

**Proposal for the Initiation of a
New Instructional Program
Leading to the Bachelor of Science in Marine Biology**

University of Oregon
College of Arts and Sciences
Oregon Institute of Marine Biology, Department of Biology

Description of Proposed Program

1. Program Overview

a. Proposed CIP number:

b. Brief Overview: The University of Oregon has been teaching marine biology on the Oregon Coast for more than 75 years and is well known both nationally and internationally for excellence in undergraduate and graduate marine education. At present, interested students can obtain an emphasis in marine biology by spending a single term at OIMB. The proposed major in marine biology will provide an opportunity for students to focus in greater depth on marine organisms, models and systems while still obtaining rigorous training in all aspects of modern biology. The major is expected to recruit students to the University of Oregon who would not otherwise come, including students from landlocked states that lack institutions with marine teaching facilities. This will be the first and only marine biology major offered in the Pacific Northwest, though similar majors offered elsewhere attract large numbers of qualified students.

Students entering the University to study marine biology will complete all of the introductory courses and prerequisites that are required for a degree in biology. They will then spend at least 3 full-time terms at the Oregon Institute of Marine Biology, where they may choose upper division electives in various subdisciplines of marine science, including zoology, botany, physiology, ecology, embryology and oceanography. The major will be offered by the existing faculty of the Oregon Institute of Marine Biology, and no new courses are proposed. A student graduating with a degree in marine biology would also be fully qualified to graduate with a biology degree.

c. When will the program be operational, if approved? The program will begin Fall Term, 2004.

2. Purpose and Relationship of Proposed Program to the Institution's Mission and Strategic Plan

a. What are the objectives of the program?

The proposed new program has the following main objectives:

- To provide an opportunity for students to focus their study on marine organisms and systems while obtaining the solid background training in modern physiology, ecology, cell biology, genetics and evolution that is already available in the U. of O. Biology Department.
- To recruit students who would otherwise be unlikely to attend the University of Oregon, including especially students living in landlocked states that lack coastal teaching facilities.
- To more fully use the existing resources and facilities of the Oregon Institute of Marine Biology.

b. How does the proposed program support the mission and strategic plan of the institution? How does the program contribute to attaining long-term goals and directions of the institution and program?

The 2002 document "Making a difference: strategic directions for the University of Oregon" identifies three major priorities for the University: quality, access, and research and economic development. The proposed program furthers all three:

- **Quality.** The proposed program embraces the objective of teaching quality by providing experiential learning under the close direction of faculty mentors. Courses at OIMB are characterized by intense personal instruction delivered primarily by senior, experienced faculty with a high dedication to teaching undergraduates. The format of our courses allows for considerable interaction with the students. All courses include active learning opportunities in the laboratory and in the spectacular field habitats that surround OIMB, including hands-on training in research methods and experimental design. We consistently hear from students that their OIMB term was a highlight of their academic experience at the University of Oregon. The marine biology major is expected to attract highly qualified students.
- **Access.** The major will provide access to a degree program not currently offered anywhere in the Pacific Northwest, and students in landlocked states will recognize an opportunity for access to a program their own states cannot provide. Moreover, students in Oregon will, for the first time, have the opportunity to earn a degree in marine biology within their own state system of higher education. We expect that some students from Oregon who might go elsewhere for a marine biology degree would be retained in Oregon because of this program.
- **Research.** OIMB is perfectly positioned to train undergraduates in research methods and prepare them for rigorous graduate research programs. Virtually all classes taught at OIMB include independent research projects as part of the course requirements. Undergraduates also have the opportunity to work in the labs of faculty and to interact closely with outstanding graduate students preparing for careers in various fields of marine biology. Faculty members at OIMB have a good record of publishing original scientific papers in collaboration with undergraduate students.

c. How does the proposed program meet the needs of Oregon and enhance the state's capacity to respond effectively to social, economic, and environmental challenges and opportunities?

Oregon is known nationally for its strong environmental ethic, but also has significant environmental challenges associated with coastal development, fisheries and industry. Students emerging from this program will be prepared to address these issues in academics, government agencies, teaching, and private sector industries (e.g., mariculture) that use or impact marine resources. Teachers trained in marine biology are particularly effective in motivating K-12 students to consider careers in science, engineering and other technical fields. Recognizing this, a number of school districts in Oregon, including the North Bend and Coos Bay districts, have adopted marine-based curricula as their science programs in the elementary and middle schools. OIMB has taken a lead in training teachers for these programs and has applied for NSF funding that would involve graduate students as teachers in K-12 classrooms. The proposed marine biology major will be an outstanding program for individuals interested in teaching science at the elementary and high school levels. The University of Oregon already offers a 5th year teacher certification program that would allow such students to graduate as fully qualified science teachers.

