



Program Portfolio  
Biology  
May 2008

### **Description of Program**

Catalog Description: The Biology/Botany degree provides knowledge of the biological sciences necessary for students pursuing careers, graduate study, or professional study for which a baccalaureate degree is appropriate.

The courses provide knowledge needed by students in related fields, such as nursing, secondary education, wildlife, agriculture, and forestry, as well as providing knowledge desired by students majoring in other disciplines both within and outside of the School of Arts and Sciences. Other objectives include emphasizing to students the importance of experience and proficiency in several sciences; helping students develop and use precise, critical and independent thought; increasing students' perception, understanding, and appreciation of themselves and their environment; creating in students an awareness of and interest in the role of biological sciences in meeting social and economic needs; and to make available residents of Eastern Oregon the individual and combined resources of the biology faculty.

The Biology/Botany program provides knowledge of the biological sciences necessary for careers in biological research and health professions including nursing, dentistry, medicine, physical therapy, and physician's assistants. In addition, the program serves the secondary education program, the Oregon Health Sciences Center nursing program, and campus-wide GE requirements. The program's overarching objective is to provide the student with a broad, in-depth intellectual framework in a liberal arts context. Biology/Botany faculty members accomplish this by requiring proficiency in several areas of biology as well as in basic aspects of math, physics, and chemistry. Also toward accomplishing these objectives, courses help students to understand and internalize factual knowledge of the field and, beyond that, to then process that information in critical and creative ways. Underpinning the program's broad objective are the faculty's efforts to remain vital in their respective fields of expertise through maintaining active research projects that also involve undergraduate researchers. Involvement with student-oriented research has allowed Biology/Botany faculty to stay abreast of their field and keep their eyes on the future, instating curricular changes in response to the constantly evolving panorama that is the field of biology.



### **Recent Programmatic Changes**

The new science building, erected in 2002/2003, provided new teaching facilities that allow Biology faculty to better serve students, including computer-integrated projection systems in the large lecture halls and faculty-designed biology laboratories. For example, all but one of the botany courses are now taught in active learning classrooms with a student-centered, inquiry-based pedagogy, instead of segregating lab and lecture times. Each class session begins with a brief introduction of the day's topic, and then students move, individually or in pairs, through

three to five different learning stations in any sequence, using microscopes, some whole specimens, and/or their texts, journal articles, or other reference materials to complete the tasks and maintain results in their laboratory notebooks. At the end of each session, the entire class meets together to discuss and review the material covered that day. In these courses, assessment includes a practical component in which students are asked to demonstrate critical thinking skills learned or practiced in the course. Such popular courses help students learn about biology and also how to continue learning about biology after they leave EOU.

In addition to new facilities, the Biology program has added the following new equipment: four polymerase chain reaction machines, an incubating oven for immunohistochemistry, a microtome for tissue slicing, new teaching microscopes, a new epifluorescent research microscope, a DNA sequencer, a new microbiological incubator, turtle traps, and new pipettmen.

Besides facilities and equipment changes, the Biology program has changes in faculty. In 2005, two older faculty retired in microbiology and physiology and were replaced by molecular biologists (Cain and Corsini). This has resulted in a significant departmental shift from expertise in classical field biology to expertise in modern molecular biology. In addition, overload teaching has been reduced by hiring a full-time term position for anatomy and physiology and a resource person for biology lab classes. Both of these temporary hires have freed up time for the tenure faculty to pursue scholarly work.

While EOU currently has strong Biology, Chemistry, and Biochemistry programs, the Biology program recently conducted a student survey that indicates a significant interest in a molecular biology degree. Indeed, out of 64 students pooled in a variety of Biology courses, 40% favored a Molecular Biology degree and 60% favored a general Biology degree. This indicates that we are inadequately serving at least 40% of our Biology students. Our survey findings are supported by trends in the biotech industry and in graduate and medical school that indicate growing expectations of expertise in molecular biology, particularly laboratory experiences. In order to be highly competitive, therefore, the Biology program will add integrated lab-lecture courses with strong lab components; design the curriculum so that students can tailor upper-division coursework with specialty courses such as Virology, Genes and Development, and Neuroethology; and require Experimental Approaches in Biology, a course where students conduct original research projects, relate that research to the literature, and present the research in poster and/or manuscript form.

