TO: PRESIDENT ALBERT W. BROWN
FROM: THE FACULTY SENATE
RE: X I. Formal resolution (Act of Determination)
     II. Recommendation (Urging the fitness of)
     III. Other (Notice, Request, Report, etc.)
SUBJECT: Revised Program for the M.S. degrees in the Biological Sciences

Resolved, that the Faculty Senate approves the revised program for the M.S. degrees in the Biological Sciences.

Signed [Signature] Date Sent: 4/5/71
(For the Senate)

TO: THE FACULTY SENATE
FROM: PRESIDENT ALBERT W. BROWN
RE: I. DECISION AND ACTION TAKEN ON FORMAL RESOLUTION

a. Accepted. Effective Date 2/1/71
b. Deferred for discussion with the Faculty Senate on
   c. Unacceptable for the reasons contained in the attached explanation

II, III.
   a. Received and acknowledged
   b. Comment:

DISTRIBUTION: Vice-Presidents: Burke, Crandall

Others as identified: Department Chairs

Distribution Date: 2/1/71
Signed: [Signature] President of the College

Date Received by the Senate:
FACULTY OF NATURAL AND
MATHEMATICAL SCIENCES

DEPARTMENT OF BIOLOGICAL SCIENCES

Chairman: Theodore J. Starr

Professors: Robear, Claffey, Cloutier, Damann, Gould, Starr,
            Syrocki, Thomas, Wallin

Associate Professors: Barr, Costa, Dilcher, Gehris, Hellmann,
                      Mosher, Thompson

Assistant Professors: DeMarce, Gianfagna, Hammond, Kibby, Little,
                      Marshall, McLean, Paris, Smith, Thieme

Programs leading to the Master of Science in Botany and the
Master of Science in Zoology are offered by the Department of
Biological Sciences. Requests for admission to either of these
programs should be directed to the Graduate Committee, Depart-
ment of Biological Sciences. The Department of Education offers
a program leading to the Master of Science in Education with a
Concentration in Biology. Requests for admission to this program
should be directed to the Chairman of the Department of Education
(for details please refer to the Education section of this
catalog).

M.S. IN BOTANY OR ZOOLOGY

Admission Procedure

Applicants for graduate study are responsible for submitting
to the Graduate Committee of the Department of Biological Sciences
the following documents:

1. Completed application form for graduate study as a
   matriculated student. (If the applicant wishes to
   pursue studies as a non-matriculated student, i.e.,
   not as a degree candidate, the application should be
   sent to the Admissions Office.)

2. Transcript(s) of records of all undergraduate and
   graduate students.

3. Two letters of recommendation from persons who have know-
   ledge of the applicant's training and aptitude for
   graduate study.

4. Graduate Record Examination scores in:
   a. General Aptitude
   b. Advanced Biology
Information as to the place and time this examination can be taken may be obtained from the Departmental office or from the Educational Testing Service, Box 953, Princeton, New Jersey 08540.

As a rule, the applicant's request for admission to the Master's Degree program (matriculation) will not be considered until the above-mentioned documents have been received. Upon admission and registration, the student is considered a Candidate for the Master of Science degree.

Deadlines for Applications for Graduate Study

Summer and Fall Sessions  -- May 1 (March 15 if applying for assistantship)

Spring Session  -- December 1

Admission Requirements

The applicant must have completed 18 semester hours of biology at an accredited institution preferably with a grade of "B" or better. He must also have credit for college physics, organic chemistry and calculus. Computer science may be substituted for calculus only upon the recommendation of the Candidate's Committee (defined below). Students may be admitted to graduate study with deficiencies in the above areas, but priority must be given to their removal. The program of study must include the courses through which the deficiencies are to be removed, with no credit toward the Master's Degree being awarded. Such courses may be taken on a pass-fail basis with the consent of the instructor. The applicant must expect to complete the requirements for a baccalaureate degree before beginning graduate studies.

