

January 14, 2010

ITEM 146-2003-R0110 **Approval to Establish a Minor in Astrobiology; Montana State University-Bozeman**

THAT: The Board of Regents of Higher Education authorizes Montana State University-Bozeman to establish a Minor in Astrobiology.

EXPLANATION: Montana State University is proposing a new Astrobiology minor to effectively promote and educate students on aspects of multidisciplinary and cross disciplinary science while at the same time bridging science and humanities.

The Astrobiology Minor will draw mainly from existing course offerings in the following departments: Earth Sciences, Physics, Chemistry & Biochemistry, Cell Biology & Neuroscience, Ecology, Plant Sciences and Plant Pathology, and History & Philosophy. As part of the new curriculum MSU will be developing two new courses for which development funding has already been secured from the Astrobiology Biogeochemicals Research Center and the Thermal Biology Institute. The proposed curriculum responds to the continuing demand for multidisciplinary and crossdisciplinary courses and curricula. As MSU continues to grow faculty expertise in this area, students are increasingly seeking an associated curriculum. As a minor, students will be able to use this program to complement curricula in their majors.

The Astrobiology Minor would be an excellent complement to research and teaching strengths of a number of departments and research centers such as the Thermal Biology Institute and the Astrobiology Biogeochemicals Research Center. TBI has an extended track record for creating research training opportunities for undergraduates. The Minor would enhance the curriculum of the aforementioned departments. The principal goal of the minor is to develop students' literacy in astrobiology so they can critically evaluate claims related to this field that they encounter well after their college education has ended.

MONTANA BOARD OF REGENTS

LEVEL II REQUEST FORM

Item No.:	146-2003-R0110	Date of Meeting:	January 14, 2010
Institution:	Montana State University-Bozeman		
Program Title:	Minor in Astrobiology		

Level II proposals require approval by the Board of Regents.

Level II action requested (check all that apply): Level II proposals entail substantive additions to, alterations in, or termination of programs, structures, or administrative or academic entities typically characterized by the (a) addition, reassignment, or elimination of personnel, facilities, or courses of instruction; (b) rearrangement of budgets, cost centers, funding sources; and (c) changes which by implication could impact other campuses within the Montana University System and community colleges. Board policy 303.1 indicates the curricular proposals in this category:

- 1. Change names of degrees (e.g. from B.A. to B.F.A.)
- 2. Implement a new minor or certificate where there is no major or no option in a major;
- 3. Establish new degrees and add majors to existing degrees;
- 4. Expand/extend approved mission; and
- 5. Any other changes in governance and organization as described in Board of Regents' Policy 218, such as formation, elimination or consolidation of a college, division, school, department, institute, bureau, center, station, laboratory, or similar unit.

Specify Request:

Montana State University-Bozeman is proposing a new Astrobiology minor to effectively promote and educate students on aspects of multidisciplinary and cross disciplinary science while at the same time bridging science and humanities. The Astrobiology Minor will draw mainly from existing course offerings in the following departments: Earth Sciences, Physics, Chemistry & Biochemistry, Cell Biology & Neuroscience, Ecology, Plant Sciences and Plant Pathology, and History & Philosophy. The proposed curriculum responds to the continuing demand for multidisciplinary and crossdisciplinary courses and curricula. As MSU continues to grow faculty expertise in this area, students are increasingly seeking an associated curriculum. As a minor, students will be able to use this program to complement curricula in their majors.

Astrobiology Minor at Montana State University

1. Overview

Montana State University is proposing a new Astrobiology minor to effectively promote and educate students on aspects of multidisciplinary and cross disciplinary science while at the same time bridging science and humanities. The Astrobiology Minor will draw mainly from existing course offerings in the following departments: Earth Sciences, Physics, Chemistry & Biochemistry, Cell Biology & Neuroscience, Ecology, Plant Sciences and Plant Pathology, and History & Philosophy. As part of the new curriculum MSU will be developing two new courses for which development funding has already been secured from the Astrobiology Biogeocatalysis Research Center and the Thermal Biology Institute. Plans for the new capstone course include communicating contemporary science to public audiences.

2. Need

- a. To what specific need is the institution responding in developing the proposed program?

The proposed curriculum responds to the continuing demand for multidisciplinary and crossdisciplinary courses and curricula. As MSU continues to grow faculty expertise in this area, students are increasingly seeking an associated curriculum. As a minor, students will be able to use this program to complement curricula in their majors.

- b. How will students and any other affected constituencies be served by the proposed program?

This program will offer a new and exciting choice for students interested in studying at the boundaries between the sciences and humanities, which will be attractive to those from both sides of this classical divide.

- c. What is the anticipated demand for the program? How was this determined?

Demand for the program has not been formally assessed but anecdotal evidence suggests that this is an area with broad appeal to students from the sciences, humanities, social sciences, and the arts. One purpose of offering this as a minor is that it requires low initial investment, which allows interest to be gauged before resources are reallocated. It is anticipated that program will eventually graduate up to 15 students per year.

3. Institutional and System Fit

- a. What is the connection between the proposed program and existing programs at the institution?

The Astrobiology Minor would be an excellent complement to research and teaching strengths of a number of departments and research centers such as the Thermal Biology Institute and the Astrobiology Biogeochemistry Research Center. TBI has an extended track record for creating research training opportunities for undergraduates. The Minor would enhance the curriculum of the aforementioned departments.

