

CORNELL UNIVERSITY ANNOUNCEMENTS

MARCH 22, 1963

AGRICULTURE 1963-1964

NEW YORK STATE COLLEGE OF AGRICULTURE
AT CORNELL UNIVERSITY,
A UNIT OF THE STATE UNIVERSITY OF NEW YORK

ACADEMIC CALENDAR (Tentative)

SECOND TERM, SPRING OF 1963

Apr. 1	M	Instruction resumed, 8 a.m.	June 4	T	Examinations end
May 25	S	Second-term instruction ends	June 10	M	Commencement Day
May 27	M	Examinations begin			

ACADEMIC YEAR, 1963-1964

Sept. 21	S	Freshman orientation	Jan. 28	T	Examinations begin
Sept. 23	M	Registration, new students	Feb. 5	W	Examinations end
Sept. 24	T	Registration, old students	Feb. 6	Th	Midyear recess
Sept. 25	W	Instruction begins, 1 p.m.	Feb. 7	F	Midyear recess
Nov. 13	W	Midterm grades due	Feb. 8	S	Registration, new students
Nov. 27	W	Thanksgiving recess: Instruction suspended, 12:50 p.m.	Feb. 10	M	Second-term instruction be- gins
Dec. 2	M	Instruction resumed, 8 a.m.	Mar. 27	F	Midterm grades due
Dec. 21	S	Christmas recess: Instruction suspended, 12:50 p.m.	Mar. 28	S	Spring recess: Instruction suspended, 12:50 p.m.
Jan. 6	M	Instruction resumed, 8 a.m.	Apr. 6	M	Instruction resumed, 8 a.m.
Jan. 25	S	First-term instruction ends	May 30	S	Second-term instruction ends
Jan. 27	M	Second-term registration, old students	June 1	M	Examinations begin
			June 9	T	Examinations end
			June 15	M	Commencement Day

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**NEW YORK STATE COLLEGE
OF AGRICULTURE AT
CORNELL UNIVERSITY**

1963-1964

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at Cornell University Is a Contract Unit of
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* Staff members at Geneva are listed on page 7.

† Numbers following names in the staff list indicate: (1) on leave, fall term; (2) on leave, spring term; (3) on leave, year.

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- ROBERT WEBSTER BRATTON, PH.D., *Animal Husbandry*.
- ROBERT LEE BRUCE, M.S., *Extension Education*.
- HARLAN BROWN BRUMSTED, PH.D., *Conservation*.
- PAUL A. BUCK, PH.D., *Food Science*.
- KENDALL SEWELL CARPENTER, PH.D., *Business Management*.
- ROBERT CHARLES CETAS, PH.D., *Plant Pathology*.
- GORDON JOSEPH CUMMINGS, PH.D., *Rural Sociology*.
- HAROLD ROBERT CUSHMAN, PH.D., *Agricultural Education*.
- HOLLIS REXFORD DAVIS, M.S., *Agricultural Engineering*.
- BERNARD EMILE DETHIER, PH.D., *Agricultural Climatology*.
- ROBERT SHAFT DICKEY, PH.D., *Plant Pathology*.
- WILLIAM C. DILGER, PH.D., *Ornithology*.
- WILLIAM JOHN DRESS, PH.D., *Botany in the L. H. Bailey Hortorium*.³
- THOMAS EISNER, PH.D., *Morphology and Biology*.
- BERTRAM LEIGHTON ELLENBOGEN, PH.D., *Rural Sociology*.
- ROBERT HUGH ENNIS, PH.D., *Secondary Education*.
- HERBERT LYMAN EVERETT, PH.D., *Plant Breeding*.
- REESHON FEUER, PH.D., *Agronomy*.
- RICHARD BERNARD FISCHER, PH.D., *Nature and Science Education*.
- ROBERT HUTCHINSON FOOTE, PH.D., *Animal Husbandry*.
- RAYMOND THOMAS FOX, PH.D., *Floriculture*.
- GEORGE FREE, M.S., *Soil Technology*.
- CHESTER HIGBY FREEMAN, M.S.A., *Extension Teaching*.
- RONALD BAY FURRY, M.S., *Agricultural Engineering*.¹
- WALTER LEO GRIFFETH, PH.D., *Agronomy*.
- LAWRENCE STANLEY HAMILTON, M.F., *Forestry*.

ASSOCIATE PROFESSORS

- HARRY ROBERT AINSLIE, M.S., *Animal Husbandry*.
- MARTIN ALEXANDER, PH.D., *Soil Science*.

- MARTIN BERNARD HARRISON, PH.D., *Plant Pathology*.
- DENNIS AUGUST HARTMAN, PH.D., *Animal Husbandry*.
- GEORGE PAUL HESS, PH.D., *Biochemistry*.
- ROBERT WILLIAM HOLLEY, PH.D., *Biochemistry*.
- RICHARD BRIAN HOW, PH.D., *Marketing*.
- FRANCIS M. R. ISENBERG, PH.D., *Vegetable Crops*.
- ORVIS FRANKLIN JOHNDREW, JR., M.S., *Poultry Husbandry*.
- LOUIS WILLIAM KAISER, B.F.A. IN RADIO, *Extension Teaching and Information*.
- EDWARD JOHN KINBACHER, PH.D., *Plant Breeding and Agronomy*.
- JOHN MERRIAM KINGSBURY, PH.D., *Botany*.
- RALPH EDWARD KRENZIN, PH.D., *Field Crops*.
- ROBERT WING LANGHANS, PH.D., *Floriculture*.
- ROBERT EDWIN LEE, PH.D., *Floriculture*.
- EDGAR ROTHWELL LEMON, PH.D., *Soil Science*.
- GILBERT LEVINE, PH.D., *Agricultural Engineering*.
- DONALD JAMES LISK, PH.D., *Pesticidal Chemistry*.
- JAMES WILLIAM LONGEST, PH.D., *Extension Service and Rural Sociology*.
- CLIFTON WILLIAM LOOMIS, PH.D., *Farm Management*.
- RUBY M. LOPER, B.S., *Agricultural Engineering*.
- CARL CLIFFORD LOWE, PH.D., *Plant Breeding*.
- RUSSELL EARL MACDONALD, PH.D., *Bacteriology*.
- RICHARD PELL MARCH, M.S., *Dairy Industry*.
- RUSSELL DICKINSON MARTIN, M.S., *Extension Teaching*.
- DONALD JAMES MCCARTY, PH.D., *Educational Administration*.
- JOHN WILLIAMS MELLOR, PH.D., *Agricultural Economics*.
- WILLIAM FREDERICK MILLIER, PH.D., *Agricultural Engineering*.
- ROBERT RISING MORROW, JR., PH.D., *Forestry*.
- ARTHUR ALLEN MUKA, PH.D., *Entomology*.
- JOHN ADAM NAEGELE, PH.D., *Entomology*.
- ARTHUR LESLIE NEAL, PH.D., *Biochemistry*.
- PAUL EDWARD NELSON, PH.D., *Plant Pathology*.
- THOMAS RUD NIELSEN, PH.D., *Soil Science*.
- GENE HERMAN OBERLY, PH.D., *Pomology*.
- RICHARD DESMOND O'BRIEN, PH.D., *Insecticide Chemistry*.
- CHARLES EVANS OSTRANDER, M.S., *Poultry Husbandry*.
- EDWIN BURNELL OYER, PH.D., *Vegetable Crops*.
- LAVERNE LEROY PECHUMAN, PH.D., *Entomology and Curator of Insects*.
- ARTHUR MORTON PHILLIPS, JR., PH.D., *Fishery Biology*.
- ELLIS ANDINE PIERCE, PH.D., *Animal Husbandry*.
- DAVID PIMENTEL, PH.D., *Insect Ecology*.
- ROBERT LEROY PLAISTED, PH.D., *Plant Breeding*.
- WILSON GIDEON POND, PH.D., *Animal Husbandry*.
- LOYD EARL POWELL, JR., PH.D., *Pomology*.
- EDGAR MERROW RAFFENSPERGER, PH.D., *Economic Entomology*.
- WILLIAM WOODLAND REEDER, PH.D., *Rural Sociology*.
- DOUGLAS SHERMAN ROBSON, PH.D., *Biological Statistics*.
- WILLIAM FRANTZ ROCHOW, PH.D., *Plant Pathology*.
- CHARLES CLYDE RUSSELL, M.J., *Extension Teaching and Information*.
- RICHARD LEANDER SAWYER, PH.D., *Vegetable Crops*.
- EDWARD ARTHUR SCHANO, M.S., *Poultry Husbandry*.
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- BERNICE MARGARET SCOTT, M.A., *Rural Sociology*.
- ROBERT RAMSEY SEANY, PH.D., *Plant Breeding and Agronomy*.
- MAURIE SEMEL, PH.D., *Entomology*.
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- ROBERT WILBER SPALDING, M.A., *Animal Husbandry*.
- JAMES RAY STOFFER, PH.D., *Animal Husbandry*.²
- PHYLLIS ELOISE STOUT, B.S., *Extension Service and Associate State 4-H Club Leader*.
- JOHN C. SWAN, B.S., *Extension Service and Associate State Leader of County Agricultural Agents*.
- HAROLD BARBER SWEET, B.S., *Extension Service and Associate State 4-H Club Leader*.
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- DANIEL QUALE THOMPSON, PH.D., *Wildlife Management*.
- JOHN FANNING THOMPSON, PH.D., *Botany*.
- FREDERICK KWAI TUCK TOM, PH.D., *Agricultural Education*.
- JOHN PRESTON TOMKINS, PH.D., *Pomology*.
- HUGH FARRANT TRAVIS, PH.D., *Animal Husbandry*.
- CHARLES HARRISON UHL, PH.D., *Botany*.
- ARI VAN TIENHOVEN, PH.D., *Avian Physiology*.

GORDON FORREST VARS, D.ED., *Secondary Education*.
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 RICHARD GRISWOLD WARNER, PH.D., *Animal Husbandry*.
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 ROBERT ELZWORTH WILKINSON, PH.D., *Plant Pathology*.
 CHARLES EDWARD WILLIAMSON, PH.D., *Plant Pathology*.
 HUGH MONROE WILSON, *Soil Conservation*.
 CARL SEYMOUR WINKELBLECH, B.S., *Agricultural Engineering*.
 PAUL H. WOOLEY, PH.D., *Entomology and Plant Pathology*.
 MADISON JOHNSTON WRIGHT, PH.D., *Agronomy*.
 FRANK WILBUR YOUNG, PH.D., *Rural Sociology*.
 ROGER GRIERSON YOUNG, PH.D., *Insect Biochemistry*.
 ROBERT JOHN YOUNG, PH.D., *Animal Nutrition*.
 PAUL JOSEPH ZWERMAN, PH.D., *Soil Conservation*.

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 RANDOLPH BARKER, PH.D., *Agricultural Economics*.
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 CLARENCE PHILLIP BAUMEL, PH.D., *Business Management*.
 RICHARD DEAN BLACK, PH.D., *Agricultural Engineering*.
 GEORGE DAVID BLANPIED, PH.D., *Pomology*.
 WILLIAM LOUIS BROWN, PH.D., *Entomology*.
 GEORGE SYDNEY BUNTING, JR., PH.D., *Botany in the L. H. Bailey Hortorium*.
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 ROBERT ALLAN DANLEY, PH.D., *Rural Sociology*.
 ALEXANDER DICKSON, M.S., *Forestry*.
 JAMES STAFFORD DOLLIVER, PH.D., *Personnel Administration*.
 WILLIAM EMERSON DRAKE, PH.D., *Agricultural Education*.
 EDWARD OSCAR EATON, PH.D., *Agricultural Engineering*.
 ALFRED WARD EIPPER, PH.D., *Fishery Biology*.

MRS. ANN M. ELLIOT, B.F.A., *Freehand Drawing*.
 JOHN MURRAY ELLIOT, PH.D., *Animal Husbandry*.
 ELMER ELLIS EWING, PH.D., *Vegetable Crops*.
 CHARLES CLAYTON FISCHER, M.S., *Floriculture*.
 DANA CLEMENT GOODRICH, JR., PH.D., *Marketing*.
 JOHN IRVING GREEN, PH.D., *Conservation*.
 RICHARD WILLIAM GUEST, M.S., *Agricultural Engineering*.
 JOHN HARP, PH.D., *Rural Sociology*.
 KENNETH DYER HICKEY, PH.D., *Plant Pathology*.
 MILTON ELLSWORTH HISLOP, M.S., *Extension Service and Assistant State Leader of County Agricultural Agents*.
 JOSEPH F. HODGSON, PH.D., *Soil Science*.
 DOUGLAS E. HOGUE, PH.D., *Animal Husbandry*.
 ELGIN BOYD HUNDTOLT, M.S., *Agricultural Engineering*.
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 EDWARD DAVID JONES, PH.D., *Plant Pathology*.
 WILLIAM TINSLEY KEFTON, PH.D., *Biology*.
 JOE KUBOTA, PH.D., *Soil Science*.
 ROBERT JOHN LAMBERT, M.S., *Freehand Drawing*.
 JAMES EDWARD LAWRENCE, B.S., *Extension Teaching and Information*.
 JOHN WILLIAM LAYER, M.S., *Agricultural Engineering*.
 ROLAND MELVILLE LEACH, JR., PH.D., *Animal Nutrition*.
 FRED GEORGE LECHNER, D.ED., *Agricultural Engineering*.
 RICHARD MULLINGTON LEWIS, PH.D., *Horticulture and Curator of Cornell Plantations*.
 ARTHUR STUART LIEBERMAN, M.S., *Floriculture*.
 JAMES WENDELL LORBEER, PH.D., *Plant Pathology*.
 ROBERT THEODORE LORENZEN, M.S., *Agricultural Engineering*.
 WILLIAM T. LOWE, D.ED., *Secondary Education*.
 ROBERT FRANCIS LUCEY, PH.D., *Field Crops*.
 DAVID CORBIN LUDINGTON, M.S., *Agricultural Engineering*.
 NICOLAAS G. M. LUYKX II, PH.D., *Public Administration*.

- ROGER HENRY MARZ, PH.D., *Public Administration*.
- HOWARD W. MATOTT, M.S., *Extension Service and Assistant State Leader of County Agricultural Agents*.
- ALEXANDER MILLER MEEK, PH.D., *Animal Husbandry*.
- WILLIAM GEORGE MERRILL, PH.D., *Animal Husbandry*.
- ROY LEONARD MILLAR, PH.D., *Plant Pathology*.
- JASON MILLMAN, PH.D., *Educational Psychology and Measurement*.
- OSCAR GORTON MINK, D.ED., *Secondary Education*.
- WARREN GLENN MONSON, PH.D., *Field Crops*.
- ROGER A. MORSE, PH.D., *Apiculture*.
- ROBERT GLENN MOWER, PH.D., *Ornamental Horticulture*.
- MALDEN CHARLES NESHEIM, PH.D., *Animal Nutrition and Poultry Husbandry*.
- JOSEPH EDWARD NOWREY, PH.D., *Food Technology*.
- VINCENT CHARLES NUCCIO, D.ED., *Assistant Professor of Educational Administration and Director of Educational Placement*.
- GERALD EDWIN REHKUGLER, M.S., *Agricultural Engineering*.
- ROGER FRANCE SANDSTED, PH.D., *Vegetable Crops*.
- ROBERT J. SCANNELL, M.L.A., *Ornamental Horticulture*.
- GLEN HENRY SCHMIDT, PH.D., *Animal Husbandry*.
- OTTO E. SCHULTZ, B.S., *Plant Pathology*.
- NORMAN ROY SCOTT, PH.D., *Agricultural Engineering*.
- THOMAS WALTER SCOTT, PH.D., *Soil Science*.
- SHAYLE ROBERT SEARLE, PH.D., *Biological Statistics*.
- WAYNE ALFRED SINCLAIR, PH.D., *Plant Pathology*.
- DANIEL GENE SISLER, M.S., *Agricultural Geography*.
- LEONARD EMILE SPIEGEL, PH.D., *Conservation*.
- JOHN BRUCE STONE, PH.D., *Animal Husbandry*.
- GLEN HANNA THACKER, M.S., *Poultry Husbandry*.
- JONATHAN STARBUCK TOBEY, PH.D., *Marketing*.
- WILLIAM GOODRICH TOMEK, PH.D., *Prices*.
- LEONARD DANIEL TOPOLESKI, PH.D., *Vegetable Crops*.
- HAROLD BRADFORD TUKEY, JR., PH.D., *Ornamental Horticulture*.
- LLOYD DALE VANVLECK, PH.D., *Animal Husbandry*.
- DONALD HOWARD WALLACE, PH.D., *Vegetable Crops and Plant Breeding*.
- JOHN A. WEIDHAAS, JR., PH.D., *Entomology*.
- WALTER FREDERICK WILKENS, PH.D., *Vegetable Crops*.
- STANLEY ARNOLD ZAHLER, PH.D., *Bacteriology*.

INSTRUCTORS

- KATHERINE EMILY BARNES, B.S., *Extension Teaching and Information*.
- CHARLES OLEN CRAWFORD, M.S., *Rural Sociology*.
- JAMES DOUGLAS GRIERSON, PH.D., *Botany*.
- BENT H. HAVSTEEN, PH.D., *Biochemistry*.
- ANTHONY HEPTON, B.S., *Botany*.
- PAUL CHARLES MUNDINGER, M.S., *Biology*.
- JOHN JOSEPH SHEEHAN, M.S., *Business Management*.
- HAROLD FRANKLIN WILKINS, M.S., *Floriculture*.

STAFF OF THE EXPERIMENT STATION AT GENEVA

PROFESSORS

- ALFRED WILLIAMS AVENS, PH.D., *Chemistry*.
- ALVIN JOSEPH BRAUN, PH.D., *Plant Pathology*.
- JOHN CARLTON CAIN, PH.D., *Pomology*.
- PAUL JONES CHAPMAN, PH.D., *Entomology and Head of the Department*.
- BENJAMIN EDWARD CLARK, PH.D., *Seed Investigations and Head of the Department*.
- WILLARD FRANCIS CROSIER, PH.D., *Seed Investigations*.
- RALPH WILLARD DEAN, PH.D., *Entomology*.
- JOHN EINSET, PH.D., *Pomology and Head of the Department*.
- FOSTER LEE GAMBRELL, PH.D., *Entomology*.

- ROBERT MCCULLOUGH GILMER, PH.D., *Plant Pathology*.
- EDWARD HADLEY GLASS, PH.D., *Entomology*.
- JAMES MORTON HAMILTON, PH.D., *Plant Pathology and Head of the Department*.
- DAVID BIRNEY HAND, PH.D., *Biochemistry and Head of the Department of Food Science and Technology*.
- GEORGE JAMES HUCKER, PH.D., *Bacteriology*.
- HANS R. LÜTHI, PH.D., *Food Science*.
- JAMES CHARLES MOYER, PH.D., *Chemistry*.
- JOHN JACOB NATTI, PH.D., *Plant Pathology*.
- DEFORREST HAROLD PALMITER, PH.D., *Plant Pathology*.
- CARL SEVERIN PEDERSON, PH.D., *Bacteriology*.

WILLARD BANCROFT ROBINSON, PH.D., *Chemistry*.

WILBUR THEODORE SCHROEDER, PH.D., *Plant Pathology*.

NELSON JACOB SHAULIS, PH.D., *Pomology*.

GEORGE LEWIS SLATE, M.S., *Pomology*.

EDWARD HOLMAN SMITH, PH.D., *Entomology*.

KEITH HARTLEY STEINKRAUS, PH.D., *Bacteriology*.

MICHAEL SZKOLNIK, PH.D., *Plant Pathology*.

EMIL FREDERICK TASCHENBERG, PH.D., *Entomology*.

MORRILL THAYER VITTUM, PH.D., *Vegetable Crops and Head of the Department*.

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JAMES ALFRED ADAMS, PH.D., *Entomology*.

JOHN DWAIN ATKIN, PH.D., *Vegetable Crops*.

KARL DIETRICH BRASE, M.S., *Pomology*.

OTIS FREEMAN CURTIS, JR., PH.D., *Pomology*.

ALEXANDER COCHRAN DAVIS, PH.D., *Entomology*.

DESMOND DANIEL DOLAN, PH.D., *Seed Investigations*.

CHESTER GENE FORSHEY, PH.D., *Pomology*.

ROBERT LAWRENCE LABELLE, B. CHEM. E., *Chemistry*.

ROBERT CONSAY LAMB, PH.D., *Pomology*.

FRANK ANDREW LEE, PH.D., *Chemistry*.

SIEGFRIED ERIC LIENK, PH.D., *Entomology*.

GUILFORD LEROY MACK, PH.D., *Chemistry*.

FREEMAN LESTER MCEWEN, PH.D., *Entomology*.

LEROY WALTER NITTLER, PH.D., *Seed Investigations*.

ROBERT SANDS SHALLENBERGER, PH.D., *Biochemistry*.

HARUO TASHIRO, PH.D., *Entomology*.

ROGER DARLINGTON WAY, PH.D., *Pomology*.

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SAMUEL WILLIAM BRAVERMAN, PH.D., *Seed Investigations*.

FRANK GEORGE DENNIS, JR., PH.D., *Pomology*.

EYSTEIN EINSET, PH.D., *Biochemistry*.

DANIEL FREDERICK FARKAS, PH.D., *Food Processing Extension*.

LONNIE ROSS HACKLER, PH.D., *Biochemistry*.

PAUL CHARLES LIPPOLD, PH.D., *Entomology*.

GERALD A. MARX, PH.D., *Vegetable Crops*.

LOUIS MELVILLE MASSEY, JR., PH.D., *Biochemistry*.

LEONARD ROBERT MATTICK, PH.D., *Food Science*.

NATHAN HIRAM PECK, PH.D., *Vegetable Crops*.

GEORGE ALBERT SCHAEFERS, PH.D., *Entomology*.

STANTON SHANNON, PH.D., *Vegetable Crops*.

DON FREDERICK SPLITSTOESSER, PH.D., *Bacteriology*.

JEROME PAUL VANBUREN, PH.D., *Biochemistry*.

THE NEW YORK STATE COLLEGE OF AGRICULTURE

CORNELL UNIVERSITY, the land-grant institution for New York State, was chartered by the Legislature in 1865. By the terms of the Land-Grant Act of 1862, teaching in agriculture has been, from the beginning, a regular part of the University program. In 1904 the legislature of the State of New York established the College of Agriculture as a state institution under the title, "The New York State College of Agriculture at Cornell University," and made an appropriation for the erection of buildings for the College. In 1906 an administration act was passed by the legislature defining the purpose and activities of the College of Agriculture thus: "The object of said College of Agriculture shall be to improve the agricultural methods of the state; to develop the agricultural resources of the state in the production of crops of all kinds, in the rearing and breeding of livestock, in the manufacture of dairy and other products, in determining better methods of handling and marketing such products, and in other ways; and to increase intelligence and elevate the standards of living in the rural districts. For the attainment of these objects the College is authorized to give instruction in the sciences, arts, and practices relating thereto, in such courses and in such manner as shall best serve the interests of the state; to conduct extension work in disseminating agricultural knowledge throughout the state by means of experiments and demonstrations on farms and gardens, investigations of the economic and social status of agriculture, lectures, publication of bulletins and reports, and in such other ways as may be deemed advisable in the furtherance of the aforesaid objects; to make researches in the physical, chemical, biological, and other problems of agriculture, the application of such investigations to the agriculture of New York, and the publication of the results thereof."

With the creation of the State University of New York in 1948, the College of Agriculture, as one of the four state-supported units at Cornell University, became an integral part of this new State University. "Created to provide a comprehensive and adequate program of higher education," the State University now includes more than thirty educational institutions. The College of Agriculture, functioning in this broad context, offers teaching and research facilities to serve the agricultural needs of the state.

THE COURSES AVAILABLE

The resident instruction in the College of Agriculture is planned for those who desire an education in agriculture and in the sciences most closely related to agriculture. It is organized, for the most part, in a course of four years, or eight

terms, leading to the degree of Bachelor of Science. Those who want instruction in a special field may register for one or more terms as special students, provided they are qualified by education and experience to pursue the courses they want to take (see page 18).

For those who cannot plan to take four years of college work, special curricula are organized, running through two years, to give specific training for definite vocational objectives. Transfer from the two-year to the four-year course is possible under certain conditions which are described in the Announcement of the two-year course.

Graduate work in the various fields of agriculture is under the jurisdiction of the Graduate School of Cornell University to which questions about admission should be addressed.

Aside from the above, there is regularly a six-week summer school designed especially for teachers, school principals, and superintendents.

There are also one-week and two-week courses with specific purposes.

The information contained in this Announcement applies specifically to the four-year course. Circulars describing the other courses referred to may be obtained on application to the Secretary of the College.

THE FOUR-YEAR COURSE

The four-year course provides an education in science with emphasis upon applications in agriculture. Graduates of the College are found in such a wide variety of occupations and situations that only a broad and basic education can give many of them the foundation needed in adjusting to the changes and responsibilities that will come their way. While it is literally correct to think of "agriculture" as applying to crop and livestock production on farms, the four-year course is organized and functions in a much broader educational context.

The requirements for a degree, as outlined on page 18, are extremely flexible, with only a few specific courses demanded of all students. The major part of the program for any individual student is chosen from three large groups of courses. This opportunity for election may result in a broad, general program or one in which basic sciences or, to the other extreme, the more applied subjects, are emphasized almost exclusively.

Programs, arranged with the help of a faculty adviser, are available in the following fields:

Agricultural Business Management

Agricultural Engineering

Applied—4 year

Professional—5 year

Agricultural Extension Service

Agricultural Journalism

Agricultural Marketing

Agricultural Missionary

Agronomy

Field Crops

Soils

Bacteriology

Biochemistry

Biological Science

Botany

Combination Programs

Business and Public Administration

Professional Agricultural Engineering

Veterinary

Conservation Education

Crops Science

Dairy Chemistry

Dairy Husbandry

Dairy Science

Entomology

Farm Finance

Farm Management

Floriculture

Food Distribution

Food Science

Foreign Agricultural Service

Fruit Production
 General Agricultural Economics
 General Agriculture
 General Biology
 Genetics
 Greenhouse Crop Production
 Landscape Service
 Livestock Production
 (Sheep, Swine, and Beef Cattle)
 Meat and Meat Products
 Nursery Crop Production
 Plant Breeding
 Plant Pathology
 Pomology
 Poultry Husbandry
 Poultry Science

Preveterinary (2 years)
 Rural Sociology
 Seed Technology
 Soil Conservation
 Soil Science
 Statistics
 Teaching Science in High School
 Teaching Vocational Agriculture in
 High School
 Turf Management
 Vegetable Crop Production and Marketing
 Vertebrate Zoology (including ornithology,
 mammalogy, and ichthyology)
 Wildlife Conservation (including fishery biol-
 ogy, wildlife management, and marine
 biology)

EMPLOYMENT OPPORTUNITIES

The employment opportunities described in the paragraphs which follow are in fields of work in which graduates of the College currently are engaged. It would be possible to compile a long list of specific jobs held by graduates; instead, it has seemed more desirable to name only a few broad fields which include these specific jobs. Experience shows that students should not train too narrowly, because unforeseen circumstances may have an important bearing on the specific jobs which they accept initially. Training appropriate for a broad vocational field will qualify graduates for more than one job opening within that field or even for openings in more than the one field.

FARMING . . . A first responsibility of the College is to the young men who plan to enter farming. A good living at satisfying work and an opportunity to contribute to community life await the graduates with the necessary farm experience and enough capital to operate a desirable farm. These young men take a general course in agriculture, with emphasis on the type of farming they plan to follow. A general course likewise fills the needs of others who may enter related fields until they have enough capital to buy or rent a farm.

BUSINESS AND INDUSTRY . . . Leaders in business and industry, particularly in those businesses or industries that market farm products or serve the production needs of farmers, are continually seeking competent young persons with agricultural college training.

The food industry is concerned with the movement of agricultural products, such as eggs, milk, meat, fruits, and vegetables, through processing plants and distribution channels to the consumer. To perform these varied services requires men and women with diverse kinds of training and personal characteristics. For instance, the milk industry provides opportunities in plant and laboratory work for graduates with training in the handling and processing of milk and milk products; in sales, business management, and regulatory jobs for graduates whose training has emphasized marketing and related courses in agricultural economics.

In the fruit and vegetable processing and marketing fields, there are jobs for fieldmen, buyers, raw-products inspectors, laboratory quality control workers, plant managers, wholesale distributors, and retail store managers. Most of these positions are with food processing companies and with retail food chains.

The business of supplying feed for New York dairy cattle and poultry is of major importance. It requires men who know New York agriculture and, more particularly, who know feeds and the feed requirements of the various types of livestock. The production and the delivery of the right fertilizers, machinery, pesticides, and all other supplies used on our farms, require the services of qualified men. They may need to be well-trained scientists, technicians, salesmen, promotional specialists, or plant operators. Some may serve eventually as managers or in other administrative capacities.

All businesses in agriculture require a knowledge of financing, advertising, insurance, and other specialized services. Credit organizations, both private and governmental, advertising concerns, and insurance companies have employed graduates of the College. Farm-loan representatives have been employed by local banks, insurance companies, and the various branches of the Farm Credit Administration. Farm experience and the ability to work with people are valuable assets as qualifications for employment, along with a general training in agriculture, including agricultural economics.

The production and sale of flowers and ornamental shrubs in New York is an important and large business. Many students who specialize in floriculture and ornamental horticulture are sons and daughters of persons in the greenhouse or nursery business. Others who do not have that background but combine practical experience with their training find satisfactory opportunities upon graduation.

The College does not have a school of journalism, but it offers several courses in agricultural journalism, visual aids, and television and radio writing and broadcasting. Job opportunities include editorial and staff positions on newspapers, farm papers, and farm magazines. Agricultural college graduates occupy positions as farm program directors and farm news writers for radio and television services in the state colleges throughout the nation.

HIGH SCHOOL TEACHING . . . Two kinds of secondary school teachers are trained at the College—teachers of vocational agriculture and teachers of science. The former includes only men, the latter both men and women.

Approximately 300 secondary schools in New York State have departments of vocational agriculture, each of which requires the services of one or more teachers. Newly trained teachers continually are needed to serve departments organized in additional schools and to replace teachers who retire or change to other occupations. Young men who have an extensive background of practical farm experience, a vital interest in boys who would like to study agriculture, and a real appreciation of the importance of agriculture in the total economy will find the teaching of vocational agriculture a challenging and rewarding field of service. Moreover, the experience gained as a teacher provides excellent background for related positions in school administration, in agricultural businesses, and in farming.

The high birth rate of the 1940's and the increasing number of boys and girls who complete high school have created a strong demand with improved salaries for high school teachers in all fields. Because of the need for scientists in industry as well as in education, the demand for science teachers is particularly acute. This demand is certain to become even greater as boys and girls in the lower grades move on into high school. The young man or young woman who has both an interest in and aptitude for science courses and mathematics, as

well as a sincere interest in the welfare of young people, will find rewarding experiences in preparing for and later in serving as a teacher of high school science.

AGRICULTURAL RESEARCH AND COLLEGE TEACHING . . . Agricultural research is concerned with adding to the fund of knowledge bearing on the production, processing, or distribution of farm products. It may be of an economic, social, physical, biological, or chemical nature, depending on the particular kind of problem being studied. The majority of those responsible for research have had advanced, specialized study in a graduate school. Graduates of the four-year course in the College who have superior records and a sound background in basic subject matter have the opportunity to pursue graduate study, often with the help of a graduate assistantship to defray part of the costs. In recent years, about a third of the graduates of the four-year course have continued with graduate or professional study.

College teaching involves preparation of the same kind as is needed for agricultural research. Whether one engages in research or in teaching depends on personal interests and abilities as well as on opportunities available at the time graduate study is completed. In many cases, graduates hold positions which combine teaching and research.

AGRICULTURAL EXTENSION SERVICE . . . The term "agricultural extension" refers to the teaching of agricultural subjects at places other than on a college campus and usually on an informal, noncredit basis. The four-year graduate may serve as a county agricultural agent, a 4-H Club agent, or an agricultural missionary. Extension specialists have their headquarters at the colleges of agriculture and conduct educational programs and meetings throughout their states; graduate study, as for other college positions, is usually required.

WILDLIFE CONSERVATION . . . Opportunities in the conservation and management of fish and wildlife are found principally in employment with either the state or federal government. Occasionally, there are openings with museums and private foundations. The training in college emphasizes the biological sciences. The work is likely to consist chiefly of survey and research, but in recent years many management and administrative positions have been established. As such, the work is exacting but of great interest to those scientists with a desire to develop and conserve our wildlife resources and to help the people to understand them.

SOCIAL SERVICES AND RURAL ORGANIZATIONS . . . Students may elect a social science concentration as applied to agriculture and rural life. Graduates with this training find opportunities with farm organizations, as case-workers in local public welfare departments, as camp directors and with youth organizations and community centers. Competent persons with specialized training in the rural social sciences at the graduate level are in increasing demand to fill community development positions in the United States and abroad; by agricultural business firms for research; by colleges for extension, research and teaching; and by government research agencies. The undergraduate concentration in the rural social sciences provides an excellent foundation for later professional study preparing for the many opportunities with community planning councils, health and welfare councils, for the professional positions in agencies providing health and welfare services, and for the rural ministry.

FOREIGN SERVICE . . . During the past few decades, the international aspect of American agricultural activities, interests, and problems has become increasingly important. The Foreign Agricultural Service, which is the international arm of the United States Department of Agriculture, is seeking well-qualified, recent graduates in limited numbers to enter its Junior Professional Development Program. These young men emphasize agricultural economics and related courses in their college training. Upon appointment, they serve initially in the United States and subsequently must be willing to accept rotating overseas and domestic assignments in accordance with the needs of the Service.

Graduates with several years of subsequent experience in agricultural work in this country may qualify for foreign assignments with agencies such as the Agency for International Development, the Food and Agriculture Organization of the United Nations, or one of the foundations. Occasionally, calls are received for graduates to work for governments of foreign countries.

STATE AND FEDERAL CIVIL SERVICE . . . Several agricultural agencies, both state and federal, employ their personnel from registers established by the New York State Department of Civil Service or the United States Civil Service Commission. Positions with these organizations may be of a research, extension, regulatory, or administrative nature. To gain a place on Civil Service registers, seniors or graduates take the appropriate examinations which are announced from time to time.

PLACEMENT SERVICES

Placement services for graduating seniors and alumni are on a decentralized but coordinated basis. The University Placement Service is available to all students and alumni of the University and is of most value to those students of the College of Agriculture who are seeking positions in business or industrial fields.

The Educational Placement Bureau serves all students and alumni of the University who are qualified for and interested in teaching or related positions in elementary and secondary schools and in colleges. College of Agriculture graduates in the fields of science teaching and vocational agriculture teaching may be placed through this Bureau.

The Office of Resident Instruction of the College provides a service which combines vocational guidance and placement and is available to both students and alumni. Those interested in graduate study are referred to the appropriate departmental offices for further information and assistance. Placement in the county extension services is a function of the state leaders' offices in agricultural and 4-H Club Extension.

Students and alumni also learn informally of employment opportunities through individual professors to whom requests may come because of their wide contacts with prospective employers throughout New York State.

DIRECTIONS REGARDING CORRESPONDENCE

For admission to the freshman class, to the two-year courses, or to advanced standing from other colleges and universities, all communications should be

addressed to the Director of Admissions of Cornell University, Edmund Ezra Day Hall.

For admission to graduate work in agriculture and candidacy for advanced degrees, communications should be addressed to the Dean of the Graduate School, Edmund Ezra Day Hall.

The *Announcement of General Information*, giving details concerning admission, expenses, scholarships, and related subjects, may be obtained by writing to Cornell University Announcements, Edmund Ezra Day Hall. Announcements of the other colleges, schools, and departments of the University may also be obtained by writing that office.

THE APPLICATION FOR ADMISSION

Admission to the College involves more than presenting specified entrance units. Both the applicant and the College are concerned that a desirable choice of college study be made. For this reason, in choosing its students, the College considers not only the secondary school record, but also other available indications of success in the curriculum the applicant proposes to undertake. Therefore, the applicant should submit full information regarding his high school record, background, work experience, school and community activities, resources for financing a college education, and the purpose in seeking it. Such information provides a basis for full consideration of the application. Correspondence regarding these matters is welcome. Applicants are not required to come to the College for interviews, but those who wish to do so should write two or three weeks in advance for appointments. Conference hours are 10 a.m. until 12 noon during the week and 9 a.m. until 12 noon on Saturdays. Requests for Saturday appointments should be avoided if at all possible.

The practice requirement of the College is described on pages 18 and 19. Prospective students are urged to read these pages carefully. Those who have neither lived on farms nor had considerable practical farm experience, and who desire admission to a field of study for which farm experience is required, are advised to seek employment for at least one full summer on a well-managed family farm before entering college. This experience is not required for registration as a freshman, but for certain freshman courses it is educationally advantageous.

Candidates for admission to the four-year course must be at least sixteen years of age. The academic requirements may be satisfied by the presentation of New York State Regents credentials, or acceptable school grades, or satisfactory ratings in the tests of the College Entrance Examination Board. Candidates who have prepared for college in New York State should offer a report of State Regents Examinations in subjects which are offered for entrance credit and in which Regents Examinations are scheduled at their schools.

Admission to the four-year course is possible only in the fall term, except for students who enter with advanced standing. Applications should be filed during the fall term of the senior year in high school, at the Office of the Director of Admissions, Edmund Ezra Day Hall. Those received after March 1 will probably be at a disadvantage.

ENTRANCE REQUIREMENTS FOR THE FOUR-YEAR COURSE

The subjects that may be offered for admission to the College of Agriculture are named in the following list; the figures following each subject indicate the value in entrance units and show the maximum and the minimum amount of credit allowed in the subject. A unit represents five recitations a week for one year in a subject. In drawing and industrial arts, 240 hours are required to earn one unit and 120 hours to earn one-half unit.

ENGLISH, 4 YEARS (required of all entering students) 4

FOREIGN LANGUAGES (modern and ancient) 1, 2, 3, 4
(If a foreign language is offered for entrance, it is desirable to present at least two years, although credit will be granted for a single year of study in not more than two languages.)

MATHEMATICS

Elementary Algebra 1	Plane Geometry 1
Intermediate Algebra 1	Solid Geometry ½
Advanced Algebra ½	Plane Trigonometry ½

Or (for schools following the recommendations of the College Board Commission on Mathematics):

College Preparatory Mathematics 1, 2, 3, or 4

SCIENCES

Biology 1	Physical Geography ½-1
Botany ½-1	Physics 1
Chemistry 1	Zoology ½-1
General Science 1	

(If a unit in biology is offered, a half-unit in botany and a half-unit in zoology may not also be counted.)