Assistantships

The Department offers a limited number of Graduate Assistantships which provide a stipend plus waiver of tuition. Students wishing to apply for an assistantship should so indicate by letter when applying for admission. Ordinarily the maximum course load for a graduate assistant is nine credit hours. The duties of the assistant are to not exceed 15 clock hours per week.

Graduate Assistants can be considered full-time students if they are registered for Research for Thesis (BTS 504 or ZOL 504), or have registered for a minimum of six semester hours.
The Major Advisor and Procedural Guidelines

The Candidate is responsible for selecting a Major Advisor. The Candidate and Major Advisor will request the assistance of two other advisors to constitute the Candidate's Committee. The names of the Advisors will be filed with the Graduate Committee of the Department.

The Candidate and his Committee will determine a program of study to be approved by and filed with the Graduate Committee of the Department. Changes in the membership of the Committee or the program of study must be approved and filed.

During the semester following completion of 12 semester hours of credit the Candidate's Committee will conduct an evaluation of the Candidate's progress to determine acceptability for continuation in the program. The results of the evaluation should be communicated to the Candidate and a report filed with the Graduate Committee of the Department. Subsequent evaluations of the Candidate may be initiated by the Major Advisor at his discretion.

The Candidate's Committee will conduct the final evaluation of the Candidate by means of a public oral comprehensive examination which will also include a defense of his Thesis. It will be the responsibility of the Major Advisor to report to the Graduate Faculty of the Department the results of the final evaluation and the acceptability of the Thesis.

The Candidate and his Advisor will request the Graduate Committee to notify the Registrar of the intended completion of all degree requirements two months in advance of the awarding of the Degree.

Requirements for the M.S. in Botany or Zoology

The programs of study leading to Master of Science degrees in either Botany or Zoology shall have the following requirements:

A. Masters Dissertation based on an original investigation and presented as a thesis.

B. A minimum of 30 or a maximum of 39 semester hours of credit constituted as follows:

1. A minimum of 20 semester hours of credit for courses taken at the 500 level which may include the Thesis.

2. A maximum of 6 semester hours of credit for Thesis research.
BIO 428 Molecular Biology

Lectures and laboratories consider the application of modern biochemical approaches to the study of life, its metabolic processes, and its physico-chemical bases. Prerequisite: Developmental Biology or General Physiology and Organic Chemistry. 4 semester hours.

BIO 444 Human Ecology and Conservation

An introduction to current issues of population growth, human habitat deterioration, and resource management and mismanagement, based on ecological geography and human natural history. Especially suitable as a free elective for non-majors. Students desiring credit towards the biology major must register for BIO 445 concurrently. Prerequisite: None. 3 semester hours.

BIO 445 Human Ecology and Conservation Laboratory

Field work to be taken concurrently with BIO 444, dealing with the ecology and improvement of woodland, rural, suburban and urban environments. Prerequisite: Ecology. 1 semester hour.

BIO 451 Aquatic Biology

A field course dealing with the collection, identification, and ecology of the plants and animals associated with various aquatic habitats. Prerequisite: Consent of instructor and Invertebrate Zoology or its equivalent. 4 semester hours.

BIO 455 Heredity and Eugenics

Genetic principles which are tools for the study of human heredity. Emphasis is on human genetics, with the idea of furnishing a practical background for teachers, paramedical majors, and liberal arts students. Not open to students who have had Genetics. Prerequisite: None. 3 semester hours.

BIO 461 Conservation Practicum

A summer field course at Keenir providing practical experience in stream improvement, foot trail construction and maintenance, and conservation of fields, wetlands, and woodlands for wildlife and recreation. Intended for students with a professional interest in park ranger or private agency sanctuary work. Prerequisite: Ecology. 3 semester hours.

BIO 462 Field Biology

Lectures and field studies concerned with energy flow and material recycling illustrated in local ecosystems. Field techniques such as trapping, banding and aquatic sampling are included along with natural history and ethological concepts, environmental problems, including population regulating mechanisms, are considered from an interdisciplinary, broadly conceptual point of view. Recommended for students in elementary and secondary education, or as a general elective course. Prerequisite: Principles of Biology or equivalent. 3 semester hours.
BIO 466 Cytology

The study of cell structure and function; includes methods and techniques for cytochemical and ultrastructural approaches. Prerequisite: General Botany, General Zoology, Organic Chemistry. 4 semester hours.

