

University of Washington
School of Oceanography 2010-2011 Academic Program Review

Daniel E. Schindler, Professor, UW School of Aquatic and Fishery Sciences,
Box 355020 (Committee Chair)

David L. Eaton, Professor, UW Department of Environmental and Occupational Health
Sciences; and Interim Vice Provost for Research, Box 354685

Mark Abbott, Dean, College of Oceanic and Atmospheric Sciences, Oregon State University,
104 COAS Administration Building, Corvallis, OR 97331-5503

M. Susan Lozier, Professor and Chair, Nicholas School of the Environment, Division of Earth
and Ocean Sciences, 333 Old Chemistry Bldg, Box 90230, Durham, NC 27708

December 9, 2011

Overview

The review committee prepared this report on the status of the School of Oceanography (SoO) at the University of Washington based on the contents of the SoO self-study (submitted September 17, 2010), and on a site visit on November 8-9, 2010. During the site visit, we met with a large cross-section of faculty, staff, graduate students, undergraduate students, and administrators in a variety of forums. These meetings were focused on a discussion of current strengths and weaknesses of the current school, and of the various groups' visions for how the SoO should adapt to embrace an ever-changing group of disciplines that comprise modern oceanography. Importantly, these discussions were placed within the context of a changing fiscal climate and the integration of SoO within the new College of the Environment (CoEnv).

Our overwhelming impression of SoO is one of an extremely healthy program making important contributions to both the overall mission of UW and to the science of oceanography on the global stage. The SoO has continuously attracted substantial external funding, provided extremely high quality graduate and undergraduate degrees, is nationally and internationally recognized for its scientific accomplishments, and continues to expand and modernize an impressive array of state-of-the-art ocean observing systems. Faculty, staff, and students are almost invariably positive about the current state of the SoO. There is no doubt to us that all degrees offered through the SoO should continue to be offered, and that the funding required to maintain the high caliber undergraduate and graduate training be made a high priority of the CoEnv and the UW. We do not see a need for another review before the next scheduled 10-year review.

While our impressions of the UW-SoO were extremely positive, we identified several issues that we believe need attention to ensure that SoO maintains its international reputation for excellence in marine sciences, and to ensure the highest quality teaching programs. We provide an overview of the most important issues in the next few paragraphs, and then expand on these in the main body of our report.

The current erosion of budgets at the UW and the uncertainties of Activity Based Budgeting (ABB) have produced an overriding atmosphere of concern for maintaining the quality of the research and the graduate program within SoO. Because SoO has emphasized a highly experiential teaching program (particularly at the undergraduate level) there is now a nearly ubiquitous concern that changes in the distribution of state funding under ABB within the UW threatens the longstanding strengths of SoO. Both faculty and staff were concerned that an increasing emphasis on the allocation of UW funds based on Student Credit Hours (SCH) would undermine the educational program they have built over the last 50 years and, in fact, could adversely affect the quality of the graduate and research programs as well. While we had extensive discussions about how to increase SCH in SoO, we believe that any changes radical enough to substantially increase SCH would jeopardize the quality of undergraduate and graduate education the SoO currently offers. We strongly encourage the SoO to continue to emphasize the high-quality education that has garnered it national recognition, and to develop additional strategies to attract SCH only if such strategies do not jeopardize the focal curriculum. We outline some suggestions to accomplish this in the Undergraduate Education section below. However, for this strategy to work, it is imperative that the CoEnv and UW administrators recognize and appropriately reward the commitments required to maintain the superb experiential education that SoO offers. We are confident that the administration appreciates the financial and time investment that such commitment requires, and believe that most of the concerns over ABB are based on misunderstandings of what will occur. We encourage SoO to continue to work to its strengths!

During the site visit, concerns about the external funding environment were also voiced, especially by the younger faculty, but also by the technical staff. Because success rates for federal funds have eroded over the last few decades, and since there is an increasing emphasis on multidisciplinary solicitations that require large investigator teams, young professors face steeper hurdles on their way toward creating vibrant and sustainable research programs than they likely did in the past. An additional concern with the funding environment focused on oceanographic research infrastructure, including both technical staff and facilities, which have traditionally been well supported by federal funding. With the decline in the success rate for research proposals and the continuing rise in the costs of facilities and staff, it is increasingly difficult to maintain continuity in the technical expertise needed to conduct first rate oceanographic research. In fact, the primary dependence of these facilities on competitive grants means that they can deteriorate (or vanish) during extended funding shortfalls. We encourage UW administration to consider mechanisms to invest in these technical capabilities in order to buffer them from the vagaries of federal funding.