3. Course of Study

a. Briefly describe proposed curriculum

B.S. in Marine Biology:

Lower Division Requirements (61- 66 credits)

General Biology BI 211,212,213, 214 (16 credits) or Foundations Biology BI 251, BI 252, BI 253 (15 credits)

General Chemistry CH 221, 222, 223 (12 credits)

General Chemistry Lab CH 227, 228, 229 (6 credits)

Organic Chemistry CH 331, 332 (8 credits) or CH 331, 335, 336 (12 credits)

Life Science Calculus I, II MATH 246, 247 or 251, 252 (8 credits)

General Physics PH 201, 202, 203 or 251, 252, 253 (12 credits)

Upper Division Requirements (minimum of 44 upper-division Biology credits including 1 & 2 below)

1. At least one course completed from each of Areas I, II, and III.

Area I: Cellular/Molecular

BI 320 Genetics (4 credits)

BI 322 Cell Biology (4 credits)

BI 328 Developmental Biology (4 credits)

BI 360 Neurobiology (4 credits)

Area II: Ecology/Evolution

BI 357 Marine Biology (4 credits)

BI 370 Ecology (4 credits)

BI 375 Biodiversity (4 credits)

BI 380 Evolution (4 credits)

BI 390 Animal Behavior (4 credits)

Area 3: Systematics/Organisms

BI 330 & 331 Microbiology and Lab (5 credits)

BI 340 Plant Diversity and Physiology (4 credits)

BI 351 or 451/551 Invertebrate Biology/Zoology (4-8 credits)

BI 353 Sensory Physiology (4 credits)

BI 355 Vertebrate Evolution and Development (4 credits)

BI 356 Animal Physiology (4 credits)

2. Three terms of full time (at least 12 credits) enrollment in courses at the Oregon Institute of Marine Biology. Courses may be chosen from the following:

BI 401 Research (maximum 4 credits)

BI 408 - summer weekend workshops for specialized topics including Biological Illustration, Biological Invasions, Bioluminescence, Coastal Wetland Restoration (maximum 4 credits)

BI 431/531 Algae and Photosynthetic Bacteria (5 credits)

Bi 451/551 Invertebrate Biology (8 credits)

BI 453/553 Marine Molecular Physiology (5 credits)

BI 454/554 Estuarine Biology (5 credits)

BI 455/555 Marine Birds and Mammals (6 credits)

BI 457/557 Marine Biology: Adaptations of Marine Organisms (6-8 credits)

BI 457/557 Marine Biology: Biology of Fishes (6-8 credits)

BI 457/557 Marine Biology: Comparative Embryology (5 credits)

BI 457/557 Marine Biology: Marine Environmental Issues (5 credits)

BI 457/557 Marine Biology: Deep-Sea Biology (5 credits)

BI 458/558 Biological Oceanography (5 credits)

BI 474/575 Marine Ecology (5 credits)

B.A. in Marine Biology:

As in other undergraduate programs, students may elect to earn the B.A. degree by demonstrating proficiency in a second language in one of three ways established at the University of Oregon:

1. Completion of at least the third term, second year of a second-language course taught in the language, with a grade of C- or P or better.
2. Satisfactory completion of an examination administered by the appropriate language department, showing language proficiency equivalent to that attained at the end of two years of college study.
3. For students whose native language is not English: providing high school or college transcripts to the Office of Admissions as evidence of formal training in the native language and satisfactory completion of WR 121 (College Composition I) and either WR 122 (College Composition II) or WR 123 (College Composition III).

b. Describe new courses. Include proposed course numbers, titles, credit hours, and course descriptions.

No new courses are proposed.

c. Provide a discussion of any nontraditional learning modes to be utilized in the new courses.

Not applicable, as no new courses are proposed.

d. What specific learning outcomes will be achieved by students who complete this course of study?

The marine biology major is designed to prepare undergraduates for graduate school in the life sciences and for a variety of careers in natural resource agencies, biological consulting firms, research laboratories, education and interpretation, and private sector industries in marine resources. Graduates of the program will have a solid grounding in all fields of general biology and sufficient understanding of the diversity of animal, plant and microbial life to apply modern biological techniques to a wide range of problems in the marine environment and elsewhere.

4. Recruitment and Admission Requirements

a. Is the proposed program intended primarily to provide another program option to students who are already being attracted to the institution, or is it anticipated that the proposed program will draw students who would not otherwise come to the institution?