### **How Program serves the Mission of the University and needs of region**

Biology/Botany: The Biology/Botany program provides knowledge of the life sciences necessary for students pursuing careers in graduate study, or professional studies. Courses also prepare students in related fields, such as nursing, secondary education, wildlife, agriculture, and forestry. The Biology program graduates the largest number of students within the science disciplines. Graduates of this program find employment in state and federal agencies; many continue on to graduate or professional schools pursuing advanced degrees in health related fields.

► Students will develop laboratory skills including research techniques, and correct use of laboratory equipment.

- Link specific assessment:

- Course laboratory:
  - BIOL 211, 212: use of basic molecular biology lab equipment, student led experimental design and data analysis
  - BIOL 323: use of more advanced molecular biology equipment, student led experimental design and data analysis
  - BIOL 341, 342: use of advanced molecular biology equipment, experimental design and data analysis
- Research student laboratory:
  - Many biology students engage in faculty mentored research projects. During these experiences they learn advanced laboratory techniques, experimental design, data analysis, and data presentation.

► Students will develop skills in organismal and ecological biology, including field research techniques and use of field and laboratory equipment.

- Link specific assessment:
  - Course laboratory/field:
    - BIOL 213: use of field equipment, data collection and analysis
    - BIOL 317, 318: lab dissection involving comparative anatomy
    - BIOL 334: learn key family characteristics and learn plant collection procedures
  - Research student laboratory/field:
    - Many biology students engage in faculty mentored research projects. During these experiences they learn advanced field techniques, experimental design, data analysis, and data presentation.

► Students will develop critical thinking skills, including writing research papers and applying analytical skills derived from supplemental coursework in chemistry, mathematics and statistics.

- Link specific assessment:
  - BIOL 357, 358: learn data collection, analysis, and writing of ecological research papers. Develop critical thinking skills through reading of the primary literature.
  - BIOL 432, 433: student led experimental design, data collection, data analysis, and writing of research papers.
  - BIOL 490: hone critical thinking skills and topic specific expository writing skills.

► Students will gain an understanding of the processes of biology that lead to adaptation and evolution of species.

- Link specific assessment:
  - BOT 202: includes survey of diversity of plant groups emphasizing phylogenetic relationships
  - BIOL 332, 334, 347 421: phylogenetic origins of specific taxonomic groups

- BIOL 431: cellular processes and interactions that control physiological adaptations.

### Key Programmatic Assessments

As previously mentioned, the Biology program has instated a self-assessment plan aimed at providing feedback which allows us to enhance student learning. To accomplish this we have begun to implement a course assessment inventory for three courses: the first term of majors biology (BIOL 211), and our capstone course, Evolution (BIOL 490). We have also begun to administer a national standardized test in our capstone course (Evolution) to better assess the degree of learning and retention that is occurring in our students. In addition, we have begun to track invested student study time vs. test score for our Principles of Biology series in an attempt to better understand time investment and management by students enrolled in rigorous science curricula.

### Current Programmatic Assessment Data/Reflections/Recommendations of Curriculum and Instruction

The biology program began two years ago to perform a thorough assessment of student performance by administering the ETS Major Field Test in Biology to all graduating seniors in the program. The results are shown in the following two tables:

Year of Exam	Adjusted Scores of Senior Class in Indicated Areas					
	Overall	Subscore 1	Subscore 2	Subscore 3	Subscore 4	
2005-2006	153	54	53	54	52	
2006-2007	160 (152)	57 (53.0)	61 (52.7)	60 (52.6)	59 (52.1)	

Table 1. Performance of Senior Class on the ETS Major Field Test for Biology in Indicated Years. Subscore categories are as follows: 1=Cell Biology, 2=Molecular Biology and Genetics, 3=Organismal Biology, 4=Population Biology, Evolution, and Ecology. National mean scores, based on 7,533 respondents and 255 institutions, are indicated in parentheses (national rankings were unavailable in 2005-2006 due to changes in the exam in that school year). Overall scores are out of 200; subscores are out of 100.

