1-22-1998

# Curricular Report No. 1997-98-4A from the Graduate Council to the Faculty Senate: proposal for a Masters of Oceanography Degree

University of Rhode Island Faculty Senate

Serial Number #97-98--12

UNIVERSITY OF RHODE ISLAND
Kingston, Rhode Island
FACULTY SENATE
BILL
Adopted by the Faculty Senate

TO: President Robert L. Carothers

FROM: Chairperson of the Faculty Senate

1. The attached BILL, titled Curricular Report No. 1997-98-4A from the Graduate Council to the Faculty Senate: Proposal for a Masters of Oceanography Degree, is forwarded for your consideration.

2. The original and two copies for your use are included.

3. This BILL was adopted by vote of the Faculty Senate on January 22, 1998.

4. After considering this bill, will you please indicate your approval or disapproval. Return the original or forward it to the Board of Governors, completing the appropriate endorsement below.

5. In accordance with Section 10, paragraph 4 of the Senate's By-Laws, this bill will become effective February 12, 1998, three weeks after Senate approval, unless: (1) specific dates for implementation are written into the bill; (2) you return it disapproved; (3) you forward it to the Board of Governors for their approval; or (4) the University Faculty petitions for a referendum. If the bill is forwarded to the Board of Governors, it will not become effective until approved by the Board.

January 22, 1998
(date)

Leland Jackson
Chairperson of the Faculty Senate

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ENDORSEMENT

TO: Chairperson of the Faculty Senate

FROM: President of the University

Returned.

a. Approved ____.

b. Approved subject to final approval by Board of Governors ✓.

c. Disapproved ____.

1.28.98
(date)

President

Form revised 9/91

**UNIVERSITY OF RHODE ISLAND**
**The Graduate School**
**Curricular Report from the Graduate Council to the Faculty Senate**
**Report No. 1997-1998-4A**

## MASTERS OF OCEANOGRAPHY DEGREE

At Meeting No. 343 held on 12 December, 1997 the Graduate Council voted to approve the following proposal which is now submitted to the Faculty Senate.

## SECTION I
## BACKGROUND INFORMATION

### ABSTRACT

The Graduate Council voted 8 -yes, 5 -no, to approve the proposal for a Masters of Oceanography (MO) and to recommend approval at the Class B level (the new program would compete for resources on an equal basis with all other University activities). The proposal submitted is a revised version of a proposal that was submitted to the Graduate Council in December, 1996.

### BACKGROUND

The Masters of Oceanography (MO) degree is intended for students who desire an advanced degree in oceanography and who have or seek careers in ocean environmental management and assessment, ocean industry, science writing, ocean policy and law, education and training, or related fields not requiring the level of research skills developed while preparing an MS thesis. The MO is viewed as a terminal science degree that would allow a full-time student complete the program within 1 calendar year or 3 semesters (without summer courses). Courses for the degree will be selected from currently existing offerings.

The proposal was reviewed under the process established by the Faculty Senate in which the graduate Council serves as the Coordinating and Review Committee for new graduate program proposals. Announcements of the receipt of the proposal were sent to the President and the Joint Educational Policy Committee, the Provost and the Council of Deans, the Budget Office, and Department Chairs and Graduate Directors. Recommendations were sought from each of these groups. Submitted comments and recommendations are appended, have been kept on file in the Graduate School, and were considered in the Graduate Council's review.

The response from the Budget Office was positive, and Linda Barrett wrote, "the Graduate School of Oceanography should see a net increase in revenues from student tuition payments."

The Joint Educational Policy Committee voted unanimously to approve the proposal and express strong support for the program.

The Council of Deans was very supportive of the proposal, and saw it "as a program that would meet a clear market-based demand for graduates in a program designed primarily to be a terminal master's program in this discipline."

## SECTION II
## RECOMMENDATION

The Graduate Council approved the following proposal for a new Masters of Oceanography degree at its regular meeting on 12 December, 1997. It is now presented to the Faculty Senate with a recommendation for approval at the Class B level - the new program would compete for resources on an equal basis with all other University activities. Following is the proposal in the format required by the Board of Governors for Higher Education.