BIO 468 Marine Science

Basic concepts in the study of the sea. Focus on elementary chemical, intermediate physical and geological oceanography, marine ecology and fisheries biology. One or more field trips are to be expected. Prerequisite: Ecology, Organic Chemistry, Physics. 4 semester hours.

BIO 471 Biology of Pollution

An ecological approach to the physiological effects of pesticides, herbicides, thermal pollution, etc. and problems resulting from their concentration in aquatic and terrestrial ecosystems. Prerequisite: Ecology and permission of instructor. 4 semester hours.

BIO 473 Organ and Tissue Culture

Preparation and application of tissue cultures of mammalian origin. Laboratories and lectures will consider the techniques of auto-radiography, fluorescence and time-lapse phase microscopy, immunology, cytochemistry and virology. Prerequisite: Microbiology and consent of instructor. 4 semester hours.

BIO 482 Biometrics

Introduction to the logic and use of statistics in planning experiments and in analysis and interpretation of biological data. Prerequisite: Algebra. 3 semester hours.

BIO 495 Topics in Modern Biology

Lectures, discussions and seminars in contemporary issues in Biology. Offered only as announced in general program. 3 semester hours.

BIO 498 Seminar in Biology

Interest-oriented groups will discuss journal articles and research of faculty and students. Recommended especially for those registered for Independent Study. 1-3 semester hour.

BIO 499 Independent Study

Arranged in consultation with instructor with permission from the Office of Vice President for Instruction and Curriculum. An undergraduate major in Biological Sciences can apply only one Independent Study course in the first 30 hours toward a major. Prerequisite: Junior or Senior standing. 1-3 semester hours.
BIO 502 Biological Sciences Seminar

Designed to acquaint students with topics of professional interest and to expose them to the stimulation of current research. Required of all candidates for an M.S. degree in Botany and Zoology. Prerequisite: Graduate Status. 1 semester hour.

BIO 523 Cell Physiology

Laboratory and lecture consider the structural elements of the cell, their functioning and interactions. Includes energy and material transformations, membrane transport, motility, and self-aggregating properties of macromolecules. Prerequisite: Molecular Biology. 4 semester hours.

BIO 535 Limnology

A laboratory and field experience involving methods in the study of the physical, chemical and biological characteristics of freshwaters. Prerequisite: Consent of instructor and Aquatic Biology or its equivalent. 4 semester hours.

BIO 585 Organic Evolution

The course is an inquiry into the origin and evolution of life at every level from the atomic to the social, with emphasis on physico-chemical and molecular aspects. Prerequisite: Evolution. 3 semester hours.

BIO 564 Biological Productivity

Measurement of primary and secondary production within aquatic and terrestrial ecosystems; physical, chemical, and biological factors which influence productivity are considered. Prerequisite: Ecology or permission of instructor. 4 semester hours.

BIO 566 Ultrastructure

Techniques for preparation of biological materials; operation of the electron microscope; analysis and interpretation of fine structure. Prerequisite: Cytology and consent of instructor. 4 semester hours.

BIO 574 Management of Biotic Resources

Theory, policy, and techniques in the management of wildlife and forest resources. Lectures deal with population and community structure, analysis, and management principles, and with public policy in wildlife and forest conservation. Field work stress problems in small woodlot management and wildlife habitat improvement. Prerequisite: Ecology and Plant Taxonomy. 4 semester hours.
1595 Topics in Modern Biology

Topics in "A Special Field of Study" (title of subject to be specified). The topics will be dealt with in seminar fashion and will reflect the needs and timely interests of the students. Prerequisite: Basic course work in the field of study consent of instructor. 1-4 semester hours.

1599 Independent Study

A creative undertaking on a problem of special interest, to be arranged in consultation with the instructor. 1-4 semester hours.
TN 411 Local Flora

A field course for the study of the major vascular plant families of this region of the State. Prerequisite: General Botany. 3 semester hours.