Year of Exam	Adjusted Scores of Senior Class in Assessment Indicators								
	1	2	3	4	5	6	7	8	9
National ('07)	43.2	55.1	45.7	48.6	58.8	44.9	53.7	56.0	52.7
2005-2006	45.7	56.5	45.7	50.8	60.9	43.5	62.7	50.7	55.9
2006-2007	44	64	55	62	61	53	63	62	61

Table 2. Performance of Senior Class on the ETS Major Field Test Assessment Indicators for Biology in Indicated Years. Assessment Indicators are as follows: 1=biochemistry and cell energetics; 2=cellular structure, organization, and function; 3=molecular biology and molecular genetics; 4=diversity of organisms; 5=animal organismal biology; 6=plant organismal biology; 7=population genetics and evolution; 8=ecology; 9=analytical skills. National scores for the

2005-2006 school year are unavailable due to changes to the exam made by ETS in that school year.

The results are relatively clear: in general categories, our students outperform at least half, and in some cases 60 percent or more, of all students and institutions nationwide. The test is compartmentalized enough, however, to show us where improvements to curriculum can be made and/or current offerings should be expanded or modified. Our students perform less robustly in the areas of biochemistry, cell energetics and biology, and molecular biology, and are not as strong in organismal and population biology as they should be. We believe this is one good argument (among many others) for creating two separate "tracks" in the biology program, one of which encompasses molecular and cellular biology and the other focused more towards ecological, organismal, and population biology, with an emphasis on conservation issues. These tracks would allow students to specialize, focus, and learn a particular area of biology in depth to become much more prepared, rather than becoming the "jacks of all trades" we currently graduate.



### **Student Accomplishments**

- Tarna Armstrong – 2006 graduate in Biology – currently teaches Biology at Hermiston High School, Hermiston, OR
- Elisha Adkins: winner of the full \$5000 Phi Kappa Phi graduate fellowship – April 2007. Elisha will also be attending Oregon State University's School of Veterinary Medicine - Fall 2008
- Heide Chamberlain- co-author on submitted manuscript 'Characterization of Modern Turtle Death Sites for Comparison with late Eocene and early Oligocene Turtle Sites'
- Haruyo Matsuyama will attend University of Missouri-Columbia to work on a Master of Science in Molecular Biology – Fall 2008
- Robert Barker will attend the Ohio College of Podiatric Medicine - Fall 2008
- Lucas Ohmes- Skeen Award recipient to conduct summer research at Friday Harbor Labs - Summer 2008
- Gary Truman- Blinks Fellowship- University of Washington for Underrepresented groups in science
- Ozy Zerbajadi and Amanda Justesen- Scholarships to attend summer Neuroethology Course at Friday Harbor Labs

### **Programmatic Assessment: Synthesis and Recommendations**

In response to the previous accreditation report which suggested a university-wide lack of program self-assessment at EOU, the biology department has instated a self-assessment plan aimed at providing feedback which allows us to enhance student learning. To accomplish this we have begun to implement a course assessment inventory for three courses: the first term of majors biology (BIOL 211), the first term of genetics (BIOL 341), and our capstone course, Evolution (BIOL 490). We have also begun to administer a national standardized test in our capstone course (Evolution) to better assess the degree of learning and retention that is occurring

