

PROPOSAL TO MODIFY AND EXTEND A MAJOR TO ANOTHER SCHOOL OR COLLEGE

I. EXACT DESCRIPTION OF REQUEST

A Biology Major exists in the School of Education, where it provides one of the areas of focus for students who wish to become teachers with certification in secondary education.

This request is to initiate a Biology Major also in the College of Agricultural and Life Sciences and the College of Letters and Science. The program proposed is similar to the existing program in Education though it is intended primarily to: i) prepare undergraduates for graduate studies in diverse areas of biology; ii) prepare certain preprofessional students (e.g. medicine, veterinary medicine, dentistry) for advanced study in the health professions; and, iii) provide a broad exposure to biology for students who want a general science education as biologists.

II. PROGRAM IDENTIFICATION

II.1 Exact Designation of Proposed Program: Biology Major

II.2 Department or Functional Equivalent: Biology Major Executive Committee

II.3 College, School, or Functional Equivalent: College of Agricultural and Life Sciences
College of Letters and Science

II.4 Institution: University of Wisconsin - Madison

II.5 Timetable for Initiation: First students accepted Fall 1999.

II.6 Degrees Affected: College of Agricultural and Life Sciences: B.S. Natural Sciences
College of Letters and Science: B.S.

III. PROGRAM DESCRIPTION

The Biology Major is designed for students with broad interests in the biological sciences and also those who wish to postpone specialization. We anticipate that many students will focus their interests and transfer to a more specialized major, while some who desire broad training in biology will remain in the Biology Major. The curriculum will provide rigorous background in mathematics and the sciences relevant to biology while allowing students to keep their options open. It will offer a balanced spectrum of upper level biology courses for those who remain in the major. The major is also designed to allow specialized tracks for subdisciplines within biology. This might lessen the pressure that has driven a proliferation of specialized majors across campus.

A major similar to what we propose here is common at most liberal arts colleges and also at many of the large public universities. Institutions comparable to UW- Madison offering a Biology Major include: University of Michigan, University of Maryland, Purdue University, Univer-

sity of California-Berkeley, Pennsylvania State University, North Carolina State University, and University of Illinois.

IV. RATIONALE AND RELATIONSHIP TO MISSION OF INSTITUTION

Biology is a broad discipline. Entering students view biology as a discipline similar to chemistry, physics, or geology and so are confused that there is not a department or major called Biology. The Biological Sciences Division encompasses one third of the majors at UW-Madison. Students are presented with a bewildering array of choices. Many postpone declaring one of the specialized majors. This hinders advising during their first two years. For example, in the first semester 1996-97, of the 26,909 undergraduate students enrolled at Madison, 15,329 had declared a major and 5,047 or about 1/3 were in one of the 37 biology majors. However, 11,580 had not declared a major. Considering this latter group, we estimate that 1/3 or 3,860 probably are interested in biology. By instituting a major in Biology we hope to induce students to declare a major earlier and thereby improve our ability to advise them. We anticipate that some students will use the major temporarily until they develop specialized interests; others will value the breadth that the Biology Major allows and stay in the major until graduation.

Undergraduate education is one of the central missions of the University. The proposed major will substantially enhance our ability to provide for students who are interested in biology. The need for a major in biology was identified in the 1991 report of the Biological Sciences Review Committee (chaired by John Hearn) and more recently in the report of the Undergraduate Biology Education Committee entitled "Issues and Recommendations for Undergraduate Instruction in the Biological Sciences at UW-Madison" issued May 23, 1995. The plan for a major in Biology is part of a broader effort to serve the needs of students that has already led to hiring a Biology Advisor and a doubling of the access to the introductory biology sequence.

V. Curriculum

In addition to fulfilling all University and College requirements, students must fulfill the following requirements for the Biology Major.

1. Mathematics (7-10 cr.)

Math 221 and a choice of:

Math 222, 231, or 232, or Stat 301, 541, or equivalent.

Students should note that some biological sciences majors require Math 222.

