

December 8, 2015

**PROFESSOR BRIAN PALENIK, Chair**  
**Department of Scripps Institution of Oceanography**

**PROFESSOR CATHERINE CONSTABLE, Director of the Earth Sciences Program**  
**Department of Scripps Institution of Oceanography**

**PROFESSOR JANE TERANES, Associate Director for Undergraduate Education**  
**Department of Scripps Institution of Oceanography**

SUBJECT: Undergraduate Program Review for the Scripps Institute of Oceanography Earth Sciences  
Program

Dear Professors Palenik, Constable, and Teranes,

In an effort to finalize past years' reviews, the Undergraduate Council has discussed the Scripps Institute of Oceanography, Earth Sciences 2011 Undergraduate Program Review. The Council acknowledges the delay in the final memo, but supports the findings and recommendations of the review subcommittee and appreciates the thoughtful and proactive response from the Program.

The Council looks forward to reviewing the Program again in the 2018-2019 academic year. At that time, our goal is to learn about the Program's progress in implementing the recommendations of the program review subcommittee and the Undergraduate Council. The Council extends its thanks to the Program for its engagement in this process and we look forward to the continued discussion.

Sincerely,

Geoffrey Cook, Chair  
Undergraduate Council

cc: R. Continetti  
T. Javidi  
R. Rodriguez  
B. Sawrey  
M. Sidney

## **UNDERGRADUATE PROGRAM REVIEW SCRIPPS INSTITUTION OF OCEANOGRAPHY**

The undergraduate program in Earth Sciences at the Scripps Institution of Oceanography (SIO) is a very impressive degree program, and has grown significantly over the past few years. The committee interviewed several groups associated with the program and found a high level of satisfaction, passion for education and optimism for the future. While SIO is generally considered to be a world class research institution at the doctoral level, the continued success of the undergraduate program would be crucial for bringing dynamism, act as a recruiting tool, and in addition be well integrated with the mission of the UC San Diego campus.

Much of the recent success in the program has come from a change in major requirements, which has allowed greater flexibility for students to complete their degrees in a four-year period, catering to a broader range of student interests, while maintaining rigor in the major. Students and faculty alike have thrived with a program in which class sizes have been small, allowing close interaction between faculty and students. In addition, students have had the opportunity to work in labs of internationally renowned researchers, providing rare opportunities for students in an undergraduate program.

However, the faculty has had to develop their courses in an environment in which there has been minimum University support, very little lab and office space devoted to the program, and from the viewpoint of a very powerful research institution in which faculty are judged for tenure and promotions almost exclusively on their research output. In addition, many of the instructors are only partially supported by the University, so they need to spend significant effort raising external funds for the remainder of their salaries. Given the significant roadblocks facing the development of an undergraduate major at SIO, the committee was very impressed with what was accomplished, and we are even more optimistic about the future potential of this program. We are heartened to learn that in spite of minimal University support, some external support for field programs has been successfully obtained, with the promise of further growth in the future.

Because of the recent rapid program growth in conjunction with support and personnel limitations, we suggest the following:

### Major Curriculum: Issues and Recommendations

1. Both faculty and students noted the need for several new elective courses, e.g., in soil mechanics, engineering geology, summer field camp, hydrology, etc. (petrology is already taught – just to a small number of students). We recommend that the general campus aid SIO during its transition to a larger Earth Science Major and the incipient Marine Biology major with temporary FTE money, etc.

It was noted that some attention to ability to teach these courses should be given in new faculty hires. Also, many of the courses listed in the catalog are taught very infrequently and are consequently not periodically available to undergraduates. It was noted that the teaching requirement has been increased recently from four to six units, which may be useful in this direction. Additionally, SIO faculty teach many ESYS core courses, which may be unsustainable as the requirements increase. An arrangement between ESYS, SIO, and the campus might help encourage SIO to continue to meet this campus-wide teaching need as SIO's commitments to its own increase in majors.

A recently hired LSOE teaches many of the courses, as many as six in a year, and some students wished more contact with other, more research oriented, professors. New faculty hires may be able to teach the required and elective courses, and a gradual increase in teaching load for all the faculty should help with this problem.

Several sources indicated that the grading was uneven across the faculty, and we recommend that instructors be given input on standard practices in grading.