- b. Will approval of the proposed program require changes to any existing programs at the institution? If so, please describe. *No.*
- c. Describe what differentiates this program from other, closely related programs at the institution (if appropriate). *N/A*
- d. How does the proposed program serve to advance the strategic goals of the institution? *Expands undergraduate opportunities and supports multidisciplinary training.*
- e. Describe the relationship between the proposed program and any similar programs within the Montana University System. In cases of substantial duplication, explain the need for the proposed program at an additional institution. Describe any efforts that were made to collaborate with these similar programs; and if no efforts were made, explain why. If articulation or transfer agreements have been developed for the substantially duplicated programs, please include the agreement(s) as part of the documentation. *N/A*

4. Program Details

- a. Provide a detailed description of the proposed curriculum. Where possible, present the information in the form intended to appear in the catalog or other publications. NOTE: In the case of two-year degree programs and certificates of applied science, the curriculum should include enough detail to determine if the characteristics set out in Regents' Policy 301.12 have been met.

ASTROBIOLOGY (tentative catalog description)

The Astrobiology Minor is designed to educate students in this **interdisciplinary** field covering the varied scientific disciplines that contribute to our general understanding of life, the origin of life, the past history of life on Earth, possible futures for life on Earth, and the possible existence of life on other planetary environments.

The principal goal of the minor is to develop students' literacy in astrobiology so they can critically evaluate claims related to this field that they encounter well after their college education has ended.

Required Courses (22 cr.)

BIOL 101 or BIOL 215 (4 cr.)

ESCI 111 (4 cr.)

GEOL 210 (3 cr.)

PHIL 3XX (3 cr.) – What is Life? (to be developed; a preliminary version has been offered as LS 301)

PHYS 101, or PHYS 311, or PHYS 312 (3 or 4 cr.)
CHEM 101 or CHEM 121 or CHEM 131 (3 or 4 cr.)
BIOL/PHYS/CHEM 3XX (4 cr.) – Astrobiology (to be developed; multidisciplinary)

Elective Courses (6 cr.)

BCHM 340 GENERAL BIOCHEMISTRY
BCHM 441 BIOCHEMISTRY OF MACROMOLECULES
BCHM 442 METABOLIC REGULATION
BIOL 213 INTRODUCTORY BIOLOGY: CELLS TO ORGANISMS
BIOL 214 INTRODUCTORY BIOLOGY: MOLECULES TO CELLS
BIOL 301 PRINCIPLES OF GENETICS
BIOL 303 PRINCIPLES OF ECOLOGY
BIOL 403 EVOLUTION
ESCI 505 GEOMICROBIOLOGY
HIST 206 DARWINIAN REVOLUTION
HIST 207 SCIENCE AND TECHNOLOGY IN WORLD HISTORY
HIST 431 SCIENCE AND TECHNOLOGY IN SOCIETY
HIST 432 HISTORY OF MODERN SCIENCE
MB 301 GENERAL MICROBIOLOGY
PHIL 225 SCIENCE, PSUEDO-SCIENCE, AND SUBJECTIVITY
PHIL 378 PHILOSOPHY OF SCIENCE
PHYS 311 SOLAR SYSTEM ASTRONOMY
PHYS 312 STARS, GALAXIES, AND THE UNIVERSE
RELS 402 NATURAL, UNNATURAL, SUPERNATURAL

Note: At least one elective course must be at the 300 level or higher.

Proposed New Courses

PHIL 3XX (3 cr.) What is Life?

The course will raise questions about different views on the origin of life and allied issues. Since this is an active research area without concrete theories in sight about the origin of life, the course will raise more questions than it will answer. The newly emerging discipline that handles “What is life?” and allied questions is called “astro-biology.”

BIOL/PHYS/CHEM 3XX (4 cr.) Astrobiology

Astrobiology is a new, multidisciplinary field of science encompassing astronomy, biology, biochemistry, genomics, chemistry, atmospheric chemistry, geochemistry, paleontology, geology, and many other fields of science and technology. Astrobiology includes the study of the origin of life, the connections between the evolution of life and of environments, the potential for life and life's actual distribution in our solar system and beyond, and future of life on Earth and in space.

- b. Describe the planned implementation of the proposed program, including estimates of numbers of students at each stage.

The program would be implemented for students matriculating Fall 2010 with a target of 10-15 minors.

5. Resources

- a. Will additional faculty resources be required to implement this program? If yes, please describe the need and indicate the plan for meeting this need.

Two new course offerings will be developed using funds that have been committed by the Astrobiology Biogeocatalysis Research Center, and the Thermal Biology Institute. The Montana Space Grant Consortium may also contribute to this project. The new courses are anticipated to have sufficient demand to justify incorporating them into the regular teaching loads of the department.

- b. Are other, additional resources required to ensure the success of the proposed program? If yes, please describe the need and indicate the plan for meeting this need. *No*

6. Assessment.

How will the success of the program be measured?

Questionnaires will be used to assess students' views on the new course offering during their development stage. Graduation numbers in the minor will be tracked, and the minor will be subject to program review as part of the normal BOR process.

7. Process Leading to Submission

Describe the process of developing and approving the proposed program. Indicate, where appropriate, involvement by faculty, students, community members, potential employers, accrediting agencies, etc.

The program has been reviewed and approved by MSU's Undergraduate Studies Committee and the Academic Affairs sub-committee of Faculty Senate.