2. Chemistry (17-18 cr.)

Chem 109-110 or 103-104 and Chem 343-344-345

3. Physics (8-10 cr.)

Physics 207-208, or 201-202, or 103-104 (Students should note that the calculus based 200 level physics courses are required by some biological science majors.)

BIOLOGY COURSES (NOTE: The total number of credits in sections 4, 5, and 6 below must equal at least 30.)

4. Introductory Biology Courses (13-17 cr.)

Option A:

Biology 151-152 and Genetics 466 (Bot/Gen/Zoo 466).

Option B:

Biocore 301-303-323-333 and two of the following laboratory courses:

Biocore 302-304-324

(This program is recommended for honors students.)

Option C:

Zoology 101-102, Botany 130 and Genetics 466 (Bot/Gen/Zoo 466). (This route is appropriate for some students in the plant sciences.)

5. Intermediate/advanced courses (13 credits minimum)

A minimum of three courses (at least 13 credits) at the intermediate/advanced level, selected from three of the five areas listed below, are needed to satisfy the biology breadth requirement. Overall, the courses taken should span plant, animal and microbial biology topics. These courses must include at least one lab or field course with 3 hours or more per week of laboratory/field instruction. At least one course must be from category “a” or “b” and at least one course must be from category “c” or “d”. The third required course may be selected from any of the five categories.

- a. Cellular and Subcellular Biology
- b. Organismal Biology (including physiology, behavior, and anatomy)
- c. Ecology
- d. Evolution and Systematics
- e. Applied Biology, Agriculture and Natural Resources

Appendix I provides a draft list of courses for meeting these breadth requirements. The final decision on these and any other courses that adequately represent each category will be made by the faculty participating in the Biology Major.

6. A laboratory or field research experience (2 credits minimum)

An intermediate/advanced laboratory or field biology course involving a minimum of 3 hr/week of lab or field instruction beyond that done for requirement 5, or a research based senior thesis, or independent study. This requirement also meets the CALS capstone experience.

VI. Advising

The entry level advising provided by SOAR and others for beginning students interested in biology is shown by the diagram in APPENDIX II. Initial student advising, responses to general inquiries, and overall coordination will be done by the Biology Advisor, currently Pat Henrikson. Students wishing to enter the Biology Major will be assigned by her or by support staff to appropriate CALS, L&S, or other faculty advisors drawn from the faculty affiliated with the program. Each faculty advisor and student will work together to devise a curriculum appropriate to the student's goals and interests, within the bounds described above.

Besides advising students about specific courses, the most critical role of advisors will be to provide information about the various majors and options for studying biology on this campus and the career implications of those choices. The advisor's role in providing information and career counseling is of the greatest importance. When students transfer to more specialized majors within CALS or L&S, they will be provided with a new faculty advisor. Unless a student elects to change his or her advisor or major, he or she will have the benefit of having the same faculty advisor throughout his/her program.

VII. Administration and Infrastructure

Administration of the program will closely follow the model provided by the current Molecular Biology Major. The governance will be vested in a Chair and Executive Committee elected by the faculty advisors and approved by the Deans of CALS and L&S. All faculty in the Biological Sciences Division will be eligible to advise students after appropriate training. The current committee appointed by Deans Certain, Jorgensen, and Read to implement the Biology Major (Deric Bownds, Chair) will serve as the initial executive committee. It will recruit a starting board of approximately 30 biology advisors who will then choose a more long term executive committee of 6-10 members. That executive committee will elect a chair for the major, subject to approval by the CALS and L&S Deans. Advisors and executive committee members will be expected to serve staggered three year terms. The executive committee will carry out the quasi-departmental functions associated with the Biology Major. These include periodic re-evaluation of curriculum requirements and courses appropriate for item 5 (Intermediate/advanced courses); handling of special cases, appeals, and exceptions; recruitment of advisors; and so on. The executive committee will also consult with existing or proposed programs, such as the Molecular Biology Major or the Neurosciences initiative, that might wish to establish themselves as "tracks"

with the Biology Major. Proposals for such tracks within the Biology Major would then be referred to the CALS and L&S colleges for evaluation and approval. Experience with existing majors suggests that administration and record keeping will require at least a 0.5 FTE secretarial position supported by appropriate office supplies and equipment budgets as long as the number of majors is below 300.

