the smelting of ores and the furnace refining of metals. The discussion is accompanied by problems dealing with the various subjects discussed.

795. *Research for Seniors.* Throughout the year. Credit two or more hours a term.

BIOLOGICAL CHEMISTRY

See under ANIMAL SCIENCES, p. 57.

AGRICULTURAL CHEMISTRY

Students will not be allowed to register in courses in Agricultural Chemistry until after they have taken and passed Chemistry 101 and 105 or their equivalent.

805. **Introductory Agricultural Chemistry (Fertilizers, Insecticides, Soils).** First term. Credit two hours. Prerequisite, Chemistry 305 (or 375). Professor CAVANAUGH. T Th 11. Baker 302.

Lectures. The relation of chemistry to agriculture; an introduction to the study of plant growth, the composition and chemical properties of soils, fertilizers, amendments, insecticides, and fungicides.

810. *Introductory Agricultural Chemistry.* First term. Credit three hours.

815. **Introductory Agricultural Chemistry (Foods and Feeds).** Second term. Credit two hours. Prerequisite, Chemistry 305 (or 375). Professor CAVANAUGH. T Th 11. Baker 302.

Lectures. Discussion of the sources, chemical composition, and properties of the principal foods and feeds such as cereals, fruits, animal products, and dairy products. Relation of methods of preservation and manufacture to the nutritive value of foods.

820. *Introductory Agricultural Chemistry (Food Analysis).* Second term. Credit three hours.

825. *Elementary Agricultural Chemistry.* Second term. Credit three hours.

830. *Elementary Chemistry of Food Products.* Second term. Credit two hours.

835. **Advanced Agricultural Chemistry (Fertilizers, Insecticides, Soils).** Either term. Credit two or more hours. Prerequisite, Chemistry 810. Professor CAVANAUGH and assistant. Day and hour to be arranged. Baker 350.

Laboratory practice. Advanced work in the chemistry of soils, fertilizers, plant composition, insecticides, or fungicides. Special topics may be selected.

840. **Advanced Agricultural Chemistry (Foods and Feeds).** Second term. Credit two or more hours. Prerequisite, Chemistry 820. Professor CAVANAUGH. Day and hour to be arranged. Baker 350.

Laboratory practice. Special topics in the chemistry of foods and food preparations.

895. *Research for Seniors.* Throughout the year. Credit two or more hours a term.

SPECIAL TOPICS

910. **Special Topics in Chemistry.** First term. Credit one hour. T 11. Baker 207.

The use of chemical literature; methods of research; administration of chemical laboratories; patent law; and other special topics.

1000. **Non-Resident Lectures on the George Fisher Baker Foundation.** Credit two hours. T Th 12. Baker 177.

NON-RESIDENT LECTURESHIP

The George Fisher Baker Non-Resident Lectureship in Chemistry at Cornell University was established early in the year 1926 by a gift 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 is as follows:

FIRST TERM, 1936-37

To be announced.

SECOND TERM, 1936-37

Dr. W. H. MILLS. Lecturer in Organic Chemistry, University of Cambridge, England.

GEOLOGY

Professors H. RIES, O. D. VON ENGELN, C. M. NEVIN, and J. D. BURFOOT, and *Doctor* C. W. MERRIAM.

Approved Major and Minor Subjects (key to symbols on p. 26)

Regional Geography **1, 2**
Mineralogy **1, 2, 3, 4**
Economic Geology **1, 2, 3, 4**
Paleontology **1, 2, 3, 4**
Petrography **1, 2, 3, 4**
Geomorphology **1, 2, 3**
Glacial Geology **1, 2, 3, 4**
Structural Geology **1, 2, 3, 4**
Stratigraphy **1, 2, 3, 4**
Sedimentation **1, 2, 3, 4**
Metamorphism **1, 2, 3**
Commercial Geography **4**
Historic Geology **3, 4**
Physical Geography **2, 3, 4**
Geology **4**
Geography **4**

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

Graduate work in Geology may include, in addition to work done in Ithaca, the opportunity to spend 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 60,000 author's separates.

Special rooms are 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 located in McGraw Hall.

A. *General Geology and Physiography.* Throughout the year. Three hours a week.

100. *Introductory Geology.* Three hours a week. Either term.

Sedimentation and Structural Geology

Professor Nevin.

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.

101. *Selected Problems in Geology.* Second term. Three hours a week.

102. **Structural Geology.** First term. Credit three hours. Prerequisite, Geology A or equivalent. Professor Nevin. Lectures, M W 11. Laboratory, W 1:40.

Geologic structures and their causes. A basic course for all students majoring in this branch of geology.

103. **Sedimentation.** First term. Credit three hours. Prerequisite, Geology A. Professor Nevin. Lectures, M W 9. Laboratory, M 1:40.

The principles involved in the formation of sediments. Laboratory work consists of experimentation with sedimentary processes and field investigations.

107. **Geologic Surveying.** Given in the summer field school. Credit six hours. Professor Nevin.

106. **Special Work in Structural Geology and Sedimentation.**

Directed reading and original investigation adapted to the needs of the student. Professor Nevin.

Physical Geography

Professor von Engeln.

The region around Ithaca affords excellent and varied illustrations of physiographic and glacial phenomena. For many years the teachers and advanced students of physical geography have been engaged in investigation of the local field problems, and there is further opportunity of this kind. 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. The work in this branch also includes introductory courses in economic and regional geography. Such studies in correlation with physical geography and geomorphology may be the preparation for advanced regional study and investigation. For teachers of Physical Geography in the secondary schools who wish to secure a Master's degree a definite program with a thesis subject appropriate to their needs has been outlined. Such work can be pursued in successive Summer Session terms.

200. **Geomorphology.** Three hours a week, first term. Prerequisite, Geology A. Professor VON ENGELN. Lectures, T Th 9. Laboratory, Tuesday 1:40. Physiography Laboratory, McGraw.

The technology of geomorphological description and interpretation of land forms with regard to process and stage and the adjustment of topography to structure.

203. *Geography of North America.* Three hours a week, second term.

206. *Commercial Geography.* Three hours a week, second term.

207. *Geography of Europe.* Three hours a week, first term.

205. **Glaciers and Glaciation.** Second term. Credit three hours. Prerequisite, Geology A. Professor VON ENGELN. Lectures, T Th 9. Laboratory, T 1:40. Physiography Laboratory, McGraw.

Living glaciers and the phenomena of the glacial period. One or more Saturdays devoted to all-day excursions in the spring. Mapping and interpretation of glacial deposits.

208. **Advanced Physiography and Regional Geography.** Prerequisites, an adequate background of course work in geology, especially in physiography and related subjects. Professor VON ENGELN. Both terms. Hours by arrangement. Physiography Laboratory.

Particular problems, especially those of glaciology and the relation of geological structure to topography and physiographic history. In general students with a minor in physiography are expected to undertake work in this course.

209. **Seminar.** Prerequisites as for course 208. Professor VON ENGELN. First or second or both terms. Usually Monday afternoon 4. Physiography Laboratory.

Reviews of current literature or of the original literature on some topic within the field of this branch of the department.

MINERALOGY, CRYSTALLOGRAPHY, AND PETROGRAPHY

Assistant Professor BURFOOT.

The laboratory equipment is relatively good as regards petrographic microscopes, apparatus for chemical and physical investigations of rocks, and apparatus for special crystallographic determinations. There are also collections of rocks and study collections of minerals, including the Benjamin Silliman, Jr., collection, acquired before the opening of the University in 1868.

Special graduate courses in this division are not offered, but advanced work is adapted to the needs of the individual. Some of the less special courses are, however, so dependent on a rather advanced knowledge of physics or chemistry or of both that they are to be considered as requiring the maturity of graduates, although open also to undergraduates with sufficient preparation.

311. *Elementary Mineralogy.* Three hours a week. Either term.

[312. **Crystallography.** First term. Credit three hours; if taken after 311, credit two hours. Assistant Professor BURFOOT. Lectures, M W 9. Laboratory to be arranged. Mineralogy Laboratory, McGraw. Not given in 1936-37.]

The classification and theory of crystals, considered, where feasible, from the point of view of the general internal structure.

[313. **Advanced Mineralogy.** First term. Credit three hours. Prerequisite, Mineralogy 311. Assistant Professor BURFOOT. Lectures, T Th 11. Laboratory to be arranged. Mineralogy Laboratory, McGraw. Given in alternate years. Not given in 1936-37.]

316. **Metamorphic Geology.** First term. Credit two hours. For advanced students. Registration by permission only. Assistant Professor BURFOOT. T Th 11.

The processes and criteria of rock metamorphism. Work with the petrographic microscope will be given those students who are qualified and desire to take it.

317. **Optical Determination of Minerals.** First term. Credit three hours. Prerequisite, Geology 311. Assistant Professor BURFOOT. Lectures, T Th 10. Laboratory, S 9-11:30. Mineralogy Laboratory, McGraw.

318. **Petrography.** Second term. Credit three hours. Prerequisite, Geology 317. Assistant Professor BURFOOT. Lectures, T Th 10. Laboratory, F 9–11:30. Mineralogy Laboratory, McGraw.

[319. **Sedimentary Petrography.** Second term. Credit three hours. Lectures, T Th 10. Prerequisite, Geology 317. Assistant Professor BURFOOT. Laboratory F 9-11:30. McGraw. Given in alternate years. Not given in 1936-37.]

The methods of investigating the mineral composition, texture, and other physical characteristics of sedimentary rocks; some of the applications of these methods to geological problems.

320. **Advanced or Special Work in Mineralogy, Crystallography, or Petrography.** Throughout the year. Credit variable. Prerequisite, variable. Assistant Professor BURFOOT. Day and hour to be arranged. McGraw.

Adapted to the needs of the individual student.

321. **Seminar.** Throughout the year. Credit one hour a term. Assistant Professor BURFOOT. M 4:15. Mineralogy Laboratory. McGraw. Given if desired by sufficient students.

PALEONTOLOGY AND STRATIGRAPHIC GEOLOGY

Doctor MERRIAM.

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.

Facilities are afforded to those desiring to study the later formations, since the department has 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 a wealth of conchological literature in the geological and the general library.

400. *Historic Geology.* Three hours a week. First term.

401. *Ancient Life.* Three hours a week. First term.

402. **Principles of Stratigraphy.** Second term. Credit two hours. Prerequisite, Geology A or 100. Dr. MERRIAM. Lectures, M W 11.

Consideration of the fundamental factors upon which stratigraphic correlation and nomenclature are based.

403. **Introductory Paleontology.** Dr. MERRIAM. Three hours a week. Throughout the year. Prerequisite, Geology 400. Lectures, T Th 11. Laboratory, Th 1:40.

405. **Invertebrate Paleontology—Foraminifera.** Second term. Three hours to be arranged. Prerequisite, Geology 403. Dr. MERRIAM.

406. **Paleontologic and Stratigraphic Problems.** Dr. MERRIAM. Prerequisite, 403. Throughout the year. Conferences and reports to be arranged. Credit variable. McGraw 28.

An informal study course arranged to fit the needs of the student.

407. **Paleobotany.** Dr. MERRIAM. One hour a week. Second term. Lecture, W 10.

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, Europe, and Africa, 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 metal mines of the Adirondacks, etc. Field trips of greater or less length are taken to some of these localities every year.

500. **General Economic Geology.** Throughout the year. Credit three hours a term. Professor Ries and Dr. EDMUNDSON. Lectures, M W 10. Laboratory or field trip F, 1:40. McGRAW.

502. **Petroleum Geology.** Second term. Credit three hours. Professor NEVIN.

503. **Petroleum Technology.** First term. Credit two hours. Professor NEVIN.

510. **Clay Investigation.** Second term. Credit three hours. Prerequisite, Geology A or 501, and Chemistry 101, and permission of the instructor. Professor RIES. One lecture and two laboratory periods to be arranged. McGraw. Primarily for graduates. Seniors only by special permission.

511. **Advanced or Special Work in Economic Geology.** Throughout the year. Credit variable. Prerequisite, dependent on the nature of the work. Open to seniors only by special permission. Professor RIES. Day and hour to be arranged. McGraw.

512. **Economic Geology Seminary.** Every two weeks throughout the year. Professor RIES.

MATHEMATICS

Professors VIRGIL SNYDER, F. R. SHARPE, W. A. HURWITZ, W. B. CARVER, B. W. JONES, R. P. AGNEW, V. S. LAWRENCE, jr., and W. W. FLEXNER; *Doctors* A. H. BLACK, J. H. CURTISS, D. C. LEWIS, jr., S. MACLANE, J. B. ROSSER, H. E. SPENCER, and R. J. WALKER.

Approved Major and Minor Subjects (key to symbols on p. 26)

Algebra **1, 2, 3**
Mathematical Analysis **1, 2, 3**
Geometry **1, 2, 3**
Applied Mathematics **1, 2, 3**
Mathematics **1, 2, 4**

If mathematics (as distinct from one of its subdivisions) is chosen as major subject, the minor subject or subjects must be chosen from some other field or fields of study.

It is recommended that when the major subject for the degree of Ph.D. is in the field of mathematics, at least one minor subject be chosen from some other field.

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 articles in current journals and on results of special reading and investigations. Discussion and reading groups or seminars are also frequently organized to meet other special interests, sometimes with the cooperation of teachers and students in other fields than Mathematics.

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 Erastus Brooks Fellowship of $600 is awarded annually in the field of Mathematics. The fellowship is ordinarily awarded only to applicants who have had one year or more of graduate study.

The following courses are offered. The courses mentioned in brackets will not be given in 1936-37, but are given from time to time.

1. *Solid Geometry.* Three hours a week, either term.
2. *College Algebra.* Three hours a week, either term.
3. *Plane Trigonometry.* Three hours a week, either term.

4, 5. *Analytic Geometry and Calculus.* Five hours a week, either term.

[15. *Elementary Course in Higher Mathematics.* Three hours a week, throughout the year. Not given in 1936-37; to be given in 1937-38.]

20. *Teachers' Course.* Three hours a week, first term.

ALGEBRA

18. **Foundations of Mathematics.** Dr. ROSSER. Second term. T Th S 9. White 1.

Postulates for algebra and geometry, theory of sets, construction of the number system, paradoxes in theory of sets, intuitionism, formalism and freedom from contradiction. There are no stated prerequisites for the course; students who contemplate taking it are requested to consult the teacher.

23. **Modern Algebra.** Dr. MACLANE. Prerequisite, Mathematics 4b or the equivalent. First term. T Th S 10. White 9.

Determinants, matrices, linear dependence, linear transformations, quadratic and bilinear forms.

31. **Introduction to Algebraic Numbers.** Assistant Professor JONES. Prerequisite, Mathematics 21. Second term. T Th S 10. White 2.

Algebraic fields; ideals; cyclotomy and its relation to constructions with ruler and compasses; other applications.

[**Introduction to Linear Algebras.** Not given in 1936-37.]

[**Theory of Equations.** Not given in 1936-37.]

[**Theory of Finite Groups.** Not given in 1936-37.]

[**Algebraic Invariants.** Not given in 1936-37.]

[**Galois Fields.** Not given in 1936-37.]

ANALYSIS

41a. **Elementary Differential Equations.** Assistant Professor LAWRENCE, first term. M W F 9. White 1. Repeated in second term, Professor SHARPE. T Th S 11. White 27. Prerequisite, Mathematics 4b or the equivalent.

41b. **Topics in Applied Mathematics.** Assistant Professor LAWRENCE. Prerequisite, Mathematics 41a or the equivalent. Second term. M W F 9. White 1.

Selected work in topics such as elliptic integrals, complex variables, vector analysis, with applications to problems in engineering and physics.

42. **Advanced Calculus.** Assistant Professor AGNEW. Prerequisite, Mathematics 4b or the equivalent. Throughout the year. M W F 11. White 6.

A study of the processes of the calculus, their meanings and applications. The course is designed to furnish a necessary preparation for advanced work in analysis and applied mathematics.

48. **Calculus of Variations.** Dr. LEWIS. Prerequisite, Mathematics 42. Second term. T Th S 9. White 21.

The usual necessary and sufficient conditions for the occurrence of a minimum will be obtained for the parametric and non-parametric problems and for variable as well as fixed end-points. If time permits, a survey will be given of Morse's theory in the large.

[**Functions of Real Variables.** Not given in 1936-37.]

[**Functions of a Complex Variable.** Not given in 1936-37.]

[**Integral Equations.** Not given in 1936-37.]

[**Infinite Series.** Not given in 1936-37.]

[**Fourier Series and Integrals.** Not given in 1936-37.]

GEOMETRY

61. **Projective Geometry.** Assistant Professor FLEXNER. Prerequisite, Mathematics 4b or the equivalent. Throughout the year. M W F 9. White 2.

The elements of projective geometry treated synthetically.

62. **Analytic Projective Geometry.** Professor CARVER. Prerequisite, Mathematics 4b or the equivalent. Throughout the year. M W F 10. White 10.

Projective geometry of one, two, and three dimensions treated by means of homogeneous coordinates.

63. **Analytic Geometry of Space.** Professor SNYDER. Prerequisite, Mathematics 4b or the equivalent. Second term. T Th S 10. White 24.

Portions of the text by Snyder and Sisam: Analytic Geometry of Space.

66. **Algebraic Geometry of Curves and Surfaces.** Dr. WALKER. Prerequisite, Mathematics 62. Throughout the year. M W F 10. White 24.

Linear series of points on an algebraic curve, birational transformations, and correspondences between curves. Systems of curves on surfaces, and the associated birational invariants.

[**Cremona Transformations.** Not given in 1936-37.]

[**Non-Euclidean Geometry.** Not given in 1936-37.]

[**Geometry of Hyperspace.** Not given in 1936-37.]

[**Differential Geometry.** Not given in 1936-37.]

[**Metric Geometry.** Not given in 1936-37.]

[**Analysis Situs.** Not given in 1936-37.]

APPLIED MATHEMATICS

80. **Differential Equations of Mathematical Physics.** Professor HURWITZ. Prerequisite, Mathematics 42 or the equivalent. Throughout the year. T Th S 11. White 6.

The derivation of the differential equations, with appropriate boundary conditions, which arise in certain problems of mathematical physics; the mathematical properties of solutions, and the physical meanings of these properties.

82. **Theory of Potential Functions.** Dr. LEWIS. Prerequisite, Mathematics 4b or the equivalent. First term. T Th S 9. White 21.

The usual theory of the logarithmic and Newtonian potential function will be presented with especial emphasis on their relation to Mathematical Physics and pure Analysis. Dirichlet's problem will be considered for the logarithmic potential function.

83. **Probability and Statistics.** Dr. CURTISS. Prerequisite, Mathematics 4b or the equivalent. Throughout the year. T Th S 10. White 9.

The theory of probability and statistics, with applications.

[**Vector Analysis.** Not given in 1936-37.]

[**Mechanics.** Not given in 1936-37.]

[**Hydrodynamics and Elasticity.** Not given in 1936-37.]

[**Relativity.** Not given in 1936-37.]

METEOROLOGY

Professor R. A. MORDOFF.

Approved Major and Minor Subjects (key to symbols on p. 26)

Meteorology **1, 2, 4**

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.

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

1. *Elementary Meteorology.* Three hours a week, either term.

2. **Climatology.** Prerequisite, Meteorology 1 or the equivalent. Professor MORDOFF. Second term. M W 9. Plant Science 114. A course covering general climatology and the various climates of the United States with emphasis on those of New York State.

211. **Research.** Prerequisite, Climatology 2, or the equivalent. Professor MORDOFF. First or second term. Hours by appointment. Original investigations in meteorology and climatology.

212. **Seminar.** Prerequisite, Climatology 2, or the equivalent. Professor MORDOFF. First term. Hours to be arranged. Plant Science 114. Preparation and reading of reports on special topics. Abstracts and discussions of papers dealing with the current literature of meteorology and climatology.

PHYSICS

Professors R. C. GIBBS, FREDERICK BEDELL, H. A. BETHE, J. R. COLLINS, G. E. GRANTHAM, H. E. HOWE, E. H. KENNARD, C. C. MURDOCK, F. K. RICHTMYER, and L. P. SMITH; *Doctors* R. F. BACHER, L. L. BARNES, C. W. GARTLEIN, M. S. LIVINGSTON, and R. W. SHAW.

Approved Major and Minor Subjects (key to symbols on p. 26)

Physics **1, 2, 3, 4**
Applied Physics **1, 2, 3, 4**

Note. Applied Physics as a major for the Ph. D. must be accompanied by a minor subject in the field of physics.

Experimental Physics **1, 2, 3, 4**
Theoretical Physics **1, 2, 3, 4**

Note. Experimental or Theoretical Physics may be named as a major subject for the Ph. D. only if accompanied by the other one of these two subjects as a minor.

Any other subdivision of physics (*e. g.* heat, x-rays, alternating currents) may be named as a minor for the master's degree when one of the above subjects is named as the major.

All three subjects for the Ph.D. should not be chosen inside the field of physics.

Opportunities are offered for study and investigation by a limited number of students in both theoretical and experimental physics. 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, and liquid air plant; shops with an experienced staff of mechanics are maintained for instrument construction, glass blowing, and carpentry.

Members of the staff will be especially interested in directing research as follows: Professor BEDELL, in electricity and magnetism, theoretical and experimental, particularly in alternating current phenomena; Professor BETHE, in quantum mechanics, particularly in the theory of nuclei and of solids; Professor COLLINS, in spectroscopy, particularly in the infra-red; Professor GIBBS, in atomic and molecular spectroscopy; Professor KENNARD, in theoretical physics, particularly in the theory of radiation and quantum mechanics; Professor MURDOCK, in X-ray and electron diffraction; Professor RICHTMYER, in X-rays; Professor SMITH, in quantum mechanics, and experimental work in ionization of gases and photo-electricity; Dr. BACHER, in nuclear physics particularly as related to effects in atomic spectra; Dr. LIVINGSTON, in ionic and nuclear physics. A weekly meeting of staff and students is held for the discussion of research in progress and of current literature, supplemented frequently by similar meetings confined to particular fields.

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

Important Notice. Since only a limited number of graduate students can be accommodated in physics, arrangement for admission must be made by application to the Dean of the Graduate School before coming to Ithaca.

3, 4. *Introductory Physics.* Three hours a week.

7, 8. *Introductory Physics.* Three hours a week.

11, 12. *Introductory Physics.* Four hours a week.

21, 22. *General Physics.* Three hours a week.

41. *Modern Physics.* First term, two hours a week.

55. *Introductory Physical Experiments.* Either term, three hours a week. For pre-medical students.

60. *Physical Experiments.* Both terms, three hours a week. Laboratory to accompany Physics 61-62.

61, 62. *General Physics.* Throughout the year, three hours a week. Prerequisite, Physics 4, 3 or the equivalent.

91. *Teaching of Physics in Secondary Schools.* Second term, two hours a week.

105. *Advanced Laboratory Practice.* Two laboratory periods and a seminar each week, either term.

106. **Advanced Laboratory Practice.** First and second term. Prerequisite, Physics 105 and such special preparation as may be needed for the experiments undertaken. Admission only after consultation. Assistant Professor COLLINS, other professors cooperating in the direction of the work in certain fields, and Drs. PARRATT and SHAW. T W Th F afternoons. Rockefeller 301.

Considerable time is devoted to each of a small number of experiments selected to meet the requirements of the individual student. Groups of students will also be organized to perform series of related experiments, in connection with which appropriate class-room instruction will be offered at hours to be arranged.

The following groups are planned for 1936-37: First term, Spectroscopy by Dr. SHAW and Electronics and Conduction in Gases by Dr. PARRATT; second term, Advanced Spectroscopy by Dr. SHAW and X-ray Diffraction and Crystal Structure by Professor MURDOCK.

110. **Mechanics.** Throughout the year. Prerequisite, Physics 60, 61, 62 and Mathematics 4 or their equivalents. Professor MURDOCK. T Th S 9. Given in alternate years.

Introductory analytical mechanics, oscillations, kinetic theory, deformable bodies, mechanics of fluids, surface phenomena, wave motion, and sound.

[120. **Electricity and Magnetism.** Throughout the year. Prerequisite, Physics 60, 61, 62 and Mathematics 4, or their equivalents. Professor MURDOCK. T Th S 9. Given in alternate years, not in 1936-37.]

A study of the laws of electrostatic and magnetic fields; electromagnetism and variable current phenomena; thermal and chemical electromotive forces; metallic, electrolytic, and gaseous conduction.

[132. **Light.** Second term. Prerequisite, Physics 60 and 62 and Mathematics 4, or their equivalents. Assistant Professor HOWE. T Th S 8. Given in alternate years, not in 1936-37.]

An introductory study of lens systems, diffraction, interference, double refraction and polarization.

142. **Heat.** Second term. Prerequisite, Physics 60 and 61 and Mathematics 4, or their equivalents. Professor GIBBS. T Th S 8. Given in alternate years.

Temperature scales, specific heats, thermal conductivity, thermodynamics, thermal radiation, high-temperature measurement, and kinetic theory.

170. **Introduction to Modern Physical Theories.** Throughout the year. Prerequisite, six hours from Physics 105 to 142 inclusive, or the equivalent. Professor RICHTMYER. T Th S 10. For seniors and first-year graduate students.

Early theories, a brief survey of the electromagnetic theory, photo-electricity, radiation and the quantum theory, atomic structure and atomic spectra including x-rays, the nucleus and nuclear disintegrations, radioactivity, matter waves, and other problems of modern physics.

200. **Introduction to Theoretical Physics.** Throughout the year. Must be preceded or accompanied by one term of Physics 110 and by Physics 120 or their equivalents in informal study. Part A, Professor KENNARD. T Th S 8; Part B, Assistant Professor BETHE. Primarily for graduates.

Part A, lectures and problem work on certain fundamental and generally useful phases of theoretical physics, such as electrodynamics, relativity, optics, thermodynamics, analytical and statistical mechanics, kinetic theory, hydrodynamics; Part B, additional individual study of some of these topics equivalent to a two-hour course. The two parts should not be separated.

[213. **Theoretical Mechanics.** First term. Prerequisite, Physics 200 or the equivalent. Professor KENNARD. T Th S 8. Given in alternate years, not in 1936-37.]

Hamilton's Principle, Hamilton-Jacobi equation; elements of Hydrodynamics and Elasticity.

222. **Electrodynamics.** Second term. Prerequisite, Physics 200 or the equivalent. Professor KENNARD. M W F 9. Given in alternate years.

A more thorough study of selected topics.

233. **Theoretical Optics.** First term. Prerequisite, Physics 200 or the equivalent. Assistant Professor COLLINS. T Th S 8. Given in alternate years.

Electromagnetic theory, dispersion, absorption, optical properties of metals, diffraction, propagation in crystals.

271. **Introductory Quantum Mechanics.** First term. Prerequisite, Physics 200 or the equivalent. Assistant Professor BETHE. M W F 9. Primarily for graduates.

Special Topic Courses

[405. **Mathematical Methods in Physics.** Throughout the year. Prerequisite, Mathematics 4, or the equivalent. Assistant Professor SMITH. Given in alternate years, not in 1936-37.]

Lectures and problem work designed to give the student a working knowledge of the principal mathematical methods used in advanced physics.

415. **Special Topics in Physics.** Reading in any branch of physics under the guidance of some member of the staff.

431. **The Physics of Soil Phenomena.** First term. Prerequisite, Physics 11 and 12, or the equivalent, and course work covering Calculus and Mechanics. Professor MURDOCK and Dr. BARNES. Two lectures and one laboratory or

problem period a week as arranged. Designed primarily for students in Civil Engineering.

Surface phenomena at fluid-fluid and fluid-solid interfaces; viscous flow in porous materials; theory of solutions, osmotic pressure, electrolytes, colloids and gels; capillary potential and hysteresis in finely divided material.

451. **Hydrodynamics.** First term. Prerequisite, Mathematics 5, or the equivalent, and suitable course work in Physics and Mechanics. Assistant Professor COLLINS. M W F 8. Primarily for engineering students.

Properties of ideal and viscous fluids; the fundamental laws of fluid motion, their development and application to such problems as the motion of solids through fluids, steady flow in tubes, surface and compressional waves, and simple rotational motion.

452. **Hydrodynamics.** Second term. Prerequisite, Physics 451 or the equivalent. Assistant Professor SMITH. M W F 8. Primarily for engineering students.

The general analytical theory of the motion of fluids; its development and application to such phenomena as the flow of perfect fluids, of viscous incompressible fluids, and of fluids subject to boundary conditions; discussion of vortex and turbulent flow.

[472. **Quantum Mechanics of Spectra and Radiation.** Second term. Prerequisite, Physics 271. Assistant Professor BETHE. T Th S 10. Given in alternate years, not in 1936-37.]

Quantum states of atoms and molecules. Transition probabilities. Dirac's theory of radiation.

476. **Quantum Mechanics of Solids.** Second term. Prerequisite, Physics 271. Assistant Professor BETHE. T Th S 10. Given in alternate years.

Quantum theory of crystals with particular reference to metals. Quantum statistics.

[477. **Quantum Mechanics of Collisions.** First term. Prerequisite, Physics 271. Assistant Professor SMITH. Three hours a week. Given in alternate years, not in 1936-37.]

The general quantum theory of atomic and nuclear collision phenomena such as scattering, excitation, ionization, and the stopping power of matter.

481. **Advanced Quantum Mechanics.** First term. Prerequisites, Physics 271 and at least one of the courses 472, 476, 477, or their equivalents. Assistant Professor BETHE. Three hours a week. Given on sufficient demand.

Lectures on the more theoretical aspects of quantum mechanics including the matrix and transformation theory, the application of the theory of groups, the Dirac relativistic theory, the theory of the positron, and quantum electrodynamics.

[571. **Spectroscopy.** Throughout the year. Prerequisite, Physics 132 or its equivalent. Professor GIBBS. W F 12. Given in alternate years, not in 1936-37.]

A detailed study of the operation of spectroscopic apparatus; the nature, origin, and structure of atomic, molecular, and Raman spectra, and of their interpretation according to current theories.

581. **Atomic Structure.** First term. Prerequisite, nine hours from Physics 105, 106, 120, 132 and 170 or their equivalents. Professor GIBBS and Dr. LIVINGSTON. M W F 10. Given in alternate years.

The development of modern atomic theory and its application in the explanation of spectral series, resonance, ionizing potentials, and fine structure; the structure of the nucleus as revealed by radioactive and isotopic phenomena and the effects of high-speed bombardment, including the most recent developments in nuclear physics.

[591. **X-Rays and the Structure of Matter.** First term. Professor RICHTMYER. M W F 10. Given in alternate years, not in 1936-37.]

Lectures and assigned readings on the production and measurement of x-rays; laws of emission, scattering and absorption; the relation of these laws to atomic structure, quantum theory and similar problems.

[592. **X-Rays and the Structure of Matter.** Second term. Professor MURDOCK. M W F 10. Given in alternate years, not in 1936-37.]

A continuation of Physics 591 dealing with the laws of diffraction of x-rays and electrons and their application to the study of the structure of matter.

640. **Alternating Currents and Electronics.** Throughout the year. Prerequisites, Mathematics 41 and Physics 120, or their equivalents. Assistant Professor SMITH and Professor BEDELL. Lectures and laboratory work.

The analytical theory and measurement of alternating currents in linear and non-linear circuits, discussion of high frequency problems; the theory and measurement of electrical phenomena in gases at low pressure with applications to vacuum tube operation.

PHYSICS FELLOWSHIPS

The President White Fellowship in Physics. Stipend $600.

The stipend of this Fellowship may, at the discretion of the Faculty, be reduced to $400 and the remaining $200 be assigned to a Graduate Scholarship.

See also Special Temporary Fellowships, page 23.

(Information in 1936-37 Announcement pertains to fellowships and scholarships available for 1937-38.)

AGRICULTURE, INCLUDING FORESTRY

AGRICULTURAL ECONOMICS AND FARM MANAGEMENT

(BUSINESS MANAGEMENT, FARM MANAGEMENT, HISTORY OF AGRICULTURE, MARKETING, PRICES AND STATISTICS, PUBLIC FINANCE, RURAL ECONOMY.)