### PROPOSAL FOR A NEW DEGREE IN OCEANOGRAPHY
### MASTERS OF OCEANOGRAPHY (MO)

**Revised, 18 December, 1997**

**A. PROGRAM INFORMATION**

1. **Name of Institution:**

   University of Rhode Island

2. **College:**

   Graduate School of Oceanography

3. **Title of Proposed Program:**

   Masters of Oceanography

4. **Intended Date of Initiation:**

   September, 1998

5. **Anticipated Date of First Degree:**

   August, 1999.

6. **Intended Location:**

   Graduate School of Oceanography, Bay Campus

7. **Institutional Review and Approval Process:**

| | **Date(s) Approved** |
|---|---|
| GSO Educational Policy Committee | 9/12/96; 10/23/97 |
| Graduate School of Oceanography | 9/16/96; 11/3/97; 12/18/97 |
| Graduate Council | 12/12/97 |
| Faculty Senate | |
| President of the University | |

8. **Summary Description:**

The Masters of Oceanography (MO) degree is designed for those who desire an advanced degree in oceanography and who are working, or intend to work, in ocean environmental management and assessment, ocean industry, science writing, ocean policy and law, education and training, or related fields not requiring the level of research skills one develops while preparing an MS thesis. The MO complements the MS and Ph.D. degrees in oceanography at URI and is designed to appeal to and attract a different type of science student or science professional. The MO is a terminal science degree, and those who want a Masters degree as a step toward the Ph.D. degree should choose the MS, rather than the MO degree. The objective of the MO degree is to provide a basic background in oceanography, and through electives, provide a limited but significant exposure to oceanographic research; and allow a full-time student to complete the program within 1 calendar year or 3 semesters (without summer courses). The degree will not provide all of the training required for those who wish a career in environmental management, policy and related fields, but rather it will provide the oceanographic background for those who need it to become, for example, better ocean managers, ocean policy makers or environmental lawyers. The 1-1.5 year timetable is important, because we see this degree as particularly valuable when combined with previous experience or training in marine environmental science, or with another higher degree, such as a law degree or other masters.

Courses for the new degree will be chosen from the existing graduate courses in oceanography taught at the Graduate School of Oceanography, URI, and supported by courses offered in other colleges including College of Resource Development and College of Engineering. Students will be encouraged to fulfill 27 of the 30-credit requirement with science courses, but will be required to take one 3-credit course in policy, management, economics, or related area depending on the students specific interests. In addition to the 30 course credits required for this degree, students will be required to pass a written comprehensive examination based on the material presented in OCG 501, OCG 540, OCG 521 and OCG 561.

9. **Signature of President:**

Robert L. Carothers

10. **Persons to be contacted during the review:**

James Yoder, Associate Dean
Graduate School of Oceanography
874-6176; -6864

Blair M. Lord, Vice Provost
Academic Programs and Services
874-2447

## B. RATIONALE

1. Nature of the Proposed Degree. The Masters of Oceanography (MO) degree is designed for those who desire an advanced degree in oceanography and who are working, or intend to work, in ocean environmental management and assessment, ocean industry, science writing, ocean policy and law, education and training, or related fields not requiring the level of research skills one develops while preparing an MS thesis. The MO complements the MS and Ph.D. degrees in oceanography at URI and is designed to appeal to and attract a different type of science student or science professional. The MO is a terminal science degree, and those who want a Masters degree as a step toward the Ph.D. degree should choose the MS, rather than the MO degree. The objective of the MO degree is to provide a basic background in oceanography; provide a limited but significant exposure to oceanographic research; and allow a full-time student to complete the program within 1 calendar year or 3 semesters (without summer courses). The timetable is important, because we see this degree as particularly valuable when combined with previous experience or training in marine environmental science, or with another higher degree, such as a law degree or other masters.