Current recruitment of students to OIMB is mostly internal, with the student pool coming primarily from Biology, General Science and Environmental Studies. Although OIMB teaches about 40% of students graduating in Biology, per-term and per-course enrollments remain low except in the summer months. The new major in marine biology will primarily target students that are unlikely to come to the University of Oregon for existing degree programs. Traditionally, many students from colleges and universities in landlocked states in the Northwest and elsewhere (e.g. Montana, Wyoming, Utah, Arizona, Missouri, Kansas) come to OIMB for summer classes. We expect the marine biology major to greatly increase the number of non-resident students and we also expect resident students to come to the UO because of this major. We will undertake a major recruitment effort in Western and Midwestern states, particularly those that have no coastline and whose students therefore have no access to coastal teaching facilities. With targeted mailings, we will reach high school students who have expressed interest in marine biology as a career.

b) Are any requirements for admission to the program being proposed that are in addition to admission to the institution? If so, what are they?

Once students fulfill UO admissions requirements and are admitted to the University, they can declare their intention to major in marine biology by designating themselves as marine biology

premajors. Premajors will be required to complete entry-level courses in Biology (General Biology BI 211 – 213 or Foundations Biology BI 251-253 and should be in good academic standing at the time of application. They will then take a written examination (in essay format) that will be used to determine entry into the program major. This examination will contain questions that focus on the student's purpose for choosing the major, including career goals and plans. The material used for recruiting and academic advising will make plain the nature of the written statement and its role in the review process. In addition, if demand for the major exceeds capacity (see below), then students will be admitted to the major dependent on their academic standing (i.e., overall GPA and GPA in the Sciences).

c) Will any enrollment limitation be imposed? If so, please indicate the specific limitation and its rationale. How will students be selected if there are enrollment limitations?

The marine biology major will require that students spend a minimum of three terms at OIMB in Charleston, Oregon. Students can take courses at OIMB during Fall, Spring and Summer terms. During the academic year, enrollment is limited by classroom size and the number of available faculty. OIMB currently has enough teaching staff to offer 9 courses of 4 or 5 credits each, distributed over the Fall and Spring academic terms. Summer terms are taught mostly by visiting faculty members from other institutions. Each classroom (which is used for both lecture and laboratory teaching activities) can seat a maximum of 24 people.

With course offerings at their current level and classes completely full, we could accommodate 32 students taking 3 classes each (13 to 15 credit loads) each term. As non-majors from Biology, General Science, and Environmental Science majors will continue to enroll at OIMB, we estimate that approximately 24 slots per term will be available to new marine biology Majors. Thus, enrollment of new students in the program will be capped initially at 24 students per year. If demand for the major exceeds our capacity, students from the pre-major will be admitted to the major dependent primarily on their academic standing (overall GPA and GPA in the sciences) and, to a lesser extent, on their essay.

If demand for the marine biology major consistently exceeds the 24-student enrollment limit, it may be possible to expand the program. One scenario for expansion involves offering an additional lecture course with larger enrollment in each academic term (Fall and Spring). Students could take a full course load by enrolling in two of four classes with enrollments limited to 24 students and a third class with enrollment up to 48. The large class (e.g., probably an introductory course in marine community ecology, oceanography or marine environmental issues) would include field trips in lieu of laboratory work. This scenario would require hiring a temporary teaching faculty during each term in which the course is taught, and the course would probably have to be required for the major. Using this scenario, the marine biology major could be expanded to accommodate 40 to 45 students per year.

5. Accreditation of the Program

No accrediting bodies or professional societies have established standards for majors in the field of Marine Biology, nor are accreditations expected to become available in the near future.

Need

6. Evidence of Need

a. What evidence does the institution have of need for the program? Please be explicit. (Needs assessment information may be presented in the form of survey data; summaries of

focus groups or interviews; documented requests for the program from students, faculty, external constituents, etc.)