SOCIAL STUDIES, including history (each course) ½-1

VOCATIONAL SUBJECTS

Agriculture ½-7	Home Economics ½-6
Bookkeeping ½-1	Industrial Arts ½-1
Drawing ½-1	

ELECTIVES—any high school subject or subjects not already used and acceptable to the University ½-2

For admission to the College of Agriculture, an applicant must have completed a secondary-school course and must offer both A and B as follows:

A. Sixteen units which must include four in English and two in mathematics. (Three units in mathematics will be required of all students entering in the fall of 1964.) Remaining units must be selected from above list.

B. Scores of the Scholastic Aptitude Test of the College Entrance Examination Board. These are not required of applicants for adult special registration. Students entering in the fall of 1964 and thereafter must also present the Writing Sample administered by the College Entrance Examination Board.

It is strongly recommended that high school students carry enough courses to offer eighteen entrance units and that these include biology, chemistry, physics, and at least three units in mathematics.

A committee on admissions in the College of Agriculture reviews the credentials of each applicant. In making its decision, the committee considers not only the nature of the subjects offered for admission and the quality of the work done in those subjects, and all available indications of ability for and interest in the work of the course to be undertaken in the College, but also the background, experience, character, and personality of the applicant.

The total number of women students at Cornell is fixed by the extent of the facilities provided by the University for the housing of women students. Present facilities are such that the number of women admitted each year must be restricted, with the result that competition for admission is especially severe for this group of applicants.

Students who wish to major in one of the sciences or to become research workers should offer adequate training in foreign languages.

HEALTH REQUIREMENTS ON ENTRANCE

Each entering student, graduate or undergraduate, is expected to assume personal responsibility for the health requirements adopted by the Board of Trustees of Cornell University. Prospective students should consult the *Announcement of General Information* or the *Announcement of the Graduate School*. Permission to register for a new semester will not be granted unless all health requirements pertaining to the previous semester have been fulfilled.

ADMISSION WITH ADVANCED STANDING

A student admitted to the College of Agriculture from another college in Cornell University, or from any other institution of collegiate rank, is regarded as having completed the number of terms and hours to which his records entitle him, and receives all the privileges of students who have completed the same number of terms and hours by residence in the College. He must furnish a transcript and a certificate of honorable dismissal from the institution from which he transfers. No more than fifteen semester hours of credit are allowed for one semester of work at another institution. To obtain the degree of Bachelor of Science, however, a student must have completed the prescribed subjects in the four-year course and the requisite number of elective hours in agricultural subjects. He must also have been in residence in the College of Agriculture for his past two terms and have completed not less than fifteen hours a term, of which two-thirds at least must be in subjects taught by the staff of the College of Agriculture. Because advanced-standing credit may reduce the number of summers available for farm or other work after admission, these applicants are ordinarily held to satisfy a part or all of the practice requirement at entrance, depending upon the number of terms of residence for which they are held.

Credit toward a degree for preparatory school work, beyond that used in satisfying entrance requirements, may be obtained only through a satisfactory grade received in an Advanced Placement Test of the College Entrance Examination Board, in each subject.

REQUIREMENTS FOR ADMISSION OF SPECIAL STUDENTS

Opportunity is provided for the admission of students whose needs may not be well met by the organized curricula of the College. Applicants for admission to such special standing must present entrance credentials as other students do, and in addition they must present a detailed statement of the program they desire to follow. They must show that they have had recent farm experience or other experience qualifying them for the special work they plan to do, and, unless they meet the regular entrance requirements they must be twenty-one years of age.

Students having a first degree and desiring further undergraduate work may be admitted as special students. The work of such students is ordinarily limited to courses in the College of Agriculture; for work taken outside, tuition is charged at the rate prevailing in the college where the work is done.

REQUIREMENTS FOR THE DEGREE OF BACHELOR OF SCIENCE

The requirements for the degree of Bachelor of Science are residence for eight terms, except for those who make an average of 75 or above, and, in addition to the prescribed work in physical education (outlined on page 21), the completion of 120 hours of required and elective work, as outlined on pages 20 and 21.

Freshmen are required to attend, during their first term, a course designed to orient students in the life of the University and specifically to acquaint them with the scope and purpose of the courses of instruction in the College. The course meets once a week and carries one hour of credit.

THE PRACTICE REQUIREMENT

The faculty of the College of Agriculture has established a practice requirement that applies to both men and women students. The basic requirement is 25 units of practice credit from acceptable experience on a farm, with 12 units of this credit required for registration in the sophomore year, and the entire 25 units for registration in the senior year. Credit for farm work experiences before matriculation is evaluated at the time of entrance. Factors considered in establishing the credits are (1) desirability of the farm from the standpoint of obtaining good experience; (2) the student's report on his farm experience; (3) reports from the farmer on the student's work; and (4) the results of a practical farm experience test. Farm experience credits after matriculation may be earned at the rate of approximately one credit per week of work, if the performance by the student in an acceptable work situation is good.

Exceptions to this requirement may be made, depending upon the objective and field of specialization of the student. Students qualify for these exceptions only after they have been so designated and reported by the adviser, for the specialty concerned, to the Offices of Student Practice and of the Director of Resident Instruction.

Students in the following specializations may meet the requirement of 25 units of practice credit through farm experience or acceptable experience in their respective professional fields, or by a combination of the two:

Agricultural business management	Food distribution
Agricultural engineering	Meats
Agricultural marketing	Ornamental horticulture
Animal husbandry	Pomology
Dairy husbandry	Poultry husbandry
Floriculture	

In the following specializations students may have the practice requirement reduced to 13 units of credit gained from appropriate experience of a professional nature:

Bacteriology	Nutrition
Biochemistry	Rural sociology
General biology	Science teaching

In the following specializations, students may be held for either of the requirements outlined above, i.e., 25 units of credit from farm experience or acceptable professional experience, or a combination of the two; or 13 units of credit from experience in their professional field:

Agricultural journalism	Entomology
Agronomy	Food science
Botany	Plant breeding
Conservation	Plant pathology
Dairy science	Vegetable crops

It is not expected that all students will elect a definite field of specialization early in their college course. A rather high proportion of the graduates have maintained general and broad interests and have elected general rather than specialized programs of instruction. On the other hand, many students have well defined professional interests and will follow specialized programs as undergraduates. Some of these may wish to meet the practice requirement through work experience in their respective fields. To do this these students must declare their field of professional interest by March 1 of their freshman year. Course schedules are then made out for the succeeding fall semester. The subjects selected have a bearing on acceptance into the desired specialization which, in turn, determines the practice requirement for which the student will be held. Unless he has been accepted and so reported, in a specialization that permits or requires practice other than the basic requirement of 25 units of credit from farm experience, he will be held to obtain 12 of these units before enrollment in the sophomore year.

In some fields of specialization, the type of practice required may vary with the qualifications or interests of the individual student. In certain instances, practice of a specific type is expected early in the college career, while in others experience gained prior to the junior year will not be accepted. Because of these and other differences, it is desirable for students to discuss with their advisers, as soon as possible, the question of specialization and the practice that will be required. The responsibility for doing this rests with the student. It may be helpful to talk with advisers in several fields and with other available counselors so that decisions will be based on the best information obtainable.

When a student has been accepted by an adviser for a special field of study, this will be reported by the adviser to the Offices of Student Practice and the Director of Resident Instruction. That report will constitute the official record of the field of specialization and the amount and type of practice that have been agreed upon. Until such a report has been filed in these offices, the student will be held for the basic practice requirement as outlined in the second paragraph of this section.

It is recognized that the interests and objectives of students are subject to change. When this occurs, a student may change his adviser, and another form will be submitted to report the new specialization and corresponding practice requirement. If a change comes too late in the college course, it may delay the time for graduation. In each case the student is obliged to satisfy the practice requirement of the specialization that has been reported for him at the beginning of his senior year.

Students who entered the College before the fall of 1960 may meet either the requirement in force at the time of their admission or the new requirement. Practice requirements do not apply to students in the two-year courses or to those admitted as adult special students, because they must have met certain experience standards to qualify for admission. Should such students transfer later to the degree course, they must meet the appropriate practice requirement.

Members of the faculty will make suggestions and be of whatever assistance they can in connection with locating employment suitable to meet the practice requirement. However, the College assumes no responsibility for assuring the student that such employment will be found and no responsibility for acceptability to the student of particular working or living conditions. Both of these considerations are the ultimate responsibility of the individual student.

Prospective students and students who desire information about any aspect of the practice requirement or wish assistance in finding employment on a farm, should write or consult Professor S. R. Shapley, Student Practice Office, Roberts Hall, Ithaca, New York. The department concerned assists in finding employment for the specialized practice.

THE COURSES LEADING TO THE DEGREE OF BACHELOR OF SCIENCE

(Required courses given in other colleges than Agriculture are described in the *Announcement of the College of Arts and Sciences*.)

Freshman Orientation Course	1
English, Introductory Course	6
Botany, Biology, or Zoology	6
Chemistry or Physics	6
Physical sciences, biological sciences, social sciences and humanities.....	27
Group A. Not less than 6 hours and not less than 2 subjects:	
Astronomy 201, 202; chemistry; geology; mathematics; Meteorology 1, 2; physics.	
Group B. Not less than 6 hours and not less than 2 subjects:	
Bacteriology 1, 3, 5, 101; Biology 1, 2, 9, 116; botany, Biochemistry 5 (organic chemistry); Conservation 7, 8, 9; Entomology	

10, 130; genetics (Plant Breeding 1, 101, Animal Husbandry 20); physiology (Veterinary Medicine 10); Plant Pathology 1, 9; zoology.

Group C. Not less than 9 hours and not less than 2 subjects:

American studies; economics; English; government; history; literature; modern foreign language; philosophy; psychology or Rural Education 10; Rural Sociology 1 or anthropology or sociology; Industrial and Labor Relations 408, 409.

Elective in the College of Agriculture (including any courses listed in this Announcement on pages 33 to 88 with exceptions specifically noted) . . . 54

Elective (either in Agriculture or in any other college in the University) . . . 20

Total 120

Orientation is not required of students entering with one term or more of advanced standing; in such cases, one hour is added to the requirement in electives in the College of Agriculture.

MILITARY TRAINING . . . As a land-grant institution chartered under the Morrill Act of 1862, Cornell has offered instruction in military science for more than 90 years. This instruction is provided through the ROTC programs of the three military departments, the Army, the Navy, and the Air Force.

These programs offer a male student the opportunity to earn a commission while he is completing his education, thus enabling him to fulfill his military commitment as an officer rather than through the draft. To obtain a commission in one of the armed services, a student must complete a four-year course of study in an ROTC program and must meet certain physical and mental requirements. Upon graduation he receives a commission and serves a required tour of active military service.

Participation in ROTC is voluntary. Interested students must enroll in the fall of the freshman year, since four years of ROTC are required to qualify for a commission. For further details, see the *Announcement of Military Training*.

Credit either in the Basic Course in military or air science (four terms), or in the first four terms of naval science, does not count toward the 120 hours required for graduation in the College of Agriculture.

PHYSICAL EDUCATION . . . All undergraduates must complete four terms of work, three hours a week, in physical education. Ordinarily, this requirement must be completed in the first two years of residence; postponement is to be allowed only by consent of the University Faculty Committee on Requirements for Graduation. Exemption from this requirement may be made by the Committee when it is recommended by the medical office, or because of unusual conditions of age, residence, or outside responsibilities. Students who have been discharged from the armed services may be exempted.

For students entering with advanced standing, the number of terms of physical education required is to be reduced by the number of terms which the student has satisfactorily completed (whether or not physical education was included in his program) in a college of recognized standing.

Material describing the courses offered in physical education will be made available to entering students by the Department of Physical Education.

BACHELOR OF SCIENCE WITH DISTINCTION

The degree of Bachelor of Science with distinction will be conferred upon those students who, in addition to having completed all of the requirements for the Bachelor of Science degree, shall have done all of their undergraduate work at Cornell University and have cumulative scholastic averages of 85 or above; and upon those transfer students who have been in residence for at least two years and have cumulative averages of 88 or above.

DEAN'S LIST

Excellence in scholarship is recognized twice a year by publishing as a Dean's List the names of those students whose semester averages in academic courses place them in the top 5 per cent of their classes.

REGISTRATION FOR COURSES

The standard schedule for the freshman year must include the following courses:

Freshman Orientation Course.....	1
Physical Education	0
English, Introductory Course.....	6
Botany 1-2, Biology 1-2, or Zoology 103 and 101.....	6
Chemistry or Physics.....	6
Elective courses in the College of Agriculture.....	6
Elective courses in the basic sciences, in social sciences and humanities, or in the College of Agriculture.....	3-6

In making his program, the student has the assistance of a faculty adviser, preferably from the field in which he expects to specialize. The adviser is ordinarily assigned to the new student for the first term, but following that he is chosen by the student. Other counselors to assist students on personal matters, vocational guidance, and placement are available in the Office of Resident Instruction, Roberts 192.

A student must register for at least twelve hours each term and no new student may register for more than eighteen hours in addition to the regular work in physical education and military training.

Failures in courses, either required or elective, taken outside the College of Agriculture are counted against the allotment of the twenty free hours that may be taken in any college.

Senior students who have met all college requirements and desire to take courses outside of the College of Agriculture in addition to those required or allowed free may do so upon paying for the additional hours at the rate of tuition prevailing in the colleges in which the courses are taken. Other students are not allowed to exceed, even by paying for the excess hours, the 20 hours of endowed college courses charged to this category unless they have met, or at

the same time are meeting, the minimum agricultural elective requirement. Senior students whose cumulative averages place them in the top 5 per cent of their class and who are recommended by the department in which their major work is done may be permitted to elect, without additional payment, up to 10 hours in basic science outside of the College of Agriculture beyond the 20 hours normally allowed for election in any college.

Courses in Advanced ROTC may be taken, in addition to the twenty hours of free electives outside the College, without payment for those excess hours.

To be eligible for the degree, the student must maintain an average grade of at least 70 for the entire course and must have an average of 70 or above in the last term of the senior year.

COURSES IN AGRICULTURE OPEN TO FRESHMEN

Agricultural Economics 50	Floriculture and Ornamental
Agricultural Engineering 1, 21, 31, 40, 42	Horticulture 1, 2
Agronomy 11	Food Science 1
Animal Husbandry 1, 10, 50, 60, 70	Meteorology 1
Biology 1-2	Orientation 1, 5
Botany 1-2	Pomology 1, 2
Conservation 1, 2, 3, 9	Poultry Husbandry 1, 20, 50
Drawing (mechanical) 1	Rural Education 10
(freehand) 10, 11	Rural Sociology 1
Entomology 10	Vegetable Crops 3, 10, 22

COMBINED COURSES

PROFESSIONAL AGRICULTURAL ENGINEERING

A JOINT program of the Colleges of Agriculture and Engineering at Cornell University leads to the degree of Bachelor of Agricultural Engineering at the end of five years. Students in this program register in the College of Agriculture during the first four years but take courses in the Colleges of Engineering, Arts and Sciences, and Agriculture. In the fifth year the registration is in the College of Engineering which recommends the candidates to the Trustees of the University for the degree.

Applicants for admission must meet the academic entrance requirements of the College of Engineering. These include English (4 units), elementary and intermediate algebra (2 units), plane geometry (1 unit), and trigonometry ($\frac{1}{2}$ unit). A foreign language (2 units) or history (2 units); advanced algebra ($\frac{1}{2}$ unit) or solid geometry ($\frac{1}{2}$ unit); and chemistry (1 unit) or physics (1 unit) must also be offered. It is strongly recommended that at least 3 of the elective units to make up the balance of 16 be in language or history. Applicants are also advised to offer advanced algebra rather than solid geometry, when a choice is possible.

Each candidate for admission is required to take the Scholastic Aptitude Test of the College Entrance Examination Board and to request the Board to report the results to the Director of Admissions, Cornell University. Candidates are urged to take the tests in January of their senior year.

Applicants must also take the College Entrance Examination Board achievement tests in advanced mathematics and either physics or chemistry. These tests should be taken not later than March of the year of the applicants' entrance to college.

Since it is the purpose of this curriculum to train engineers for agriculture in its many relationships of building, soil and water management, machinery, manufacturing and processing of agricultural products and supplies, drainage, irrigation, and so on, evidence of interest in and background for engineering work in agriculture is a qualification for admission that is given careful consideration. Only a limited number of students are admitted to the program, and agricultural experience and the quality of the academic preparation are important criteria in the selection of applicants.

The curriculum includes basic work in biology, mathematics, physics, and chemistry; a well-rounded selection of courses in engineering science and technology, including agricultural engineering; courses in soils, crops, farm management, and other subjects in agriculture; and general studies to provide a broad and useful training.

Charges for tuition and fees, during the first four years in the curriculum,

are the same as outlined on page 28, except that students in this combined course are required to take more courses outside the College of Agriculture than are permitted to other students for which they must pay, on a credit-hour basis, as soon as the regular allowance has been used up. The amount of the charge depends upon the specific courses that are taken but is approximately a total of \$1000 for residents of the state, who pay \$200 tuition a term. The additional charge for the excess out-of-college instruction in the case of non-residents, who pay \$300 tuition a term, is approximately \$800. Payment for the excess hours begins in the fourth term, but the major part is paid in the third and fourth years. In the fifth year these students are subject to the tuition and General Fee charged in the College of Engineering, which at present are \$700 for tuition and \$150 for the General Fee each term.

Students in the agricultural engineering curriculum must satisfy the practice requirement, as described on pages 18 and 19 of this Announcement.

In applying for admission the applicant should indicate in the application, which should be sent to the Director of Admissions, that he wants to enter the College of Agriculture for the joint program with the College of Engineering in agricultural engineering.

The amount, time, and manner of payment of tuition, fees, or other charges may be changed by the Board of Trustees at any time without notice.

WITH BUSINESS AND PUBLIC ADMINISTRATION

Properly qualified students of the College of Agriculture may during their third year apply for admission to a joint program with the College of Agriculture and the Graduate School of Business and Public Administration. Under this program, the student who is admitted may complete the requirements for the Bachelor of Science degree for the College of Agriculture at the end of his fourth year and for the degree of Master of Business Administration or degree of Master of Public Administration at the end of his fifth year.

A careful selection of courses is necessary if the two degrees are to be earned in five years; so a student who is interested should plan his program with the help of the designated faculty adviser, beginning with the sophomore year. If the decision to apply is not made until later, consultation with the adviser is necessary to determine whether the requirements for the two degrees can be met in five years or if a longer time is needed.

The opportunity to receive these two degrees in five years, when the normal time is six years, is made possible by the inclusion in the fourth-year schedule of certain courses from the Department of Agricultural Economics that may be acceptable in lieu of certain first-year requirements by the Graduate School of Business and Public Administration. Similarly, the faculty of Agriculture accepts up to nine hours of courses in Business and Public Administration in the fourth year toward the satisfaction of the requirement in the social studies. These substitutions are allowed only to those who have been accepted for admission by the Graduate School of Business and Public Administration and who have their schedules approved by the College of Agriculture faculty adviser for this program.

In the fifth year the student registers only in the Graduate School of Business and Public Administration. The program of that year includes the remaining core subjects required of all students in Business and Public Administration,

together with elective courses. The specific courses to be taken depend upon the career interests of the student and are determined in consultation with his adviser. At the beginning of this fifth year the student will select a concentration from among the following: accounting (industrial or professional), agricultural management, business management, city management, finance, hospital administration, managerial economics, marketing, personnel management, production, public administration, and transportation. Options within the agricultural management concentration include:

- Management of farm cooperatives
- Agricultural credit administration
- Agricultural industries
- Agricultural marketing
- Public policy and the administration
of government agricultural programs
- Management of natural resources

During the first four years these students are subject to the tuition requirements of the College of Agriculture and in the fifth year to those of the Graduate School of Business and Public Administration.

For further details about this joint program and its admissions requirements reference should be made to the *Announcement of the Graduate School of Business and Public Administration*.

The College of Agriculture and the Graduate School of Business and Public Administration also cooperate in a special program in food distribution. This joint effort carries the sponsorship of the National Association of Food Chains. The majority of the students have been employed in the food distribution industry, but the program also attracts others. Qualified degree holders may enroll in the Graduate School as candidates for the Master of Science or Doctor of Philosophy degree, or in the Graduate School of Business and Public Administration as candidates for the Master of Business Administration degree which requires two years of residence. Undergraduates register in the College of Agriculture as candidates for the Bachelor of Science degree. Others who are not interested in a degree enroll as special students in the College of Agriculture and are granted a certificate at the successful completion of one year of work.

WITH THE SCHOOL OF NUTRITION

A plan of the College of Agriculture and the Graduate School of Nutrition permits students of Agriculture, who qualify, to follow a curriculum that leads to the regular degree of the College of Agriculture at the end of the fourth year, and the degree of Master of Nutritional Science or Master of Food Science at the end of the fifth year. To meet the requirements for the two degrees in five years, instead of the normal time of six years, the student in Agriculture should start planning his program with the adviser for students of nutrition not later than the end of the freshman year. During the first four years of this program, students are subject to the tuition requirements of the College of Agriculture and in the fifth year to those of the School of Nutrition.

WITH THE VETERINARY COLLEGE

Students who do their preveterinary work in the College of Agriculture and are accepted by the Veterinary College at Cornell University sometimes qualify for degrees from both colleges. This takes about seven years and is ordinarily done by spending the first three years in Agriculture followed by four in the Veterinary College, including a combined registration in Agriculture during one or two years.

PAYMENTS TO THE UNIVERSITY

TUITION

TUITION for undergraduate students pursuing full or special courses in the New York State College of Agriculture, who at the time of their matriculation are, and for at least twelve months prior thereto have been, bona fide residents of the State of New York, is \$200 per term.

Since physical presence in the state, especially for persons under age, by no means constitutes legal residence, applicants who are at all doubtful of their own right to exemption should address inquiries in advance to the Director of Resident Instruction in the College of Agriculture.

No student is allowed to transfer from any course to another course in Cornell University without first paying the difference in tuition for the credit transferred.

Students in the College of Agriculture who do not qualify as New York State residents are required to pay tuition of \$300 a term. Students transferring from the College of Agriculture to other colleges in the University must first make payment for the difference in tuition for the credit transferred.

Senior students desiring to take, while registered in the College of Agriculture, courses in other colleges in the University beyond those specifically required and also beyond the twenty hours allowed free may do so upon payment of tuition for the additional hours at the rate of tuition in the college in which the work is taken.

Tuition and fees become due when the student registers. The University allows ten days of grace from the first registration day of each term of the regular session. The last day of grace is printed on the bill for tuition and fees which the student is required to present at the Treasurer's Office.

Any student, graduate or undergraduate, who fails to pay his tuition, fees, and other indebtedness within the time prescribed by the University is thereby dropped from the University. When in his judgment the circumstances in a particular case so warrant it, the Treasurer may allow an extension of time to complete payments. For such extension, the student is assessed a fee of \$5. A reinstatement fee of \$10 is assessed in the case of any student who is permitted to continue or return to classes after being dropped from the University for default in payments. For reasons satisfactory to the Treasurer and the Registrar, which must be presented in writing, the above assessment may be waived in any individual case. If the student withdraws, University fees are charged on the basis of 10 per cent for each week or fraction thereof in attendance.

The amount, time, and manner of payment of tuition, fees, or other charges may be changed by the Board of Trustees at any time without notice.

FEES AND INSTRUCTIONAL EXPENSES

A DEPOSIT OF \$45 must be paid after the applicant has received notice of provisional acceptance. At the time of the first registration in the University, the deposit is used to cover matriculation charges, provides for certain graduation expenses, and establishes a fund for undergraduate and alumni class activities. The deposit is not refundable.

A DEPOSIT OF \$30 is required for a uniform, payable at registration in the first term, for students who enroll in the basic course in military science. Most of this deposit is returned as earned uniform allowance upon completion of the basic course.

A UNIVERSITY AND COLLEGE COMPOSITE FEE of \$50 for New York State residents, and \$150 for nonresidents, is required at the beginning of each term. This fee and the tuition cover the following services: (1) *Health services and medical care*, centered in the Gannett Medical Clinic or out-patient department and in the Cornell Infirmary or hospital. Students are entitled to unlimited visits at the Clinic; laboratory and X-ray examinations indicated for diagnosis and treatment; hospitalization in the Infirmary with medical care for a maximum of 14 days each term and emergency surgical care. For further details, including charges for special services, see the *Announcement of General Information*. (2) *Willard Straight Hall membership*. Willard Straight Hall is the student union; each student shares in the common privileges afforded by the operation of Willard Straight Hall, subject to regulations approved by the Board of Managers of the Hall. (3) *Laboratory services* for courses taken in the state colleges. (4) *University administration and endowed college laboratory services*. (5) *Physical recreation*. Each male student is entitled to the use of the gymnasium and the University playgrounds, and to the use of a locker, showers, and towels in Teagle Hall, Barton Hall, or the Schoellkopf Memorial Building; and each woman student to the use of the women's recreation rooms and playgrounds, and to the use of a locker. (6) *Student activities*. The fee helps to provide funds for worthy student organizations as approved by the Board of Trustees on recommendation of the Executive Board of the Cornell Student Government.

BOOKS, instruments, and instructional supplies may cost from \$25 to \$50 a term.

MISCELLANEOUS RULES AND ASSESSMENTS

Every student is held personally responsible for any injury done by him to any of the University's property.

Assessments, charged to the student's account and payable at the Treasurer's office, are levied upon the student in certain circumstances, under the following rules of the University: (1) A matriculated student desiring to register after the close of registration day must first pay a fee of \$5. (2) A student desiring to take an examination or other test for the completion of a course in which the grade "absent" or "incomplete" was reported must first pay a fee of \$2 for each examination or other test.

For reasons satisfactory to the proper authority, any of the above-mentioned assessments may be waived in any individual case if the student's failure to comply with the regulation was due to ill health or to any other reason beyond his control. Application for such a waiver should be made to the Secretary of the College.

STUDENT HOUSING AND DINING ARRANGEMENTS

UNDERGRADUATE STUDENTS

MEN . . . Cornell University provides, on the campus, comfortable dormitory facilities for approximately 2,000 men. These dormitories are a five-minute walk from the center of the campus and are situated on a fifteen-acre plot to the west of the main campus and overlooking Cayuga Lake to the north, the valley to the south. The area is bounded by West, University, and Stewart Avenues and Campus Road. The dormitories in this area are divided into two main groupings, the Baker Group and University Halls.

The Baker Group, comprised of Baker Tower, Founders Hall, North Baker Hall, South Baker Hall, Mennen Hall, Lyon Hall and McFaddin Hall, is of fireproof construction, English collegiate in design, and affords accommodations for approximately 650 men.

University Halls, comprised of Units 1-6, were opened in 1954 and accommodate 1350 men. They are of modern fireproof construction and offer excellent study, social, and recreational facilities.

Students not assigned to dormitories under direct supervision of the University secure quarters in fraternity houses (for members only), rooming houses, cooperative houses, and private homes.

Application forms for University dormitories will be mailed automatically by the Office of Admissions to each male candidate for admission as a freshman or to a transfer student at the time of notification of provisional acceptance to the University. Housing in University dormitories can be guaranteed for entering freshman students who have been admitted to the University and have filed dormitory applications by June 1.

Cornell men are at liberty to dine wherever they choose; but within its varied food service program, Cornell offers a special dining arrangement for its student men. This meal plan, which is entirely optional in every way and available to any Cornell man, incorporates many desirable features. It provides for the prepayment of dining fees on a semester basis, and it affords worthwhile savings in food costs. The plan offers a selection of dining rooms: Willard Straight Hall, the student union building; Baker Cafeteria in University Hall, Unit I; Noyes Lodge on Beebe Lake; the College of Home Economics Cafeteria in Martha Van Rensselaer Hall; and the Dairy Bar-Cafeteria in Stocking Hall. Devised to meet student needs, this dining arrangement encourages good eating habits in comfortable surroundings; it is designed for economy and convenience, and allows for a wide menu selection and a liberal mealtime schedule.

WOMEN . . . Cornell University provides comfortable, well-furnished dormitories and dining rooms for undergraduate women attending the University.

Undergraduate women are required to live in University-operated dormitories or sororities (for members only) unless, because of exceptional circumstances, other arrangements are approved by the Office of the Dean of Students.

An application form for living accommodations for undergraduate women will be sent to each candidate by the Office of Admissions with the notice of provisional acceptance to the University.

GRADUATE HOUSING

Sage Hall, the graduate center, provides dormitory housing for approximately 200 men and women. Sage Hall is located in the center of the campus and is convenient to all colleges. Dining facilities are provided within Sage Hall and are operated as a public cafeteria.

Off-campus housing is available in the Ithaca area in apartment houses, rooming houses, and private homes.

HOUSING FOR MARRIED STUDENTS

Facilities for married students include Cornell Quarters, containing 34 duplex dwellings consisting of two two-room apartments and 16 four-room cottages. Pleasant Grove Apartments offers 64 one-bedroom and 32 two-bedroom apartments. Hasbrouck Apartments, completed in 1962, contains 198 two-bedroom apartments and 48 one-bedroom apartments. All apartments for married students are unfurnished.

Detailed information on all types of housing, including off-campus housing for men and married students, may be obtained by writing the Department of Residential Halls, Day Hall.

DEPARTMENTS OF INSTRUCTION

WITH OUTLINES OF COURSES THAT MAY BE CHOSEN BY
REGULAR OR SPECIAL STUDENTS AS AGRICULTURAL ELECTIVES

Special notice. Unless otherwise noted, all courses are given in the buildings of the College of Agriculture. Courses enclosed in brackets will not be given in 1963-1964.

Courses numbered from 1 to 99 are open to undergraduates generally; courses numbered from 100 to 199 are intended primarily for upperclassmen and graduates; courses numbered from 200 up are intended primarily for graduates.

ORIENTATION

1. Orientation. Fall term. Credit one hour. Required of all freshmen in Agriculture. One lecture-discussion period a week, M 10, 11; T 10; W 9; Th 10; F 9, 10, or 11. Warren 160 or 201. *Professors* Harden, Hertel, and Tyler.

5. Orientation. Fall or spring term. Credit three hours. The credit is not counted toward the 120 hours required for the degree. Fall term: for entering students only, M W F or T Th S 9 or 10. Warren 37. Spring term: may be elected by first- or second-year students only; sections for two-year students, M W F 11; for four-year students, M W F 12. Warren 160. *Dr.* ——. Emphasis on the analysis and reasoning involved in the solution of work problems which have been drawn mainly from College of Agriculture courses requiring the use of mathematics.

10. Introductory College Mathematics. Fall or spring term. Credit three hours. M W F 8, T Th S 8. Warren 37. M W F 12. Warren 231. *Dr.* Geiselmann.

Designed to give students with a sound high school mathematics background a unified treatment of the basic ideas of college algebra, trigonometry, and analytic geometry. Selection of topics will be made from the following:

- (a) Exponents, radicals, logarithms, and the slide rule.
- (b) Quadratic and higher degree equations.
- (c) The binomial theorem, permutations, combinations, and probability.
- (d) Determinants, mathematical induction, topics from analytic geometry, and topics from trigonometry.
- (e) Maxima, minima, limits, curve tracing.

Throughout the course considerable emphasis will be placed upon: the concept of function, graphing, problem solving, and methods of proof. A term paper will be required.

11. Applied Calculus. Fall or spring term. Credit one hour. Registration restricted to students who are also enrolled in Mathematics 111. Enrollment limited to twenty students. Th 7-9 p.m. Warren 37. *Dr.* Geiselmann.

Designed for students in agriculture who are enrolled in Mathematics 111 and who should profit from an extended treatment of the topics covered. Special emphasis will be placed on the application of analytic geometry and differential and integral calculus to the problems encountered in agricultural and related sciences. One hour of lecture and discussion followed by a one-hour computation period.

AGRICULTURAL ECONOMICS

Courses in this Department provide instruction in the fields of farm management, prices, business management, public ad-

ministration and finance, marketing, land economics, food distribution, agricultural policy, and economic development.

FARM MANAGEMENT

102. Farm Management. Spring term. Credit five hours. Not open to freshmen. This course should be preceded by as many as possible of the courses dealing with the production of crops and animals. Lectures, M W F 10. Warren 45. Laboratory: for undergraduate students, T W Th or F 2-4; for graduate students, F 4-6. Warren 101. On days when farms are visited, the laboratory period is 1:30-5:30. *Professor Warren.* A study of the organization and operation of the farm from the point of view of efficiency and continuous profit; farm records, farm business analysis, factors affecting profits, size of business, choice of enterprises, partnership arrangements, getting started in farming, planning the organization and management of specific farms. One all-day trip and five half-day trips are taken to visit farms in near-by regions.

103. Farm Cost Accounting. Fall term. Credit three hours. Prerequisite, Course 102. Lectures, W F 8. Laboratory, W or F 2-4. Warren 160. Prelims will be held in the evening. Brief weekly conferences to be arranged. *Professor Kearl.* Cost-accounting methods and procedures as applied to farms. Topics considered are the organization of accounts, methods of recording information, methods of depreciation determination, methods of cost allocation, summarization and analysis of accounts, making financial and operating statements, and studying farm businesses from the standpoint of management and research.

104. Farm Management. Spring term. Credit three hours. Prerequisite, Course 102. F 2-4, S 8-10. Warren 160. *Professor Cunningham.* Study of the organization and operation of major types of farms in different regions of New York State, with particular reference to land, market, and other resources. Field trips are taken, either Friday afternoons or Saturdays all day. One overnight trip is taken.

105. Farm Finance. Spring term. Credit three hours. Prerequisite, Course 102. Lectures, T Th 10. Discussion, T 2-4. Warren 145. *Professor Smith.*

A study of sound financial arrangements for farmers and the credit institutions which serve them. Emphasis is placed on aspects of farm management relating to obtaining and using capital. Alternative sources of credit are analyzed and consideration given to safe and profitable debt levels and selection of alternative investment opportunities. Insurance programs, family financial planning,

and retirement and estate planning for farmers are also studied.

106. Farm Appraisal. Fall term. Credit three hours. Prerequisite, Course 102. Lecture, T 10. Laboratory, T 1-5. Warren 101. *Professor Warren.*

A study of factors governing the price of farms, methods of farm valuation, and practice in the appraisal of farms of various types.

108. Production Economics. Spring term. Credit three hours. T Th 11. Discussion, to be arranged. Warren 232. *Assistant Professor Barker.*

A study of the principles and concepts of agricultural production economics.

206. Farm Organization in United States. Fall term. Credit three hours. Enrollment limited to graduate students from countries other than the United States and Canada. Lecture, W 10. Laboratory and field trip, W 1:30-5:50. Warren 101. *Professor Warren.*

A study of the organization and operation of farms in the United States, from the point of view of efficiency and continuous profit. Intended to acquaint students from other countries with farm organization in the United States, to serve as a basis for deciding on the adaptation of United States ideas to the circumstances of other regions. Visits to representative farms, study of research results in the field of farm management, and analysis of farm records.

207. Farm Management Research Methods. Fall term. Credit two hours. Open only to graduate students. F 2-4. Warren 232. *Professor Stanton.*

A discussion of problems involved in doing farm management research. Emphasis is placed on the organization of research projects, sources and methods of obtaining data, sampling, and the different methods of analyzing data commonly used by research workers in this field.

208. Farm Resource Allocation. Fall term. Credit three hours. Open only to graduate students. Lectures, M W F 12. Warren 160. *Professor Robinson.*

A review of economic theory, statistical methods, and empirical studies applicable to resource allocation problems in agriculture. Topics discussed include production functions, linear programming, interindustry studies, and game theory.

PRICES AND STATISTICS

Attention is directed to courses in mathematics and statistics in the Colleges of Arts and

Sciences and Engineering and in the School of Industrial and Labor Relations.

111. *Introductory Statistics*. Fall term. Credit three hours. Lectures, T Th 11. Warren 45. Laboratory, M T W or Th 2-4, or W 10-12. Warren 360. *Professor Stanton*.

An introduction to procedures and methods of analysis used in the study of agricultural and economic data. Frequency distributions, measures of central tendency and dispersion, index numbers, time series analysis, simple regression and correlation, point and interval estimation, and tests of hypotheses are covered.

115. *Prices*. Spring term. Credit three hours. Prerequisite, Economics 103 and junior, senior, or graduate standing. Lectures, M W F 8. Warren 231. *Assistant Professor Tomek*.

A study of commodity prices including the economic forces affecting price and the institutional framework within which pricing takes place. This is an applied course with price theory used as a guide. Elementary methods of price analysis are discussed.

215. *Seminar in Price Analysis*. Spring term. Credit two hours. Primarily for graduate majors in agricultural economics. The student should have preparation in economics and statistics at the level of Economics 311 and I. & L.R. 311. Time to be arranged. *Assistant Professor Tomek and Professor Stanton*.

A study of analytical tools used in demand and supply analysis. This study includes development of economic models and specific statistical models. Single equation and simultaneous equations methods of estimating coefficients of statistical models are discussed. Interpretation of results and limitations of such analyses are considered.

BUSINESS MANAGEMENT

Attention is directed to the courses in administrative engineering in the College of Engineering, in economics in the College of Arts and Sciences, and in administration in the School of Hotel Administration and the Graduate School of Business and Public Administration.

121. *Accounting*. Fall term. Credit three hours. Lectures, M F 11. Warren 45. Laboratory, T or Th 8-10; M T W or Th 2-4. Warren 201. First class of term on Friday. *Associate Professor Carpenter*.

A comprehensive survey of basic accounting principles. Some analysis and interpretations of financial statements with special emphasis on agricultural businesses.

122. *Accounting*. Spring term. Credit three hours. Prerequisite, Course 121 or its equivalent. Lectures, T Th 11. Warren 45. Laboratory, T or W 2-4. Warren 260. *Professor*

Consideration of corporation and partnership accounting, asset valuation, income determination, special problems, and interpretation and use of financial statements. Emphasis is placed on special problems of agricultural business.

125. *Business Management*. Fall term. Credit three hours. Prerequisite, Courses 122, 140, and Economics 103. Lectures, M W F 8. Warren 245. *Professor* ———.

An introductory course in principles of business management, with emphasis on organizing and financing an operation, administrative and fiscal management policies and practices, and changes in structural organization. Designed especially for students who are planning careers in agricultural business.

126. *Farmers' Cooperatives*. Spring term. Credit three hours. Lectures, M W 9. Warren 45. Discussions, W or Th 2-4. Warren 145. *Associate Professor Carpenter*.

What cooperatives are, what they have tried to do, and what they have done; their legal status and special problems of organization, finance, and control.

127. *Business Law*. Fall term. Credit three hours. Lectures, M W F 9. Warren 231. Limited to upperclassmen. *Professor* ———.

Consideration is given chiefly to legal problems of particular interest to persons who expect to engage in business, including contracts, liens, mortgages, and negotiable instruments, automobile and other insurance, ownership and leasing of property; wills; estates; inheritance taxation; and other practical problems.

128. *Economics of Managerial Decisions*. Spring term. Credit three hours. Prerequisites, Economics 103 and Course 121 or their equivalents. Lectures, M W F 9. Warren 145. *Assistant Professor Aplin*.