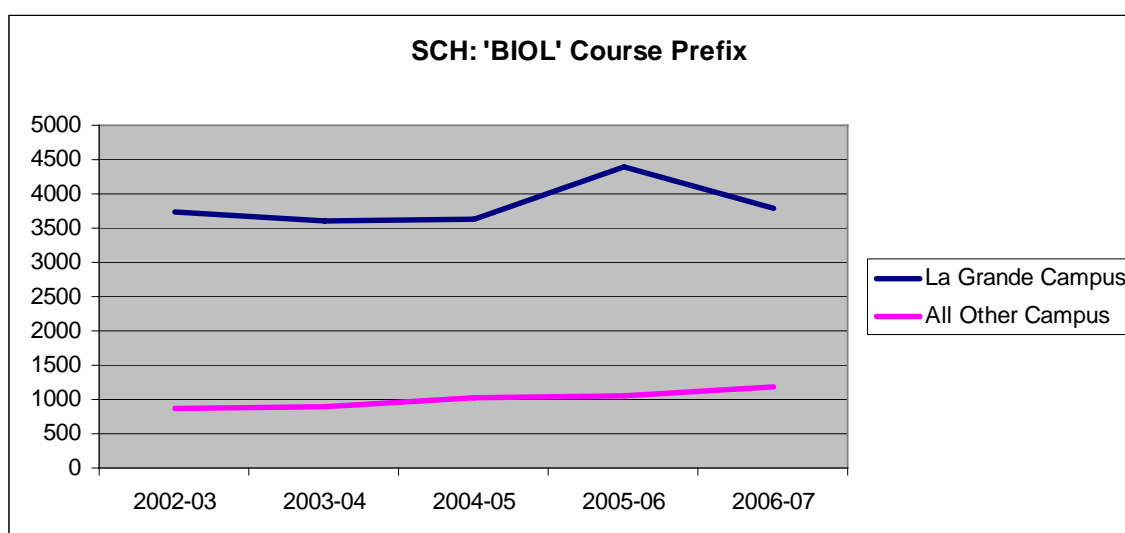
in our students. In addition, we have begun to track invested student study time vs. test score for our Principles of Biology series in an attempt to better understand time investment and management by students enrolled in rigorous science curricula.

We have queried the Biology student body to assess demand for a molecular biology degree, finding it to be quite high (40%). In response we have developed a curriculum for this degree and are in the process of ratifying it.

## Enrollment and Program Performance

### Eastern Oregon University

#### 5 Year Student Credit Hours Generated by 'BIOL' Course Prefix



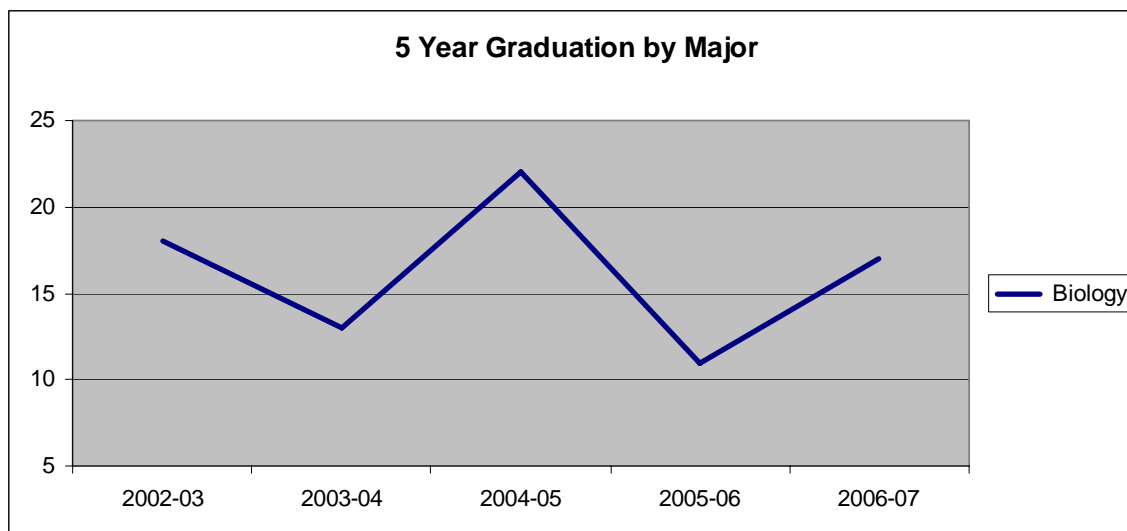
	2002-03	2003-04	2004-05	2005-06	2006-07
La Grande Campus	3735	3595	3620	4393	3795
All Other Campus	872	907	1022	1058	1185

Total	4607	4502	4642	5451	4980
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\*SCH includes all terms effective end of term

### Eastern Oregon University

#### 5 Year Graduation by Major



	2002-03	2003-04	2004-05	2005-06	2006-07
Biology	18	13	22	11	17

### Commentary on Enrollment and Graduate Trends

The 5 year average for Biology student credit hour is 3827.6 which is well above the student credit average of 1008.8 for all other campuses. On average, biology graduates 16 students per year. These students go on to graduate schools or acquire work with state or federal agencies.