Professors G. F. WARREN, G. N. LAUMAN, J. E. BOYLE, G. P. SCOVILLE, E. G. MISNER, W. I. MYERS, F. A. PEARSON, LELAND SPENCER, V. B. HART, M. P. RASMUSSEN, F. F. HILL, M. S. KENDRICK, M. C. BOND, WHITON POWELL, M. P. CATHERWOOD, S. W. WARREN, T. E. LAMONT, F. A. HARPER, and L. C. CUNNINGHAM.

Approved Major and Minor Subjects (key to symbols on p. 26)

Business Management **1, 2, 3, 4**
Farm Management **1, 2, 3, 4**
History of Agriculture **1, 2, 3, 4**
Marketing **1, 2, 3, 4**
Prices and Statistics **1, 2, 3, 4**
Public Finance **1, 2, 3, 4**
Rural Economy **1, 2, 3, 4**

BUSINESS MANAGEMENT

121. *Financial Statements.* Three hours a week.

122. *Accounting Method.* Three hours a week.

[125. *Business Organization and Management.* Three hours a week. Not given in 1936-37.]

126. **Cooperative Marketing.** Second term. Professor POWELL. Lectures, W F 8. Agricultural Economics Building 225. Discussion groups, M at hours to be arranged. Agricultural Economics Building 201.

Agricultural cooperation as a form of business organization. The nature, extent, and legal background of agricultural cooperation; policies and practices involved in the organization, finance, and operation of effective cooperative associations.

127. *Business Law.* Two hours a week.

[229. **Agricultural Credit.** First term. Professor ————. Lectures, W F 8. Agricultural Economics Building 125. Not given in 1936-37.]

A study of the credit institutions which serve agriculture.

FARM MANAGEMENT

102. **Farm Management.** Second term. Assistant Professor S. W. WARREN. Lectures, M W F 10. Agricultural Economics Building 25. Laboratory, F 2-6. Agricultural Economics Building 101. Four half-day trips and one all-day trip are taken during April and May to visit farms in near-by regions. These trips are taken on the day of the regular laboratory period.

103. **Farm Records and Accounts.** First term. Assistant Professor WILLIAMSON. Lectures, T Th 8. Agricultural Economics Building 25. Laboratory, W 1:40-4. Agricultural Economics Building 101.

203. **Business Organization and Management of Successful New York Farms.** First term. Professor SCOVILLE. F 1:40-4, S 8-10. Agricultural Economics Building 101. During October and November all-day trips are usually taken on Saturdays. Two two-day trips are taken, leaving Friday morning and returning Saturday night.

[205. **The Appraisal of Farm Land.** First term. Assistant Professor S. W. WARREN. Lecture, Th 11. Agricultural Economics Building 125. Laboratory, T 1:40-4. Agricultural Economics Building 101. Not given in 1936-37.]

A study of factors governing the price of land; and the appraisal of land for use, for sale, for purposes of making loans, and for taxation.

[206. **Land Economics.** Second term. Professors ————. Lecture, T 8. Agricultural Economics Building 125. Laboratory, T 1:40-4. Agricultural Economics Building 140. Not given in 1936-37.]

207. **Research Methods in Farm Management.** First term. Professor G. F. WARREN. T 11. Agricultural Economics Building 101.

Attention is given to the more important methods of determining the principles of farm management and the preparation of results for publication.

208. **Research Methods in Farm Management.** Second term. Professor MISNER. Th 2-4. Agricultural Economics Building 140.

Experience is given in the tabulation and the study of farm management data and in preparing the results for publication. During the spring vacation several days are spent in taking farm-management survey records.

299. **Seminar.** First and second terms. Departmental Staff. M 4:10-5:15. Agricultural Economics Building 401.

HISTORY OF AGRICULTURE

171. **History of Agriculture.** First term. Professor LAUMAN and Mr. COFFEY. Lectures, M W F 11. Agricultural Economics Building 325.

The important phases of the development of agriculture are considered historically. Special stress is laid on the rise of the agricultural classes, on the beginnings of rational agriculture, and on modern agrarian problems.

172. **History of Agriculture in the United States.** Second term. Professor LAUMAN and Mr. COFFEY. M W F 11. Agricultural Economics Building 325.

This course deals with the land, its settlement, and its settlers in their economic, social, and political aspects; the technical development of agriculture; the beginnings of permanent agriculture; the rise of marketing problems and of the agrarian movements.

278. **Research in Rural Economy or History of Agriculture.** First and second terms. Professor LAUMAN. Agricultural Economics Building 316.

279. **Agricultural History Seminar.** First and second terms. Professor LAUMAN. Th 2:30. Agricultural Economics Building 316.

MARKETING

141. *Marketing.* Four hours a week.

142. **Marketing Fruits and Vegetables.** First term. Professor RASMUSSEN. Lectures, M W F 9. Agricultural Economics Building 225. Laboratory: Th 4-6. Agricultural Economics Building 140.

A study of the economic factors involved in the marketing of fruits and vegetables. Regional and seasonal competition; areas of distribution; methods of handling; costs of marketing; types of marketing organizations; sales methods; transportation and carrier services; produce law and methods of credit rating; terminal problems.

143. **Marketing Dairy Products.** Second term. Credit four hours. Professor SPENCER. Lectures, M W F 9. Agricultural Economics Building 225. Laboratory, Th 4. Agricultural Economics Building 201.

A study of economic problems relating to the distribution of milk and other dairy products; also the factors affecting success in this branch of business enterprise.

One all-day trip to visit milk plants is taken sometime in May.

Fee for materials furnished and for transportation on trips, $4.

144. **Marketing Poultry Products.** Second term. Dr. VAN WAGENEN. Lecture, T 10. Agricultural Economics Building 225. Laboratory T 1:40-4. Agricultural Economics Building 140.

146. *The Organized Exchanges and Speculation.* Two hours a week.

147. **Marketing Trip to New York City.** Second term. Professor SPENCER in charge. Representatives of other departments will cooperate in the course.

The entire time of the class for a week in April is spent in New York City in-

specting and studying the marketing of dairy products, of eggs and poultry, of fruits and vegetables, and of livestock and meat.

Registration fee, $7, to cover hire of busses in New York City. Total cost of trip need not exceed $30 in addition to railroad fare. This course will be given only if 20 or more students register at the beginning of the term.

148. **Research in Marketing.** First and second terms. Professor BOYLE.

242. **Methods and Results of Research in Marketing.** First term. Professor RASMUSSEN. W 4-6. Agricultural Economics Building 140.

A critical study of research projects in marketing, and practice in planning market research. The major part of the time is devoted to projects dealing with the marketing of fruits and vegetables.

243. **Methods and Results of Research in Marketing.** Second term. Credit two hours. Professor SPENCER. W 4-6. Agricultural Economics Building 201.

A critical study of research projects in marketing, and practice in planning market research. The major part of the time is devoted to projects dealing with the marketing of dairy products.

246. **Collective Bargaining.** Second term. Professor BOYLE. Lectures, T Th 8. Agricultural Economics Building 330.

Collective bargaining and its use by labor, capital, and agriculture. The policy of collective bargaining. A study in price determination.

PRICES AND STATISTICS

Attention of students is directed to Mathematics 4a, Analytical Geometry and Calculus, and to Mathematics 83, Probability and Statistics.

111. **Statistics.** First term. Professor PEARSON. Lecture, M 8. Agricultural Economics Building 25. Laboratory, M 1:40-4. Agricultural Economics Building 140.

A study of the principles involved in the collection, tabulation, and interpretation of agricultural and marketing statistics. Analysis of statistical problems with an 80-column tabulating machine.

112. **Statistics.** Second term. Prerequisite, course 111. Professor PEARSON. Lecture, M 8. Agricultural Economics Building 125. Laboratory, M 1:40-4. Agricultural Economics Building 140.

A continuation of course 111. A study of the application of probable error, sampling, gross, partial, and multiple correlation, curve fitting to problems in this field. Methods of using 80-column tabulating equipment for multiple-correlation analysis.

115. **Prices.** Second term. Professor PEARSON. Lectures, T Th 9. Laboratory, W 1:40-4. Agricultural Economics Building 125.

A study of prices of farm products in relation to agricultural and industrial conditions.

PUBLIC FINANCE

135. **Local Government.** First term. Assistant Professor CATHERWOOD. Lectures, W F 8. Agricultural Economics Building 225. Laboratory, Th 1:40-4. Agricultural Economics Building 201.

Historical development, organization, and operation of local government. Particular attention will be given to the receipts, expenditures, and administration of counties, towns, and school districts in New York.

138. **Taxation.** Second term. Prerequisite, a beginning course in economics. Assistant Professor KENDRICK. Lectures, M W F 11. Agricultural Economics Building 25.

The emphasis of the course is on state and local problems connected with rural taxation. Among the subjects considered are: the growth of expenditures; the rise of modern tax problems; how various governmental divisions in New York and other States get their tax revenues; the general-property tax and its administration, and the special cases of personal-property, farm, and forest taxation; income, inheritance, and gasoline taxes; grants-in-aid and shared revenues; and the problem of building a system of taxation. Fee for materials furnished, $2.

Rural Economy

151. *Public Problems of Agriculture.* Two hours a week.
161. *Agricultural Economics.* Four hours a week.
262. *Rural Economy, Elementary Course.* Three hours a week.

263. **Rural Economy.** Advanced Course. Second term. Professor Lauman. Lectures, M W F 9. Agricultural Economics Building 325.

264. **Planning for Agriculture.** Second term. Professor Lauman and Mr. Coffey. Lectures, T Th 9. Agricultural Economics Building 325.
A study of the more important rehabilitating and redirecting plans for agriculture in various countries of the world.

269. **Rural Economy Seminar.** First and second terms. Professor Lauman. T 2:30. Agricultural Economics Building 316.

AGRICULTURAL ENGINEERING

Professors H. W. Riley, B. B. Robb, J. C. McCurdy, F. H. Randolph, F. L. Fairbanks, L. M. Roehl, and F. B. Wright.

Approved Major and Minor Subjects (key to symbols on p. 26)

Agricultural Engineering **1, 2, 4**

Students desiring to undertake graduate work in Agricultural 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.

Special Facilities

Farm Power Machinery. The laboratory equipment available consists of a 150-HP Froude Hydraulic Absorption Dynamometer, a Szekely Traction Dynamometer, with either disc or strip recording mechanism, tractors of many types, the usual farm power machines, and farm lands affording typical Eastern soils and topography.

Refrigeration. A special laboratory is equipped with numerous milk-cooling tanks with electrically operated condensing units; water, steam, and electric service; gages, meters, thermometers, and a Leeds and Northrup potentiometer with thermocouples. Additional commercial equipment readily available.

Ventilation of Animal Shelters and Crop Storages. For this work the department is using a Leeds and Northrup Micro-Max resistance thermometer recorder giving an automatic continuous record of 64 thermometer stations in addition to an L. and N. portable resistance thermometer indicator with hand switch for 24 stations. Poultry houses and cattle, sheep, and hog barns, with natural and electric ventilation, are available.

Land Drainage. The University farms, being of rolling topography and of various soil types and formations, afford, in their extensive and well mapped drainage systems, unusual opportunities for advanced study.

1. *Farm Mechanics.* Three hours a week, either term.
101. *Electricity on the Farm.* Three hours a week, second term.
102. *Farm Power Machinery.* Three hours a week, second term.
9. *Household Mechanics.* Two hours a week, second term. For women students.
10. *Household Mechanics.* Three hours a week, either term. For women students.
21. *Farm Engineering.* Three hours a week, either term.
121. *Farm Engineering, Advanced Course.* Two hours a week, second term. Given in alternate years.

122. *Drainage and Irrigation.* Two hours a week, second term. Given in alternate years.

24. *Farm Concrete.* Two hours a week, first term.

31. *Farm Structures.* Three hours a week, either term.

131. *Farm Structures, Advanced Course.* Two or three hours a week, either term.

40. *Farm Shop Work.* Two hours a week, both terms.

41. *Shop Work for Rural High School Teachers.* Three hours a week, both terms.

46. *Household Carpentry, Furniture Repairing and Refinishing.* Two hours a week, second term. For women students.

47. *Farm Blacksmithing.* One hour a week, either term.

48. *Advanced Farm Blacksmithing.* One to two hours a week, either term.

251. **Research in Agricultural Engineering.** Prerequisite, permission to register. Professors RILEY, ROBB, MCCURDY, FAIRBANKS, ROEHL, and RANDOLPH and Assistant Professor F. B. WRIGHT. Hours as arranged. Investigations for which the student is prepared and for which adequate facilities can be provided.

252. **Seminary.** Required of graduate students and open to advanced seniors. Departmental staff. M 4:30-5:45. Both terms, credit one hour a term. Presentation and discussion of papers on special problems in agricultural engineering.

161. *Mechanism of Hotel Machines.* Four hours a week, either term.

162. *Hotel Power Plants.* Three hours a week, second term.

163. *Hotel Auxiliary Equipment.* Three hours a week, first term.

164. *Hotel Planning.* Three hours a week, second term.

166. *Hotel Maintenance.* One hour a week, first term.

AGRONOMY

Professors T. L. LYON, J. A. BIZZELL, H. O. BUCKMAN, J. K. WILSON, B. D. WILSON, F. B. HOWE, H. B. HARTWIG, D. B. JOHNSTONE-WALLACE, and R. F. CHANDLER, jr.

Approved Major and Minor Subjects (key to symbols on p. 26)

Agronomy **4**
Field Crop Production **1, 2**
Soil Chemistry **1, 2**
Soil Microbiology **1, 2**

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. These and other facilities afford opportunity for students properly trained in any one or more of the several sciences to investigate soil or plant nutrition problems.

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.

1. *The Nature and Properties of Soils.* First or second term. Credit five hours.

3. *Practical Soil Management.* First term. Credit three hours. Given in alternate years.

7. *Soil Classification and Conservation.* Second term. Credit three hours.

11. *Production of Field Crops.* First term. Credit four hours.

107. **Soil Bacteriology.** Second term. Credit three hours. Prerequisite, course 1, Bacteriology 1, and Chemistry 201 or its equivalent. Professor J. K. WILSON. Lecture, W 8. Caldwell 143. Laboratory, W F 1:40-4. Caldwell 201.

A course in biological soil processes designed primarily for students specializing in soil technology and bacteriology. The laboratory work is supplemented by reports and by abstracts of important papers on the subject. Laboratory fee, $5.

115. **Forest Soils.** First term. Prerequisites, course 1 and Botany 31. Students must consult instructor before registering for the course. Assistant Professor CHANDLER. Hours to be arranged. Caldwell 492.

Assigned readings and biweekly discussions of the more important forest soils literature.

201. **Soils, Advanced Lecture Course.** First term. Prerequisite, course 1 and Chemistry 201 or its equivalent. Students must consult instructor before registering for this course. Professor BIZZELL. Lectures, T Th S 8. Caldwell 143.

The lectures are supplemented by reviews of literature and by the preparation of abstracts.

202. **Soils, Advanced Laboratory Course.** First term. Prerequisite, course 1 and Chemistry 201 or its equivalent. Professor BIZZELL. Laboratory, F 1:40-4. Caldwell 294. Laboratory fee, $3.

A course designed primarily for special training in methods used in soil investigation.

221. **Research in Agronomy.** Throughout the year. For graduate students only. Professors LYON, BIZZELL, BUCKMAN, J. K. WILSON, B. D. WILSON, F. B. HOWE, H. B. HARTWIG, D. B. JOHNSTONE-WALLACE and R. F. CHANDLER, JR. Hours by appointment. Caldwell 350.

222. **Seminar.** Throughout the year. Required of graduate students taking work in the department. S 11-12:30. Caldwell 143.

ANIMAL BREEDING

Professors F. B. HUTT, S. A. ASDELL, G. O. HALL, A. C. FRASER, M. W. HARPER, R. B. HINMAN, and A. L. ROMANOFF.

Approved Major and Minor Subjects (key to symbols on p. 26)

Animal Breeding **1, 2, 3, 4**

The Departments of Animal Husbandry and Poultry Husbandry provide jointly ample facilities for investigations in animal genetics and the physiology of reproduction.

The Department of Poultry Husbandry maintains a flock of about 2000 fowls including representatives of several different breeds. Other species of domestic and game birds are also available. In addition to all facilities for experimental breeding, the accumulated records of the department are available for study and other extensive data are provided by two laying tests conducted under the supervision of the department. Calculating machines are available for statistical study and the laboratories provide equipment for histological and physiological work.

The Animal Husbandry Department has herds and flocks of the main breeds of dairy cattle, beef cattle, horses, sheep, swine and goats. Colonies of rabbits, rats and mice are also available for work in genetics and the physiology of reproduction. A well equipped laboratory is maintained for histological investigations and the meat laboratory provides facilities for study of the meat producing animals.

Before entering upon graduate work the student should have had courses in general biology or zoology, animal or human physiology, organic and inorganic chemistry. For students in the Department of Poultry Husbandry some training or experience in that field is necessary.

The following courses are offered in the Departments of Animal Husbandry (A. H.), Poultry Husbandry (P. H.), and Plant Breeding (P. B.). Students are expected to take certain courses in animal physiology, embryology, cytology and histology, and are usually advised to select at least one of these subjects for their minor requirements.

P.H. 20. *Poultry Breeds, Breeding and Judging.* First term. Credit three hours.

P.H. 30. *Poultry Incubation and Brooding.* Second term. Credit two hours.

A.H. 20. *Animal Breeding.* First term. Two lectures and one laboratory a week.

P.B. 101. *Genetics.* Second term. Credit four hours.

P.B. 201. **Advanced Genetics.** Prerequisite, course 101 and Botany 124. Professor FRASER. Second term. Given in 1936-37, only for those graduate students who are completing work for advanced degrees in June. Registration by special permission. Hours to be arranged.

Group discussions of advanced principles of genetics, with special attention to methods of analysis. Laboratory studies of experimental data and of genetical "unknowns" in Drosophila. Laboratory fee, $3. Deposit, $2.

P.B. 211. **Biometry.** Second term. For graduate students only. Th 1:40-4. Plant Science Building 146. Assistant Professor LIVERMORE.

A discussion of statistical methods for the study of variation, correlation, curve fitting, experimental error and the analysis of variance; and the application of these methods to problems in biology and related fields. Laboratory fee, $2.

A.H. 120. **Problems in Animal Genetics.** First term. Prerequisite, Animal Husbandry 20 or Plant Breeding 101. T Th 11. Recitation by appointment. Professor HARPER.

Lectures, conferences and reports, including statistical methods as applied to breeding animals. The work will consist largely of practice in making reports on statistical problems.

[A.H. 125. **Physiology of Reproduction.** Second term. Registration by permission. M 10. Animal Husbandry Building B. Assistant Professor ASDELL. Not given in 1936-37.]

A course in the physiology of the process of reproduction, chiefly in mammals, and of the related internal secretions.

[P. H. 120. **Poultry Genetics.** Second term. Credit three hours. Given in alternate years. Prerequisites, Poultry 20 and Plant Breeding 101 or equivalents. M W F 11. Poultry Building 305. Professor HUTT. Not given in 1936-37.]

Inheritance in domestic birds, the application of genetic principles to poultry breeding, disease resistance, hybrid vigor, cytology, physiology of avian reproduction, fertility, embryonic mortality, sex and secondary sex characters.

P. H. 130. **Advanced Incubation.** Second term. Credit one hour. Given in alternate years. Open to graduate students and qualified seniors. Lectures at hours to be arranged. Research Assistant Professor ROMANOFF.

A consideration of the growth and development of the embryo, with special reference to the principles of artificial incubation.

P.H. 220. **Animal Genetics.** First term. For graduate students. Prerequisites, Plant Breeding 101 and permission of the instructor. Professor HUTT.

Assigned readings and conferences on inbreeding, hybridization, disease resistance, lethal genes, genetic sterility, sex, heredity in laboratory animals, domestic animals and man, sire indices, and other topics. Designed to acquaint the student with the literature and methods of research in animal genetics.

P.H. 229. **Seminar in Animal Breeding.** First and second terms. F 4:15. Poultry Building 305. Professors HUTT, ASDELL, and staff.

Discussion of current literature and special topics of interest to workers in this field.

ANIMAL HUSBANDRY

Professors F. B. MORRISON, M. W. HARPER, E. S. SAVAGE, L. A. MAYNARD, C. M. MCCAY, E. S. HARRISON, S. A. ASDELL, R. B. HINMAN, and J. P. WILLMAN.

Approved Major and Minor Subjects (key to symbols on p. 26)

Animal Husbandry **1, 2, 3, 4**
Animal Nutrition **1, 2, 3, 4** (See also under Animal Nutrition)

Animal Breeding **1, 2, 3, 4** (See also under Animal Breeding)

Note. If the major for the Ph.D. degree lies in one of these three fields, not more than one of the other two should be selected for a minor.

For the special facilities of the Animal Husbandry department in Animal Breeding and Animal Nutrition and detailed descriptions of the courses in these fields see the statements under these subjects.

The department is well equipped with herds and flocks of animals of the leading breeds of livestock and with modern barns adapted for experimental work. The livestock include a herd of over 150 dairy cattle, a herd of beef cattle, studs of draft horses, a flock of over 200 sheep, and a herd of breeding swine. The library includes a very full collection of the herd and flock registries of all of 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, livestock feeding, breeding, and production.

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 the production and the processing, sale, grading, and measuring of their various products such as milk, meat, and horse power, including animal mechanics.

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.

1. *Livestock Production.* First term. Two lectures and one laboratory period a week.

10. *Livestock Feeding.* Second term. Three lectures and one laboratory period a week.

40. *The Horse.* Second term. Two lectures and one laboratory period a week.

41. *Advanced Live Stock Judging, Beef, Cattle, Horses, Sheep, and Swine.* Second term. One lecture and one laboratory period.

50. *Dairy Cattle.* Second term. Two lectures and one laboratory period a week.

51. *Advanced Judging, Dairy Cattle.* Second term. Hours by appointment.

60. *Beef Cattle.* Second term. Two lectures and one laboratory period a week.

70. *Swine.* Second term. Two lectures and one laboratory period a week.

80. *Sheep.* First term. Two lectures and one laboratory period a week.

90. *Meat and Meat Products.* First or second term. One lecture and two laboratory periods a week.

93. *Meat Cutting.* First or second term. One period a week.

110. **Animal Nutrition.** First term. See **Animal Nutrition.**

111. **Animal Nutrition.** First term. Laboratory course. See **Animal Nutrition.**

120. **Problems in Animal Genetics.** First term. See **Animal Breeding.**

[125. **Physiology of Reproduction.** Second term. Not given in 1936-37. See **Animal Breeding.**]

130. **Physiology of Lactation.** Second term. Given in alternate years. See **Animal Nutrition.**

219. **Seminar in Animal Nutrition.** First and second terms. See **Animal Nutrition.**

229. **Seminar in Animal Breeding.** First and second terms. See **Animal Breeding.**

150. **Dairy Cattle, Advanced Course.** Second term. Credit two hours. Prerequisite, Course 50. Lecture, W 11. Practice, W 1:40-4. Animal Husbandry Building E. Professors SAVAGE and HARRISON.

Analysis of breeding operations in successful breeding establishments. Formulating a breeding program. Selection of foundation females and herd bulls and special problems in the feeding and management of the purebred dairy herd.

200. **Research.** First and second terms. Hours by arrangement. Professors MORRISON, HARPER, SAVAGE, HARRISON, HINMAN, and WILLMAN.

201. **Seminary in Animal Husbandry.** First and second terms. Required of all graduate students taking either a major or minor subject in Animal Husbandry. M 11. Professor MORRISON and departmental staff.

ANIMAL NUTRITION

Professors L. A. MAYNARD, C. M. MCCAY, L. C. NORRIS, S. A. ASDELL, F. B. MORRISON, E. S. SAVAGE, and G. F. HEUSER.

Approved Major and Minor Subjects (key to symbols on p. 26)

Animal Nutrition **1, 2, 3, 4**

Facilities for graduate study in animal nutrition are provided jointly by the departments of animal husbandry and poultry husbandry.

Adequately equipped laboratories are provided for the study of the chemistry and physiology of nutrition, the chemistry of feeding stuffs and animal products, and the histology of animal tissues. All of the common species of both laboratory and farm animals are available in order that a given nutrition problem may be studied with the animal best suited to its solution.

Special attention is given to the problems of the nutrition of herbivora and poultry. The herds and flocks of the departments of animal husbandry and of poultry husbandry are drawn upon for farm animals. The combined facilities of the two departments provide excellent opportunities for comparative studies of the nutritional physiology of various species.

In order to enter upon graduate study in animal nutrition as a major field the student should have had courses in general biology or zoology, introductory chemistry, organic chemistry, human or animal physiology, physics, and animal breeding or genetics. In the course of their graduate study candidates for the doctor's degree are expected to acquire training in biochemistry, physiology, histology, physical chemistry and biometry, and are generally advised to select one of these fields as a minor.

The following courses are offered in the departments of Animal Husbandry (A.H.) and Poultry Husbandry (P.H.):

A.H. 10. *Livestock Feeding.* Second term. Three lectures and one laboratory period a week.

P.H. 110. *Poultry Nutrition.* Second term. Two lectures and one laboratory period a week.

A.H. 110. **Animal Nutrition.** First term. Prerequisite, course A.H. 10 or P.H. 110 or Home Economics 122 and a course in physiology and in organic chemistry. Lectures, M W F 10. Animal Husbandry Building B. Professor MAYNARD.

The chemistry and physiology of nutrition and the nutritive requirements for growth, reproduction, lactation, and other body functions.

A.H. 111. **Animal Nutrition.** Laboratory course. Must be preceded or accompanied by course 110. Registration by permission. M W F 1:40-4. Animal Nutrition Laboratory, Dairy Building. Professor MCCAY.

This course is designed to familiarize the student with the application of chemical methods to the solution of fundamental problems of nutrition. Laboratory fee, $10; breakage deposit, $5.

A.H. 130. **Physiology of Lactation.** Second term. Registration by permission. W 10. Animal Husbandry Building B. Professors MAYNARD and ASDELL.

A discussion of the development of the mammary gland and the physiological process governing its activity.

P.H. 210. **Experimental Methods in Poultry Nutrition.** First term. For graduate students. Registration by appointment. Lecture and laboratory period, W 1:40-5. Given in alternate years. Poultry Building. Research Assistant Professor NORRIS.

A critical consideration of the domestic fowl as an experimental animal and of the experimental methods used in conducting research projects in poultry nutrition.

219. **Animal Nutrition Seminar.** First and second terms. Weekly conferences, M 4:15. Registration by permission. Professors MAYNARD, MCCAY, and NORRIS.

A consideration of the experimental data on which the principles of animal nutrition are based, and a critical review of current literature.

BACTERIOLOGY

See under ANIMAL SCIENCES, p. 55.

DAIRY INDUSTRY

Professors J. M. SHERMAN, H. E. ROSS, H. C. TROY, P. F. SHARP, E. S. GUTHRIE, W. E. AYRES, B. L. HERRINGTON, and Dr. V. N. KRUKOVSKY.

Approved Major and Minor Subjects (key to symbols on p. 26)

Dairy Industry **1, 2, 3, 4**
Dairy Chemistry **1, 2, 3, 4**
Dairy Bacteriology **4**

Before taking up graduate work in dairy industry, it is desirable that the 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.

Formal courses open to undergraduate and graduate students are given in the following subjects:

1. *Introductory Dairy Science.* Credit three hours a week. Either term.

101. **Analysis of Dairy Products.** Second term. Credit three hours. Lecture and laboratory practice, T 1-6. Dairy Building 218. Assistant Professor HERRINGTON and Dr. KRUKOVSKY.

The application of chemical methods to commercial dairy practice; analysis by standard chemical and factory methods; standardization and composition control; tests for adulterants and preservatives. Laboratory fee, $10.

102. **Market Milk and Milk Inspection.** Second term. Credit five hours. Must be preceded or accompanied by course 1, should be preceded or accompanied by Bacteriology 1 or its equivalent. Lecture and laboratory practice, T Th 1-6. Dairy Building 218 and 146. Professor ROSS.

Attention is given to the production and control of market milk, with special reference to its improvement; milk as food; shipping stations; transportation and sale; pasteurizing; standardizing; clarification; certified milk; milk laws; commercial buttermilk; methods of cooling; harvesting and storage of ice; duties of milk inspectors; apparatus and buildings. The practice includes visits to dairies in the vicinity of Ithaca. A required two-day inspection trip in the neighboring counties may be arranged. Laboratory fee, $10.

103. **Milk-Products Manufacturing.** First term. Credit five hours. Prerequisite, course 1. Lectures, recitations, and laboratory practice, T Th 1-6. Dairy Building 120. Professor GUTHRIE and Assistant Professor AYRES.

The principles and practice of making butter, cheese, and casein, including a study of the physical, chemical, and biological factors involved. Consideration is given also to commercial operations and dairy-plant management. Laboratory fee, $10.

104. **Milk-Products Manufacturing.** Second term. Credit five hours. Prerequisite, course 1; should be preceded or accompanied by course 101. Lectures,

recitation, and laboratory practice, F 1-6, S 8-1. Dairy Building 120. Assistant Professor AYRES.

The principles and practice of making condensed and evaporated milk, milk powders, ice cream, and by-products, including a study of the physical, chemical, and biological factors involved. Laboratory fee, $10.

105. **Dairy Chemistry.** First term. Credit two hours. Prerequisite, qualitative and quantitative analysis and organic chemistry. Lectures, M W 8. Dairy Building 119. Professor P. F. SHARP.

A consideration of milk and dairy products from the physico-chemical point of view.

Dairy Bacteriology. (See Bacteriology 106.)

200. **Milk Products.** Throughout the year. Credit two hours each term. Must be preceded or accompanied by course 105. Lectures, T Th 8. Dairy Building 218. Professor P. F. SHARP.

An advanced consideration of the scientific and technical aspects of milk products.

202. **Seminary.** Throughout the year. Without credit. Required of graduate students specializing in the department; open to undergraduate students taking advanced work. Hours to be arranged. Dairy Building. Professor SHERMAN.

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.

FLORICULTURE AND ORNAMENTAL HORTICULTURE

Professors E. A. WHITE, R. W. CURTIS, J. P. PORTER, and C. J. HUNN.

Approved Major and Minor Subjects (key to symbols on p. 26)

Floriculture **1, 2, 3, 4**
Ornamental Horticulture **1, 2, 3, 4**

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 chemistry, 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 jour-

nals 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, which are as follows:

1. *Principles and Methods of the Propagation and Management of Greenhouse Crops.* Three hours a week, first term.
2. *Amateur Floriculture.* Three hours a week, second term.
3. *Herbaceous Plant Materials.* Three hours a week, second term.
5. *Flower Arrangement.* One hour a week, second term.
7. *Plant Propagation.* Four hours a week, first term.
8. *Woody-Plant Materials.* Four hours a week, both terms.
10. *A Brief Introduction to Landscape Design and Ornamental Horticulture.* Three hours a week, second term.
101. *Commercial Floriculture.* Four hours a week, both terms.
103. *Wholesaling and Retailing Flowers.* Two hours a week, second term.
104. *Conservatory Plants.* Two hours a week, second term. Given in alternate years.
109. *Commercial Practice in Woody-Plant Propagation.* Two hours a week, both terms.
112. *Lawn Making and Greenkeeping.* Two hours a week, second term.
113. *Landscape Work on Small Properties.* Three hours a week, first term.
114. *Landscape Work on Small Properties.* Six hours a week, second term.
115. *Planting Design.* Two hours a week, first term.
116. *Planting Design, Advanced Course.* Three hours a week, second term.
117. *The Construction of Small Gardens.* Three hours a week, first term.
171. *Tree and Shrub Management.* Two hours a week, second term.
162. *Special Problems in Floriculture.* Hours to be arranged, first or second terms.

Seminary. First term. Required of all graduate students.

FORESTRY

Professors R. S. HOSMER, A. B. RECKNAGEL, C. H. GUISE, and J. N. SPAETH.