Emphasis is placed on identifying problems in a business, recognizing alternatives, and using economic data as guides to making decisions in agriculture marketing firms. Principal topics considered include sales forecasting, cost estimation and control, pricing policies of a firm, and planning capital investments. Class discussion is supplemented by case studies to illustrate concepts and techniques available to management to assist them in making sound decisions.

- 226. Seminar in Agricultural Cooperation.** Spring term. Credit two hours. Open only to graduate students. T 4-6. Warren 204. *Associate Professor Carpenter.*

A discussion of the economic theory concerning farmer cooperatives. Special attention is given to problems of financing, management, control, and membership relations peculiar to farmer cooperatives.

PUBLIC ADMINISTRATION AND FINANCE

- 130. Rural Government.** Fall term. Credit three hours. Lectures, T Th 9. Warren 145. Discussion period, T or Th 2-4. Warren 31. *Professor Lutz.*

Government in the United States with emphasis upon examination, analysis, and resolution of public issues confronting leadership in open-country areas of New York. Government organization, administration, functions, and finance are discussed in this context.

- 138. Taxation.** Fall term. Credit three hours. Open to juniors, seniors, and graduate students. Lectures, M W F 11. Warren 145. *Assistant Professor Luykx.*

A study of the principles and practices of public finance, with emphasis on taxation. Among the topics examined are the growth of public expenditures and its causes; historical changes over time in sources of revenue; and property, inheritance, business, and personal income taxation.

- 230. Seminar on Comparative Rural Government.** Spring term. Credit two hours. Open only to graduate students. Time to be arranged. *Assistant Professor Luykx.*

An examination of formal and informal institutions which play a part in the management of rural public affairs in developing countries. Emphasis will be placed on the analyses of their functions, organization, and means of support in specific situations.

- 237. Administration of Public Agricultural Programs.** Spring term. Credit two hours. Primarily for graduate students. Undergraduate registration by permission of the instructor. F 2-4. Warren 260. *Professor Lutz.* An examination of government organizations for administering and financing public agricultural programs; a study of some problems of administration and finance, including organization of agencies, management of personnel, budgetary management, interagency relationships (national, state, and local), and relationships among national, state, and local levels of government. Course 130 or

one or more courses in government and public administration are desirable before taking this course.

MARKETING AND FOOD DISTRIBUTION

- 140. Marketing.** Fall or spring term. Credit three hours. Lectures: fall term, M W F 10; spring term, M W F 11 except for weeks when field trips are taken, then M F lectures only. Warren 45. Field trips, T W or Th 1:30-5:30. *Professor Darrah.*

A study of how farm products are marketed. Special attention is given to the consumption of farm products, the factors that affect consumption, production areas, market channels, the operation of different marketing agencies, marketing services, and costs. One all-day and five half-day trips are taken to visit marketing agencies.

- 143. Pricing and Distribution of Market Milk.** Fall term. Credit three hours. Lectures, M F 11. Warren 345. Discussion period, F 2-4. Warren 260. *Professor Story.* A study of the marketing system for milk and how it is changing. Also a study of methods and principles of pricing milk, with special attention to federal and state milk orders.

- 145. Field Study of Food Industries.** Spring term. Credit two hours. Registration by permission. W 12. Warren 245. *Professor Earle.* Observations are made of the organization and operation of businesses in the food industry. Trips are made to manufacturers, processors, wholesalers, and retail firms throughout the term. Four days of spring vacation are spent in New York City and Philadelphia visiting food distribution firms.

- 147. Marketing Institutions.** Spring term. Credit two hours. Prerequisite, Course 140 or its equivalent. Enrollment limited to 40. M 12. Warren 245. *Professor Dominick.* Economic functions performed by various types of specialized marketing agencies, with an emphasis on their physical operating patterns. Five days of spring vacation are spent in New York City inspecting and studying the major terminal marketing institutions. Total cost of the trip need not exceed \$50 in addition to transportation to and from New York.

- 148. Food Distribution.** Fall term. Credit three hours. Open to seniors and graduate students. Prerequisites, Courses 125 and 140. M W F 10. Warren 245. *Professor Earle.* An analysis of the factors affecting food

distribution costs, prices, and the consumption of food products; a study of the structure and the changing pattern of the food industry, with a description and analysis of the services performed by the various marketing agencies.

149. Food Industry Management. Spring term. Credit three hours. Open to seniors and graduate students. Prerequisite, Course 148. M W F 10. Warren 245. *Professor Earle.*
A study of management principles as they apply to the operation of organizations in the food industry.

240. Introduction to Marketing Research. Spring term. Credit two hours. Enrollment limited to graduate students. M 2-4. Warren 201. *Professor Brunk.*
Objectives of marketing research, organization of research agencies, selecting and planning projects, preliminary investigation procedures, surveys, experimental designs, methods engineering, case studies, field and office supervision, preparation of reports, and application of results.

241. Food Merchandising and Promotion. Fall term. Credit two hours. Enrollment limited to graduate students. T 2-4. Warren 345. *Professor Brunk.*
A seminar course exploring alternative merchandising and promotional devices used in the foods industry with special attention given to identification and measurements of basic forces having an impact on buying behavior.

242. Market Organization and Structure. Fall term. Credit two hours. Open only to graduate students. Registration by permission. M 2-4. *Professors Story and Brunk.*
A seminar course exploring the relationship of market organization and structure to the combined efficiency of production and marketing processes. Alternative market structures will be examined with respect to supply arrangements, market outlets, business considerations, and environmental conditions.

245. Special Problems in Milk Marketing. Credit two hours. Open to graduate students majoring or minoring in dairy marketing and business management. Time to be arranged. *Professors Spencer and Story and Assistant Professor Aplin.*
Each term special topics will be selected for study, such as provisions and administration of federal and state milk control programs, costs of processing and distribution, market structure, and consumer preferences and demands.

[246. Research in the Pricing and Distribution of Milk. Spring term. Registration by permission of the instructor. Credit two hours. *Professors Spencer and Story and Assistant Professor Aplin.*] Not given in 1963-1964.
Selection and delineation of problems to be studied, a critical review of past and current research, planning new research projects, research organization and finance, ways of bringing about more general acceptance of findings and more prompt adoption of recommendations from research projects in this field.

248. Seminar in Food Distribution. Fall term. Credit two hours. F 2-4 p.m. Warren 401. *Professor Earle.*
Leading authorities in the food industry are guest discussion leaders. Emphasis is placed on the relation of the food industry to the economy, sources of supply, and a descriptive survey of the functions and trends among marketing organizations in the food industry. Topics discussed are concurrent with those in Course 148.

249. Seminar in Food Industry Management. Spring term. Credit two hours. F 2-4 p.m. Warren 401. *Professor Earle.*
Leading authorities of the food industry are guest discussion leaders. Emphasis is placed on the management aspects of operating and coping with the problems of firms in the food industry. Topics discussed are concurrent with those in Course 149.

AGRICULTURAL POLICY AND ECONOMIC DEVELOPMENT

50. Agricultural Geography. Fall term. Credit four hours. Lectures, M W F 9, Warren 45; or M W F 11, Warren 131. Discussion, W Th or F 2-4, or W 7-9. Warren 345. *Assistant Professor Sisler.*

The economics and geography of the world's agriculture, providing a basis for understanding past development and future changes in agriculture. Elementary economic principles, historical development, physical geography, and population growth are studied in their relation to agricultural development and the economic problems of farmers. Particular emphasis is placed upon study of the agriculture of various farming regions of the United States, their economic problems and competitive situation.

151. Public Problems of Agriculture. Fall term. Credit three hours. Open to juniors, seniors, and graduate students. Two lectures plus one discussion section each week. Lec-

tures, T Th 9. Warren 45. Discussion sections, W 2. Th 11 or 2, or F 10. Warren 260. *Professor Robinson.*

A review of the economic characteristics of agriculture as an industry and the problems associated with agriculture which are likely to call for government action. Federal farm programs suggested or enacted during recent decades are analyzed. Among the topics discussed are farm price supports, land tenure, credit arrangements, and soil conservation programs.

- 152. *Agricultural Land Economics.*** Spring term. Credit four hours. Primarily for juniors, seniors, and graduate students. For undergraduates, Courses 50 and 102 should precede or accompany this course. Lectures, M W F 9. Warren 245. Discussion and laboratory, primarily for undergraduate students, Th 2-4; primarily for graduate students, T 2-4. Warren 160. When field trips are taken, the laboratory period is 1-5:30. *Professor Conklin.*

Physical land variability, systems of physical land classification, fundamental economic concepts, traditional and revised theories of land use and farming returns, systems of economic land classification, patterns of change in land use, the effect of institutional arrangements upon land use, problems of conservation, and factors involved in land-policy formation. Four field trips are taken.

- 154. *Economics of Agricultural Development.*** Spring term. Credit three hours. Open to juniors, seniors, and graduate students. Prerequisite, Course 50 or consent of the instructor. Lectures, T Th S 9. Warren 345. *Associate Professor Mellor.*

A discussion of the special problems of agricultural development, particularly in low per-capita income areas and countries. Attention will be devoted to the relationship between development in agriculture and in other sectors of the economy, capital and capital formation, the role of land and land reform, increasing efficiency in resource use, coordination problems in agricultural development, and the like.

- 251. *Seminar in Agricultural Policy.*** Spring term. Credit two hours. Open only to graduate students. M 2-4. Warren 160. *Professor Robinson.*

An analysis of current agricultural policies and proposed programs in the United States and selected foreign countries.

- 252. *Special Problems in Agricultural Land Economics.*** Fall or spring term. Credit one or more hours. Open only to graduate stu-

dents. Prerequisite, Course 152 and permission of the instructor. *Professor Conklin.* Special work on any subject in the field of land economics that is of particular interest to the student. The student normally is expected to prepare a report on his work that is suitable for mimeograph reproduction and distribution.

- 253. *Principles of Research in Agricultural Production Economics.*** Spring term. Credit three hours. Open only to Ph.D. candidates. S 9-12. Warren 260. When field trips are taken, S 9-6. *Professor Conklin.*

The general problem of acquiring knowledge; major philosophical patterns of thought including rationalism, empiricism, relativism, and experimentalism; the past research continuum in agricultural production economics; the forces that guide choices among research alternatives; current research and future possibilities. Field trips are designed to supplement discussions of actual and possible research efforts.

- 254. *Seminar on the Economics of Agricultural Development.*** Spring term. Credit two hours. Open only to graduate students who have completed Course 154 or its equivalent. Times to be arranged. *Associate Professor Mellor.*

More advanced study of the subject matter of Course 154.

- 255. *Seminar on Latin American Agricultural Policy.*** Fall term. Credit two hours. Registration by permission of the instructor. Time to be arranged. *Professor Barraclough.* An examination of policies for the development of agriculture in Latin America including treatment of land tenure and the planning process.

- 195. *Undergraduate Research.*** Fall and spring terms. Credit one to three hours depending upon the problem undertaken and the extent and quality of work done. A student desiring to register must obtain the written permission of a professor who will supervise the work. Open to seniors with grade averages of 80 or higher. Designed to afford opportunities for outstanding undergraduates to carry out independent studies of suitable problems under appropriate supervision.

- 290. *Seminar in Agricultural Economics Extension.*** Fall term. Credit two hours. Primarily for graduate students. M 2-4. Warren 448. *Professor C. A. Bratton.*

The scope and nature of agricultural economics extension work will be considered. This will include early development of ex-

tension work in agricultural economics, objectives of agricultural economics extension; how programs are developed; extension methods used; and the importance of coordinating research and extension projects.

AGRICULTURAL ENGINEERING

Four-year students in the College of Agriculture with a major interest in a semitechnical agricultural engineering program may elect a varied sequence of courses that will prepare them for opportunities with many of the industries, organizations, and agencies serving agriculture or for farming enterprises which increasingly require understanding and application of engineering principles. A suggested sequence of courses may be obtained directly from the department.

Students interested in a professional career in agricultural engineering for research, teaching, extension, design, product development, and manufacturing must take a prescribed sequence of courses that leads to a Bachelor of Agricultural Engineering degree granted by the College of Engineering. The detailed curriculum may be found in the *Announcement of the College of Engineering*.

1. **Elements of Agricultural Engineering.** Fall or spring term. Credit three hours. Lectures, T Th 10. Recitation period, F 11 or 12. Riley-Robb 125. Laboratory, M T W Th or F 2-4:30. Riley-Robb 160. Fall term, Assistant Professor Rehkugler. Spring term, Assistant Professor Ludington.

An introductory course covering basic principles of farm structures, electric power and processing, soil and water conservation, and power and machinery. Some of the topics included are farm wiring, electric motors, elementary statics and structural design, refrigeration, water pumps and systems, internal combustion engines, machinery, and soil and water engineering problems. Emphasis is placed upon the application of basic physical principles to the solution of agricultural engineering problems.

2. **Introduction to Agricultural Engineering.** Spring term. Credit two hours. Lecture, M 11. Laboratory, W 11. Riley-Robb 105. Limited to students in the five-year agricultural engineering curriculum. Selected staff. An introduction to the application of engineering principles to problems in agriculture, with a brief history of the development of agricultural engineering in the United States. Problems that are of primary interest to the agricultural engineer

are used to provide understanding of the application of principles and to test the students' comprehension of the subject matter.

The seminar is designed to familiarize students with the extension phase of agricultural economics.

4. **Mechanical Drawing.** Fall or spring term. Credit three hours. Lectures, T Th 8. Riley-Robb 105. Laboratory: fall term, W 1:40-4:30 or Th 1:40-4:30; spring term, W 1:40-4:30. Riley-Robb 425. Limited to 40 students per laboratory. Book and supply lists are available at the book stores. Associate Professor Furry.

Graphic presentation, including lettering, use of instruments; orthographic projection of multiview drawings including sections, auxiliaries, plans and elevations; pictorial drawing, graphs and charts; elementary descriptive geometry; and the practical applications of these principles to simple problems. Both machine drawing and architectural drawing conventions and practices are discussed and employed in the solution of drawing problems.

5. **Advanced Mechanical Drawing.** Spring term. Credit three hours. Prerequisite, Course 4 or sufficient high school drawing. Lectures, W F 8. Laboratory, Th 1:40-4:30. Riley-Robb 425. Limited to 40 students. Book and supply lists are available at the book stores. Associate Professor Furry.

A continuation of Course 4 with work on machine drawing, including assembly drawings; intersections; developments; descriptive geometry; sectional and auxiliary views; and the use of conventional practices and symbols. Also studied are graphical methods related to other engineering courses and practical engineering problems; these include engineering graphs and charts; nomography; vector geometry and graphical calculus.

The student will be allowed to perform much of his drawing work with the aid of drafting machines. Advanced drafting techniques are also discussed, illustrated, and employed as time permits.

21. **Farm Surveying.** Spring term. Credit three hours. Prerequisite, trigonometry. Lectures, M W 10. Recitation, F 10. Riley-Robb 105. Laboratory, M T or W 2-4:30. Riley-Robb 15. Assistant Professor Black.

A study of the use and care of the simpler surveying equipment. Special emphasis is placed on its application to farm problems. This course cannot be substituted for the surveying requirement of the five-year agricultural engineering program.

31. **Farm Structures.** Fall term. Credit three hours. Prerequisites, intermediate algebra and physics. Lectures, M W F 8. Riley-Robb 105. *Assistant Professor Lorenzen.*

The elementary problems of farm buildings; a study of basic structural requirements, insulation, ventilation, and functional requirements for farm animals.

32. **Farm Structures Laboratory.** Fall term. Credit two hours. Open only to agricultural engineering students who are currently taking or have previously taken Course 31 and Drawing 4. Laboratory, Th 1:40-4:30. Riley-Robb 325.

On days that field trips are taken the laboratory will start at 1. Four trips are scheduled. *Assistant Professor Lorenzen.*

Designed to teach some of the practical applications of basic design principles to farm-building construction. Includes practical work in the mixing and testing of concrete, visits to some of the farm buildings on the campus to see different types of construction, and some work on the general design and layout of farm buildings for efficiency of operation.

40. **Woodworking and Carpentry.** Spring term. Credit two hours. Open to all students. Lecture, T 9. Riley-Robb 125. Laboratory, M T or Th 1:40-4:30 or Th 8-10:50. Riley-Robb 70. Limited to twenty students per section. *Professor Foss.*

Designed to acquaint the student with the woodworking, carpentry, concrete, tool-fitting, and wood-finishing jobs common to the farm and home. The skill in use of both hand and power tools is emphasized in the construction and repair of farm equipment. A field trip is included to a local woodworking plant and sawmill.

42. **Farm Metal Work.** Fall or spring term. Credit two hours. Open to all students. Lecture, Th 9. Riley-Robb 125. Laboratory including metal lathe work, M 1:40-4:30. Laboratory not including metal lathe work, T 8-10:50, or T or Th 1:40-4:30. Riley-Robb 60 and 64. Limited to 20 students per laboratory section. *Assistant Professor Lechner.*

A course giving instruction and practice in the fundamentals of electric arc welding, oxyacetylene welding, sheet metal work, pipe fitting, hot and cold metal work, and

metal lathe work as they apply to farm shop work for both repair and construction jobs.

43. **Advanced Farm Metal Work.** Fall or spring term. Credit one or two hours. Prerequisite, Course 42, its equivalent, or permission of instructor. Laboratory for one credit, F 1:40-4:00; for two credits, one additional 2½ hour laboratory to be arranged. Riley-Robb 60 and 64. *Assistant Professor Lechner.*

Students may take machine shop practice in fall term. Advanced farm welding, or metal project construction, or redesign offered in spring term. The latter must be taken in conjunction with advanced farm welding for two credits.

101. **Electricity on the Farm.** Spring term. Credit three hours. Open to juniors and seniors. Prerequisite, Course 1 or Physics 102 or the equivalent. Lectures, T Th 10. Riley-Robb 105. Laboratory, T or Th 2-4:30. Riley-Robb 164. *Professor Shepardson.* The application of electricity for light, heat, and power on farms, with emphasis on the principles of operation, selection, and installation of electrical equipment for the farmstead. Laboratory sections are combined for one half-day field trip.

102. **Farm Power.** Fall term. Credit three hours. Open to juniors and seniors. Prerequisite, Course 1 or Physics 101 and 102, or the equivalent. Lectures, T Th 11. Riley-Robb 125. Laboratory, M T W or Th 2-4:30. Riley-Robb 74. *Professor —.*

A study of the principles of operation and adjustment of internal combustion engines and their farm applications. Principal emphasis on farm tractors, including care and operation, power transmission, power requirements, and economic factors.

103. **Field Machinery.** Spring term. Credit three hours. Not open to freshmen. Prerequisite, Course 1 or Physics 101 and 102, or the equivalent. Lectures, T Th 11. Riley-Robb 125. One recitation period, F 8, 9, 10, 11, or 12. Riley-Robb 225. Laboratory, M T W or Th 2-4:30. Riley-Robb 74. *Associate Professor Millier.*

A study of the use, care, operation, and adjustment of farm field machines. Machines in each of the major groups, tillage, seeding, harvesting, processing, spraying and dusting, fertilizing, and crop loading are included.

105. **Engineering Drawing.** Fall term. Credit four hours. Open only to five-year engineering students. Lectures, M W 8. Laboratories,

T F 1-4:30. Riley-Robb 425. *Associate Professor Furry.*

Designed to promote an understanding of the engineer's universal graphic language. The lectures will deal primarily with spatial relationships involving the problem-solving techniques of descriptive geometry. The laboratories will develop a working knowledge of drawing conventions, standard and advanced drafting techniques, and their application to machine, architectural, and pictorial drawing problems. Graphs and engineering graphics (nomography and graphical calculus) will also be included. Students will accomplish their work with drafting machines as well as the standard T-square and board. Department equipment will be utilized to reproduce selected drawing exercises to illustrate the techniques involved and verify line work quality. The first half hour of the laboratory will be utilized as an instruction-recitation period. Laboratories will be conducted to promote learning through informal student-teacher contact.

121. Soil and Water Conservation. Spring term. Credit two hours. Prerequisite, Agronomy 1 or equivalent. Course 21 is recommended. Must be taken with Agronomy 121. Lecture, F 9. Riley-Robb 105. Laboratory, M or T 2-4:30. Riley-Robb 72. *Associate Professor Levine.*

A study of the principles and practices used in soil and water conservation. Engineering aspects of erosion control, water management and storage, drainage, and irrigation receive primary consideration. One all-day field trip is taken on a Saturday.

202. Farm Power. Fall term. Credit three hours. Prerequisite, Engineering 3601 or the equivalent. Lectures, laboratory, and computing periods. Time and place to be arranged. *Professor —.*

Thermodynamic principles applied to internal combustion engines. Applications of kinematics and dynamics to tractor design and field use. Elements involved in proper construction, selection, and operation of farm tractors. Emphasis on writing of engineering reports.

203. Agricultural Machinery Design. Spring term. Credit three hours. Prerequisite, Engineering 3341 or the equivalent. Two lectures, one laboratory. Time and place to be arranged. *Professor Gunkel.*

The principles of design and development of agricultural machines to meet functional requirements. Emphasis is given to stress analysis, selection of materials of construction, and testing procedures involved in machine development.

220. Surveying. Spring term. Credit two hours. Primarily for students in the five-year agricultural engineering curriculum. One lecture, one laboratory. Time and place to be arranged. *Associate Professor Levine.*

A study of the principles and practices of surveying measurements. Fundamentals of measurement, sources of errors. Use of steel tape, engineer's level, transit and plane table. Emphasis upon agricultural engineering applications.

221. Soil and Water Engineering. Spring term. Credit three hours. Prerequisites, Course 220, Engineering 2302, and Agronomy 1, or their equivalents. Two lectures, one laboratory. Time and place to be arranged. *Assistant Professor Black.*

An advanced course in the application of engineering principles to the problems of soil and water control in agriculture. Includes design and construction of drainage systems and farm ponds; and design and operation of sprinkler systems for irrigation.

231. Farm Structures Design. Spring term. Credit three hours. Prerequisites, Engineering 2732 and 3605 or their equivalents. Lectures, T Th 8. Laboratory, W 2-4:30. Riley-Robb 325. *Professor Boyd.*

An advanced course in the application of structural design principles to farm buildings. Includes functional requirements, characteristics of materials, structural design, and the principles of environmental control in farm buildings.

241. Low-Cost Roads. Credit three hours. Primarily for foreign students. Offered upon sufficient demand in fall term. Prerequisite, consent of instructor. Principally directed study with one two-hour discussion period per week to be arranged. *Professor J. W. Spencer.*

Study of economic importance of adequate roads; road improvement planning and programming; location and geometric design; engineering soil characteristics and classification; drainage; stabilization methods; dust palliatives; wearing surfaces.

251. Special Problems in Agricultural Engineering. Fall or spring term. Credit one or more hours. (Normally reserved for seniors in upper two-fifths of class.) Prerequisites, adequate ability and training for the work proposed, and permission to register. Staff. Special work in any branch of agricultural engineering on problems under investigation by the department or of special interest to the student, provided, in the latter case, that adequate facilities can be obtained.

253. *Special Topics in Agricultural Engineering.* Fall and spring terms. Credit one hour. Open only to seniors. T 12. Riley-Robb 225. *Professor French.*

Presentation and discussion of the opportunities, qualifications, and responsibilities for positions of service in the various fields of agricultural engineering.

300. *General Seminar.* Fall and spring term. Required of graduate students. M 12:30. Riley-Robb 400.

Presentation and discussion of research and special problems in agricultural engineering. Staff.

301. *Technical Seminar.* Spring term. Credit one or two hours. Time to be arranged. Riley-Robb 205. Staff.

Thorough investigation and discussion of research in a special area of interest to those enrolled.

310. *Research Methodology.* Fall term. Credit three hours. Lectures, T Th 11. Riley-Robb 105. Laboratory, F 2-4:30. Riley-Robb 325. *Professor Boyd.*

Selecting, planning and conducting research including literature review, experimental design, collection and analysis of data, progress report writing and budgeting. Use of dimensional analysis to develop general equations to define phenomena. Principles of similitude with reference to both agriculture and engineering.

AGRONOMY

Students majoring in agronomy have a choice of three curricula: (1) general agronomy; (2) field crops; and (3) soil science (including soil conservation). The first curriculum is for students with a general interest in the production of crops as influenced by soil properties, crop management, and culture. Ample opportunity will be given for adequate training in agronomy and related agricultural fields. Somewhat less emphasis is placed on the sciences in the general agronomy curriculum.

The field crops and soil science curricula are for students who want to specialize in these more specific fields. They will be expected to take more basic courses in the physical and biological sciences. Students interested in preparation for graduate training should choose either the field crops or soil science curriculum.

SOIL SCIENCE

1. *Nature and Properties of Soils.* Fall or spring term. Credit four hours. Prerequisite, Chemistry 101 or 105 or Biochemistry 2. Lectures, M W F 9. Caldwell 100. Laboratory; fall term, M T W Th or F 2-4:30; or T or Th 10-12:30; spring term, M T W Th or F 2-4:30; or S 8:30-11. Caldwell 49. Fall term, primarily for two-year students; limited number of four-year students will be admitted with consent of instructor. Spring term limited to four-year students. Fall term, *Professor Lathwell.* Spring term, *Professor ———.*

A comprehensive introduction to the field of soil science with emphasis on scientific principles and their application in solutions of practical soil management problems.

90. *Undergraduate Agronomy Seminar.* Spring term. Credit one hour. Prerequisites, Courses 1 and 11 or the equivalent. Th 12. Criticism by appointment. Warren 37. *Professor ———.* Each student is expected to give a talk on an article from the recent scientific literature in agronomy. Additional outside reading will be required.

101. *Identification, Appraisal, and Geography of Soils.* Spring term. Credit four hours. Prerequisite, Course 1 or permission of the instructor. Lectures, M W F 11. Laboratory, M or F 2-4:30. Warren 37. *Professor Cline.* The soil as a natural body. Principles of identification and classification of geographic units of soil and interpretation of such units for applied objectives. Geography of major kinds of soil of North America in relation to environment and cultural patterns. Field practice in characterizing, mapping, and interpreting geographic soil units.

103. *Organic Soils.* Fall term. Credit two hours. Given in alternate years. Prerequisite, Course 1. Lecture, T Th 9. Warren 31. *Professor Dawson.*

Physical and chemical properties of organic soils used for crop production and soil conditioning. One all-day Saturday field trip.

[104. *Forest Soils.* Fall term. Credit two hours. Given in alternate years. Prerequisite, Course 1. Occasional field trips to be arranged. *Associate Professor Stone.*] Not given formally in 1963-1964. Special arrangements will be made for individual students by consultation.

Ecology of forest soil including relation-

ships to soil development, forest management, and hydrology.

- 106. Soil Microbiology.** Spring term. Credit three hours. Prerequisite, Course I or Bacteriology I. Lectures, M W F 8. Warren 31. Associate Professor Martin Alexander.

A study of the major groups of soil microorganisms, their ecological interrelationships, and the biochemical functions of the soil population.

- 108. Chemical and Physical Properties of Soil.** Fall term. Credit four hours. The lectures without the laboratory may be taken for three hours' credit. Primarily for advanced undergraduates and graduate students. Prerequisites, if lecture only, Course I; otherwise Course I and quantitative analysis. Lectures, M W F 11. Warren 37. Laboratory, S 8-10:30. Caldwell 294. Professor —.

A sequel to Course I in which chemical and physical aspects of important soil phenomena are developed in more detail. Particular attention is given to the chemistry of nutrient elements in soil and to the physics of water retention and movement. Laboratory exercises acquaint the student with some of the more important chemical and physical techniques used in soil investigations.

- 110. Agronomy Literature.** Spring term. Credit one hour. Primarily for juniors, seniors, and beginning graduate students. Time to be arranged. Staff.

Study of the research and extension periodicals reporting work in agronomy. An essay on an appropriate subject in agronomy is required of each student.

- 121. Soil and Water Conservation.** Spring term. Credit two hours. Prerequisite, Course I or equivalent. Course II is recommended. Must be taken with Agricultural Engineering 121. Lectures, M W 9. Riley-Robb 105. Associate Professor Zwerman.

A study of the principles and practices used in soil and water conservation. Agronomic aspects of erosion control, water management and storage, drainage, and irrigation receive primary consideration. One all-day Saturday field trip.

- 124. Soil Fertility and Fertilizers.** Fall term. Credit three hours. Prerequisite, Course I or permission of the instructor. Lectures, M W F 9. Warren 145. Associate Professor Bouldin.

This course deals mainly with the basic principles underlying the ability of soils to supply essential mineral elements for

the growth of higher plants. Attention will also be given to soil amendments such as lime, fertilizer, and organic materials, their means of manufacture, their properties and reactions in different kinds of soil. Factors influencing the economic return from the use of lime and fertilizers will also be considered.

- 201. Soil Chemistry, Lectures.** Fall term. Credit three hours. Given every other year, alternating with Course 207. Prerequisites, Course I and a one-year course in introductory physical chemistry, or consent of the instructor. M W F 11. Warren 245. Professor Peech.

Chemical and mineralogical composition and chemical properties of soils, chemical processes and ionic equilibria in soils.

- 202. Chemical Methods of Soil Analysis.** Fall term. Credit three hours. Prerequisites, Course I, Chemistry 230 or 236 or their equivalent. Enrollment limited to twenty students. T Th 2-4:30. Caldwell 100. Professor Peech.

Lectures, laboratory exercises, and demonstrations designed to familiarize the student with different chemical techniques for studying soils.

- [203. Morphology, Genesis, and Classification of Soils.** Spring term. Credit three hours. Given every other year, alternating with Course 224. Prerequisite, graduate standing or permission of the instructor. Professor Cline.] Not given in 1963-1964.

Principles of soil classification, reactions and processes of soil genesis, and development and significance of major groups of soils of the world. One all-day field trip on a date to be arranged.

- [207. Soil Physics, Lectures.** Fall term. Credit three hours. Given every other year, alternating with Course 201. Primarily for graduate majors in agronomy. Prerequisites, Course I and one year of college physics or permission of the instructor. Professor R. D. Miller.] Not given in 1963-1964. A study of physical properties and processes of soil, with emphasis on basic principles.

- 208. Soil Physics, Laboratory.** Fall term. Credit two hours (one hour if preceded by Course 108 laboratory). Must be preceded or accompanied by Course 207. S 8-10:30 or as arranged. Caldwell 294. Professor R. D. Miller.

Exercises in physical methods used in soil investigations.

- 209. Research in Soil Science.** Fall and spring terms. All members of the professional staff.

210. *Special Topics in Soil Science.* Fall and spring terms. Credit one to six hours. The topics to be treated will be announced at the beginning of each term. Time to be arranged. Staff.

224. *Soil Fertility, Advanced Course.* Spring term. Credit three hours. Given every other year, alternating with Course 203. Prerequisites Course 1 and Chemistry 201 or its equivalent. Lectures, T Th S 9. Warren 37. *Associate Professor Bouldin.*

A study of the soil as a source of the mineral nutrients needed for effective crop production and of the properties and use of liming materials, fertilizers, and manures.

FIELD CROPS

11. *Production of Field Crops.* Fall or spring term. Credit four hours. In the fall, open to all classes beginning with first-semester freshmen until all four-year applicants have been accommodated. Two-year students will not be admitted. In the spring, two-year students will be given preference over those in the four-year course.

Graduate students must consult the instructor before registering. Auditors not permitted. Lectures, M W F 10. Caldwell 100. Laboratory: fall term, M T W or Th 2-4:30; spring term, T W Th or F 2-4:30. Caldwell 250. *Professor Hartwig.*

Deals principally with the crops that are used for feeding livestock and poultry. Emphasis is placed on the hay, silage, pasture, and grain crops of the United States. Cultural methods, management, crop rotations, lime and fertilizer practices, soil and climatic adaptations, and the fundamental principles of species and varietal recognition are considered. Two outdoor practicums involving study in a very extensive crop garden will be held during regular laboratory periods.

112. *Feed Crops.* Spring term. Credit four hours. Prerequisite, an introductory course in crop production. A course in livestock feeding is desirable but not essential preparation. Lectures, M W F 8. Discussion, F 11 or 12. Warren 345. *Associate Professor M. J. Wright.*

The production of field crops with reference to their value for livestock in terms of energy, protein, and other nutritional components per unit of land utilized. Consideration will be given to establishment, management, harvesting, and preservation practices that influence yield and nutritive value. Corn, small grains, and forage grasses and legumes will be emphasized.

113. *Physiological Ecology of Crop Plants.*

Fall term. Credit three hours. Prerequisites, Courses 1 and 11 or their equivalents. Lectures, T Th S 9. Warren 160. *Professor Musgrave.*

Fundamental principles of plant physiology applied to the analysis of the effects of environmental factors on temperature and light reactions, nutrient uptake, and water requirements of crop plants during growth, maturation, and dormancy.

115. *Weed Control.* Spring term. Credit three

hours. Graduate students may register only by permission. Prerequisite, Course 11. Lectures, T Th 8. Caldwell 100. Laboratory, M 2-4:30. Plant Science 202. *Professor Fertig.* Principles and methods of weed control. Emphasis on principles of control by mechanical, biological, and chemical methods, their adaptability and limitations. Laboratory covers identification, habits, and control methods of weeds common in the Northeast, weed seed identification, spray equipment and its use. Field trips to be arranged.

125. *Economic Crop Products, Their Nature, Properties, and Use.* Spring term. Credit

four hours. Open to juniors, seniors, and graduate students. Prerequisite, course in field crop production and organic or biochemistry or permission of instructor. Lectures, M W F 9. Laboratory, W 2-4:30. Warren 37. *Professor MacDonald.*

The nature, quality, and processing of crop plants and their products. Particular reference will be directed to the occurrence, production characteristics, processing or extraction, storage, and use of such products. Feed, food, fiber, oil, drug, and various industrial crops will be discussed in some detail. Emphasis will be on the nature of the product and its control.

211. *Special Topics in Field Crops.* Fall and

spring terms. Credit one to six hours. The topic to be treated will be announced at the beginning of each term. Time to be arranged. Staff.

213. *Crop Ecology.* Spring term. Credit two

hours. Given every other year, alternating with Course 214. Prerequisites, Courses, 1, 11, and Botany 31. Class meetings to be twice weekly for first eight weeks of semester for two hours per meeting. Times to be arranged. *Professor Musgrave.*

An extension of Course 113 and a study of special techniques used to obtain and analyze physiological data on crop plant responses to environmental conditions occurring in the field.

- [214. *Grasslands and Grassland Research*. Fall term. Credit three hours. Given every other year alternating with Course 213. Prerequisites, Course 112, Plant Breeding 102 or 203, and Botany 31, or their equivalent, and permission to register. *Professor MacDonald*.] Not given in 1963-1964.

A study of ecological factors underlying the development, maintenance, and management of different grassland types for different uses, and the principles and practices of grassland and forage-crop investigations. Different grassland species, types, and associa-

tions will be discussed in relation to adaptation, objectives, and use. Emphasis will be on research.

219. *Research in Field-Crop Production*. Fall, spring, and summer terms. All members of the professorial staff.

DEPARTMENTAL SEMINAR

290. *Seminar*. Fall and spring terms. Required of graduate students majoring or minoring in the department. S 11-12:00. Caldwell 100.

ANIMAL HUSBANDRY

A comprehensive program of courses is available to students interested in almost any phase of animal husbandry. In consultation with an adviser, a student may select a sequence of courses that would prepare him for (1) livestock farming—dairy cattle, beef cattle, sheep, or swine; (2) service in extension; (3) work in meat packing or feed industries; and (4) various agricultural businesses. For those interested in careers in teaching and/or research, the above course program may be modified to include more of the basic science courses. In this manner, the student may enter the more specialized fields of animal nutrition, animal breeding, animal physiology, animal genetics, or meat processing. Students are advised to register for Courses 1, 10, and 20 before taking the more advanced courses.

LIVESTOCK PRODUCTION

1. *Introductory Animal Science*. Fall term. Credit three hours. Lectures, W F 10. Morrison 146. Laboratory, T Th or F 2-4:30 or W 11-1. Livestock Pavilion. *Assistant Professor Elliot* and assistants.

Designed to acquaint the beginning student with the development, scope, economic importance, problems, and language of the livestock industry. All commercially important classes of farm animals are considered, with emphasis on dairy cattle, beef cattle, sheep, and swine. The place of the biological sciences in a rapidly changing animal agriculture is stressed. The intent is to give insight into opportunities in the field, and to serve as an introduction to subsequent specialized courses.

10. *Livestock Feeding*. Fall or spring term. Credit four hours. Prerequisite, Chemistry 101, 105, or Biochemistry 2. Lectures: fall term, M W F 11; spring term, M W F 9.

Morrison 146. Laboratory: fall term, Th or F 2-4:30; spring term, M W Th or F 2-4:30. Morrison 164. Fall term, *Associate Professor R. G. Warner* and assistants. Spring term, *Professor S. E. Smith* and assistants.

The feeding of farm animals, including the general basic principles, feeding standards, the computation of rations, and the composition and nutritive value of livestock feeds.

- Health and Diseases of Animals (Veterinary 61)*. Spring term. Credit three hours. Not open to first-year students or to those who have had no course in animal husbandry. Lectures, M W F 11. Veterinary College C 207. Dr. Wagner and collaborators. The causes and the nature of the common diseases of livestock are discussed. Emphasis is placed on the prevention and control of animal diseases.

41. *Applied Livestock Selection: Beef Cattle, Sheep, and Swine*. Fall term. Credit two hours. Prerequisite, Course 1. Should be scheduled in the sophomore or junior year. Lecture and laboratory period, W 1:40-4:30. Livestock Pavilion and Barns. *Professor J. I. Miller*.

The application of the various methods used in determining utility value of market and breeding classes of meat animals. Visual appraisal, carcass data, breeding records, and performance tests are considered.

- [42. *Livestock Judging: Beef Cattle, Sheep, and Swine*. Spring term. Credit two hours. Given in alternate years. Prerequisite, Course 1 or permission to register. Course 41 also recommended. Students may register for only one laboratory period for one hour of credit by permission of instructor. *Professor J. I. Miller*.] Not given in 1963-1964. Judging market and breeding classes of beef cattle, sheep, and swine, with major emphasis on a study of the type of breeding stock which best meets modern demands.

One field trip of about two days' duration is made to give additional opportunities to study livestock in outstanding herds or flocks.

43. Advanced Livestock Judging. Fall term. Credit two hours. Registration by permission. Given in alternate years. M F 2-4:30. Livestock Barns. *Professor J. I. Miller.* An advanced study of purebred market and breeding classes of beef cattle, sheep, and swine. Intended primarily to give additional training to successful students of Course 42. Two 2-day trips are taken on week ends. Members of this group are selected to represent the institution in intercollegiate judging competitions.