2. Needs Which This Program Addresses and Opportunities for Graduates. Recent studies emphasize the importance of master's education. In a book entitled, A Silent Success. Master's Education in the United States, the authors report on their study of master's education and reach some important conclusions (Conrad et al. 1993). First, they generally found that students, program alumni and faculty highly value the master's experience. In particular, students and alumni appreciated learning diverse points of view and new developments in their field, pursuing independent projects and working directly with faculty who took an interest in their work. The authors also stress the important societal benefits of a master's degree. More than any other level of education, master's degrees are the choice of professionals returning to school in our knowledge-centered society. The surveys summarized in A Silent Success showed that "most graduates of master's programs were far more competent and confident professionals" and returned to their jobs as more productive employees. The authors continue, "No less important, master's education significantly promotes greater equity in the academic and non-university workplace by preparing people - including many from diverse ethnic, racial, gender, and socioeconomic backgrounds - to assume key leadership positions in the larger society."

We are not aware of a non-thesis, Masters of Oceanography program at a major US oceanographic institution, so we lack a good model for comparison. However, our proposed degree is targeted toward students with an interest in applied oceanography, so we will attract students similar to those who are interested in non-thesis option master's degree programs in environmental science. These programs are thriving. For example, we reviewed the proposal for a the new Master's Degree in Environmental Science and Management at University of California, Santa Barbara (UCSB). Dean Jeff Dozier received more than 600 written requests for applications before the program was even approved. Dozier's

proposal cites statistics from similar programs at Duke and Yale. Each has more than 100 students in their respective programs, and each receives more than 500 applications per year.

New master's programs, such as the one at UCSB mentioned above, are growing and gaining increasing respect in the United States, but master's programs in the physical sciences (e.g. oceanography) lag other fields. For example, of the 387,070 master's degrees awarded in the US in 1994, only 2% were in the physical sciences compared to 24% in management and 26% in education (Tobias et. al. 1995; Tobias and Chubin 1996). According to Tobias and Chubin (1996), we need to train students to do research in mathematics and the physical sciences, but we also need new degree strategies in the physical sciences to "train students to understand and appreciate the results of scientific research, rather than to create new knowledge themselves." In the physical sciences, new programs based on these new strategies will train students for jobs in technology transfer, marketing, international trade, environmental regulation and research management. These new programs will work best in complex, interdisciplinary fields where a bachelor's degree does not produce proficiency (Tobias and Chubin 1966). Oceanography is an excellent candidate for this sort of new degree program in the physical sciences in that oceanography is both interdisciplinary and complex. For example, oceanographers need a BS-level of knowledge in a traditional scientific field before seeking an advanced degree in oceanography.

The Graduate School of Oceanography (GSO) has been offering the thesis-option MS in Oceanography since the 1950s and has awarded more than 300 MS degrees. Unlike most other large oceanographic institutions (e.g. Oregon State University, Woods Hole Oceanographic Institution, Scripps Institution of Oceanography), the MS degree at GSO is a legitimate terminal degree and not a booby prize for those not qualifying for the Ph.D. degree program. This long tradition of training MS students has earned GSO a respected niche among employers seeking MS graduates, and GSO has been a leading provider for technical positions at university and government laboratories, as well as the environmental consulting industry. In the two-year period from 1993-1995, GSO awarded 16 MS degrees. Of the 16, 2 continued for a Ph.D. at GSO, 5 are now working for federal agencies, 1 is working at state agency, 4 are working for universities or research institutions, 1 is a high school teacher and we do not know what 2 of the graduates are doing. On the one hand, these statistics illustrate the success of our MS program in that 90% of our recent MS graduates are employed in positions requiring higher education. On the other hand, 11 (including 2 who are working on their Ph.D.) of the 16 are employed at universities, private research institutions or federal laboratories; and future job growth in such positions will be limited owing to leveling of federal funding for oceanographic research (recent statistics from Consortium for Oceanographic Education and Research). GSO needs to attract and train graduate students for a broader range of careers.