### Program and Course Scheduling Requirements

#### *General Education and Service Course Schedule*

#### **FALL YEAR 06-07**

Course	Load Hours	Mean Enroll
BIOL 101	3	115
BIOL 211	5	66
BIOL 211L	0	66 (4 sections)
BIOL 231	4	65
BIOL 231	4	53
BIOL 231 L	0	118 (6 sections)
BIOL 235	3	23
BIOL 421	4	8

#### **FALL YEAR 07-08**

Course	Load Hours	Mean Enroll
BIOL 101	3	45
BIOL 101	3	46
BIOL 211	5	61
BIOL 211L	0	61 (4 sections)
BIOL 231	4	64
BIOL 231	4	48
BIOL 231 L	0	112 (6 sections)
BIOL 234	4	12
BIOL 234 L	0	12
BIOL 235	3	22
BIOL 421	4	16

**WINTER YEAR 06-07**

Course	Load Hours	Mean Enroll
BIOL 102	3	57
BIOL 212	5	38
BIOL 212L	0	38 (3 sections)
BIOL 232	4	101
BIOL 232 L	0	101 (5 sections)
BIOL 433	5	14
BIOL 433 L	0	14

BOT 202      5      19

**SPRING YEAR 06-07**

Course	Load Hours	Mean Enroll
BIOL 103	3	35
BIOL 104	1	30 (2 sections)
BIOL 213	5	33
BIOL 213 L	0	33 (2 sections)
BIOL 233	4	72
BIOL 233 L	0	72 (4 sections)
BIOL 234	4	32
BIOL 234 L	0	32 (2 sections)
BIOL 334	5	14
BIOL 357	4	31

*Major Course Requirements***FALL YEAR 06-07**

Course	Load Hours	Mean Enroll
BIOL 211	5	66
BIOL 211L	0	66 (4 sections)
BIOL 317	5	20
BIOL 317L	0	20 (1 section)
BIOL 347	5	6
BIOL 421	4	8

**WINTER YEAR 07-08**

Course	Load Hours	Mean Enroll
BIOL 102	3	39
BIOL 212	5	44
BIOL 212L	0	44 (3 sections)
BIOL 232	4	90
BIOL 232 L	0	90 (5 sections)
BIOL 433	5	22
BIOL 433 L	0	22

BOT 202      5      20

**SPRING YEAR 07-08**

Course	Load Hours	Mean Enroll
BIOL 103	3	31
BIOL 104	1	18 (2 sections)
BIOL 213	5	41
BIOL 213 L	0	41 (2 sections)
BIOL 233	4	71
BIOL 233 L	0	71 (4 sections)
BIOL 234	4	36
BIOL 234 L	0	36 (2 sections)
BIOL 334	5	13
BIOL 357	4	19

**FALL YEAR 07-08**

Course	Load Hours	Mean Enroll
BIOL 211	5	61
BIOL 211L	0	61 (4 sections)
BIOL 317	5	12
BIOL 317L	0	12 (1 section)
BIOL 421	4	16



BIOL 431	5	27
BIOL 445	3	2

BIOL 431	5	21
BIOL 445	3	2

#### WINTER YEAR 06-07

Course	Load Hours	Mean Enroll
BIOL 212	5	38
BIOL 212L	0	38 (3 sections)

BIOL 318	5	15
BIOL 318 L	0	15 (1 section)
BIOL 323	5	11
BIOL 323 L	0	11 (1 section)
BIOL 350	4	5
BIOL 341	4	32
BIOL 341 L	0	32 (1 section)

BIOL 432	5	7
BIOL 432 L	0	7
BIOL 433	5	14
BIOL 433 L	0	14

BOT 201	5	19
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#### SPRING YEAR 06-07

Course	Load Hours	Mean Enroll
BIOL 213	5	33
BIOL 213 L	0	33 (2 sections)

BIOL 357	4	31
BIOL 358	1	20
BIOL 334	5	14
BIOL 342	4	34
BIOL 342 L	0	34 (1 section)