60. Beef Cattle. Spring term. Credit three hours. Prerequisite, Course 1 or permission to register. Lectures, T Th 10. Morrison 163. Laboratory, F 2-4:30. Livestock Pavilion and Beef Cattle Barns. *Professor J. I. Miller.* A general course in beef-cattle production. The management, feeding, breeding, selection, and marketing problems involved in the beef-cattle enterprise are emphasized. A one-day field trip is taken to study successful beef production methods.

70. Swine. Spring term. Credit three hours. Prerequisite, Course 1 or permission to register. Lectures, T Th 9. Morrison 146. Laboratory T 2-4:30. Morrison 38 and Swine Barn. *Associate Professor Pond.* A general course in swine production. The application of nutritional and genetic principles to practical swine management are stressed, and practical exercises are included. A one-day field trip is taken.

80. Sheep. Fall term. Credit three hours. Prerequisite, Course 1 or permission to register. Courses 10 and 20 recommended. Lectures, T Th 10. Morrison 163. Laboratory, M 2-4:30. Morrison 164 and Sheep Barn. *Assistant Professor Hogue.* A general course in the care, breeding, feeding, management, and selection of sheep. Lectures and laboratory periods designed to give the student a practical knowledge of sheep production as well as some scientific background for improved practices in sheep production.

MEATS

90. Meat and Meat Products. Fall or spring term. Credit three hours. Course 1 is recommended before registering for this course. Lecture. T 8. Morrison 82. Laboratory, M W or T Th 2-4:30. Morrison 63. Registration limited to sixteen students in each section. *Associate Professor Stouffer.*

Livestock slaughtering, retail meat cutting, live animals and carcass relationships, and the storage and preservation of meat and meat products. A one-day field trip to packing plants will be taken.

93. Meat Cutting. Fall or spring term. Credit one hour. Prerequisite, Course 90 and permission to register. Enrollment limited to five students each term. One laboratory period each week, time to be arranged with the instructor. Morrison 91. Mr. Holley. Supervised practice in meat selection, cutting, and merchandising for students with a special interest in meats.

94. Meat Selection and Grading. Fall term. Credit one hour. Given in alternate years. Prerequisite, Course 90. Registration by permission. W 11-1. Morrison 82. *Professor Wellington.* Not given in 1963-1964. Classification and grading of meat, judging and selection of carcasses and wholesale cuts. Field trips and practice hours are arranged at meat packing plants. Members of this class are selected to represent the institution in intercollegiate judging competitions.

190. Meat Technology. Fall term. Credit three hours. Given in alternate years. Prerequisite, Course 90 or by permission. Open to upperclassmen and graduate students. Lecture, T 9. Morrison 82. Laboratory, T Th 2-4:30. *Professor Wellington.* The basic methods of meat processing, formulations, methods of meat product testing, and meat product development through study and laboratory experience.

DAIRY HUSBANDRY

50. Dairy Cattle. Fall or spring term. Credit three hours. Courses 10 and 20 are recommended before registering for this course. Lectures: fall term, T Th 8; spring term, T Th 10. Morrison 146. Laboratory, M or Th 2-4:30. Fall term, Morrison 163 and Livestock Pavilion; spring term, Morrison 174 and Livestock Pavilion. Fall term, primarily for four-year students; limited numbers of two-year students will be admitted with consent of instructor. Spring term, primarily for two-year students; limited numbers of four-year students will be admitted with consent of instructor. Fall term. *Assistant Professor Schmidt* and assistants. Spring term. *Professor —* and assistants. Some of the economic aspects of the dairy industry; study of dairy breeds; factors in breeding and development of dairy cattle; milking methods and milk production problems; efficient feeding; and care, manage-

ment, and health of the dairy herd. Practice in selection, herd management, formulating of rations, planning of breeding program, and keeping of records.

51. **Dairy-Cattle Judging.** Spring term. Credit two hours. Prerequisite, Course 50. Practice, W 2-4:30 and S 10-12:30. (In the last half of the semester, the Wednesday meetings are discontinued and the class meets all day Saturday.) Livestock Pavilion. *Professor Trimberger.*

A beginning course in the selection and judging of all breeds of dairy cattle. Practice includes all-day trips on Saturdays during the latter part of the term to herds in the state.

52. **Advanced Dairy-Cattle Judging.** Fall term. Credit one hour. Prerequisite, Course 51. Registration by permission. Practice hours to be arranged. *Professor Trimberger.* Intended primarily to give additional training in comparative judging to successful students of Course 51. Members of the class are selected to represent the institution in intercollegiate judging competitions.

150. **Dairy Production.** Spring term. Credit three hours. Prerequisite, Course 50. Open only to juniors and seniors and second-year two-year students. Lectures, T Th 11. Morrison 163. Laboratory and discussion, T 2-4:30. Morrison 164. *Professor Trimberger.* Analysis of breeding and management programs in successful herds. Evaluation of the programs of dairy-cattle breed associations. Emphasis is placed on the application of the principles of dairy breeding, feeding, and management to the development and operation of a successful dairy farm.

151. **Physiology and Biochemistry of Lactation.** Spring term. Credit three hours. For seniors and graduate students. Prerequisite, Courses 127 or Veterinary Physiology 10. A course in biochemistry is recommended before registering for this course. Lectures, T Th 9. Morrison 163. Laboratory, W 2-4:30. Morrison 174. *Assistant Professor Schmidt* and assistants.

An advanced course in the anatomy of the mammary gland, the physiological mechanisms of milk secretion, and the biochemical synthesis of milk constituents in laboratory and farm animals.

ANIMAL BREEDING AND PHYSIOLOGY OF REPRODUCTION

20. **Animal Breeding.** Fall term. Credit three hours. Prerequisite, Botany 1, Biology

1 or Zoology 103 and 104. Lectures, T Th 9. Morrison 146. Recitation, demonstration, and laboratory, M T W Th or F 2-4:30. Morrison 174. *Associate Professor Foote* and assistants.

An introduction to the anatomy and physiology of reproduction and the genetics of farm animals, and improvement of livestock through the integrated application of this knowledge. Laboratory material to give the student a first-hand knowledge of reproductive processes, and equipment for studying problems in livestock improvement are provided.

120. **Problems in Animal Breeding.** Fall term. Credit three hours. Prerequisite, Course 20 or Plant Breeding 101. Lectures, T Th 11. Morrison 342. Laboratory, W 2-4:30. Morrison 164. *Professor Henderson.*

A consideration of the problems involved in the improvement of the larger farm animals and the application of genetics in their solution.

125. **Physiology of Reproduction.** Spring term. Credit two hours. Open to graduate students and upperclassmen. Prerequisite, a course in human or veterinary physiology. Lectures, M W 10 Morrison 342. *Professor Asdell.*

An advanced course in reproduction, principally in mammals.

126. **Applied Animal Physiology.** Fall term. Credit one hour. Open to upperclassmen and graduate students. T 9. Morrison 342. *Professor Asdell.*

The application of physiological methods to problems of growth, reproduction, and lactation in farm animals.

127. **Fundamentals of Endocrinology.** Fall term. Credit three hours. Lectures, T Th 10. Morrison 38. Laboratory to be arranged. *Professor Hansel.*

A general course in the physiology of the endocrine glands, and the roles played by each hormone in the regulation of normal body processes. The laboratory work consists of a series of projects designed to illustrate the basic principles of endocrinology and their applications to more efficient production in all classes of livestock.

130. **Livestock Improvement through Artificial Breeding.** Spring term. Credit four hours. Prerequisite, Course 20 or equivalent, and consent of instructor. Lectures, T 10. Recitation to be arranged. Laboratory, T and F 2-4:30. Morrison 174 and 38. *Associate Professor R. W. Bratton.*

The application of principles of physiology and genetics in the breeding of farm live-

stock artificially so as to maximize genetic improvement of those traits of economic importance. The laboratories will provide opportunity for students to obtain experience in the collection, study, processing and use of sperm of farm animals, except poultry, and to study the genetic problems relevant to artificial breeding.

ANIMAL NUTRITION

110. Principles of Animal Nutrition. Fall term. Credit three hours. For senior and graduate students. Prerequisites, a course in human or veterinary physiology and a course in organic chemistry or biochemistry. Lectures, M W F 10. Morrison 342. *Professor Loosli.*

The chemistry and physiology of nutrition and the nutritive requirements for growth, reproduction, lactation, and other body functions.

111. Laboratory Work in Animal Nutrition. Fall term. Credit three hours. Prerequisites, quantitative analysis and Course 110, or its equivalent, and permission of the instructor. M W F 2-4:30. Morrison 342 and 443. *Associate Professor Warner* and assistants. Each student engages in a series of short research projects with experimental animals, such as rats, dogs, and sheep. Both classical and modern techniques of animal experimentation are taught. The applications of biochemical methods to the solution of animal nutrition problems are included.

210. Special Topics in Animal Nutrition. Spring term. Credit one hour. Registration by permission. Th 8. Morrison 342. *Professors Loosli and S. E. Smith.*

A presentation and discussion of the knowledge and techniques of special fields of animal nutrition, with particular reference to farm animals.

215. History of Nutrition. Fall term. Credit one hour. Primarily for graduate students. Th 4:30. Savage 130. *Professor Loosli.*

The purpose is to familiarize the student

with the background literature in nutrition and to improve his technique in using the libraries. Each student prepares four written reports and summarizes these in brief oral reports to learn better ways to present technical information.

219. Seminar in Animal Nutrition. Fall term. Credit one hour. Open to graduate students with major field of study in animal nutrition. Registration by permission. T 4:30. Rice 300. Animal Nutrition staff. A critical review of the literature and other topics of special interest to graduate student in animal nutrition.

DEPARTMENTAL RESEARCH AND SEMINAR

195. Undergraduate Research. Fall and spring terms. Credit one to three hours, depending upon the problem undertaken and extent and quality of work done. Before registering for this course the student must obtain the written permission of a professor who will supervise the work. Open only to seniors of high scholastic ability with grade averages of 80 or above.

Designed to afford opportunities for outstanding undergraduates who plan to go to graduate school to carry out independent studies of suitable research problems under appropriate supervision. Each student will be expected to make a review of the literature, prepare a project outline, conduct the research, and write a summary report.

200. Research. Fall and spring terms. Credit and hours by arrangement. For graduate students. All members of departmental staff.

201. Seminar. Fall and spring terms. Required of all graduate students taking either a major or a minor subject in animal husbandry. Advanced undergraduates are admitted by permission, and, if a satisfactory report on an approved subject is presented, may receive not to exceed two hours' credit. M 11. Morrison 348. Staff in Animal Husbandry.

BACTERIOLOGY

Students are accepted as majors in bacteriology only upon consent of the head of the Department or of a member of the staff designated to act for him. Acceptance is granted only to those students who follow the prescribed courses outlined by the Department and whose scholastic records are entirely satisfactory.

1. General Bacteriology. Fall term. Credit five hours. Prerequisite, Chemistry 102 or 106. Lectures, M W F 11. Stocking 218. Laboratory practice, M W or T Th 2-4:30, T Th 8-10:30. Stocking 301. *Professor H. W. Seeley* and assistants.

An introductory course; general survey of the field of bacteriology, with the funda-

mentals essential to further work in the subject.

2. **General Bacteriology.** Fall term. Credit three hours. Prerequisite, Chemistry 102 or 106. Not open to undergraduate students in the College of Agriculture. Lectures, M W F 11. Stocking 218. *Professor H. W. Seeley.* The same as the lecture part of Course 1. By special permission, this course may be elected by graduate students and advanced students in certain professional courses.
3. **Agricultural and Home Economics Bacteriology.** Spring term. Credit three hours. Not recommended for first-year students. Not accepted as prerequisite for advanced courses except with special permission from the instructor. Bacteriology 5 must be taken with Bacteriology 3. Lectures, M W F 11. Caldwell 100. *Professor VanDemark.* The basic principles of bacteriology and their application in agriculture, home economics, industry, and public health.
5. **Agricultural and Home Economics Bacteriology Laboratory.** Spring term. Credit one hour. Must be taken simultaneously with Bacteriology 3. One laboratory period a week. T 8-9:50 or 11-12:50; or W or Th 2-3:50. Stocking 301. *Professor VanDemark and assistants.* General laboratory techniques as applied in agriculture and household bacteriology.
6. **General Bacteriology Laboratory.** Fall term. Credit two hours. Prerequisites, Chemistry 102 or 106 and Bacteriology 2 or its equivalent. Not open to undergraduate students in the College of Agriculture. Laboratory, M W or T Th 2-4:30. Stocking 301. *Professor H. W. Seeley and assistants.* The same as the laboratory part of Course 1. By special permission this course may be elected by graduate students and advanced students in certain professional courses.
101. **Dairy and Food Microbiology.** Spring term. Credit four hours. Prerequisite, Bacteriology 1. Lectures, T Th 9. Stocking 119. Laboratory, T Th 9-12. Stocking 321. *Professor Naylor and assistant.* A study of the microorganisms of importance in foods, with laboratory practice in the use of standard methods for microbiological testing and control of food products.
103. **Advanced Bacteriology.** Spring term. Credit four hours. Given in alternate years. Prerequisites, Course 1 and organic chemistry. Lecture and laboratory, T Th 2-5:30. *Associate Professor MacDonald and assistants.*

A study of the comparative physiological and ecological relationships among the bacteria. Such subjects as bacterial anatomy, cell growth, ecology, nutrition, and autotrophy are covered. Some of the more complex groups of bacteria, such as the photosynthetic bacteria, are studied in detail. Laboratory emphasis is on techniques for the isolation, cultivation, and rigorous study of these and other groups.

104. **Advanced Microbiology.** Fall term. For upperclassmen and graduate students. Credit four hours. Prerequisites, Course 1 and organic chemistry. Lectures and laboratory practice, T Th 1:40-4:30. Stocking 119. *Assistant Professor Zahler and assistant.* A study of a variety of biological phenomena among viruses, bacteria, yeasts, and molds. Genetics, radiation effects, and unusual growth patterns will be among the topics included.

Soil Microbiology. See Agronomy 106.

Pathogenic Bacteriology. (See the *Announcement of the New York State Veterinary College.*)

210. **Physiology of Bacteria.** Spring term. Credit two hours. Prerequisites, Course 1 and at least one additional course in bacteriology and one in organic chemistry. Organic chemistry may be taken concurrently. Lectures, T Th 10. Stocking 120. *Professor Delwiche.* The physiology of bacteria and the biochemistry of microbic processes.

212. **Applied and Industrial Microbiology.** Fall term. Credit three hours. May be taken for two hours' credit with permission. Given in alternate years. Prerequisite, Course 1. T Th 11 and S 10. Stocking 119. Staff. A survey of the microbiology of food, water, sewage, and industrial fermentations.

213. **Morphology and Cytology of Bacteria.** Fall term. Credit three hours. For seniors and graduate students. Lectures, T Th S 9. Stocking 119. *Professor Knaysi.* The morphology, cytology, and microchemistry of microorganisms.

- [214. **Virology.** Spring term. Credit two hours. Given in alternate years. Prerequisites, Courses 1 and 210 or the equivalent. *Professor Naylor.*] Not given in 1963-1964. A study of the nature and properties of viruses with major emphasis on bacterial viruses.

215. **Chemistry of Bacterial Processes.** Spring term. Credit two hours. For seniors and

graduate students. Lectures, M W 11. Stocking 119. *Professor Delwiche.*
The chemistry of the metabolism, fermentation, and biosynthetic processes of micro-organisms.

- 216. Microbial Genetics.** Fall term. Credit two hours. Given in alternate years. For upperclassmen and graduate students. Hours to be arranged. *Assistant Professor Zahler.* Genetics of micro-organisms, especially bacterial and viruses. An advanced course for students who have had basic training in bacteriology and genetics.

- [217. Methods in Advanced Bacteriology.** Spring term. Credit four hours. Given in alternate years. Prerequisites, permission of instructor. Limited enrollments. Intended primarily for graduate students. Hours to

be arranged. *Associate Professor MacDonald.]* Not given in 1963-1964.

This course is intended to acquaint advanced students with some of the more important techniques used in the study of bacterial physiology. Emphasis will be placed on the use of radioisotopes; growth, structure, and function of cells.

- 220. Research.** Fall or spring term. Credit one or more hours, by arrangement. For advanced students. Staff.

Special problems in any phase of bacteriology may be elected, including those involving the use of radioisotopes.

- 221. Seminar.** Fall and spring terms. Without credit. Hours to be arranged. Stocking. Staff.

Required of graduate students in the department.

BIOCHEMISTRY

Students desiring to specialize in biological chemistry need to have a thorough foundation in mathematics, physics, chemistry, and biology. To this end, the student is advised to follow a course program which will yield a basic understanding of the fundamental principles of chemistry and their application to biological problems. Furthermore, the student is advised to follow a broad program in basic biology, including the study of bacteriology, botany, genetics, and zoology. The program is designed to permit the student to follow a career in the various phases of scientific agriculture and to form the basis for graduate study in biochemistry.

- 2. Introductory Agricultural Chemistry.** Fall term. Credit five hours. Open only to two-year students in the College of Agriculture. Lectures and recitations: M T W Th F 11. Savage 100. *Associate Professor Neal* and assistants.

Lectures, demonstrations, and recitations dealing with the fundamental principles of chemistry and their application to agricultural practices. This course is not accepted as a prerequisite for further courses in chemistry or biochemistry.

- 5. Agricultural Biochemistry.** Fall term. Credit three hours. Prerequisite, Chemistry 102 or 106 or the equivalent. May not be taken for credit by students who have completed a more advanced course in this department. Lectures, T Th F 12. Savage 100. *Associate Professor Neal.*

An elementary course for the general agri-

cultural students, dealing with the biochemistry of crop and animal production, of the materials concerned, such as feeds, fertilizers, and insecticides, and of the products that result.

- 101. Elements of Biochemistry, Lectures.** Fall term. Credit four hours. Prerequisite, organic chemistry, or Food and Nutrition 215. For undergraduate and graduate students. M T Th S 8. Caldwell 100. *Professor Daniel.*

A basic course dealing with the chemistry of biological substances and their transformations in living organisms.

- 102. Elements of Biochemistry, Laboratory.** Fall term. Credit two hours. Prerequisite, quantitative analysis or Food and Nutrition 215, or by permission of the instructor. Must be taken with or after Course 101. M W or T Th 2-4:20. Preliminary examinations will be held twice during semester at 7:30 p.m. *Professor Daniel, Associate Professor Neal,* and assistants.

Laboratory practice with biochemical substances and experiments designed to illustrate chemical reactions which may occur in biological systems.

- 140. Food Biochemistry.** Spring term. Credit three hours. Prerequisite, Course 101. Lectures, M W F 11. Savage 100. *Associate Professor Shallenberger* and staff members from the Department of Food Science and Technology, New York State Agricultural Experiment Station, Geneva, New York.

A discussion of some of the important non-microbial changes in foods, such as denaturation and the Maillard browning reaction. Emphasis is placed on the occurrence, significance, and prevention or control of the changes as they affect the color, odor, flavor, texture, or nutritive value of foods.

[150. *Biochemistry and Nutrition of the Vitamins*. Spring term. Credit two hours. Given in alternate years. Prerequisite, Chemistry 353 and 355, Course 101, or their equivalent. Primarily for graduate students. Lectures. T Th 10, Savage 100. *Professor Daniel*.] Not given in 1963-1964.

The chemical, physiological, and nutritional aspects of the vitamins.

160. *Nutritional Biochemistry*. Spring term. Credit three hours. Prerequisites, Biochemistry 101 or the equivalent and a beginning course in nutrition, e.g., Animal Husbandry 110, Poultry Husbandry 110, or Food and Nutrition 324. Lectures, M W F 10. Savage 100. *Professors Barnes and Wright and Assistant Professors Gaylor and McCormick*. The biochemical bases of processes related to nutrition in the intact animal will be discussed. Emphasis will be placed on the integration of physiological and biochemical mechanisms in digestion, absorption, transport, and metabolism and will include comparative aspects of the normal and pathologic states.

201-202. *General Biochemistry, Lectures*. Throughout the year. Credit four hours per term. Prerequisites, quantitative analysis, Organic Chemistry 357 and 358 or the equivalent, and Physical Chemistry 389 and 390 or the equivalent. Physical chemistry may be taken concurrently. M W F S 9. Savage 100.

Fall term (201), *Professor Gibbs*. An integrated treatment of the fundamentals of biochemistry. Particular emphasis will be given to the chemical constituents of biological systems, bioenergetics, the metabolism of carbohydrates and lipids, respiratory pathways, and the factors involved in the regulation of three metabolic pathways. Spring term (202), *Professor Williams*. A continuation of Course 201. Emphasis will be placed on enzyme kinetics and on the chemistry, metabolism, biosynthesis, and

biological functions of amino acids, proteins, nucleic acids, and isoprenoids.

203. *General Biochemistry, Laboratory*.

Spring term. Credit three hours. Must be taken with or following Course 202, or the student must have had the equivalent. Registration by permission of instructor before November 1. M W or T Th 1:40-4:30 and additional periods by appointment. Savage 230. *Professor Nelson*.

A study of the more important techniques used in biochemical investigations. Emphasis is placed on the interpretation of data and written reports covering the various experiments.

195. *Special Problems in Biochemistry*. Fall or spring. One or more credit hours. For biochemistry undergraduate majors. Prerequisite, adequate ability and training for the work proposed. Special work in any branch of biochemistry on problems under investigation by the departmental staff.

290. *Biochemistry Seminar*. Fall and spring terms. Required of graduate students majoring in biochemistry and open to all who are interested. F 4:15. Savage 100.

292. *Nutrition Seminar*. Spring term. Credit one hour. Registration by permission. M 4:15. Savage 100. *Professor Barnes and staff*.

294. *Food Biochemistry Seminar*. Fall term. Credit one hour. Registration by permission. M 4:30. Savage 130. *Professor Barnes, Associate Professor Shallenberger, and staff members from the Department of Food Science and Technology, New York State Agricultural Experiment Station, Geneva, New York*. Assignments and discussions of literature pertaining to the biochemical aspects of foods and food processing.

301. *Special Topics in Biochemistry*. Fall or spring term. Credit one or two hours. Registration by permission of instructor. Lectures, discussions, and assignments to original literature. T 9. *Professor Williams and staff*.

The special topic and the instructor will be announced each term prior to preregistration.

Insect Biochemistry. See full description under "Entomology."

BIOLOGY

Students are accepted as majors in general biology only after satisfactory completion of two years of the special interdepartmental

biological science curriculum (or the equivalent). This interdepartmental curriculum has been designed to provide enough basic

science courses (e.g., zoology, botany, chemistry, mathematics, physics, genetics, etc.) during the student's first two years in college to permit him to proceed into any of the more specialized biological majors during his last two years; students interested in this curriculum should request a copy of the publication, *Biological Sciences*, from the Office of Resident Instruction, New York State College of Agriculture. The general biology major is designed especially for those students who, at the end of their sophomore year, are still uncertain which phase of biology they hope ultimately to pursue, and who wish to continue in a general program, often deferring their choice of a specific field until graduate school.

- 1-2. General Biology.** Fall and spring terms. Credit three hours a term. Biology 1 with a grade of 50 or higher is prerequisite to Biology 2, unless special permission is obtained from the instructor. Not open to students who have taken both Zoology 103-104 (or 101-102) and Botany 1-2. If Biology 1-2 is taken after Zoology 103-104 (or 101-102) or Botany 1-2, credit two hours a term. Lectures, M W 8, Ives 120, or M W 10, Warren 231, or M W 11, Caldwell 100 (fall), Plant Science 233 (spring). Laboratory, M T W Th or F 2-4:30, or Th F or S 8-10:30, or T Th or F 10-12:30, or S 9-11:30. Roberts 392 or 304. *Assistant Professor Keeton, Mr. Mundinger, and assistants.*

Designed to acquaint students majoring within or outside the animal and plant sciences with the established principles of biology, and with the body of research that led to the formulation of these principles. Specifically, the topics are the organization, integration, and maintenance of living organisms, and their reproduction, heredity, behavior, and interactions. Emphasis is placed on an understanding of each topic in the light of modern evolutionary theory.

- 9. Biological Basis of Social Problems.** Spring term. Credit three hours. Not open to students who have taken Biology 1 or 2, Plant Breeding 1 or 101, Zoology 201 or 242. Lectures and demonstrations, T Th S 9. Comstock 145. *Professor Uhler.*

An elementary course designed especially to furnish a background in biological science for students in the College of Home Economics who intend to enter the field of nursery-school teaching, though open to other interested students as well. A survey course of biological principles, with empha-

sis on human structure, development, heredity, and eugenics.

- 105. Laboratory Methods in Biology.** Fall term. Credit three hours. Prerequisite, Biology 1-2, Botany 1-2, or Zoology 102 or 104. Limited to juniors, seniors, and graduate students; 20 students per section. Lectures and laboratories, T or F 10-12:30 or T 7:30-10 p.m. and additional periods by appointment. Roberts 306. *Professor Uhler.* For students who intend to teach or to follow some phase of biology as a profession. Subjects covered: collection, preservation, and storage of materials; the preparation of bird and mammal skins for study; injection of blood vessels and embalming; clearing and staining of small vertebrates; and the preparation and staining of smears, whole mounts, and sections.

- 116. General Ecology.** Fall or spring term. Credit three hours. Prerequisite, Biology 1-2, Botany 1-2, or Zoology 102 or 104, or equivalent. Lectures, W or Th 2-4. Comstock 145. One laboratory a week by appointment. *Associate Professor Pimentel.* Basic ecological principles are focused on the role of environment in the survival of plants and animals. Competition between organisms and other interrelationships and the influence of climate and the physical habitat on living systems are studied. Consideration is given to the fundamentals of population dynamics, behavior, and the migration and movement of organisms. The structure and organization of species populations and communities are studied in the light of recent evolutionary theory. Laboratory and field studies are employed to illustrate the dynamic aspects of ecology.

- 302. Seminar in Evolutionary Theory.** Fall term. Credit two hours. Registration by permission of instructors. Lecture, Th 11. Discussion section, Th 12. Comstock 145. *Assistant Professors Brown and Keeton.*

Discussion of selected topics in modern evolutionary science, with emphasis on the systematic, ecological, and behavioral aspects.

- 307. Research in Biology.** Either term. Credit and hours to be arranged. Prerequisite, adequate preparation in biological sciences and permission from the professor under whom the work is to be taken. Comstock or Roberts. *Professor Uhler, Associate Professor Eisner, and Assistant Professor Keeton.*

Practice in planning, conducting, and reporting independent laboratory and/or library research programs.

BOTANY

Students interested in the study of plants and their contributions to life in general are encouraged to consult a member of the Botany Department staff. Those desiring to obtain a broad familiarity with plants as a basis for teaching, technical assistance, or practical work following college should complete Courses 31, 117, and 123; two of the following courses: 112 or 113; 124; 126 or 127; Plant Breeding 101. Others wishing to specialize in some aspect of botanical research or University teaching should obtain a background in mathematics, physics, chemistry, and languages as well as experience in the five intermediate areas of the departmental offerings.

Students seeking further information about a botany career and related matters are invited to consult with staff members in the Department at any time.

1-2. Introductory Botany. Fall and spring terms. Credit three hours a term. If taken after Biology 1-2, credit two hours a term. Students may begin the course in the spring term. Lectures, T Th 9 or 11. Plant Science 233. One laboratory period a week, M T W Th or F 2-4:30, T 10-12:30, S 8-10:30 or S 9-11:30. Plant Science 240, 242, and 262. *Professor Banks and assistants.*

Designed to give general students an understanding of the growth and evolution of plants and their role in nature. Provides the basic knowledge necessary for those who intend to specialize in some aspect of plant science.

Botany 1 is devoted to a study of growth in the flowering plants, with emphasis placed on structure, function, and reproduction. Botany 2 is concerned with the phyla of plants, with representative life cycles, and with a consideration of the importance of various groups in the study of biological principles. The study of the evolution of the groups of plants is based on genetical and environmental mechanisms that control it. The classification and ecology of plants is introduced in several laboratory periods spent in the field. The scientific process, the growth of botanical knowledge, botanical principles, and, particularly, the necessity of changing interpretations as new information is acquired are introduced throughout the course.

112. Freshwater Algae. Fall term. Credit three hours. Prerequisite, Courses 1-2 or the equivalent. Lectures, M W 11. Laboratory, F 2-4:30. Plant Science 202. *Associate Professor Kingsbury.*

A comprehensive survey of the freshwater algae, including structure, ecology, physiology, economic importance, and evolution where appropriate. The laboratory is designed, in addition to furnishing illustrative material for lecture topics, to provide a working familiarity with the local algal flora.

[113. Marine Algae and the Bryophytes. Spring term. Credit three hours. Given in alternate years. Prerequisites, Courses 1-2 or Course 112. *Associate Professor Kingsbury.*] Not given in 1963-1964.

While a continuation of Course 112, this course is designed to be complete in itself. It includes a survey of the groups of the brown and red algae, a discussion of the landward migration, and surveys of the liverworts, hornworts, and mosses. Participation in an optional field trip to marine habitats on Cape Ann and Cape Cod, Massachusetts, is limited to twelve students.

117. Taxonomy of Vascular Plants. Fall term. Credit four hours. Prerequisites, Courses 1-2 or the equivalent and permission to register. Lectures, T Th 9. Plant Science 143. Laboratory, T Th 2-4:30. Mann 464. *Professor Clausen.*

An introduction to the principles and literature of taxonomy, and a survey of the major groups of seed plants and ferns. Methods of identification are stressed. Work in laboratory periods in the first part of the term is in the field.

118. Taxonomy and Ecology of Vascular Plants. Spring term. Credit four hours. Prerequisites, Course 117 and either Course 124 or Plant Breeding 101 and permission to register. Lectures, T Th 9. Plant Science 143. Laboratory, T Th 2-4:30. Mann 464. *Professor Clausen.* (Will not be given in 1965.)

The lectures are concerned with the principles of classification and distribution of vascular plants. The laboratory provides experience in both bibliographical procedures and methods of studying plants in the field. Trips are scheduled in laboratory periods and on four Sundays in the second half of the term.

217. Seminar in Taxonomy and Ecology of Vascular Plants. Fall term. Credit one hour. Prerequisite, Course 118 and permission to register. Required of graduate students taking work in taxonomy. M 12. Mann 464 and Plant Science 143. *Professor Clausen.*

A consideration of problems concerned with the classification and distribution of vascular plants.

123. **Plant Anatomy.** Fall term. Credit four hours. Prerequisites, Courses 1-2 or the equivalent and permission to register. Lectures, T Th 8. Warren 145. Laboratory, either M W 2-4:30 or T Th 10-12:30. Plant Science 211. *Associate Professor* Bierhorst. A detailed study of the internal structure of vascular plants.

124. **Cytology.** Fall term. Credit four hours. Prerequisites, Courses 1-2 or Zoology 102 or 104 or the equivalent. Lectures, M W 9. Plant Science 143. Laboratory, M W or T Th 10-12:30. Assignments to laboratory section must be made at time of registration. Plant Science 219. *Associate Professor* Uhl. The principal topics considered are protoplasm, cells and their components, nuclear and cell division, meiosis and fertilization, and the relation of these to the problems of development, reproduction, taxonomy, and heredity. Both plant and animal materials are used. Microtechnique is not included.

125. **Microtechnique.** Spring term. Credit two hours. Prerequisites, Courses 1-2 and permission to register. Hours to be arranged. *Associate Professor* Uhl.
A laboratory course in methods of preparing plant material for microscopical study.

224. **Cytogenetics.** Spring term. Credit three hours. Prerequisites, Course 124 and Plant Breeding 101 or the equivalent. Lectures, M W 9. Plant Science 143. Laboratory, M or W 10-12:30. Plant Science 219. *Professor* ———.
An advanced course dealing mainly with the cellular mechanisms of heredity and including recent researches in cytology, cytotaxonomy, and cytogenetics.

126. **Morphology of Vascular Plants.** Spring term. Credit four hours. Given in alternate years. Prerequisites, Courses 1-2 or the equivalent and permission to register. Lectures, M W 12. Plant Science 141. Laboratory, M W 2-4:30. Plant Science 211. *Associate Professor* Bierhorst.
An advanced course in the comparative morphology, life histories, and phylogeny of the lower vascular plants, both fossil and recent.

- [127. **Morphology of Vascular Plants.** Spring term. Credit four hours. Given in alternate years. Prerequisites, Courses 1-2 or the equivalent and permission to register. *Asso-*

ciate Professor Bierhorst.] Not given in 1963-1964.

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

Comparative Morphology of Fungi. Given in the Department of Plant Pathology.

31. **Plant Physiology.** Fall or spring term. Credit four hours. Prerequisites, Courses 1-2 (or Biology 1-2), and introductory chemistry. Lectures, T Th 10. Plant Science 143. Laboratory, T Th, or W F 2-4:30, or M 2-4:30, and S 8-10:30. Plant Science 227. *Professor* ———.

Designed to acquaint the student with the general principles of plant physiology. Topics such as water relations, photosynthesis, translocation, digestion, respiration, mineral nutrition, growth, and reproduction are studied in detail. Particular emphasis is placed, both in laboratory and classroom, on the discussion of principles and their application to plants.

- 230-231. **Plant Physiology, Advanced Lecture Courses.** Fall and spring terms. Credit three hours a term. Limited to seniors and graduate students. Prerequisite, training in botany and chemistry to be determined in each case by the professor in charge. Course 230 advisable, but not essential, before 231. Lectures, M W F 10. Plant Science 143. *Professor* Steward.

Fall term: cells and cell physiology; properties of protoplasm, its membranes and organelles; relations of cells, tissues, and organs to water and solutes; water relations and stomatal behavior; inorganic plant nutrition; the essential nutrient elements. Spring term: plant metabolism and organic nutrition (photosynthesis, respiration, nitrogen metabolism); translocation; physiology of growth and development.

- 232-233. **Plant Physiology, Advanced Laboratory.** Throughout the year, but may be entered in the spring term. Credit three hours a term. Prerequisites, courses in plant physiology, organic chemistry, and physics, and a passing grade in an examination covering these topics given at the first class meeting. Laboratory, T Th or W F 2-5:30. Plant Science 241. *Professor* ———.

Fall term: photosynthesis, water relations, ion accumulation, responses to light and gravity. Spring term: respiration, nutrition, hormones, nitrogen metabolism, and photoperiodism.

- [234. *Plant Physiology, Advanced Lecture Course*. Fall term. Credit two hours. Prerequisite, Course 231 or adequate preparation in botany and chemistry.] Not given in 1963-1964.

This course deals primarily with physiology in relation to hormones, photoperiodism, and vernalization.

239. *Seminar in Plant Physiology*. Fall and spring terms. Required of graduate students taking work in plant physiology and open to all who are interested. F 11. Plant Science Seminar Room. Professor Steward, Associate Professor Thompson, and Dr. Shantz. The discussion of current problems in plant physiology; the presentation of reports on

the research of graduate students and members of the staff.

171. *Special Problems in General Botany, Anatomy, Cytology, Morphology, Paleobotany, Phycology, Physiology, Taxonomy, and Ecology*. Fall and spring terms. Credit not less than two hours a term. By appointment. Professors Banks, Clausen, Moore, and Steward, Associate Professors Bierhorst, Kingsbury, Thompson, and Uhl.

Students engaged in special problems or making special studies may register in this course. They must satisfy the instructor under whom the work is taken that their preparation warrants their choice of problem.

CONSERVATION

The Department of Conservation offers a wide variety of training in natural resources conservation, fish and wildlife management, marine ecology, and vertebrate zoology. The sequence for students in soil and water conservation is given in the Department of Agronomy, and a curriculum for those interested in conservation education has been developed in cooperation with the Department of Rural Education.

Students desiring to specialize in any of these aspects of conservation or vertebrate zoology may obtain a suggested list of courses for the four-year period by consulting the department.

1. *Conservation of Wildlife*. Fall term. Credit two hours. Lectures, T Th 11. Fernow 122. Professors Clausen, Conklin, Hewitt, Kellogg, Raney, Swanson, and Webster, Associate Professors Brumsted, L. S. Hamilton, Barlow, and Pimentel, and co-operating specialists.

An introduction to the wildlife resources of North America and their interrelations with other resources; the importance of the flora and fauna in our economic and cultural life. Serves as an introductory course for conservation majors and is of general cultural and informational interest to students in other fields.

2. *Farm Forestry*. Fall term. Credit three hours. Lectures, M W 11. Laboratory, W 1:40-4. Fernow 122. Note: field laboratories will sometimes end as late as 5:30 in good weather. This will be compensated by elimination of the laboratory period during a portion of the cold weather at the end of the term. Associate Professor Morrow. Designed to give the student the basic in-

formation necessary to implement sound management practices in a woodland tract. Field trips to woodlots will emphasize variations in value and potential. Actual practice in tree identification, log scaling, timber estimating, tree marking, and cutting in immature stands is given. Each student is assigned an area of woods to put his knowledge of forestry into practice.

3. *Conservation of Natural Resources*. Spring term. Credit two hours. Lectures, T Th 10. Fernow 122. Associate Professor L. S. Hamilton.

The natural resource problems of the United States: Soil, water, forests, wildlife, minerals, and recreational needs for an increasing population. River basin development; the conservation movement; public resource agencies and policies; current resource-use conflicts.

4. *Woodland Ecology and Management*. Fall term. Credit three hours. Lectures, M W 11. Laboratory, M 2-4:30. Fernow 210. Associate Professor L. S. Hamilton.

Limited to those majoring in wildlife management and allied conservation fields. A study of the forest community and forest management for the production of wood, wildlife, water, recreation, and other services. All laboratories conducted in the field. One weekend trip to the Adirondacks or other major forest region of the State.