2. The growth of the major has resulted in long wait-lists for classes and inability to register for required classes, causing understandable frustration among the major students. Limitations include inadequate class space as well as insufficient resources to deal with larger enrollments. Some students felt that there should be some priority for SIO majors and ESES earth science majors. Plans to accommodate the upper division classes in light of the increased lower division enrolment are to be considered. The students also expressed a need to have more quantitatively oriented classes.
3. Based on our meeting with around ten Earth Science Majors and their unanimous input, we recommend that that department consider the following, but recognize that the limited set of students may not be representative.
  - A. Is BILD 3 a necessary graduation requirement for all ES/Geology students? The students we spoke with felt it is not useful for geologists.
  - B. Is the laboratory portion of requirement for SIO 104 Paleobiology necessary for all students? The students like the four-unit lecture part of the course, but think the additional two-unit lab portion is not relevant for all geology students.
  - C. Students felt that SIO 100 could be a six-unit course, because this course actually takes much more time than any other four-unit course.
4. There was considerable discussion, from the students as well as other instructors, on the lack of summer field experience for students, in the curriculum, which is common to most other top ranked competitive Earth Science programs. Such a course acts to solidify the students' knowledge and skills as a geologist and promotes professional confidence in addition to increasing job prospects. We realize that the cost of a summer field program can be fairly high to initiate, there are ways in which one can be initiated at lower costs, e.g.; (a) To team with an existing field program (for example, in San Diego State University) and providing the marginal support for the additional students, (b) Make information available to students about which other programs may allow students to join their field camps.

Some students would also like an opportunity to get experience working with industry, through internships. This could be facilitated through dedicated advising by faculty. Another way is to participate in or foster career days on campus, where students can meet industry personnel (or graduate alumni) or company recruiters. An undergraduate club was proposed by the students to enhance such the educational and professional experiences.

### Student advising and Instructional support

At present, students are mostly being advised informally from by an enthusiastic and popular LSOE. An additional compensated post/advisor for education, e.g., the Vice Chair of Undergraduate Education, may be needed (as in many UCSD departments) in light of increased enrolment. Such a role is currently being played by program directors and seems to be voluntary. The academic coordinator, who may need more help and authority, does much of the work.

Apart from the campus mandated training, there does not seem to be any specific instruction for SIO based teaching assistants (TAs). We recommend instituting sessions where training in teaching techniques, academic integrity, etc. is done. For courses that have laboratory or field components such training could involve issues such as first aid administration, conflict management, etc. Many TAs serve as graders and could be involved in leading discussion sections. It was suggested that SIO involve the Center for Teaching Development (CTD) in improvement of teaching caliber.

Moreover, the senior undergraduates would like an opportunity to serve as TAs (as in many other departments) and it was unclear for them as to how they could apply. This can also help with the growing class sizes as many Earth Science classes involve numerous field trips and lab sections, and TA support is severely limited. We then suggest increasing TA support and supporting the option of increasing the use of undergraduate TAs, either paid or for course credit.

### Teaching Facilities and Office, Laboratory, and Study Space

The lab and office space available to the SIO Earth Sciences undergraduate program appears to be woefully inadequate. It was unanimously thought that additional office space on the Main Campus would be useful as the Earth Science and Marine Biology majors grow. The purposes would be: as space for instructor office hours, as well as for TA office hours (TA offices at SIO were considered not useful due to the distance from the campus and were poorly/not attended)

The laboratory and field component of many of the Earth Science courses are universally praised as extremely useful. However, with the increasing popularity and student numbers, access to the experimental facilities is becoming increasingly hard. We heard that some smaller labs were even held in instructor's personal research areas. There is then a serious need for additional space on both the main campus and SIO if the undergraduate program is to thrive.

Clearly more lab space and support for laboratories will be needed. We heard reports concerning the poor state of some of the existing lab facilities, e.g., it was reported that the Ritter lab was too small and the equipment was not well maintained (e.g., non-functioning microscopes in the mineralogy lab.) and the only lab on the UCSD main campus (York 3030) was too small. The space for computing facilities is scarce as well, with room capacities of around four computers. Several remedies are possible, all involving some resource input from the campus (as computing courses serve students outside of Earth Sciences, as well).

We heard from several groups, especially the TAs and students that the undergrads need a space (say, for at least 10-12 students at a time) for studying on the SIO campus - which should preferably be available 24 hours/day.

### Computing and Software:

SIO 110 teaches GIS (involving skills invaluable to all aspects of the Earth Sciences) and currently only has software licenses for 16 workstations, which is a limitation with increasing number of students. We learnt that the students are presently being asked to use their own laptops and obtain their own ArcGIS licenses, a situation that may be difficult to sustain. Given the importance for professional employment through the learning of such software, we recommend finding means to expand the number of licenses and probably also the required space.

In summary, we have a highly positive view of the state of the undergraduate program at SIO, with much scope for further improvement in light of the increased popularity and enrollment. In our report, we have highlighted issues related to the major curriculum; adequate classroom, laboratory, and computing space; in addition to student advising and instructional support- all of which need attention and additional resources. Additionally new FTEs would also be needed to replace lost faculty in key areas, e.g., in petrology and geochemistry. It was noted that we only met with students and faculty from the Earth Science Major. In this context, we recommend that the Marine Science Minor and new Marine Biology Major be reviewed in around three years since we are unable to comment on these at this time. Consequently, better coordination would be desirable between the ocean sciences and the earth sciences.

We are also optimistic that the new marine biology program would mark a definitive milestone for the visibility of SIO at the undergraduate level. Such a program also would need increased resources, which the department is aware of and working towards ramping up. We recommend that UCSD provide as much extra support as it can during the difficult transition to where the SIO undergraduate programs play a larger and a major role.

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