BIOL 410	4	4 (Microscopy)
BIOL 410	4	3 (Neurobiology)
BIOL 410 L	0	3 (Neurobiology)
BIOL 490	3	14

#### WINTER YEAR 07-08

Course	Load Hours	Mean Enroll
BIOL 212	5	44
BIOL 212L	0	44 (3 sections)

BIOL 318	5	5
BIOL 318 L	0	5 (1 section)
BIOL 323	5	16
BIOL 322 L	0	16 (1 section)
BIOL 321	2	9
BIOL 341	4	25
BIOL 341 L	0	25 (1 section)

BIOL 410	3	2 (Molecular bio)
BIOL 432	5	10
BIOL 432 L	0	10
BIOL 433	5	22
BIOL 433 L	0	22

BOT 201	5	20
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#### SPRING YEAR 07-08

Course	Load Hours	Mean Enroll
BIOL 213	5	41
BIOL 213 L	0	41 (2 sections)

BIOL 322	5	12
BIOL 322L	0	12 (1 section)
BIOL 357	4	19
BIOL 358	1	19
BIOL 334	5	13
BIOL 342	4	22
BIOL 342 L	0	22 (1 section)

BIOL 410	4	4 (Microscopy)
BIOL 410	3	4 (Virology)
BIOL 490	3	18

- A total of 8 students for a total of 20 credits of research BIOL 401 was taught 2006-2007

- A total of 16 students for a total of 40 credits of research BIOL 401 was taught 2007-2008
- A total of 9 students for a total of 26 credits of Practicum/Internship BIOL 409 was taught 2006-2007

Total SCH Required per academic year (General Education and service courses and major courses)

Total-----load hours

## Staffing

- Karen Antell, Ph.D. in Botany, teaches biology, botany, and supporting courses for rangeland resources; maintains the greenhouse; curates the herbarium research collection; chairs the Rebarrow Forest board; and engages students in research into local ecosystems.
- Shaun Cain, Ph.D. in Zoology and specializing in cellular and organismal neurobiology, teaches anatomy and physiology, cell biology, neurobiology, and neuroethology, and engages undergraduate students in research into neurotransmission in the slug.
- Joe Corsini, Ph.D. in Microbiology, teaches biology, microbiology, immunology, and virology, as well as a microbiology service course for the OHSU nursing program; involves students in a variety of paleontological and microbiological studies; is also involved in outreach activities with local K-12 schools, the National Park Service, and the US Forest Service.
- Laura Mahrt, Ph.D. in Zoology and specializing in herpetology, teaches service anatomy and physiology courses for the nursing program via DDE, as well as herpetology, mammalogy, comparative anatomy, animal behavior and ecology; is conducting a long-term study on the endangered spotted frog; and is extensively involved in community outreach.
- Bonnie Postovit, M.S. Zoology & Physiology, teaches on-campus lectures and labs in human anatomy and physiology—a prerequisite course for nursing and dental hygiene students, and an important element of the Physical Activity & Health major.
- John Rinehart, Ph.D. in Genetics and specializing in molecular genetics, teaches genetics, nursing genetics, the general education biology series, invertebrate zoology, and molecular biology; provides research experiences to undergraduates; and collaborates with the US Forest Service.
- Maurizio Valerio, Ph.D. in Natural Sciences, Master in Zoology, teaches biology laboratories for the general education biology series and microbiology laboratories for the nursing program; he also teaches history of science and is extensively involved in a diverse array of community trainings and outreach activities.



## Faculty Accomplishments

Instruction is enhanced by faculty outreach activities. For example, Karen Antell cooperates with the Oregon Department of Fish and Wildlife, is involved in the Ladd Marsh replanting project, and co-organizes with Laura Mahrt the Girls in Science event every year; Joe Corsini presents workshops for a local children's program, Think Link Science Saturday, and cooperates with the National Park Service Service and U.S. Forest Service on paleontology projects; Laura Mahrt

volunteers for the Regional High School Robotics and High School Math competitions annually and cooperates with the Oregon Dept. of Fish and Wildlife on turtle and spotted frog projects; John Rinehart cooperates with the U.S. Forest Service; and Shaun Cain conducts science lectures and discussions with kids at local public schools through the Friday Harbor K-12 Outreach Program.