- 7-8. *Taxonomy and Natural History of Vertebrates*. Fall and spring terms. Credit three hours a term. Prerequisite, Zoology 103 and 104 or 101 and 102. Lecture, M 8. Fernow 122. Laboratory, M W 2-4:30 or T Th 2-4:30. Fernow 14. Fall term, Pro-

- fessor Raney*. Spring term. *Professor* ——. Lectures on fishes, amphibia, reptiles, birds, and mammals, dealing with principles of classification and nomenclature, characteristics, relationships, and bionomics of these groups. The laboratory gives practice in the identification of North American species. Field studies of the local fauna are undertaken during the fall and spring.
9. **General Ornithology**. Spring term. Credit three hours. Lectures, M W 11. Fernow 122. Laboratory, W Th or F 2-4:30. Fernow 210. *Professor Sibley*. Introduction to the biology of birds; their structure, classification, adaptations, migration, behavior, distribution, ecology, and evolution. Laboratory work on anatomy, identification of specimens, classification, nests and eggs, molts, plumages, and development.
10. **Field Ornithology**. Spring term. Credit one hour. Prerequisite, Course 9, which may be taken concurrently. S 8-12. First meeting of class, Fernow 122. *Professor Sibley*. Field identification, ecology, and behavior of local species. Two all-day Saturday field trips will be taken.
- [22. **Ichthyology**. Spring term. Credit three hours. Prerequisite, Course 7 or permission to register. *Professor Raney*.] Not given in 1963-1964. Evolution, relationships, structure, habits, ecology, and literature of fishes. Laboratory studies on structure and identification of fishes. Field studies on ecology and life histories.
25. **Mammalogy**. Fall term. Credit three hours. Prerequisite, Courses 7-8 or permission of instructor. Lectures, T Th 8. Fernow 122. Laboratory, F 2-4:30 or S 8-10:30. Fernow 14. *Professor* ——. 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.
101. **Selected Topics in Conservation**. Fall term. Credit one hour. F 8. Fernow 122. *Professor Swanson*. Primarily for graduate students, but open to upperclassmen, by permission of instructor. Discussions of important conservation problems of current interest.
102. **Principles of Wildlife Management**. Fall term. Credit three hours. Prerequisite, consent of instructor. Lectures, M W F 10. Fernow 122. *Professor Hewitt*. Fundamental mechanisms of wildlife populations; ecological, social, and economic aspects of wildlife management.
103. **Wildlife Management Laboratory**. Fall term. Credit one hour. Required of wildlife management majors registered in Conservation 102. Field and laboratory, F 2-4:30, and several field trips to be arranged. Fernow 212. *Professor Hewitt*.
104. **Wildlife Management Methods**. Spring term. Credit three hours. Prerequisites, Courses 102 and 103. Lecture, F 11. Laboratory, F 1:40-4:30. Fernow 212. Several all-day field trips. *Professor Hewitt*. Methods and techniques in the management of game species and their practical application in the field. Intended for students interested in professional wildlife management.
110. **Economic Zoology**. Spring term. Credit one hour. Prerequisites, Courses 7-8. F 8. Fernow 122. *Professor Eadie*. Economics of amphibians, reptiles, birds, and mammals. Economic status, habits, and control of injurious species.
112. **Literature of Zoology, Conservation, and Ecology**. Spring term. Credit one hour. Given in alternate years. W 9. Fernow 14. *Professors Eadie and Raney*. The literature of zoology, ecology, and kindred fields, fish and fisheries, aquaria, amphibians, reptiles, birds, and mammals; wildlife management; preserves; game farms; animals in relation to recreation and economic zoology.
122. **Advanced Ichthyology**. Spring term. Credit three hours. Prerequisite, Course 7 or permission to register. Lectures, T Th 8. Fernow 122. Laboratory, F 2-4:30. Fernow 14. *Professor Raney*. A continuation of Course 22, alternating with it. May be taken without Course 22 as prerequisite.
128. **Advanced Ornithology**. Fall term in odd-numbered years. Credit three hours. Prerequisites, Course 9 or equivalent and permission of instructor. M W 2-4:30. Fernow 210. *Professor Sibley*. Lectures on advanced aspects of avian biology including speciation, ecology, physiology, and classification. Laboratory study of the orders, families, and principal genera of the birds of the world; their structure, classification, and distribution.
131. **Biological Acoustics**. Fall term. Credit three hours. Prerequisites, courses in animal physiology and physics. Lecture and laboratory, T Th 2-4:30 and one other period

by appointment. Fernow 210. *Professor Kellogg.*

A study of sound, as it affects animals, and as it is used in the study of animal behavior and communication. Modern methods of recording and analyzing sounds of animals, especially birds, will be emphasized.

150. Seminar in Integrated Resources Development. Spring term. Credit two hours. Graduate students, or seniors with adviser's recommendation and consent of instructor. W 2-4. Place to be arranged. Staff from Agricultural Economics, Agronomy, Architecture, Civil Engineering, Conservation, and Economics, and other invited specialists. *Associate Professor L. S. Hamilton in charge.*

Studies of natural resource development programs in watersheds, river basins, or other planning units; the problems of resource interrelationships, economic analysis, administrative organization, policy implementation.

Limnology (Entomology and Limnology 171). Spring term. Credit three hours. See full description under *Entomology and Limnology*.

173. Fishery Biology. Fall term. Credit three hours. Students other than majors in the Department of Conservation must have permission of instructor to register. M W F 12. Fernow 122. *Professor Webster.*
Principles of fishery management, stressing dynamics of growth, populations, and production. Techniques of fishery management and the investigational aspects of fishery biology are also included.

174. Fish Culture. Spring term. Credit two hours. Prerequisite, permission of instructor. Lecture, M 12. Laboratory, M 2-4:30. Fernow 126. *Associate Professor A. M. Phillips, Jr.*
A study of the production of fish in hatcheries and hatchery management.

175. Fishery Biology Laboratory. Spring term. Credit two hours. Prerequisites, Course 173 and permission of instructor. Limited to graduate majors and minors. T Th 1:40-4. Fernow 126. *Professor Webster.*
Field and biometrical exercises in fishery management.

180. Oceanography. Fall Term. Credit three hours. Prerequisites, general zoology, botany, chemistry, and physics, or the equivalents. Lectures, T Th 10. Laboratory, Th 12-12:50. Fernow 122. *Associate Professor Barlow.*
Physical and chemical aspects of the oceans,

particularly as background for marine ecology; geography and geology of the ocean floor; currents, tides; distribution of temperatures. Laboratory work in processing oceanographic data.

181. Marine Ecology. Spring term. Credit three hours. Prerequisites, general zoology, chemistry, physics, and either invertebrate zoology or limnology. Lectures, M W F 9. Fernow 122. *Associate Professor Barlow.*

The sea as an environment; the physical and chemical characteristics of marine habitats; the productivity of the sea; the relation of hydrography to fisheries and faunal distributions.

190. Comparative Vertebrate Ethology. Fall term. Credit three hours. Prerequisites, Courses 7-8 and permission of instructor; courses in comparative vertebrate anatomy and physiology are highly desirable. Lectures, T Th 9. Fernow 122. Laboratory, to be arranged. Fernow 212. Primarily for graduate students; upperclassmen will be accepted to capacity of laboratory. *Associate Professor Dilger and assistant.*

A survey of the methods and principles of vertebrate ethology for students specializing in this field or for those in other branches of zoology wishing to broaden their knowledge of animal behavior. Emphasis is placed on the causation, function, biological significance, and evolution of species-typical behavior. The laboratories are designed to give firsthand knowledge of the material covered in lectures.

400-407. Research Problems. Either term. Credit and hours to be arranged. Problems are undertaken in any of the fields of study in the Department, but adequate preparation in the specialized field, and permission of the instructor are prerequisites. Fernow Hall.

400. Fishery Biology. *Professor Webster and Associate Professor A. M. Phillips, Jr.*

401. Herpetology. *Professor —.*

402. Ichthyology. *Professor Rancy.*

403. Mammalogy. *Professors Eadie and —.*

404. Ornithology. *Professors Kellogg and Sibley, and Associate Professor Dilger.*

405. Wildlife Management. *Professors Swanson, Hewitt, and Associate Professor Thompson.*

406. Forestry. *Associate Professors L. S. Hamilton and Morrow.*

407. *Oceanography*. Associate Professor Barlow.
410. *Conservation Seminar*. Fall and spring terms. Without credit. For graduate students majoring in conservation, but open

to all who are interested. Th 4:30-6:00 p.m. Fernow 122. Staff.

Discussions of literature and current research in the broad field of conservation and vertebrate zoology.

DAIRY SCIENCE

Students in this department may choose between two basic programs, dairy industry and dairy science. In one, the emphasis is on the operation and management of dairy plants; the other emphasizes the chemistry and bacteriology of milk and milk products as a basis for quality control and research.

1. *Introductory Dairy Science*. Fall or spring term. Credit three hours. Prerequisite, Chemistry 102 or 106. Fall term: Lectures, T Th 11. Stocking 218; laboratory, T 2-4:30. Stocking 209. Spring term: Lectures, T Th 8. Stocking 218; laboratory, T 2-4:30. Stocking 209. *Professor Shipe*.

The scientific and practical aspects of milk and a survey of the dairy industry. Special attention is given to the composition of milk and its physical and chemical properties, quantitative tests for fat and other constituents.

5. *Biochemical Analysis of Milk and Certain Food Products*. Fall term. Credit three hours. Open to juniors, seniors, and graduate students. Lecture demonstrations, W F 11. Stocking 120. Laboratory practice, F 1:40-4:30. Stocking 216. *Professor Krukovsky*.

Certain phases of chemistry and quantitative analysis as applied to the quality control and improvement in the palatability and nutritional values of milk and fat-containing food products, including the influences of the plant and animal.

102. *Fluid Milk Processing and Quality Control*. Spring term. Credit four hours. Given in alternate years. Prerequisites, Course 1 and Bacteriology 1 or its equivalent. Recitation, F 12. Stocking 120. Laboratory, F 1:40-4:30. Stocking 127. *Associate Professor March* and assistants.

The scientific, technical, and sanitary aspects of the fluid-milk industry.

103. *Food Products from Milk Fermentations*. Fall term. Credit five hours. Given in alternate years. Prerequisites, Course 1, Bacteriology 1, and organic chemistry or biochemistry. Lectures and laboratories, T Th 11-12:50 and 1:40-4:30. Stocking 120. *Professor Kosikowski* and assistant.

The chemistry, bacteriology, and technology of milk fermentations leading to important

foods, including cheese, butter, yoghurt, sour cream, buttermilk, and fermented milks. Consideration is given to chemical by-products of milk fermentations such as casein, lactic acid, and alcohol. Line-flow processing practices are carried out in the laboratory.

104. *Concentration and Freezing of Milk and Milk Products*. Spring term. Credit five hours. Given in alternate years. Prerequisite, Course 102. *Professor Jordan* and assistant.] Not given in 1963-1964.

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.

108. *Commercial Grades of Dairy Products*. Spring term. Credit one hour. Given in alternate years. Should be preceded by Course 1. Th 1:40-4:30. Stocking 124. *Professor Shipe*.

The classification of dairy products and the factors involved in grading them.

111. *Analytical Methods*. Spring term. Credit four hours. Prerequisites, college physics and quantitative analysis. Lectures, T Th 11. Laboratory practice, T 1-5. Stocking 119. *Professor Herrington* and assistant.

A study of the more important operations and apparatus used in quantitative analysis, and their practical application.

113. *Chemistry of Milk*. Fall term. Credit two hours. Prerequisites, qualitative and quantitative analysis and organic chemistry. Hours by arrangement. Stocking 120. *Professor Herrington*.

The subject matter changes from year to year. It may deal with colloidal phenomena in milk and its products. It may deal with the enzymes of milk, with milk proteins, with milk fat, or with chemical reactions and equilibria in dairy products. Graduate students may register in successive years and find little duplication of material.

130. *Dairy and Food Engineering*. Fall term. Credit four hours. Given in alternate years. Prerequisites, Physics 103 and 104 or the equivalent and Course 1. *Professor Jordan*.] Not given in 1963-1964.

Engineering aspects of dairy and food plant operations.

131. *Dairy Administration*. Spring term. Credit three hours. Prerequisite, Course 102. Lecture and computation period, W F 1:40-4:30. Stocking 410. Mr. Hofer.

A study of dairy-plant forms and records used in inventory control and the preparation of Market Administrator reports.

203. *Food Products from Milk Fermentations*. Fall term. Credit two hours. Given in alternate years. Not open to dairy graduate students or dairy majors. Prerequisites, a course in bacteriology and organic chemistry or biochemistry. Lectures, T Th 11. Stocking 120. Professor Kosikowski.

The chemistry, bacteriology, and technology of milk fermentations leading to important foods, including cheese, butter, yoghurt, sour cream, buttermilk and fermented milks. Consideration is given to chemical by-

products of milk fermentations such as casein, lactic acid, and alcohol.

Dairy Bacteriology. (See Bacteriology 101.)

210. *Special Topics in Dairy Chemistry*. Fall term. Credit one hour. Registration by permission. Time to be arranged. Professor Herrington.

The class undertakes, by cooperative effort, to prepare a comprehensive, written review of some topic in the field of dairy chemistry. The subject for review is changed each term, and graduate students may register indefinitely.

251. *Special Problems in Dairy Science*. Fall or spring term. Credit one or more hours, by arrangement. For advanced students. Staff.

Special problems in any phase of dairy science may be elected.

252. *Seminar*. Fall and spring terms. Time to be arranged. Stocking. Staff. Required of graduate students in the Department.

DRAWING

FREEHAND DRAWING AND ILLUSTRATION

- 9-10. *Drawing for Landscape Students*.

Throughout the year. Credit three hours a term. Credit may not be received for both Course 9 and Course 11. Fall term is prerequisite to spring term. Fall term, W F 2-4:30; spring term, M W F 11-12:50. Mann 500. Assistant Professors Elliot and Lambert. Planned to develop practical ability in the sketching of outdoor planting and landscape features, facilities in lettering, and knowledge of isometric and perspective construction from plans and elevations. Sketch-book assignments, to be done outside class, are given throughout the year.

11. *Freehand Drawing*. Fall or spring term. Credit three hours. Credit may not be received for both Course 9 and Course 11. For beginning students. Lecture, T or W 10. Six hours of time, including the lecture period, are to be spent in the drawing room, preferably in two-hour units. These hours must be scheduled between 9 and 12 M T W Th F or T 2-4 in the fall term, and between 9 and 11 M W F or T 2-4 in the spring term. Mann 500. Assistant Professors Elliot and Lambert.

The objective is to develop accuracy of observation and skill in delineation. Practice is given in outdoor sketching and in the drawing of still-life set-ups, interior scenes, and human figures. The principles of free-

hand perspective are taught and applied. The course is designed to aid those who plan to work in nature study, biological sciences, and home economics. Sketch-book assignments to be done outside class are given throughout the year.

12. *Freehand Drawing and Illustration*. Fall term. Credit two hours. Prerequisite, Drawing 11 or the equivalent. Six hours of time, including one lecture period arranged during the first week, are to be spent in the drawing room, preferably in two-hour units. These hours may be scheduled between 9 and 12 M T W Th F. Mann 500. Assistant Professor Lambert.

This course carries on from the object drawing of the beginning course to the organization of a complete illustration. The subject matter is derived largely from quick, on-the-spot sketches. Composition, perspective relationships, and ways of rendering are all considered. The work is planned primarily to help students who expect to use their sketching ability in landscape work, interior decorating, or the illustrating of their own papers, bulletins, and books.

14. *Water Color Illustration*. Spring term. Credit two hours. Prerequisite, Course 11 or the equivalent. Six hours of practice must be scheduled, preferably in two-hour units, between 9 and 12 M T W Th F or T W 2-4. Mann 500. Assistant Professor Lambert.

The student learns to mix colors, lay washes, and plan the values of his composition before he tries illustration in color.

16. **Special Problems.** Fall or spring term. Credit two hours. For advanced students only. Three hours of practice required for each hour of credit. Prerequisite, Courses 10, 12, or the equivalent. Mann 500. *Assistant Professors Elliot and Lambert.* For students who wish to attain proficiency in some particular type of illustration or technique.
17. **Scientific Illustration.** Fall term. Credit two hours. Prerequisite, Course 11 or per-

mission of the instructor. Six hours of practice to be scheduled, preferably in two-hour units. These hours may be scheduled between 9 and 12 M T W Th F. *Assistant Professor Elliot.*

A survey of illustration methods suitable for different scientific fields; training in the techniques of pen and ink, scratch board, stipple board, wash, and color overlays. Instruction in the use of the camera lucida, pantograph, projectoscope, and other time-saving methods of getting accurate results as quickly as possible. Methods of reproducing illustrations are studied in relation to cost and problems of publication.

ENTOMOLOGY AND LIMNOLOGY

For related work see the courses listed under the headings "Biology" and "Conservation" in this Announcement, and under "Zoology" in the *Announcement of the College of Arts and Sciences.*

Students are accepted as majors in entomology only upon the consent of the head of the department or of a member of the staff designated to act for him. Except in certain fields, this will normally be done only at the end of the sophomore year. Certain prescribed courses are required, and a high scholastic average is expected.

GENERAL ENTOMOLOGY

10. **Introductory Entomology.** Fall or spring term. Credit three hours. Lectures: Fall term, W F 11; spring term, T Th 9. Comstock 245. Laboratory: Fall term, W or Th 2-4:30; spring term, M T W Th or F 2-4:30. Comstock 100. *Associate Professor Rallensperger and assistants.*

A survey of the structure, biology, and classification of insects; an introduction to the study of insects as a major segment of the biological community. Laboratory exercises in the anatomy and biology of insects and practice in the techniques of insect identification.

General Ecology (Biology 116). Fall and spring terms. Credit three hours. See full detailed description under "Biology."

218. **Techniques of Biological Literature.** Fall term. Credit two hours. Given in alternate years. Lectures, T Th 9. Comstock 300. *Professor Franclemont.*

History of the development of entomological literature and a critical study of the biologists' works of reference and the principles of zoological nomenclature. Practice in the

use of indices and bibliographies, and practice in the preparation of the latter.

INSECT MORPHOLOGY

122. **Insect Morphology and Histology.** Spring term. Credit four hours. Prerequisite, Course 10 or permission of instructor. Lectures, T Th 11. Laboratories, M W 1:40-4:30. Comstock 270. *Associate Professor Eisner.*

The principles of morphology, as illustrated by the insects. Topics are considered at the anatomical, histological, and cytological levels. Emphasis is placed on special problems in morphogenesis, adaptive radiation, and functional anatomy. The various topics are considered in the light of modern evolutionary theory, and an effort is made to relate them to recent behavioral and physiological work. The laboratory is devoted largely to dissection and histological technique.

INSECT TAXONOMY

130. **Introductory Insect Taxonomy.** Spring term. Credit four hours. Students not majoring in entomology may take the lecture or the laboratory separately for two hours' credit by permission. Prerequisite, Course 10. Lectures, T Th 10. Comstock 300. Laboratory, T Th 2-4:30. Comstock 300. *Assistant Professor Brown.*

An introduction to the systematics and distribution of insects. Laboratory practice in the identification of orders, families, and representative genera of insects; methods of collection and preparation of insect specimens. Field trips are taken in the late spring.

231. Taxonomy of the Smaller Orders of Insects. Fall term. Credit three hours. Given in alternate years. Prerequisite, Course 130. Lectures, F 10. Laboratory, F 2-4:30 and one other by arrangement. Comstock 300. Assistant Professor Brown.

Lectures on the classification, evolution, and bionomics of the orders and families of insects, exclusive of the larger orders of Holometabola. Laboratory studies on the literature and on the characters and classification of representative genera and species. Continuation of taxonomy of Holometabola is in Courses 232, 233, and 234.

[232. Taxonomy of the Immature Stages of Holometabola. Fall term. Credit three hours. Given in alternate years. Prerequisite, Course 231 or permission of the instructor. Professor Franclemont.] Not given in 1963-1964.

Lectures on the structure and habits of insect larvae. Laboratory studies of the literature, comparative morphology, and identification of the immature stages of the Holometabola.

[233. Taxonomy of the Coleoptera and Lepidoptera. Spring term. Credit three hours. Given in alternate years. Prerequisite, Course 130. Professor Franclemont.] Not given in 1963-1964.

Laboratory studies on the literature and on the characters and classification of representative genera and species of these orders.

234. Taxonomy of the Diptera and Hymenoptera. Spring term. Credit three hours. Given in alternate years. Prerequisite, Course 130. Lecture, W 12. Laboratory, F 2-4:30 and one other by arrangement. Comstock 300. Assistant Professor Brown.

Laboratory studies on the literature and on the characters and classification of representative genera and species of these orders.

Seminar in Evolutionary Theory (Biology 302).

Fall term. Credit two hours. See full description under "Biology."

ECONOMIC ENTOMOLOGY

141. General Economic Entomology. Fall term. Credit three hours. Prerequisite, Course 10 or the equivalent. Lectures, T Th 9. Comstock 145. Laboratory, T 2-4:30. Comstock 100. Associate Professor Raffensperger and assistants.

Lectures on the life histories and habits of insects injurious to the major plant and animal crops of the United States, and on methods used in their control; laboratory exercises on the commoner pests and more important insecticides.

[241. Special Topics in Economic Entomology. Fall term. Credit three hours. Given in alternate years. Prerequisite, Plant Breeding 210 or its equivalent and permission to register. Primarily for graduate students. Professor Gyrisco.] Not given in 1963-1964.

A course dealing with principles of control for insects of field and forage crops, forage seed crops, and small grains. Emphasis is placed on field plot techniques, practical experimental designs, sampling, analysis of data; insecticide residues on forage, in milk, and meat, the problems and limitations they involve; and effects of toxic residues on pollinating insects. Laboratories deal with sight identification of arthropod pests of field crops, field plot layouts, and instrumentation for field work in insect biology.

[242. Special Topics in Economic Entomology. Spring term. Credit three hours. Given in alternate years. Prerequisite, Course 141 or permission to register. Professors Brann and Dewey.] Not given in 1963-1964.

A continuation of Course 241. Topics treated: insecticide application equipment and insect pests of fruit.

[243. Special Topics in Economic Entomology. Fall term. Credit three hours. Given in alternate years. Prerequisite, Course 141 or permission to register. Assistant Professors Morse and Weidhaas.] Not given in 1963-1964.

A continuation of Courses 241 and 242. Topics covered: large scale insect eradication; control programs and insect pests of woody ornamentals.

244. Insect Pathology and Biological Control. Spring term. Credit three hours. Given in alternate years. Permission to register is required. By appointment. Associate Professor Pimentel.

The ecology and epidemiology of insect-pathogen systems and principles of biological control are considered.

PARASITOLOGY AND MEDICAL ENTOMOLOGY

150. Introductory Parasitology. Every spring term. Credit four hours. Prerequisite, Biology 1 and 2, or Zoology 102 or 104 or their equivalents. Course 10 is also recommended. Limited to 12 students per section. Lectures, M W 10. Comstock 245. Laboratories, T 10-12:30 or 2-4:30 and Th 10-12:30 or 2-4:30. Comstock 200. Professor Travis.

An introduction to the symbiotic way of life among animals, primarily the proto-

zoan, helminth, and arthropod species. Special emphasis is given to the recognition of selected symbiotic species and how they live with their hosts.

- [251. *Advanced Parasitology (Protozoa and Helminths)*. Fall term. Credit three hours. Given in alternate years. Open to graduate students; undergraduates only by permission. Prerequisite, Course 150 or its equivalent. Professor Travis.] Not given in 1963-1964. A continuation of Course 150 for graduate students interested in the parasitic protozoa and helminths. Practical experience with methods of collection, preparation; detailed studies on recognition and life cycles. Special emphasis is given to the parasites that are transmitted by arthropods.

252. *Advanced Parasitology (Medical Entomology)*. Fall term. Credit three hours. Given in alternate years. Open to graduate students; undergraduates only by permission. Prerequisites, Course 150 and Course 10 or their equivalent. Lecture and one laboratory, Th 2-4:30, and one laboratory by arrangement. Comstock 200. Professor Travis. A continuation of Course 150 for graduate students interested in medical or veterinary entomology. Practical experience with methods of collection, preparation; detailed studies on recognition, life cycles, and control. Special emphasis is given to species that are causative agents of disease in man and other animals, or are the vectors or the intermediate hosts of disease-producing organisms.

APICULTURE

61. *Introductory Beekeeping*. Spring term. Credit two hours. Lectures, T Th 11. Comstock 245. Professor Dyce.

Intended to afford a general knowledge of the fundamentals of beekeeping, including the life history, instincts, and general behavior of honeybees. Special attention is given to the role of bees in the cross-pollination of agricultural crops, as well as production of honey and beeswax.

261. *Advanced Beekeeping*. Throughout the year. Credit three hours a term. Given in alternate years. Prerequisites, Courses 10 and 61 and previous beekeeping experience. By appointment. Professor Dyce and Assistant Professor Morse.

An advanced course for those specializing in apiculture. Considerable time is devoted to a study of the entire field of beekeeping. Laboratory work covers bee behavior, external and internal anatomy, disease diagnosis, honey and beeswax production and

preparation for market, and the management of colonies for pollination service.

- [262. *Special Topics in Beekeeping*. Throughout the year. Credit three hours a term. Given in alternate years. Registration by permission; open to qualified juniors, seniors, and graduate students. By appointment. Professor Dyce and Assistant Professor Morse.] Not given in 1963-1964.

A technical course designed for advanced students, and covering scientific investigation in all phases of the subject. Special attention is given to improved methods of apiary and honeyhouse management and the preparation of honey for market. Current literature on beekeeping is assigned, reviewed, and evaluated by students. Lectures and discussions are supplemented by fields trips.

LIMNOLOGY

171. *Limnology*. Spring term. Credit three hours. Prerequisites, nine hours of biological science, including Course 10 or the equivalent, a course in general physics, and a course in general chemistry. Lecture, F 10. Comstock 145. Laboratories and field trips, F 2-4:30 and S 8-10:30. Comstock 270. Professor Berg.

A study of the life of inland waters and important physical and biological factors that affect it.

272. *Advanced Limnology*. Fall term. Credit three hours. Prerequisites, Course 171 and permission to register. Normally limited to graduate students majoring or minoring in limnology. Lecture and laboratory, T 2-4:30, and one additional laboratory or field trip, by arrangement. Comstock 110. Professor Berg.

Discussions and analyses of current limnological concepts and problems, including the critical study of selected reference works and research papers.

Fishery Biology and Fish Culture. See full description under "Conservation."

INSECT PHYSIOLOGY AND BIOCHEMISTRY

285. *Insect Physiology*. Fall term. Credit three hours. Given in alternate years. Prerequisites, one year each of physics and chemistry, with courses in biochemistry and physiology recommended. M W F 9. Comstock 145. Professor Patton.

Lectures and demonstrations to introduce and develop the subject of insect physiology and its applications.

286. *Insect Biochemistry*. Spring term. Credit two hours. Given in alternate years. Registration by permission of instructor. Prerequisite, *Biochemistry* 101. T Th 11. Comstock 145. *Associate Professor* Young. A discussion of biochemistry as applied to insects. Energy metabolism, detoxification, secretion, development, metabolism of insecticides, resistance.

INSECT TOXICOLOGY AND INSECTICIDAL CHEMISTRY

[295. *Insect Toxicology*. Fall term. Credit four hours. Given in alternate years. Prerequisites, Course 141, general chemistry, and organic chemistry. Undergraduate students by permission. *Professor* Dewey.] Not given in 1963-1964.

A discussion of toxicological factors affecting insects. A study of insecticides including physical factors affecting formulation, toxicity to insects, and the principles of evaluating their effects on insects.

[296. *Insecticide Chemistry and Action*. Spring term. Credit three hours. Given in alternate years. Prerequisites, general chemistry and organic chemistry. Undergraduate students by permission. *Associate Professors* O'Brien and Lisk.] Not given in 1963-1964. The chemistry of insecticides, and their metabolism and mode of action in insects and mammals with emphasis on the relation between structure and activity. Analytical techniques of use in structure elucidation and residue evaluation.

RESEARCH

300-399. *Research*. Fall and spring terms. Credit to be arranged. Prerequisite, permis-

sion to register from the professor under whom the work is to be taken.

310. *Insect Ecology and Insect Pathology*. *Associate Professor* Pimentel.

320. *Insect Morphology, Histology, and Embryology*. *Associate Professor* Eisner.

330. *Taxonomy*. *Professor* Franclemont, *Associate Professor* Pechuman, and *Assistant Professors* Keeton and Brown.

340. *Economic Entomology*. *Professors* Rawlins, Brann, Dewey, Matthyse, and Gyrisco; *Associate Professors* Naegle, Semel, Woolley, Lisk, and Muka; *Assistant Professors* Weidhaas and Johnson.

350. *Medical Entomology and Parasitology*. *Professor* Travis.

361. *Apiculture*. *Professor* Dyce and *Assistant Professor* Morse.

370. *Limnology*. *Professor* Berg.

385. *Insect Physiology*. *Professor* Patton.

386. *Insect Biochemistry*. *Associate Professor* Young.

395. *Toxicology of Insecticides*. *Professor* Dewey.

396. *Chemistry and Action of Insecticides*. *Associate Professor* O'Brien.

SEMINAR

Jugatae. Fall and spring terms. M 4:30-5:30. Comstock 245.

The work of an entomological seminar is conducted by the *Jugatae*, an entomological club that meets for a discussion of the results of investigations by its members.

EXTENSION TEACHING

1. *Oral and Written Expression*. Throughout the year. Credit three hours a term. Fall term is prerequisite to spring term. Primarily for students of the two-year courses. Lectures and practice: Fall term, M W F 8 or 11 or T Th S 10; spring term, M W F 8, 9, or 11. Warren 231. Criticism, by appointment, daily 8-5 and S 8-1. *Associate Professors* Freeman and Martin, and Messrs. Lueder and ———.

Practice in oral and written presentation of topics in agriculture and other fields, with criticism and individual appointments on the technique of public speech. Designed to en-

courage interest in public affairs, and, through demonstrations and the use of graphic materials and other forms, to train for effective self-expression in public. Special training is given to competitors for the Eastman Prizes for Public Speaking and the Rice Debate Stage. In addition, some study is made of representative work in English literature. Part of the work in the second term is a study of parliamentary practice.

101. *Oral and Written Expression*. Fall or spring term. Credit two hours. Open to

juniors and seniors. The number in each section is limited to twenty students. Lectures and practice: Fall term, M W 9, T Th 9, 10, or 11, W F 10, Warren 131; spring term, M W 9, T Th 9 or 11, Warren 131. Criticism, by appointment, daily 8-5, S 8-1. *Professor Peabody, Associate Professors Freeman and Martin, and Mr. Lueder.*

Practice in oral and written presentation of topics in agriculture and other fields, with criticism and individual appointments on the technique of public speech. Designed to encourage interest in public affairs, and, through demonstrations and the use of graphic materials and other forms, to train for effective self-expression in public. Special training is given to competitors for the Eastman Prizes for Public Speaking and the Rice Debate Stage. (See pages 101 and 102.)

- 102. Oral and Written Expression.** Spring term. Credit two hours. Prerequisite, Course 101, of which Course 102 is a continuation. Lectures and practice, T Th 10 or W F 10, Warren 131. Criticism, by appointment, daily 8-5, S 8-1. *Professor Peabody and Associate Professor Freeman.*

Part of the work consists of a study of parliamentary practice.

- 104. Advanced Oral Expression.** Spring term. Credit two hours. Prerequisites, Courses 101 and 102 and permission of the instructor. Limited to nine students. M W 12, Warren 131. *Professor Peabody.*

An advanced course of study and practice in oral expression as directly related to the needs of the county agricultural agent, the home demonstration agent, the 4-H Club agent, the extension specialist, and the vocational teacher.

JOURNALISM

- 15. Agricultural and Home Economics Journalism.** Fall term. Credit three hours. M W F 10, Warren 145. *Associate Professor Russell.*

An introductory course dealing with the farm press, daily and weekly newspapers, magazines, trade journals, book publishing, advertising, radio, television, and other fields related to agricultural and home economics journalism. The operations of the major mediums of communication and the techniques of writing for each are studied.

- 110. News Writing.** Spring term. Credit two hours. Prerequisite, Course 15. Th 2-4, Warren 232. *Professor Knapp.*
- Primarily the writing of agricultural and home economics news for publication. In-

cludes criticism, discussions, and consultations on published material written by students.

- 112. Agricultural Advertising and Promotion.**

Spring term. Credit two hours. Open to juniors and seniors, and to other students by permission of the instructor. W 2-4, Warren 245. *Associate Professor Russell* and guest lecturers from advertising agencies.

The use of commercial advertising and sales promotion methods and media in promoting the sale of products and new or improved farm and home practices and programs. Includes market analysis, planning of the advertising and/or promotion units, selection of media, preparation of copy, and sales-promotion pieces.

- 113. Writing for Magazines.** Spring term.

Credit three hours. Open to juniors, seniors, and graduate students. M 1:40-4:30, Warren 260. *Professor Ward.*

Deals chiefly with the writing of fact articles for publication in agricultural, home economics, or general magazines. Students may write on any subject they choose. The articles and publication markets are analyzed.

Publication: The Arts of Writing and Printing (Home Economics 310). Fall term. Credit three hours. T 9, Th 9-11. *Associate Professor Stocks, Mrs. Hall, and others.* Registration by permission of instructor. See *Announcement of the College of Home Economics.*

RADIO-TELEVISION

- 120. Radio Broadcasting and Telecasting.**

Spring term. Credit three hours. Not open to freshmen. M W F 9, Roberts 131. *Associate Professor Kaiser.*

An introductory course to familiarize students, particularly those in agriculture and home economics, with the best methods of presenting ideas by radio and television. Practice includes auditions and criticisms for all members of the class in preparing and presenting radio talks; continuity writing and program arrangements.

- 122. Television Production and Programing.**

Fall term. Credit two hours. Open to juniors, seniors, and graduate students. T 2-4, Roberts 131. *Associate Professor Kaiser.*

A survey of television as a means of getting information to the public. A study is made of the techniques employed in televising informational-type programs. Students prepare formats and scripts and prepare and present programs before a closed-circuit

camera. Evaluation or criticism of the programs is made by the instructor and the class.

VISUAL AIDS

130. *Photography*. Spring term. Credit two hours. Lectures and laboratory, 8 9-12. Roberts 131. Open to juniors, seniors, and graduate students. Limited to twenty-five students. Registration by permission only. Primarily intended for those who plan to enter fields of agriculture and home economics in which a knowledge of photographic principles is important. *Professor E. S. Phillips*.

The techniques of photography to be used in newspapers, magazines, bulletins, and for film strips, motion pictures, and other media.

[131. *Visual Aids: Their Scope, Preparation, and Use*. Fall term. Credit two hours. Open to juniors, seniors, and graduate stu-

dents. *Professor E. S. Phillips* and departmental staff.] Not given in 1963-1964.

Designed to familiarize the student with the forms, purposes, preparation, and use of all types of visual aids (slide sets, motion and news photography, exhibits, posters, and other media), useful to teaching, promotion or public relations problems in agriculture and home economics. Includes practice in selecting and planning specifically assigned problems.

RESEARCH

195. *Undergraduate Research*. Fall and spring terms. Credit one to three hours. Open to seniors majoring in the department who obtain written permission of professors supervising their work. Designed to permit outstanding undergraduates to carry out independent studies in communications research under appropriate supervision. Departmental staff.

FLORICULTURE AND ORNAMENTAL HORTICULTURE

Instruction in the Department of Floriculture and Ornamental Horticulture is planned for students with the following interests: (1) commercial plant production, distribution, or utilization, including the management of greenhouses, nurseries, and wholesale and retail establishments; (2) developing a landscape service, including the planning, construction, planting, and maintenance of small properties; (3) superintendence of parks, golf courses, cemeteries, arboretums, or garden centers; (4) the culture and use of ornamental plants in the home garden and in the home; (5) turfgrass production and management; (6) scientific research and teaching.

Special curricula are set up to meet the needs of those students desiring training in the above fields.

Undergraduate students may plan their course as preparation for graduate training leading to university teaching, or research positions with universities, experiment stations, or industry.

Courses 1, 3, 10, 12, 13, 115, and 123, are required of all students majoring in the Department. These students must also satisfy the department practice requirement based on experience with ornamental plants and their culture.

GENERAL COURSES

General Horticulture. See Vegetable Crops 3.

1. *General Floriculture and Ornamental Horticulture*. Fall term. Credit three hours. Intended primarily for departmental majors. Lectures, M W 8. Plant Science 37. Laboratory, M or T 2-4:30. Plant Science 15. *Associate Professor Langhans*.

An elementary course covering the principles and practices of growing ornamental plants in the garden, greenhouse, and home.

[2. *Introduction to Landscape Design*. Fall or spring term. Credit three hours. Open to all students except department majors. Mr. Dwelle.] Not given in 1963-1964.

A consideration of the principles of landscape design as applied to the small-residence property.

5. *Principles of Flower Arrangement*. Fall or spring term. Credit two hours. Enrollment limited to 18 students for each laboratory section. Fall term: Lecture, Th 9. Plant Science 37. Laboratory, W or Th 2-4:30, or Th 10-12:30. Plant Science 22. Spring term: Lecture, T 10. Plant Science 37. Laboratory, W 2-4:30 or Th 10-12:30

or Th 2-4:30. Plant Science 22. *Associate Professor Fox.*

A study of the care and handling of flowers, the factors affecting keeping quality, and the design principles involved in the use of flowers and related decorative materials.

- [123. *Environment and Plant Growth.* Fall term. Credit four hours. Prerequisites, Course 115, Botany 31, Agronomy 1 (all may be taken concurrently with Course 123). *Professor J. G. Seeley.*] Not given in 1963-1964. A comprehensive study of the application of basic science to the culture of ornamental plants.

PLANT MATERIALS

10. *Taxonomy of Cultivated Plants.* Fall term. Credit four hours. Intended primarily for departmental majors. Prerequisite, Botany 1 or its equivalent. Lectures, W F 10. Plant Science 37. Laboratory, W F 2-4:30. Plant Science 29. *Assistant Professor Ingram.*

A study of the kinds of cultivated ferns and seed plants and their classification into families and genera. Emphasis is placed on methods of identification, the preparation and use of the analytical keys, the distinguishing characteristics of the families concerned, and their importance in ornamental horticulture.

- [12. *Herbaceous Plant Materials.* Spring term. Credit three hours. Prerequisite, Course 10 or permission to register. *Associate Professor Lee.*] Not given in 1963-1964. A study of the ornamental herbaceous plants used in landscape and garden plantings. Emphasis is placed on the identification, use, and culture of bulbs, annuals, and perennials.

13. *Woody-Plant Materials.* Spring term. Credit four hours. Prerequisite, Course 10 or permission to register. Lectures, T Th 9. Plant Science 37. Laboratory and field trips, M and W or F 2-4:30. Plant Science 29. *Assistant Professor Mower.*

A study of the trees, shrubs, and vines used in landscape planting. Emphasis is placed on their characteristics and values for use as landscape material. The class visits Rochester parks.

113. *Woody-Plant Materials, Advanced Course.* Fall term. Credit two hours. Prerequisite, Course 13. Lecture to be arranged. Laboratory, F 2-4:30. Plant Science 15. *Assistant Professor Mower.*

The important groups of landscape materials and the literature of the subject. A

knowledge of the ordinary woody plants for landscape use in the Northeast is presumed. Emphasis is on less-known northern plants and upon plant groups basic in landscape design in other regions of the United States. Opportunities for practice in the determination of unknowns and in the use of the literature are provided. A trip is taken to Washington, D.C., and vicinity.

NURSERY MANAGEMENT

114. *Turfgrass Management.* Spring term. Credit two hours. Prerequisite, Agronomy 1 or permission to register. Lecture, W 11. Plant Science 37. Laboratory, Th 2-4:30. Plant Science 29. *Professor Cornman.*

The principles, practices, and materials for the construction and maintenance of lawn areas. Some attention is given sports turf. A week-end inspection trip is taken to experimental test plots and special turf areas.