Approved Major and Minor Subjects (key to symbols on p. 26)

Forest Policy **1, 2, 3, 4**
Forest Production
  Economics **1, 2, 3, 4**
  Silviculture **1, 2, 3, 4**
  Management **2, 3, 4**
  Protection **2, 3, 4**
Forest Utilization
  Economics **1, 2, 3, 4**
  Logging **2, 3, 4**
  Manufacturing **2, 3, 4**

Graduate Work in Forestry

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 Mathias H. Arnot Forest of 1880 acres, twenty miles south of Ithaca, a gift 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 great part of its area, made up of second growth hardwoods and hemlock. The University is also in possession of other parcels of wooded and open land, in the vicinity of Ithaca, aggregating approximately 670 acres. This property is well adapted to research work and graduate study in forestry. A square mile of typical Adirondack timberland in Essex and Hamilton Counties has been deeded to Cornell University by Finch, Pruyn, and Company for forest experiments to be conducted by the Department of Forestry in collaboration with the United States Forest Service.

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 normally devoted to individual work done under the direction of a member of the Forestry Staff, not to undergraduate class work taken by graduate students, although in special cases a part of the student's time may be so spent. Instruction in professional forestry is limited to graduate students only. Candidates for advanced degrees other than Master of Forestry may register for a minor in forestry.

Candidates for the degree of Master of 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 completed satisfactorily an undergraduate course in professional forestry, which includes basic education in the fields of forest policy and economics, forest protection, silviculture, forest utilization, and forest management, leading to the Bachelor of Science degree or its equivalent.

Candidates will also be required to submit evidence of satisfactory field training and experience prior to the completion of work leading to the degree of Master of Forestry. 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 of Forestry should enter at the beginning of the first (autumn) term. Otherwise it will be difficult to arrange his work satisfactorily.

Under the Charles Lathrop Pack Research Professor 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. Assistant Professor SPAETH.
Forest Management. Professor RECKNAGEL and Professor GUISE.
Forest Policy. Professor HOSMER.
Forest Protection. Professor HOSMER.
Forest Utilization. Professor RECKNAGEL.

GENERAL FORESTRY

1. *The Farm Woodlot.* Three hours a week, first term.
3. *Conservation of Natural Resources.* Two hours a week, second term.
4. *The Field of Forestry.* Two hours a week, first term.
[23. *Silviculture.* Three hours a week, first term. Not given in 1936-37.]
54. *Forest Mensuration and Management.* Three hours a week. Second term.
[106. *Wild-Life Conservation in Relation to Forestry.* Second term. Not given in 1936-37.]

PROFESSIONAL FORESTRY

224. **Research Methods in Silvics and Silviculture.** Prerequisite, professional training in forestry. Assistant Professor SPAETH. First term. Credit two hours. Hours to be arranged. The use of instruments in the study of forest environment; the use of sample plots in silvicultural research.

254. **Statistical Methods in Forestry.** Prerequisite, professional training in forestry. Professor GUISE. Second term. Credit two hours. Hours to be arranged. The application of statistical methods to problems in forestry.

256. **Advanced Forest Management.** Prerequisite, professional training in forestry. Professor RECKNAGEL. First term. Credit three hours. Hours to be arranged. Theory and practice of forest management, including the making of a forest working plan.

261. **Seminar.** Professors HOSMER, RECKNAGEL, and GUISE, and Assistant Professors SPAETH and CHANDLER. Both terms. Without credit. Hours to be arranged. Field and classroom conferences on important phases of forestry.

NEW YORK STATE AGRICULTURAL EXPERIMENT STATION AT GENEVA

See separate section of this announcement, p. 159.

POMOLOGY

Professors A. J. HEINICKE, L. H. MACDANIELS, D. B. CARRICK, JOSEPH OSKAMP, and M. B. HOFFMAN.

Approved Major and Minor Subjects (key to symbols on p. 26)

Pomology **1, 2, 4**

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.

1. *General Pomology.* Second term. Credit three hours.
2. *Fruit Varieties.* First term. Credit two hours.

111. *Packing and Storage of Fruit for Market.* First term. Credit two hours.

112. *Advanced Laboratory Course.* Second term. Credit two hours.

[121. **Economic Fruits of the World.** First term. Professor MACDANIELS. Given in alternate years. Not given 1936-37.]

131. **Advanced Pomology.** First term. Discussion, M W F 8. Plant Science 141. 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.

202. **Special Topics in Pomology.** Throughout the year Conference periods to be arranged. Plant Science 141. Professor HEINICKE, Professor CARRICK, Professor MACDANIELS, or Professor OSKAMP.

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.

201. **Research Problems in Pomology.** Throughout the year. Professors HEINICKE, MACDANIELS, OSKAMP, CARRICK, and HOFFMAN.

200. **Seminary.** Members of the staff. First and second terms. M 11. Plant Science 404.

POULTRY HUSBANDRY

Professors F. B. HUTT, G. F. HEUSER, G. O. HALL, L. C. NORRIS, and A. L. ROMANOFF.

Approved Major and Minor Subjects (key to symbols on p. 26)

Poultry Husbandry **2, 4**

The department provides excellent facilities for research in the genetics, physiology, incubation, embryology, nutrition, and behavior of domestic birds. A flock of over 2000 birds of various breeds of the domestic fowl is maintained, and turkeys, ducks, geese and game birds can be obtained when needed. The equipment includes the usual facilities for hatching, brooding and rearing poultry, together with laying houses and pens for experimental work. There is a well equipped chemical laboratory and complete facilities for work in poultry nutrition, equipment for studies of incubation and facilities for various kinds of histological and physiological work.

The accumulated records of the department are available for study and other extensive data are provided by two laying tests conducted under the supervision of the department.

Students for the Ph.D. degree in this department may elect either Animal Breeding or Animal Nutrition as the major field of study. For requirements and courses in these fields see pp. 99 and 102 of this publication. Animal Breeding and Animal Nutrition may also be elected as major or minor fields of study for the M. S. degree.

Poultry Husbandry may be elected as a major for the M.S. degree and as a minor for the M.S. or Ph.D. degree when the major is taken in a field of study other than Animal Breeding or Animal Nutrition.

The prerequisites for graduate students electing a major subject in this department include some undergraduate training in poultry husbandry, some experience in that field, courses in Zoology or Animal Biology, physiology and chemistry, as well as permission of the major adviser.

1. *Farm Poultry.* First term. Credit three hours.

20. *Poultry Breeds, Breeding and Judging.* First term. Credit three hours.

30. *Poultry Incubation and Brooding.* Second term. Credit two hours.

50. *Marketing Poultry Products.* First term. Credit three hours.

109. *Special Problems.* First or second term, or throughout the year. Credit one or two hours a term.

110. *Poultry Nutrition.* Second term. Credit three hours.

170. *Poultry Hygiene and Disease.* First term. Credit two hours.

120. **Poultry Genetics.** Second term. For details see Animal Breeding.

130. **Advanced Incubation.** Second term. For details see Animal Breeding.

205. **Research.** Throughout the year. Professors HUTT and HEUSER, Assistant Professors HALL, NORRIS, and ROMANOFF.

209. **Seminar in Poultry Biology.** Throughout the year. Hours to be arranged. Required of all graduate students in the department. Professors HUTT and HEUSER, Assistant Professors HALL, NORRIS, and ROMANOFF.

A survey of recent literature and research in poultry biology.

219. **Animal Nutrition Seminar.** First and second terms. For details see Animal Nutrition.

210. **Experimental Methods in Poultry Nutrition.** First term. For details see Animal Nutrition.

220. **Animal Genetics.** First term. For details see Animal Breeding.

229. **Seminar in Animal Breeding.** First and second terms. For details see Animal Breeding.

RURAL SOCIAL ORGANIZATION

Professors DWIGHT SANDERSON, W. A. ANDERSON, and L. S. COTTRELL, JR.

Approved Major and Minor Subjects (key to symbols on p. 26)

Rural Social Organization **1, 2, 4**

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.

1. *General Sociology.* First or second term. Credit three hours.

12. *Rural Sociology.* First term. Credit three hours.

111. *Rural Community Organization.* Second term. Credit two hours. Open to juniors, seniors and graduate students. Prerequisite, courses 1 and 12 or the permission of the instructor. Lectures and discussions, W F 8. Agricultural Economics Building 340. Professor SANDERSON.

The application of sociology to the practical problems of rural community organization. The course covers three main divisions: the use of community organization as a tool for guiding social change; a critical study of rural community organizations; methods of making organizations effective through developing rural leadership, analyzing community needs, building community programs, and coordinating programs.

121. **The Family.** First or second term. Credit three hours. Open to juniors, seniors and graduate students: open to sophomores only if registered in the curriculum for social workers in the College of Home Economics. Prerequisite, course 1 or its equivalent. Lectures, discussions, and reports. First term, T Th S 9: Second term, T Th S 8. Agricultural Economics Building 340. Assistant Professor COTTRELL.

This course considers the social problems of the family both on the farm and in the city; the history of the family, particularly during the past century; the differences between family life in the country and in the city; the function of the family in society; marriage and divorce; relations of parents and children; and how the family may be conserved.

122. *Social Problems and Public Welfare Organization.* Second term. Credit three hours. Prerequisite, course 1. Lectures and discussions, M W F 11. Agricultural Economics Building 340. Assistant Professor COTTRELL.

A study of social problems such as poverty, delinquency, crime, the physically handicapped, the feeble-minded and mentally diseased, social insurance, public health, mothers' pensions, unemployment, and the like; a consideration of public and private agencies for social work and desirable public policy with regard to their organization and support.

123. *Social-Work Practice.* Throughout the year.

131. *The Social Psychology of Rural Life.* First term. Credit three hours. Open to juniors and seniors. Prerequisite course 1 and one course in psychology. T Th S 10. Agricultural Economics Building 340. Assistant Professor COTTRELL.

An outline of social-psychological principles useful in the study of social attitudes, public opinion and collective behavior. Special attention is given to these phenomena in the rural social life.

[132. **Rural Leadership.** Second term. Credit two hours. Prerequisite, permission to register. Professor SANDERSON. Not given in 1936-37.]

A seminary course in which a descriptive account of leadership is given from both sociological and psychological points of view. General principles are discussed, with special case references to studies of rural leaders in New York and other States.

207. **Sociological Theory and Research.** First term. Credit three hours. Prerequisite, permission to register. T Th S 9. Agricultural Economics Building 302. Assistant Professor ANDERSON.

A course devoted to the critical analysis of recent and contemporary sociological theory.

208. **Systematic Sociology.** Second term. Credit three hours. For graduate students. T Th S 9. Agricultural Economics Building 302. Assistant Professor ANDERSON.

This course is designed to present in a systematic way the whole field of sociology, with special emphasis on sociological theory. The work is divided between discussions concerning the essential aspects of the subject, and reports on special topics.

209. **Seminary.** Second term. For graduate students. Professor SANDERSON.

The structural characteristics and classification of different types of social groups as related to their functions are studied. F 2-4. Agricultural Economics Building 302. Professor SANDERSON.

211. **The Rural Community.** First term. Credit two hours. Primarily for graduate students. Open to seniors by permission. Prerequisite, courses 1 and 12 or their equivalents. F 2-4. Agricultural Economics Building 302. Professor SANDERSON.

A study of the historical development of the rural community; a comparative study of types of rural communities; the rural community as a sociological group and its place in society; methods of community development and organization.

213. **Research in Rural Social Organization.** Throughout the year. For graduate students only. Hours and credit to be arranged. Professor SANDERSON and Assistant Professors ANDERSON and COTTRELL.

217. **The Rural Church and the Community.** Second term. Credit two hours. Prerequisites, course 1 and permission to register. Not given for less than six students. Hours to be arranged. Agricultural Economics Building 302. Assistant Professor ANDERSON.

The church as a social institution; its functions in present-day rural life; problems and programs of work.

[219. **Seminary.** First term. Credit two hours. For graduate students. Professor SANDERSON. Not given in 1936-37.]

A review of research in rural sociology and an analysis of methods and results.

231. **Social Psychology of Rural Life.** First term. Credit three hours. For graduate students only. Hours to be arranged. Assistant Professor COTTRELL.

The same plan as that outlined in 131 is followed except that more background on the part of the student is assumed and more attention will be given to theoretical aspects.

232. **Social Psychology of Rural Life.** Second term. Credit three hours. Prerequisite 231 or consent of instructor. Hours to be arranged. Assistant Professor COTTRELL.

A continuation of 231. Special attention is devoted to practical application of social-psychological principles to problems of research and practice in the field of social attitudes, public opinion and propaganda.

VEGETABLE CROPS

Professors H. C. THOMPSON, PAUL WORK, E. V. HARDENBURG, J. E. KNOTT, and ORA SMITH; *Doctor* HANS PLATENIUS.

Approved Major and Minor Subjects (key to symbols on p. 26)

Vegetable Crops **1, 2, 4**

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 on this subject.

The facilities available include the regular classrooms and laboratories; research laboratories, with the necessary equipment for chemical and physiological work; cold storage and common storage rooms; greenhouse space of approximately 7,500 square feet; hotbeds and cold frames, and about 25 acres of land devoted to teaching and research work. Special equipment is obtained as needed for students majoring in this field.

In order to enter upon graduate work in this field, the student should have the equivalent of the following courses: Botany 1 and 31, Plant Pathology 1, Entomology 12, Agronomy 1, Vegetable Crops 1, 2, 11, 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 crops are required to take the courses 101, 113, 121, and to attend the seminar.

Students majoring in vegetable crops will ordinarily find it necessary to spend one summer in Ithaca, in order to grow and study plant materials used in their research work.

1. *Vegetable Crops.* Second term. Credit three hours.

2. *Special Vegetable Crops.* Botany 1 should precede or accompany this course. Second term. Credit three hours.

[11. *Vegetable Forcing.* Prerequisite, course 1. Second term. Credit three hours. Given in alternate years. Not given in 1936-37.]

12. *Grading and Handling Vegetable Crops.* First term. Credit three hours.

101. **Advanced Vegetable Crops.** Professor THOMPSON. Prerequisite, course 1 and Botany 31. Second term. Credit four hours. Lectures, M W F 9. One conference period to be arranged. East Roberts 223.

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 is discussed.

113. **Types and Varieties of Vegetables.** Professor WORK. Prerequisite, course 1. First term. Credit three hours. Given in alternate years. East Roberts 223. Lecture and laboratory, M 1:40-4. East Ithaca gardens. One week of laboratory work preceding the beginning of regular instruction is required.

Taxonomy, origin, history, characteristics, adaptation, identification, classification, exhibition, and judging, of kinds and varieties of vegetables. Characteristics, production, and handling of vegetable seeds. The leading varieties of the vegetable crops are grown each year. Laboratory fee, $2.

121. **Morphology and Anatomy of Vegetable Crop Plants.** Assistant Professor SMITH. Prerequisite, course 1 and Botany 1. First term. Credit two hours. Lecture and laboratory, Th 1:40-4. One additional hour to be arranged. East Roberts 225.

A study of the anatomy and development of the roots, stems, leaves, flowers, fruits, and seeds, and of the reproductive processes of vegetable crop plants.

221. **Research.** Members of the staff are prepared to direct investigations in the various lines of vegetable production and handling.

222. **Seminar.** Members of the department staff. Recent literature is taken up for general study and discussion. All graduate students in vegetable crops are required to take part in this seminar. Time to be arranged. East Roberts 223.

GRADUATE SCHOOL OF EDUCATION

EDUCATION AND RURAL EDUCATION

Professors BAYNE, BINZEL, BUTTERWORTH, EATON, FERRISS, FREEMAN, HOSKINS, HULSE, JOHNSON, JORDAN, KRUSE, MOORE, OGDEN, PALMER, STEWART, WINSOR.

Approved Major and Minor Subjects (key to symbols on p. 26)

Agricultural Education **1, 2, 3, 4**
Curriculum **1, 2, 3, 4**
Education **3, 4**
Educational Administration **1, 2, 3, 4**
Educational and Mental Measurement (including Statistics) **2, 3, 4**
Educational Method **3, 4**
Educational Psychology **1, 2, 3, 4**
History of Education **2, 3, 4**
Home Economics Education **3, 4**
Nature Study **1, 2, 3, 4**
Rural Education **1, 3, 4**
Rural Secondary Education **1**
Secondary Education **1**
Supervision **1, 2, 3, 4**
Vocational Education **1**
Theory and Philosophy of Education **1, 2, 3, 4**

The development of standards for public school service during the last several years promises soon to place upon the graduate level much of the professional work that has hitherto been secured through undergraduate training. Hence, those looking forward to a city superintendency, to a principalship of a city elementary or high school, to a principalship or superintendency of a village school, to high school teaching, to a supervisorship, and the like, will find it desirable, if not essential, to have training beyond a first degree. It is to give this needed professional service that the Graduate School of Education has been established. Although the emphasis will be upon the graduate work, Cornell University will, through this teacher-training organization, continue to offer those facilities that have been available to the undergraduates of the various colleges.

A separate Announcement listing the offerings in Education may be obtained by writing to the Director.

There are two types of advanced degrees for students of education, as follows:

1. The degrees of *Master of Arts*, *Master of Science*, and *Doctor of Philosophy* are administered directly by the Graduate School of Cornell University.

2. The degree of *Master of Science in Education* is administered directly by the Graduate School of Education, subject to the regulations of the Graduate School of Cornell University.

A graduate student in the field of Education may become a candidate for a degree in either of these categories.

Admission

1. Qualified students may be admitted to candidacy for the degrees of Master of Arts, Master of Science, or for the degree of Doctor of Philosophy with a major or minor or both in some phase of Education. A graduate of any college in which requirements for the first degree are substantially equivalent to those for the first degree at Cornell may be admitted to resident study in the Graduate School. It should be noted that these requirements include three entrance units in one foreign language or two in each of two languages. He may at once enter upon candidacy for an advanced degree if he can show that he is qualified to carry on study in the field in which he proposes to work.

In order to avoid delay 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. They should address the Dean of the Graduate School, Cornell University, Ithaca, N. Y. Students who wish to work under the direction of a particular professor should communicate with him also.

Qualified students may be admitted to candidacy for the degree, Master of Science in Education, under the same conditions, except that the requirement in foreign language is omitted.

In order to avoid delays at the beginning of the academic year, those who desire to enter the Graduate School of Education are advised to make application for admission, either in person or by letter, in the preceding spring or summer. They should address both the Dean of the Graduate School, Cornell University, Ithaca, N. Y., and the Director of the Graduate School of Education.

The Master's Degree in Education

A degree of Master of Science in Education is conferred upon a candidate who, after completing not less than one year of residence devoted to study in a field in which Education constitutes the major portion, has given satisfactory evidence of ability to carry graduate work, and has met such other requirements as his Special Committee with the approval of the Graduate School of Education may have established. Every candidate must have passed a final comprehensive examination.

This degree is designed for school executive officers and teachers who wish to enter upon a course of professional study involving neither close restriction nor intensive research. This course of study is both comprehensive and critical. It has, however, a distinctly professional emphasis. The amount of prescribed work will be adjusted to the particular preparation and experience of the candidate. In general these candidates are expected to fall into one of three classes:

Class I. Men and women, graduates of standard colleges, of approved experience in educational positions, who are seeking professional preparation on the graduate level.

Class II. Men and women, graduates of standard colleges, who wish to qualify as school principals or as supervisors in special fields in accord with professional requirements of various states.

Class III. Men and women, graduates of standard colleges, qualified for graduate work, but who have not included in their undergraduate programs courses in the field of Education sufficient for certification as teachers.

1. With the approval of the Director of the Graduate School of Education the candidate shall choose three members of the graduate faculty to serve as a special committee to direct his work. At least two of these shall be from the staff in Education, one of the two being selected by the candidate to act as chairman. This committee is empowered to determine the special qualifications of the candidate to undertake a program proper to his particular professional interest. An approved program must have unity, in terms both of purpose and of sequential development. Within an approved program are included such courses, seminars, projects, investigations, and examinations as the committee may require. These provisions may have the consequence of extending the residence requirements for students of Class III beyond the minimum of one year.

2. The office of the Director of the Graduate School of Education acts as an office of record, and the candidate for one of these degrees shall, within ten days of his registration, file in writing a statement approved by his committee, showing his plan of work and course of study.

3. Upon the satisfactory completion of the work outlined by the Special Committee and the passing of a final comprehensive examination, the Faculty of the Graduate School of Education will recommend to the Faculty of the Graduate School that the candidate be granted the appropriate degree. The maximal period allowed for completion of all requirements conforms to the regulations of the Graduate School of Cornell University.

4. Prior to scheduling the final examination, all members of the staff under whom the candidate has carried his course work or who have acted in an advisory or similar capacity with him will be informed of his proposed examination

and will be asked to express an opinion regarding his fitness for such examination, and invited to be present and take part in the examination.

The courses expected of the candidate will usually fall into four groups designated as A, B, C, and D. There will be no sharp line of demarcation between these groups, but the following statement may serve as a guide in differentiating them:

Group A. Courses of a special nature, such as a group of courses in English, the languages, history or science which are essential to a well-trained high school teacher of these several fields.

Group B. Courses directly preliminary and introductory to advanced studies in Education.

Group C. Advanced courses in theory or science of education presupposing studies of an introductory type.

Note: For example, courses in curriculum theory, philosophy of education, history of education, educational psychology, mental measurements. To undertake a course in Class C, the student must have completed an acceptable preliminary course in Class B, or an equivalent study in the field of the advanced course.

Group D. Advanced special courses in the field of educational practice, which presuppose a professional background.

Note: Courses in educational administration, supervision, teacher-training, and the like, would fall, presumably, in Group D. To qualify for such a course, the candidate must give evidence of professional study and experience represented minimally, say, by certification to teach, and one year of successful service in employment as teacher, principal, supervisor, or the like. Such preparation may be gained either before or after entrance upon candidacy, but it is prerequisite to recognition or satisfactory completion of courses in Group D.

For detailed information regarding these degrees write to the Director of the Graduate School of Education.

COURSES OF INSTRUCTION. In the statement of courses given below, "Ed. 20," "Ed. 21," etc., indicate that the courses are offered in the Department of Education. "R.E. 111," "R.E.114," etc., indicate that the courses are offered in the Department of Rural Education.

The Department of Rural Education courses numbered under 100 are intended primarily for underclassmen; those from 101 to 200 are primarily for upperclassmen or graduate students; while those numbered 201 and over are primarily for graduate students. All courses offered by the Graduate School of Education 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

[R.E. 1. *Introduction to Problems of Public Education.* First term. Credit two hours. Not given in 1936-37.]

Ed. 20. **Seminary in Education.** First term. Credit two hours. Primarily for graduate students; open to upperclassmen by permission. Professor FREEMAN. T 4-6. Goldwin Smith 248.

Topics relevant to educational theory.

[Ed. 21. **Seminary in Education.** Second term. Credit two hours. Admission by permission of the instructor. Professor JORDAN. M 4-6. Goldwin Smith 248. Not given in 1936-37.]

[R.E. 234. **Seminary.** First term. Credit two hours. M 2-3:30. Stone 309. Professor BUTTERWORTH. Not given in 1936-37.]

PSYCHOLOGY

Ed. 1. *Educational Psychology.* Either term. Credit three hours.

R.E. 110. *Psychology: An Introductory Course.* Either term. Credit three hours.

R.E. 111. *Psychology for Students of Education.* Either term. Credit three hours.

R.E. 112. *Psychology for Students of Education.* Either term. Credit three hours.

R.E. 114. *Psychology for Students of Hotel Administration.* First term. Credit three hours.

R.E. 117. *Psychology of Childhood and Adolescence.* Either term. Credit three hours.

R.E. 119. *Personnel Administration.* Second term. Credit three hours.

R.E. 211a. **Psychology for Students of Education.** First term. Credit three hours. For mature students with teaching experience. Lectures, M F 11-12:20. Stone 309. Professor KRUSE.

R.E. 212. **Psychology of Learning.** Second term. Credit two hours. Th 4:15-6. Stone 309. Professor KRUSE.

[R.E. 213. **Psychology of Learning in the School Subjects.** Second term. Credit two hours. Assistant Professor BAYNE. Not given in 1936-37.]

[R.E. 218. **Seminary in Educational Psychology.** Second term. Credit two hours. Th 4:15-6. Stone 309. Professor KRUSE. Not given in 1936-37.]

R.E. 219. **Seminary in Personnel Administration.** Second term. Credit two hours. Open to qualified seniors and graduates. Th 4:15-6. Stone 203. Assistant Professor WINSOR.

Ed. 8. **Experimental Education.** Either term. Credit and hours to be arranged. Consent of the instructor is required. Education 7 should normally precede this course. Professor FREEMAN.

Problems of experimental education; the application of psychological and statistical methods to problems in educational psychology; chief results and bearings.

[Ed. 17. **Mental Development.** First term. Credit two hours. Prerequisite Education 1 or its equivalent. T 4-6. Professor FREEMAN. Not given in 1936-37.]

Ed. 18. **Individual Differences.** Second term. Credit two hours. Prerequisite, Education 1 or its equivalent. It is desirable, though not required, that Education 7 precede this course. M 2-4. Goldwin Smith 248. Professor FREEMAN.

The nature, causes and implications of individual differences in abilities, interests, and achievement. Graduate students desiring it will be given an opportunity to make a special study of problem cases.

METHOD

R.E. 121. *Method and Procedure in Secondary School Teaching.* First term. Credit three hours.

Ed. 4. *Methods, Practice and Extra-instructional Problems.* Credit nine hours.

R.E. 126. *The Teaching of Science in the Secondary School.* Either term. Credit two hours.

R.E. 131. *Introduction to the Teaching of Agriculture in the Public Schools.* First term. Credit three hours.

R.E. 132. *The Teaching of Agriculture in the Secondary Schools.* First and second terms. Credit three hours each term.

R.E. 133. *Apprentice Teaching in Agriculture.* First or second term. Credit to be arranged.

R.E. 134. *Adult Education.* First term. Credit three hours.

[R.E. 134a. *Adult Education.* Second term. Credit two hours. Not given in 1936-37.]

R.E. 135. *The Teaching of Home Economics in the Secondary School.* Either term. Credit three hours.

R.E. 136. *Directed Teaching of Home Economics in the Secondary School.* Either term. Credit two or four hours.

R.E. 137. *Extra-instructional Problems.* Second term. Credit two hours.

[R.E. 222. **Principles of Method.** Second term. Credit three hours. Professor STEWART. Not given in 1936-37.]

R.E. 226. **Research in Science Teaching.** Either term. Credit one or two hours. M or W at 9. Fernow 8. Professor PALMER, and Assistant Professor JOHNSON.

Special problems in science teaching.

R.E. 227. **Seminary in Elementary Education.** First term. Credit two hours. M 4-6. Stone 309. Professor MOORE.

R.E. 228. **Seminary in Child Guidance.** Second term. Credit two hours. For graduate students who have had work in child guidance. F 4-6. Nursery School. Professor WARING.

R.E. 232. **Special Problems in Program Planning for the Teaching of Agriculture.** Second term. Credit two hours. T Th 11. Open to undergraduates by permission only. Assistant Professor HOSKINS.

An advanced study of a community program of agriculture and farming, based upon approximate aims, objectives and standards.

[R.E. 240. **Cooperative Extension Work.** First term. Credit three hours. Professor EATON. Not given in 1936-37.]

PREPARATION OF TEACHERS FOR NORMAL SCHOOLS AND COLLEGES

[R.E. 241. **The Preparation of Teachers for Normal Schools and Colleges.** Second term. Credit three hours. Professor BUTTERWORTH. Not given in 1936-37.]

R. E. 243. **Problems of College Teaching.** Throughout the year. Credit one hour each term. Open to college students intending to teach in colleges. Given provisionally upon enrollment of not less than six students. Hours of meeting two or three times a week will be arranged after enrollment and consideration of student's schedules. Professor EATON.

[R.E. 245. **The College Preparation of Teachers of Agriculture for the Secondary School.** Second term. Credit three hours. Professor STEWART. Not given in 1936-37.]

R.E. 248. **The Preparation of Teachers of Home Economics.** Second term. Credit three hours. Given in alternate years. Open to graduate students of approved qualifications. Time to be arranged. Professor BINZEL.

[R. E. 249. **Seminary in Home Economics Education.** First term. Credit two hours. Open to graduate students. Time to be arranged. Professor BINZEL. Not given in 1936-37.]

R.E. 250. **Seminar in Agricultural Education.** First term. Credit two hours. Open only to graduate students whose progress in graduate study is satisfactory. T 4-5:30. Stone 309. Professor STEWART.

A consideration of the policies and plans for teaching and research in agricultural education for the secondary school.

MEASUREMENT AND STATISTICS

Ed. 7. **Mental Measurements.** First term. Credit three hours. By permission of the instructor candidates for the principal's certificate may enroll for two hours credit. Prerequisite, Education 1 or equivalent. T Th S 9. Goldwin Smith 225. Assistant Professor FREEMAN.

The nature of intelligence. History of the development of individual and group tests of intelligence; principles underlying their formation and application; the use of tests of intelligence in dealing with defective and superior children, and with problem cases; their use in general school problems and in fields outside the school. The theory, construction, and use of educational tests. Demonstration in administering tests.

R.E. 251. **Educational Measurement.** First term. Credit three hours. Candidates for the principal's certificate may register for two hours. Prerequi-

site, a course in educational psychology. Open to graduates and upper classmen. T Th 8 and an hour to be arranged. Stone 309. Assistant Professor BAYNE.

Mental and educational measurement in relation to the classification of pupils, determination of the progress of pupils, and other problems of the teacher, supervisor, and administrator.

R.E. 253. **Statistics for students of Education.** Second term. Credit three hours. Primarily for graduate students in education. Open to a limited number of other students upon approval of instructor. T Th 10 and an hour to be arranged. Stone 309. Assistant Professor BAYNE.

ADMINISTRATION AND SUPERVISION

[Ed. 10. **High School Administration.** Second term. Credit two hours. For seniors, graduates, and other qualified students. W F 3. Goldwin Smith 236. Professor JORDAN. Not given in 1936-37.]

Ed. 11. **Extra-classroom Activities.** First term. Credit two hours. For seniors and graduates. M 4-6. Goldwin Smith 236. Professor JORDAN.

A study of the place extra-classroom activities should assume in the school program. General principles involved, with special attention given to athletics, dramatics, publications, school finance, music, debate, and school clubs.

Ed. 12. **The Junior High School.** First term. Credit two hours. For seniors, graduates, and other qualified students. M W 9. Goldwin Smith 248. Professor JORDAN.

Psychological, biological, and pedagogical bases for the Junior High School; fundamental principles, organization and administration; curricular content in detail; methods of instruction.

R.E. 261. **The Administration of Rural Schools.** First term. Credit three hours. Candidates for a principal's certificate may register for two hours credit. T Th 11 and third hour to be arranged. Stone 203. Professor BUTTERWORTH.

A course for students of experience dealing with the problems of organizing and administering education in the elementary and secondary schools in country and village districts.

[R.E. 262A. **School Finance.** Second term. Credit two hours. T Th 9. East Roberts 223. Professor BUTTERWORTH. Not given in 1936-37.]

R.E. 262c. **The School Plant.** Second term. Credit two hours. M 4-6. Stone 309. Professor BUTTERWORTH.

Standards for school buildings; measurement of school building facilities; planning the school program to meet the needs of the community; the financing of school buildings; modern equipment for the school plant; and similar problems.

R.E. 263. **Procedures and Techniques in Supervision.** First term. Credit three hours. Candidates for the principal's certificate may register for two hours credit. M W F 10. Stone 203. Professor MOORE.

Designed for superintendents, supervisors, and principals. Students who have not had experience in these fields will be admitted only upon permission of the instructor. Students taking this course must be prepared to spend four full days or more in observing supervisory procedures in various school systems.

R.E. 264. **Seminar in Rural School Administration.** Second term. Credit two hours. S 10. Stone 309. Professor BUTTERWORTH.

Designed for those desiring to make an intensive study of administrative problems in rural elementary and secondary schools. Topic to be announced.

R.E. 265. **Seminary for Principals.** Second term. Credit three hours. Designed for all graduate students who are candidates for a principal's certificate. W 4-6 and additional time in field work. Stone 309. Professor MOORE.

R.E. 266. **The Supervision of the Elementary School Subjects.** Second term. Credit three hours. Candidates for a principal's certificate may register for two hours credit. M W F 9. Stone 309. Professor MOORE.