Undergraduate marine biology majors are tremendously popular programs where they are offered. However, because such majors can only be offered effectively in coastal states that have invested resources in marine laboratory facilities, there are relatively few good places to obtain marine biology degrees. Most marine biology programs in large universities receive hundreds of applicants per year and are able to choose highly qualified students. Here are a few examples:

- **The University of California, Santa Barbara** has a long and distinguished history of teaching and research in the marine sciences, but they only recently instituted a specialized major in Aquatic Biology (comprising both Marine and Freshwater Biology). The program currently has approximately 200 majors and is the most popular major in a large department. (contact: Dr. Gretchen Hoffman)
- **California State University Long Beach** is the only school in the California state system that offers a degree in marine biology. The degree is offered by 8 marine faculty who reside in a Biology department of about 35. These numbers are similar to the faculty ratios at U. of O. The marine biology major is the second most popular program, after General Biology. There are currently 199 students in the program and 20-30 graduate per year. (contact: Professor Charles Galt).
- **The College of Charleston** (South Carolina) initiated a marine biology major approximately 15 years ago. This major has now become the most popular major at the college, with 120 marine biology majors in a biology department of approximately 630 students. Until recently, when a common market tuition scheme for surrounding states was eliminated, enrollments averaged 300. Before the major was instituted, the college had a marine biology emphasis similar to the one at the University of Oregon. When the major was introduced, applications and enrollments increased significantly (contact: Dr. Scott France).
- **The University of Maine** started a marine biology major just 5 years ago. Much, but not all, of the coursework is offered at the Darling Marine Center, a coastal lab about 2 hours from main campus that resembles OIMB in many respects. The marine biology major has experienced the highest enrollment growth of any program in the university, with enrollment growing in 5 years from zero to 110 students. (contact: Professor Kevin Eckelbarger).
- **Eckerd College** in Florida offers a degree in marine science with a specialization in marine biology. The program admits approximately 120 new majors each year and graduates about 50 each year, with the attenuation resulting largely from a rigorous lower division curriculum. About 50% of the graduates from this program go on to graduate school. (contact: Dr. Nancy Smith).
- **The University of North Carolina, Wilmington** admits about 200 marine biology majors per year and graduates approximately 100 per year. As in the proposed program at U. of O., students are admitted as sophomores after a rigorous year of prerequisites in biology and other disciplines. The marine biology degree is an extremely popular program. (contact: Professor Joseph Pawlik)
- **The University of Rhode Island** offers a popular marine biology degree program to which approximately 80 students are admitted each year. The first year is spent with prerequisites requirements, after which students may choose from about a dozen electives in marine science. Research opportunities are also offered for undergraduate course credit.

Marine Biology is a popular career goal among young students. With the assistance the admissions office at the University of Oregon, we searched the database of high school juniors who took the PSAT test for students who specified marine biology as their primary college interest and career goal. The results are presented in Table 1. This database includes primarily college bound students competing for National Merit scholarships, so it represents only a fraction of the total population of

students. Our search was restricted to students with GPA scores of 3.0 and higher and focused on western states and a few other states from which the University of Oregon commonly attracts students.

Table 1. Number of high school juniors in various coastal and landlocked states taking the PSAT test who listed marine biology as their career goal.

Coastal States		Landlocked States	
State	Students	State	Students
Oregon	110	Utah	33
Washington	166	Idaho	34
Alaska	17	Montana	41
California	1057	Nevada	41
Hawaii	55	Ohio	351
Massachusetts	292	Minnesota	120
Connecticut	190	Illinois	280

Several universities in the Pacific Northwest (notably University of Washington, University of Alaska Fairbanks and Juneau, Western Washington University and Oregon State University) offer courses on various aspects of marine science, and specialized undergraduate degrees are available in fisheries and in oceanography. However, there is no college or university in the Northwest where a student may obtain a degree in marine biology.

b. Identify statewide and institutional service-area employment needs the proposed program would assist in filling. Is there evidence of regional or national need for additional qualified individuals such as the proposed program would produce? If yes, please specify.

Employment in marine biology has traditionally been driven by academics, fisheries, and service in government agencies. In recent years, as genetic and molecular techniques have become available, many new opportunities for research and employment have opened up in the marine realm. Some of the newer applied fields include marine natural product chemistry (search for promising pharmaceuticals in marine organisms), marine biotechnology (use of marine organisms to address economic problems such as fouling and medical problems such as cancer), aquaculture (farming and ranching of marine organisms for food, medicine, etc.), marine environmental biology and toxicology. The tightening environmental regulations in Oregon and elsewhere require biologists who can assess real and potential environmental perturbations. Such marine biologists work in both government service and private firms.

c. What are the numbers and characteristics of students to be served? What is the estimated number of graduates of the proposed program over the next five years? On what information are these projections based?

Approximately 40% of University of Oregon students who graduate with a degree in biology already enroll for at least one term at OIMB. We expect that a number of these students will take advantage of the opportunity to earn a marine biology degree. Marine biology is a particularly popular career option for undergraduate students, and some marine biology degree programs on the east coast attract hundreds of applicants per year. Because the proposed program will be limited in size to the capacity of OIMB, we expect to admit highly qualified students who have the ability to complete a rigorous degree program with a strong grounding in the basic sciences. Once the program numbers attain steady state, we anticipate having approximately 100 marine biology students enrolled at any given time, and 25 – 30 graduating majors each year.

d. Are there any other compelling reasons for offering the program?