115. *Plant Propagation.* Fall term. Credit three hours. Prerequisite, Botany 31 or the equivalent, or permission of the instructor. Lectures, T Th 8. Plant Science 37. Laboratory, Th 2-4:30. Greenhouses and nurseries. *Assistant Professor Tukey.*

The germination of seeds, rooting of cuttings, multiplication of bulbs, and propagation of plants by budding and grafting are studied from the standpoint of the basic mechanisms governing the initiation and development of roots and shoots, including the physiology of dormancy, growth regulators, and germination. Field trips are taken to view commercial plant propagation techniques.

117. *Nursery Crop Production and Maintenance.* Spring term. Credit four hours. Prerequisite, Course 115. Lectures, M W F 8. Plant Science 37. Laboratory, M 2-4:30. Greenhouses and nursery. *Professor Pridham.* The problems of commercial propagation and growing of nursery plants to marketable stage. Digging, storage, and packaging of nursery stock, and commercial planting and maintenance practices are included. Plant growth is considered in relation to soil and climate factors of site. Control of growth by watering, cultivation, and pruning of landscape plants in garden and park planting is stressed. Field problems and observational trips are included in laboratory work.

COMMERCIAL FLORICULTURE

124. *Florist Crop Production.* Spring term. Credit four hours. Prerequisite, Course 123.

Lectures, M W F 9. Plant Science 37. Laboratory, W 2-4:30. Greenhouses. *Associate Professor Boodley.*

The commercial production of florist crops. Emphasis is on culture of plants as influenced by greenhouse environment. Field trips are made to commercial greenhouses.

125. **Flower-Store Management.** Spring term. Credit three hours. Prerequisites, Course 5 and permission to register. Lecture, T Th 8. Plant Science 37. Laboratory, T 2-4:30. Plant Science 22. *Associate Professor Fox.* Lectures devoted to flower-shop management, business methods, merchandising, and marketing of floricultural commodities. Laboratories to include the application of subject matter and the principles of commercial floral arrangement and design. A required two-day field trip is made to flower shows and to wholesale and retail florist establishments.

LANDSCAPE SERVICE

The landscape service curriculum leads to the Bachelor of Science degree.

3. **Elementary Landscape Design.** Fall term. Credit three hours. Prerequisite, Drawing 9 or 11. Intended primarily for departmental majors. Lectures, T Th 11. Laboratory, Th 2-4:30. Plant Science 433. *Assistant Professor Scannell.*

Principles of design, with practice in the use of drawing instruments and graphic interpretation of ideas.

32. **Intermediate Landscape Design.** Spring term. Credit three hours. Prerequisites, Courses 3, 12, and 13 and Drawing 10. Lecture, M 11. Laboratory, T Th 10-12:30. Plant Science 433. Mr. Dwelle.

The application of the principles of design to the specific problems of the small residential property. A terminal course for those not intending to major in this field.

132. **Planting Design.** Fall term. Credit three hours. Prerequisite, Course 32. Lecture, W 12. Laboratories, W 2-4:30 and F 10-12:30. Plant Science 433. *Assistant Professor Scannell.*

An advanced course in design, with emphasis on plant combinations and uses in association with structures and gardens. Practice in drawing and estimating planting plans.

133. **Advanced Landscape Design.** Spring term. Credit four hours. Prerequisite, Course 32. Lecture, M 12. Laboratory, M W 2-4:30 and one additional period. Plant Science 433. *Assistant Professor Scannell.*

Practice in making landscape plans for real situations is an essential part of this course. Residential housing, industrial, and commercial landscape treatments are included.

141. **Nursery-Landscape Construction.** Fall term. Credit three hours. Prerequisite, Agricultural Engineering 21. Lectures and laboratory, T Th 8-11. Plant Science 433. Mr. Dwelle.

Particular emphasis on principles of earth work, drainage, and the construction of small structures. Practice in interpreting and drawing construction details and the reading and drawing of grading plans.

142. **Advanced Nursery-Landscape Construction.** Spring term. Credit two hours. Prerequisite, Course 141. Lecture and laboratory, W F 10-12:30. Plant Science 433. *Assistant Professor Scannell.*

Preparing grading and drainage plans. Practice in preparing and reading dimension plans. Details of cost estimating.

DEPARTMENTAL SEMINAR

241. **Seminar.** For departmental staff and graduate students. Fall and spring terms. Time to be arranged.

250. **Special Problems in Floriculture and Ornamental Horticulture.** Fall or spring term. Credit two or more hours. Prerequisites, adequate training for the work and permission to register; primarily for graduate students. *Professor J. G. Seeley and staff.* Special work on problems under investigation by the department or of special interest to the student, provided adequate facilities are available. Students must satisfy the staff member under whom the work is to be taken that their preparation warrants their choice of problems.

FOOD SCIENCE

The curriculum in food technology is specifically designed to prepare students for: (1) production and research; or (2) sales and management positions in the food industry. Both programs are designed to give the stu-

dent a broad background in the basic sciences, as well as a more specialized concept in a study of foods. Those interested in the first program will be encouraged to take allied courses pertaining to food, such as

dairy, animal husbandry, poultry, pomology, and vegetable crops. Those interested in the second program will combine courses in food technology with courses in business management, accounting, organization, and administration.

- 1. Introductory Food Science.** Fall term. Credit two hours. Especially for freshmen and sophomores. Lectures, M W 10. Stocking 218. *Associate Professor* Buck.

A survey course to orient the student in the broad field of food science and processing. Includes the economic importance of the food industry and the relation of engineering operations and processes in the production, processing, and handling of the raw products through distribution of the processed foods.

- 101-102. Principles of Food Technology.**

Throughout the year. Credit three or five hours a term. Prerequisites. Chemistry 106 and 353 or equivalent. Bacteriology 1, Physics 102. Lectures, T Th 10. Riley-Robb 225. Laboratory, Th 2-4:30. Riley-Robb 44. For those who register for 5 hours credit: prerequisite, a course in calculus, or analytical geometry and differential equations, and a course in biochemistry. Additional lecture and laboratory, T 1:40-4:30. Riley-Robb 44. *Associate Professor* Buck. The fundamentals involved in the processing, production, and distribution of raw material to finished product, with emphasis on the unit operations and processes employed by the canning, freezing, fermentation, and dehydration industries. The fundamental and physical properties of foods and their nutritive components, food additives and preservatives, and the principles of manufacture are discussed. Laboratory practice involves actual processing and preservation of various food products, and field trips.

- 106. Food Processing Instrumentation.** Fall term. Credit three hours. Prerequisite or

concurrent, Course 101. Lectures, M W 9. Riley-Robb 225. Laboratory, F 2-4:30. Riley-Robb 146. *Assistant Professor* Nowrey.

Principles of engineering analysis and judgment are employed in examination of instruments for measurement and control of food processes. Topics include pressure, temperature, and flow measurements, plus selected instruments for measuring physical and chemical properties of foods. Electronic components of electrical instruments are discussed. The use of instruments in the enforcement of food laws is also presented.

- 107. Food Engineering Calculations.** Spring term. Credit three hours. Prerequisite, Course 101. Lectures, M W 9. Riley-Robb 225. Laboratory, F 2-4:30. Riley-Robb 146. *Assistant Professor* Nowrey.

Analysis and presentation of technical data collected from food processes using statistical and graphical methods. Empirical equations and dimensional analyses are also discussed. The use of computers in programming food processes is presented.

- 190. Food Technology Seminar.** Throughout the year. Credit one or two hours a term. Prerequisite, credit or concurrent registration in Course 101. Lecture, T 11. Riley-Robb 225. *Associate Professor* Buck.

A discussion of current literature on industrial aspects of food technology and related topics and special lectures.

- 220. Research.** Fall or spring term. Credit one or more hours by arrangement. For graduate students. Staff.

Special problems in any phase of food science may be elected.

Food Engineering. (See Dairy Science 130.)

Food Biochemistry. (See Biochemistry 140.)

Food Biochemistry Seminar. (See Biochemistry 294.)

Food Microbiology. (See Bacteriology 101.)

METEOROLOGY

- 1. Basic Principles of Meteorology.** Fall term. Credit three hours. Prerequisite, Physics 101 or one year of high school physics. Lectures, T Th 11. Plant Science 143. Laboratory, T W or Th 2-4:30. Plant Science 114. *Associate Professor* Dethier.

Simplified treatment of the structure of the atmosphere; heat balance of the earth; general and secondary circulations; air masses, fronts, and cyclones; hurricanes; thunder-

storms, tornadoes, and atmospheric condensation. In the laboratory, emphasis is on the common meteorological instruments and the weather map.

- 2. Climatology.** Spring term. Credit three hours. Prerequisite, Course 1. Lectures, M W F 11. Plant Science 141. *Associate Professor* Dethier.

The first ten weeks are devoted to the description of world climates in terms of the

global distribution of radiation, temperature, pressure and wind, precipitation and air masses, and the factors which produce this distribution.

During the last five weeks of study, emphasis is on the factors influencing the microclimate and the variation of climate due to vegetation and small-scale topographic features.

PLANT BREEDING

Four-year students interested in specializing in genetics, plant breeding, or statistics may obtain suggested sequences of courses by consulting the head of the department, R. P. Murphy. Professional careers in these fields ordinarily involve advanced study. Therefore, undergraduate course work in most instances will be directed toward preparation for graduate study. Appropriate fundamental courses in biology, mathematics, chemistry, and English will make up the bulk of the curriculum. For those who plan to continue study at the graduate level, course work in a foreign language is required.

GENETICS

1. *Human Heredity and Eugenics*. Spring term. Credit two hours. (Students who have had Course 101 are allowed one-hour credit.) Prerequisite, Zoology 104, Botany 1-2, or Biology 1-2. Lectures, W F 10. Discussion period, M 10; attendance voluntary. Warren 145. *Professor Srb*.

An introduction to the laws of heredity, a survey of heritable characters in man, and discussions of the relationship between heredity in man and social problems. Intended primarily for students who have not previously had a college course in genetics and who wish to obtain a knowledge of principles of heredity, especially as applied to man.

101. *Genetics*. Fall or spring term. Credit four hours. Prerequisite, a beginning course in biological science. Courses in cytology and in taxonomic botany and zoology are found helpful. Lectures, M W F 8. Plant Science 233. Laboratory, T 8-10, or M W Th or F 2-4. Plant Science 41. *Professor Stinson and Associate Professor Everett and assistants*.

A general study of the fundamental principles of genetics in plants and animals. Discussions of simple cases of inheritance, gene action and interaction, gene linkage, and the chromosome theory of heredity, in-

212. *Special Topics in Meteorology and Climatology*. Fall or spring term. Credit one or more hours. Prerequisite, permission of the instructor. *Associate Professor Dethier*. Study of meteorological topics more advanced than or different from those in other courses. Subject matter depends on the background and desires of those enrolling.

heritance of quantitative characters, inheritance of sex, effects of inbreeding and crossing, cytoplasmic inheritance, the origin of heritable variations and their relation to evolution. Laboratory studies of hybrid material in plants and breeding experiments with *Drosophila*.

201. *Physiological Genetics*. Spring term. Credit two hours. Prerequisites, Course 101 and a course in organic chemistry. Lectures, M W 8. Plant Science 141. *Professor Srb*. The nature and function of hereditary units studied in terms of physiology and biochemistry. Students are expected to do extensive reading in the periodical literature of genetics and to prepare a term paper.

204. *Population Genetics*. Spring term. Credit two hours. Prerequisite, Course 101 or the equivalent. Lectures, T Th 11. Discussion period to be arranged, attendance voluntary. Plant Science 37. *Professor B. Wallace*.

A study of factors which influence the genetic structure of Mendelian populations and which are involved in race formation and speciation.

PLANT BREEDING

102. *Plant Breeding*. Spring term. Credit three hours. (Students who have had Course 101 are allowed two hours credit.) Prerequisite, Botany 1-2. Lectures, T Th 8. Plant Science 141. Laboratory, T 2-4:30. Place to be arranged. *Associate Professor Plaisted*.

A study of the principles and practices used in developing, evaluating, distributing, and maintaining improved crop varieties. Approximately one-third of the course is devoted to a study of elementary genetics. Designed primarily for students who wish a general knowledge of plant breeding. Students who expect to engage professionally in plant breeding should take Courses 101 and 203 instead of this course.

203. *Methods of Plant Breeding*. Fall term. Credit three hours. Prerequisites, Course 101,

Botany 1, and a course in at least one of the following: field crops, vegetable crops, floriculture, or pomology. Lectures, T Th 8. Plant Science 141. Laboratory, T 2-4:30. Place to be arranged. *Professor Munger.* Designed primarily for graduate students, but open to properly qualified seniors who expect to engage in plant breeding. A study of the principles and practices of plant breeding. Lectures, supplemented by periods in the greenhouse and experimental fields. A one-day field trip is taken.

215. Statistics for Quantitative Genetics. Spring term. Credit three hours. Prerequisites, 211 and 203 or their equivalents. Time and place to be arranged. *Associate Professors Lowe and Plaisted.* An introduction to statistical methods currently used in research in quantitative genetics and plant breeding.

Special Topics in Plant Science Extension (Vegetable Crops 229). Spring term. Credit one hour (additional credit by special arrangement). Given in alternate years. Lecture, F 8. Discussion period, F 2-4. East Roberts 222. *Professors Minges and A. A. Johnson.* Designed for graduate students and advanced undergraduates in the several plant science fields who wish to acquire a knowledge of extension work and activities in preparation for careers in extension and in other work closely associated with extension, such as research and technical work in both public and commercial organizations. Examples are drawn from the United States and the developing countries. Staff members from other plant science departments collaborate in teaching the course.

STATISTICS AND BIOMETRY

***210. Statistical Methods I.** Fall term. Credit one, three, or four hours. Prerequisite, graduate standing or permission of instructor. T Th S 10. Warren 345. Laboratory to be arranged. *Associate Professor Choi.* The distributions of statistics encountered in biological and other fields are considered from the point of view of elementary probability notions and by sampling from known populations. The results, with principles of experimentation, are applied to the con-

ducting of experiments and interpretation of results. The nature and validity of experimental error are treated. Topics include point and interval estimation, tests of hypotheses, the simpler experimental designs and their analyses of variance, linear regression, and correlation.

***211. Statistical Methods II.** Spring term. Credit one, three, or four hours. Prerequisite, Course 210 or the equivalent. T Th S 10. Warren 345. Laboratory to be arranged. *Associate Professor Choi.*

The work of 210 is continued. Topics include factorial experiments, individual degrees of freedom, analysis of covariance, analysis of variance of two-way classifications with disproportionate numbers, multiple and curvilinear regression, curve fitting, the treatment of discrete data, some recent developments in statistics.

[212. Experimental Methods. Spring term. Credit one hour. Designed for major and minor graduate students in the Department. Prerequisite, Course 211 or the equivalent. *Associate Professor Lowe.*] Not given in 1963-1964.

The use of statistical methods and experimental design in problems of plot technique and related agricultural research.

213. Design of Experiments I. Fall term. Credit three hours. Prerequisite, Course 211, including one hour of algebra, or the equivalent. Time and place to be arranged. *Professor Federer.*

Principles and techniques of experimentation, extensions and variations of the completely randomized, complete block, and latin square designs, the factorial experiment and confounding, lattice designs, crossover designs, augmented and other designs, covariance analyses, error rates, tests for ranked means, sample size and variance component analyses.

214. Design of Experiments II. Spring term. Credit three hours. Prerequisite, Course 213 or the equivalent. Time and place to be arranged. *Professor Federer.*

A continuation of the work discussed in Course 213. A discussion from selected topics on long-term experiments, combination of results from several experiments, sequential experimentation, variance component analyses, estimation procedures,

* An additional hour per week is devoted to algebraic derivations and manipulations associated with the statistical techniques and computational procedures of the lectures and laboratory. The purpose is to give the student a better understanding of statistics and to improve his background for further work in statistics, such as that in Course 213. This optional hour carries one hour credit and may be taken with or without the regular three hours credit.

linear hypotheses, heritability studies, multivariate analyses, and related topics.

219. *Statistical Genetics*. Spring term. Credit three hours. Prerequisite, Course 213 and Mathematics 711, or permission of the instructor. Time and place of lectures to be announced. *Associate Professor* Robson. A brief introduction to probability theory, estimation, properties of estimators, and Markov chains, as applied to selfing, sibling, backcrossing and random mating series with and without linkage. Haploids, diploids, and polyploids are considered. Other topics (e.g., Powers' Partitioning Method) are discussed.

PLANT PATHOLOGY

The department offers programs of instruction in plant pathology, mycology, plant nematology, and plant virology. Undergraduate programs are developed for students planning careers in state or federal regulatory work, in technical service, in agricultural chemical sales, as county agents, in farm advisory services, as laboratory technicians, or in other agricultural positions.

Programs for those interested in teaching or research in these areas are offered at the graduate level. Undergraduates aiming toward such programs are advised to take the general biological sciences curriculum with emphasis on the plant sciences.

1. *Elementary Plant Pathology*. Fall or spring term. Credit three hours. Prerequisite, Botany 1-2 or Biology 1-2, or the equivalent. Lecture, Th 11. Plant Science 336. Recitation, T 11. Plant Science 37. Laboratory, T W Th or F 2-4:30. Plant Science 341 and 343. Conferences to be arranged. *Assistant Professor* Millar.

An introductory course dealing with the nature, cause, and control of disease in plants. Representative diseases of cultivated crops are studied in the laboratory.

2. *Plant Disease Control Practices*. Spring term. Undergraduate and special students. Credit three hours. Given in alternate years. Prerequisite, Course 1 or equivalent. Lecture, T 11. Plant Science 336. Laboratory and recitation, T Th 2-4:30. Plant Science 342. *Professor* L. J. Tyler and assistant. For undergraduates who expect to engage in general farming, fruit, vegetable, cereal, or ornamental growing, in agricultural agent work, or in teaching of agriculture in secondary schools. Consideration is given to modern methods for controlling diseases of plants through production and use of

DEPARTMENTAL SEMINAR AND RESEARCH

150. *Research in Plant Breeding, Genetics, and Statistics*. Fall, spring, or summer. Credit one or more hours by arrangement with instructor. Prerequisite, permission to register. Members of the departmental staff.

222. *Seminar*. Fall and spring terms. Without credit. Suggested for graduate students taking either a major or a minor in this department. Open to qualified seniors. Time and place to be announced. Members of the departmental staff.

disease-free propagative materials, seed treatments, regulatory laws, crop rotation, plant surgery, sanitation, soil treatment, spraying and dusting, and development and use of disease resistant varieties. Limited to 24 students.

3. *Pathology of Trees and Shrubs*. Spring term. Credit three hours. Prerequisite, Botany 1 and 2 or the equivalent. Lecture, F 11. Plant Science 336. Laboratory, F 1:40-4:30 and one laboratory to be arranged. Plant Science 362. *Assistant Professor* Sinclair.

For students preparing for nursery or landscape work, for careers as park superintendents, arborists, or city foresters, or for other horticultural professions; dealing with the nature and causes of plant disease, recognition, diagnosis and treatment of diseases of woody plants.

9. *Comparative Morphology of Fungi*. Spring term. Credit four hours. Given in alternate years. Prerequisite, Botany 1-2 or its equivalent, and permission to register. Lectures, M W 11. Plant Science 336. Laboratories, M W 1:40-4:30. Plant Science 326. *Professor* Korf.

An introductory course in mycology. Emphasis is placed on morphology rather than on taxonomy.

- [119. *Mechanisms of Variation in Fungi*. Fall term. Credit one hour. Given in alternate years. Prerequisites, Course 9 and Plant Breeding 101 or their equivalents. *Professor* Korf.] Not given in 1963-1964.

A lecture course relating observed variation in fungi with peculiar structural limitations inherent in both filamentous and non-filamentous systems. The advantages of certain fungus types for use as tools in solving genetical and biochemical problems is

stressed, as are nuclear and cytoplasmic genetic systems, mating reaction phenomena, adaptive enzyme systems, and hormonal systems operating in fungi.

- 131. Undergraduate Research.** Fall or spring term or both. Credit three to five hours. Registration by permission. Not less than three laboratories of three clock hours each per week. Staff members.

Designed to afford opportunity for selected undergraduates to test their inclinations and ability to do research work. The student is expected to prosecute with interest and enthusiasm, under informal direction of the professor, some problem or problems mutually agreed upon.

- 201. Advanced Plant Pathology.** Fall term. Credit four hours. For graduate students. Prerequisite, a course in introductory plant pathology and permission to register. Lecture, T Th 11. Plant Science 336 and 342. Laboratory, T Th or W F 2-4:30. Plant Science 342. *Professor Boothroyd.*

Designed to acquaint the student with the basic principles and techniques of the science of phytopathology and to provide an adequate foundation for successful prosecution of research in this field.

- [202. Principles of Plant Disease Control.** Spring term. Credit three hours. Given in alternate years. Graduate students only. Prerequisite, Course 201, or its equivalent and permission to register. Lecture, T 11. Plant Science 336. Laboratory and discussion, T Th 2-4:30. Plant Science 342. *Professor L. J. Tyler.*] Not given in 1963-1964. For graduate students who expect to teach and/or perform research in educational institutions, experiment stations, or agricultural chemical companies in connection with the development and use of plant disease control materials and methods. Emphasis is placed upon the philosophies underlying the four principles of plant disease control: exclusion, eradication, protection, and immunization. Attention is given to the existing body of knowledge upon which present disease control practices are based. Objectives are to help the student interested in plant protection equip himself not only to apply existing methods and materials but to enable him to improve upon them by developing new ideas, etc., especially in situations where control of plant diseases requires new approaches. Limited to 24 students.

- 205. Plant Virology.** Fall term. Credit three hours. For graduate students with majors or minors in plant pathology. Open in spe-

cial cases to other graduate students interested in virology. Prerequisite, Course 201 or permission to register. Lecture, T Th 10. Plant Science 336. Laboratory, F 2-4:30. Plant Science Greenhouse. *Professor Ross.* Designed to provide advanced graduate students with basic information on the nature and properties of plant viruses and on the diseases they cause.

- 206. Plant Nematology.** Spring term. Credit three or four hours. Given in alternate years. For graduate students with majors or minors in plant pathology. Open in special cases to other students interested in nematology. Prerequisite, Course 201 or permission to register. Two lectures and one or two three-hour morning laboratory periods per week. Hours to be arranged. Plant Science 343. *Professor Mai.*

Anatomy, morphology, and taxonomy of plant parasitic forms and nonparasitic soil-inhabiting forms of nematodes are studied. Plant pathogenic forms also are considered from the standpoint of host-pathogen relationships, host ranges, life cycles, and the symptoms they cause. Principles and methods of control are discussed.

- [207. Bacterial Plant Pathogens.** Spring term. Credit two hours. Given in alternate years. For graduate students with majors or minors in plant pathology. Open in special cases to other students interested in plant pathogenic bacteria. Prerequisite, Course 201 or permission to register. *Associate Professor Dickey.*] Not given in 1963-1964.

Designed to provide students with basic information on bacterial plant diseases and phytopathogenic bacteria. The laboratory will include some of the more important techniques used in the study of bacterial plant pathogens.

- 208. Physiology of Plant Diseases.** Fall term. Credit two hours. Given in alternate years. For graduate students with majors or minors in plant pathology. Open in special cases to others with special interest in this area. Prerequisites, Course 201, Biochemistry 101, Botany 231, and permission to register. Lecture, F 9. Plant Science 336. Laboratory, F 1:40-4:30. Plant Science 304. *Assistant Professor Bateman.*

Designed to provide students with insight into the mechanisms of pathogenesis and altered metabolism of diseased plants.

- 211. History of Plant Pathology.** Spring term. Credit one hour. Prerequisite, Course

201. Conference, M 8-10. Plant Science 422. Staff members.
For registration see *Professor Kent*.
- [229. *Advanced Mycology*. Fall term. Credit three hours. Given in alternate years. Prerequisites, Course 9 or its equivalent and permission to register. *Professor Korf*.] Not given in 1963-1964.
Part of a two-course sequence (229 and 239) designed especially for students specializing in mycology or plant pathology. Emphasis is placed on morphology and taxonomy, but other aspects of mycology are embraced. Practice in identification of specimens is stressed in various groups, and field work is required. Basidiomycetes and Phycomycetes are covered in detail.
231. *Special Problems in Mycology or Plant Pathology*. Fall or spring term, or both. Credit three to five hours each term. For graduate students not majoring in mycology or plant pathology who desire to conduct research in mycology or plant pathology. Registration by permission. Three to five weekly laboratory periods of three hours each. Staff members.
For work in mycology, modern techniques and the experimental approach are stressed, in areas such as physiology, developmental morphology, genetic systems, or cytotaxonomy.
For work in plant pathology for minor thesis or problems, or for students wishing to develop familiarity with modern techniques in some phase of the science.
- [239. *Advanced Mycology*. Spring term. Credit three hours. Given in alternate years. Prerequisites, Courses 9 and 229 or their equivalents and permission to register. *Professor Korf*.] Not given in 1963-1964.
Part of a two-course sequence (229 and 239) described above. Fungi Imperfecti and Ascomycetes are covered in detail.
241. *Philosophy of Plant Pathology*. Fall term. Credit two hours. Designed for Ph.D. students majoring in plant pathology. Prerequisites, Courses 201, 229, and at least two other courses from 202, 205, 206, 207, and 208, or permission to register. Conferences, M W 8-10. Plant Science 422. *Professor Kent*.
A conference with advanced graduate students examining the concepts of plant pathology as they relate to the approach to basic and applied research problems, teaching, and extension.
- 245-254. *Current Topics*. Fall and spring terms. Credit to be arranged. For graduate students with special interests in the particular area. Prerequisite, permission to register. Time to be arranged. Plant Science 422.
Weekly discussions of current topics in special areas of plant pathology and mycology. Students will be required to do extensive reading of current literature and to present oral and written reports.
245. *Plant Virology*. *Professor Ross and Associate Professor Rochow*.
246. *Plant Nematology*. *Professor Mai and Associate Professor Harrison*.
247. *Bacterial Plant Pathogens*. *Associate Professor Dickey*.
248. *Physiology of Plant Diseases*. *Assistant Professors Bateman and Millar*.
249. *Mycology*. *Professor Korf*.
250. *Diseases of Vegetable Crops*. *Professor Sherf, Associate Professor Wilkinson, and Assistant Professor Lorbeer*.
253. *Pathology of Trees and Shrubs*. *Assistant Professor Sinclair*.
254. *Diseases of Florist Crops*. *Professor Dimock*.
261. *Seminar*. Fall and spring terms. Credit one hour. Required of all graduate students taking work in the department. T 4:30-5:30. Plant Science Seminar Room. *Professor Korf*.
271. *Plant Pathology Colloquium*. Fall and spring terms. Credit one hour. First and third Thursdays 7:45-9:45 P.M. Plant Science Seminar Room. Staff and graduate students.

POMOLOGY

Students who desire to do their major work in pomology may obtain a suggested sequence of courses for the four-year period by consulting the department.

General Horticulture. (See Vegetable Crops 3.)
Those who want a general course in horti-

culture covering flowers, fruits, and vegetables should take this course.

1. *Tree Fruits*. Fall term. Credit three hours. Should be preceded or accompanied by an elementary course in botany. Lectures, T Th 8. Warren 131. Laboratory,

W 2-4:30. Plant Science 107. *Professor Edgerton.*

A study of the general principles and practices of tree-fruit culture and their relation to the underlying sciences. Topics to be covered include propagation, varieties, orchard management, and growth and fruiting habits. Practical work is presented in grafting, pruning, site and soil selection, and planting.

2. **Small Fruits.** Fall term. Credit three hours. Should be preceded or accompanied by an elementary course in botany. Lectures, M W 8. Plant Science 143. Laboratory, M 2-4:30. Plant Science 107. *Associate Professor Tomkins.*

A study of the general principles and practices in the culture of grapes, strawberries, brambles and bush fruits; and their relation to the underlying sciences. Fruiting and growth habits are covered, with practical work in pruning, planting, and propagation. One or two Saturday field trips will be taken.

111. **Post-Harvest Physiology, Handling, and Storage of Fruits.** Fall term. Credit three hours. Prerequisite, Course 1 or 2. Lectures, T Th 8. Plant Science 143. Laboratory, F 2-4:30. Plant Science 107. *Professor Smock.* The chemistry and physiology of fruits as they affect quality and marketability are studied. Handling methods, maturity indices, and storage practices are considered. Practical work involves grading and inspection of fruits and storage of fruit in different ways. One Saturday field trip is required.

112. **Advanced Laboratory Course.** Spring term. Credit two hours. S 8-12. Plant Science 107. *Professors Hoffman and Edgerton.* This course is designed to give more extended practice in the various orchard operations than can be given in Course 1. Special attention is given to problems of pruning, grafting, orchard-soil selection and management, pollination, and spray practice. One or two field trips extending into the afternoon are made.

121. **Economic Fruits of the World.** Spring term. Credit three hours. Given in alternate

years. Prerequisite, Botany 1 and 2 or permission to register. Lectures, M W 8. Plant Science 143. Laboratory, F 2-4:30. Plant Science 114. *Professor Smock.*

A study of all species of fruit-bearing plants of economic importance, such as the date, the banana, the citrus fruits, the nut-bearing trees, and the newly introduced fruits, with special reference to their cultural requirements in the United States and its insular possessions. All fruits not considered in other courses are considered here. Designed to give a broad view of world pomology and its relationship with the fruit industry of New York State.

- [131. **Advanced Pomology.** Fall term. Credit three hours. Given in alternate years. Prerequisites, Courses 1 and 2 and Botany 31. *Professor Hoffman.*] Not given in 1963-1964. A comprehensive study of the sources of knowledge and opinions as to practices in pomology. The results of experiences and research pertaining to pomology are discussed, with special reference to their application in the solution of the problems in commercial fruit growing.

- [231. **Special Topics in Experimental Pomology.** Spring term. Credit three hours. Given in alternate years. Open to qualified seniors and to graduate students. *Professors Hoffman, Boynton, Smock, and Edgerton.*] Not given in 1963-1964.

The student is expected to review critically and to evaluate the more important original papers relating to various phases of pomological research. Recent experimental methods applicable to the topic are fully considered.

200. **Seminar.** Fall and spring terms. Without credit. Required of students taking Course 201 and graduate students in pomology. T 11. Plant Science Seminar Room. Members of the departmental staff.

201. **Research.** Fall, spring, or both terms. Credit two or more hours a term. Prerequisite, Course 131. *Professors Hoffman, Smock, Boynton, Edgerton, Associate Professors Oberly, Powell and Tomkins, and Assistant Professor Blanpied.*

POULTRY HUSBANDRY

The poultry industry offers opportunities in all phases of production, distribution, technical service, research, and teaching. Individual preference and aptitudes should be considered in making a choice. Suggested

sequences of courses are available to students interested in production or in a business allied to it, and to those interested in a career in research, teaching, or commercial work in such specialized biological science

fields as genetics, nutrition, physiology, or food technology. Adequate high school preparation in mathematics, science, and English is very desirable, particularly for students interested in the latter fields.

1. **Introduction to Poultry Science.** Fall term. Credit three hours. Lectures, M W F 8. One recitation period, to be arranged. Rice 300. *Professor Baker*, assisted by other members of the staff.

A general course dealing with the principles of poultry production.

- [50. **Market Eggs and Poultry.** Fall term. Credit two hours. Given in alternate years. *Professor Baker.*] Not given in 1963-1964. A detailed study of the interior and exterior qualities of eggs, abnormalities, egg grades, and standards; practice in candling, grading, and packing. Grades and standards of market poultry; killing, dressing, and packing. General market information. Two field trips are taken.

80. **Poultry Farm Management.** Spring term. Credit three hours. Given in alternate years. Prerequisite, Course 1 or its equivalent. Lectures, T Th 10. Laboratory, T 2-4:30. Rice 101. *Professor Marble.* Management of the hatchery, young stock, and laying flock. Practical management problems of the hatchery man and commercial poultryman will be studied. A two-day field trip is taken.

150. **Poultry Meat and Egg Technology.** Spring term. Credit three hours. Given in alternate years. Prerequisites, Chemistry 303, or its equivalent, and Bacteriology 1. Open to graduate students, juniors, and seniors. Lectures, T Th 9. Rice 101. Laboratory, M 2-4. Rice 100. *Professor Baker.*

A discussion and study of some of the important microbial and nonmicrobial changes in poultry meat and eggs as well as the chemical composition and preservation of these products. Development of new products is also emphasized.

- [170. **Poultry Hygiene and Disease.** Fall term. Credit two hours. Given in alternate years. Prerequisites, Bacteriology 1 or 3, and Veterinary Physiology 10. *Dr. Ritter.*] Not given in 1963-1964.

The nature of the infectious and parasitic diseases of poultry and the principles of hygiene applicable to poultry farming for the prevention and control of diseases.

190. **Poultry Problems.** Fall or spring term. Credit, one, two, or three hours. Open to juniors or seniors. Prerequisite, written permission of staff member concerned. Investi-

gation of some problem in the field of poultry husbandry by the student under the direction of a member of the staff. *Professor Bruckner.*

209. **Seminar in Poultry Biology.** Fall and spring terms. For graduate students. F 4:15. Rice 201. Members of the departmental staff. A survey of recent literature and research in poultry biology.

ANATOMY, GENETICS, AND PHYSIOLOGY

20. **Poultry Breeds, Breeding, and Judging.** Fall term. Credit three hours. Given in alternate years. Lectures, T Th 10. Laboratory, T 2-4:30. Rice 101. *Professor Marble.* Selecting and judging birds for production and breed characters; origin, history, and classification of breeds; introduction to breeding.

120. **Poultry Genetics.** Spring term. Credit three hours. Open to graduate students, seniors, and juniors. Given in alternate years. Prerequisites, Zoology 104, Plant Breeding 101, or their equivalents, and permission of the instructor. Lectures, M W F 9. Rice 201. *Professor Cole.*

A survey of inherited characters in domestic birds, cytology, linkage, inbreeding, hybrid vigor, resistance to disease, genetic principles in poultry breeding, physiology of avian reproduction, infertility, embryonic mortality, and avian endocrinology.

124. **Animal Genetics.** Spring term. Credit three hours. For veterinary students only. Lectures, T Th 9. Discussion period, T 2. Rice 300. *Professor Hutt.*

Principles of genetics; sex determination and sex linkage; inherited characters in domestic animals, with special reference to lethal genes and genetic resistance to disease; progeny-testing, inbreeding and crossbreeding.

- [130. **Physiology of Avian Reproduction.** Fall term. Credit three hours. Given in alternate years. Prerequisites, Zoology 104 and either Zoology 476 or Animal Husbandry 127. A course in physiology is highly desirable. Open to juniors, seniors, and graduate students. *Associate Professor van Tienhoven.*] Not given in 1963-1964.

Sex and its manifestations. Anatomy, embryology, and histology of the reproductive organs; endocrine manifestations with respect to reproduction; photoperiodicity, gametogenesis, fertilization, and pathenogenesis; embryonic development; sexual behavior; interaction of reproduction and nutrition.

140. *Anatomy of the Fowl.* Fall term. Credit three hours. Open to juniors, seniors, and graduate students. Given in alternate years. Prerequisites, Zoology 104 or Biology 2 and permission of the instructor. Lectures, T Th 8. Rice 201. Laboratory, F 2-4:15. Rice 100. *Professor Cole.*

The lectures, supplemented by laboratory periods for study and dissection, are designed to acquaint the student with the anatomy of the fowl.

NUTRITION

110. *Poultry Nutrition.* Spring term. Credit three hours. Prerequisite, chemistry and physiology or permission of instructor. Not open to freshmen. Lectures, M W F 8. Rice 300. *Assistant Professor Nesheim.*

The principles of poultry nutrition and their application to poultry feeding and feed manufacturing.

210. *Advanced Poultry Nutrition.* Spring term. Credit three hours. For graduate students. Not given every year and not unless ten or more students apply for the course.

T 2 and Th 2-4. Rice 201. *Professor Scott.* A study of one or more important fields of research in poultry nutrition, a critical consideration of the experimental methods used in conducting the investigations, and discussion of further studies needed, including the planning of the experiments.

211. *Research in Nutrition.* Fall or spring term. Credit and hours to be arranged. For graduate students. Registration by permission of staff member concerned. *Professor Scott, Associate Professor Young, and Assistant Professor Nesheim.*

For students desiring experience in planning, conducting, and reporting independent research projects in poultry nutrition.

219. *Seminar in Animal Nutrition.* Fall term. Credit one hour. Open to graduate students with major field of study in animal nutrition. Prerequisite, Animal Husbandry 110 or the equivalent. Registration by permission. T 4:30. Rice 300. Animal nutrition staff.

A critical review of the literature and other topics of special interest to graduate students in animal nutrition.

RURAL EDUCATION

PROGRAM FOR THE PREPARATION OF SECONDARY-SCHOOL TEACHERS *

With careful planning, it is possible to meet the requirements for a Bachelor of Science degree and, at the same time, the certification requirements for teaching. Therefore, students who desire to prepare for teaching science or agriculture should plan their programs with the appropriate adviser in science teaching, or in agricultural education.

Those planning to teach science in secondary schools should take Psychology (Rural Education 10 or Psychology 101) during their freshman or sophomore years. In the junior year they should take Educational Psychology (Rural Education 111) and Methods of Teaching Science in Secondary Schools (Rural Education 128). They complete the required courses in the senior year by registering for Practice in Teaching Science in Secondary Schools (Rural Education 129), and Social Foundations of Education (R.E. 190). Elec-

tives are chosen to complete the 18 hours of professional credit required for a provisional certificate. A permanent certificate requires an additional year.

Students planning to teach agriculture should have a conference with a member of the staff in agricultural education to ascertain the requirements in agriculture, science, and education. This should be done immediately after deciding to teach so as to avoid conflicts and delay in completing all of the requirements. The professional courses required are: Rural Education 131 in the junior year, Rural Education 111, 132, and 134 in the fall term of the senior year, and Rural Education 190 or 194 in the spring term of the senior year. A major portion of the work in the fall term of the senior year is student teaching in one of the rural high schools. Students enrolling in Rural Education 132 and 134 are required to report for course work and student teaching September 3, 1963.

Independent study programs consisting of tutorial study are available to honors students preparing to teach agriculture. In-

* For other courses in education, consult the Announcements of the Schools of Education and of Industrial and Labor Relations, and of the Colleges of Home Economics and Arts and Sciences.

formation concerning tutorial study may be obtained in Room 205, Stone Hall.

ADMINISTRATION AND SUPERVISION

219. *Personnel Administration in Educational Institutions.* Spring term. Credit three hours. Open to graduate students in education. Th 4-6, and one hour to be arranged. Warren 31. *Assistant Professor Hills.* The methods and principles of recruitment, selection, placement, maintenance, organization, and government of staff and employees are analyzed.