A second major concern that emerged from the site visit is that the internal intellectual organization of SoO, with a strong emphasis on its historical roots, may not serve it well as it enters the CoEnv and, more importantly, as it faces the oceanography research opportunities and educational imperatives that lie ahead. The SoO is organized along four disciplinary lines (Biological Oceanography, Chemical Oceanography, Physical Oceanography, and Marine Geology) that largely reflect the funding structure at NSF and a curriculum structure that developed early in the history of SoO. It is clearly important for SoO to maintain strength in the wide variety of disciplines that constitute oceanography. However, it is our firm belief that this internal structure is sufficiently rigid that it impedes innovation across the SoO. While the current structure is amenable to maintaining the disciplinary balance in the undergraduate program curriculum, it does not encourage interdisciplinary linkages within SoO. The SoO has recognized this limitation and has attempted a remedy by identifying interdisciplinary research and teaching themes (e.g., coastal oceans, carbon and climate) as a framework to encourage more collaboration within the School. However, this alternative organization scheme is sufficiently *ad hoc* that it falls short of achieving the intellectual potential in the SoO. One exception may be the Program on Climate Change, but recent budget cuts appear to have seriously impacted the program and its sustainability is uncertain. We believe that SoO, particularly its new leadership, needs to work explicitly to enhance communication and collaboration across the School. There are many avenues from which to approach this cross-pollination, but a simple high-impact activity to quickly reinvigorate integration across the SoO is the re-initiation of a well-funded, school-wide weekly seminar series. Additionally, while SoO clearly needs to be careful about maintaining its disciplinary expertise, we believe strongly that new faculty hires should be motivated primarily by emerging thematic opportunities within oceanography rather than strict adherence to its disciplinary roots.

The combination of both these internal and external forces for change should encourage the SoO faculty and UW leadership to continue to revise their strategic vision on a regular basis. The 10 year 'self study' document provided an excellent summary of the strengths and accomplishments of the SoO over the past decade and identified important new directions for the SoO in the coming decade. These new directions include building on the three interdisciplinary themes (Climate and Carbon Cycling, Coastal Ocean and Extreme Environments). The document also proposed several joint faculty recruitments (Computer Science and Engineering, Electrical Engineering, Civil and Environmental Engineering, Genome Sciences, and Public Health, were specifically mentioned). In revising their vision, the most effective balance between teaching and research should be considered, as well as the appropriate mix of faculty positions and the most promising hiring strategies. The SoO is encouraged to develop a strategic plan that is mostly

resilient to possible changes in the external environment and one that will best position the SoO for future success in research and education. The vision must be based on an explicit set of values and principles that can be used to guide the SoO to set priorities as to what it must do (as well as what it won't do). It should also provide a parallel strategy for facilities and infrastructure (including information technology) that will be needed to support the SoO research and education vision. Although support for higher education and research may look bleak at the moment, the SoO should develop a vision for what it will be after the storm passes.

In the sections below we provide more detailed feedback on specific themes that emerged from the site visit.

Administrative Leadership

SoO is at a critical crossroads. The move to a broadly defined College of the Environment (CoEnv) from the more focused College of Ocean and Fisheries Sciences (COFS) presents several serious challenges for SoO, particularly in representation of the School on the national stage and within the UW. The previous dean of COFS was both an established oceanographer and was able to commit considerable energy to promoting UW Oceanography. Because the CoEnv has a broader mission than COFS had, advocacy for SoO by the new CoEnv dean will be considerably less than it has been in the past. It will thus be critical that the new director of SoO has both the interest and capabilities for promoting the research and teaching mission nationally, within the state, and across UW. It is equally important that the director has the time necessary to serve as such an advocate for SoO. Our recommendations for a need to adapt the administrative leadership of SoO are mostly concerned with this new set of responsibilities that will be critical for the new director. Our recommendations are:

- the Director should be supported by 12 months of permanent (state) support
- the search for a Director should target an individual with the reputation, skills, and desire to act as an effective advocate for the research, teaching and service missions of SoO
- the Director should be an individual who is receptive to, and engages, a strong Faculty Council both as a source of innovation and for delegating the administrative needs of the school
- SoO should establish a more active Faculty Council that works more directly with the Director than it has in the recent past to assume some of the administrative responsibilities of the School so that the Director is able to properly represent the school on all scales, especially nationally.
- Depending on the roles the Faculty Council assumes, Affiliate Directors should also be appointed to further alleviate some the administrative burden on the Director. Such Affiliate Directors may focus on issues such as faculty development, the graduate program, research infrastructure, and space and facilities.
- the Director would preferably maintain an active research program

Faculty Structure

The SoO has a long history of success with its current distribution of faculty positions. The current faculty includes 30 fulltime tenure track positions and 18 WOT faculty supported primarily on soft money. The current structure is highly dependent on the abilities of both WOT faculty and tenure-track faculty to attract external grants. Tenure track faculty often buy-back up

to three months of their salary per year to dedicate more time to research, and the balance of their state salaries are then used to support WOT faculty. Given the current funding climate, the sustainability of this system is in jeopardy. Thus, we believe that SoO should maintain their recent trend towards hiring tenure track faculty. Appointments at the APL where federal funding is more reliable than through standard grant avenues are particularly amenable to maintaining WOT positions in SoO. Also in light of the current funding trends, assistant professors should be appointed on a 9-month basis to relieve the stress of having to raise 6 months of salary within 4 years of arriving at UW (see subsequent comments in section on junior faculty).

During the site visit, several groups expressed their perceived need to maintain the current size of the faculty to support the central teaching and research activities of the SoO. While the value of the current WOT faculty is readily apparent, we do not believe that maintaining the current faculty size is a useful goal in and of itself in formulation of a hiring plan. We believe that a hiring plan should reflect the perceived intellectual needs of the SoO given a combination of thematic and disciplinary expertise required to capitalize on emerging research opportunities both regionally and nationally.

Future Faculty Hires

The SoO is reaching a critical age structure such that a large proportion of the faculty will retire in the next 5-10 years. SoO is acutely aware of this problem and has developed a 10-year hiring plan as a means to prepare for hiring opportunities as they become available. While the description of the future hiring plan in the self study seemed to reflect a balance of perceived disciplinary and thematic needs in the next few years, a different perspective was communicated during the site visit. Our overriding impression from the site visit was that the School was currently too focused on replacing disciplinary expertise than it was poised to capitalize on emerging research opportunities. While it is clear that certain disciplinary expertise is absolutely required to maintain the intellectual foundation of an oceanography curriculum and research program, too much emphasis on this will likely stifle innovation in the long-term.

Our recommendations:

- The hiring plan should be a living document that is revisited and updated on a routine basis as SoO needs will likely be an ever-changing set of targets.
- We strongly discourage a curriculum-based strategy for developing and updating the hiring plan. The hiring plan should be more focused on a mix of disciplinary expertise and thematic interests across SoO. While the overall SoO curriculum provides an effective structure against which to assess the disciplinary balance with the School, adhering too closely to a rigid curriculum will likely impede the process of adapting to an ever-changing landscape in the field of oceanography
- Once SoO has updated their vision for hiring based on emerging research themes, the faculty and administrators of the School need to decide how best to make those hires. In particular, the balance between targeted hires and open searches, between WOT and tenure-track faculty, and between SCH and RCR, should be assessed. While the faculty will clearly need to assess the extent to which the hiring of WOT faculty are necessary to meet the School's long term goals, it is apparent that research faculty at APL and researchers at PMEL provide resources and guidance for graduate students, enhance research collaborations, and provide instructional expertise on an as needed basis. Essentially, these researchers play many of the roles that WOT faculty within SoO do, though admittedly these roles are filled more so for the physical and chemical

oceanography units and less so for the others. Thus, the faculty should consider whether the School is not best served by moving toward a model where faculty positions within SoO are all tenure track and the WOT positions are essentially “outsourced”.