GSO recently polled about 50 GSO alumni who are NOT working for universities, research organizations or for federal research

laboratories and asked their opinion of a non-thesis master's degree. One of the specific questions was: "Would the organization for which you work consider employing a person with a non-thesis option Masters degree, such as the one GSO is proposing?" The responses covered the spectrum ranging from very enthusiastic to very negative, although most supported the new degree. What follows are brief excerpts from some of the favorable responses (as well as the respondents organization).

"We would certainly be willing to send a student to a one-year non-thesis degree program. We often send employees to Texas A&M for a one-year Ocean Engineering program (no thesis)." (Army Corps of Engineers).

"I would advise most people not planning to go on for a Ph.D. to take the non-thesis option. In most companies (I also worked for an engineering/environmental planning consulting firm), I think the fact that one has a Masters is more important than the research they did - or if they did a thesis." (Army Corps of Engineers).

"Your proposed non-thesis option Masters degree sounds like an interesting alternative for someone with a BS in science who wants to get into science journalism." (Writer for Science).

"We would hire someone with the non-thesis option Master's degree and I do not believe the thesis-option degree would give any competitive advantage.....a review of the proposed requirements for the non-thesis option reinforces my sense that this would be good for a mid-career student." (Assistant to the City Administrator, Santa Barbara)

"If the proposed GSO MS degree included courses on business, management and policy, I expect a non-thesis MS degree would actually confer a competitive advantage to the applicant." (Northeast Utilities).

"Definitely appropriate. She looks for broad-based background including many different courses. Nine credits of electives may be too few." (Phone conversation with Diamond Environmental Associates).

"For the environmental investigations, project management work that I do, I would advise a person to get any kind of MS if it can be completed in less than 2 years.... I feel that 3-4 years for a MS is too long, no matter what or where the person is, unless they can afford to be a professional student." (Assistant VP, SAIC).

"Encourages strongly the link with environmental law. Lawyers do not understand environmental issues." (Phone conversation with Wade Research, Inc.).

"My organization often helps staff by providing a 75% tuition remission for training that is job related. The non-thesis masters degree would be especially attractive because the employee could complete the degree relatively quickly..." (Versa, Inc.).

Unfavorable comments can be summarized within three areas:

1. A thesis helps develop and demonstrate analytical, problem solving and writing skills. In particular, several survey respondents stressed the importance of writing and communication skills.
2. Knowledge of scientific research is only gained by doing research.
3. Concern that the degree would overlap with Marine Affairs degree.

Based on these comments, GSO must provide a means for non-thesis students to obtain writing and communication skills. Second, GSO must ensure that the proposed degree complements the MMA program and does not compete or overlap with it. The first issue is addressed under Section D, whereas the second issue is addressed under Section C, part 3. Finally, the clear message from our alumni (and our faculty) is that the thesis-option MS degree is essential for those planning to conduct laboratory or field research following graduation or for those who wish to continue for a Ph.D.. The MO is an option for those who desire a career requiring technical understanding and the capability to interpret the results of scientific research, but who do not plan to directly participate in hands-on scientific research.

4., 5. and 6. Clientele for Whom the Program is Intended, Program Size and Admission Requirements. The Masters of Oceanography (MO) is designed for those who desire an advanced degree in oceanography and who are working, or intend to work, in ocean environmental management and assessment, ocean industry, science writing, ocean policy and law, education and training, or related fields not requiring the level of research skills one develops while preparing an MS thesis. The GSO faculty view the MO as a terminal science degree, and those who want a Masters degree as a step toward the Ph.D. degree should choose the MS, rather than the MO degree. Alternatively, the MO is for students with an undergraduate degree, or high aptitude, in a scientific field, and who want to work in an applied field of oceanography. The MO will be particularly useful if the student has prior working experience in an applied area of marine science, or if the degree is combined with another higher degree in policy, management, law, business or in another technical field such as engineering. We anticipate applications from recent BS recipients, as well as those planning to continue in environmental law and from those who entered the workforce with a BS degree and who now require additional training for advancement.