243. *Principles and Procedures in Supervision.* Spring term. Credit three hours. M W F 11. Warren 145. *Associate Professor Wardeberg.*

A basic course in the nature and scope of supervision; fundamental principles and various procedures are considered. Open to those already in supervisory positions, either in school work or elsewhere, and experienced persons aspiring to becoming supervisors.

261. *Theory and Practice of Administration.* Fall term. Credit two or four hours. S 9-10:30, 11-12:30. Warren 260. *Associate Professor McCarty.*

A basic course in the theory and processes common to a variety of administrative positions, both within the school system and elsewhere. Both the science and the art of administration are examined. Theory is employed in group analysis of case studies. Those preparing for the position of supervisor, principal, or superintendent should enroll for four credit hours; others may take the first session for two credit hours.

262. *Secondary School Principalship.* Spring term. Credit two hours. Given in alternate years. Th 4-6 and one hour to be arranged. Warren 232. *Professor M. Johnson.*

The responsibilities of the secondary school principal within the school building. Special attention will be given to the problems of the six-year high school.

[263. *Elementary School Principalship.* Spring term. Credit two hours. Given in alternate years. *Associate Professor McCarty.*] Not given in 1963-1964.

Systematic treatment and discussion of problems in administration of staff, pupils, finances, and plant.

264. *School Finance and Facilities.* Spring term. Credit three hours. Prerequisite, Course 261 or equivalent. T 4:15-5:45, and

one hour to be arranged. Warren 232. *Assistant Professor Nuccio.*

Typical problems: how local school funds are levied, collected, and disbursed; budget making; bonding; state funds and their distribution; planning, utilization, and upkeep of school facilities.

AGRICULTURAL EDUCATION

131. *Introduction to Teaching Agriculture.* Spring term. Credit one hour. Required of juniors and others entering the directed teaching program in the senior or following year. M 2-4:30. Warren 31. *Assistant Professor Drake.*

An introduction to the origin, development, objectives, course of study, individual farming programs, and method of teaching vocational agriculture in secondary schools.

132. *Methods, Materials, and Directed Practice in Teaching Agriculture in the Secondary School.* Fall term. Credit nine hours. Staff in agricultural education.

Directed participation in off-campus centers in the specific and related problems of teaching agriculture on the junior and senior high school levels, to include adjustment in the school and community; evaluation of area resources, materials of instruction, and school facilities; organization and development of local courses of study; launching and directing supervised farming programs; planning for and teaching all-day classes; advising Future Farmer chapters; and other problems relating to development of a balanced program for vocational education in agriculture in a local area.

133. *Special Problems in Agriculture.* Graduate and undergraduate. Fall or spring term. Credit one or two hours. W 12. Warren 260. *Associate Professor Cushman and staff.*

The purpose is to provide students an opportunity to study individually, or as a group, selected problems in agricultural education to meet the particular needs of the students.

134. *Organization and Direction of Young Farmer Programs.* Graduate and undergraduate. Fall term. Credit three hours for undergraduate section; two hours for graduate section. F 3:45-5:45. Warren 37. *Associate Professors Cushman and Bail.*

Emphasis will be placed on solving the problems encountered by teachers of agriculture in such phases of the young farmer program as making arrangements to have a

- program, determining instructional needs and planning programs of instruction, teaching young farmers in groups, giving individual on-farm instruction, organizing and advising the local young farmer association, and evaluating the young farmer program.
- 230. Seminar in Agricultural Education.** Spring term. Credit one hour. W 4:15-6. Warren 31. *Assistant Professor Drake.* Recommended for Master's degree candidates who have had teaching experience and doctoral candidates with majors and minors in agricultural education. The seminar will be primarily centered around current problems and research in the field.
- 231. Supervision in Agricultural Education.** Fall term. Credit two hours. Offered in alternate years. Open to students with experience in teaching agriculture, or by permission. W 3:45-5. Warren 260. *Associate Professor Bail.* The function of supervision, program planning, and supervisory techniques as applied to state programs in agricultural education.
- 232. Advanced Methods and Materials of Teaching Agriculture.** Fall term. Credit two or three hours. M F 2-3:30. Warren 101. *Associate Professor Tom.* Consideration is given to an analysis of selected teaching techniques and to the selection, preparation, and use of instructional materials in agriculture.
- 233. Planning Courses of Study and Programs in Agriculture.** Spring term. Credit two or three hours. M F 2-3:30. Warren 232. *Professor Hill.* Guiding principles, objectives, and sources of information will be developed for planning the courses of study and teaching calendar. Consideration will be given to principles, meaning, and function of farming programs, and how they are planned and used as a means of instruction.
- 235. Planning and Conducting Programs of Teacher Preparation in Agriculture.** Fall term. Credit two hours. Given in alternate years. M 3:45-5:45. Warren 232. *Professor Hill.* Open to persons with teaching experience in agriculture who are preparing for or are engaged in the preparation of teachers, or in related educational service.
- [**236. Organization and Administration of Agricultural Education.** Spring term. Credit two hours. Given in alternate years. W 2-4. Warren 31. *Associate Professor Cushman.*] Designed for teachers, high school principals, teacher trainers, supervisors, and others who are responsible for the administration of agricultural programs or who wish to qualify for this responsibility. Emphasis will be placed on interpreting the vocational acts and on problems of administration at the local and state level.
- [**239. Teaching General Agriculture in the Secondary School.** Spring term. Credit two hours. *Associate Professor Tom.*] Not given in 1963-1964. The organization, purpose, and content of courses in agriculture in junior and senior high schools to serve those who elect to study agriculture for its general educational values in preparation for rural living.
- [**339. Evaluating Programs of Agricultural Education.** Spring term. Credit two hours. Given in alternate years. Open to students with experience in teaching agriculture, or by permission. *Assistant Professor Drake.*] Not given in 1963-1964. Students will study objectives and evaluative criteria, and will develop criteria and procedures for evaluation of programs of agricultural education in the secondary schools.

EDUCATIONAL PSYCHOLOGY

- 10. Psychology.** Fall or spring term. Credit three hours. Recommended for freshmen and sophomores only. May not be taken for credit by students who have had Psychology 101 or equivalent. Two lectures plus one discussion section each week. Lectures, M W 10. Plant Science 233. Discussion sections, Th 8, 9, 10, or 11 or F 8, 9, 10, 11, or 12. *Assistant Professor Mink.* A study of topics in psychology such as learning, perception, motivation, emotion, individual differences, and personal-social relationships.
- 111. Educational Psychology.** Fall or spring term. Credit three hours. Prerequisite, an introductory course in psychology. Limited to prospective teachers or others preparing for educational careers. Not open to freshmen or students who have taken Course 117 or Child Development and Family Relations 315. Spring term limited to students enrolled in the special block-time teacher-preparation program. It is recommended that students complete their practice teaching before registering for this course. Lectures, M W F 9. Spring, blocked time, M W F 9-11. (See 111H below.) Comstock 245. *Professor Glock.* Consideration of the outstanding facts and

principles of psychology bearing upon classroom problems.

111H. Educational Psychology. Fall or spring term. Credit one to four hours. Hours as arranged. *Assistant Professor Ripple.* Open only to honors students in agricultural education, English, home economics education, and social studies who are registered for independent study and tutorials in their fields. Through a program of independent reading, research activities, and seminars, the students will pursue study of human development, the learning process, motivation, retention and forgetting, transfer, higher mental processes, personal-social organization, individual differences, the social psychology of the classroom, technological and other innovations, evaluation and measurement, and research methodology as these apply to the task of managing and organizing learning experiences for students so as to bring about desirable behavioral changes. Some of this work is done in connection with the social and philosophical foundations of education and direct observation and experience in the public schools. This work satisfies New York State requirements for certification as a public school teacher. Students register in the semester in which the tutorial and independent study work is to be completed.

117. Psychology of Adolescence. Spring term. Credit two hours. Designed especially for teachers and prospective teachers; others admitted only by permission of instructor. Not open to freshmen or sophomores. Prerequisite, a course in general psychology. T 2-4. Warren 245. *Assistant Professor Ripple.* A survey of the nature of adolescent growth and development, with emphasis on some of the casual factors pertaining to adolescent behavior.

211. Educational Psychology. Fall term. Credit three hours. Permission of instructor required. For mature students with teaching experience. M W F 11-12:30. Warren 232. *Professor Glock.* Special emphasis is given to the topic of learning and its relationship to the teacher's problems.

216. Psychological Foundations of Education. Fall term. Credit three hours. Hours to be arranged. Warren 345. *Assistant Professor Mink.* Open only to fifth-year students in the School of Education. Consideration is given to those psychological factors that relate to the learning process.

251. Educational Measurement. Spring term. Credit three hours. Permission of the instructor required. Hours to be arranged. *Assistant Professor Millman.* A study of the construction of achievement tests and the use of aptitude tests, achievement tests, and other measuring instruments in the classification and guidance of pupils and improvement of instruction.

253. Introduction to Educational Statistics. Fall term. Credit three hours. T Th 8-10. Warren 245. *Assistant Professor Millman.* A study of common statistical procedures encountered in educational literature and research. Includes the computation and interpretation of descriptive measures and tests of significance.

254. Statistical Instruments in Education. Spring term. Credit three hours. Prerequisite, Course 253 or permission of the instructor. T Th 8-10. Warren 245. *Assistant Professor Millman.* A study of the multiple regression, factor analysis, analysis of variance and covariance, and other statistical procedures useful in educational research.

ELEMENTARY AND SECONDARY EDUCATION

240. The Art of Teaching. Spring term. Credit twelve hours. M-F 8-4 and other hours arranged. Students may register only with the consent of the instructor. Conference Room, Stone. *Associate Professor Wardeberg.* For those enrolled in the fifth year program in elementary education. Students are placed in elementary classrooms in Ithaca and surrounding communities for directed student teaching.

242. Secondary Education in the United States. Fall term. Credit three hours. Limited to graduate students. Th 4-6, and one hour to be arranged. Prerequisites, courses in educational psychology and social foundations of education, or permission of instructor. Warren 232. *Professor M. Johnson.*

Historical background and theoretical considerations relating to such major issues in American secondary education as its purposes, control, scope, organization, standards, and relation to other levels of education. Prevalent and proposed practices analyzed with a view to reconciling the demands of intellectual integrity and the expanded expectations contemporary society places upon the secondary school.

247. Seminar in Elementary Education. Fall term. Credit four hours. T Th 9-10:30. Warren 260. Spring term. Credit three hours. Time to be arranged. *Associate Professor Wardeberg.*

Fall term work includes visiting elementary schools (beginning September 3, 1963); materials and methods in mathematics, social studies, and special curricular areas; organization of the elementary school. Spring term work is a problems seminar based on the student teaching experience. For students enrolled in Course 240.

313. Teaching Reading and the Language Skills. Fall term. Credit three hours. M W F 11. Warren 31. *Associate Professor Wardeberg.*

Materials and techniques in effective teaching of the language arts in the elementary school; special emphasis on the teaching of reading. Open only to graduate students and those in registered programs.

314. Seminar in the Teaching of Secondary Mathematics. Spring term. Credit three hours. W 4-6, and one hour to be arranged. Warren 232. Dr. Geiselmann.

Useful materials and practical methods for effective teaching of mathematics in the junior and senior high schools. Attention will be given to research in mathematics education, and to recent proposals for curriculum revision. Special interests of the students serve as a guide for the further selection of topics.

EXTENSION, ADULT, AND HIGHER EDUCATION

Other divisions and departments that offer additional courses helpful in the field of extension education are:

Home Economics
Rural Sociology
Sociology
Agricultural Economics
Anthropology

Extensive flexibility is permitted each student in the selection of a course program to meet his special interests and professional needs.

212. Educational Psychology for Extension and Other Rural Development Workers. Fall term. Credit three hours. M 2-4. Warren 31. *Associate Professor Bruce.*

For advanced students in extension education and administration.

223. Organization, Administration, and Supervision in the Cooperative Extension

Service. Fall term. Credit two hours. For graduate students majoring or minoring in extension education and others interested in broadening their knowledge of the extension service as an educational institution. W 2-4. Warren 232. *Associate Professor Bruce.*

Study and discussion include an analysis of current policy, objectives, organization, staffing, financing, program content, procedures, and the over-all role of the extension service in relation to current developments and trends affecting its operation.

224. Program Building in Extension Education. Fall term. Credit two hours. For graduate students in extension education and others interested in adult education. T 2-3:30. Warren 260. *Professor Leagans.*

The basic problems, principles, and procedures in the process of extension program building in both agriculture and homemaking.

225. Teaching and Communication in Extension Education. Spring term. Credit two hours. For graduate students in extension education and related fields who are concerned with teaching people in out-of-school situations. T 2-3:30. Warren 31. *Professor Leagans.*

The principles and processes of extension teaching and communication are analyzed and related to the problems of selecting, combining, and effectively using extension teaching methods for disseminating useful information and promoting its use.

227. Seminar: Comparative Extension Education. Fall and spring terms. Credit two hours each term. Th 2-4. Warren 132. *Professor Leagans and staff.*

An analysis of extension education and community development programs in different cultures, in different circumstances of economic, political, and social development, and in different agricultural resource environments. To help students develop a philosophy, a background of knowledge, and professional skill that will enable them to initiate, organize, and administer extension and community development programs in other cultures and to provide effective professional leadership for various rural development activities.

228. Advanced Seminar in Extension Education. Spring term. Credit two hours. Open only to graduate students with experience in extension education. W 2-3:30. Warren 232. *Associate Professor Bruce.*

The seminar will select for close study professional problems that are currently of

major concern in the extension service. Problems may be drawn from such fields as administration, supervision, personnel recruitment and training, scope of programs, integration, the unit approach, and the like. Selections will be made in the light of special interest of the seminar members.

- [321. *Special Studies in Extension Education.* Fall term. Credit two hours. Offered only if eight or more students enroll. Lectures, individual time to be arranged. *Professor Leagans.*] Not given in 1963-1964.

The objective is to provide assistance in thesis preparation to graduate students in extension education. The course consists of three parts: (1) exploration of potential fields and specific delineation of the thesis area; (2) setting up of a plan of thesis organization based on research techniques and methods, including establishment of objectives or hypotheses, preparation of questionnaires, or other research instruments, the collection, analysis, and interpretation of data in line with the objectives; and (3) preparation of the thesis, its writing, editing, revising, and styling.

GUIDANCE AND PERSONNEL

282. *Educational and Vocational Guidance.* Fall term. Credit two hours. For graduate students only. T 4-6. Warren 201. *Professor A. G. Nelson.*

Principles and practices of educational and vocational guidance. Historical and theoretical background of the guidance movement; educational, vocational, and community information needed; the study of the individual; group methods; counseling; placement and follow-up; the organization, administration, and appraisal of guidance programs.

283. *Counseling.* Spring term. Credit two hours. For graduate students only. Prerequisites, Courses 255 and 282 or their equivalents. M 4:15-6. Warren 201. *Professor A. G. Nelson.*

Techniques for counseling with individuals concerning various types of educational, social, and vocational adjustment problems. Case studies.

284. *Group Techniques in Guidance.* Spring term. Credit two hours. T 4:15. Warren 201. *Professor A. G. Nelson.*

Methods and materials for presenting educational and orientation information to students. Theory and practice of group guidance.

285. *Occupational and Educational Information.* Fall term. Credit four hours. Permis-

sion of the instructor required. T Th 1. Field trips and laboratory, M afternoon. Warren 160. *Professor A. G. Nelson.*

Survey and appraisal of occupations and training opportunities; study of sources of educational and vocational information; job analysis; vocational trends. Field trips to places of employment.

- [289. *Supervised Practice in Testing and Counseling.* Spring term. Credit three hours. For advanced graduate students only. Prerequisites, Courses 255, 283, and 285, or their equivalents, and permission of the instructor. Hours for observation and practice to be arranged. *Professor A. G. Nelson.*] Not given in 1963-1964.

Practice in the administration, scoring, and interpretation of psychological tests. Observation and supervised experience in counseling at the Cornell Guidance Center. Case conferences and assigned readings.

HISTORY AND THEORY OF EDUCATION

190. *Social and Philosophical Foundations of Education.* Either term. Credit three hours. Open to juniors by consent, seniors, and graduate students. M W F 10. East Roberts 222. Special graduate section in the fall. T Th 2-3:30. Warren 160. *Associate Professor Ennis and Assistant Professor Lowe.*

A consideration of the problems of providing education in a democracy. The role of the schools, control of the schools, and the professionalization of teaching will be examined in the light of our social class, economic, political, religious, and value structures. Relevant philosophic insights will be applied.

194. *Principles of Vocational Education.* Spring term. Credit two hours. Open to undergraduates only by special permission. Hours to be arranged. First meeting, Th 4:15. Warren 37. *Professor W. A. Smith.* The meaning, purpose, and methodology of vocational education and its place in the total school program. Applicable for administrators, supervisors, teacher trainers, and teachers.

271. *The Logic of Teaching.* Fall term. Credit three hours. Open to graduates and advanced undergraduates. Consent of instructor required. M W 4-5:30. Warren 160. *Assistant Professor Ennis.*

A consideration of definitions, explanation, proof, problem solving, and the structure of subject matter as they bear upon the work of the classroom teacher.

276. *Curriculum of American Schools.* Fall term. Credit two or three hours. Enrollment limited to graduate students, teachers, and other school specialists. M 4-6. Warren 31. Professor Stutz.

A consideration of major problems, principles, and techniques in determining the school curriculum. Relation of curriculum principles and trends to specific curriculum problems of concern to members of the class. Persons taking the course for three hours of credit are required to assume extra responsibilities.

297. *History of Education in the Modern Period.* Spring term. Credit three hours. For graduate students only. M 4-6 and one hour to be arranged. Conference Room, Stone. Professor Stutz.

A survey of education from the beginning of the seventeenth century to the present, with emphasis on public education and on policies and problems.

399. *Seminar in Educational Research.* Spring term. Credit two hours. Primarily for doctoral students. Admission by consent. Th 4-6. Warren 201. Associate Professor Ennis, Assistant Professors Gowin and Millman.

A study of the basic questions of research strategy that lie beneath particular examples of educational research. Such topics as causality, construct validity, operational definitions, and generalizing will be examined. Examples of research to be considered will be chosen by participants and will be either their own research, at whatever stage, or other research.

JUNIOR HIGH SCHOOL PROGRAM

391. *Junior High School Education.* Fall or spring term. Credit three hours. Limited to interns in junior high school teaching. Hours to be arranged. Stone 310. Associate Professor Vars.

Examines educational programs for young adolescents in the light of the history, status, and philosophy of the junior high school. Includes guidance, articulation, exploration, general education programs such as block-time and core, and such recent developments as auto-instruction and team teaching.

392. *Internship in Junior High School Teaching.* Fall or spring term. Credit six hours. Designed especially for interns in the Junior High School Project. Course 393 must be taken concurrently. Professors M.

Johnson and Rockcastle, Associate Professor Vars, Assistant Professors M. Bruce, Lowe, and Mink, and Dr. Geiselmann.

Full-time directed teaching experience in a public school throughout the school's fall or spring semester.

393. *Seminar in Junior High School Teaching.* Fall or spring term. Credit two hours. Hours and place to be arranged. Limited to interns in Junior High School Project. Professor M. Johnson, Associate Professor Vars, Assistant Professors M. Bruce, Lowe and Mink, and Dr. Geiselmann. Discussion of problems arising in the course of intern teaching.

394. *Seminar in Junior High School Education.* Spring term. Credit one hour. Prerequisite, Courses 392 and 393. Open only to interns in Junior High School Project. Hours and place to be arranged. Professor M. Johnson.

Review and analysis of teaching experiences and their implications for professional growth and improvement of educational programs at the junior high school level.

NATURE STUDY, SCIENCE AND CONSERVATION EDUCATION

107. *Teaching of Elementary School Science.*

Fall term. Credit three hours. Registration by permission. Lecture, W 1:40; practical exercises, W 3-4:30 and one other period to be arranged. Stone 7. Professor Rockcastle.

The content and methods of elementary-school science and nature study, with field work and laboratory experience useful in classroom and camp. Designed particularly for those who are preparing to teach or supervise elementary science or nature study.

108. *Field Natural History.* Fall or spring term. A full-year course; may be taken either term or both terms. Credit three hours. Open to juniors, seniors, and graduate students, and to sophomores with instructor's permission. Limited to twenty students per section. Lecture: Fall term, Th 10; spring term, T 10. Stone 7. Weekly field trips and lecture, T or F 1:40-4:30, begin with the first meeting. Friday section primarily for those experienced in field biology. Associate Professor Fischer.

Devoted to studies of local plants and animals, their ecology and their relations to humans. Applications to teaching science and conservation are emphasized.

109. *Our Physical Environment*. Spring term. Credit three hours. Open to juniors, seniors, and graduate students primarily interested in public school teaching. Lecture, W 1:40. Practical exercises, W 3-4:30 and one other period to be arranged. Stone 7. Professor Rockcastle.

A study of the commonplace machines and materials in our physical environment, and their effectiveness in demonstrating basic scientific principles. Frequent field trips and first-hand examination will be used in studying air, water, soil, light and sound, as well as some elementary mechanical and electrical devices. Emphasis will be placed on the physical environment as an aid to teaching the physical sciences in the public schools.

128. *Methods of Teaching Science in Secondary Schools*. Fall or spring term. Credit three hours. Prerequisite, Educational Psychology 111 or the equivalent or concurrent registration. For juniors, seniors, and graduate students. Th 1:40-4:30, and hours for observation to be arranged. Stone 7. Professor P. G. Johnson, Assistant Professor Bruce, and assistants.

A consideration of methods and materials useful in teaching science in secondary schools. Observation of the work of experienced teachers constitutes an important part of the course.

129. *Practice in Teaching Science in Secondary Schools*. Fall or spring term. Credit six or twelve hours. Prerequisites, Course 128 or 207 and permission of the instructor. For seniors and graduate students. Hours to be arranged. Assistant Professor M. Bruce and assistants. Supervised practice in teaching science in secondary schools, with frequent conferences on teaching plans and problems.

202. *Natural History Literature*. Fall term. Credit two hours. Open to juniors, seniors, and graduate students interested in nature, science, and conservation education. T Th 11. Stone 7. Associate Professor Fischer. A survey of writings in the nature, science, and conservation education fields, with special attention to outstanding writers and their works, designed for teaching and for leisure-time reading.

203. *Natural History Writing*. Spring term. Credit two hours. Open to juniors, seniors and graduate students interested in nature, science, and conservation education. T Th 11. Stone 7. Associate Professor Fischer. Designed to improve natural history, sci-

ence, and conservation writings. Subject matter, sources of information, types of articles, use of illustrations, and outlets for students' articles are covered.

205. *Teaching of Conservation*. Spring term. Credit two hours. Associate Professor Fischer.] Not given in 1963-1964.

Consideration of the principles, materials, and methods of conservation education useful to teachers and others engaged in teaching the wise use of the resources of the nation.

207. *Teaching of Science in Secondary Schools*. Fall term. Credit three hours. Registration by permission only. Professor P. G. Johnson and assistant.] Not given in 1963-1964.

A consideration of problems of selection and organization of subject matter, of choice and use of materials, and of methods of teaching science at the secondary-school level.

209. *Development of Nature and Science Education in the United States*. Fall term. Credit two hours. Professors P. G. Johnson and Rockcastle and Associate Professor Fischer.] Not given in 1963-1964.

Studies of the historical development of science teaching, the major personalities and their ideas, and current influences on science course content and methods of teaching.

226. *Research in Nature Study, Science, and Conservation Education*. Fall or spring term. Credit one hour. Required of graduate students who major or minor in science education. M 4:30-6. Stone 7. Professors P. G. Johnson and Rockcastle, Associate Professor Fischer, and Assistant Professor M. Bruce.

A seminar dealing with special problems.

GENERAL EDUCATION

199. *Informal Study in Education*. Maximum credit three hours each term. Members of the staff.

This privilege is granted to a qualified student of junior rank or above when approved by his adviser from the education staff who is personally responsible for the study.

214. *College Teaching*. Spring term. Without credit. M 7:30 p.m. Warren 45, Assistant Professor Gowin and members of the University staff.

For those who plan to teach in colleges and universities. Concepts and methods of teaching, organization of subject matter, motiva-

tion, learning, testing, grading, and similar problems.

- [270. *Seminar in Education*. Spring term. Credit one hour. Open to advanced graduate students only. T 4-5:30. Conference room, Stone. Members of the staff.] Not given in 1963-1964.

Problems related to elementary and secondary education, curriculum, administrative procedures, and research.

299. *Educational Research Methods*. Fall term. Credit one or two hours. One-hour lecture, one-hour discussion. (Student may elect either the lecture or the discussion or both.) Recommended for Master's degree candidates. T Th 11. Members of the staff. The lecture will emphasize the selection of experimental variables, experimental design, measurement procedures, and the inferential process. Practical considerations

in the selection of a research topic, planning the research, and the writing of a research proposal and report will be covered in the discussion section.

300. *Special Studies*. Credit as arranged. Members of the staff.

Students working on theses or other research projects may register for this course. The staff members concerned must be consulted before registration.

400. *Internship in Education*. Fall and spring terms. Credit from two to six hours, as arranged. Members of the staff.

Opportunity for apprentice or similar practical experience on the graduate level in administration, agricultural education, guidance, personnel administration, supervision, and other types of professional service in education.

RURAL SOCIOLOGY

Students who specialize in rural sociology may choose a sequence of courses designed (1) to provide a broad general training for work with farm and community organizations, in rural development, and in the social services, (2) to provide the foundation for later professional training in the field of social service, or (3) to prepare for a career in research, teaching, and extension in rural sociology. In general, graduate study is required for those wishing to become professional sociologists.

1. *General Sociology*. Fall or spring term. Credit three hours. May not be taken by those who have credit for Sociology 101. Lectures, M W 8. Warren 45. Discussion sections, Th 8, 9, 10, or 11 and F 8, 9, 10, or 11. *Assistant Professor* Harp.

A general introduction to the theory and methods of sociology. Major topics selected for discussion include culture, socialization, deviancy and social control, stratification, ideologies, and social change. Supplementary reading including recent research will be assigned for illustrative purposes and to assist students in analyzing topical areas as term projects.

12. *Foundations for Social Action*. Spring term. Credit three hours. Open to sophomores, upperclassmen, and graduate students. No prerequisite. M W F 10. Warren 31. *Associate Professor* Reeder.

The purpose is to provide the basic information essential to an understanding of social action and planned change. The

course is designed for two categories of students: (1) students of various fields who wish to take one or two courses in sociology and who want to gain the kind of knowledge which relates directly to human relationships in their occupation and in their activities as organization members and citizens; (2) persons whose work or interests are likely to involve them in some phase of planned change—either as administrators, organization leaders, extension agents, teachers, or community development workers—and others for whom the role of change agent is an essential part of their job.

105. *Organization Methods*. Spring term. Credit three hours. Prerequisite, Course 1 or 12 or permission of the instructor. T Th 11-12:50. Warren 31. *Associate Professor* Reeder.

A study of the methods and techniques by which officers, group members, and administrators may increase the effectiveness of organizations. Five categories of organization problems are considered: (1) program problems, (2) leadership problems, (3) membership problems, (4) problems related to meetings, and (5) organizational and public relations problems. Primary emphasis is given to organizations and service agencies which are found in rural society, such as farm bureau, home bureau, Grange, 4-H, churches, schools, fraternal organizations, and civic clubs. Designed to give students experience in using some of the basic organization methods.

111. *Rural Community Organization*. Fall term. Credit three hours. Prerequisite, Course 1 or 12 or permission of the instructor. T Th 11-12:30. Warren 31. *Associate Professor* Reeder.

A consideration of the problems involved in helping people and organizations in a community work together to meet their common needs.

There are two major emphases: (1) analysis of communities from the perspective of the community development worker as a change agent, (2) consideration of the problems which confront community development workers and the processes and methods by which they carry out their various community development tasks. Projects in nearby communities provide field laboratory experiences.

120. *Comparative Rural Societies*. Fall term. Credit three hours. Open to juniors, seniors, and graduate students. Prerequisite, a course in general sociology or anthropology. M W F 11. Warren 201. *Professor* Polson.

A comparison of the social organization of rural life in selected countries. The emphasis is on the social structure and the value systems of societies undergoing rapid change.

124. *The Sociology of Social Work*. Fall term. Credit three hours. Not open to freshmen or sophomores. Prerequisite, Course 1 or equivalent. Lectures and discussions, M W F 9. Warren 232. *Associate Professor* Taletz.

The sociology of occupations. Social work is treated as a case study of the professionalization of an occupation. The following topics are covered: (1) the function of work for society and the individual; (2) bureaucratic structure and specialization; (3) the development of occupational norms and identification; (4) occupational status; (5) the process of occupational selection; (6) dynamics of occupational change—horizontal and vertical mobility; (7) a case study of an occupation: trends in the professionalization of social work.

132. *Leadership*. Spring term. Credit two hours. Open to upperclassmen and graduate students. Prerequisite, an introductory behavioral science course, or permission of the instructor. Th 2-4. Warren 31. *Associate Professor* Cummings.

A study of leadership theories and strategies as applied to the purpose, structure, and problems of major social institutions. Relevant literature is reviewed for the primary purpose of identifying any cross-institutional generalizations. The nature of leadership re-

quirements in political action settings along with implications for adult education leader development programs is emphasized.

134. *Rural Social Problems and Public Policy*. Spring term. Credit two hours. Given in alternate years. Open to juniors and seniors by permission and to graduate students. T Th 10. Warren 31. *Professor* Larson.

Relates the problem concept to a theoretical frame of reference, traces the development of social problems in American rural life, analyzes the policy-making process, and treats the sociological aspects of such current public problems in the United States as low-income and underemployed farmers, migratory agricultural labor, and institutionalized social services. Each problem selected is analyzed in terms of historical background, public policy, national programs, and the consequences of the policy and program. Comparisons are made with other countries.

- [135. *Agrarian Social Movements*. Spring term. Credit three hours. Open to seniors and graduate students. *Assistant Professor* Harp.] Not given in 1963-1964.

A sociological analysis of the major agrarian social movements in the United States and Canada. An interpretation of relevant research findings in terms of current theories of collective behavior. The organizational structure and function of major farmer organizations are examined in a context of interconnections and interdependencies among social structures.

137. *Adjustment in the Middle and Later Years*. Spring term. Credit three hours.

T 2-4 plus one hour to be arranged. Warren 232. Open to juniors, seniors, and graduate students. *Associate Professor* Taletz. Consideration is given to adjustment in the middle and later years of life as a process of biological, psychological, and social change. Emphasis is placed upon changes in role and status, marital and family relationships, living arrangements, and employment. The provisions, public and private, that have been developed to meet the aged person's economic, social, psychological, medical, recreational, educational, and housing needs are described and evaluated.

- [205. *Seminar in Population Theory*. Fall term. Credit three hours. Graduate students or permission of the instructor. *Professor* ———.] Not given in 1963-1964.

A critical review of population theory. Theoretical assumptions underlying popu-

lation policies. Introduction to research methods used in population analysis.

208. *Applications of Sociological Theory.*

Fall term. Credit three hours. Open to juniors and seniors by permission and to graduate students. T Th 8-9:30. Warren 232. *Assistant Professor* Harp.

A systematic approach to the use of sociological theories in research. The student is instructed in the formalization of theory. A number of theoretical statements are analyzed.

211. *The Small Community in Modern American Society.* Fall term. Credit three hours. Open to juniors, seniors, and graduate students by permission. W F 2-3:30. Warren 31. *Professor* —.

A critical examination of current theories of the small community. Consideration is given to the development of a nomenclature of community properties and to the ways these properties operate in the social system of the community. The focus is on the development of a systematic conceptualization of the small community.

212. *Rural Social Systems.* Fall term. Credit three hours. Open to juniors, seniors, and graduate students who have had Course 1 or equivalent. M W F 9. Warren 31. *Professor* Larson.

Intended as a basic course in the sociology of rural life, using the social system concept as a theoretical framework. Rural society in the United States is used as a case to illustrate the structure and function of major rural social systems in modernized societies. Comparisons are made with western European countries. The changing relationship with urban and societal systems is discussed. Some consideration is given to the implications of social structure and function for action programs serving rural people. Two all-day field trips to rural areas arranged on Saturdays.

[213. *Seminar: Rural Sociology.* Spring term in alternate years. Credit three hours. Prerequisite, Course 212. *Professor* Larson.] Not given in 1963-1964.

A review of the development of rural sociology and of the theoretical points of view represented in systematic works. A review of research literature in selected major subfields of rural sociology. Emphasis is on sociological generalizations and on the integration of theory and research.

214. *Peasant Societies of Latin America.*

Spring term. Credit three hours. Open to seniors and graduate students. T Th 2-3:30.

Warren 201. *Associate Professor* Ellenbogen.

The unit of analysis is the community. A systematic analysis of selected types of peasant communities in Latin America focuses on the transition occurring in the systems of farming and land tenure arrangements, communication-transportation networks, institutional patterns and associational systems, and the orientations of norms and values. Consideration is also given to the linkages between the peasant community and national institutions and associations.

215. *Research Design.* Fall term. Credit three hours. Open to graduate students. T Th 1:40-3. Warren 37. *Professor* —.

Discussion of the relation of research design to theory and practice. Members of the seminar design research on problems of their own choosing.

216. *Cross-Cultural Research Methods.* Spring term. Credit three hours. Prerequisite, Course 215 or permission of the instructor. T Th 1:40-3. Warren 37. *Associate Professor* Young.

Problems of adapting methods to other cultural settings as well as the use of specifically cross-cultural procedures. Discussion of modifications of surveys, key informant interviews, observation techniques, photography, case studies, and the exploitation of census and other available data. Special attention to comparisons based on the data of the Human Relations Area files. Consideration of designs, units of analysis, variables, and hypotheses relevant to problems of less developed countries.

218. *Applications of Sociology to Problems of Rural Society.* Spring term. Credit three hours. Open to graduate students. M W 11-12:30. Warren 31, *Professor* Polson.

Application of sociological theory and methods to the problems of institutions and agencies concerned with rural development. Special emphasis is placed on programs for agricultural extension education and community development in low-income countries.

[225. *The Survey Method in Social Action Research.* Spring term. Credit two hours. Open to seniors by permission and to graduate students. *Professor* —.] Not given in 1963-1964.

A number of the more important theories of social action are examined. Action research designs are developed by the class, utilizing some of the theories reviewed. Consideration is given to the researcher-sponsor relationships in defining the research problem and planning the survey

or self-survey, alternative methods of data collection, and interviewing techniques and report writing. Approaches to the feedback of survey findings to the consumer are also explored.

DEPARTMENTAL SEMINAR, RESEARCH AND SPECIAL STUDY

150. Undergraduate Research. Fall and spring terms. Credit one to three hours, by arrangement, depending upon the problem undertaken. A student desiring to register must obtain the permission of the professor who will supervise the work. Open to seniors with grade averages of 80 or higher.

250. Informal Study in Rural Sociology. Throughout the year. Credit to be arranged. Prerequisites, graduate standing and permission of the department staff member concerned. Members of the staff.

251. Research in Rural Sociology. Throughout the year. Credit to be arranged. Prerequisites, graduate standing and permission of the staff member concerned. Members of the staff.

299. Seminar. Fall and spring term. No credit. For graduate students majoring in rural sociology. Second and fourth Monday of each month, 3:30-5. Warren 32. Departmental staff.

VEGETABLE CROPS

Students planning to specialize to a greater or less extent in vegetable crops should consult the department regarding choice and sequence of courses. An outline of suggestions is available.

3. General Horticulture. Spring term. Credit four hours. Lectures, M W F 8. Caldwell 100. Laboratory, M T W Th or F 2-4:30. East Roberts 301. Associate Professor Sheldrake.

An introductory course in general horticulture, including flower, fruit, and vegetable growing. Intended primarily for students who want a general knowledge and for those who wish to specialize in some field of horticulture but have limited background, either in practical experience or in training in botany and agronomy.

10. Vegetable Judging, Grading, and Identification. Fall term. Credit one hour. Hours to be arranged. East Roberts 301. Associate Professor Sheldrake.

Intended to prepare students to become competent in teaching this material to pre-adult groups when they are serving as teachers, agents, or leaders in 4-H and vocational agriculture. Subjects included are weed identification, insect and disease identification, vegetable judging, vegetable kind and variety identification, seed identification, potato defects and grading, and seedling identification.

11. Commercial Vegetable Crops. Spring term. Credit four hours. Should be preceded by elementary courses in agronomy, botany, or horticulture, or their equivalent. Lectures, M W F 11. East Roberts 222. Laboratory, W or F 2-4:30. Professor Sweet.

Intended for the students who wish to specialize in commercial vegetable growing. Consideration is given to the economic importance, cultural requirements, marketing, and storage of important vegetables. Field trips are required.

12. Handling and Marketing Vegetables. Fall term. Credit three hours. Lectures, T Th 11. East Roberts 222. Laboratory, T or W 2-4:30. East Roberts 223. Professor Hartman.

(Students registered for the Tuesday laboratory are scheduled to go on a field trip at 9:30 a.m., on Wednesday, the day on which classes officially begin at noon in the fall term.)

The handling of vegetables from harvest, whether for fresh market or processing, through the marketing channels to the consumer; personnel, facilities, machinery, and organization of the industry; quality measurement and grade standards; federal, state, and other regulations; principles and practices in precooling, storage, packaging, pre-packaging, other types of handling.

22. Potato Production and Processing. Spring term. Credit three hours. Lectures, T Th 10. East Roberts 222. Laboratory, T 2-4:30. East Roberts 223. Professor Ora Smith.

General principles and practical phases of potato production, storage, and processing are discussed. Growth processes and soil and environmental factors are emphasized as influencing production. Topics such as storage methods, grading, packaging, cooking quality, nutritive value, processing, and industrial uses of potatoes also are studied. Two field trips, one of which is all-day, are taken to potato farms and processing plants.

101. *Vegetable Crops, Advanced Course.* Fall term. Credit four hours. Prerequisites, Course 11 and Botany 31. Intended primarily for advanced undergraduate and graduate students. Lectures, M W F 11. East Roberts 222. Laboratory, M 2-4:30. East Roberts 223. *Professor Kelly.*

A systematic study of the literature dealing with practices in vegetable production. Results of experiments that have been conducted or are being conducted are studied, and their application to the solution of practical problems is discussed.

112. *Handling and Marketing, Vegetables, Advanced Course.* Fall term. Credit four hours. Primarily for graduate students and undergraduates specializing in marketing or food technology. Lectures, T Th 11. East Roberts 222. Laboratory, T or W 2-4:30. East Roberts 223. One-hour conference to be arranged. *Professor Hartman.*

(Students registered for the Tuesday laboratory are scheduled to go on a field trip at 9:30 a.m., Wednesday, the day on which classes officially begin at noon in the fall term.)

This course has the same lectures, laboratories, and field trips as Course 12. Much more outside reading of research and trade publications in the area covered by the course is required in Course 112 than in Course 12, and different examinations are given for the two courses.