- SoO should make the diversification of its faculty a priority for future hires. While some progress has been made in this regard with the previous 5 hires, we strongly urge the School to actively develop a strategy to recruit underrepresented groups into the faculty. Such a strategy might be to agree that the hiring plan be flexible with respect to thematic or disciplinary fields as world-class scientists who would diversify the faculty become available on the job market.

Junior Faculty

SoO has hired 5 assistant professors in the last 5 years, all in line with the 10-year hiring plan developed in 2005. By all accounts these new faculty seem generally satisfied with their positions and are making progress towards achieving tenure and promotion. However, based on our conversations with 3 of these new hires, we believe that more attention should be paid to mentoring and integrating new faculty into SoO. While the self-study outlined the School’s basic plan for providing periodic feedback to its assistant professors, our assessment based on interviews with this group is that the plan is not working effectively. We believe that there should be more formalized engagement of the junior faculty by the senior faculty in terms of both providing direct mentorship and in integrating them into existing research programs and grants. Given the declining success rates in grant applications, it is critically important that the senior faculty assist their less experienced junior colleagues, and include them in large grants where possible. The new faculty certainly appreciate the 12 months of salary they receive during their first 3 years on the job, but are feeling under extreme pressure to successfully raise the 6 months per year that is required by year 4 of their appointment. Given the current funding climate we believe that SoO should make future appointments on a 9-month basis, with the option of buying back faculty time if faculty are successful at raising more than 3 months per year of salary. SoO should also consider the role that generous startup packages may play in this apparent isolation of some of the junior faculty. If more senior faculty think that new hires are “set up,” then they may be less likely to seek out opportunities to mentor junior faculty.

Undergraduate Program

SoO has been remarkably successful at developing and maintaining a world-class undergraduate BS degree. Based on discussions with SoO undergraduates, the opportunities for research with professors and graduate students are the highlight of their degree program. While they feel the SoO degree may be more demanding than a lot of other UW degrees, they were almost overwhelmingly enthusiastic about the program. We see little need to change much in the BS degree offered by SoO, but offer several suggestions for broadening the impact of the undergraduate degrees of the School. Our recommendations are:

- Continue the focus on high quality experiential learning. SoO, along with other units at UW, is clearly a leader in this type of education. We suggest that SoO continue to maintain this focus for its undergraduate teaching strategy.
- UW and CoEnv must recognize the importance of the high quality, but relatively expensive, educational program of SoO. Thus, an ABB accounting strategy must be flexible enough to recognize and reward the intensive, high-quality undergraduate program that SoO offers. Such recognition and reward must occur both at the level of

UW and within CoEnv. The quality of the SoO education should be considered one of the defining characteristics of the entire UW. Related to this is the provision of central support for ‘ship time’ that is an essential component of the experiential learning of both undergraduate and graduate students.

- While we see maintaining the focus on experiential learning the best strategy for maintaining prominence within the UW and nationally, we do see ways to increase the student credit hours (SCH) that SoO can garner. We suggest that the SoO consider the following for attracting a greater number of students to its classes and majors:
 - a) Revive the dormant BA in Oceanography. While the strength of the SoO undergraduate program will likely always be in training young scientists, there is increasing interest and growing career opportunities for students with training in the human dimensions of marine ecosystems. We can envision a BA degree that maintains a strong science foundation, but that replaces some of the upper division or more specialized science courses with courses in humanities, economics and policy taught in other departments on campus. We do not believe this would weaken the BS that is currently the sole focus of the SoO undergraduate program, but would rather attract a slightly different type of student interested in applying the intellectual basis of ocean sciences in more socially relevant contexts. Such a major would mesh well with the mission of the CoEnv and might attract additional support as a result. This should be done in careful consultation with the Program on the Environment to ensure that the two programs are complimentary, and not redundant.
 - b) Include more data intensive projects in the experiential learning components of education. While such opportunities would not necessarily translate into field (ship or lab) experience for the students, projects in data management, visualization, and simulation are equally relevant and valid dimensions of the emerging field of modern oceanography. Such dimensions of experiential learning will likely attract students who might otherwise pursue an education in fields such as engineering, computer sciences, or information sciences.
 - c) While some ‘distance learning’ is currently a component of the undergraduate curriculum (e.g., Oceans 101), greater emphasis could be placed on developing more of these courses to be available to undergraduates at other institutions (both within the US and international) that do not have a marine sciences program.
 - d) While SoO seems to expend considerable effort at outreach to high schools and the UW undergraduate program, our meeting with SoO undergraduates suggested that this outreach is not as effective as it could be. Are there better ways for SoO to penetrate the UW undergraduate community to communicate the options for a degree in Oceanography? Are there more effective ways to advertise the SoO to high schools across the country?