GSO has a national and international reputation and our MS and Ph.D. students come from all over the US and the world. We also plan to recruit nationally and internationally for our MO program, but we are also interested in recruiting Rhode Islanders who are now in the workforce. Potential RI students could come from ocean industry, federal and state laboratories and from state agencies. A typical successful applicant will have a BS degree in a scientific field, an undergraduate GPA of 3.3 or higher, and scores on the GRE exams placing the student in the upper 75%. Alternatively, the successful applicant will demonstrate high motivation and aptitude through workplace experience, by high achievement in GSO courses taken prior to admission to the MO program, or in some other way. GSO plans to enroll approximately 5-15 MO students per year beginning in fall, 1997, and within a few years, have up to 25 MO students in residence.

## C. INSTITUTIONAL ROLE

The primary GSO mission is research and graduate education. The MO is a response to two important trends in graduate education.

First, we anticipate that the degree will be popular with those who desire additional scientific training after spending several years in the workforce, but who do not have the time or the professional requirement to make the 2-4 year commitment that is required for an MS in Oceanography. We hope that this degree will attract a relatively high percentage of Rhode Islanders, particularly those presently in the work force, who need additional training for advancement or for new careers. Second, the MO is an excellent choice to complement another higher degree, since it can be completed in 1 to 1.5 years. For example, a student could acquire the MO and a law degree in the same amount of time (4 years) that many oceanography students now spend on a thesis-option MS degree. A student could also acquire the MO and the MMA degree at URI in 2 years and thus acquire a strong background in both ocean science and policy. Producing scientists who are versatile and have a wide variety of skills is one of the key recommendations of a recent National Academy of Sciences report on the future of graduate education of scientists and engineers (Committee on Science, Engineering and Public Policy, National Academy of Sciences, 1995). The MO can do part of this job, and in a relatively short period of time, so that it is practical for graduates to also acquire another higher degree.

We initially anticipate approximately 5-10 new MO students per year and can reasonably accommodate up to 15 new MO students per year with present faculty and resources. Some will matriculate full-time and complete the degree in 1 to 1.5 years. Others may enroll part-time and take longer to complete their degree. We anticipate a maximum of 25 MO students in residence.

## D. CONTENT

### 1. Curriculum Display

**a. The title of the program is Masters of Oceanography, CIP Number: XXXXXXX.**

**b. Courses.** Courses for the new degree will be chosen from the existing graduate courses in oceanography taught at the Graduate School of Oceanography, URI, and supported by courses offered in other colleges including College of Resource Development and College of Engineering. Students will be encouraged to take only science courses to fulfill their 27 or the 30-credit requirement, but will be required to take 3-credits in social science or policy.

Graduate School of Oceanography

1. Required Courses:
   - OCG 501 Physical Oceanography
   - OCG 521 Chemical Oceanography
   - OCG 540 Geological Oceanography
   - OCG 561 Biological Oceanography

2a. Possible Science Electives:
   - OCG 480/580 Introduction to Marine Pollution
   - OCG 505 Marine Analytical Chemistry
   - OCG 510 Descriptive Physical Oceanography
   - OCG 523 Organic Geochemistry of Natural Waters