- [113. *Kinds and Varieties of Vegetables.* Fall term. Credit three hours. Given in even-numbered years. Prerequisite, Course 3 or 11 or permission to register. Laboratory work preceding the beginning of regular instruction is required. *Professor Minges.*] Not given in 1963-1964.

A study of new and standard varieties and strains of vegetables, their origin, characteristics, adaptation, identification, and evalua-

tion. The vegetable seed industry is also discussed. The main value of this course lies in the study of crops in the field.

225. *Research Methods in Vegetable Crops.* Spring term. Credit four hours. Given in alternate years. Primarily for graduate students. Prerequisite, Course 101. It is recommended that Plant Breeding 210 and 211 precede or accompany this course. *Professor Kelly and Associate Professor Oyer.*

A study of research techniques peculiar to vegetable crops.

229. *Special Topics in Plant Science Extension.* Spring term. Credit one hour. (Additional credit by special arrangement.) Given in alternate years. *Professors Minges and A. A. Johnson.*

Designed for graduate students and advanced undergraduates in the several plant science fields who wish to acquire a knowledge of extension work and activities in preparation for careers in extension and in other work closely associated with extension, such as research and technical work in both public and commercial organizations. Staff members from other plant science departments collaborate in teaching the course.

231. *Undergraduate Research.* Fall and spring terms. Credit one or more hours a term, by arrangement. For advanced undergraduate students. Registration by written permission of the staff member who is to direct the research. Members of the staff. Special problems may be elected in any line of vegetable work. Summer residence is often necessary in connection with experimental problems.

232. *Seminar.* Fall and spring terms. Required of graduate students taking either a major or minor in this department. Th 4:15. East Roberts 222. Members of departmental staff.

COURSES IN OTHER COLLEGES

Satisfactory completion of certain courses in other colleges at Cornell may meet the specific requirements of regular students in the College of Agriculture.

Reference should be made to the *Announcement of the College of Arts and Sciences*, or

to the supplements issued by that College, for descriptions of English 111 and 112, Chemistry 101 and 102, or 105 and 106, Physics 101 and 102, ecology 105, and Zoology 103 and 104, which may be used to satisfy the requirements in those subjects, as listed on page 20.

GENERAL INFORMATION

THE BUILDINGS

THE BUILDINGS and land of Cornell University are valued at approximately \$100,000,000 and the equipment at approximately \$39,000,000. On that portion of the campus devoted principally to the College of Agriculture, and frequently referred to as the "upper campus," there are fourteen buildings containing classrooms. Around the "Ag quadrangle" are the following buildings which house the departments indicated:

Comstock Hall, entomology
Caldwell Hall, agronomy
Warren Hall, agricultural economics and rural sociology
Stone Hall, rural education
Roberts Hall, extension teaching and information

East Roberts Hall, vegetable crops
Plant Science Building, floriculture and ornamental horticulture, pomology, plant breeding, botany, and plant pathology

Slightly northwest of the quadrangle is Savage Hall in which are centered the activities in biochemistry. In succession to the east of the quadrangle are:

Fernow Hall, conservation
Rice Hall, poultry husbandry
Stocking Hall, dairy and food science

Riley-Robb Hall, agricultural engineering
Morrison Hall, animal husbandry

As far as possible, classes and laboratory exercises for courses offered in the eighteen departments of the College are conducted in the buildings in which the offices of the departments are located. However, in many instances this is impossible. The student should therefore consult the course descriptions in this Announcement in order to determine the exact location of each class or laboratory exercise.

In addition to the foregoing classroom buildings, on the campus of the College are an auditorium (Bailey Hall), a fine modern library (Mann Library), sixteen greenhouses, a judging pavilion, and numerous special laboratories and barns.

Students in the College of Agriculture take many courses in other colleges of the University, particularly in the College of Arts and Sciences. There the most frequently visited buildings are Goldwin Smith Hall for English and the humanities, Baker Laboratory for chemistry, Rockefeller Hall for physics, and Stimson Hall for zoology.

Of interest to all students in the University are such buildings as the Uris

Library for undergraduate study, Olin Library for graduate research, Gannett Medical Clinic, Willard Straight Hall for social activities, Anabel Taylor Hall for interfaith activities, Barton Hall and Teagle Hall for physical education, Lynah Hall for ice skating, and Sage Chapel for interdenominational church services.

The offices of administration for the College of Agriculture are located in Roberts Hall, and those for the general administration of the entire University are situated in Day Hall. The administrative center of student life in the College of Agriculture is the Office of Resident Instruction located in Roberts Hall. All students, both prospective and already enrolled, are urged to visit this office for guidance on questions pertaining to undergraduate activities.

LANDS FOR RESEARCH AND INSTRUCTION

Cornell University owns or leases about 12,000 acres of land. Of this, approximately 7,500 acres are used by the several departments of the College of Agriculture. About 600 acres more are in wildlife preserves and field stations and are used jointly by several departments of the University.

The type and amount of land assigned to each department varies according to its needs. Some departments, such as Agronomy, Plant Breeding, Floriculture and Ornamental Horticulture, and Vegetable Crops, need tillable land with certain types of soil on which to conduct field experiments. The Animal Husbandry Department needs large areas suitable for pasture and for the production of hay, grain, and corn for silage to feed experimental animals in the dairy and beef cattle herds, sheep, and swine. The Department of Pomology has an area of about 100 acres that is used for orchard and small fruits, and the Department of Poultry Husbandry uses a sizable area for poultry buildings and range.

Arable land not immediately needed by the individual departments for research and instruction is operated by the Office of Farm Services on an extensive basis. This office also acts as a service department, plowing and fitting some of the land used by other departments for experimental purposes. This system avoids the duplication of expensive machinery and uses the farm labor efficiently. The Departments of Animal Husbandry, Agronomy, Plant Breeding, and Pomology, because they have such large acres under cultivation, own their own equipment.

The cropland and pasture used by departments of the College comprise about 3,000 acres. The remaining area used by the College consists of forest tracts and of lands used as wildlife preserves and field stations. The Department of Conservation alone operates almost 5,000 acres, of which the Arnot Forest, about twenty miles southwest of Ithaca and consisting of more than 4,000 acres, and the Adirondack Forest of 624 acres, are the most extensive. The wildlife preserves and field stations include a biology field station at the head of Cayuga Lake, wildlife reservations at McLean and Ringwood (each only a short distance from Ithaca), and a wildlife preserve at Slaterville. Vegetable crops and floriculture research is conducted on Long Island and a foundation seed potato farm is located near Lake Placid.

The New York State Agricultural Experiment Station at Geneva occupies 640 acres of land used for fruit and vegetable research. It has 30 acres of experimental grape vineyard and laboratory facilities at Fredonia in Chautauqua

County, and it leases laboratory facilities at Poughkeepsie in the Hudson Valley for research serving the fruit and vegetable industry of that region.

LIBRARIES

The Colleges of Agriculture and Home Economics are served by the Albert R. Mann Library of about 265,000 volumes. This is supplemented by the other libraries of Cornell University, containing more than 2,200,000 volumes, many of which also relate directly to agricultural and home economics subjects. In addition to materials on applied agriculture and home economics, the Mann Library contains extensive collections dealing with such related sciences as botany, biochemistry, bacteriology, genetics, entomology, and medicine. It also includes large collections in economics, sociology, psychology, and education, and smaller collections on a variety of other subjects. Of major importance are the numerous complete files of foreign and domestic periodicals and government publications, of which some 7,800 are received currently.

The principal collection on entomology and limnology is in Comstock Hall. Small collections of reprints, bulletins, and duplicate books and journals are provided by several departments in their own buildings for use by their faculty and graduate students.

The Albert R. Mann Library building, completed in 1952, has a capacity of 425,000 volumes and 700 reading-room seats. The first floor is devoted primarily to books assigned for class reading, with rooms seating 375 persons. Also on this floor are rooms for typing and for small groups studying together, and the Ellis Room containing books and periodicals for casual reading. On the second floor are the reference, bibliography and periodical reading rooms, offices and work rooms, the main loan desk, and the card catalog. The catalog provides a record of the library materials in all libraries and departmental collections of the Colleges. The library has a comprehensive collection of bibliographies, as well as a card catalog of publications of the United States Department of Agriculture.

When the University is in session, the library is open, with librarians on duty to assist readers, from 8 a.m. to 11:30 p.m. daily except Saturday, when it closes at 5 p.m., and Sunday, when it opens at 1 p.m. Information on library regulations and suggestions for use of the library are provided all new students in orientation meetings each fall. More detailed information appears in a hand-book distributed at that time.

SCHOLARSHIPS

GENERAL INFORMATION

Scholarships available only to students in the College of Agriculture are listed on the following pages. *Applications for these scholarships should be made on a College of Agriculture Scholarship Application at the Office of Resident Instruction, 192 Roberts Hall*, except that entering students who do not live on farms will be considered if they file the Cornell University Financial Aid Application with the Office of Scholarships and Financial Aid, Day Hall.

Financial aid in the form of scholarships, jobs, and loans is also awarded from other funds on a competitive basis to students entering or enrolled in any

undergraduate division of the University. Brochures describing this aid and application blanks are available from the Office of Scholarships and Financial Aid.

Recipients of Regents College Scholarships, Regents Scholarships for Children of Deceased or Disabled Veterans, and Special State Scholarships for Children of Disabled or Deceased Soldiers, Sailors, or Marines, who enroll at the New York State College of Agriculture, apply the amount of money they receive toward their college expenses. Recipients of Regents Scholarships for Engineering and Scientific Studies may utilize these scholarships in the College of Agriculture if they register in the five-year course in professional agricultural engineering. The local guidance counselor or high school principal should be consulted for information about the rules of administration.

SCHOLARSHIPS AWARDED BY THE COLLEGE OF AGRICULTURE

ROBERT M. ADAMS 4-H MEMORIAL SCHOLARSHIP

The Robert M. Adams 4-H Memorial Scholarship was established in memory of Professor R. M. Adams by the 4-H Clubs of the state. It yields approximately \$50 a year. Students who are New York State residents are eligible to apply after their first year in the College, and those who have been 4-H Club members are given first consideration. The award is based on financial need, character, ability, and scholarship. Application should be made by June 1.

BEATTY AGRICULTURAL SCHOLARSHIP

The Beatty Agricultural Scholarship fund, a gift of the late Harrison L. Beatty, provides a scholarship of approximately \$300 to a student entering the College of Agriculture from the Town of Bainbridge or from Chenango County. Grades in Regents Examinations receive major consideration in making the award. Application blanks may be obtained from guidance counselors in Chenango County schools and must be on file by February 15.

HENRY H. BUCKLEY STUDENT AID FUND

A fund is provided by the Henry H. Buckley Foundation in memory of Mr. Buckley, a well-known farmer of Oneonta, New York, who died in 1942. The purpose is to aid worthy students, of any class, who need financial assistance. In 1963-1964, \$1,000 is available. In making awards, preference will be given to applicants from Chenango, Delaware, Herkimer, Madison, Montgomery, Oneida, Otsego, and Schoharie counties.

The last date for filing applications by prospective students is February 15, and for students in residence it is June 1.

WALTER R. CLARKE MEMORIAL ENDOWMENT

The Walter R. Clarke Memorial Endowment in memory of Mr. Clarke, a prominent fruit farmer who lived at Milton, New York, provides a scholarship of \$150 each year for a student of any class in the College of Agriculture who is primarily interested in fruit growing. Promise of successful work in this field is the basis for an award. Preference is given to students from the Hudson Valley

area. The last date for filing applications by prospective students is February 15, and for students in residence it is June 1.

CORNELL-ARGENTINE EXCHANGE SCHOLARSHIP

A male freshman is chosen each May to spend a year at the University of Buenos Aires. Most expenses, other than transportation, are paid by the sponsors in Argentina. In exchange, a student enrolled with the Faculty of Agronomy and Veterinary of the University of Buenos Aires is chosen to come to Cornell to study for one year in the College of Agriculture. His expenses here are paid by the Office of Foreign Students, the College, and students.

Information is available at the Office of Resident Instruction. To be eligible, a freshman must have an average of 78 or above and must file an application by the end of the first week in April. The selection is made by a student-faculty committee.

CORNELL DAIRY SCIENCE ASSOCIATION SCHOLARSHIP

A scholarship of \$400 is provided by the Cornell Dairy Science Association. It is awarded at the end of the sophomore year to a student with a major in dairy industry. A payment of \$100 is made at the beginning of each term of the junior and senior years, provided the recipient continues with a major in dairy industry. Applications should be filed by June 1.

CORNELL POMOLOGY CLUB SCHOLARSHIP

The Pomology Club provides a scholarship of \$400 each year, to be awarded to a sophomore, or senior students who is specializing in pomology or has major interest in that field. Scholarship and financial need receive equal consideration in making awards, and qualified students are eligible for awards in succeeding years. Applications should be filed by June 1.

CORNELL POULTRY CLUB SCHOLARSHIP

The Poultry Club supports an annual scholarship of \$300 to be awarded to an entering freshman who intends to specialize in poultry husbandry. Evidence of interest in the poultry industry, potential qualifications to contribute to the development of the industry, and financial need are to be considered in making the award. Applications should be received by February 15.

CORNELL-SWEDISH EXCHANGE SCHOLARSHIP

A male sophomore is chosen each year to spend his third college year at the Royal Agricultural College, Uppsala, Sweden. All expenses except transportation are paid by the Swedish students. In exchange a student from the Royal Agricultural College is chosen to come to Cornell, and the students of the College of Agriculture pay his expenses.

Information and application blanks are available at the Office of Resident Instruction. To be eligible, a sophomore must have an average of 78 or above, and he must file an application by the end of the first week in January. The selection is made by a student-faculty committee early in February.

DAIRY MARKETING RESEARCH FUND SCHOLARSHIP

The Dairy Marketing Research Fund has established a scholarship with an annual value of \$500. A candidate, to be eligible for an award, must have completed the work of the junior year and attained a cumulative average in all of his courses of 78 or above. In addition, he must have passed at least one course in dairy industry, in dairy marketing, and in dairy husbandry or farm management, except that no more than one of those courses may be included in the schedule for the senior year. Consideration is also given to financial need, character, personality, and potential qualifications for contributing to improved relationships and techniques in the marketing of milk or the manufacture of dairy products. Application for the scholarship must be filed with all supporting information by June 1.

WILLIAM FREDERICK DREER FUND

A fund from the estate of William Frederick Dreer has been established to provide a worthy student specializing in floriculture or ornamental horticulture an opportunity for study and directed practice in foreign countries for approximately one year. The award is currently \$2,500 and is available to either an undergraduate or graduate student within the period of his college course or upon its conclusion. Scholarship, character, maturity, seriousness of purpose, and promise of ability to make contributions to his field are considered in making awards. Applications should be on file at the Office of the Department of Floriculture and Ornamental Horticulture by December 1 preceding the June in which travel will start.

LEONARD A. DUDLEY SCHOLARSHIP ENDOWMENT

The Leonard A. Dudley Scholarship Endowment was established by gifts from Leonard A. Dudley of Binghamton, New York. The income from the fund provides one or more scholarships for members of any class in the College of Agriculture. Awards are made to deserving men or women with demonstrated financial need who are specializing in agricultural engineering, agricultural business, or agricultural science.

In selecting recipients, the Scholarship Committee gives first preference to students from Broome County and second preference to students from Tioga, Cortland, Chenango, and Delaware Counties. The last date for filing applications by prospective students is February 15, and for students in residence it is June 1.

EASTERN FROSTED FOODS ASSOCIATION SCHOLARSHIP

An annual scholarship of \$300 has been established by the Eastern Frosted Foods Association. It is to be awarded, at the end of the sophomore or junior year, to a student in food technology. In considering candidates, the Committee on Scholarships gives major emphasis to indications of ability to promote advancement of the industry, with preference to those with special interest in freezing. Applications must be filed by June 1.

EASTERN MILK PRODUCERS COOPERATIVE SCHOLARSHIPS

Three annual scholarships of \$500 each are provided by the Eastern Milk Producers Cooperative Association, Inc. Their purpose is to assist worthy stu-

dents of any class in the College of Agriculture, with preference to be given to sons or daughters of members of Eastern Milk Producers Cooperative Association. In order to qualify, students must rank in the upper two-fifths of their high school graduating class or of their class in college. They must also establish a need for financial assistance and show evidence of outstanding character and leadership ability. Applications from entering freshmen must be received by February 15 and from others by June 1.

ESSO 4-H SCHOLARSHIP

The Esso Standard Oil Company has established four-year scholarships of \$200 a year to be awarded, two each year, to students entering the College of Agriculture. The awards are made on the basis of merit, ability, and need, to boys who have satisfactorily completed at least three years of 4-H Club work including the preceding year, and who graduate from high school with a scholastic standing in the upper half of the class. The recipient receives \$200 each year for four years, provided he remains in college and maintains a satisfactory record.

Application blanks may be obtained from the 4-H Club agent in each county and must be on file by February 15.

GENERAL FOODS FUND SCHOLARSHIPS

The General Foods Fund, Inc., has provided ten scholarships for freshmen entering in 1963-1964 and will provide five additional scholarships for sophomores in 1964-1965. The freshman scholarships are valued at \$400 and the sophomore scholarships at \$200. Students specializing in agricultural engineering, bacteriology, biochemistry, biological science, and in dairy and food science are eligible to apply. The awards are made on the basis of intellectual competency, demonstrated leadership ability, high moral character, and financial need. Freshman applications must be filed by February 15, sophomore applications by June 1.

HEATLEY GREEN SCHOLARSHIP

The Heatley Green Scholarship Endowment was established under the will of Mrs. Green in memory of her husband, who had been a New York State farm boy and was a graduate of the College of Engineering at Cornell in the class of 1901. Mr. Green believed strongly in proper training for successful farming, and this scholarship is used to help and encourage worthy undergraduate students of moderate means. The value of the scholarship for 1963-1964 is \$950. Awards are on an annual basis and may be made to one student or divided between two or more students of any class in the College of Agriculture. The last date for filing applications by prospective students is February 15, and for students in residence it is June 1.

HERVEY S. HALL SCHOLARSHIP

The Hervey S. Hall Scholarship, established by bequest of Miss Mary F. Hall, of Spencer, New York, and having an annual value of \$150, is awarded to a properly qualified student of either sex, a resident of New York State pursuing a course in agriculture leading to the degree of Bachelor of Science, and in need of financial aid. It is "to be granted first to a student from the town of Spencer,

New York, should a suitable candidate appear, or a student from Tioga County, or from the State at large." Application should be made by June 1.

H. J. HEINZ COMPANY SCHOLARSHIP

The H. J. Heinz Company has provided a scholarship for students participating in the Food Distribution Program in 1963-1964. The value of this scholarship is \$1,500. The student will receive \$1,000. The remaining \$500 will be used to expand the Food Distribution Program. The award is made on the basis of scholastic achievement or promise, character, financial need, and the student's desire to pursue a career in the food industry. This scholarship is not available to students on leave of absence from food companies. Application must be completed by June 1.

ALFRED C. HOTTES AMATEUR GARDENING SCHOLARSHIP

The Alfred C. Hottes Amateur Gardening Scholarship Fund, a gift of the late Alfred C. Hottes, provides one or two scholarships of \$300. Eligible candidates are undergraduate students in the College of Agriculture who, by reason of their academic records, character, and activities, show promise of advancing through their study and work the subject of floriculture and ornamental horticulture as an amateur activity. In the application each applicant should point out how he might be expected to do this. Application should be made by June 1.

DAVID KENNEDY JOHNSTON ENDOWMENT FUND

This fund, established by a bequest under the will of Nettie J. Huey, provides scholarships and grants-in-aid for worthy students entering the College, or already enrolled, and specializing in animal husbandry. Preference is given to residents of Venango County, Pennsylvania. The last day for prospective students to apply is February 15, and for students in residence it is June 1.

CARL E. LADD MEMORIAL SCHOLARSHIPS

A fund in memory of Carl E. Ladd, Dean of the College from 1932 until his death in 1943, provides scholarships with an annual value of \$300 each. Sixteen or more scholarships are open to young men and women from New York farms who are members of any class in the College of Agriculture. The awards are made on the basis of character, financial need, promise for future leadership, and school record. Applications from prospective students should be made by February 15. Students in residence should file applications by June 1.

GEORGE LAMONT EDUCATIONAL FUND

The George LaMont Educational Fund was established by gifts from George B. LaMont and his son T. E. LaMont, owners of the LaMont Fruit Farm in Albion, Orleans County, New York. The income from the fund provides one or two scholarships, of \$300 each, for Orleans County farm boys of good moral character, who have a record in school and out that shows ability and application, and who are in need of financial assistance. Awards are for one year and usually are made only to young men entering college. Application blanks are

distributed by the guidance counselors and teachers of vocational agriculture in Orleans County high schools. Applications must be received by February 15.

HUDSON H. LYON MEMORIAL SCHOLARSHIP

The endowment for this scholarship fund was established by the late H. H. Lyon of Bainbridge, New York. The income, amounting to about \$1,600 a year, is to be used to aid students who are preparing for Protestant Christian missionary service, with preference to those who include agriculture in their training. The last date for filing applications by prospective students is February 15, and for students in residence it is June 1.

FRANK W. MASON AGRICULTURAL SCHOLARSHIP

The Frank W. Mason Agricultural Scholarship was established by gifts from Frank W. Mason, a prominent fruit farmer of Albion, Orleans County, New York. The income provides an annual scholarship of \$200 for a young man or woman from Orleans County, with preference given to graduates of the Albion Central School and those who are interested in fruit growing or marketing. In making awards, consideration is given to need for financial assistance, academic ability, moral character, and promise for future leadership in the broad relationships of agriculture.

Application blanks are distributed by the guidance counselors and teachers of vocational agriculture in Orleans County high schools. Applications must be received by February 15.

FRANK B. MORRISON MEMORIAL SCHOLARSHIPS

An endowment fund, established by Mrs. Frank B. Morrison in memory of her husband, a former head of the Department of Animal Husbandry, provides two annual awards of \$300 each. They are made to juniors or seniors of outstanding ability whose major interests are in animal husbandry. A committee from the faculty of the Department of Animal Husbandry considers both academic achievement and personal qualities of leadership and character in recommending awards. Applications should be filed by June 1.

NATIONAL FOOD BROKERS ASSOCIATION FOUNDATION, INCORPORATED, SCHOLARSHIP

The National Food Brokers Association Foundation, Inc., has provided a scholarship for students participating in the Food Distribution Program in 1963-1964. The value of this scholarship is \$400. The award is made on the basis of scholastic achievement or promise, character, financial need, and the student's desire to pursue a career in the food industry. Application must be completed by June 1.

NEW YORK FARMERS SCHOLARSHIPS

This fund is provided by the New York Farmers for the purpose of assisting young men with good ability, who need financial aid, to continue their agricultural education. Preference in making awards will be given to farm boys, those who wish to farm, and those who expect to serve farmers directly. Applications

for the freshman scholarships must be received by February 15 and for sophomore, junior, and senior year scholarships by June 1.

NEW YORK LIME ASSOCIATION SCHOLARSHIPS

The New York Lime Association provides six annual scholarships of \$250 each, with two to be awarded to members of each of the three upper classes. In selecting students for awards major interest in agronomy, scholastic achievement especially in the sciences, potential ability for leadership, and need for financial assistance are considered. The awards are normally given for one year but may be renewed if the student qualifies in competition with other members of his class. Applications must be filed by June 1.

NEW YORK STATE CANNERS AND FREEZERS ASSOCIATION, INCORPORATED, SCHOLARSHIP

An annual scholarship of \$200 is provided by the New York State Canners and Freezers Association, Incorporated. It is available to a student who is a resident of New York State and gives evidence of preparing for a career in the processing of fruits and vegetables. Preference will be given to a student who is entering his junior year. In making the selection, the Committee on Scholarships takes into consideration character, scholastic record, financial need, leadership ability, and other desirable qualification. Applications should be filed by June 1.

RALSTON PURINA SCHOLARSHIP

The Ralston Purina Company offers an annual scholarship of \$500 to an outstanding undergraduate student in agriculture. The award is made each year to a student who will be entering his senior year or, under unusual circumstances, his junior year. The recipient must rank in the upper 25 per cent of his class scholastically. Evidence of leadership ability, moral character, participation in extracurricular affairs, sincerity of purpose, and financial need are taken into account in making an award. Applications must be filed by June 1.

ROBERTS SCHOLARSHIPS

The Roberts Scholarship Fund, a gift of the late Dr. Charles H. Roberts, of Oakes, Ulster County, New York, provides five scholarships, each retainable for one year, but not open to entering students. As expressed by the founder, the purpose of these scholarships is to furnish financial assistance to students in the College of Agriculture who are of good moral character, who show native ability, tact, and application, and who are in need of such assistance, especially students coming from rural districts. The awards are made after the close of each year. Applications must be filed by June 1. The present value of each scholarship is \$300.

AARON H. RUBENFELD MEMORIAL SCHOLARSHIP

The Aaron H. Rubenfeld Memorial Scholarship was established by the Middletown Milk & Cream and Dellwood Dairy Divisions of Deltown Foods, Inc., of Yonkers, New York, in memory of their late president and founder, who believed in actively encouraging progress in the dairy industry. Candidates for this \$1,000

award must have completed their sophomore year in the College, must show evidence of need for the financial assistance, must have demonstrated interest in the dairy industry, and must possess characteristics that indicate potential ability to contribute to improvement in the production, marketing, and manufacture of milk and milk products. With other qualifications equal, preference will be given to children of employees of either of these two companies and of producers shipping their milk to Middletown Milk & Cream Division or its affiliates. Payment of \$250 is made to the recipient at the beginning of each semester in the junior and senior year. Applications should be filed not later than June 1.

SEARS, ROEBUCK SCHOLARSHIPS

The Sears, Roebuck Foundation has provided fifteen scholarships for freshmen entering in 1963-1964 who have demonstrated an interest in agriculture. The value of each scholarship is \$300 or \$400. The awards are made on the basis of character, financial need, scholastic promise, and potential for leadership in the field of agriculture. Applications must be completed by February 15.

WARD W. STEVENS HOLSTEIN SCHOLARSHIP

A fund in honor of Ward W. Stevens provides a scholarship to a male undergraduate student in either the two-year or the four-year course in the College of Agriculture, who has completed at least one-half of his course. The value of the scholarship is \$750. It may be awarded to one student or divided between two students. A student who has held the scholarship is eligible to reapply. The award is based on character, exceptional ability in the judging and handling of dairy cattle, high scholastic rank in dairy-husbandry courses, need of financial assistance, and special interest in the Holstein breed of cattle. Applications should be received by June 1.

LOUIS WARE SCHOLARSHIP-FELLOWSHIP AWARD

An annual scholarship of \$1,000 has been provided by the International Minerals and Chemical Corporation as a tribute to the chairman of its board, Louis Ware, and his lifetime interest in agriculture and mining. The purpose of this award is to recognize and encourage a student entering the senior year, who is academically and personally outstanding and who is likely to continue his achievements in the field of agricultural science in Graduate School. Need is not a primary consideration. The recipients of these senior scholarships in six colleges of agriculture will be eligible to compete for a graduate fellowship in agricultural science. This graduate fellowship will be renewable so that a recipient, if he is meeting the requirements, will receive \$3,000 for each of three years, if necessary for completion of his Ph.D. study and research. Applications must be filed by June 1 and should include the major field in which graduate work is likely to be pursued.

WESTERN NEW YORK SECTION OF THE INSTITUTE OF FOOD TECHNOLOGISTS AWARD

Two annual scholarships of \$300 are provided by the Western New York Section of the Institute of Food Technologists. They are available to worthy

students who have been approved for admission or who are enrolled in the College with a specialization in the Department of Dairy and Food Science. The last date for prospective students to apply is February 15, and for students in residence it is June 1.

WOMAN'S NATIONAL FARM AND GARDEN ASSOCIATION SCHOLARSHIPS

The New York State division of this Association has provided the following two scholarships:

A SCHOLARSHIP IN HONOR OF ITS FIRST PRESIDENT, MRS. FRANCIS KING . . . The value of the scholarship is \$500, payable over a two-year period. The award is made biennially to a woman of the sophomore class in the College of Agriculture. Character, interest in agriculture, scholarship, and financial need are considered. Applications should be made before June 1.

A SCHOLARSHIP IN RECOGNITION OF ITS HONORARY PRESIDENT, MRS. WALTER DOUGLAS . . . Junior or senior women in the College of Agriculture who have achieved high standing are eligible to apply for the award of \$200. Character and financial need are considered, with preference given to girls who have been active in a 4-H Club. Application should be made by June 1.

SCHOLARSHIPS FOR NONRESIDENTS

Twenty tuition scholarships are available for nonresidents of the State. They are awarded annually, and evidence of need is required. The last date for filing by prospective students is February 15, and for students in residence it is June 1.

OTHER SCHOLARSHIPS

Information about other scholarships open under certain conditions to undergraduates in the College of Agriculture may be obtained in the Office of Scholarships and Financial Aid, Day Hall.

AWARDS

ALPHA ZETA SCHOLARSHIP KEY

The Alpha Zeta Fraternity presents a scholarship key to the student who made the highest scholastic average in the first year of the four-year course. The name of the recipient is also inscribed on a plaque in the Office of Resident Instruction. The key is presented at the annual barbecue in the fall.

ALUMNI PRIZES

The Alumni Association of the College of Agriculture provides two annual prizes of \$50. These are awarded by the faculty, one to the junior who had the highest cumulative average at the end of the sophomore year, and one to the senior who had the highest cumulative average at the end of the junior year.

BORDEN AGRICULTURAL SCHOLARSHIP AWARD

The Borden Company has established an annual scholarship award to recognize and assist outstanding students who give promise of future achievement. The award is made to the student in the College of Agriculture who has taken at least two courses in dairying and who, upon entering his senior year, has the highest average grade for all of his previous college work of any of the similarly eligible students. The value is \$300 payable upon registration in the College for the senior year.

BURPEE AWARD IN HORTICULTURE

An annual award of \$100 is made possible through a grant from the W. Atlee Burpee Company, Seed Growers, Philadelphia, Pennsylvania, and Clinton, Iowa. The purpose is to encourage outstanding students in the study of vegetable growing and flower growing. The award is made at the beginning of the senior year and is divided equally between two students, one in the field of floriculture and ornamental horticulture and the other in vegetable crop production. To be eligible, the student shall have completed Botany 31 or its equivalent, and at least two courses in the department concerned, and shall have signified intention of specializing in that department.

EASTMAN PRIZES FOR PUBLIC SPEAKING

The Eastman Prizes for Public Speaking of \$100 and \$25, established in 1918, are awarded by a committee of judges to any regular or special student in the College of Agriculture for public speaking on country-life subjects. Elimination contests are held beginning approximately December 1, with the final contest taking place during Cornell Agricultural Progress Days in March. Contestants sign up before December 1 in the Extension Teaching and Information Office, 500 Mann Hall, where additional information may be obtained.

PAUL H. GULDIN MEMORIAL ENDOWMENT

The Paul H. Guldin Memorial Endowment, established by Mrs. Paul H. Guldin as a memorial to her husband, a graduate of the College in 1912, is to encourage undergraduate students in the Colleges of Agriculture and Home Economics to become interested, and to take part, in the development of a more adequate rural leadership. The income supports a contest for the best original articles or stories, written by undergraduates in these Colleges and published in the *Cornell Countryman*, that contribute to the purpose of the endowment. The awards will be made twice a year, the first award being based on the articles in the October, November, December, and January issues and the second awards on the February, March, April, and May issues. In each instance the awards will be \$75 for first place, \$50 for second place, and \$25 for third place. The selection will be made by a committee from the faculty, appointed by the Dean.

FRANK B. MORRISON MEMORIAL PRIZES

The Frank B. Morrison Memorial Prizes, totaling \$100 annually, are given to students winning top awards in the Students' Fitting and Showmanship Contest.

**NATIONAL PLANT FOOD INSTITUTE
SOIL FERTILITY ACHIEVEMENT AWARD**

The National Plant Food Institute has provided an award of \$200 for an outstanding junior or senior who has enrolled in at least four courses in agronomy and/or courses dealing primarily with plant nutrition. Selection of the student will be made on the basis of scholarship, leadership, character, and professional interest in the field of soil fertility. The recipient will receive an appropriate key and his name will be engraved on a plaque.

CHARLES LATHROP PACK FOUNDATION FORESTRY PRIZE

The Charles Lathrop Pack Foundation Forestry Prize of \$40 is awarded annually in April for the best essay on forestry submitted by a resident student who has taken some course in forestry during the current college year. The purpose of the prize is to aid in training men and women to write articles that will arouse in the public an interest in forestry and an appreciation of what forestry means to the country. The award is made by a committee appointed by the President of the University. The detailed regulations are furnished by the Department of Conservation. The essay must be deposited at the office of the head of the Department of Conservation by noon on April 15.

RICE DEBATE STAGE

The Rice Debate Prizes of \$100 and \$25, established in 1927, are awarded by a committee of judges to any regular or special student in the College of Agriculture for a public debate on farm life problems. A topic is selected each year by a faculty committee. Elimination contests are held beginning approximately December 1, with the final contest taking place during the spring semester. Contestants sign up before December 1 in the Extension Teaching and Information Office, 500 Mann Hall, where additional information concerning the topic and the contest may be obtained.

RING MEMORIAL FUND PRIZE

The Ring Memorial Fund was established under the will of Charles A. Ring to advance horticultural science. The income is used for a prize of approximately \$50 to be awarded to an outstanding sophomore student specializing in plant or horticultural science.

Instructors and advisers of students in the plant sciences are requested to nominate, in writing, sophomores who show promise of advancing horticultural science. Consideration is to be given to grades in horticultural and supporting science courses; attitude toward education, horticulture, and scientific work; demonstrated ability for leadership; character and personality. Nominations must be received at the Office of Resident Instruction before May 1.

SAMUEL L. STEWART PRIZE

The Samuel L. Stewart Prize of \$100 is offered annually in an essay contest, to promote the production and distribution of high-quality milk, and to acquaint producers and handlers with the factors which may affect its palatability. The

contest is open to undergraduate students in the College of Agriculture. Essays of 600 to 800 words must be filed at the Office of Resident Instruction by April 15.

OTHER PRIZES

Information concerning other prizes open to students enrolled in the University is given in the *Announcement of Prize Competitions*. Copies may be obtained at the Visitor Information Center, Day Hall.

LOANS

A fund contributed by students of the College is available for small, short-time, emergency loans. Applications may be made to the College Secretary.

A fund, the interest on which is available for loans to students specializing in floriculture, has been established by Mr. Max Schling of New York City. Another loan fund for students of floriculture, with principal and interest available, has been contributed by the New York Florists Club. Applications for loans from both these funds may be made to the College Secretary.

For other loan funds, available to students of all colleges at Cornell, application should be made at the Office of Scholarships and Financial Aid, Day Hall.

HEALTH SERVICES AND MEDICAL CARE

These services are centered in the University's Gannett Medical Clinic (out-patient department) and in the Cornell Infirmary (hospital). Students are entitled to unlimited visits at the Clinic; laboratory and X-ray examinations indicated for diagnosis and treatment; hospitalization in the Infirmary with medical care for a maximum of fourteen days each term and emergency surgical care. On a voluntary basis, insurance is available to supplement the services provided by the tuition and the General Fee. For further details of services, see the *Announcement of General Information*.

INDEX

- Administration (Rural Education), 77
- Admission of regular students, 15; with advanced standing, 17; of special students, 18
- Agricultural Economics, 33
- Agricultural Education, 77
- Agricultural Engineering, 39
- Agricultural Policy, 37
- Agronomy, 42
- Anatomy, Genetics, and Physiology (Poultry Husbandry), 75
- Animal Breeding, 47
- Animal Husbandry, 45
- Animal Nutrition, 48
- Apiculture, 62
- Awards, 100
- Bacteriology, 48
- Beekeeping, 62
- Biochemistry, 50
- Biology, 51
- Biometry, 70
- Botany, 53
- Buildings, 89
- Business Management, 35
- Calendar, *Inside Front Cover*
- Combined courses: Professional Agricultural Engineering, 24; Business and Public Administration, 25; School of Nutrition, 26; Veterinary College, 27
- Conservation, 55
- Conservation Education, 82
- Council members, iii
- Courses in other colleges, 88
- Courses open to freshmen, 23
- Dairy Husbandry, 46
- Dairy Science, 58
- Dean's List, 22
- Degree, requirements for, 18
- Degree with Distinction, 22
- Dining Arrangements, 31
- Drawing, 59
- Economic Development, 37
- Education, Elementary and Secondary, 79
- Education, General, 83
- Educational Psychology, 78
- Emeritus Professors, iii
- Employment Opportunities, 11
- Entomology and Limnology, 60
- Entomology, Economic, 61
- Entrance requirements, 16
- Expenses, 29
- Extension Education, 80
- Extension Teaching, 63
- Faculty, 1
- Farm Management, 34
- Farms, 90
- Fees, 29
- Field Crops, 44
- Floriculture, 65
- Floriculture, Commercial, 66
- Food Distribution, 36
- Food Science, 67
- Forestry, 55, 57
- Four-year course, the, 10
- Genetics (Plant Breeding), 69
- Graduation, 20, 21
- Guidance and Personnel, 81
- Health services and medical care, 103
- Housing, 31
- Ichthyology, 56, 57
- Insect Morphology, 60
- Insect Physiology, 62
- Insect Taxonomy, 60
- Insect Toxicology, 63
- Journalism, 64
- Junior High School Program, 82
- Landscape Service, 67
- Libraries, 91
- Limnology, 62
- Livestock Production, 45
- Loans, 103
- Mammalogy, 56, 57
- Marketing, 36
- Meats, 46
- Meteorology, 68
- Military Training, 21
- Miscellaneous rules and assessments, 29
- Nature Study, 82
- Nursery Management, 66
- Nutrition, 51, 76
- Oceanography, 57, 58
- Oral and Written Expression, 63
- Orientation, 33
- Ornamental Horticulture, 65
- Ornithology, 56, 57
- Parasitology and Medical Entomology, 61
- Physical Education, 21
- Physiology of Reproduction, 47
- Plant Breeding, 69
- Plant Materials, 66
- Plant Pathology, 71
- Pomology, 73
- Poultry Husbandry, 74
- Practice requirement, 18
- Prices, 34
- Public Administration and Finance, 36
- Radio-Television, 64
- Registration, 22
- Required courses, 20
- Residential Halls, 31
- Rural Education, 76
- Rural Sociology, 84
- Scholarships, 91
- Science Education, 82
- Soil Science, 42
- Staff, 1
- Statistics and Biometry, 70
- Supervision (Rural Education), 77
- Television, 64
- Trustees, ii
- Tuition, 28
- Vegetable Crops, 67
- Visual Aids, 65
- Wildlife, 55, 56, 57
- Zoology, 56