The University of Oregon has invested significant resources on facilities and faculty on the Charleston campus, yet enrollments remain low at OIMB except in summer term. Few students enroll in the U. of Oregon specifically to study marine biology because marine biology degrees are marketed successfully elsewhere in the country. We would like to see the facilities at OIMB fully used. Furthermore, recent state cuts in funds for research lines (OIMB has traditionally been funded as a research unit, with no funds earmarked for its educational functions) requires that additional revenues be generated by tuition in order to maintain its high quality teaching programs.

e. Identify any special interest in the program on the part of local or state groups (e.g., business, industry, agriculture, professional groups).

None has been identified.

f. Discuss considerations given to making the complete program available for part-time, evening, weekend, and/or placebound students.

The 3-term OIMB portion of this proposed major is a total immersion experience in which students integrate lab and field work with more traditional lectures. OIMB is fully handicap accessible and can accommodate students with physical disabilities. However, the timing of the learning experiences would make it very difficult to offer the major to part-time, evening or weekend students.

Outcomes

7. Program Evaluation

a. How will the institution determine the extent to which the academic program meets the objectives previously outlined? (Identify specific post-approval monitoring procedures and outcome indicators to be used.)

OIMB currently collects information about its programs from all students who attended the Institute. At the end of each class, each student is offered the opportunity to evaluate the class using two instruments: the standard UO scantron evaluation form to which the instructor can add specific questions, and an open-ended questionnaire that asks for reactions to the course, instructor, teaching assistant, and instructional methods.

In addition each student is also offered the opportunity to evaluate the OIMB program using a 40 question program evaluation we have developed (Human subjects compliance # E 418-02) that provides us information on the academic program, OIMB resources including library and technology access, campus life, and the influence of the OIMB program on career goals. We will add a section to this instrument that will determine if a student applied to the University because we offer a marine biology major. At the end of each term, the director of the institute also conducts an informal meeting with the students to obtain feedback on campus life, course offerings and recruitment. All of these feedback mechanisms will enable us to maintain quality in the offerings for a marine biology major.

b. How will the collected information be used to improve teaching and programs to enhance student learning?

At the end of each term we review the instruments previously mentioned and use the information to make adjustments that improve the OIMB programs.

8. Assessment of Student Learning

a. What methods will be used to assess student learning? How will student learning assessment be embedded in curriculum?

A large variety of methods are used to assess student learning in the OIMB courses. They include written and practical examinations, laboratory reports, laboratory notebooks, individual, group, and whole course projects, student discussions of literature, written papers, student presentations, poster sessions, and many non-graded assessments embedded in the curriculum. All student research reports have been bound and archived in the OIMB library since the 1960's. The courses at OIMB follow a nontraditional format in that each course meets for the entire day with the instructor and teaching assistant in full time attendance. This makes it very easy to embed assessment in the curriculum.

b. What specific methods or approaches will be used to assess graduate (completer) outcomes?

We will monitor post-graduation outcomes by sending an e-mail survey to each graduate 6 months after graduation and again 18 months after graduation. OIMB has a long tradition of maintaining contact with all alumni through an annual newsletter, so the mechanism is already in place for initiating these surveys.

c. Is a licensure examination associated with this field of study?

No.

Integration of Efforts

9. Similar Programs in State

a. List all other closely related OUS programs.

There are no other marine biology degree programs in the state. Courses that cover aspects of marine biology are taught in the Biology Department at Portland State University and in the departments of Fisheries and Wildlife, Oceanography and Zoology at Oregon State University.

b. In what way, if any, will resources of other institutions (other OUS institution or institutions, community college, and or/private college/university) be shared in the proposed program? How will the program be complementary to, or cooperate with, an existing program or programs?

Since there are no other institutions in the state offering an undergraduate major in marine biology, this question is not directly applicable. Most of the other state institutions do have biology programs, and their students are always welcome to attend OIMB for a term or more. For example, Portland State University has a program in Environmental Sciences and Resources, and we would invite faculty in that program to recommend a marine biology term at OIMB to their students. Similarly, Oregon State University offers fall term classes at Hatfield Marine Science Center in coastal ecology and resource management for advanced undergraduates and graduate students in the Department of Fisheries and Wildlife. We would encourage students in that program to include a term at OIMB in their course of study.

c. Is there any projected impact on other institutions in terms of student enrollment and/or faculty workload?