A course designed for supervisors, elementary school principals, and superintendents. It includes a consideration of important research studies which have a

direct bearing upon the teaching and supervision of the elementary school subjects.

R.E. 267. **The Organization and Administration of Agricultural Education.** Second term. Credit three hours. Should follow course 261 or its equivalent. T Th 11-12:20. Stone 203. Professor STEWART.

Designed primarily for persons preparing to organize, administer, and supervise agricultural education. Participation in field experience, field study, and supervision make up a part of the program of study.

[R.E. 269. **The Administration and Supervision of Home Economics Education.** First term. Credit three hours. Open to students of approved qualifications. The course includes directed observation of and participation in supervision. Professor BINZEL. Not given in 1936-37.]

R.E. 276. **Principles of Curriculum Building.** Second term. Credit three or four hours. For graduate students primarily. T Th 2-3:20 and an additional hour to be arranged for those wishing to carry further the study of special curriculum problems. Stone 309. Professor FERRISS.

A consideration of the major problems, principles, and techniques in determining educational objectives, and curriculum content and organization.

[R.E. 278. **Seminary in Rural Secondary Education.** Second term. Credit two hours. Given in alternate years. M 4-6. Stone 203. Professor FERRISS. Not given in 1936-37.]

HISTORY OF EDUCATION

Ed. 3. **History of Education.** (a) (Greek, Roman, and Early Medieval.) First term. Credit two hours. Open to upperclassmen and graduates only. Professor LAISTNER. (See History 7.) (b) (Late Medieval and Modern.) Second term. Credit two hours. Open to upperclassmen and graduates only. Professor SMITH. (See History 36.)

Ed. 13. **History of American Education.** First term. Credit three hours. Prerequisite, Education 1, or its equivalent. Dr. HULSE. T Th S 10. Goldwin Smith 236.

A survey of educational change in the United States from the beginning of the seventeenth century to the present, with special emphasis on public schools, and consideration of the religious, economic, political, and social factors affecting education. European influences throughout the period will also be considered briefly.

EDUCATIONAL THEORY

Ed. 2. **Principles of Secondary Education.** Either term. Credit three hours. Prerequisite, Education 1. First term, M W F 2. Goldwin Smith 234. Professor FREEMAN. Second term. T Th S 9. Goldwin Smith 234. Professor FREEMAN.

The nature and significance of Education; biological and psychological foundations; the secondary school as a social institution; educational ideas and values; the curriculum.

Ed. 5. **Theory of Behavior.** Second term. Credit two hours. Primarily for graduate students; open to upperclassmen by permission. T 4-6. Goldwin Smith 248. Professor OGDEN.

The nature of behavior; learning, insight, personality and character; educational applications.

R.E. 181. *Principles of Education.* First or second term. Credit three hours.

R.E. 194. *Education and Vocations.* First term. Credit three hours.

R.E. 281. **Rural Secondary Education.** First term. Credit three hours. Primarily for graduate students. M W F 9. Stone 309. Professor FERRISS.

A course to consider some of the more basic problems in the nature, organization, curriculum, and extension of secondary education in its adaptation to rural needs and conditions.

R.E. 294. **Philosophy of Education.** Second term. Credit three hours. Open to graduate students whose studies in education are well advanced. M W F 11. Stone 309. Professor EATON.

An examination of the concepts of education, and of the bearing of several major theories of life upon education.

[R.E. 295. **Comparative Education.** First term. Credit two hours. Professors BUTTERWORTH, FERRISS, and MOORE. Not given in 1936-37.]

NATURE STUDY

R.E. 107. *The Teaching of Nature Study and Elementary-School Science.* Second term. Credit three hours.

R.E. 108. *Field Natural History.* First term. Credit two hours.

R.E. 202. **Nature Literature.** First term. Credit two hours. M W 10. Fernow 8. Open to students who will have completed their preparation for certification as science teachers by the end of the current year. M W 10. Fernow 8. Professor PALMER.

Acquaintance with prose, poetry, and fiction useful in enriching science courses in elementary and in secondary schools with critical examination of nature and science books for these grade levels.

[R.E. 209. **The Nature Movement and Its Makers.** First term. Credit two hours. M W 10. Fernow 8. Professor PALMER and Miss GORDON. Not given in 1936-37.]

THE ENGINEERING DIVISION

DEXTER SIMPSON KIMBALL, *Chairman.* FREDERICK GEORGE SWITZER, *Secretary.*

THE ENGINEERING DIVISION of the Graduate School consists of all professors and assistant professors of the College of Engineering, the Dean of the Graduate School, and such other members of the Faculty of the University as have supervision of the work of Graduate Students in the Division.

Each of the main branches (C.E., E.E., and M.E.) of the Division has a COMMITTEE ON GRADUATE WORK which has direct charge of the following: examining engineering credentials of applicants for admission, which, however, must first be sent to the Dean of the Graduate School; corresponding with applicants for the purpose of giving or receiving information or of giving advice concerning the availability of facilities for the graduate work desired in Engineering; the registration of students in the subdivision, after they have registered in the Graduate School; giving advice and approval regarding the student's program and the selection of his Special Committee, which has direct charge of his work; looking after the completion of language and undergraduate shortages; and making final review of the students' records to check the fulfillment of all scholastic requirements for the degrees. The membership of the Committees on Graduate Work in the three subdivisions is as follows:

COMMITTEES ON GRADUATE WORK IN THE ENGINEERING DIVISION

CIVIL ENGINEERING.—S. C. Hollister, *Chairman*, 11 Lincoln Hall; C. L. Walker, *Secretary*, 21-A Lincoln Hall; E. W. Rettger, 33-C Lincoln Hall.

ELECTRICAL ENGINEERING.—P. M. Lincoln, *Chairman*, Franklin Hall; W. C. Ballard, jr., *Secretary*, Franklin Hall; Vladimir Karapetoff, 17 Franklin Hall.

MECHANICAL ENGINEERING.—Herman Diederichs, *Chairman*, 18 West Sibley; F. G. Switzer, *Secretary*, 303 West Sibley; G. B. Upton, Mechanical Laboratory.

GRADUATE STUDY IN ENGINEERING

The instructing staffs and the laboratories, libraries, and other facilities of the various departments of the College of Engineering and those of the other departments of the University are available for students desiring to pursue graduate study and research in engineering and allied fields. Graduate students in engineering will also find among the regular and elective courses given in the College and in mathematics, physics, chemistry, and in other departments of the University, many suitable for advanced study. For the courses offered, and for the laboratory, library, and other facilities in Engineering, see the Announcement of the College of Engineering.

ADVANCED DEGREES OFFERED

The degrees of Master of Civil Engineering (M.C.E.), Master of Electrical Engineering (M.E.E.), Master of Mechanical Engineering (M.M.E.), Master of Science in Engineering (M.S. in Engineering), and Doctor of Philosophy (Ph.D.), are granted in the field of engineering.

THE DEGREES OF M.C.E., M.E.E., M.M.E., AND M.S. IN ENGINEERING

Subject to certain general regulations of the Graduate School,[1] the rules governing admission to candidacy for and for graduation with

[1]See page 9.

one of the professional degrees (Master of Civil Engineering, M.C.E., Master of Electrical Engineering, M.E.E., Master of Mechanical Engineering, M.M.E. and Master of Science in Engineering, M.S. in Engineering), are established and administered by the Engineering Division of the Graduate School.

The Degree of Ph.D.

The rules governing admission to candidacy for, and those for graduating with, the degree of Doctor of Philosophy (Ph.D.) are established and administered by the Faculty of the Graduate School.[2] For further information concerning this degree, see pp. 11.

ADMISSION TO GRADUATE STUDY IN ENGINEERING

(1) All applications for admission to the Graduate School and all applications for Graduate Fellowships and Scholarships must be sent to the *Office of the Graduate School*. Obtain the necessary blanks and instructions from that office.

(2) If the applicant wishes to become a candidate for one of the advanced Engineering Degrees his credentials should include not only information requested on page 9, but in addition, (a) a catalogue of the institution from which he graduated, with each subject that he has completed clearly marked therein, and (b) a detailed statement concerning his practical experience, together with letters from his employers.

(3) In all cases, the applicant should designate as definitely as possible his chosen fields of study, both major and minor, so that he may be advised concerning the facilities and personnel available in those fields.

(4) A prospective graduate student may write to the office concerned (Civil Engineering, Electrical Engineering, or Mechanical Engineering) for advice or information concerning graduate work in Engineering.

(5) Candidacy for the Advanced Engineering Degrees, M.C.E., M.E.E., or M.M.E., presupposes the substantial equivalent of the corresponding first degree at Cornell University. In the evaluation of a candidate's credits, however, the quality of his previous work, his practical experience, and his chosen field of advanced study will be considered in making adjustments for candidates whose undergraduate course has not been the exact equivalent of the corresponding undergraduate courses at Cornell. For language requirements, see page 9.

(6) Candidacy for the advanced Engineering degree M.S. in Engineering presupposes graduation from a school or college of recognized standing and thorough and adequate training in the par-

[2]Although not under the supervision of the Engineering Division, it is to the advantage of candidates for non-professional degrees in Engineering who have registered in the Graduate School to register also in the appropriate branch of the Engineering Division.

ticular field chosen for advanced work. For language requirements, see page 9.

(7) Applicants who desire to work in engineering subjects without becoming a candidate for any degree should refer to page 10.

REGISTRATION

All graduate students must first register in the Graduate School at the beginning of each term. In addition, a graduate student in engineering must, at the beginning of each term of residence, register at the office of the Engineering School of whose faculty his major professor is a member.

A student shall select his program of study as well as his Special Committee (see page 10) with the advice and approval of the Committee on Graduate Work in that subdivision (C.E., E.E., or M.E.) in which his major subject falls. No change in the program of study nor in the personnel of the Special Committee shall be made without the written approval of the appropriate Committee on Graduate Work and the advice of the student's Special Committee.

FIELDS OF GRADUATE INSTRUCTION IN ENGINEERING

A candidate for a master's degree in Engineering must present a *thesis* on a subject in his major field. The thesis must show initiative and originality and must conform to the general requirements of the Graduate School. It may take one of the following forms:

(a) An analytical or interpretative discussion of results already in existence.

(b) A design or construction or both, of sufficient importance and originality to demonstrate thoroughly a knowledge of the principles involved and of their applications.

(c) A dissertation based upon his own original investigation, analytical or experimental.

In the following pages are outlined, (1) the special facilities, and (2) the opportunities for graduate study in the various engineering subjects which may be chosen as Major or Minor Subjects.

The work of a graduate student in Engineering will be limited presumably to one field. This may be chosen in any one of the three larger branches of Engineering, i.e., Civil, Mechanical, or Electrical, although further sub-division 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 branch naturally making the same applications that he himself desires to make. For example, in Mechanical Engineering, hydraulics naturally leads towards, and is developed with a

view to, turbine or 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 branch. 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, construction, analysis, laboratory research, or interpretative investigation of results already in existence.

The facilities and opportunities offered for graduate work in engineering are discussed in the following pages.

Approved Major and Minor Subjects (key to symbols on p. 26)

In Civil Engineering

Astronomy
  Geodetic Astronomy **2, 4**
  Geodesy **1, 2, 4**
Highway Engineering **2, 4**
Hydraulic Engineering **2, 3, 4**
Hydraulics
  Theoretical **1, 2, 3, 4**
  Experimental **1, 2, 3, 4**
Materials of Engineering **2, 4**
Mechanics **1, 2, 3, 4**
Railway Engineering
  Railway Maintenance **1, 2, 3, 4**
  Railway Location **1, 2, 3, 4**
  Railway Operation and Management **1, 2, 3, 4**
Sanitary Engineering
  Garbage Collection and Disposal **3, 4**
  Sewage Treatment **1, 2, 3, 4**
  Water Purification **1, 2, 3, 4**
Soil Mechanics **1, 2, 3, 4**
Structural Engineering
  Structural Engineering **1, 2, 3, 4**
  Theory of Structures **1, 2, 3, 4**
Surveying
  Geodetic Engineering **1, 2, 4**
  Topographic Engineering **1, 2, 4**

In Electrical Engineering

Economics of Public Utilities **1, 2, 3, 4**
Electrical Communications **1, 2, 3, 4**
Electrical Design **1, 2, 3, 4**
Electric Power Generation, Transmission and Distribution **1, 2, 3, 4**
Electric Circuit Analysis **1, 2, 3, 4**
Electrical Conduction through Gases **1, 2, 3, 4**
Electrical Machinery **1, 2, 3, 4**
Electrical Measurements **1, 2, 3, 4**
Electric Power Applications **1, 2, 3, 4**
Experimental Electrical Engineering **1, 2, 3, 4**
Materials of Engineering (In Electrical Engineering) **1, 2, 3, 4**

In Mechanical Engineering

Administrative Engineering
  Industrial Accounting **2, 3, 4**
  Industrial Marketing **1, 2, 3, 4**
  Industrial Statistics **3, 4**
Aeronautical Engineering **1, 2, 3, 4**
Automotive Engineering **1, 2, 3, 4**
Experimental Mechanical Engineering **1, 2, 3, 4**
Heat-Power Engineering **1, 2, 3, 4**
Hydraulic Engineering **1, 2, 3, 4**
Industrial Engineering **1, 2, 3, 4**
Machine Design **1, 2, 3, 4**
Materials of Engineering **1, 2, 3, 4**
Mechanic Arts **1, 2, 3, 4**
Mechanics **1, 2, 3, 4**
Metallography **1, 2, 3, 4**

ADMINISTRATIVE ENGINEERING

Professors J. R. BANGS, jr., and S. S. GARRETT.

3A21. *Economic Organization.* Credit 3 hours. First term.
3A23. *Business and Industrial Management.* Credit 4 hours. Second term.
3A31. *Accounting for Engineers.* Credit 3 hours. Either term.

3A32. **Accounting for Engineers.** Prerequisite 3A31. Credit three hours. Second term. The accounting of industrial corporations: bond and stock issues and valuation; good will; depreciation; reserves; sinking funds; income tax returns; flexible budget; consolidated statements; statement analysis; unsettled questions in accounting practice.

3A41. **Business Statistics and Forecasts.** First or second term. Three recitations a week. Credit three hours. Prerequisite courses 3A21, 3A22. Elements of the technique of statistical analysis. The collection, preparation, and use of business statistics. The sources of information. Business indices and business barometers.

3A44. **Industrial Marketing.** First term. Credit three hours. Two recitations and one lecture a week. Prerequisite courses 3A21, 3A22, 3A23, and 3A41. A study of the field of industrial marketing using the case method of instruction. The scope of the course includes product planning, policy, and research; sales and market analysis; distribution channels; pricing and terms of sale; sales promotion; management and organization of sales force; sales control.

3A45. **Industrial Marketing.** Second term. Credit two hours. One recitation and one 2½ hour laboratory period a week. Prerequisite course 3A44. The application of the principles of marketing to specific problems. Each student will develop a complete market study and analysis for given industrial products.

3A51. **Business and Industrial Research.** Either or both terms. Credit one hour for forty hours of actual work. Open to a very limited number of seniors and graduate students who have shown by training and aptitude their ability to carry on original investigations in business and industrial subjects.

NOTE:—Only a limited number of graduate students can be taken in this department. Those contemplating graduate work in Administrative Engineering are advised to make advance arrangements with the department.

AERONAUTICAL ENGINEERING

Professor K. D. WOOD.

Problems related to the design and performance of airplanes may be carried on in this field. The laboratories of the department of Experimental Engineering are available for studies on airplane engines. Arrangements may be made with the authorities of the Ithaca airport for flight experiments. Most of the technical

reports and notes of the National Advisory Committee for Aeronautics and the Aeronautical Research Committee are available in the library.

3M35. *Aerodynamics.* Two recitations a week, either term.

3M36. *Airplane Design.* Two recitations a week, either term.

3M45, 3M46. **Airplane Design.** Prerequisite course 3M35. Course 3M36 must accompany or precede these courses. Assistant Professor K. D. WOOD. Throughout the year, two computing periods a week. Calculations and drawings similar to those required by the Department of Commerce for approval of the design of an airplane. Factory and airport inspection trips.

3M51. **Aeronautical Problems.** Prerequisite course 3M35. Assistant Professor K. D. WOOD. Two to five periods a week, as arranged. Preparation of report on investigation of some specialized phase of aerodynamics or airplane design, such as airfoil characteristics, propeller characteristics, airplane performance, airplane stability, load factors for design, autogyro performance, rocket propulsion, or fluid resistance.

AGRICULTURAL ENGINEERING

See under AGRICULTURE, p. 97.

AUTOMOTIVE ENGINEERING

Professors G. B. UPTON, V. R. GAGE, and A. C. DAVIS.

Special problems relating to Automotive Engineering may be selected for advanced study. Laboratory facilities of the Department of Experimental Engineering are available for research on internal combustion engines, and arrangements may be made for investigations on other automotive topics. Students desiring to take a minor in this field may find courses 3X45, 46, 47 and 48 suitable as a foundation.

3X45, 3X47. **Automotive Design.** Professor UPTON. Two lectures and two computing periods a week, first term. General study of automotive road vehicles and their functioning; driving, braking, steering, springing, power required for operation.

3X46, 3X48. **Automotive Design.** Professor UPTON. Two lectures and two computing periods a week, second term. Power plants of automotive field, particularly internal combustion types. General design and functioning, lubrication, mechanical efficiency, volumetric efficiency, valving, balancing, carburetion, ignition, performance.

DESCRIPTIVE GEOMETRY AND DRAWING

(*In Civil Engineering*)

Professors J. T. PARSON and H. T. JENKINS.

200. *Drawing.* Freshman. Credit three hours. First term.
201. *Drawing.* Freshman. Credit three hours. Second term.
202. *Drawing.* Sophomore. Credit one hour. First term.
203. *Drawing.* Sophomore. Credit one hour. Second term.

204. **Advanced Drawing.** Professor PARSON. Credit, one to three hours. Either term.

Perspective drawings (rendered in pencil, ink, and washes) of buildings, bridges, dams, and other engineering works; building details of window frames, cornices, molding, and other simple details; Old English lettering.

205. *Descriptive Geometry.* Credit two hours. Second term.
206. *Descriptive Geometry.* Credit two hours. Second term.

207. **Advanced Descriptive Geometry.** Assistant Professor JENKINS. Credit, one to three hours. Either term.

A continuation of courses 201 and 202. Problems in intersections, developments, warped surfaces, shade, shadows, perspective, and stereotomy.

ELECTRICAL ENGINEERING

Professors P. M. LINCOLN, V. KARAPETOFF, W. C. BALLARD, R. F. CHAMBERLAIN, B. K. NORTHROP, E. M. STRONG, L. A. BURCKMYER, M. G. MALTI, TRUE MCLEAN, and M. G. NORTHROP.

RESEARCH: Research in Electrical Engineering may be divided into two general classes (a) theoretical and (b) experimental. Whenever possible the student is required to prove his theoretical deductions by experiment and conversely he is required to explain his experimental results by theoretical considerations.

For theoretical research the facilities of a well equipped library are available.

For experimental research special equipment and shop facilities are required. The College of Engineering maintains several mechanics and has machine shops fully equipped to provide shop facilities. The available special equipment required for experimental work along specific lines is given under the general topics outlined below:

GRADUATE COURSES AND TOPICS: Unless otherwise specified, graduate courses offered in the School of Electrical Engineering, are given either term or both terms as needed. Members of the faculty are prepared to guide students in the *graduate topics* given below.

ELECTRIC CIRCUIT ANALYSIS

410-11a. *Elements of Electrical Engineering.*

485. *Applied Mathematics.*

421-22. **Advanced Electrical Theory.** Prerequisites: E.E. 411, 432, and 485. Professor KARAPETOFF and Dr. SOHON; First term, five hours credit.

Laws of electric and dielectric circuits; electric networks, polyphase circuits and transients.

481-2. **Engineering Mathematics.** Prerequisites elements of electric circuit analysis. Professor KARAPETOFF. Throughout the year, two hours. Two recitations a week.

General methods by which engineering problems are expressed in mathematical form. The course consists of problems taken from mechanical, civil, or electrical engineering, involving analytic geometry, elements of differential and integral calculus, vector analysis, operational analysis, differential equations, and the theory of probabilities. The topic will be selected to suit the class.

486-7. **Heaviside's Operational Calculus.** Prerequisites, 421-2 or their equivalent. Assistant Professor MALTI. Throughout the year, credit 3 hours a term. Two lecture-recitations and one computing period a week.

Mathematical introduction. The writing of operational equations for networks, lines, and cables. The infinite integral theorem, Heaviside's Expansion Theorem, Duhamel's Theorem. Solution of operational equations by using the above theorems.

Graduate Topics: General Theory of Circuits and Networks, skin effect, eddy currents in metallic masses, transient phenomena, electro-magnetic oscillations and waves, electric wave filters.

ELECTRICAL MACHINERY

412a. *Elements of Electrical Engineering.*

423-4. **Advanced Electrical Theory.** Prerequisites, E.E. 421, 423. Professor KARAPETOFF and Dr. SOHON. Second term. Five hours credit.

Laws of the magnetic circuit with applications to machine design.

431-432. *Electrical Laboratory.*

442. **Electrical Design.** Prerequisite courses 421, 423. Professor LINCOLN and Assistant Professor NORTHROP. Second term. Credit four hours. Fundamental principles underlying the design of direct-current and alternating current machinery.

433-434. **Advanced Electrical Laboratory.** Prerequisite courses 412, 485, 431, and 432. Professor CHAMBERLAIN and Assistant Professor BURCKMYER. Throughout the year, one recitation and laboratory period with a report each week.

Theory and Characteristics of Electrical Machinery. Prerequisites, General knowledge of the theory and testing of electrical machinery. Professor KARAPETOFF and Assistant Professor MALTI. Advanced theory of electric and magnetic circuits. Mathematical treatment of the physical laws involved in the performance of continuous and alternating current machines. Transient behavior of High-voltage apparatus. Relationship between proportions and operating characteristics. The theory underlying special tests for the determination of machine constants.

Graduate Topics. Advanced study of the *parameters* of revolving machines, special design problems, hunting and stability problems, short circuit phenomena, commutation, armature reaction.

SPECIAL EQUIPMENT. A great variety of direct and alternating current machines are available, so selected as to afford at least one machine of every type ordinarily encountered in practice. Most of these represent modern construction and are of such size and design as to give typical performance, but at the same time provision is made for great flexibility of operation. For example, in five of the synchronous machines the coil terminals are brought out to an external connecting board. One 15-kva. synchronous machine is, in addition, provided with a phase-wound rotor and a squirrel-cage rotor, either of which may be readily used to replace the synchronous rotor. A modern type of synchronous converter is arranged for direct or inverted operation, either single-phase, two-phase, or three-phase, with metering and control boards which permit very rapid change of operating conditions. There are three types of commutating alternating-current motors, four types of fractional-horsepower alternating-current motors, and a large number of direct-current machines.

Typical examples of automatic starters for alternating and direct current motors are provided, including time-element, counter-e.m.f., and series lock-out types, in addition to drum controllers and a complete Sprague multiple-unit railway control system.

The non-rotating apparatus also includes constant-potential transformers of standard and special construction, constant-current transformers, induction regulators, storage batteries and a small mercury-arc rectifier.

THE ELECTRONIC LABORATORY contains various types of high vacuum thermionic devices, gas conduction devices, photo-electric cells, mercury tubes, and a modern 6-phase steel case mercury rectifier with grid control and complete vacuum apparatus, which may also be operated as an inverter.

The facilities for testing are well-planned and very complete. For machine testing, there are numerous Prony brakes, an electric dynamometer, and a special apparatus for determining the complete characteristics of fractional-horsepower motors.

ELECTRICAL COMMUNICATION

451. **Electrical Communication Engineering.** Prerequisite courses E.E. 412, 485, 450. Professor BALLARD and Assistant Professor MCLEAN. First term. Credit three hours.

Theory of alternating currents as applied to telegraph, telephone and radio communication. Theory and application of thermionic devices.

452. **Electrical Communication Engineering.** Prerequisite course, E.E. 451. Second term. Credit four hours.

452a. *Theory of Communication Networks.* Second term. Credit 2 hours.

452b. *Elements of Broadcast Engineering.* Second term. Credit 2 hours.

454. *Current Topics in Communication Engineering.*

GRADUATE TOPICS. Electro-mechanical vibrating systems, propagation of electromagnetic waves, thermionic tubes and their applications, design of radio circuits, sound recording and reproduction, electric wave filters, carrier current telephony.

SPECIAL EQUIPMENT. Broadcast transmitter, 1 KW., complete and up to date in separate building with antenna towers. Complete studio and control equipment. Available to advanced students for special problems. Primary frequency

standard, consisting of 100 k.c. temperature controlled quartz crystal oscillator with multivibrator and harmonic amplifier. Laboratory is equipped with 2.5 Kw., 2,000 volt, D.C. power supply and large assortment of power tubes and parts for experimental work on radio transmitters.

Complete type D carrier current telephone equipment, with signalling auxiliaries.

Audible and carrier frequency oscillator, with complete set of resistance, inductance, and capacitance standards for impedance bridge measurements.

Vacuum tube voltmeter-milliammeter and transmission measuring set.

Complete laboratory model 100 line step-by-step dial telephone exchange.

Large assortment of small meters and equipment for studying characteristics of receiving tubes, audio transformers, and telephone equipment.

Electrical Measurements

432-2. *Electrical Laboratory for E. E. Juniors.*

433-4. **Advanced Electrical Laboratory.**

Graduate Topics. Design of special types of meters and the characteristics of the exponential response meter, development of methods of measurement, characteristics of measuring instruments.

Special Equipment. The Standardizing Laboratory includes standard precision ammeters and voltmeters. A Silsbee current-transformer test set, and primary standards of voltage and resistance with the necessary potentiometers and auxiliary equipment arranged for convenient checking of secondary standards and of other meters.

Power Generation, Distribution, and Rate Making

441. **Electric Power Plant Design.** Prerequisite courses, E.E. 412, 485, and 432. Professor Lincoln. First term, three hours. Selection and arrangement of Power Plant Equipment.

464. **Electrical Power Transmission and Distribution.** Prerequisite courses, E.E. 421, 423, 433. Professor Lincoln and Assistant Professor M. G. Northrop. Second term. Credit three hours.

444. **The Economics of Public Utilities.** Professor Lincoln. Second term. Credit two hours.

A study of the origin and development of Public Utilities, Regulation, Rates and Rate Structures, and Public Relations.

Stability of Electric Power Systems. Prerequisites, General theoretical and experimental study of alternating current circuits and machines. Professor Karapetoff.

The method of symmetrical coordinates, positive, negative, and zero-sequence, impedance of stationary apparatus and revolving machines; theoretical and experimental determination of such impedances. Static and dynamic stability of simple and complex aggregates; methods of computation. Means for increasing stability.

Graduate Topics. Circuit breakers and reactor problems.

Sag stress in transmission lines, corona, regulation of long lines, insulator stresses. Valuations, rate structures, accounting methods, rate of return, public ownership, holding companies, depreciation, public regulation, capitalization.

Special Equipment. The University Hydroelectric Power 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 tests and inspection.

Applications of Electric Power

461. **Elements of Electric Railway Practice.** Prerequisite courses 412, 432. Professor Chamberlain. First term. Credit two hours.

A study of the application of electric power to transportation.

462. **Industrial Application and Control of Electricity.** Prerequisite courses 423, 433. Professor CHAMBERLAIN. Second term. Credit two hours.

Study and selection of motor drives and control, electric welding, and electric heating.

466. *Illumination.*

MATERIALS OF ELECTRICAL ENGINEERING

Solid Dielectrics. Prerequisites, 421-2-3-4, or their equivalent. Assistant Professor MALTI. Throughout the year. Credit two hours a term.

A study of the anomalous behavior of solid dielectrics under varying conditions of e.m.f., time, frequency, temperature, pressure, humidity, and ionizing radiation.

Magnetic Materials. Prerequisites, 421-2-3-4, or their equivalent. Assistant Professor MALTI. Throughout the year. Credit two hours a term.

A study of the properties of magnetic materials such as hysteresis, permeability, the effect of crystal structure and heat treatment on the magnetic properties of materials and magnetic analysis (i.e. the correlation of magnetic and mechanical properties).

Structure of Matter, and Applied Electronics. Prerequisites, Physics and Chemistry in the usual scope of undergraduate courses for engineers. Professor KARAPETOFF. The electron, its charge, mass, diameter, and velocity. Cathode Rays. Elements of kinetic theory of gases. Periodic system in terms of orbital electrons. The structure of the nucleus. Photons and electro-magnetic radiation. Ionization and excitation of gases. Applications to gaseous conduction, spark-over, arcs, mercury-vapor apparatus, etc.

Electrical Testing. Prerequisites, 421-2-3-4, 433. Assistant Professor BURCKMYER.

The testing of the materials of construction for determining their magnetic and electrical properties.

SPECIAL EQUIPMENT. The magnetic testing apparatus includes a Fahy permeameter, an Epstein apparatus and a large motor-generator set comprising two sine-wave generators and a third-harmonic generator on the same shaft, with provision for adjusting phase displacement and for measuring form factor. The dielectric testing apparatus includes an 80,000-volt testing transformer together with full-wave rectifying equipment and an electrostatic voltmeter. Among the general pieces of test equipment are a very complete assortment of meters and three oscillographs. For the study of discharge of electricity through gas a vacuum system is available, which produces a vacuum up to 10-3m.m. Hg and specially designed tubes to show special discharge phenomena.

EXPERIMENTAL MECHANICAL ENGINEERING

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

THE STEAM LABORATORY. The boiler section of this laboratory supplies steam for routine and research testing. There are a number of representative types of steam engines, several small steams turbines, a two-stage air compressor, together with auxiliary equipment consisting of surface and jet condensers, indicators, gages, calorimeters, flue gas apparatus, pyrometers, etc.

THE GAS ENGINE LABORATORY. There is a variety of gasoline, oil and gas engines in the smaller sizes, as well as a number of high speed automotive engines, and a Diesel engine. Testing equipment includes indicators (high speed and other types) pyrometers, three electric dynamometers and two absorption dynamometers. A recent addition to the equipment is a single-cylinder, variable compression experimental gasoline engine designed for basic research work.

THE BELT TESTING LABORATORY. This laboratory contains a belt testing machine which consists of two 75-HP electric dynamometers capable of operating at any speed up to 1,000 r.p.m. and of carrying pulleys up to 36 inches in diameter. The belt tension, power transmitted by the belt, and the slip of the belt may be observed. Belts can be tested in widths up to 10 inches and the pulley center distance may be varied from 4½ feet to 20 feet.

THE HYDRAULIC LABORATORY. In addition to the usual equipment for undergraduate instruction there is a vertical shaft hydraulic turbine with governor, arranged for research work. There is also a complete test stand for research and testing of pumps in capacities up to 1,000 G.P.M. and 230 ft. head at speeds up to 4,000 r.p.m., including an electric dynamometer of 13-HP rating with independent motor-generator power supply and control, a 3-inch motor-driven centrifugal booster pump and 1½-inch motor-driven centrifugal priming pump, 2-inch, 3-inch and 4-inch calibrated Venturi tubes; precision platform scales with tank for the collection and weighing of water in amounts up to 6,500 lbs.

THE OIL TESTING LABORATORY. This laboratory contains a Cornell oil-testing machine, a Thurston standard railway-testing machine, and several smaller testing machines. The small 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 York absorption machine and a very complete York refrigerating compression plant.

THE CEMENT LABORATORY. This laboratory contains apparatus for the testing of cement and concrete.

THE FUEL TESTING LABORATORY. This laboratory contains equipment of fuel calorimeters and other apparatus needed for the determination of the composition and heat value of gas, liquid, or solid fuels.

For the major work in this department the graduate student is required to select a subject in the field of experimental research. This work is in charge of officers of instruction who devote a considerable portion of their entire time to it and give advice and assistance to graduate students who are carrying on investigations in this department.

The laboratories of this department are available for use by graduate students who are carrying on theoretical investigations in any other department and who wish to do experimental work in parallel with the theoretical work.