TN 414 Plant Taxonomy

A study of the bases, techniques, history, and modern development of the systematic of vascular plants. Major plant groups are studied on a world-wide basis with emphasis on the principal families of the flora of the northeastern United States. Prerequisite: General Botany. 3 semester hours.

TN 424 Plant Physiology

A study of physiological processes of plants. Includes assimilation, photosynthesis, respiration, plant nutrition, transpiration, growth, reproduction and responses of plants to environmental conditions. Prerequisite: Organic Chemistry, General Physiology or Developmental Biology. 4 semester hours.

TN 450 Mycology

Lecture and investigations on the morphology, physiology and biochemistry of selected groups of fungi. Prerequisite: Organic Chemistry and Microbiology. 3 semester hours.

TN 468 Plant Ecology

The interaction of plants and the environment on the population, community, and ecosystem levels are studied. Ecosystems are discussed as steady state systems in which plants are the primary producers. Some laboratory populations are investigated and methods of vegetation analysis applied in a field study of a model ecosystem. Prerequisite: Ecology. 4 semester hours.

TN 475 Morphogenesis

A course in experimental plant morphogenesis designed to give the student an understanding of (a) the growth and differentiation of plant organs and tissues and the internal and external factors affecting them and (b) the experimental approach to such problems. Prerequisite: Plant Morphology or Plant Physiology. 4 semester hours.

TN 480 Independent Study

Arranged in consultation with instructor, with permission from the Office of Vice President for Instruction and Curriculum. An undergraduate major in Biological Sciences can apply only one Independent Study course in the first 30 hours toward major. Prerequisite: Junior or Senior standing. 1-3 semester hours.
TN 504 Research for Thesis

An individual investigation of an original problem to be submitted in a format acceptable to satisfy the requirements for the Master's Thesis as determined by the graduate faculty of the department. Prerequisite: Degree Candidacy. Maximum of 10 semester hours.

TN 546 Aquatic Vascular Plant Ecology

A lecture and field course dealing with the ecology, physiology, morphology, and taxonomy of vascular hydrophytes. Prerequisite: Permission of instructor and Ecology. 4 semester hours.

TN 552 Principles of Systematics

An investigation of the principles of classification, nature of relationships, processes of evolution and establishment of taxonomic systems. Related disciplines, biological and physical, are applied to systematics problems. Prerequisite: Plant Taxonomy and Genetics. 3 semester hours.

TN 558 Physiology

Physiology, morphology, ultrastructure and ecology of algae. Laboratory work includes culturing techniques. Prerequisite: Permission of Instructor, Microbiology and Ecology. 4 semester hours.

TN 558 Plant Geography

A world-wide survey of the distribution and development of contemporary and geologically historical plant communities. The environmental conditions giving rise to plant communities within specific ecosystems, and present research in plant distribution will be discussed. One weekend field trip will be required. Prerequisite: Plant Ecology or permission of instructor. 3 semester hours.

TN 599 Independent Study

A creative undertaking on a problem of special interest, to be arranged in consultation with the professor directing the study. 4 semester hours.
ZOL 415 Invertebrate Zoology

The origins of animal groups with special reference to the metazoa, bilateria, "higher" invertebrates, and their relationship to the vertebrates. Prerequisite: General Zoology and Ecology. 4 semester hours.

ZOL 417 Entomology

A study of the biology and classification of insects. Emphasis is placed on anatomy, physiology, and ecology of selected types. A collection and identification of species is required. Prerequisite: General Zoology. 4 semester hours.

ZOL 426 Histology

A study of cell and tissue structure with emphasis on the vertebrates and an introduction to technique. Prerequisite: Comparative Vertebrate Anatomy, General Physiology, and Organic Chemistry. 4 semester hours.

ZOL 428 Parasitology

A study of parasitic organisms with special emphasis on those affecting man and domesticated animals; their identification, classification, comparative morphology, life cycles and ecology. Prerequisite: Invertebrate Zoology and consent of instructor. 3 semester hours.