As we intend to recruit from an entirely new population of students, there should be no measurable impact.

Resources

10. Faculty

a. Identify program faculty, briefly describing each faculty member's expertise/specialization. Separate regular core faculty from faculty from other departments and adjuncts. Collect current vitae for all faculty, to be made available to reviewers upon request.

- Professor Nora Terwilliger's teaching and research interests are in the areas of comparative physiology and biochemistry, invertebrate zoology and invertebrate development. She has an active research program investigating the regulation of expression and the intricacies of molecular form and function of the hemocyanin gene family, particularly in crustaceans. She teaches courses in Invertebrate Zoology and Marine Molecular Physiology at OIMB.
- Professor Craig Young is director of OIMB. His research focus is on invertebrate reproduction, development and larval biology in both coastal waters and the deep sea, but he also works on various aspects of invertebrate functional morphology, systematics, and ecology. Dr. Young teaches a course in Comparative Embryology and Larval Development and an occasional course in Deep-Sea Biology. In the past, he has also taught courses in Invertebrate Zoology, Marine Ecology, Reproductive and Larval Ecology, and Marine Biodiversity.
- Professor Richard Emler's research includes the areas of evolution, ecology, development and biomechanics. He studies organismal structure and function emphasizing developmental, larval, and juvenile stages of marine invertebrates. He also examines life history evolution from historical, functional, and ecological perspectives and most recently has focused on ecological linkage between larval and juvenile stages of marine invertebrates. Professor Emler currently teaches Estuarine Biology and Invertebrate Zoology, and in the past has taught Marine Ecology, the Physical Biology of Air and Water, Marine Communities.
- Dr. Alan Shanks is interested in how the interaction of the behavior of marine organisms with the physics of the ocean affects the distribution, survival, and movement of the organisms. He is particularly interested in the interaction between biology and physical oceanography at small time and space scales (e.g., internal waves, Langmuir circulation, fronts, convergences, etc.). Current research focuses on very nearshore oceanography and its potential role in affecting the dispersal and settlement of larval invertebrates and fish. Alan teaches Animal Behavior and Biological Oceanography.
- Professor Emerita Lynda Shapiro's research interests include the biology of pelagic marine phytoplankton; distributions and abundances of the eukaryotic ultraplankton, incorporation of these minute cells into the microbial food web, and the role of associated bacteria on the nutrition of phytoplankton; harmful algal blooms; and sustainable harvesting of marine macroalgae. Although she is now retired, Lynda will continue teaching one course per year at OIMB for the next five years. She teaches Biological Oceanography and a course on Marine Algae and Photosynthetic Bacteria.
- Dr. Jan Hodder is the educational coordinator at OIMB and is responsible for the coordination of the Institutes undergraduate teaching programs. She is the principal investigator of the Faculty Institutes for Reforming Science Teaching through Field Stations project, a professional development program for undergraduate faculty at 46 institutions throughout the US. She teaches Marine Birds and Mammals, Vertebrate Form and Function, and Marine Environmental Issues.

b. Estimate the number, rank, and background of new faculty members who would need to be added to initiate the proposed program in each of the first four years of the proposed program's operation assuming the program develops as anticipated). What commitment does the institution make to meeting these needs?

No additional faculty are needed to run the basic program over the first four years. However, if the

program should expand by addition of a large lecture course, it would be necessary to hire one additional instructor.

c. Estimate the number and type of support staff needed in each of the first four years of the program.

Support staff for OIMB are already in place. These include a budget manager, office assistant, facilities director, three maintenance workers and a computer information technology consultant who also sets up labs and maintains the institute's stockroom. One of the teaching faculty, Dr. Jan Hodder, will continue to serve as the education coordinator for the program and the institute. Her responsibilities include recruitment, scheduling and other day-to-day operations associated with courses. At present, OIMB receives 3 graduate teaching fellows to assist with four classes offered in each of the two teaching terms. Under conditions of low enrollment, it has been possible to cover all of the classes by splitting the responsibilities of some T.A.'s between two classes. With increased class sizes, an additional teaching assistant will be required during each of the two academic terms. We propose the use of undergraduate teaching assistants as a cost-effective way of meeting this need.

11. Reference Sources

a. Describe the adequacy of student and faculty access to library and department resources (including, but not limited to, printed media, electronically published materials, videotapes, motion pictures, CD-ROM and online databases, and sound files) that are relevant to the proposed program (e.g., if there is a recommended list of materials issued by the American Library Association or some other responsible group, indicate to what extent access to such holdings meets the requirements of the recommended list).