Students contemplating experimental research should communicate with the department as far as possible in advance of beginning work in order to arrange for the use of available equipment.

3X32. *Introductory Experimental Engineering.* One laboratory period a week and a written report of the work. Second term.

3X41, 3X42. *Experimental Engineering.* One laboratory period a week and a written report of the work. Throughout the year.

3X43. *Experimental Engineering.* Selected experiments from 3X41. First term.

3X51. **Experimental Engineering Research.** Prerequisites dependent upon field of investigation selected. Professors DIEDERICHS, SAWDON, UPTON, GAGE, DAVIS. Either or both terms. Open to a limited number of seniors and graduates who have available at least two laboratory periods a week and who have shown proficiency in engineering subjects. Special problems and investigations which are in general carried on in the laboratories under the immediate direction of the members of this department, but which may be carried on in any department of engineering under the general supervision of this department. The work done may be reported upon in a thesis.

TOPICS SUGGESTED FOR ADVANCED WORK

Mechanical Laboratory Practice.

Instrumentation.

Experimental Research along various lines.

HEAT-POWER ENGINEERING

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

In each of the many branches of this very extensive field are innumerable opportunities for making advanced studies of interest and value. This advanced

work includes such studies as original investigations in engineering thermodynamics; interpretative studies of available data and other material; investigations in power plant economics; the design, selection, and arrangement of apparatus, and plant layout, to meet specific requirements; analytical and experimental research; to mention but a few of the opportunities available. The department and college libraries are liberally provided with reference books, periodicals, transactions of engineering societies, reports, and other material relating to this field.

As prerequisite for the graduate work in this field the student should have had the equivalent of the fundamental courses in heat-power engineering that are required of undergraduates in mechanical engineering at Cornell. 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:

3P31, 3P32. *Heat-Power Engineering.* Three hours a week, throughout the year.

3P41, 3P42. *Heat-Power Engineering.* Three hours a week, throughout the year.

3P44, 3P45. **Steam Power-Plants.** Prerequisites, 3D31, 3D32, 3D33, 3P31 and 3P32 and must be accompanied or preceded by 3P41 and 3P42. Professor BARNARD. Two hours a week throughout the year.

Load curves; station factors; power-plant economics; cost of plants and of their equipment and output; principles of economic selection of plant equipment with respect to the load curve, cost factors and local conditions; steam prime movers, steam generators, condensers, and other plant apparatus; performance characteristics and design features of this apparatus; piping; coal and ash storage and conveying machinery; plant location; plant layout; and similar topics.

3P46, 3P47. **Computing and Design.** Must be accompanied by 3P44 and 3P45. Professor BARNARD. Two three-hour periods a week, throughout the year.

The practical solution of problems discussed in 3P44 and 3P45.

3P48. **Air Conditioning.** Prerequisites 3P31 and 3P32, or 3P33 and 3P34. Assistant Professor MACKEY. Two hours a week. First term. Properties of mixtures of air and water vapor and the principles of air conditioning, including the heating, cooling, humidifying, dehumidifying, filtering, and distribution of air in enclosures for improving human comfort or for the control of the properties of hygroscopic materials.

3P49. **Refrigeration.** Prerequisite 3P32, or 3P34. Professor ELLENWOOD. Two hours a week, first term. General principles, applications, and economic and commercial factors involved in various forms of modern refrigeration as applied to both domestic and industrial installations, including those pertaining to air conditioning.

3P50. **Power Plant Economics; Equipment Selection.** Prerequisite 3P32, or 3P34. Professor BARNARD. Two hours a week. First term. Costs of equipment and plants; energy costs; load curves, station factors; determining characteristics of equipment; selection of best working pressures, temperatures and cycles; economic number and size of units. Selection of equipment based on these and other determining considerations. Economic operation. Applications to central stations and to industrial power and heating plants. By-product power. Other similar topics.

3P51. **Steam Turbines.** Prerequisites 3P32 or 3P34. Assistant Professor CLARK. Two hours a week, second term.

Classification of turbines and description of leading features of the various types; mechanical and thermal considerations underlying the action of steam in turbines; calculations involved in turbine design; discussion of building, erecting, and testing; adaptability to special conditions of service; economic results of the use of turbines in engineering practice.

3P52. **Internal Combustion Engines.** Prerequisites 3D31, 3D32, 3D33, and 3P32 or 3P34. Assistant Professor CLARK. Two hours a week, first term.

Fuels; general theory and salient points in the design and operation of internal combustion engines; study of existing commercial types, relative advantages, and questions of economy; current developments.

3P53. **Steam Boilers and Related Apparatus.** Prerequisites 3D31, 3D32, 3D33, and 3P32 or 3P34. Professor BARNARD. Two hours a week, second term.

Fuels, combustion, combustion apparatus; furnaces and boiler types, proportions, materials, design of details; superheaters, economizers, air heaters; accessories; equipment, arrangement and operation of steam generating plants.

3P55. **Graphical Computations and Representations.** Prerequisites 3D31, 3D32, 3D33 and 3P32 or 3P34. Assistant Professor MACKEY. Two hours a week, second term.

Slide rules; construction of net work charts and alignment charts for the solution of equations; representation of statistics; and derivation of empirical equations from experimental curve.

3P56. **Advanced Heat-Power Engineering and Research.** Prerequisites dependent upon the work to be done. Professors BARNARD, ELLENWOOD, and others. Hours and work to meet the individual needs of each student.

3P57, 3P58. **Heat Engineering.** Prerequisite, 3P32. Must be accompanied or preceded by 3P41 and 3P42. Assistant Professor MACKEY. Two lectures and two computation periods a week, throughout the year. Properties of mixtures, dimensional analysis, fluid flow, heat transmission, selection of fans and pumps and refrigeration; applications to problems in air conditioning.

The following group offerings for seniors may be used as minors by graduate students: **Option A**—Power-Plant Engineering: 3P44, 3P45, 3P46, 3P47, 3P50.

Option B—Heat Engineering: 3P57, 3P58, 3P49.

TOPICS SUGGESTED FOR ADVANCED WORK

Advanced Engineering Thermodynamics.
Steam Engineering.
Internal Combustion Engineering.
Economic Studies.
Heat Transmission.
Fuels, Combustion, Burners, Furnaces.
Flow of Fluids through Closed Conduits; Power Plant Piping.
Refrigeration.
Compressors and Pneumatic Machinery.
Air Conditioning.
Power and Heating Projects.

HIGHWAY ENGINEERING

Professors W. L. CONWELL and R. Y. THATCHER.

The laboratories for testing aggregates and concrete are located in the basement of Lincoln Hall. These laboratories are equipped for all the routine tests.

The laboratory equipped for examining bituminous materials, bituminous mixtures, etc. and subgrade soils is housed in a small separate building used solely for this work.

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 are also available to graduate students.

265. *Highway Engineering.* Three hours a week. Either term.

266. **Highway Laboratory.** Prerequisites, Course 265 or its equivalent. May be taken concurrently with Course 265. Professor CONWELL. Credit three hours. Either term.

Examination of bituminous and non-bituminous highway materials; design and tests of bituminous paving mixtures; sampling and tests of subgrade soils.

267. **Advanced Highway Engineering.** Prerequisite, Course 265 or its equivalent. Professor CONWELL. This course is conducted as a seminar, meeting one evening a week. Credit three hours. Second term.

Students are assigned topics in the field of highway engineering. Papers are written on the assigned topics, and the student is required to speak on his assignment at the seminar.

268. **Advanced Highway Laboratory.** Prerequisites, Courses 265 and 266. Professor CONWELL. Hours to be arranged. Credit three hours. Either term.

Special investigations of materials; special problems in design of paving mixtures; research in subgrade soils; etc.

291g. **Design in Highway Engineering.**

297g. **Research in Highway Engineering.**

In addition to regular work in the courses listed, occasional field trips are made.

Note: For highway structures see STRUCTURAL ENGINEERING.

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 Master's or Doctor's degree 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 (including laboratory), 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 tendency is to underestimate the time required for preliminary thesis work and that necessary for a thorough digestion of results. Consequently the work should be begun, if possible, early in the first term of residence.

HYDRAULICS

Professor E. W. SCHODER.

240. *Hydraulics.* Credit four hours. Either term.

241. **Advanced Hydraulics.** Prerequisite, Hydraulics 240 or the equivalent. Professor SCHODER. Three hours a week. Second term.

Broader theoretical treatment of some of the topics in elementary hydraulics; backwater and variable flow; the hydraulic pump; water hammer and surges; viscous flow; water wheels; centrifugal pumps.

242. **Hydraulic Measurements.** Prerequisite, Hydraulics 240 (including the laboratory) or the equivalent. Professor SCHODER. Three two and one half-hour periods a week. First term.

Field and testing laboratory methods of measuring rates of flow, coefficients, slopes, characteristics, etc.; experimental studies on Pitot tubes in pipes; current meters and floats in open channels; ordinary water meters; special losses of head;

fire hose and nozzles; Venturi meters; weirs. The determination of efficiency, capacity, and characteristics of hydraulic machinery by tests.

297 c. **Research in Hydraulics,** either theoretical or experimental.

Hydraulic Engineering

Professor F. J. Seery.

230. *Water Supply.* Credit three hours. Either term.

231. **Hydraulic Construction.** Prerequisite, course 230 or the equivalent. Professor Seery. Computing and designing. Credit three hours. Second term.

Problems in Water Storage including the design of structures associated with stream regulation; preliminary investigations; economics; estimates; design of dams, etc.

232. **Water Power Engineering.** Prerequisite, courses 240 and 230, or the equivalent. Professor Seery. Three hours a week. Given only if a sufficient number elect the course. Usually first term.

Hydraulic problems involved in the planning for and the design of water power developments.

233. **Hydraulic Engineering.** Prerequisite, course 230 or the equivalent. Professor Seery. Three hours a week. Either term if a sufficient number elect the course.

Problems in Water Supply not covered in Course 230; theory of groundwater flow, wells, methods of development, earthen dams, masonry dams, spillways and other appurtenances of dams.

234. **Conservancy and Reclamation Engineering.** Prerequisite, Courses 230 and 240, or the equivalent. Professor Seery. Three hours a week. Given only if a sufficient number elect the course. Either term.

Flood flow estimates; flood protection; irrigation and drainage.

236. **Hydraulic Power and Pumping Plant.** Prerequisite, course 232. May be taken concurrently with 232. Professor Seery. Computing and designing. Credit three hours. Given only if a sufficient number elect the course. First term. Problems relating to power and pumping plants.

291c. **Design in Hydraulic Engineering.**

In Mechanical Engineering

Professor F. G. Switzer.

The hydraulic laboratory, under the direction of the Department of Experimental Engineering, is 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.

[3M41, 3M42. **Hydraulic Power Plants.** Prerequisites 3M21, 3M22a, 3M22b and 3M23, or 3M33. Professor Switzer. Two hours a week throughout the year. Not given in 1936-37.]

Power Developments, Hydraulic Turbines, Power study, water power legislation and the Federal Power Commission. Interconnection of power plants, hydraulic and thermal.

[3M43, 3M44. **Hydraulic Power Plant Problems.** Must be accompanied by courses 3M41, 3M42. Professor Switzer. Two computing periods a week throughout the year. Not given in 1936-37.]

Problems involving the principles taken up in courses 3M41, 3M42.

3M52. **Special Hydraulic Power Plant Problems.** Prerequisites 3M41, 3M42, 3M43 and 3M44. Professor Switzer. Hours to be arranged either term.

Topics relating to design, operation, and economics of hydraulic power plants, selected to meet the individual needs of each student.

TOPICS SUGGESTED FOR ADVANCED WORK

Hydraulic Turbines.
Draft Tube Design and Performance.
Centrifugal Pumps.
Economics of Water Power Plants.

INDUSTRIAL ENGINEERING

Professors M. A. LEE and D. S. KIMBALL.

The departmental library of literature on Industrial Engineering subjects is available for the use of graduate students. In the micro-motion laboratory 16 mm. motion picture cameras and projectors with the necessary auxiliary apparatus are available for motion and process studies as well as the necessary tools and work places for setting up and studying various operations.

The courses offered include a consideration of the organization, administration and selection and location of equipment for industrial enterprises.

No formal graduate courses are offered but facilities are available for original work in the field of Industrial Engineering.

To take advanced work in this department the student must have had the equivalent of the undergraduate courses 3I31, 41, 43 and 44. Students desiring to take a minor in this field may enroll for the following undergraduate courses.

3I31. *Industrial Organization.* Two lectures a week, either term.

3I43, 3I44. *Industrial Engineering.* Two computing periods and one lecture a week, both terms.

3I46. *Industrial Relations.* Two lectures a week, first term.

3I47. *Cost Accounting.* One lecture and one computing period a week, second term.

3I48. *Industrial Engineering.* Two recitations a week, second term.

TOPICS SUGGESTED FOR ADVANCED WORK.

Micro-motion analysis.
Investigations for motion and process economy.
Practical economic and production investigations in near-by industries.

MACHINE DESIGN

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

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 eight 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.

120. *Descriptive Geometry.* First term. Credit three hours.

121. *Mechanical Working Drawing.* Second term. Credit three hours.

3D21. *Kinematics, Recitations.* First term. Credit two hours.

3D23. *Empirical and Kinematics Drawing.* First term. Credit two hours.

3D24. *Kinematics, Recitations and Drawing.* Second term. Credit three hours.

3D25. *Kinematics, Recitations.* First term. Credit three hours.

3D26. *Empirical and Kinematic Drawing.* First term. Credit two hours.

3D31. *Machine Design, Recitations.* First term. Credit two hours.

3D32. *Machine Design, Recitations.* Second term. Credit two hours.

3D33. *Machine Design, Drawing.* Second term. Credit three hours.

3D34. *Machine Design, Recitations.* First term. Credit two hours.

3D35. *Machine Design, Drawing.* Either term. Credit two hours.

3D36. *Machine Design, Drawing.* Second term. Credit one hour.

3D51. *Mechanical Technology.* Either term. Credit three hours.
3D54. *Elements of Structural Work.* Second term. Credit three hours.

3D52. **Advanced Kinematics and Kinetics.** Prerequisites 3D21, 3D23, and 3D24 or 3D25 and 3D26. Professor ALBERT or ROGERS. Three periods a week, second term.

Graphical and semi-graphical treatment of linear and angular velocities and accelerations and of the resulting forces, stresses, and strains due to the form and mass of the moving parts of mechanisms and machines. Vibration and critical speeds and the theoretical basis and use of balancing machines for securing static and running balance of machine parts, will be treated so far as time permits.

3D53. **Materials Handling.** Prerequisites 3D21, 3D23 and 3D24, or 3D25 and 3D26. Professor ————. Two lectures a week, second term.

Treatment and analysis of the known methods of handling different kinds of materials and of the principles and considerations involved in a proper choice of the method of handling any given kind of material.

TOPICS SUGGESTED FOR ADVANCED WORK

Descriptive Geometry.
Kinematics and Dynamics.
Machine Design and Design Methods.
Special Design Problems.
Investigational Work.

MANAGEMENT ENGINEERING

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

The study of methods of construction is neglected in some colleges and the graduate student who is not familiar with them may well take course 264. Books and periodicals on construction methods for various types of work, on management of construction work and laws and practices governing it are available in the Library of the School of Civil Engineering.

264. *Engineering Construction.* Three hours a week. Either term.

290. **Engineering Law.** Professors BARNES, PERRY, CRANDALL, and THATCHER. Three hours a week. Either term.

Contract work vs. day labor; fundamental laws of contract; agency; torts; real and personal property; water rights; corporations and partnerships; sales; inheritance; negotiable instruments; insurance; bankruptcy; suretyship; transportation, and patents and copyrights.

290-A. **Advanced Engineering Law.** Second term. Credit three hours. Open to those who have completed course 290 of which this course is largely an extension. Some additional topics treated are municipal laws and ordinances, labor laws under various jurisdictions, reclamation and other laws concerned with the development of natural resources and compensation and insurance laws. Actual cases will be used for illustrating the above and also some of the topics treated in course 290. Professor BARNES and Assistant Professors PERRY, CRANDALL, and THATCHER.

293. **Engineering Management.** Professors BARNES, PERRY, CRANDALL, and THATCHER. Three hours a week. Either term.

Financial feasibility of projects; economic selection of plant or structure; estimates, plans and layouts for execution of work; and management of construction, including cost keeping and accounting; general rules of management.

295. **Valuation Engineering.** Prerequisite, courses 264 and 290. May be taken concurrently with 290. Professor CRANDALL. Three hours a week. Second term.

Valuations and appraisals of properties for rate making, purchase or sale, condemnation, merger, assessment, investment or management purposes, with special attention to rulings and decisions of the courts in rate and valuation cases.

MATERIALS OF ENGINEERING

In Civil Engineering

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 investigation and researches as the results find their way into print.

The laboratory equipment is selected to make all ordinary and many special tests and investigations of the materials of construction. 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.

225. *Materials of Construction.* Credit three hours, either term.
226. *Materials Laboratory.* Credit three hours, either term.

297b. **Engineering Research in Materials.**

In Mechanical Engineering

Professors H. DIEDERICHS, G. B. UPTON, and A. C. DAVIS.

Experimental problems relating to the origins and control of the properties of ferrous and non-ferrous metals, cements, woods, etc., may be carried on in this department. For advanced work in this field the student must have had course 3X31 or its equivalent. Advanced work is also offered in Applied Metallography.

The Materials Testing Laboratory. This laboratory is equipped for tension and compression tests with an Olsen 300,000-lb. machine, a Riehlé 100,000-lb. 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 Riehlé machine of 200,000 pounds capacity and a Fairbanks machine of 10,000 pounds capacity. There are one Olsen torsion machine of 200,000 inch-pounds capacity, two Upton-Lewis fatigue testing machines, and an Amsler-Charpy-Izod impact testing machine. The small equipment includes hardness testing machines, extensometers, a cathetometer, gas and electric furnaces, tempering baths, and 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.

3X21, 3X22. *Metallurgy and Properties of Materials.* Three lectures a week throughout the year.

3X31. *Materials Testing Laboratory.* One laboratory period a week and a written report of the work. First term.

3X52. **Applied Metallography.** Professor UPTON. Two lectures a week, first term.

Theories and technique of metallography critically reviewed; applications to practice of control of properties of metals. This course will be modified to suit especially the interests of graduate students taking it.

MECHANIC ARTS

Professors A. E. WELLS and W. E. MORDOFF.

The shops available for graduate research work include the following: forge shop, foundry, welding shop, pattern shop, and machine shop. The shops are also available for use in the building of equipment for research in any department. Arrangements for the construction of new equipment should be made in advance with the head of the department.

102. *Wood Work.* 3 hours a week, either term.
103. *Introductory Engineering Laboratory.* 3 hours a week, either term.
3S21. *Pattern-making.* 3 hours a week, either term.

3S22. *Foundry.* 3 hours a week, either term.
3S31. *Machine Shop.* 9 hours a week, either term.
3S32. *Machine Shop.* 6 hours a week, either term.

TOPICS SUGGESTED FOR ADVANCED WORK

Melting of ferrous and non-ferrous metals.
Selection and testing of foundry sands.
Welding practice.
Foundry practice.
Machine shop practice.

MECHANICS

In Civil Engineering

Professors S. G. GEORGE, E. W. RETTGER, S. C. HOLLISTER, 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 machanics 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 and German, and an ability to read technical works in these languages is extremely valuable.

220. *Mechanics of Engineering.* Credit five hours. Either term.
220A. *Mechanics Laboratory.* Credit two hours. First term.
221. *Mechanics of Materials.* Credit four hours. Second term.
221A. *Mechanics Laboratory.* Credit one hour. Second term.

222. **Advanced Mechanics.** Prerequisite, Courses 220 and 221. Professor GEORGE or RETTGER. Three hours a week. First term.

Advanced mechanics of materials; induced and combined stresses; Mohr's diagram; a survey of experimental methods for localized stresses; special cases of flexure; Castigliano's Theorem of Least Work, with applications.

223. **Engineering Problems.** Prerequisite, Courses 220, 221 and 240. Two computing periods a week. Credit two hours. Either term.

A series of problems such as occur in ordinary engineering practice and covering a wide range of topics.

224. **Engineering Mathematics.** Prerequisite, Course 240 or its equivalent. Professor RETTGER. Three hours a week throughout the year.

An elementary course in ordinary and partial differential equations with applications to Engineering problems; vector analysis; theory of complex variable. Trigonometry, hyperbolic functions, calculus, etc. are dealt with in so far as this is necessary for a clear understanding of the theory.

228. **Theory of Elasticity.** Prerequisite, first term of 224. Professors HOLLISTER and RETTGER. Four hours a week. Second term.

Theory of elastic breakdown; fundamental relations of stress and strain, Airy stress function; problems in two-dimensional and three-dimensional stress and strain; Analogies and their applications to solutions of Engineering problems in elasticity.

229. **Experimental Elasticity.** Prerequisite 228. May be taken concurrently with 228. Professor HOLLISTER. Credit depends upon approved work done. Second term.

Experimental study in applications of the theory of elasticity to engineering problems; investigations of stress concentrations and distributions by (a) photoelastic analysis, (b) Model analysis based upon the membrane, electrical, slab, or other analysis, (c) Model tests.

297. **Research in the field of Advanced Mechanics.**

In Mechanical Engineering

Professors E. H. WOOD, F. G. SWITZER, W. R. CORNELL, H. C. PERKINS, and K. D. WOOD.

In addition to the regular laboratory equipment, there are also available facilities for the study of balancing problems, and for photo-elastic investigations. The equipment includes a Bausch and Lomb polariscope with five-inch diameter beam; bakelite; polishing tables; annealing oven; a 2,000-lb. Olsen Universal hydraulic testing machine arranged for tension, compression and transverse loading; mercury arc for monochromatic light source.

3M21. *Theoretical and Applied Mechanics.* Five hours a week, either term.

3M22a. *Strength of Materials.* Five hours a week for nine weeks of second term.

3M22b. *Strength of Materials, continued.* Five hours a week for six weeks of second term.

3M23. *Hydraulics.* Five hours a week for six weeks of second term.

3M32. *Applied Mathematics.* Three hours per week, first term.

3M33. *Fluid Mechanics.* Three recitations and one lecture per week, second term.

3M55. **Photoelasticity.** Prerequisite, 3M22b. Professor SWITZER. Two lectures, one laboratory period and report a week. Second term. The optics of photoelasticity, the stress-optical effect, plane and circularly polarized light, white and monochromatic. Elements of elasticity required for the analysis of observations and the determination of principal stresses.

TOPICS SUGGESTED FOR ADVANCED WORK

Vibration problems.
Theory of Elasticity.
Photo-elastic stress analysis.

RAILROAD ENGINEERING

Professors F. A. BARNES, W. L. CONWELL, J. E. PERRY, CARL CRANDALL, and R. Y. THATCHER.

The Library of the School of Civil Engineering contains an excellent collection of books, periodicals and publications of railway or other technical societies dealing with the location, construction, maintenance and operation of railroads. Books and other publications on transportation are available either in this collection or in the University Library. Maps and profiles are available for studies of the economics of location, and special plans provide for studies of signal layouts, interlocking and yard and terminal design. Instrumental equipment is available for securing data for special problems in relocation and for designs of structures.

260-A. *Location Surveying.* See Course 213. Credit one hour. One week during summer vacation.

260-B. *Route Surveying and Drawing.* Credit three hours. Either term.

261. **Railroad Maintenance of Way.** Prerequisite, courses 260-A and 260-B. Professor PERRY. Three hours a week. First term.

Drainage, track materials, design, track-laying and maintenance; separation of grades, and improvement in grades and alinement.

262. **Railroad Operation and Management.** Prerequisite, courses 260-A and 260-B. Professor BARNES. Three hours a week. Second term.

Railroad history and development. Principal departments and their interrelations, i.e., organization. Freight and passenger traffic, freight houses and yards, shops, car service, signaling, interlocking and train rules.

263. **Railroad Location.** Prerequisite, courses 260-A and 260-B. Professor BARNES. Three hours a week. Second term.

Railroad History and development. Economic principles governing the location of new railroads and revision of existing ones to produce the most efficient transportation agencies.

269. **Transportation.** Second term. May be elected by qualified seniors and graduates. Professors BARNES and CONWELL.

A course covering travel and transport agencies with special reference to their facilities, ownership, financing, regulation and coordination. A brief review of the development of transportation throughout the world is used as a background for an intensive study of the present situation in the various countries and comparison of the policies and practices in use. Particular attention is given to the various proposals designed to promote more efficient use of the various transportation agencies in the United States by better coordination, pooling of facilities etc., and economic studies are made of some of the new projects which are under discussion.

291e. **Railroad Engineering Design.**

297e. **Railroad Engineering Research.**

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 applications of electricity in transportation 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.

Courses offered to graduate students may be divided into two classes: those fundamental studies in Chemistry, Biology, and Bacteriology, which the undergraduate student in Civil Engineering has not had an opportunity of pursuing; and those dealing with the design, construction and operation of sewage treatment and water purification plants. The sewage treatment and water purification plants in the City of Ithaca and in neighboring communities offer opportunity for experimental study in sewage treatment fields.

A well-equipped sanitary laboratory established in the School of Civil Engineering provides an opportunity for students to acquire laboratory technique in water and sewage analyses, and also a practical training in interpretation. The Kuichling Library for Hydraulic and Sanitary Engineering, and the main library of the School are well provided with the literature dealing with Sanitary Engineering topics.

250. *Sanitary Biology.* Credit three hours. Second term.

251. *Sanitary Biology.* Credit two hours. First term.

252. *Municipal Sanitation.* Credit four hours. Either term.

253. **Purification and Control of Water Supplies.** Prerequisite, Water Supply, Course 230. Professor OGDEN. Two recitations and one laboratory period a week. Credit three hours. Second term.

254. **Sewerage Works.** Prerequisite, Course 252. Professor OGDEN. Two recitations and one laboratory period a week. Credit three hours. First term.

255. **Treatment of Wastes.** Prerequisite, Course 252. Professor WALKER. Three hours a week. Second term.

256. *Municipal Engineering.* Credit three hours. First term.

257. **Purification of Water.** Prerequisite, Course 253. Professor OGDEN. Three hours a week. Either term.

258. **Conference on Present Methods of Sewage Disposal.** Prerequisite, Course 254. Professor OGDEN. Three hours a week. Either term.

259. **Laboratory Course.** Prerequisite, Courses 253 and 254. Professors OGDEN and WALKER. Second term.

291d. **Design in Sanitary Engineering.**

297d. **Research in Sanitary Engineering.**

SOIL MECHANICS

Professors S. C. HOLLISTER, C. E. O'ROURKE, and H. T. JENKINS.

The new and extensive field of soil mechanics offers the graduate student innumerable opportunities for advanced study. The mechanical and physical properties of soil as an engineering material are being investigated, and experimental problems relating to the physical characteristics are carried on in the Soil Mechanics Laboratory.

Earth pressures, stability, shear, elasticity and permeability are among the major divisions of a correlated study which is at present under way. Other investigations are being undertaken as the interest in them develops.

The Soil Mechanics Laboratory is fully equipped for work by graduate students. The freezing room and humid room are available for research work. There is also a shop for use in the building of new equipment.

As a prerequisite for work in this field, students should have had Physics of Soil Phenomena (Physics 431) as described on page 91, or its equivalent.

228. **Theory of Elasticity.**—See page 138.

229. **Experimental Elasticity.**—See page 138.

287. **Soil Mechanics.** Prerequisite, Physics 431. Professors HOLLISTER, O'ROURKE, and JENKINS. Two lectures and one laboratory period a week, first term.

FIELDS OF ADVANCED WORK

Physical Properties of Soils.
Bearing Capacity of Soil.
Permeability of Soil.
Stability of Soil.
Flow of Water through Earth Dams.

STRUCTURAL ENGINEERING

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

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.

The department is equipped with a Beggs Deformeter for the Mechanical Analysis of Structures. The facilities of the testing laboratories are available to graduate students.

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

270. *Bridge Stresses.* Credit four hours. Either term.

271. *Structural Design.* Credit three hours. Either term.

272. **Higher Structures.** Prerequisite, courses 270 and 271, or their equivalents. Professor URQUHART or O'ROURKE. Three hours a week. Either term. Required of all graduate students whose major or minor is in Structural Engineering.

Statically indeterminate structures; continuous beams and trusses; arches and rigid frames.

273. **Steel Buildings.** Prerequisite, courses 220, 221 and 271, or their equivalents. Professor BURROWS. Computing and Drawing, six hours a week. Credit three hours. First term.

Design of steel framework for buildings of the prevailing type used in power house or shop construction; provision is made for an electric crane moving the full length of the building.

274. **Bridge Design.** Prerequisite, course 271 or the equivalent. Professor BURROWS. Computing and Drawing, six hours a week. Credit three hours. Second term.

Computations and Drawings for the complete design of a railway bridge of six or seven panels, or a heavy highway bridge.

275. **Investigation of Existing Bridges.** Prerequisite, course 271 or the equivalent. Professor BURROWS. Computing, six hours a week. Credit three hours. Second term.

Inspection of an existing bridge for the determination of the sizes and condition of plates and shapes, followed by computations to determine either the unit stresses under a specified load or the safe load according to standard specifications.

280. *Concrete Construction.* Credit three hours. Either term.

281. *Foundations.* Credit three hours. Either term.

282. **Reinforced Concrete Building Design.** Prerequisite course 280, or the equivalent. Professors URQUHART and O'ROURKE. Computing and drawing, six hours a week. Credit three hours. First term.

Complete design and detail drawings for a reinforced concrete flat-slab building including stairway, elevator shafts, penthouses, etc.; investigation of other types of floor systems.

283. **Fixed Arches.** Prerequisite, Courses 270, 271, and 280. Professor URQUHART and Assistant Professor O'ROURKE. Credit three hours, first term.

Theory of the curved beam; the closed ring; the fixed arch; influence lines for arches of various forms; selection of curvature of axis for various loadings; effect of temperature and rib-shortening; effect of plastic flow on stresses in a reinforced concrete arch; design of a reinforced concrete arch and its abutments.

284. **Concrete Highway Bridges.** Prerequisite, course 280, or the equivalent. Professors URQUHART and O'ROURKE. Computing and drawing, five hours a week. Credit three hours. Second term.

Design of short span bridges; a slab bridge; a beam bridge; a through-girder bridge; abutments; complete detail drawing of one bridge.

285. **Reinforced Concrete Design.** Prerequisite, course 280, or the equivalent. Professors URQUHART and O'ROURKE. Computing, six hours a week. Credit three hours. Either term.

Theory and design of retaining walls, multiple column footings, bins, tanks, swimming pools, covered reservoirs.

286. **Building Construction.** Professor URQUHART and non-resident lecturers. Three hours a week. Second term. Given in alternate years.

One lecture a week by a non-resident engineer or architect who is well known in the field of building construction; one lecture by a member of the University staff; followed by a quiz on the lectures.

291f. **Design in Structural Engineering.**

297f. **Research in Structural Engineering.**

TOPOGRAPHIC AND GEODETIC ENGINEERING

Professors P. H. UNDERWOOD and L. A. LAWRENCE.

The preliminary work as a qualification for work in this department should include the equivalent of the regular undergraduate course in civil engineering, including work in General and Practical Astronomy. A thorough training in Mathematics and Physics is desirable.

Graduate work for those interested in Topographic and Geodetic Engineering includes courses in Advanced Topographic Surveying, in Geodesy, Least Squares, Geodetic Astronomy, and in Photographic and Aerial Surveying. The Library of the School of Civil Engineering contains an extensive collection of reference books in the subjects mentioned. The surveying equipment of the School is also available for practice work.

110. *Elementary Surveying.* Credit three hours. Either term.

182. *Elements of Field Astronomy.* (Given in Department of Astronomy.) Credit two hours. Either term.

211. *Advanced Surveying.* Credit two hours. First term.

212. *Advanced Surveying.* Credit two hours. Second term.

213. *Summer Survey: Topographic, Hydrographic,* and *Geodetic Survey: Camp.* Credit four hours. Five weeks during last of summer preceding first term.

214. *Mapping.* Credit two hours. Second term.