Instruction is also enhanced by faculty research. For example, most recent faculty research includes: Karen Antel's 2007 abstract and poster at the Wildlife Society Meeting, "Macroinvertebrates in Bear Creek, Longley Meadows," John Rinehart's 2006 publication of a study entitled "Genetic structure of *Dendroctonus mexicanus* (Coleoptera: Curculionidae: Scolytinae) in the Trans-Mexican Volcanic Belt," Laura Mahrt's 2005 publication with C. Nowak of "New county record of *SCAPHIOPUS INTERMONTANUS* (Great Basin Spadefoot) in Union county Oregon" in the *Herpetological Review* 36:335, Joe Corsini's 2006 publication of manuscript entitled "Paleoenvironmental implications of size, carapace position, and incidence of non-shell elements in White River turtles" in the international journal *Palaeogeography, Paleoclimatology, and Paleoecology*, and Shaun Cain's 2005 publication of a study entitled: "Immunochemical analyses of magnetically responsive neurons in the mollusc *Tritonia diomedea*" in the *Journal of Comparative Physiology*.

In addition to research, Biology faculty are also actively involved in earning grant funding for research projects. John Rinehart wrote two successful grants, both Joint Venture Agreements with the US Forest Service, with a combined total value of US\$291,238.00. Joe Corsini has submitted two grants to the National Science Foundation RUI section, one a Fossil Turtle grant and the other a Molecular Virology grant, with a total of \$900,000 requested. Shaun Cain has also worked on two grants, one to the NSF entitled *Magnetic Field Sensor in the Marine Mollusk, Tritonia. Where Is It and How Does It Work?* and the other entitled *Gridless TEM Sample Supports*, with the total requested \$376,295.

### **Minimum Staffing Requirements**

- 1) Current assessment of Faculty Based on the current faculty in Biology, the following total FTE are available:

Total = 1.0 FTE -----

- 2) Efficiency Ratios

#### Load/Faculty On Campus

Based on the 2006/7 SCH, the ratio of SCH to faculty in BIOL prefix courses is \_\_\_\_\_  
Student load hours/1.0 FTE = \_\_\_\_\_ load hours per faculty member.

Total SCH is \_\_\_\_\_

ON Campus SCH \_\_\_\_\_

ONLINE SCH \_\_\_\_\_

ON SITE SCH \_\_\_\_\_

SCH/Faculty Need

On campus \_\_\_\_\_ cr hr/ 36

### **Summary Recommendations/Observations**

The Biology program is strong in terms of teaching, as is evidenced by the botany program's shift to an integrated lab/lecture format. In addition, many of our students are involved with undergraduate research projects. At any one time during the year, 15-25% of our students are engaged in undergraduate research. And, the proposed molecular biology degree will effect a shift of upper-division courses to low enrollment, project-style pedagogy.

The Biology program has made progress in efforts to assess teaching and student learning. Outreach continues to be exemplary, with faculty involved in community science outreach projects such as Think Link, Science Fair judging, high school robotics competitions, cooperation with state agencies such as the Oregon Department of Fish and Wildlife, and cooperation with federal agencies such as the National Park Service.

Faculty members are concerned about many social issues that revolve around biology: the degradation of the environment, medical technology, agricultural biotechnology, climate change, and alternative energy, to name a few. They have yet to instate tools for assessing their impact on student awareness and their ability to reach out to residents of Eastern Oregon. In the future they will attempt to assess the program's impact on student attitudes and awareness of social issues through surveys and questionnaires. These questionnaires will be administered to entering freshman and then again when these individuals graduate, providing us with an indicator in the changes in perception as student proceeds through the program.

While the Biology undergraduate research program is established, it lacks sufficient vitality to provide for all interested students. In the future, faculty will pursue dialogue (with EOU administration) aimed at attaching resources to provide consistent high quality research experiences to all Biology graduates. The discussion will revolve around the resources required for this task: time (faculty), space, equipment maintenance and reagent budgets, and hiring a biology preparatory technician.

### **Administrative Review of Program**