The Rippey Library at OIMB is a branch library of the University of Oregon Libraries and houses the University's marine science journal and book holdings. University of Oregon has a long tradition of teaching in this field, so the collection includes remarkable holdings such as the 19th century Challenger Reports, as well as complete runs of core marine journals. Materials not housed in the Rippey Library are available through intra-library loan from the UO Science Library, Interlibrary Loan and through the Orbis-Cascade Summit catalog. Articles are delivered within a day via Ariel online document transfer and monographs are delivered five days per week via the Orbis-Cascade courier system. The OIMB campus has access to all of the electronic resources purchased by the University. A professional librarian staffs the library and through connections such as IAMSLIC (International Association of Aquatic and Marine Science Libraries and Information Centers), Special Libraries Association and regional library groups provides the materials outside of the normal channels needed by library patrons. The library building was constructed in 1999 and will provide for another 15 years of collection growth. Completion of the second floor is currently underway to house additional common-use computer facilities for students enrolled in the major.

b. How much, if any, additional financial support will be required to bring access to such reference materials to an appropriate level? How does the institution plan to acquire these needed resources?

We are currently in the process of shifting additional marine related journals from the Science Library in Eugene to the Rippey Library in Charleston. No additional funds are required to acquire resources needed for the marine biology major.

12. Facilities, Equipment, and Technology

a. What unique resources (in terms of buildings, laboratories, computer hardware/software, internet or other online access, distributed-education capability, special equipment, and/or other materials) are necessary to the offering of a quality program in the field?

The proposed program requires classrooms and lab space with running seawater, microscopes and other standard lab equipment; boats and vans for field trips; a good library with marine journals and

books; shop and lab facilities to support student research projects; and housing for students. These resources are already available at OIMB. The following paragraphs describe the required (and already available) resources in detail.

OIMB is essentially a small university campus. We have five classrooms, each set up as a 24-person lecture/laboratory classroom. Four of the classrooms are plumbed for running seawater, allowing classes to maintain marine organisms in the classroom. In addition, there are extensive running seawater facilities outside the classrooms where students and researchers can set up experiments. Several classes have specialized sets of equipment. We have enough quality compound and dissecting microscopes to support an entire Invertebrate Zoology Class, with additional microscopes to support activities in other classes. The Biological Oceanography and Estuarine Ecology classes have access to a CTD (instrument that measures salinity, temperature, Chlorophyll fluorescence and particulate concentration vs. depth) as well as the analytical equipment for performing chemical analyses of seawater. The Marine Birds and Mammals and Vertebrate Form and Function classes make use of an extensive collection of seabird and marine mammal skeletons, skins and frozen specimens. All courses have access to a new imaging laboratory that houses a scanning electron microscope and a laser scanning confocal microscope. An NSF grant has outfitted the Marine Molecular Physiology class with all of the necessary equipment and instrumentation needed in a modern physiology lab, including a PCR thermal cycler and electrophoresis equipment. We have audiovisual equipment for all classrooms as well as all of the other paraphernalia needed for teaching lecture/laboratory classes. All classrooms are connected to the OIMB computer network. For larger lecture classes, we have a lecture hall that will accommodate 100 people.

OIMB is a residential campus. We have 38 dormitory beds, 9 single person dorm rooms, 6 cottages, and an apartment. The cottages and apartment are generally used to house graduate students and visiting lecturers and scientists. The dormitory population is supported by a dining hall and kitchen. A laundry/ recreation hall is also available for the campus residents.

Each faculty member at OIMB has laboratory and office space for themselves, their graduate students, and undergraduates pursuing independent research projects. In addition, we have laboratory and office space for approximately 13 visiting investigators. The research facilities and staff of the South Slough National Estuarine Research Reserve is located on the OIMB campus increasing both the number of scientists in residence and opportunities for students to carry out independent research.

OIMB maintains a small fleet of boats that support both the teaching and research objectives of the facility. Three smaller boats (two Avons and a John-boat) are primarily used in the estuary by researchers. The two larger boats, the 23-foot outboard *Pugettia* and the 42-foot *Pluteus*, are used to support teaching and research. For teaching, the *Pugettia* is used to take groups of students on short cruises within the Coos Bay estuary and the *Pluteus* is used to take classes on cruises offshore or within the estuary. Both are excellent teaching and research platforms. For larger groups of students, we sometimes charter a commercial fishing boat, the Betty Kay.