215. *Problems in Adjustment of Observations.* Credit one hour. Second term.

216. **Least Squares: Adjustment of Observations.** Prerequisite, Calculus and Physics. Professor UNDERWOOD. Two hours a week. Second term.

Applications are made to problems in physics, astronomy, mechanics, hydraulics, surveying, etc., with some attention given to the derivation of empirical formulae.

217. **Advanced Topographic Surveying.** Prerequisite, Course 213. Professor UNDERWOOD. Two hours a week. Second term.

Economics of surveying methods; surveys for special purposes: storage and distribution of water for irrigation, earthwork on a large scale, lines of communication, etc.; photographic surveying.

219. **Photographic and Aerial Surveying.** Prerequisite, Advanced Surveying, course 212. Professor UNDERWOOD. Three hours a week. Second term.

The principles of photographic surveying; surveys with camera stations on the ground; stereoscopic methods and apparatus; aerial surveys.

HOME ECONOMICS

ECONOMICS OF THE HOUSEHOLD AND HOUSEHOLD MANAGEMENT

Professors HELEN CANON and ELLA M. CUSHMAN.

Approved Major and Minor Subjects (key to symbols on p. 26)

Economics of the Household and Household Management **1, 2, 4**

As a basis for graduate work in economics of the household, elementary courses in the various divisions of home economics and in economics are usually required. For the Doctor's degree a minor in economics is usually required.

26. *Problems in Consumer Buying.* Three hours a week, first or second term.

112. *Household Management in Relation to Family Living.* Credit three hours, first term.

130. *Economic Conditions as They Affect the Incomes and Well-being of Families.* Credit two hours, first or second term.

145. *Management of Individual Resources for Financial Security.* Two hours a week, first or second term.

250. **Economic Problems of the Household.** Professor CANON. Second term. Two hours a week. Hours to be arranged. Martha Van Rensselaer Hall 114.

FAMILY LIFE

(Child Development and Parent Education)

Professors ETHEL B. WARING, MARIE B. FOWLER, and KATHERINE REEVES, and

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Approved Major and Minor Subjects (key to symbols on p. 26)

Family Life **1, 2, 4**

Graduate work in Family Life involves course work to supplement and extend the student's undergraduate experience; field work with families in their homes; conference and discussion groups; and research. The laboratory is the Nursery School, situated in Martha Van Rensselaer Hall. Following are the prerequisite and graduate courses in Family Life:

[111. *The Family: Its Modern Social and Economic Problems.* Two hours a week, either term. Not given in 1936-37.]

113. *Orientation in Family and Social Relationships.*

100. *Orientation in Child Development.* Two hours credit, either term.

101. *Principles in Behavior and Guidance, Elementary Course.* Three hours credit, either term.

107. *Home and School Environment for Young Children.* Three hours credit, first term.

[125. *Infant and Child Hygiene, Elementary Course.* Two hours credit, second term. Not given in 1936-37.]

126. *Home Nursing and Child Hygiene.* Three hours credit, either term.

[127. *Infant and Child Hygiene, Advanced Course.* Two hours credit, second term. Not given in 1936-37.]

200. **Orientation in Child Development and Parent Education.** Open to graduate and senior students with adequate training in child development and parent education. Professor FOWLER. Three hours credit, second term. T Th 8. Martha Van Rensselaer Hall, Amphitheatre.

Planned to give graduate and advanced students some experience with less mature students in developing a simple organization of subject matter in the field. Laboratory fee, $5.

205. **Principles in Behavior and Guidance.** Advanced Course. Prerequisite, Family Life 101. Professor WARING. Second term. T Th S 8. Martha Van

Rensselaer Hall 117. Lectures and discussion. Two hours of observation weekly in the laboratory. Programs to be checked with instructor during registration. Laboratory to be arranged after the first lecture period.

This course undertakes to direct students to observe what situations young children meet, how they meet them, and what adults do to help or to hinder the children in meeting them in desirable ways. Laboratory fee, $7.50.

213. **Orientation in Family and Social Relationships.** Open to graduate and senior students with adequate training in family life. Professor ROCKWOOD. Three hours credit, first term. T Th 8. Third hour to be arranged. Martha Van Rensselaer Hall Amphitheatre.

Planned to give graduate and advanced students an opportunity to work with less mature college students and with groups of young people and of older people organized for study throughout the state. Laboratory fee, $5.

215. **Studies in Child Development and Parent Education.** Prerequisite Family Life 205. Professor WARING. First and second terms. Open to graduate students who are carrying on research or making special studies in the field of child development and parent education. At least four hours each of two terms for students majoring in the department for a master's degree or minoring for a doctorate. F 2-4 is held provisionally for group activities. Laboratory fee, $7.50.

220a, 220b. **Participation in Nursery School.** Prerequisite, Family Life 101 and 107. Professors FOWLER and WARING, Assistant Professor REEVES, and Mrs. BATES. Credit three or four hours. A total of thirty hours of supervised participation with the children in the Nursery School for each hour of credit, and one hour in conference with the teaching staff each week. Open only to a limited number of seniors and graduate students with adequate personal and professional qualifications. Laboratory to be arranged. Conference: 220a, M 3; 220b, T 12. Laboratory fee, $7.50.

[**Seminary in Behavior and Guidance.** See Rural Education 228. Prerequisite, some work in Family Life. Professor WARING. Second term. Credit two hours. W 2-4. Martha Van Rennselaer Hall G38. Not given in 1935-36.]

The seminary investigates the contributions of various psychological theories to the understanding and guidance of young children.

FOODS AND NUTRITION

Professors HELEN MONSCH, MARION PFUND, HAZEL HAUCK, FAITH FENTON, L. A. MAYNARD, and C. M. MCCAY.

Approved Major and Minor Subjects (key to symbols on p. 26)

Foods and Nutrition **1, 2, 3, 4**
Nutrition **1, 2, 3, 4**

The laboratories for graduate work in food and nutrition are situated in the new building of the College of Home Economics and in the Dairy Building. Six laboratories are available for graduate work: a child nutrition laboratory, equipped for nutrition work and the study of energy metabolism of infants and small children; an adult nutrition laboratory for dietary studies and experiments with energy metabolism; a nursery school for the study of feeding problems with preschool children; 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.

In order to undertake 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.

The facilities of the laboratory of Animal Nutrition are described on page 102.

2. *Science Related to Food Preparation.* Throughout the year.
9. *Food Preparation: Principles and Comparative Methods.* First term.
22. *Food Selection: Dietetics, Introductory Course.* First term.
109. *Food Preparation, Advanced Course.* First or second term.

111. *Meal Planning and Preparation.* First or second term.
121. *Food Selection: Nutrition and Dietetics.* Second term.
122. *Food Selection: Nutrition and Dietetics.* First or second term.

102a. **Science Related to Foods.** Throughout the year. Credit two hours a term. Open to graduate students and transfers by permission. Attendance at F.N. 2 lectures required. One hour to be arranged. Professor PFUND.

This course is designed to help the more mature student make use of science in the study of foods, and to give her an opportunity to discuss the current literature. Fee for materials, $1 a term.

102b. **Science Related to Foods: Advanced Laboratory Course.** First or second term. Credit three hours. Limited to six students. Open to graduate and upperclass students with adequate training. Hours to be arranged before registration. Room 357. Professor PFUND.

An opportunity is given for independent laboratory work on special problems in which the student is interested. Laboratory fee, $10.

124. **Food Selection in Relation to the Treatment of Disease.** First term. Credit two hours. Open to seniors and graduate students. Advised for those specializing in hospital dietetics. Prerequisite, Foods and Nutrition 122. Lecture, discussion and laboratory. T 11; Th 11-1. Martha Van Rensselaer Hall 426 and 358. Assistant Professor HAUCK.

This course consists of a study of diet in those diseases in which choice of food is an important factor of treatment. Fee for materials, $6.

131. **Problems of Family Nutrition with Special Emphasis on Child Feeding.** First or second term. Credit 2, 3, 4, or 5 hours. May all be taken in one term or in two consecutive terms. Open to seniors and graduate students. Three hours advised for teachers; two hours advised for all students. Prerequisite, Foods and Nutrition 121, 122, or the equivalent. Lectures and discussions, T 2-4. Martha Van Rensselaer Hall 339. Laboratory, Infant Feeding, Th 2-4:30. Homes in Ithaca and Well-baby clinic; Feeding of Pre-school Children, W 10:30-12:50 one section, Th 10:30-12:50 one section, Nursery School and homes in Ithaca; Feeding of School Children, F 2-4:30, Martha Van Rensselaer Hall 358, public schools and homes in Ithaca. Infant Feeding Laboratory limited to sixteen students. Pre-school Feeding Laboratory limited to six in each section. School Feeding Laboratory limited to ten students. Professor MONSCH and Miss HELLER.

A study of family problems in nutrition with special emphasis on the nutritional needs of the child. It offers experience for the study of actual family situations provided by laboratory practice in a well-baby clinic, in private homes, in the nursery school, and in the public schools. The nutritional needs of children of all ages, the importance of proper feeding to the physical health of the child, and the relation between sound nutrition practice in feeding children and the community health and family income are considered. Laboratory fee, $8 for each laboratory credit hour.

150. **Special Problems.** First or second term. Credit and hours by arrangement. Open to seniors and graduate students in home economics, and to other qualified students. Directed by a member of the department concerned with the special problem selected.

Fee determined by the problem.

[224. **Human Calorimetry.** First term. Credit two hours. Primarily for graduate students but open to seniors with the permission of the instructor. Class limited to six students. Hours to be arranged. Martha Van Rensselaer Hall. Assistant Professor HAUCK. Given in alternate years. Not given in 1936-37.]

The laboratory work in this course consists of energy metabolism determinations using the Benedict portable respiration apparatus. Laboratory fee, $5.

229. **Research in Foods and Nutrition.** Throughout the year. For graduate students with training satisfactory to the instructor. Hours to be arranged. Professors MONSCH, MAYNARD, MCCAY, and PFUND, and Assistant Professors HAUCK and FENTON.

This course offers opportunity for individual research in animal nutrition, human nutrition, metabolism, food chemistry, and chemical changes taking place in the process of food preparation. Laboratory fee, from $5 to $25.

230. **Seminary in Foods and Nutrition.** Throughout the year. Credit one hour a term. Required of graduate students specializing in Foods and Nutrition. Hours to be arranged. Professors MONSCH and PFUND, and Assistant Professors HAUCK and FENTON. Martha Van Rensselaer Hall 301. Fee for materials, $1.

In addition to the above, the following courses in Nutrition are offered in the Laboratory of Animal Nutrition (see page 102).

110. **Animal Nutrition.** Professor MAYNARD.

111. **Animal Nutrition, Laboratory Course.** Professor MCCAY.

219. **Special Topics and Animal Nutrition.** Professors MAYNARD and MCCAY.

TEXTILES AND CLOTHING AND HOUSEHOLD ART

Professors BEULAH BLACKMORE, MURIEL BRASIE, GRACE MORIN, and DORA W. ERWAY.

Approved Major and Minor Subjects (key to symbols on p. 26)

Textiles and Clothing and Household Art **2, 4**

Graduate work for the Master's degree is offered in Textiles and Clothing and Household Art. The work in Textiles and Clothing may emphasize either the economic side or the applied-art side of the subject. Candidates should have a background of thorough undergraduate work in this field.

TEXTILES AND CLOTHING

3. *Clothing Selection and Textile Study.* Credit two hours. First or second term.

5. *Clothing Construction.* Textiles and Construction. Credit three hours. First or second term.

10. *Clothing for Children.* Credit two hours. First or second term.

103. *Clothing Problems and Shop Practice.* Credit three hours. First or second term.

115. *Commercial Clothing and Advanced Practice in Construction.* Credit three, four or five hours. First or second term.

HOUSEHOLD ART

1. *Beginning Course.* Credit two hours. First or second term.

10. *Lectures in Household Art.* Credit one hour. First or second term.

16 a, b, c, d. *Problems in Color and Design in the Studio for Handicrafts.* Credit one to four hours a term. May be taken in consecutive terms. First or second term.

25. *House Planning.* Credit two hours.

31. *Home Furnishing.* Credit two hours.

32. *Home Furnishing.* Credit two hours. First or second term.

15. **Clothing Design and Modeling.** Assistant Professors BRASIE and R. J. SCOTT. By permission of the department. First or second term. Credit three hours. Martha Van Rennselaer Hall 215 and 217.

55. **Problems in Purchasing Household Textiles.** Professor BLACKMORE. By permission of instructor. First term. Credit two hours. Martha Van Rensselaer Hall.

120. **Seminary in Clothing.** Assistant Professor BRASIE and other members of the Textile and Clothing Staff. Prerequisite or parallel, Rural Education 135 or its equivalent. Second term. Credit two hours. Martha Van Rensselaer Hall 215.

150. **Special Problems.** Professors BLACKMORE and MORIN and Assistant Professors BRASIE and ERWAY. First or second term. Credit and hours to be arranged. Martha Van Rensselaer Hall.

HOTEL ADMINISTRATION

Professors H. B. MEEK, F. H. RANDOLPH, LOUIS TOTH, A. L. WINSOR, and JOHN COURTNEY.

Approved Major and Minor Subjects (key to symbols on p. 26)

Hotel Management **2, 4**
Hotel Accounting **2, 4**

Note. A major or minor subject may be selected in the field of Hotel Administration provided the other subject is taken outside the department of Hotel Management and has the approval of the Dean of the Graduate School.

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 the 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.

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.

81 and 82. *Accounting.* Credit six hours. Throughout the year.
181 and 182. *Hotel Accounting.* Credit six hours. Throughout the year.
183. *Hotel Accounting, Advanced.* Credit three hours. First term.
184. *Food and Beverage Control.* Credit two hours. Second term.
151. *Hotel Operation.* Credit two hours. First term.
160. *Introductory Hotel Engineering.* Credit four hours. First term.
161. *Mechanical Service Equipment.* Credit four hours. Second term.
162a. *Hotel Power Plants, Lectures.* Credit two hours. First term.
162b. *Hotel Power Plants, Laboratory.* Credit two hours. First term.
163a. *Hotel Auxiliary Equipment, Lectures.* Credit two hours. Second term.
163b. *Hotel Auxiliary Equipment, Laboratory.* Credit two hours. Second term.

164. **Hotel Planning.** Must accompany or follow 163a and 163b. Open to a limited number of seniors and graduate students with the consent of the instructor. Credit three hours. Professor RANDOLPH.

Planning the layout for a proposed hotel, emphasizing floor plans and selection and arrangement of engineering equipment in various departments. Determining different engineering costs; use of metering devices in promoting efficient operation. Materials fee, $3.

166. **Hotel Structures and Maintenance.** Prerequisite, mechanical drawing. Credit two hours. Mr. SAYLES. First term. Lectures, T Th 11. East Roberts 223.

Materials and methods of building construction; specification and repair of furniture; the usual methods employed by the trades in the alteration of hotel structures. Materials fee, $1.

185. **Hotel Accounting Problems.** Second term. Credit two hours. Prerequisite, Hotel Accounting 183 or its equivalent. W 11-1. Martha Van Rensselaer Hall 278. Assistant Professors TOTH and COURTNEY.

Incorporating the hotel owning and operating companies. Financing bond issues and discounts. Accounting provisions in hotel leases and management contracts. Installation of hotel accounting systems.

186. **Interpretation of Hotel Financial Statements.** Second term. Credit two hours. Prerequisite, Hotel Accounting 183 or its equivalent. W 1:40-4. Martha Van Rensselaer Hall 278. Assistant Professors TOTH and COURTNEY.

Study and discussion of hotel balance sheets and profit and loss statements. Typical balance sheets and operating ratios of representative hotels.

189. **Problems in Hotel Analysis.** First or second term. Credit two or three hours, depending on work done. Registration limited. Martha Van Rensselaer Hall 227. Assistant Professor COURTNEY.

A seminar course for graduate students or seniors in hotel administration. Application of statistical methods to problems in hotel analysis. Each student will solve one or more problems.

153. **Special Hotel Problems.** Second term. Credit two hours. Prerequisite, Hotel Administration 151 or its equivalent. Registration limited. Hours to be arranged. Professor MEEK.

A seminar course for graduate students and seniors in hotel administration. Devoted to the study of problems in the management of hotels or in the relationship of the hotel as an institution to the community it serves.

119. **Personnel Administration in Hotels.** Prerequisite, Rural Education 114 or its equivalent. Three hours. Assistant Professor WINSOR. Second term. M W F 8. Stone 102.

Study of the problems of human relations in industry. Methods and problems of recruitment, selection, placement, maintenance, organization, and government of employees are analyzed with particular reference to the hotel industry.

219. **Seminary in Personnel Administration.** Open to qualified seniors and graduates. Assistant Professor WINSOR. Second term. Two hours. Th 4:15-6. Stone 203.

A study of current problems in personnel administration.

LAW

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

The Division of Law consists of the members of the Faculty of Law, representatives of associated departments in the College of Arts and Sciences, Professors CARL BECKER, G. W. CUNNINGHAM, DONALD ENGLISH, and R. E. CUSHMAN, and such other members of the Graduate School Faculty as for the time being are serving on the special committees of candidates for the graduate degrees in law.

Approved Major and Minor Subjects (key to symbols on p. 26)

Jurisprudence **1, 2, 3, 4**
Legal History **1, 2, 3, 4**
Private Law **1, 2, 3, 4**
Procedure **1, 2, 3, 4**
Public Law **1, 2, 3, 4**

Graduate work in law is organized under the direction of the Division of Law of the Graduate School, in which is vested authority to establish and administer rules for admission to candidacy for, and graduation with, the degrees LL.M. and J.S.D.

This method of organizing graduate work in law is considered especially advantageous since it offers to graduate students in law an opportunity to correlate their work in law with work in allied fields in other departments of the University, such as those in philosophy, history, government, business and finance.

Candidates for either of the graduate degrees in law must be in residence not less than one academic year.

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 designed 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 the history, content, administration, and progress of the law. 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.

A number of furnished offices are provided in the new Law School building, Myron Taylor Hall, for graduate students in law.

For more detailed information regarding graduate work in law see the current Announcement of the Law School.

The Library of the Law School contains some 75,000 volumes. In reports of the Federal Courts, and of the several American State jurisdictions, and in the reports of the British Commonwealth of Nations, Scotch, Irish, Canadian, Australian, and English colonial reports, the law library is practically complete to date. 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. It contains a rapidly growing collection of reports, statutes, periodicals, and texts in French, German, and Italian. The Earl J. Bennett collection of Statute Law and the Myron C. Taylor collection of League of Nations Publications are of special value and interest. Several hundred volumes of the records and briefs of cases in the Supreme Court of the United States and 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 850,000 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.

Seminar courses in law will be given when the election by suitable groups is indicated. Advanced courses in associated fields also may be required or approved. Directed research will be arranged with the approval of the faculty.

50. **Jurisprudence.** First term. Two hours. Professor LAUBE. An examination of the nature and end of law, its sources, its forms, its scope, its application and its growth. Assigned reading and selected cases. Required for all graduate students in law and elective for other graduate students and selected third year law students.

50a. **Problems in Jurisprudence.** Second term. One hour. Professor LAUBE. Elective for graduate and selected third year students.

51. **Administrative Law.** Second term. Two hours. Professor MACDONALD.

A discussion of the law applicable to determinations involving private rights made by bodies other than the courts. This involves a study of the theory of the separation of powers, and of the functions of the three branches of government. The course centers upon the nature of the various powers over private rights granted to non-judicial bodies; the nature of the proceeding before such bodies; the manner of the determination of the issue, including executive discretion; and the nature of the control exercised by the courts over such determinations. Elective for graduate and third year students.

52. **Round Table on Damages.** First term. One hour. Professor WILSON. A course of informal study covering the general principles of damages at law and contrasting these with other forms of relief which may be available in certain typical situations. Fifteen class hours will be devoted to informal discussion. Elective for graduate students and for ten third year students with permission of the professor in charge.

54. **Seminar in Corporations.** Second term. Prerequisite: Satisfactory completion of a course in Private Corporations. Professor STEVENS. Supervised individual study of particular problems, preparation of reports, and group conferences. Elective for graduate and for selected third year students with the consent of the instructor.

55. **Seminar in Legal History.** Time to be arranged. Professors WHITESIDE, THOMPSON, and FARNHAM. Elective for graduate and selected third year students.

56. **Seminar in International Law and International Relations.** Time to be arranged. Professors BURDICK and ROBINSON. Elective for graduate and selected third year students.

57. **Seminar in Modern Movements in Procedure.** Time to be arranged. Professors THOMPSON, MACDONALD, and WILSON. Elective for graduate and selected third year students.

60. **Problems in the Public Utility Field.** Second term. One hour. Prerequisite: A course in the Law of Public Utilities. Professors THOMPSON and ROBINSON. Seminar based on research problems. Elective for graduate and selected third year students.

61. **Problems in Trusts and Estates.** Second term. Professor WHITESIDE. Elective for graduate and selected third year students.

VETERINARY MEDICINE

Approved Major and Minor Subjects (key to symbols on p. 26)

Animal Pathology **1, 2, 3, 4**
Animal Physiology **1, 2, 3, 4**
Diseases of Large Animals **1, 2, 3, 4**
Diseases of Small Animals **1, 2, 3, 4**
Immunology **1, 2, 3, 4**
Pathogenic Bacteriology **1, 2, 3, 4**
Pharmacology **1, 2, 3, 4**
Poultry Diseases **1, 2, 3, 4**
Veterinary Anatomy **1, 2, 3, 4**
Veterinary Obstetrics **1, 2, 3, 4**
Veterinary Parasitology **1, 2, 3, 4**
Veterinary Surgery **1, 2, 3, 4**

ANIMAL BREEDING, HUSBANDRY, NUTRITION

See under AGRICULTURE, p. 99.

VETERINARY ANATOMY

Professor EARL SUNDERVILLE.

The laboratories of the department are well equipped for classwork and research. In the regular courses offered, the anatomy of the domestic animals is given.

The following courses are open to graduate students. For details of subject matter, see the Announcement of the New York State Veterinary College.

1. **Comparative Osteology.** Three hours. First term.
2. **Arthrology.** One hour. First term.
3. **Myology and Viscera.** Three hours. First term.
4. **Myology, Thoracic, and Abdominal Viscera, Lymphatic System, and Organs of Special Sense.** Six hours. Second term.
5. **Blood Vessels and Nerves of the Arm, Leg, and Head.** Five hours. First term.
6. **Canine Anatomy.** One hour. Second term.

VETERINARY PHYSIOLOGY

Professors H. H. DUKES and C. E. HAYDEN; *Doctor* JESSE SAMPSON.

The laboratories of the department are well equipped for research work in the physiology of the domestic animals. Adequate facilities are available for work in both the experimental and the applied chemical fields. The Flower Library, in James Law Hall, provides a well-assorted collection of periodicals and books on physiology and related subjects. These may be supplemented by the many works on physiology in the University Library. The Veterinary Experiment Station, not far from the College, may be utilized for the study of those problems outside the scope of the laboratory.

Graduate students who plan to do their major work in veterinary physiology must have had the basic subjects of the department or their equivalents. Graduate students who plan to do minor work in veterinary physiology may undertake special problems or research work if they are qualified, or they may pursue work in the regularly scheduled courses of the department.

10. *Animal Physiology.* Three hours a week, either term.
11. *Chemical Physiology.* Six hours a week, second term.
12. *Physiology of the Domestic Animals.* Three hours a week, second term.
13. *Physiology of the Domestic Animals.* Three hours a week, first term.
14. *Experimental Physiology.* Six hours a week, first term.
15. *Applied Chemical Physiology.* Five hours a week, first term.

16. **Advanced Experimental Physiology.** Five hours a week, second term. Prerequisites, Course 12 or 13, or its equivalent, and Courses 14 and 15, or their equivalent. Registration by permission. Time to be arranged. Professors DUKES and HAYDEN, and Dr. SAMPSON.

A laboratory course in mammalian and avian physiology. Laboratory fee, $10.

17. **Special Problems in Chemical Physiology.** Both terms. Registration by permission. Hours to be arranged. Professor HAYDEN and Dr. SAMPSON.

This course will be adapted to the needs of students and will consist of laboratory work, conferences, collateral readings, and reports. Laboratory fee, $2 a credit hour.

18. **Research.** Throughout the year. Hours to be arranged. For graduates only. Professors DUKES and HAYDEN.

ANIMAL PATHOLOGY, BACTERIOLOGY AND IMMUNOLOGY

(See also under BACTERIOLOGY, p. 55)

Professors W. A. HAGAN, PETER OLAFSON, E. L. BRUNETT, and A. ZEISSIG.

The laboratories of pathology and bacteriology are well equipped with apparatus for research in pathological anatomy, pathogenic bacteriology, and immunity. The department operates two diagnostic laboratories to which a great deal of pathological materials comes. A variety of fresh material is thus made available for study. In the Flower Library, which is housed in the same building with the department, a very complete set of current periodicals, and the more important books and monographs dealing with the work of the department is available.

Candidates for advanced degrees, electing pathology or bacteriology as their major subjects, must have had at least the corresponding general subjects given in this department, or their equivalents. 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 being subject to the approval of the staff member who is in charge of the minor.

The following courses are open to graduate students. For additional information, see the Announcement of the New York State Veterinary College.

40. *General Pathology.* First term. Two hours.
40a. *General Pathology Laboratory.* First term. Two hours.
41. *Special Pathology.* Second term. Two hours.
41a. *Special Pathology Laboratory.* Second term. Two hours.
42. *Pathology of Infectious Diseases.* First term. Two hours.
43. *General Bacteriology.* First term. Two hours.
43a. *General Bacteriology Laboratory.* First term. Two hours.
46. *Diseases of Poultry.* Second term. Two hours.
48. *Food Hygiene.* Second term. Two hours.
49. *Pathogenic Bacteriology and Immunity.* Second term. Two hours.
49a. *Pathogenic Bacteriology Laboratory.* Second term. Three hours.
149. *Pathogenic Bacteriology Laboratory.* Second term. Two hours.

151. **Immunological Methods.** Prerequisites, Courses 49, and 49a or 149. Professor ZEISSIG. First term. Class limited to twelve students. Two laboratory periods on consecutive days. Hours to be arranged. Laboratory fee, $10.

152. **Advanced Work in Pathology and Bacteriology.** For students who have completed the undergraduate courses in pathology and bacteriology. Professors HAGAN and OLAFSON. Special problems or assignments will be given. Hours to be arranged. Laboratory fee, $2 a credit hour.

153. *Hematology.* Second term. One hour.

154. **Seminar.** First and second terms. One hour, time to be arranged. Required of all graduate students.

(For Dairy Bacteriology, see Dairy Bacteriology; for soil bacteriology, see Agronomy.)

DISEASES OF BREEDING CATTLE

(Also includes VETERINARY PARASITOLOGY)

Professors R. R. BIRCH, H. L. GILMAN, and D. W. BAKER.

The department maintains a herd of cattle to be used in research with diseases that interfere with reproduction. Ample facilities are at hand for the study of the clinical and laboratory aspects of this group of diseases, and special research problems are being worked out at all times. Excellent facilities are also available for investigation of parasitological problems.

The following courses are open to graduate students. For additional information, see the announcement of the Veterinary College.

62. *Animal Parasitology.* First term. Two hours.

62a. *Parasites Laboratory.* First term. One hour.

63. **Advanced Work in Animal Parasitology.** Either term. Hours by arrangement. Special problems with the parasites of animals. Professor BAKER.

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.

20. *Pharmacology.* Two hours a week throughout the year.

21. *Materia Medica and Pharmacy.* Two hours. First term.

22. *Diseases of Small Animals.* Two hours a week. Second term.

22a. *Diseases of Small Animals.* Two hours a week.

23. *Recitations in Materia Medica and Therapeutics.* Two hours.

24. **Advanced Work.** This course will consist principally of the study of the action of drugs upon well and sick animals, and of the diseases of small animals. This will be supplemented by collateral reading and reports.

25. *Small Animal Clinic.* Six actual hours a week.

VETERINARY MEDICINE, AMBULATORY CLINIC, AND OBSTETRICS INCLUDING DISEASES OF THE GENITAL ORGANS

Professors D. H. UDALL and M. G. FINCHER.

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. 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.

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 bones, tendons, and tendon sheaths.

Candidates for advanced degrees should have as preliminary preparation, general pathology, physiology, general and special surgery.

32. **Special Surgery.** Professor FROST.

Research in Surgical Diseases. Professor FROST.

THE MEDICAL SCIENCES

AS PRESENTED IN THE MEDICAL COLLEGE IN NEW YORK CITY

The Graduate Faculty of the Medical College (Group F of the Graduate School) at present consists of professors in the preclinical branches of medicine who accept properly qualified students as candidates for the higher academic degrees. The qualifications required of graduate students are in every particular those which are required of students in other divisions of the University. 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. V. Morrill, Chairman of the Group, may be consulted for additional information. For a description of the work in the Medical College in Ithaca and in New York City, see the Announcement of the Medical College.

The Medical College in New York City now occupies a portion of the plant of the New York Hospital-Cornell Medical College Association. This new medical center is located on the bank of the East River north of the Rockefeller Institute for Medical Research. It occupies several city blocks extending from the East River on the east to York Avenue on the west, and from Sixty-eighth Street on the south to Seventy-first Street on the north. All city streets within the area, except Seventieth Street, have been eliminated. Thus the buildings in the group comprising the plant are for the most part contiguous and so arranged as to facilitate easy access between the clinical departments of the Medical College situated in the New York Hospital and the laboratories of the preclinical departments of the Medical College.

The Medical College group consists of buildings in the western part of the plant, facing York Avenue, opposite Sixty-ninth Street. These buildings from north to south are occupied by the departments of Anatomy, Public Health, Bacteriology, Pathology, Physiology, Biochemistry, and Pharmacology. The library is located in the building of the Department of Pathology and is constructed to accommodate with its stacks 100,000 volumes.

ANATOMY

Professors C. R. Stockard, C. V. Morrill, G. N. Papanicolaou, J. F. Nonidez, 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.

Topographical and Regional Anatomy. Professors STOCKARD and MORRILL.
Human Histology and Histogenesis. Professor NONIDEZ.
Experimental Morphology. Professor STOCKARD.
Anatomy of the Infant and Postnatal Development. Professor STOCKARD.

BACTERIOLOGY AND IMMUNOLOGY

Professors JAMES M. NEILL and JOHN Y. SUGG.

The course given to second year students consists of lectures, laboratory work, and group conferences. Emphasis is placed upon the aspects of bacteriology and of immunology that are pertinent to an understanding of the etiology and pathogenesis of infectious diseases. The study of infectious material from patients is included in the laboratory part of the course, not only to acquaint the student with the technical procedures but to illustrate the directness of application of the fundamental principles of the subject to the practical methods used in the examination of clinical material.

Graduates and special students. Opportunities for advanced study and for research will be offered to students particularly interested in bacteriology and immunology. Hours to be arranged.

BIOCHEMISTRY AND CHEMICAL PATHOLOGY

Professors S. R. BENEDICT and R. W. JACKSON.

The laboratories available for advanced work and research in physiological chemistry and chemical pathology include those of the Department of Biochemistry, 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 and departmental libraries 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 may be pursued at the College, together with more advanced work in special lines.

Organic and Physiological Chemistry: Research.
Physiological Chemistry.
Chemical Pathology.

PATHOLOGY

Professors EUGENE L. OPIE, ROBERT A. MOORE, JACOB FURTH, and JULES FREUND.

The departmental laboratories are suitably equipped for carrying on graduate study and research problems in the general field of Pathology. Since members of the staff are engaged in varied investigations concerning etiology and pathogenesis, the department offers wide opportunity for the experimental study of disease. Adequate facilities for the care of animals are generally available. There is a small departmental library where some of the current journals and reference books are kept on file. The main library is situated on the floor immediately beneath the department, and is readily accessible. There is a carefully culled collection of mounted museum specimens, in addition to an active file of preserved gross material for study. The histological collection is likewise unusually rich in material. Autopsies for the entire hospital are performed by the members of the department, and offer an opportunity for the study of fresh pathological tissues.