OCG 524 Chemistry of the Marine Atmosphere
OCG 531 Synoptic and Dynamic Meteorology
OCG 533 Principles of Scientific Writing (approval pending)
OCG 576 Marine Microbiology
OCG 591/592 Individual Study
OCG 605 Dynamical Oceanography
OCG 606 Aquatic Community Ecology
OCG 610 Geophysical Fluid Dynamics I
OCG 611 Geophysical Fluid Dynamics II
OCG 613 Waves
OCG 614 Tides
OCG 620 Chemical Distributions
OCG 623 Physical Chemistry of Seawater
OCG 625 Organic Geochemistry of Sediments
OCG 628 High Temperature Geochemistry
OCG 643 Subduction Zones
OCG 644 Global Paleoclimatology
OCG 645 Petrology of the Oceanic Crust
OCG 646 Deep-Sea Sediments and Processes
OCG 649 Plankton Paleoecology
OCG 651 Marine Stratigraphy
OCG 652 Marine Geophysics
OCG 655 Paleomagnetism and Geomagnetism
OCG 661 Phytoplankton Taxonomy
OCG 663 Phytoplankton Physiology
OCG 464 Phytoplankton Ecology
OCG 665 Marine Bio-Optics and Remote Sensing
OCG 668 Productivity of Ocean Margins
OCG 669 Marine Fish Ecology and Production
OCG 670 Fish Population Dynamics
OCG 671 Marine Zooplankton Ecology
OCG 673 Fisheries Oceanography
OCG 678 Low-Temperature Geochemistry
OCG 693/694 Special Studies
OCG 695 Seminar in Oceanography

College of Resource Development

NRS 402 Wildlife Biometrics
NRS 410 Fundamentals of GIS.
NRS 423 Wetland Ecology
NRS 424 Wetlands and Land Use
NRS 461 Hydrology and Water Management
NRS 505 Biology and Management of Migratory Birds.
NRS 509 Concepts of GIS and Applications in Environmental Science
NRS 514 Fate of Organic Chemicals in Soils and Sediments.
NRS 522 Advanced GIS Analysis of Environmental Data.
NRS 526 Microbial Ecology of Soils and Sediments
NRS 555 Applied Coastal Ecology
FST 415 Fishery Science
FST 510 Applied Problems in Marine Fisheries Ecology
FST 516 Early Life History of Aquatic Resource Animals
FST 521 Evaluation of Fish Capture System.

College of Engineering

OCE 560 Introduction to Data Collection Systems
OCE 561 Introduction to the Analysis of Oceanographic Data.
OCE 565 Ocean Laboratory I
OCE 571 Underwater Acoustics I

2b. Partial, but not exclusive list, of Possible Social Science and Policy Electives:
MAF 456 Polar Resources and Policy
MAF 461 Coastal Zone Management
MAF 511 Ocean Uses and Marine Sciences
MAF 515 Marine Pollution Policy
MAF 521 Coastal Zone Law
MAF 523 Fisheries Law Management
MAF 562 Admiralty Law
MAF 577 International Ocean Law
MAF 582 Estuarine Management
REN 534 Economics of Natural Resources
REN 514 Economics of Marine Resources
REN 440 Benefit-Cost Analysis

**c. Description of New Courses. No new courses will be required for this degree.**

**d., e., f. and g. Required courses, options course distribution requirements and number of free electives.**

Course Distributions
1. Required Courses (13 credits): OCG 501 (Physical Oceanography), OCG 521 (Chemical Oceanography), OCG 540 (Geological Oceanography) and OCG 561 (Biological Oceanography).
2. Scientific Tool Requirement: Statistics course (e.g. STA 409, STA 532, STA 550), Data Analysis (e.g. NRS 402, OCE 561) or Scientific Writing (OCG 693G/OCG 533). (3 credits).
3. Seminar in Oceanography (OCG 695, 2 credits).
4. Electives (9 credits) 6 credits are normally chosen from the list given above in section 2a, but other science courses suitable for graduate credit can be substituted with the approval of the student's advisor and the Program Director (Associate Dean, GSO). In addition, students are required to take a 3-credit course in policy, management, economics, or related area (examples given in 2b above) depending on the student's specific interests and background.
5. Independent Study (OCG 591 or 592 for 3 credits). Individual study of an assigned topic or special problem requiring a major paper involving literature search and/or original investigation supervised under one or more members of the GSO faculty, including Adjuncts.

**h. Total Number of Credits.** 30 Credits will be required for this degree. In addition, students will be required to pass a written comprehensive examination based on the material presented in OCG 501, OCG 540, OCG 521 and OCG 561.

