

Fantasy or Fiction

Waking Up to the Public's Lack of Understanding

BY ELLEN PRAGER

ONCE UPON A TIME, in a land faraway, there was a society in which people understood and were excited about science, especially ocean science. I first dreamed of this place a few years ago as I sat behind a wall of one-way glass watching as group after group of coastal residents participating in a marketing research activity revealed their

ignorance, and even worse, indifference, about the environment and, specifically, the ocean. They were a diverse group of individuals in terms of ethnicity, affluence, and education; they were brought together by an ocean-related industry to assess their responses to and understanding of certain environmental and ocean issues. My horror reached a peak when

all but a few, including the educator in the bunch, explained or agreed that global warming is due to sun shining through the ozone hole. "Noooooooo!" That's me knocking my head on the wall behind the glass. Several people said they did not think that the environment affected them personally and, while many of the individuals present were



The Monterey Bay Aquarium showcases the ocean's wonders and provides an effective vehicle to reach the public. Photo courtesy of Mike Quigley

aware of ocean issues, they had little knowledge or understanding of the science involved.

Several years later I once again longed for that far off world of ocean science understanding. I was in New York discussing a potential partnership with a major television network to cover ocean- and earth-science stories. I

enthusiastically suggested that overfishing and fisheries decline were excellent topics for coverage, given their relevance to everyday life in terms of health, the economy, and jobs. The network executive's response was, as I remember it, "Fish? There's a problem with fish? When I go to the market, there are plenty of fish." That deal was not to be done. Sadly,

this high-level news representative is an example of the media "gatekeepers" who control what is and is not covered by major media outlets and in the medium from which, I am sorry to say, most members of the public get their science and technology information—television (National Science Foundation, 2008).

These are not extreme cases, rather

BOX 1. BECOME A STAKEHOLDER IN K-12 EDUCATION

By Sarah Schoedinger, National Oceanic and Atmospheric Administration, Office of Education

MUCH OF WHAT IS TAUGHT today in K–12 schools across the United States is driven by local or state standards and even more so by the required tests that assess students' proficiency in math, reading, and science. In theory, holding school-system decision makers and practitioners accountable for student learning is a good idea. In practice, it is an educational disaster in the making because the tests generally do not assess the knowledge and skills that really matter—understanding the nature of scientific endeavor and the application of core content knowledge using critical-thinking skills. Additionally, our K–12 science curriculum today is “a mile wide and an inch deep” in terms of

content and skills. Furthermore, the curriculum lacks coherence across, and even within, grade levels.

These large challenges will not be solved through a single course of action at one level in our decentralized educational system. So, what can members of the oceanography community offer? Become a more active stakeholder in the system. Get engaged in decision making about K–12 education at local and/or state levels. Partner with K–12 teachers and/or schools to provide access to the world of oceanography—the data and information, the research tools, and probably, most importantly, the real-world experiences that got most of us interested in the field. The K–12

curriculum is overburdened, so the answer is not to add more standards and testing requirements to address our parochial interests. Rather, work *with* the teachers, the science coordinators, and the superintendents to figure out how oceanography, which provides a real-world context for integrating core concepts in biology, chemistry, and physics, can help them keep their students engaged in acquiring the scientific knowledge and skills that will serve them and our society well now and in the future (for more ideas, see Feller, 2008).

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Feller, R.J., C.R. Lotter, and J.E. Singer. 2008. An awakening (Part II): How you can help science education. *Oceanography* 21(2):68–71.

they illustrate well the unfortunate reality of the world in which we live. Research shows that although many people may be aware of ocean and environmental issues, they don't understand the science involved (AAAS, 2005; Coyle, 2005; NSF, 2008). In one national survey about ocean and coastal literacy, only some 14% of the people questioned felt they were informed or very well informed, 52% said they were somewhat informed, and about 33% responded that they were not informed (Steel, 2006). The same survey then tested