No regular course of study is offered by the department for graduate students, but applicants in this field are given every opportunity for special work under the direct supervision of a member of the department. Such work may include the original investigation of some problem, and may be credited towards the appli-

cant's graduate degree. Applicants who have been admitted to the Graduate School are required to present the equivalent of the first two years of medicine for admission to graduate work in the department.

Preliminary requirements: Anatomy, including Histology and Embryology, General Pathology, including Pathological Anatomy. Autopsy Technique and Experimental Pathology.

PHARMACOLOGY

Professors ———— and HARRY GOLD.

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. A string galvanometer, radio-tube amplifiers for the study of action potentials, 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.

PHYSIOLOGY

Professors ————, DAYTON J. EDWARDS, MCKEEN CATTELL, and WILLIAM H. CHAMBERS.

The laboratories of this department are equipped for teaching and for research on special problems. Advantages are afforded also by a departmental library that contains complete sets of the principal physiological journals with selected sets on certain allied subjects and a fairly large number of books on physiology and related topics.

There are no courses arranged especially for graduate students but it is expected that candidates electing a major in physiology will familiarize themselves with the regular required work for the students of medicine. In addition there will be opportunity to pursue intensively some topic which the candidate may elect with the advice of a member of the department. Special facilities are available for carrying on work in the subjects of nerve conduction, energetics of muscle, dynamics of the heart and circulation, and calorimetry as applied to animal metabolism.

Students electing physiology as a minor course may select either the regular work given to medical students, or may select only a portion of this course provided an additional amount of special work is undertaken.

As a prerequisite for graduate work in physiology the student will be expected to have a thorough training in the fundamental sciences of physics, chemistry, and biology.

PUBLIC HEALTH AND PREVENTIVE MEDICINE

Professors JOHN C. TORREY and MORTON C. KAHN.

Public Health and Preventive Medicine. This course is comprehensive in nature and deals with the fundamental factors concerned in the origin, increase and control of communicable and non-communicable diseases. It is intended to familiarize the student with the opportunities for disease prevention through public health organizations and in private practice, both in urban and rural communities. Among the subjects discussed in a series of lectures are environmental control, sources and modes of infection, specific and non-specific prophylaxis, vital statistics, and public health administration. Many of these subjects are illustrated by laboratory and field demonstrations. 96 hours.

Epidemiology. A study of the factors and principles concerned in the origin, spread and abatement of the more important communicable diseases as illustrated by past and, when possible, current outbreaks. Collection of epidemiological data and statistical analyses. Conferences. Hours to be arranged.

Medical Zoology and Parasitology. This course is intended to supplement and extend the required work in this field. Diagnosis, life histories of parasites and their vectors, and control measures are considered. Laboratory work and conferences. Hours to be arranged.

Practical Field Work in Public Health. Technic of sanitary surveys. Study of municipal and county health organizations and their activities. Hours to be arranged.

Tropical Hygiene. Special hygienic problems associated with a tropical environment. Lectures and conferences. Hours to be arranged.

Public Health Laboratory Methods and Procedures. Students may select specific problems for investigation or the course may be made of general character.

THE NEW YORK STATE AGRICULTURAL EXPERIMENT STATION AT GENEVA

U. P. HEDRICK, *Director*

Professors P. J. PARROTT, F. C. STEWART, R. S. BREED, A. C. DAHLBERG, C. B. SAYRE, RICHARD WELLINGTON, D. K. TRESSLER, D. C. CARPENTER, R. C. COLLISON, H. J. CONN, H. GLASGOW, G. J. HUCKER, J. G. HORSFALL, M. T. MUNN, B. R. NEBEL, C. S. PEDERSON, W. H. RANKIN, H. B. TUKEY, G. P. VAN ESELTINE, Z. I. KERTESZ.

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 for field experimental work with fruit and vegetable crops and certain special soil studies. A dairy herd is maintained for special studies by the several interested departments. It has laboratory buildings devoted to research in agricultural bacteriology, agricultural chemistry, agricultural botany, dairying, economic entomology, pomology, and vegetable crops. 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.
Fermentation and Food Bacteriology. Professor PEDERSON.
Systematic Bacteriology. Professors BREED and HUCKER.

AGRICULTURAL BOTANY

Plant Disease. Professors STEWART, RANKIN, AND HORSFALL.
Seed Control and Improvement. Professor MUNN.

AGRICULTURAL CHEMISTRY

The Preservation of Fruits and Vegetables. Professor TRESSLER.
The Chemistry of Fruits and Fruit Juices. Professor TRESSLER.
Plant Enzymes. Professor KERTESZ.
Chemistry of Milk and its Products. Professor CARPENTER.
Chemistry of Proteins. Professor CARPENTER.

DAIRYING

Dairy Products. Professor DAHLBERG.

ECONOMIC ENTOMOLOGY

Orchard Insects. Professors PARROTT and GLASGOW.
Canning Crop Insects. Professor GLASGOW.

POMOLOGY

Genetics of Fruit Breeding. Professor WELLINGTON.
Fruit Propagation and Management. Professor TUKEY.
Systematic Botany of Horticultural Plants. Professor VAN ESELTINE.
Orchard Soil Management. Professor COLLISON.
Cytology. Professor B. R. NEBEL.

VEGETABLE CROPS

Canning Crops. Professor SAYRE.
Variety Studies of Vegetables. Professor SAYRE.

FELLOWS: SCHOLARS: ROSTER OF DEGREES

FELLOWS AND GRADUATE SCHOLARS IN 1935–36

HONORARY FELLOW

Traver, Jay R., Ph.D., Cornell, 1931.

RESIDENT DOCTORS

Blizzard, Alpheus Wesley, B.S., Ohio, 1913, A.M., Cornell, 1916, Ph.D., Columbia, 1926.
Cornateanu, Nicolae D., Ing. Agr., Bucarest College of Agriculture, 1923, Dr., Vienna, 1925.
Hirsh, Frederick Rudolph, jr., A.B., A.M., Ph.D., Cornell, 1926,1928, 1931.
Jones, Matthew Turner, B.S., M.S., Case School of Applied Science, 1929, 1930, Ph.D., Cornell, 1935.
Kaufman, Sidney, A.B., Ph.D., Cornell, 1930, 1934.
Patton, Alva Rae, Ph.D., Minnesota, 1935.
Preston, Reginald Damson, B.S., Ph.D., Leeds University, 1929, 1931.
Ries, Donald Timmerman, B.S., Cornell, 1925, M.S., Michigan State, 1927, Ph.D. Cornell, 1930.
Schickel, Norbert Henry, M.E., Ph.D., Cornell, 1909, 1933.
Smith, Osgood Reuel, B.S., Hamilton, 1930, M.S., Ph.D., Cornell, 1931, 1933.
de Tomasi, James Ambrogio, Dr. Sc., Milan, 1924.
Towl, Forrest Milton, C.E., M.C.E., Cornell, 1886, 1935.
Weindling, Richard, Ph.D., California, 1933.
Wheeler, Everett Pepperell, A.B., M.S., Ph.D., Cornell, 1923, 1926, 1930.
Work, Samuel Healea, B.S.A., Ohio State, 1925, Ph.D., Cornell, 1934.

ENDOWED AND UNIVERSITY FELLOWSHIPS

The Anna Cora Smith Fellowship in Home Economics: Vera Aileen Caulum, B.S., Iowa State, 1929.
The Charles Bull Earle Memorial Fellowship in Mechanical and Electrical Engineering: Roger French Diffenderfer, E.E., Cornell, 1935.
Clinton DeWitt Smith Fellowship in Agriculture: G. Malcolm Trout, B.S., M.S., Iowa State, 1923, 1924.
Cornell-Brookings Fellowship in Economics (Second term only): Arthur Reign Barnett, A.B., Hiram, 1932.
Cornell Fellowship in English, combined with the Graduate Scholarship in English: Arthur Russell Jewitt, A.B., Dalhousi College, 1926, A.M., Oxford University, 1930.
The Edgar J. Meyer Memorial Fellowship in Engineering Research combined with the Sibley Fellowship in Mechanical and Electrical Engineering: Byron E. Short, B.S. in M.E., M.S. in M.E., Texas, 1926, 1930.
Erastus Brooks Fellowship in Mathematics: Lawrence Henry Bowen, A.B., Furman, 1913, A.M., Chicago, 1922.
The Fellowships in Greek and Latin: Elizabeth Rose Heist, A.B., Cornell, 1933; Lillian R. Jaffin, A.B., Hunter, 1934, A.M., Cornell, 1935.
The Fellowship in Political Economy: Robert J. Landry, A.B., Oberlin, 1935.
The George C. Boldt Fellowship in History: William Carroll Bark, A.B., A.M., Stanford, 1931, 1932.
The Goldwin Smith Fellowship in Botany, Geology or Physical Geography (First term): Wilbert C. Dennis, B.S., M.S., Virginia, 1933, 1934; *(Second term):* Walter Jewitt, B.S., Alberta, 1927, A.M., Queens, 1934.
The McGraw Fellowship in Civil Engineering: Arthur V. Peterson, B.S. in C.E., New York University, 1934.
The President White Fellowship in Modern History: Eugene Edwin Pfaff, A.B., A.M., North Carolina, 1930, 1934.

The President White Fellowship in Physics: Paul Leon Hartman, B.S. in E.E., Nevada, 1934.

The President White Fellowship in Political and Social Science: Victor Oscar Prall, jr., A.B., A.M., Wesleyan, 1934, 1935.

The Sage Fellowship in Chemistry combined with the Graduate Scholarship in Chemistry: Donna Price, A.B., Goucher, 1934.

The Schuyler Fellowship in Animal Biology: Leonard Grumbach, A.B., A.M., Cornell, 1934, 1935.

The Susan Linn Sage Fellowships in Philosophy (First term): Cedric Evans, A.B., A.M., Nebraska, 1933, 1934; *(Second term):* Frederick L. Will, A.B., Thiel College, 1929, A.M., Ohio State, 1931; Milton Williams, A.B., Wesleyan University, 1931, A.M., North Carolina, 1932.

The Susan Linn Sage Fellowship in Psychology: Martha Lou Lemmon, A.B., Sweet Briar, 1934.

The University Fellowship in Agriculture: Ruth Elizabeth Remsberg, B.S., M.S., Idaho, 1928, 1929.

The University Fellowship in Architecture: Benjamin John Rabe, B.Arch., Cornell, 1935.

The University Fellowship in German: Arthur Monroe Hanhardt, A.B., Walla Walla, 1925, A.M., Nebraska, 1931.

SPECIAL TEMPORARY FELLOWSHIPS

The American Zinc and Chemical Company Fellowship: Wreal Lester Lott, A.B., Brigham Young, 1933.

Anheuser-Busch Fellowship: Paul Eugene Newman, B.S. in Agr., Purdue, 1932, M.S., Wisconsin, 1934.

The Corn Gluten Meal Fellowship: Richard C. Ringrose, B.S., Cornell, 1932.

Dairy and Ice Cream Machinery and Supplies Association Fellowship: Charles Franklin Niven, jr., B.S.A., Arkansas, 1935.

The Frosted Foods Fellowship Number 1: Stella Gould, B.S., Cornell, 1935.

The Kraco Fellowship (First term): Horace Jewell Davis, B.S., Louisiana State, 1932; *(Second term):* Royal A. Sullivan, A.B., Cornell, 1929.

The Lily Disease Investigation Fellowship: Daniel Keith O'Leary, B.S., Washington State, 1929.

The Nassau County Farm Bureau Association Fellowship: Mathias Cowley Richards, B.S., Utah State, 1932.

New York Florists' Club Fellowship for Floriculture Research: Robert Smith Bell, B.S., Cornell, 1934.

The New York Florists' Club Fellowship for the Investigation of Diseases of Roses Grown under Glass: Eldon Wood Lyle, B.S., Oregon State, 1930.

The New York Florists' Club Fellowship for the Study of Diseases of Cyclamens and Other Potted Plants, Lilies, and Miscellaneous Plants: Jack Mayson Bickerton, B.S.A., British Columbia, 1934.

The Niagara Sprayer and Chemical Company Fellowship for the Testing and Development of Fungicides: Russell A. Hyre, B.S., Ohio State, 1930.

The North Shore Disease and Insect Control Fellowship: Kenneth Eugene Maxwell, B.S., California, 1934.

The Staten Island Growers' Fellowship: Manson Bruce Linn, A.B., Wabash, 1930.

SCHOLARSHIPS

The Graduate Scholarships in Animal Biology: Frederick Milton Baumgartner, A.B., Butler, 1931, A.M., Kansas, 1933, Henry Keith Townes, jr., B.S., A.B., Furman, 1932, 1933.

The Graduate Scholarship in Archaeology and Comparative Philology: Elizabeth Grace Van Buskirk, A.B., Vassar, 1927.

The Graduate Scholarships in Architecture: Michael Kunic, Arch. Eng., Prague State School of Architecture, 1934, Richard J. Marlitt, A.B., B.Arch., Oregon, 1933, 1935, Harold E. Atkinson, B.Arch., Cornell, 1935.

The Graduate Scholarship in Botany (First term only): Iris Josephine Trump, B.S., William Smith, 1933.

The Graduate Scholarship in Civil Engineering: Donald Potter Keel, C.E., Cornell, 1935.
The Graduate Scholarships in Greek and Latin: Miriam E. Friedman, A.B., Hunter, 1935, Loretta J. Sullivan, A.B., Vassar, 1934.
The Graduate Scholarship in History: Albert M. Tewksbury, A.B., Bucknell, 1933.
The Graduate Scholarship in Mathematics: Ross A. Harrison, A.B., Hartwick, 1933, A.M., Cornell, 1934.
The Graduate Scholarship in Physics: Anne Rebecca Oliver, A.B., Goucher, 1934.
The Susan Linn Sage Graduate Scholarships in Philosophy: Oliver C. Dunn, A.B., A.M., Stanford, 1930, 1934, Robert L. Ormsby, A.B., Toronto, 1933, (*First term only*) Frederick L. Will, A.B., Thiel College, 1929, A.M., Ohio State, 1931, Paul E. Williams, A.B., College of Puget Sound, 1933, A.M., University of California, 1935.
The Susan Linn Sage Graduate Scholarship in Psychology (*First term*): Harold Frederick Dahms, A.B., Nebraska, 1934; (*Second term*): John Walker MacMillan, A.B., Toronto, 1932.

TUITION SCHOLARSHIPS

Sylvia Allen, A.B., Wellesley, 1934, M.S., Cornell, 1935.
Mildred Garman Arnold, B.S., Cornell, 1932.
Donald C. Bryant, A.B., A.M., Cornell, 1927, 1933.
Henry A. Carlock, B.S., Denison, 1928, M.S., Ohio State, 1931.
Pao Chuan Chao, B.S., Missouri, 1934, M.S. in Agr., Cornell, 1935 (Second term).
David Dropkin, M.E., Cornell, 1933.
Margaret Hargrove, A.B., Randolph Macon, 1925, A.M., Cornell, 1931.
Frederick Warren Hayward, B.S., Middlebury, 1932, M.S., Cornell, 1933.
Jesse Emmert Ikenberry, A.B., Bridgewater, 1928, A.M., Cornell, 1932.
Sarah Geraldine Longwell, A.B., Denison, 1929, A.M., Radcliffe, 1930.
George J. Mundt, A.B., Dartmouth, 1933.
Helene Nusslé, A.B., Coe, 1917 (Second term).
Grace Ostrander, A.B., New York State College for Teachers, 1925, A.M., Cornell, 1933.
Alice Pattee, A.B., Rockford, 1930, A.M., Cornell, 1934.
Mary Caroline Patterson, B.S., Cornell, 1934 (First term).
June Estelle Perkins, A.B., Cornell, 1935 (Second term).
John R. Raeburn, B.S., Edinburgh, 1932, M.S., Cornell, 1934.
Mark Rich, B.S., Linfield College, 1922, B.D., Rochester, 1925, A.M., Cornell, 1933.
Harry W. Tobey, C.E., Cornell, 1935.
Judson Dwight Wilcox, A.B., Cornell, 1935.
William Yu Yang, B.S., Nanking, 1930 (Second term).

ADVANCED DEGREES CONFERRED IN 1934–35

MASTERS OF ARTS

Conferred September 26, 1934

Erma Evangeline Anderson, A.B.; English, Elizabethan Literature. Thesis: *A Critical Study of Some Biographers of Robert Browning and William Morris.*
John Keener Archer, A.B.; Educational Administration, Educational Measurements. Thesis: *State Scholarships at Cornell.*
Frederick DeWitt Becker, A.B.; English Literature, Music. Thesis: *The Personal Relations of Byron and Shelley.*
Doris Rae Bell, B.S.; English, Spanish. Thesis: *Relatives, Friends, and Acquaintances of John Keats.*
Mildred Arene Bell, B.S.; Zoology, Education. Thesis: *An Experiment on Method of Presentation in the Teaching of the Human Body in Biology, Conducted in the Owego Free Academy, Owego, N. Y.*
Clara VanBurk Hagey, A.B.; Education, French. Thesis: *A Survey of the Teaching of French in the Junior High Schools of New York State.*

Doris Mae Hanna, B.S.; American History, French. Thesis: *Progressivism of Woodrow Wilson.*

Mary Antoinette Holley, A.B.; American History, Modern European History. Thesis: *The Liberalism of Andrew Johnson in Tennessee Politics.*

Nellie Clare McAllister, A.B.; Biology, Botany. Thesis: *A Study of the Insects Affecting Indian Hemp, Apocynum Cannabinum.*

Ruth Preston Miller, A.B.; English Literature of the Nineteenth Century, American Literature. Thesis: *The Middle Ages in Tennyson's Arthurian Poems.*

Anna White Pearsall, A.B.; General Physics, The Teaching of Physics. Thesis: *Intensities of the Satellites of the X-Ray Line L B_2 for Elements in the Atomic Number Range 43 to 53 Inclusive.*

Lyle E. Roberts, B.S.; Rural Education, Rural Social Organization. Thesis: *Trends in the Development of Central Rural Schools in New York State.*

Harold Lawrence Ruland, A.B.; French, Education. Thesis: *A Critical Edition of Paul Hervieu's* Theroigne de Mericourt.

Julia Cooper Watkins, A.B.; French, Nineteenth Century Poetry. Thesis: *Poets that have Influenced Albert Samain.*

Franklin Clodfelter Williams, B.S.; Experimental Physics, Mathematics. Thesis: *Fine Structure of the Helium Line, 3888.*

Katherine Mae Williams, A.B.; Education, Economics. Thesis: *Planning a Commercial Curriculum.*

CONFERRED FEBRUARY 6, 1935

Vivian Murray Chambers, B.S.; Vertebrate Zoology, Entomology. Thesis: *Analysis and Interpretation of Xiphophorin Fishes Based on Statistical Investigations.*

Leonard Grumbach, A.B.; Zoology, Histology and Embryology. Thesis: *The Morphology and Regeneration of the Anal Fin of Platypoecilus Maculatus.*

Margaret Eleanor Hartman, A.B.; Modern European History, American History. Thesis: *Jefferson's European Experience.*

Victor E. Minotti, A.B.; Modern European History, English History. Thesis: *Political Evolution in Italy, 1919-1928.*

Louise Victoria Plumer, A.B.; American Literature, Philosophy. Thesis: *The Problem of Evil in the Novels of Herman Melville.*

George Frederick Reinhardt, A.B.; Modern European History, Government. Thesis: *German Interest in the Russo-Japanese War.*

Francis Burt Rosevear, A.B.; Chemical Microscopy, Petrography. Thesis: *A Microscopic Study of the Polymorphous Forms of Potassium Nitrate.*

Edith Judith Varon, A.B.; Education, Psychology. Thesis: *The Development of Alfred Binet's Psychology.*

CONFERRED JUNE 17, 1935

Claude Moore Bailey, B.F.A.; History of Painting and Sculpture, History of Architecture. Thesis: Giotto; *an Analysis and Appreciation of his Style.*

Beverly Arlene Baker, A.B.; American History, European History. Thesis: *Abraham Lincoln and Slavery.*

Charles Parker Baker, A.B.; Experimental Physics, Theoretical Physics. Thesis: *The Linear Pulse Amplifier.*

Mary Fuertes Boynton, A.B.; Comparative Study of Literature, English History. Thesis: *Tragic* Hamartia *in the* Iliad, *the* Odyssey, *and Sophocles'* Antigone.

Margaret Elizabeth Bradley, A.B.; Comparative Study of Literature, Education. Thesis: *Principles of Comedy in* The Tempest.

Frederick Guyon Bull, A.B.; Literary Criticism, Classics. Thesis: *King Alfred.*

Ruth Burden, A.B.; Comparative Study of Literature, Classics. Thesis: *Literary Method in Bede's* Ecclesiastical History of the English Nation.

Eileen Henrietta Carlson, A.B.; Latin Literature, Latin Language. Thesis: *The Influence of Tibullus and Propertius on Certain English Poets of the XVI and XVII Centuries.*

Ruth Viola Daniels, B.S. in Ed.; Elizabethan Literature, Classical Literature. Thesis: *The Development of Erasmus, the Scholar and Educator, as Revealed in his Letters.*

Marshall Delph Earle, jr., B.S.; Applied Electricity, General Physics. Thesis: *A Lamp Bridge Voltage Regulator.*

Barbara Edes, A.B.; Psychology, Educational Psychology. Thesis: *Adaptation to Pain Aroused by a Cold Stimulus.*

Eleanor Elmore, A.B.; French, Latin. Thesis: *English and American Criticism of Paul Valery.*

Thomas Wyckoff Fennell, B.S.; Literary Criticism, Latin. Thesis: *Science and Shelley.*

Rousseau Hayner Flower, A.B.; Entomology, Paleontology. Thesis: *The Venation of the Hind Angle of the Hind Wing of the Lebellulinae.*

Douglas Hewitt, A.B.; Comparative Study of Literature, English History. Thesis: *Alcuin and the Frankish Reformation.*

Lillian Ruth Jaffin, A.B.; Latin, Greek. Thesis: *The Pastoral Element in Roman Elegiac Poetry.*

Hoover Harding Jordan, A.B.; English, Education. Thesis: *The Verse Satire of Thomas Moore.*

Martha Lou Lemmon, A.B.; Psychology, Physiology-Neurology. Thesis: *The Minimal Temperature for Burning Heat in the Mouth.*

Donald Heys Rogers, A.B.; English Language and Literature, Old English. Thesis: *Milton's Sonnet* On the Late Massacre in Piedmont.

Adam Peruben, A.B.; Geometry, Algebra. Thesis: *The Types of Plane Collineations.*

Olive Northup Snyder, A.B.; American Literature, English. Thesis: *The Principal Concepts of Emerson's Philosophy and their Relation to his Theory of Literary Expression.*

Evangeline Voorhees Thatcher, A.B.; English Poetry, Biography. Thesis: *The Literary Relationship of Byron and Shelley.*

Walter Welti, A.B.; English, Law. Thesis: *Dryden's Portrayal of Restoration Society.*

Harry Keith Work, A.B.; Rural Economy, Marketing. Thesis: *State Legislative Barriers to Interstate Trade.*

MASTERS OF ARTS IN EDUCATION

Conferred September 26, 1934

Clayton Hamilton Brown, A.B.
William John Clarke, A.B.
Charles Edward Lewis, B.S.
Clifford Fowler McNaught, B.S.
Hilton Clifford Buley, B.S.
Wood Bridge Hall, B.S.
Joseph Charles McLain, A.B.
Louise Andrews Smith, B.S.
Murray Hunt Wilcox, A.B.

Conferred June 17, 1935

Hollis Nelson Todd, A.B.

MASTERS OF SCIENCE

Conferred September 26, 1934

Edison Orlando Bates, B.S.; Histology and Embryology, Botany. Thesis: *A Quantitative Study and Interpretation of the Occurrence of Basophile (Mast) Cells in the Subcutaneous Tissue of the Albino Rat: Mus Norvegicus Var Albinus.*

Cyrus Ezra Beekey, B.S.; Biology, Education. Thesis:*The Biology of Scatopsidae, with Special Reference to Scatopse (Rhegmoclema) similis n. sp.*

Arthur P.A. Brito-Mutunayagam, B.S.; Soils, Agricultural Chemistry. Thesis: *The Persistence of Calcium Carbonate in Limed Soils.*

Earl G. Brougham, B.S.; Agricultural Economics and Farm Management, Pomology. Thesis: *Some Economic Results of Various Cultural Practices in Apple Orchards of the Hudson Valley.*

Waldo Beale Cookingham, B.S.; Secondary Education, Rural Education. Thesis. *A Case Study of Learning Difficulties in a Class in Economic Geography.*

DeForrest Fredrick Cummings, B.S.; Analytical Chemistry, Inorganic Chemistry. Thesis: *The Titration of Iron with Permanganate in the Presence of Hydrochloric Acid.*

Gordon Huff Ellis, B.Chem.; Biochemistry, Organic Chemistry. Thesis: *Parathyroid Tetany and Calcium Metabolism.*

Mary Verna Faust, A.B.; Ornamental Horticulture, Floriculture. Thesis: *A Study of Ornamental Horticulture as a Guidance Course for High School Seniors.*

Dorothy Alice Fisher, B.S.; Botany, Zoology. Thesis: *The Family Orchidaceae.*

Henry Shuster Gutknocht, B.S. in Ed.; Botany, Zoology. Thesis: *The Morphology and Anatomy of the Inflorescence and Flower of Cephalanthus Occidentalis L.*

Willis Kerns, B.S.; Rural Social Organization, Rural Education. Thesis: *The Activities, Interests, and Needs of Rural Young Men in Genesee County, New York.*

Verne Myron Lefler, B.S.; Botany, Plant Pathology. Thesis: *The Characeae of the Cayuga Lake Basin.*

Howard Charles Lindemann, B.S.; Physics, Theoretical Physics. Thesis: *The Design, Construction, and Adjustment of a Voigt-Minor Polarograph.*

Frederick Coleman Luddon, A.B.; Physical Chemistry, Industrial Chemistry. Thesis: *The System-Barium Iodide, Iodine, and Water, at 25°C.*

Nena Myrtle Roberson, B.S.; Economics of Textiles, Rural Education. Thesis: *Buying Sheets for the Household.*

Iola Adelaide Smith, B.S.; Nature Study, Entomology. Thesis: *A Survey of the Science Literature (except in Chemistry and Physics) in Seven Cities for the Years 1927, 1928, 1929, and 1930. A Contribution to Interest Studies in Science.*

Dorothy May Tilden, A.B.; Child Development, Child Nutrition. Thesis: *A Comparative Study of the Eating Behavior of Thirteen Nursery School Children.*

George VanVleet, jr., A.B.; Aquiculture, Ichthyology. Thesis: *Studies on the Use of Malachite Green, Lugol's Solution, and Cresol, in the Control of Fish Diseases.*

CONFERRED FEBRUARY 6, 1935

Leonard Keyser Beyer, B.S.; Ornithology, Entomology. Thesis: *A Study of the Bank Swallow, Riparia Riparia (Linn.).*

Howard D. Corbus, B.S.; Agricultural Education, Agricultural Economics. Thesis: *The Need for a State Wide Study of Courses in Agriculture in Michigan.*

Larue Joseph Elmore, B.S.; Ornithology, Poultry Husbandry. Thesis: *A Study of the Sexual Behavior of Ruffed Grouse (Bonasa Umbellus Linn.).*

Virginia Hatcher Rhoades, B.S. in Ed.; Cytology, Genetics. Thesis: *A Study of Fertilization in Zea Mays.*

James Reid Robinson, B.S.; Administration and Supervision, Agricultural Education. Thesis: *A Study of Some Transportation Practices of the Central Rural School Districts of New York State 1932-33.*

Helene Margaret Wallace, A.B.; Mycology, General Botany. Thesis: *The Morphology and Development of Caliciopsis Pinea Peck.*

Delpha E. Wiesendanger, A.B.; Household Management, Child Development. Thesis: *Consideration of the Needs of Children in Selecting Household Furnishings as Determined by a Study of 55 Families in Ithaca, N. Y.*

CONFERRED JUNE 17, 1935

John Alonzo Bennett, A.B.; Applied Electricity, Communication. Thesis: *Investigation of Transients with the Cathode Ray Oscillograph.*

Alfred Herman Cash, E.E.; Physics, Mathematics. Thesis: *A Survey of Precision Powder Methods in X-Ray Crystal Analysis.*

Marguerite Decker Dixon, A.B.; Family Life, Economics of the Household. Thesis: *A Study of the Clothing of 60 Children, 3 to 4½ Years of Age in Ithaca, N. Y., 1932-33.*

Abraham Jacobus DuPlessis, B.S.Agr., M.S.Agr.; Statistics, Farm Management. Thesis: *A Comparison of Wholesale Market Prices of Ten Agriculture Commodities in Holland, United Kingdom, and United States 1913-34.*

Dorothy Pearle Dyott, A.B.; Organic Chemistry, Agricultural Chemistry. Thesis: *The Reversal of the Michael Condensation.*

James Lindsay Dyson, B.S.; Economic Geology, Sedimentation and Structural Geology. Thesis: *Effect of Sodium Sulphate on the Porosity of Limestones.*

Eugene En-Jung Fan, B.S., A.B.; Experimental Physics, Electrical Communications. Thesis: *Generation of Microwaves with Commercial Electron Tubes.*

Miriam Sophronia Gould, B.S. in Ed.; Nutrition, Bacteriology. Thesis: *A Study of the Urinary Excretion of Vitamin C and Capillary Resistance in Relation to Vitamin C Ingestion.*

Carl McClellan Hill, B.S.; Organic Chemistry, Inorganic Chemistry. Thesis: *The Action of Grignard Reagents on Alpha, Beta-Unsaturated Ethers.*

Victor Gerard Jean Jonkmans, Ing.Agr., Lic. Comm.; Marketing, Statistics and Prices. Thesis: *An Economic Study of 34 Farms in Belgium.*

Adele Louise Kline, B.S.; Zoology and Physiology, Education. Thesis: *A Test of Auditory Discrimination in the Cat by the Conditioned Reflex Method.*

Grace Ware Laubengayer, B.S.; Nutrition, Child Guidance. Thesis: *The Evolution of Artificial Infant Feeding in Relation to the Development of the Science of Nutrition.*

John Charles Mathieson, A.B.; Marketing, Business Management. Thesis: *Some Notable American Agricultural Cooperatives as Revealed in House Organs and Other Literature—Chiefly for the Period 1925-1935.*

Joseph Behney Moore, B.S.; Insect Physiology, Ecology. Thesis: *Studies of the Reactions of Potato Aphids to Bordeaux Spray Mixture on Potato Leaves.*

Juanita Henderson Neely, A.B.; Poultry, Rural Education. Thesis: *Economic Factors Influencing Egg Marketing in South Carolina.*

Frank Pico, B.S.; Animal Husbandry, Animal Breeding. Thesis: *Dairy Improvement in the Tropics.*

Laura Elizabeth Rowland, B.S.; Limnology, Bacteriology. Thesis: *A Study of Zygopterous Odonata.*

Thomas Joseph Schmitt, jr., B.S.F.; Forest Entomology, Forest Pathology. Thesis: *The Scolytid Beetles Infesting Deciduous Trees in the Vicinity of Cornell University and a Short Study of the Eastern White Pine Cone Beetle* (Conophthorus coniperda *Schwarz*).

Eleanor Rosetta Smyth; Child Nutrition, Family Life. Thesis: *A Comparative Nutritional Study of Two Groups of Ithaca School Children,*

Edward James Talbot, B.S.; Farm Management, Marketing. Thesis: *An Analysis of the Loaning Operations of the Ithaca Production Credit Association from Organization to February 28, 1935.*

George Whitaker Ware, B.S.A.; Vegetable Crops, Farm Management. Thesis: *Plant Protectors for Cantaloupes.*

Jean Warren, B.S.; Household Management, Statistics. Thesis: *Home Produced Food Used by 291 Farm Families in Livingston County, New York, 1928-29.*

Richard Warren, B.S.; Agricultural Engineering, Statistics. Thesis: *A Comparison of Coal, Oil, Gas and Electric Brooders for Brooding Chicks in Colony Brooder Houses, and the Use of the Electric Canopy Hover for Warm and Cold Room Brooding.*

Hsien-tong Yang, B.S.; Marketing, Business Management. Thesis: *The One-Variety Cotton Community in U.S.A. and its Probable Adaptation to China.*

MASTERS OF SCIENCE IN EDUCATION

Conferred September 26, 1934

William Henry Garwood, B.S. Laura Tubbs, B.S. in Ed.
Fred William Wickert, B.S. in Agr.

