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# Oceanography

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# THE NEW WORLD OF Oceanography

One of my favorite stories to relay to my undergraduate classes is about Adelard of Bath, who was an English naturalist in the early twelfth century during the reign of Henry the First. Among the 76 questions in Adelard's *Treatise on Nature* are:

- Why are the waters of the sea salty?
- How do the oceans not increase from the flux of the rivers?
- Whence comes the ebb and flow of the tides?

Many centuries passed before we had answers to these questions, though some of Adelard's questions remain up for speculation, including this one: Do beasts have souls? Today, we might substitute "politicians" for "beasts" and find the answer equally elusive. But that is a whole other story. Instead, I mention Adelard because I was reminded of him often when I served as a member of the US National Research Council Decadal Survey for Ocean Sciences Committee. During our committee deliberations, we too were trying to identify unanswered questions, in our case about the ocean. In the process of that identification, it was readily apparent to me just how much we had learned about the ocean since I started my graduate studies at the University of Washington over 30 years ago. Unlike the centuries it took for many of Adelard's questions to be answered, research questions today seem to have a half-life of just a couple of decades, if not just a few years.

As I near the end of my term as TOS president, I have been reflecting on how quickly our profession, not just the questions we pursue, has changed since I was a graduate student. At that time, information on research progress arrived monthly via subscriptions to journals from professional societies and background information was gleaned from a hike to the library. Graduate students, by and large, entered and left graduate school with the expectation of an academic career. And those graduate students, and certainly the faculty, were fairly homogeneous in their ethnic, gender, and racial makeup.

Today, in the digital age, almost anyone with a smart phone in almost any part of the world could, in a matter of time that I do not care to estimate, find most if not all of

the information that I teach my students over the course of a semester. Most any article written by most anyone on most any subject in oceanography can be found with a few keystrokes. The digital age has democratized access to information; information is ubiquitous, free, and available to everyone. Today, as I have written before in this column, graduate students have been largely disabused of the presumption that an academic career awaits them upon graduation. Nationwide, only about 10% of PhDs in science, technology, engineering, and mathematics (STEM) fields now move on into academic positions. We do not have firm numbers for ocean sciences, but a recent estimate is that only 43% of ocean science PhDs currently go into academia, which is likely an overestimate for those entering the professoriate since that estimate counts PhDs entering postdoctoral positions.

And today, though we have made little progress in recruiting underrepresented minorities into our profession, there has been a noticeable rise in the number of women in graduate school and in early and mid-career stages in ocean science professions. Today, the presence of women at meetings, on committees, in the classroom, in the lab, and at sea registers hardly any surprise.

My reflection of these changes turned to an assessment of how well The Oceanography Society, as a professional society, is responding to these changes. Here's my TOS report card:

**1** When there is so much information available, synthesis and context become all the more valuable. In this regard, *Oceanography* magazine does an excellent job. Quarter after quarter, this magazine, under the superb leadership of Ellen Kappel, provides a set of articles expertly wrapped around a topical theme. Yet the magazine is more than the sum of these parts, since it offers commentary on the threads that connect these articles. I am not the only one impressed with the value and quality of *Oceanography*: *Oceanography's* 2015 impact factor of 3.883 places it third among oceanography journals, on the heels of two review journals that are published annually.

**2** In an effort to provide further synthesis and focus, the TOS Council is considering reintroducing meetings that characterized the society in its first decade, namely, small format meetings with well-defined topics. These meetings would focus, for example, on one or two of the questions identified in the *Sea Change* report. The idea here would be to synthesize the current understanding of a particular research question and to place future research in the context of related questions and funding opportunities.

**3** Though relatively slow to fully understand the changing landscape for PhD graduates in ocean sciences, TOS is now committed to addressing this change on two fronts. First, TOS plans to pilot a mentoring program for graduate students interested in exploring careers other than academia. This mentoring program, set to begin in early 2017, will pair students across the country with two senior oceanographers, each with a different career. Though it is a small start, this program, once expanded, could provide a valuable network for graduate students to learn about the host of careers available to oceanographers.

That network will only be possible if TOS works on expanding its nonacademic membership. This expansion is the second front in our effort to serve our graduate student members and, simultaneously, enrich our society with innovative ideas from new members. Though this effort is just in its embryonic stage, the TOS Council has begun to formulate plans to recruit TOS members from the corporate, nonprofit, and government agency sectors.

**4** Though I do not know of any direct TOS efforts to diversify our community, *Oceanography* magazine has certainly highlighted women in oceanography, most notably with its first *Women in Oceanography* issue in March 2005, still the most requested volume of *Oceanography*, and its follow-up a decade later as a supplement to the December 2014 issue. Still, we have serious work to do in expanding our professional ranks to

include underrepresented minorities. At a recent meeting with the presidents and executive directors of the American Geophysical Union and the Association for the Sciences of Limnology and Oceanography, it was understood that we would all be best served by combining resources and ideas to develop a plan for diversification. On this front, it is fair to say that we are just at the starting line. To move forward, all ideas are welcome.

So, my overall view is that though there is work to do, TOS is responding to changes in our profession. If I had to describe TOS's shift over the past few years, it would be a shift away from thinking of ourselves as a professional society toward thinking of ourselves as a professional *community*. Indeed, a community's role is to build networks, collectively support students, provide equal opportunity and access to all talented individuals, and be a trusted source of information. TOS is building that community.

On the latter point, I can think of no individual who does a better job of building the TOS community than Jenny Ramarui, the TOS Executive Director. I finish my term as TOS President with gratitude for Jenny's guidance during these past two years, but also with a deep appreciation for her commitment to our TOS community. TOS moves through presidents every two years, but Jenny keeps a firm hand on the helm, guiding this community of oceanographers. We all owe her our thanks.

It has been an honor serving as TOS president. I am delighted to hand the reins next month to Alan Mix, Professor and Director of the Stable Isotope Laboratory in the College of Earth, Ocean, and Atmospheric Sciences at Oregon State University. I look forward to continuing to work with him and all of you on the betterment of this TOS community.



M. Susan Lozier, TOS President