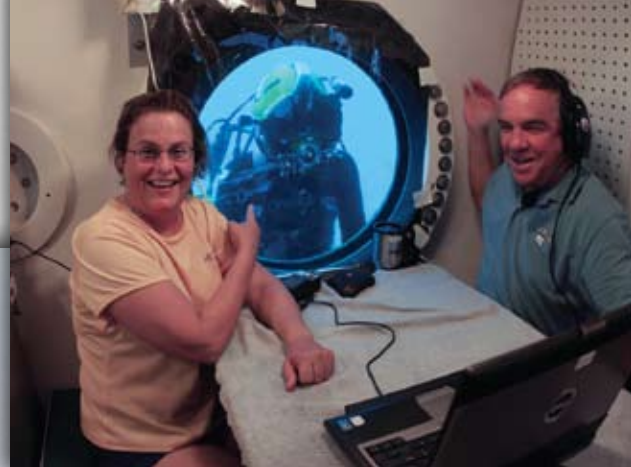
people's knowledge of ocean-related terms and their ability to answer five basic, multiple-choice, ocean-science questions. Less than one-third of those sampled knew what the term bycatch meant, and overall the results were poor. In a similar study restricted to Oregonians, only 10% of the coastal residents and 8% of the noncoastal residents could correctly answer basic questions about the ocean, fisheries, El Niño, marine life, and upwelling, resulting in a median score of about 2.5 or an “F” by public-school grading standards (Lach and Steel, 2005).

The bottom line: the public is failing when it comes to understanding ocean science, and we should be worried, very worried. The public is not some nebulous body without influence, power, or

wealth. The public includes our political representatives who decide how the nation invests its federal and state dollars and what our governing policies should be. Members of the public sit on school boards, deciding what is and is not taught in our nation's classrooms. Members of the public make up local land and water planning boards, governing important decisions that affect our coasts and oceans. The power brokers of industry and the media are part of the public as are the world's great philanthropists. The public includes parents who help determine their children's exposure to the ocean and to science. And the students we want to draw into ocean science careers, or at least educate to be ocean literate and caring, are part of the public. The public has enormous

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Scientists Chris Marten and Niels Lindquist (diver) and Congresswoman Ileana Ros-Lehtinen video conference live with schoolchildren from under the sea in NOAA's Aquarius undersea research station. *Photo courtesy of Bob Care*



2006 National Ocean Sciences Bowl competitors explore tide pools of the California coast with ocean scientists and educators. *Photo courtesy of Mike Quigley*



power to shape the future of the ocean and ocean science.

Today, even more than in the past, the fact that most of the public has so little understanding of ocean science is extremely troublesome, given the chronic underinvestment in ocean science, the emergence of impacts stemming from our long-term use and misuse of the sea, the revolution in information access, and increased competition for students and money. Degradation of the ocean has been occurring since humans first began to exploit its resources; however, over the last two decades, the cumulative impact of our activities has become increasingly apparent. Growing scientific documentation and notable societal effects have heightened our awareness

of problems that include overfishing, habitat loss, nonpoint source pollution, harmful algal blooms, invasive species, and climate change. The need for scientific information to find solutions to these problems and better manage our influence on the sea has increased both in scale and urgency. So, too, has the need for individuals to make wise choices as consumers, voters, and in behaviors that affect our coasts and ocean. Today, as a result of chronic underinvestment, much of our ocean science infrastructure is aging and in shamefully poor condition. Furthering the problem is that we are living in an era of budget shortfalls combined with costly international and domestic issues. Ocean science is now low on the nation's list of priorities, leaving us to compete

for a smaller percentage of the federal research budget. The excitement of and investment in ocean exploration and undersea technology development so prevalent in the 1960s and 1970s seems but a distant dream.

Other careers, many of which are more lucrative and visible, are also now luring students away from the natural sciences. For example, with the popularity of television's *CSI*, forensic science is now one of the hottest classes on campus and in career choices. Over the past two decades, we have also experienced a revolution in information technology that has brought great benefit to science, but has also helped to propagate pseudoscience, myths, misunderstandings, and purposeful deceptions regarding the environment and ocean. Debate can

BOX 2. ENGAGING THE NEWS MEDIA

By Dan Vergano, *USA Today*

FORGIVE THE MARINE METAPHOR (and the preachy tone), but ocean scientists are swimming against a riptide of competing news. Getting your findings in front of the public requires a sharklike approach to survival—fast and opportunistic—rather than waiting for a newsman's net to sweep your results into the limelight.