APPENDIX I

Intermediate/ Advanced Courses for the Biology Breadth Requirement (see Curriculum V.5)

Examples of courses that meet the requirement for completing a course in at least three of the five subdisciplines. In accumulating other biology credits toward the total credits required for their degrees (120 in L&S and 124 in CALS), students, in consultation with their advisors, will have the opportunity to specialize or to take any biology electives of interest to them.

a. Cellular and subcellular biology

Animal Health and Biomedical Sciences

AHABS 528: Immunology

Bacteriology

Bact 526: Physiology of Microorganisms

Bact 550: Physiological Diversity of procaryotes

Biochemistry

Biochem 501: Introduction

Biochem 507/8: General Biochemistry

Biochem 550: Topics in Medical Biochemistry

Biochem 651: Biochemical Methods

Biomolecular Chemistry

BioMol Chem 314: Introduction to Human Biochemistry

BioMol Chem 603: Human Biochemistry

BioMol Chem 611: Neurochemistry

Horticulture

Hort 561: Introductory Cytogenetics

Medical Microbiology and Immunology

MM&I 341: Immunology

MM&I 529: Immunology Lab

Neurophysiology
Neurophys 610: Cellular Neurophysiology

Nutritional Sciences
Nutr Sci 332 Human Nutritional Needs
Nutr Sci/Biochem 510 Biochemical Principles of Human and Animal Nutrition
Nutr Sci 615 Advanced Nutrition: Physiology of Nutrition; Energetics
Nutr Sci 616 Advanced Nutrition: Integration of Nutrition with Metabolism
Nutr Sci 617 Advanced Nutrition: Carbohydrates; Minerals; Human Nutrition

Zoology
Zoo 523: Neurobiology I
Zoo 555: Laboratory in Developmental Biology
Zool 570: Cell Biology
Zool 572: Laboratory in Cell Biology

b. Organismal biology

Animal Health and Biomedical Sciences
AHABS 301: Physiology of Domestic and Laboratory Animals

Anatomy
Anat 328: Human Anatomy
Anat 329: Human Anatomy - Kinesiology

Botany
Bot 300: Plant Anatomy
Bot 305: Principles of Plant Structure
Bot 330: Algae
Bot 332: Fungi
Bot 360: Bryophytes
Bot 350: Plant Physiology
Bot 500: Plant Physiology

Entomology
Entomol 302: Introduction to Entomology
Entomol 321: Physiology of Insects
Entomol 323: Insect Neurobiology
Entomol 530: Insect Behavior

Forest Ecology and Management
Forest 415-Tree Physiology

Nutritional Sciences

Nutr Sci 431 Nutrition and Life Span

Physiology

Physiol 335: Physiology

Psychology

Psych 449: Animal Behavior (cannot count both Psych 449 and Zoo 330)

Psych 556: Hormones and behavior

Wildlife Ecology

WL Ecol 401: Physiological Animal Ecology

Zoology

Zoo 300: Invertebrate Zoology

Zoo 301: Invertebrate Zoology Lab

Zoo 330: Ethology (cannot count both Psych 449 and Zoo 330)

Zoo 430: Comparative Anatomy of Vertebrates

Zoo 431: Comparative Anatomy Lab

Zoo 470: Introduction to Animal Development

Zoo 524: Neurobiology II

Zoo 531: Ethology Lab (only with Zoo 330/ Psych 449)