Graduate Program

One of the best indicators of the strength of the SoO is its graduate program. The current student body is clearly bright and motivated. A large fraction of them hold national fellowships and it appears that most of the students publish their research during their graduate tenure. Most (~95%) of graduate students continue with careers within the field of oceanography following graduation; probably the clearest indicator of the quality of the SoO graduate program. Integration of APL and PMEL adds tremendous value to the graduate program in terms of funding and opportunity to work on a broad array of environmental problems for the students. Like the undergraduate student

body, the graduate students were very positive about the current graduate program and had few suggestions for improvement. We recommend the following to further strengthen the graduate program in SoO:

- Consider developing a professional MS program designed more for students interested in pursuing careers at the interface of oceanography as a science and its relevance to policy and business. Such a degree would mesh well with the mission of the CoEnv and provide a mechanism for better integration within the college and across the UW. Such a program would need to be planned carefully so as not to diminish the impact of the current science-based PhD program which is clearly the strength of the program and should remain as such.
- While the current graduate program is clearly very strong, it is relatively small given the level of research funding SoO attracts. Our feeling is that more external funding should be directed to developing a larger graduate student body. Such a strategy would require gradual refocusing of research funding from the large contingent of WOT faculty towards a larger graduate student population.
- Currently, the time to degree for the MS is highly variable and the requirements are not clear to the graduate students. SoO faculty should clarify the expectations and requirements for the MS so that it is granted on a more predictable time scale.
- The graduate program currently suffers from a distinct lack of interdisciplinary opportunities within the school. Students cited the PCC and the Astrobiology programs as the key opportunities for interacting with students outside their own disciplines, but saw few opportunities within SoO. Greater emphasis should be placed on promoting multi-disciplinary opportunities within the school. As mentioned elsewhere in this report, revitalizing a well-funded school-wide seminar series would go a long way towards initiating more integration across the disciplines of the School.
- Graduate students whose primary advisor is an affiliate professor should be assigned a co-advisor with a regular faculty appointment within SoO. While affiliate faculty clearly have enormous value in the graduate program, they often do not have the necessary knowledge of the curriculum and graduate school requirements to best serve their students. Co-advisors would likely eliminate this problem.
- Increasing the ethnic diversity within the graduate student population should be made a top priority for development and recruitment. While this problem is equally applicable across environmental sciences, it may be particularly acute in oceanography. Increasing ethnic diversity in oceanography would be a very tangible development goal. While there is currently some outreach to K-12 programs by SoO locally, it might be worth exploring how these efforts could be expanded both across the state and nationally. Given the scarcity of high quality undergraduate programs in oceanography nationally, SoO may be able to attract more ethnically diverse students to their undergraduate and graduate programs than they currently do.
- In a discussion with the Graduate Student Director, the committee learned that twice as many female graduate students as male graduate students finish with a terminal MS degree. While we had no other information upon which to judge whether this imbalance is proportional to the gender balance of the student population, the imbalance is sufficiently large to warrant an examination.

Staff

A substantial fraction of the operating budget of the SoO is used to employ a large staff. About half of the staff is currently dedicated to individual faculty projects while the other half provide general support to the school. The staff clearly constitute a motivated and positive community that makes substantial contributions to both the research and teaching activities in the School. The most noteworthy indication of the staff quality was a clear concern for maintaining the quality of the services they offer to the School as they approach their own retirements. Because nearly all staff are supported on soft money, they see few options for overlap between their careers and the careers of their eventual successors. Our recommendations are:

- Strengthen the funding safety net to keep staff employed during lulls in funding cycles.
- Allow for overlap of replacement staff with established staff as they retire. In many circumstances, such overlap will be critical for maintaining the quality of the research enterprise at SoO.
- Provide more explicit orientation of new faculty to the staff and facilities upon their arrival and before they develop their own labs. Such a strategy will be critical for reducing the size of start-up funds needed to attract new faculty and will better use existing staff and infrastructure resources within the SoO.
- Improve communication about opportunities for staff to take professional development courses. Many staff currently balance a wide range of job duties, for many of which they have no professional training.
- Enhance cohesion among staff and with the faculty. As with the graduate students, a departmental seminar series, with appropriate social trimmings, would accomplish a lot in this regard.
- Consider hosting an annual “State of the School” meeting to which all faculty, staff and students are invited. Award presentations, introduction of new School members, accomplishments of the past year and the goals for the coming year, can all be on the agenda for such a meeting.

Facilities and Infrastructure

Oceanography is a highly technical field requiring a wide range of instrumentation and associated support facilities (labs, ships, computing). SoO has been extremely successful at generating the external funding to develop cutting edge instrumentation to serve its research and teaching missions. SoO has also been successful at using its research infrastructure to enhance the quality of its undergraduate and graduate teaching. Such integration of the teaching activities within the research infrastructure is commendable and is yet another clear indicator of the high quality experiential teaching emphasis in SoO. Our recommendations to maintain the current infrastructure and facilities, and increase their impact on teaching and research are:

- It is critical that UW continue to provide the 45 days of ship time support to SoO for the *R/V Thompson*. While this is a relatively large expenditure, it is the focus of the undergraduate program and provides considerable leverage for research. Without this university support, the UW would have to re-compete for the NSF contract that provides the bulk of the support for the vessel. The UW is unlikely to receive the award without providing matching funds to the operating budget. The *Thompson* will need a mid-life refit in the next 5-10 years in order to maintain her operating capabilities. Although this

- refit will be funded by the federal agencies, it is critical that both SoO and COEnv begin to raise agency and university awareness of this issue.
- The *R/V Barnes*, a smaller vessel used for regional cruises, is the public ‘face’ of SoO in the state of Washington and in Puget Sound in particular. This vessel is nearing the end of its lifetime and a replacement is needed. We view this replacement as particularly important given the renewed interest in restoring the ecological status of Puget Sound and the regional public interest in this issue. The funding needed to replace the *Barnes* is not likely to be raised through traditional grants or state support. However, we see this as a very tangible and attractive development target for both the CoEnv and the UW in general. We encourage UW Advancement to develop a specific plan to get this ball rolling.
 - The dramatic rise of OOI (Ocean Observatories Initiative), coupled with the leadership and participation of SoO researchers in this initiative, provides considerable teaching and research opportunities for SoO faculty and students. While it is too early in the development of these large initiatives to assess how well they are taken advantage of locally, we suggest that the SoO develop an aggressive plan to implement these into the teaching program.
 - SoO is advised to develop an active Space and Facilities Committee to relieve some of the administrative burden of the new Director, but also so that more collective attention is given to space and facilities issues that invariably develop as new major research and teaching projects develop.
 - Other issues that need to be remedied include:
 - a) Upgrading and modernizing teaching labs, particularly Room 14 in the Oceanography Teaching Building
 - b) Staging area is desperately needed for the OOI, scheduled for launch in 2014. Currently there is only a limited amount of staging area needed for short term storage, testing and calibration, and final assembly of the complex infrastructure needed for the Regional Science Nodes portion of the OOI.
 - c) The SoO-wide computing facilities are not sufficient to support the integration of teaching and research that is desired to capitalize on the opportunities that the ocean observing platforms offer. In particular the Spatial Analysis Lab needs expansion so that it can more effectively capitalize on the teaching opportunities the ocean observing platforms offer. SoO needs significant upgrades to its networking infrastructure between and within SoO facilities in order to take advantage of eScience capabilities as well as observatories such as OOI. The SoO strategy should also address the need to balance local capabilities (in labs and offices) with more centralized resources. IT is moving towards mobility and personalization, and SoO will need to accommodate these requirements for both its research and education programs. More dedicated funding should be allocated to this and we suggest that the SoO take the initiative on a major infrastructure grant in an attempt to accomplish this.