All classes have large laboratory and especially field components. Because of the importance of fieldwork to our teaching, one of the most important attributes of OIMB is its proximity to a diversity of high quality marine environments. Within five miles of the campus one can visit estuarine mud flats (nearly pristine habitats and also disturbed ones), high-energy open coast sandy beaches, rocky intertidal habitats (both sheltered and exposed), and the open ocean. There are a variety of freshwater and terrestrial habitats near the campus as well, including a 100-acre coastal forest (set aside as a biological reserve) that is part of the OIMB campus. These latter habitats have been used to support classes in freshwater biology and forest ecology, which have also been taught at OIMB.

b. What resources for facilities, equipment, and technology, beyond those now on hand, are necessary to offer this program? Be specific. How does the institution propose that these additional resources be provided?

No additional facilities, equipment, or technologies are needed for the proposed program. OIMB is a completely functional marine laboratory well set up for research and teaching and can support a major in marine biology with no new commitments of resources.

13. If this is a graduate program, please suggest three to six potential external reviewers.

Not applicable.

14. Budgetary Impact

a. On the "Budget Outline" sheet, please indicate the expected cost of the program for the first four years of its operation (one page for each year).

(See attached sheets)

b. If federal or other grant funds are required to launch the program, describe the status of the grant application process and the likelihood of receiving such funds. What does the institution propose to do with the program upon termination of the grant?

No grant funds are required to initiate the program.

c) If the program will be implemented in such a way as to have little or minimal budgetary impact, please provide a narrative that outlines how resources are being allocated/reallocated in order that the resource demands of the new program are being met. For example, describe what new activities will cost and whether they will be financed or staffed by shifting of assignments within the budgetary unit or reallocation of resources within the institution. Specifically state which resources will be moved and how this will affect those programs losing resources. Will the allocation of going-level budget funds in support of the program have an adverse impact on other institutional programs? If so, which programs and in what ways?

The marine biology major will be implemented within the constraints of the OIMB operating budgets without requesting reallocations of resources from other budgetary units within the University. No new classes will be added and no new faculty are required. Our only needs for additional funds during the first four years are for: 1) rental of an additional van from the University motor pool to handle increased numbers of students on field trips, and 2) one additional teaching assistant in each fall and spring term. The cost of a van is estimated at \$950.00 per term (\$305.00 per month plus 0.23 per mile), and the per-term cost of an undergraduate teaching assistant is estimated at \$1181.00 (\$1125.00 plus 5% OPE). These additional expenses, totaling \$2131.00 per term, will be covered by a fee of \$100.00 per student paid during each term of enrollment at OIMB.

The proposed major in marine biology will be developed within the Department of Biology using existing courses and faculty, so there will likely be costs to that department. We estimate that students will take about 33% (20 credits) of their biology courses on main campus and 60% (36 credits) of their biology courses at OIMB. The remaining 7% of credits for the major (4 credits) can be taken at either location.

Dr. Alan Dickman (chair of the Biology Department Curriculum Committee) has estimated that 24 new marine biology students in the Biology Department would require the addition of one laboratory section to either the BI 211+ or BI 251+ series and possibly an additional lab section in one of the 300 level courses. Each lab section is taught by a graduate teaching fellow (GTF) and an undergraduate teaching fellow (UTF). Thus, 2 or 2.5 GTFs per year and a similar number of UTFs will be needed to cover these additional lab sections. It may also be necessary to hire a half-time instructor to teach one additional section of a 300 level class. Based on projections we have received from the Office of Resource Management, it appears that the additional tuition revenues distributed to Biology from marine biology majors will be adequate to cover these additional expenses and also to compensate OIMB for recent budget cuts.

Each spring term, we will encourage marine biology pre-majors to enroll in Biology 199, an existing short course that introduces students to the coast and to OIMB. As part of this experience, we will discuss course requirements and potential scheduling options with the students. We will also hold

another advising event on main campus each fall, in which OIMB faculty will be available to assist with academic advising. We also anticipate that academic advisers in the Biology department will assist with the advising for pre-majors in the proposed program. We have discussed the potential impact of this service with Pat Lombardi, the head of the advising office. Because the marine biology major is identical in most respects to the biology major, Pat does not expect the small amount of additional advising for marine biology majors to be a problematic for his staff.

If the new marine biology major is in high demand and exceeds the 24 new students per year that we can handle with minimal additional costs, we could eventually increase the number of majors by offering larger lecture/field courses at OIMB in the Fall and Spring terms (see section 4c, above). For each such course added, we would require funds for a temporary instructor and one GTF or UTF.