Zoo 532: Sociobiology/ Social Ethology

Zoo 611: Comparative Physiology

Zoo 612: Comparative Physiology Lab

Zoo 619: Biology of Mind

c. Ecology

Bacteriology

Bact 330: Host-Parasite Interactions

Bact 425: Environmental Microbiology

Botany

Bot 460: General Ecology

Entomology

Entomol 342: Insect Ecology

Entomol 468: Studies in Field Entomology

Entomol 473: Plant-Insect Interactions

Entomol 572: Insect Population Ecology

Environmental Toxicology

EnvTox 507: People, Chemical, Environment

Forest Ecology and Management

Forest 550: Forest Ecology

Forest/Zool/Botany 665: Landscape Ecology

Plant Pathology

Pl Path 525: Comparative Ecology of Microorganisms and Macroorganisms

Wildlife Ecology

WL Ecol 318: Principles of Wildlife Ecology

d. Evolution and systematics

Botany

Bot 400: Plant Systematics

Bot 401: Vascular Flora of Wisconsin

Bot 562: Cytotaxonomy

Entomology

Entomol 331: Taxonomy of Mature Insects

Entomol 432: Taxonomy and Bionomics of Immature Insects

Entomol 701: Advanced Taxonomy (open to undergraduates)

Geology

Geol 540: Invertebrate Paleontology

Geol 541: Paleobiology

Geol 544: Evolution of the vertebrates

Zoology

Zoo 360: Extinction of Species

Zoo 410: Evolutionary Biology

e. Applied Biology, Agriculture and Natural Resources

Agronomy

Agronomy 300 Cropping Systems

Agronomy 302 Forage Management and Utilization

Agronomy 304 Grain Crops

Agronomy 328 Integrated Weed management

Agronomy 338 Plant Breeding and Biotechnology

Agronomy 377 Cropping Systems of the Tropics

Agronomy 501 Plant Breeding (also Hort)

Animal Science

AS 301 Physiology of Domestic and Laboratory Animals (also AHABS)

AS 434 Reproductive Biology (also Dairy Sci)

AS 503 Avian Physiology

AS 505 Rumen Microbiology (also Bact/Dairy Sci)

AS 610 Quantitative Genetics (also Genetics)

Dairy Science

Dy Sci 305: Lactation

Dy Sci 311: Comparative Animal Nutrition (also AnSci/NutSci)

Dy Sci 360: Principles of Animal Breeding (also An Sci)

Dy Sci 414 Ruminant nutrition (crosslisted with An Sci) (Grummer)

Dy Sci 466 Dairy Cattle Breeding (Jensen)

Entomol 351: Principles of Economic Entomology

Entomol 371: Medical Entomology

Entomol 500: Insects and Diseases in Forest Resource Management

Entomol 541: Biological Control of Insects

Entomol 570: Principles of Insect Pest Suppression

Food Science

Bact/Food Science 324: Food Bacteriology Lab

Bact/Food Science 325: Food Bacteriology

Food Science 550: Food Fermentations

Food Science 612: Food Enzymes

Food Science 650: Advanced Microbiology of Foodborne Pathogens

Forest Ecology and Management

Forest 312: Wood Identification

Forest 410: Silviculture

Forest 571: Statistical Methods for Bioscience I (also Hort/Statistics)

Forest 572: Statistical Methods for Bioscience II (also Hort/Statistics)

Forest 635: Forest Stand Dynamics

Nutritional Sciences

Nutr Sci 350 World Hunger and Malnutrition

Soil Science

Soils 230: Soil: Ecosystem and Resource

Soils 321: Soil and Environmental Chemistry

Soils 323: Soil Biology (also PI Path)

Soils 326: Plant Nutrition Management (also Agron/Hort)

Soils 523: Soil Microbiology and Biochemistry (also Bact)

Soils 532: Environmental Biophysics (also Atm Ocn)

Wildlife Ecology

WL Ecol 301: Terrestrial Vertebrates: Life History and Ecology

Zoo/WL Ecol 335: Human/Animal Relationships: Biological and Philosophical Issues

WL Ecol 379: Principles of Wildlife Management

WL Ecol 548: Diseases of Wildlife

WL Ecol 549: Diseases of Wildlife Laboratory
WL Ecol 655: Animal Population Dynamics

APPENDIX II

Diagram of advising for students interested in Biology Sciences at UW-Madison