Conferred June 17, 1935

Isabelle Frisbie Bull, B.S. John Caperton Pace, A.B.

MASTER OF SCIENCE IN AGRICULTURE

Conferred September 26, 1934

Dorothy Belle Merrill, B.S.; Landscape Design, Vertebrate Zoology. Thesis: *A Study of Color and its Relationship to the Arrangement of Plant Material in Gardens.*

Conferred February 6, 1935

Pao Chuan Chao, B.S.; Farm Management, Agricultural Statistics and Prices. Thesis: *An Economic Study of Land Utilization in the Town of Hornellsville, Steuben County, New York.*

Conferred June 17, 1935

Robert Wesley Cantley, B.S. in Agr.; Dairy Manufacturing, Bacteriology. Thesis: *A Comparison of Skimmed Milk Powder Media with Standard Nutrient Agar for Bacterial Counts on Milk.*

Siang-long Hsiong, B.S.; Pomology, Genetics. Thesis: *Culture of Pomelo and Shaddock in the United States.*

Alexander Joss, B.S. in Agr. Bus.; Business Management, Farm Management. Thesis: *Development of an Improved System of Assessing the Taxable Property in the Town of Germantown, Columbia County, New York.*

Albertus Lambertus Prinsloo, B.S. Agr.; Farm Management, Marketing. Thesis: *A Farm Management Study of 21 Livingston County, New York Farms for the Years 1927-1930.*

Ford Alrick Quitslund, A.B.; Marketing, Prices and Statistics. Thesis: *Marketing of Fruits and Vegetables on New York City Farmers' Markets.*

Hsioh Nien Shen, B.S.; Plant Breeding, Entomology. Thesis: *The Resistance of Plants to Insect Injury.*

Sih Chang Yu, B.S.; Plant Breeding, Agronomy. Thesis: *The Relation of Cultural Practices in Cotton Production to Problems of Improvement.*

MASTER OF SCIENCE IN ENGINEERING

Conferred June 17, 1935

Edward Aloysius Brown, jr., B.S.; Hydraulic Engineering, Structural Engineering. Thesis: *A Study of Stresses in the Shear-Resisting Keyway of a Dam.*

Roland Clough Brown, B.S.; Hydraulics, Structural Engineering. Thesis: *Underflow Studies Related to Earth and Masonry Dams.*

Stephen Read Hanmer, B.S.; Hydraulics, Structural Engineering. Thesis: *Soil Tests for Earth Dams.* (Joint thesis with Alexander McQueen Quattlebaum.)

Ching-Ying Ling, B.S.; Hydraulic Engineering, Meteorology. Thesis: *Studies on Flood Control.*

Alexander McQueen Quattlebaum, B.S. in C.E.; Structural Engineering, Hydraulic Engineering. Thesis: *Soil Tests for Earth Dams.* (Joint thesis with Stephen Read Hanmer.)

John Shelford, B.S. in C.E.; Experimental Hydraulics, Structural Engineering. Thesis: *Measurement of the Discharge of Water from Horizontal Pipes Flowing Partly Full Using the Depth Coordinate Method.*

Stanley Tanner Wray, B.S.; Hydraulics, Structural Engineering. Thesis: *Preliminary Studies in Photoelasticity and its Application to Stresses in the Internal Bracing of a Roller Dam.*

MASTER OF ARCHITECTURE

Conferred June 17, 1935

James William Breed, A.B.; Architectural Design, History of Architecture. Thesis: *Architectural Drawing and Thesis.*

MASTER IN FORESTRY

Conferred September 26, 1934

Leon Edward Chaikin, B.S.; Forest Management, Forest Economics. Thesis: *A Statistical Analysis of Timber Estimating in the Hemlock Hardwood Type.*

MASTERS OF CIVIL ENGINEERING

Conferred September 26, 1934

Mo-Lun Fock, B.S. in C.E.; Structural Engineering, Railroad Engineering. Thesis: *The Application of Various Methods in the Analysis of Rigid Frame Bridges.*

Ying-Choi Hu, B.S. in C.E.; Structural Engineering, Highway Engineering. Thesis: *Analysis of Continuous Frames.*

William Lindsay Malcolm, B.S., M.A.; Sanitary Engineering, Structural Engineering. Thesis: *A Proposal for Sewage Disposal Works for the City of Kingston, Ontario.*

Conferred February 6, 1935

Wan-Li Huang, B.S.C.E.; Hydraulic Engineering, Meteorology. Thesis: *A Study of Excessive Precipitations.*

Conferred June 17, 1935

Carl Conrad Cooman, C.E.; Hydraulics, Structures. Thesis: *A Study for the Design of a New Cornell Hydraulic Laboratory.*

Harold Vern Hawkins, B.S. in C.E.; Structural Engineering, Hydraulic Engineering. Thesis: *Theory and Application of Buckling Stresses in Trusses.*

Guang Hua Hsieh, B.C.E.; Hydraulic Engineering, Sanitary Engineering. Thesis: *Detention Basin as a Means of Flood Control and its Applications.*

Pei-Su Hsing, A.B.; Hydraulic Engineering, Railroad Engineering. Thesis: *The Bank Protection Methods and Devices.*

Chuan Ching Hsu, B.S.C.E.; Hydraulic Engineering, Railroad Engineering. Thesis: *Flood Control.*

Chennan Li, B.S.C.E.; Hydraulic Engineering, Sanitary Engineering. Thesis: *The Levee in Flood Protection.*

Forrest Milton Towl, C.E.; Hydraulics, Pneumatics. Thesis: *"f", The Pipe Line Flow Factor.*

MASTERS OF MECHANICAL ENGINEERING

Conferred June 17, 1935

David Dropkin, M.E.; Experimental Engineering, Heat Power Engineering. Thesis: *Ventilation and Heat Distribution.*

Joseph Olmstead Jeffrey, M.E.; Experimental Engineering, Materials of Engineering. Thesis: *A Precision Method for the Measurement of Condenser Tube Surface Temperatures for the Determination of Film Coefficients of Heat Transmission.*

DOCTORS OF PHILOSOPHY

Conferred September 26, 1934

Harold Jerome Brooks, B.S., M.S.; Animal Husbandry, Animal Physiology, Biochemistry. Thesis: *Factors Influencing Lactation in the Goat.*

Herbert Noel Campbell, B.S., M.S.; Optical Chemistry, Physical Chemistry, Inorganic Chemistry. Thesis: *The Occurrence of Indium in Meteorites.*

Welsey Barnett Carroll, A.B.; English Prose, Modern English Prose, Old English. Thesis: *The Fiction of Joseph Conrad.*

Jane Louise Chidsey, A.B., A.M.; Physiology, Biochemistry, Anatomy. Thesis: *A Study of the Interrelationship of Insulin and Adrenalin in Carbohydrate Metabolism.*

John Milton Coruthers, B.S., M.S.; Marketing, Farm Management, Dairy Industry. Thesis: *One Variety Cotton Communities.*

Philip Carl Eisman, B.S.; Bacteriology, Organic Chemistry, Physical Chemistry. Thesis: *The Use of Sulphuric Acid and Diatase-Producing Micro-Organisms in the Ethyl Alcohol Fermentation of Corn Meal.*

Anna May French, A.B., A.M.; Insect Morphology, Entomology, Zoology. Thesis: *The Nephrocytes of Zygoptera with Notes on the Heart and the Oenocytes.*

Leo Franklin Hadsall, A.B., A.M.; Nature Education, Vertebrate Zoology, Ecology. Thesis: *The Extension Activities of Certain Publicly Supported Institutions in Assisting Teachers in Service in Elementary Science or Nature Study.*

Alta Bell Hall, B.S., A.M.; Public Speaking, Political Science, International Law. Thesis: *George Campbell's* Philosophy of Rhetoric. *Book I. A Critical Edition.*

William Franklin Hall, B.S., M.S.; Rural Education, Agricultural Education, Rural Social Organization. Thesis: *The Professional Movement of Rural School Teachers in Pennsylvania.*

Harlan Ware Hamilton, A.B., A.M.; Eighteenth Century Prose, Romantic Poets, Seventeenth Century English. Thesis: *William Combe.*

Emily Gilchriest Hatch, A.B., A.M.; Dramatic Production, Dramatic Literature and Structure, History of Painting and Sculpture. Thesis: *The Kathakali: the Indigenous Drama of Malabar.*

Barnard Wolcott Hewitt, A.B., A.M.; Drama and the Theatre, Dramatic Literature, History of Art. Thesis: *The Theatre and the Graphic Arts.*

Kenneth Hood, B.S.; Agricultural Economics and Marketing, Finance, Rural Economy. Thesis: *An Economic Study of Part-Time Farming in Elmira and Albany Areas, New York, 1932 and 1933.*

Stacey Francis Howell, A.B., M.S.; Biochemistry, Physiology, Bacteriology. Thesis: *Some Properties of Crystalline Urease.*

Katharine Pattee Hummel, A.B., A.M.; Histology and Embryology, Parasitology, Physiology. Thesis: *The Structure and Development of the Lymphatic Tissue in the Intestine of the Albino Rat (Mus Norvegicus Albinus).*

Walter Hugh Johns, A.B.; Latin, Greek, Ancient History. Thesis: *The Technical Terms in Cicero's Rhetorical Works.*

Richard August Laubengayer, B.S.; Plant Anatomy, Plant Physiology, Bacteriology. Thesis: *Studies in the Anatomy and Morphology of the Polygonaceous Flower.*

William Ramsdell Leonard, A.B., A.M.; Money and Banking, Statistics, Economic Theory. Thesis: *Effect of Highway Competition on Railways, 1921-1929.*

Louis Linden Madsen, B.S.; Animal Nutrition, Biochemistry, Physiology. Thesis: *Nutritional Myodegeneration of Herbivora Fed Normal and Synthetic Rations.*

Jacob Clarence Mauer, B.S.; Bacteriology, Organic Chemistry, Physical Chemistry. Thesis: *A Comprehensive Study of Streptococci of Human Feces.*

Orlo Harrison Maughan, B.S.; Farm Management, Statistics, Finance. Thesis: *An Economic Study of Rural Store Credit, 1932.*

Herbert Windsor Mumford, jr., B.S., M.S.; Marketing, Farm Management, Prices and Statistics. Thesis: *The Distribution of Milk and Cream through Retail Stores in Upstate Cities, New York.*

Harold Raymond Nelson, A.B.; Experimental Physics, Theoretical Physics, Mathematics. Thesis: *Electron Diffraction by Hydrocarbon and Stearic Acid Films.*

Ernest Mishael Norris, B.S.A., M.S.; Agricultural Education, Rural Secondary Education, Rural Economy. Thesis: *Determining Implications for Vocational Education from Certain Characteristics and Trends of the Negro Population in Kentucky.*

Harlow S. Osgood, B.S., M.S.; Animal Nutrition, Physiology, Physical Chemistry. Thesis: *A Study of the Nutrition of the Adult Using the White Rat as the Experimental Animal.*

James Leo Paschal, B.S.; Farm Management, Marketing, Rural Economy. Thesis: *An Economic Study of Market Vegetable Farms without Greenhouses, Rochester Area, New York, 1932-33.*

John Adam Fitz Randolph, A.B., A.M.; Mathematical Analysis, Geometry, Astronomy. Thesis: *Caratheodory Measure and a Generalization of the Gauss-Green Lemma.*

Roy W. Roberts, B.S.A., M.S.; Rural Education, Farm Management, Agricultural Education. Thesis: *Estimating the Cost of Pupil Transportation in Arkansas.*

Theodore George Rochow, B.Chem.; Optical Chemistry, Physical Chemistry, Psychology. Thesis: *A Microscopical Study of the Freezing of Emulsions.*

Antonio Rodriguez-Geigel, B.S., M.S.; Plant Physiology, Agronomy, Soils. Thesis: *Effect of Boron on the Growth of Certain Green Plants.*

Walter Pingrey Rogers, A.B., A.M.; American History, Modern European History, English History. Thesis: *Andrew D. White and the Transition Period in American Higher Education.*

Samuel Edward Ronk, B.S.A., M.S.A.; Farm Management, Economics, Marketing. Thesis: *Prices Received by Producers in New York State, 1841-1933.*

Maurice St. Pierre, A.B., B.S.A.; Animal Husbandry, Animal Breeding, Economics. Thesis: *Relative Efficiency of Limited and Full-Feeding for Fattening Pigs in Dry Lot.*

William Nelson Shankwiler, A.B., A.M.; European History, Renaissance and Reformation, Philosophy (Government). Thesis: *The Idea of the Nobility and the Third Estate of a Constitution of France.*

George Edward Smock, A.B., A.M.; Nineteenth Century English Literature, Eighteenth Century Literature, Philosophy. Thesis: *Sir Walter Scott's Theory of the Novel.*

Leland Burdine Tate, A.B., A.M.; Rural Social Organization, Agricultural Economics, Rural Economy. Thesis: *The Rural Homes of City Workers and the Urban-Rural Migration.*

Bertrand Max Wainger, A.B., A.M.; American Literature, Philosophy, English History. Thesis: *Liberal Currents in Provincial Massachusetts 1692-1766.*

Ethel May Williams, A.B., A.M.; Spanish Literature, French, Spanish Language. Thesis: *The Development of the Literary Tertulia.*

William Thaddeus Wilson, B.S.A., M.S.; Farm Management, Agricultural Prices and Statistics, Economics. Thesis: *An Economic Study of Land Utilization in Monroe County, New York, 1933.*

Laurence Clark Woodruff, A.B., A.M.; Insect Ecology, Organic Chemistry, General Zoology. Thesis: *The Cockroach, Blattella Germanica L., as a Test Animal for Nutritional Studies.*

James Crawford Woodward, B.S.A., M.S.; Animal Nutrition, Biochemistry, Physiology. Thesis: *A Study of the Nutrition and Physiology of the Virginian Deer (Odocoilous Virginianus).*

Conferred February 6, 1935

Leonard Palmer Adams, A.B., A.M.; Labor, Economic Theory, Constitutional Law. Thesis: *An Analysis of the Recent Legislative Proposals for Unemployment Insurance in the United States.*

Frederick Sturges Andrews, B.S., A.M.; Musicology, French, Italian. Thesis: *Mediaeval Modal Theory.*

Gerard Albert Baptist, Ing. Agr., Lic. en Scs. Econ., M.S.; Farm Management, Marketing, Prices and Statistics, Economics of Enterprise. Thesis: *An Economic Study of Market Garden Vegetable Greenhouse Farms, Rochester Area, 1932 and 1933.*

Howard Wayland Beers, B.S., M.S.; Rural Social Organization, Educational Psychology, Statistics. Thesis: *Family Research Categories Derived from Interview Observations of a Hundred Farm Families.*

Mary Campbell Brill, A.B., A.M.; English Language and Literature, English History, Latin Writers. Thesis: *Milton and Ovid.*

Shih-Ti Chen, B.S.; Histology and Embryology, Entomology, Cytology. Thesis: *The Interstitial Cells in the Ovary of the Dog.*

William James Congdon, B. Chem.; Industrial Chemistry, Physical Chemistry, Industrial Organization. Thesis: *Plate Efficiency in Distillation.*

Mary Frances Crowell, B.S.; Animal Nutrition, Biochemistry, Entomology. Thesis: *The Effect of Various Food Factors upon the Life Cycle of the Webbing Clothes Moth* (Tineola Bisselliella Hum).

Trevor Rhys Cuykendall, B.S. in E.E., M.S.; Experimental Physics, Mathematics, Theoretical Physics. Thesis: *The Absorption of Ultra-Short X-Rays by Elements of Low Atomic Number.*

Margaret Shea Gilbert, A.B., A.M.; Embryology and Histology, Anatomy, Neurology. Thesis: *The Development of the Hypophysis: Factors Influencing its Formation in Mammals.*

William Paul Gilbert, A.B.; Experimental Physics, Theoretical Physics, Mathematics. Thesis: *Some Higher Terms in the Spectrum of AGII and an Extension of the RhI-Like Isoelectronic Sequence to the Spectrum of AGIII.*

Edward Wesley Hughes, B. Chem.; Inorganic Chemistry, Experimental Physics, Theoretical Physics. Thesis: *The Structures of the Azide Group as Revealed by X-Ray Crystal Structure Analyses of Ammonium, Lead and Silver Azides and of Cyanuric Triazide.*

Paul Henry Lang, License es Lettres; French Literature, French Philology, Musicology. Thesis: *The Literary Aspects of the History of the Opera in France.*

Andrew Louis, Ph.B.; German Literature, German Philology, Old Icelandic. Thesis: *The Motive of Renunciation in Modern German Literature.*

Jacob Lausch Maxton, B.S., M.S.; Farm Management, Marketing, Economics. Thesis: *Economic Study of Poultry Farming in Virginia.*

Horace Peterson, A.B., A.M.; American History, Modern European History, English History. Thesis: *Factors Governing the Decision for War, 1914-1917.*

Willis Winslow Pratt, A.B., A.M.; Nineteenth Century Poetry, Elizabethan Literature, Eighteenth Century English. Thesis: *Shelley Criticism in England, 1810-1890.*

Henry Ellis White, B.S., M.S.; Statistics and Prices, Farm Management, Marketing. Thesis: *An Economic Study of Wholesale Prices at Cincinnati, 1844-1914.*

Feaster Wolford, B.S.A., M.S.A.; Agricultural Education, Secondary Education, Farm Management. Thesis: *Methods of Determining Types of Content for a Course of Study for Eighth Grade Science in the High Schools of the Southern Appalachian Region.*

Conferred June 17, 1935

John Cranford Adams, A.B.; Elizabethan Literature, French, Eighteenth Century English. Thesis: *The Structure of the Globe Playhouse Stage.*

William Carroll Barnes, B.S.; Vegetable Crops, Plant Physiology, Genetics. Thesis: *A Study of the Effect of Some Environmental Factors on Growth and Color of Carrots.*

Andrew Bongiorno, A.B., A.M.; Literary Criticism, Greek, Rhetoric. Thesis: *Castelvetro's Commentary on the* Poetics *of Aristotle.*

Joseph Henry Brant, A.B.; Organic Chemistry, Biochemistry, Industrial Chemistry. Thesis: *A Study of Some Halogenated Furan Derivatives.*

Arthur Louis Brody, B.S.; Entomology, Bacteriology, Histology and Embryology. Thesis: *The Transmission of Fowl Pox.*

Arthur Westgate Browne, A.B.; Organic Chemistry, Physical Chemistry, Inorganic Chemistry. Thesis: *Some Alkyl Amino Esters of Phenanthrene—The Reaction of Ethylene Imine with the Grignard Reagent.*

Jacob Herbert Bruckner, B.S.A.; Poultry Marketing, Plant Breeding. Thesis: *The Optimum Environmental Conditions for Winter Egg Production.*

Ollie David Burke, B.S.E.; Plant Pathology, Entomology, Plant Physiology. Thesis: *The Silver Scurf Disease of Potatoes.*

Hugh Stuart Cameron, D.V.M., M.S.; Diseases of Breeding Cattle, Obstetrics, Immunology. Thesis: *Bovine Trichomoniasis.*

Laurence Adams Carruth, B.S., M.S.; Economic Entomology, Insect Morphology Plant Pathology. Thesis: *Some Effects of Reduced Air Pressure on the Various Stages of the Life Cycle of* Drosophila melanogaster *Meigen.*

Livingston Hunter Chambers, A.B., A.M.; Geometry, Analysis, Physics. Thesis: *On (2, 2) Planar Correspondences.*

Pe Chin Chang, M.S. in Ed.; Rural Education, Administration of Education, Educational Measurement. Thesis: *The Administrative Reorganization of the Educational System of a County in China—Based on the Analysis of Ching Ting Hsien.*

Marjorie Chapman, A.B., A.M.; Botany (Morphology), Zoology (Taxonomy), Cytology. Thesis: *The Floral Anatomy of the Berberidaceae.*

Joseph R. Chelikowsky, A.B., A.M.; Economic Geology, Structural Geology, Petrography. Thesis: *Geologic Distribution of Fire Clays in the United States.*

Wei Chen, A.B.; Soil Technology, Sanitary Chemistry, Bacteriology. Thesis: *Injurious Effects of Overliming Dunkirk Silty Clay Loam Soil.*

Hulon Lilley Cochran, B.S., M.S. in Agr.; Vegetable Crops, Plant Physiology, Soils. Thesis: *Factors Influencing Fruit Setting in the Pepper* (Capsicum Frutescens L.)

Arthur Marston Crosman, B.S., A.M.; Morphology, Physiology, General Pathology. Thesis: *An Experimental Study of Dissolution and Absorption of Retained Dead Fetuses in the Rat.*

Harry Stonewall Davidson, B.S.; Optical Chemistry, Analytical Chemistry, Inorganic Chemistry. Thesis: *The Recovery of Rare Elements as Volatile Chlorides.*

Roland Balch Dearborn, B.S., M.S.; Vegetable Crops, Plant Physiology, Soils. Thesis: *Nitrogen Nutrition and Chemical Composition in Relation to Growth and Fruiting of the Cucumber Plant.*

Manherlal C. Desai, B.Ag.; Plant Physiology, Cytology, Organic Chemistry. Thesis: *Effect of Certain Nutrient Deficiencies on Stomatal Behaviour.*

Charles Orville Dirks, B.S.Agr., M.S.; Economic Entomology, Pomology, Insect Morphology. Thesis: *The Seasonal Occurrence of the Macrolepidoptera as Determined by Light Trap Studies at Orono, Maine.*

Leila Murill Doman, B. of Ed.; Economics of the Household, Economic History, Rural Social Organization. Thesis: *A Study of Price Variations in Retail Grocery Stores.*

Raymond Smith Edmundson, B.S., M.S.; Economic Geology, Mineralogy and Petrography, Structural Geology. Thesis: *Barite Deposits of Virginia.*

Robert Paul Ferguson, A.B.; Inorganic Chemistry, Physical Chemistry, Organic Chemistry. Thesis: *A Study of the Surface Tension and Parachor of Diborane.*

Robert Tyson Fitzhugh, B.S., A.M.; Scottish Vernacular Poetry, Seventeenth Century Literature, Philosophy. Thesis: *Robert Burns as Seen by his Contemporaries, A Sourcebook of Fact and Opinion.*

Rudd Fleming, Ph.B., A.M.; English Language and Literature, Musicology, English History. Thesis: *Plutarch in the English Renaissance.*

James Donald Forrester, B.S., M.S.; Structural Geology, Economic Geology, Paleontology. Thesis: *Structure of the Uinta Mountains.*

May Katharyn Gyger, A.B.; Insect Ecology, Medical Entomology, Insect Morphology. Thesis: *A Key to the Libellulinae of the Philippine Islands.*

Frank Arling Haasis, B.S.; Plant Pathology, Plant Physiology, Entomology. Thesis: *A Study of Narcissus Mosaic with Notes on Other Possible Virus Diseases of Narcissus.*

Oscar Hugo Hammer, A.B.; Economic Entomology, Plant Pathology, Morphology. Thesis: *A Study of the Biology and Control of the Apple Curculio,* Tachypterellus quadrigibbus *Say, in the Champlain Valley of New York.*

Arthur Leslie Harrison, B.S.A.; Plant Pathology, Plant Physiology, Economic Entomology. Thesis: *Studies on the Physiology of Bean Mosaic.*

John Henry Hawkins, B.S., M.S.; Economic Entomology, Insect Morphology, Insect Taxonomy. Thesis: *The Wheat Wireworm* Agriotes Mancus *Say with Notes on Some Other Injurious Elaterids.*

Thomas Lloyd Jacobs, A.B.; Organic Chemistry, Physical Chemistry, Inorganic Chemistry. Thesis: *The Synthesis and Ozonation of Some Disubstituted Acetylenes.*

Matthew Turner Jones, B.S., M.S.; Experimental Physics, Theoretical Physics, Astronomy. Thesis: *The Absorption of Ultra-Short X-Rays by Elements of High Atomic Number.*

Lawrence Alpheus Kimpton, A.B., A.M.; Epistemology, Metaphysics, History of Philosophy. Thesis: *The Problem and Method of the Critical Philosophy.*

Cecil Alexander Lamb, B.S.A., M.S.A.; Plant Physiology, Physical Chemistry, Mathematics. Thesis: *Tensile Strength, Extensibility, and Other Characteristics of Wheat Roots in Relation to Winter Injury.*

Guenther Wolfgang Lassman, B.S.; Insect Embryology, Histology, Veterinary Bacteriology. Thesis: *The Early Embryological Development of* Melophagus ovinus *L., with Special Reference to the Development of the Germ Cells.*

Burtis Carl Lawson, B.S., M.S.; Agricultural Education, Secondary Education, Educational Phsychology. Thesis: *Scholastic Achievements of Selected Groups of College Students.*

Alvin Thorvald Martinus Lee, B.S., M.S.; Farm Management, Economics, Marketing. Thesis: *An Economic Study of Commercial Poultry Farming in New York State, Years Ended September 30, 1932 and 1933.*

Floyd Edward Lovelace, A.B.; Agricultural Chemistry, Organic Chemistry, Physical Chemistry. Thesis: *The Influence of Neutral Salts on the Optical Activity of Gelatin.*

Robert Bruce McCormack, B.S.A.; Plant Pathology, Bacteriology, Plant Breeding. Thesis: *The Associative Action of Some Species of Actinomyces.*

Edward Maloney McGrath, A.B.; French Literature, American Literature, Old French. Thesis: *Jules Barbey d'Aurevilly: a Study of his Fiction.*

Robert Maurice Melampy, B.S., A.M.; Animal Nutrition, Biochemistry, Entomology. Thesis: *The Lipid Metabolism of the Cockroach.*

Charles Robert Mingins, A.B.; Experimental Physics, Theoretical Physics, Electric Waves. Thesis: *Electro-magnetic Wave Fields Near the Earth's Surface.*

Harriet Frances Montague, B.S., A.M.; Geometry, Algebra, Philosophy. Thesis: *Certain Non-involutorial Cremona Transformations of Hyperspace.*

George Clinton Moore, B.S.; Vegetable Crops, Agronomy, Plant Physiology. Thesis: *Soil and Plant Response to Certain Methods of Potato Cultivation.*

Leo Tildon Murray, A.B., M.S.; Zoology, Botany, Geology. Thesis: *A Comparative Study of the Dermal Skeletons of the Inland Cryptodiran Turtles of the United States and Canada.*

James Winston Neely, B.S.A.; Plant Breeding, Agronomy, Plant Physiology. Thesis: *Plat Technique Studies with the Field Bean, (Phaseolus Vulgaris).*

Charles Edmund Palm, A.B.; Economic Entomology, Insect Morphology, Plant Pathology. Thesis: *The Alfalfa Snout Beetle,* Brachyrhinus ligustici L.

John Mason Parker III, A.B., A.M.; Structural Geology, Economic Geology, Petrography. Thesis: *Regional Systematic Jointing in Gently Dipping Sedimentary Rocks.*

Louis Pyenson, B.S., M.S.; Economic Entomology, Ecology, Plant Physiology. Thesis: *The Toxic Effects of Naphthalene on the Various Stages of Insects.*

John Marlin Raines, Mus.B., A.B., A.M.; Literary Criticism, Old English, Greek. Thesis: *Literary Criticism in the Writings of the Poets of the Old Greek Comedy.*

James Wilson Ramsay, B.S., A.M.; Physical Chemistry, Chemical Microscopy, Biochemistry. Thesis: *The Viscosities of Cuprammonium Cellulose Solutions.*

Eugene George Rochow, B.Chem.; Inorganic Chemistry, Physics, Optical Chemistry. Thesis: *Contributions to the Chemistry of Fluorine.*

John Enoch Rutzler, jr., B.Chem.; Physical Chemistry, Analytical Chemistry, Inorganic Chemistry. Thesis: *Colloid Chemistry of the Nervous Systems. V.*

Albert Cornwell Shuman, B.Chem.; Spectroscopy, Physical Chemistry, Mineralogy. Thesis: *A Critical Study of the Magneto-Optic Method of Chemical Analysis.*

Geddes Wilson Simpson, A.B., A.M.; Economic Entomology, Insect Morphology, Plant Pathology. Thesis: *Entomological Aspects of Seed Potato Production in Northern Maine.*

Robert Sinclair Snell, B.S., M.S.; Plant Anatomy, Plant Physiology, Genetics. Thesis: *The Morphology of the Spikelets and Flowers of* Carex, Kobresia, *and* Uncinia.

Harold Ray Snyder, B.S.; Organic Chemistry, Biochemistry, Inorganic Chemistry. Thesis: *Alkyl Derivatives of Boron.*

Edward Israel Strongin, B.S.; Anatomy-Neurology, Psychology, Physiology. Thesis: *Tolerance and Antagonism as Manifested Within the Human Body under the Influence of Caffein, Cigarettes, and Alcohol.*

Argus John Tresidder, A.B., A.M.; Nineteenth Century Literature, Dramatic Literature, Dramatic Production. Thesis: *Arnold Bennett: A Critical Study.*

Marcus George VanCampen, B.S.; Organic Chemistry, Biochemistry, Microscopy. Thesis: *A Study of the Diene Reaction with Furan Compounds.*

Ralph Albert VanMeter, B.S. in Bus. Adm., M.S.; Pomology, Plant Physiology, Chemistry. Thesis: *The Effects of Summer and Autumn Nitrogen Applications on Fruit Production in the Strawberry.*

Alfred VanWagenen, B.S.; Poultry, Farm Management, Genetics. Thesis: *Interior Egg Quality Factors, Their Changes and Inheritance Behavior.*

Harry Ross Varney, B.S., M.S.; Marketing, Farm Management, Prices and Statistics. Thesis: *Transportation of Milk and Cream to the New York Market.*

Thomas Elliott Wannamaker, B.S. in Chem.; Industrial Chemistry, Optical Chemistry, Industrial Organization. Thesis: *The Lubricating Properties of Lime-Base Greases.*

Adolph Michael Wasilifsky, A.B., A.M.; Sixteenth Century English, Middle English, Eighteenth Century English. Thesis: *John Donne the Rhetor: A Study of the Tropes and Figures in the St. Paul Sermons.*

Julius Rudolph Weinberg, A.B., A.M.; Scientific Method (Philosophy), Mediaeval Philosophy, Modern Philosophy. Thesis: *Logical Positivism of the Viennese Circle.*

Othello John Wheatley, B.S., M.S.; Marketing, Economic Theory, Finance. Thesis: *The Valuation of Farm Land.*

James Albert Wood, E.E., M.S.; Electrical Engineering, Physics, Mathematics. Thesis: *A Graphical Method of Wave Analysis and its Application to the Interpretation of Inductance of Coils Having Magnetic Cores.*

Alan Wardlaw Woodrow, B.S.A.; Apiculture, Insect Morphology, Economic Entomology. Thesis: *The Relation of Colony Size and Composition to the Flight of Honeybees for Fruit Pollination.*

Francis Dunham Wormuth, A.B., A.M.; English History, Law, Modern European History. Thesis: *The Royal Prerogative during the Reigns of the First Two Stuarts.*

Donald Wyman, B.S., M.S.A.; Ornamental Horticulture, Plant Physiology, Plant Design. Thesis: *Growth Experiments with Pin Oak Trees Which are Growing under Lawn Conditions.*

Clayton Scott Wynn, A.B.; Industrial Chemistry, Physical Chemistry, Organic Chemistry. Thesis: *The Effect of Salts upon the Detergent Action of Soap.*

Kenneth Richard Younger, B.Chem., M.Chem.; Industrial Chemistry, Physical Chemistry, Organic Chemistry. Thesis: *The Rate of Heat Transfer between Condensing Organic Vapors and a Metal Tube.*

MEMBERS OF THE STAFF OFFERING COURSES FOR GRADUATE STUDENTS, 1936–1937