ZOL 432 Ornithology

Identification, classification and natural history of birds, including ecology and conservation practices. Field experiences in identification and behavior are emphasized, together with skin preparation techniques. Prerequisites: Ecology or permission of instructor. 3 semester hours.

ZOL 457 Ichthyology

Taxonomy, distribution, natural history and economic importance of fishes with emphasis on Great Lakes forms. Prerequisite: Ecology. 3 semester hours.

ZOL 459 Mammalogy

A study of the major mammal groups living today. Emphasis is placed on the identification, classification, life histories, habits, control of nuisance species, economic importance and literature pertaining to mammals. Field experiences are given relative to the investigation of small mammal populations. Prerequisite: Ecology. 3 semester hours.

ZOL 466 Embryology

Laboratories and lectures consider the development of vertebrate animals from the origin of the germ cells, through maturation, fertilization, cleavage, cellular differentiation, and histogenesis to organogenesis and the growth of the embryo. Prerequisite: Comparative Vertebrate Anatomy, General Physiology, and Organic Chemistry. 4 semester hours.
ZOL 469 Animal Ecology

Distribution and behavior of animals as affected by various environmental factors. Special attention to animal population dynamics and evolution. Prerequisite: Ecology. 4 semester hours.

ZOL 499 Independent Study

Arranged in consultation with instructor with permission of the Office of Vice President of Instruction and Curriculum. An undergraduate major in Biological Sciences can apply only one Independent Study course in the first 30 hours toward a major. Prerequisite: Junior or Senior standing. 1-3 semester hours.

ZOL 594 Research for Thesis

An individual investigation of an original problem to be submitted in a format acceptable to satisfy the requirements for the Master's Thesis as determined by the Graduate Faculty of the department. Prerequisite: Degree Candidacy. Maximum of 10 semester hours.

ZOL 543 Comparative Invertebrate Physiology

The basic life processes of selected invertebrates will be considered. Emphasis will be on the unity of functions despite the diversity of structures. Experimental work will consist of projects in several areas of physiology. Prerequisite: Cell Physiology or Biochemistry and permission of the instructor. 4 semester hours.

ZOL 545 Aquatic Invertebrates

Aquatic invertebrates from a variety of habitats will be collected and identified. Studies of their life histories, ecology, and importance to man will be emphasized. Prerequisite: Ecology. 3 semester hours.

ZOL 555 Experimental Embryology

A study of the major principles and problems in developmental biology including genetic control, cellular differentiation, fertilization, cell movements, embryonic induction and regeneration. An introduction to relevant laboratory techniques. Prerequisite: Genetics, Embryology and Biochemistry. 4 semester hours.

ZOL 557 Applied Limnology

Limnological techniques with special reference to fisheries management. Techniques of determining populations, population development, food habits, growth studies, life histories, aquatic productivity, and fish propagation. Prerequisite: Limnology and Ichthyology. 4 semester hours.
ZOL 571 Endocrinology

A study of the ductless glands and their secretions. Emphasis is placed on the actions of hormones on growth, metabolism, and adaptation of animals to changes in their internal and external environments. Prerequisite: Anatomy and Physiology I and II or Vertebrate Physiology. 4 semester hours.

ZOL 572 Ethology

Vertebrate behavior under natural conditions will be discussed, stressing behavioral adaptations which contribute to animal survival and regulations of population. Topics such as development of behavior, the role of behavior in animal evolution, evolution of animal societies and inferences for human behavior will be considered. The course is designed to be of interdisciplinary value. Prerequisite: Ecology. 4 semester hours.

ZOL 573 Neurobiology

The functions of nervous tissue and related peripheral elements including muscle and receptors as well as central nervous system functions of invertebrates and vertebrates contributing to a physiological basis of behavior. Prerequisite: Anatomy and Physiology I and II or Comparative Vertebrate Anatomy and Vertebrate Physiology. 3 semester hours.

ZOL 599 Independent Study

A creative undertaking on a problem of special interest, to be arranged in consultation with the professor directing the study. 3-4 semester hours.