**2. <u>Typical Curriculum</u>**
i) Full-Time with no prior courses. Degree completed in 1-year.

Fall:
OCG 501 Physical Oceanography (3)
OCG 561 Biological Oceanography (4)
OCG 695 Seminar in Oceanography (1)
OCG 693G/OCG 533 Scientific Writing (3)

Spring:
OCG 540 Geological Oceanography (3)
OCG 521 Chemical Oceanography (3)
REN 514 Economics of Marine Resources (3)
OCG 668 Productivity of Ocean Margins (3)
OCG 695 Seminar in Oceanography (1)
Summer:
OCG or NRS Elective (3)
OCG 591 Individual Study (3)

ii) Full-Time with no prior courses. Degree completion in 3 semesters with no summer courses.
Fall:
OCG 501 Physical Oceanography (3)
OCG 561 Biological Oceanography (4)
OCG 695 Seminar in Oceanography (1)
OCG 693G/OCG 533 Scientific Writing (3)
Spring:
OCG 540 Geological Oceanography (3)
OCG 521 Chemical Oceanography (3)
OCG 668 Productivity of Ocean Margins (3)
OCG 695 Seminar in Oceanography (1)
Fall:
OCG 591 Individual Study (3)
NRS 509 Concepts of GIS and Applications in Environmental Science (3)
REN 514 Economics of Marine Resources (3)

**E. INTERINSTITUTIONAL CONSIDERATIONS**

GSO is the premier oceanographic institution in the New England region, and based on recent rankings by the National Academy of Sciences is one of the top 5 in the US. No other New England institution offers the depth and breadth of the GSO graduate curriculum. We see only positive impacts of the MO program on other graduate programs at URI. For example, we will encourage MO students to also consider obtaining the MMA degree from URI's Marine Affairs Department as a master's in both ocean science and policy is a powerful combination. We will not compete with the MMA program, and in fact, may provide additional students for some of their courses. We also see positive impacts on graduate programs in URI's College of Resource Development, as we will encourage MO students to consider courses in that college as electives. URI's College of Continuing of

Education should also benefit, as potential MO students may choose to take 1 or more courses through CCE before matriculating into the MO program.

We anticipate no specific transfer agreements with independent institutions, no cooperative arrangements with similar programs, no external affiliations with other agencies and the proposed program will be available only to students from Vermont under the NEBHE Regional Student program. We are discussing the possibility of some form of cooperation with regional law schools, but these discussions are exploratory only and the other parties do not wish to be identified in this proposal.

## F. RESOURCES

The number of GSO MS and Ph.D. graduate students has declined from a high of more than 150 students in residence during the 1970s and early 1980s to less than 110 in fall, 1996. The number of GSO faculty has also declined during this period, but GSO can reasonably accommodate up to about 15 new MO students per year within the existing administrative structure and with the present faculty, curriculum, learning resources, facilities and equipment, and operating expenses. MO students will be administered and advised in the same way as MS and Ph.D. students. All GSO faculty may participate in the program. We have no special funds for scholarships or fellowships for this program, and expect MO students to cover all tuition and other expenses.

As MO students will be incorporated into GSO's existing graduate program, the MO program will provide a net increase in revenue.

## G. EVALUATION

MO students will be admitted, graded and evaluated by the same standards as GSO MS students. We will evaluate the success of the program using the following criteria:

1. Quality of the applicants and of those matriculating into the program, compared to GSO MS students and to national statistics for MS students in oceanography as compiled and published by the Consortium for Oceanographic Research and Education (CORE).
2. Performance in GSO courses as compared to GSO MS students.
3. Career placement of graduates, with the specific attention to the type of job as compared with the MS students. In other words, one of our goals is to develop new career pathways for GSO graduates, and the MO program will not be successful if the graduates compete (probably unsuccessfully) for the same jobs that attract our MS students.
4. GSO will ask the Marine Programs Advisory Committee to establish an ad hoc subcommittee (possibly adding members to the subcommittee from GSO alumni who presently hold jobs in areas for which the MO program hopes to place graduates) to evaluate the success of the program.