On the front lines of collapsing fisheries, climate change, and ocean acidification, ocean scientists have a big story to tell. People flock to aquariums, remember Jacques Cousteau, and last year read about a Pulitzer Prize that went to a *Los Angeles Times* series on the health of the ocean. So why isn't there more ocean science news in the newspaper?

Because you enjoy lots of competition and your competitors—astronomers, climate scientists, politicians, and movie stars—make it easy to run their stories. It helps to think like a reporter if you want one to take *your* news bait instead.

News stories are stories first, news a close second. The first question every reporter asks is: What's the story? In science news, the story is usually that some smart folks have discovered something fascinating, and that's a fine story. The second question is: Why does it matter? If your story doesn't have some implications for our readers, we can't run it (unless it has a really cool picture).

Regarding competition, you have to make things easy for reporters, or else it's

back to the Hubble photo. The astronomers have NASA's media machinery at their disposal. The big-name science journals push stem cells, human origins, and microbes. Even the physicists send out a weekly run-down of interesting new findings in their field.

Don't get me wrong. NOAA and the marine labs on the coasts make very good efforts, with fellowships, sea trips, and the like, to reach out to reporters. But you have a real opportunity to get more news out, considering the challenges the oceans face, if you think of what you do as a news story and if you make it respectable for your field's leading lights to make news. The astronomers aren't going to wait for you.

foster scientific advancement; however, now it can also be misused to create doubt and suspicion of science and scientists in the public eye. For all of these reasons, today, we in the ocean science community need to engage the public and promote a better understanding of the ocean and ocean science.

HITTING THE BULL'S-EYE

To more effectively reach, inform, and engage the public, we need to take advantage of knowing where people get their information, effectively target the various audiences involved, and invest in both traditional and innovative outreach and education activities. We must also make such efforts of more value within our own community.

The Audience

When it comes to outreach and education, one size does not fit all. Recognizing your target audience and the interests it represents is critical for effective engagement. For instance, while ideologically our political representatives should care most about what is best for the nation both in the short and long term, let's face it: their attention is usually on short-term crisis management and what matters most to their constituents. When talking ocean science on Capitol Hill, it is useful to consider links to hot-button issues and the economy, jobs, human health, and quality of life, especially in a member's home district. When presenting to a group of business leaders, incorporating

powerful economic valuations is effective. For example, the national ocean economy generated \$138 billion dollars in 2004 (Judy Kildow, National Ocean Economics Project, *pers. comm.*, 2008), and consumers annually spend over \$50 billion dollars on seafood, which ranks number two, just behind oil, in the US trade deficit. After I made a presentation on ocean and coastal issues in Southwest Florida, a wealthy banker said to me that he had never heard the ocean and coasts described in quantitative economic terms and that it made him realize the true risks his community faced due to recurrent algal blooms, beach erosion, and overfishing.

Getting the message right for multiple audiences is critical. A portion of society

BOX 3. GETTING OCEAN NEWS STORIES ASSIGNED TO A REPORTER

Jeff Burnside, Reporter, WTVJ NBC 6, Miami

will respond emotionally to the plight of the sea's charismatic megafauna, and some people may understand the need to sustain marine biodiversity. A small percentage of the population may even be convinced that the ocean is a critical component of the planet's life support system, but for many people these messages just do not resonate. We have been using them for years and look where we are today! We also need to create and use messaging that connects individuals to the ocean through the things that influence them on an everyday basis—for example, health, safety, jobs, quality of life, and recreation. And we need to find more ways to make ocean science relevant, understandable, and, yes, even entertaining. We need to capitalize on the gee-whiz factor of undersea adventure and discovery, take advantage of the surprise, humor, and wonder involved in ocean science. How we deliver our message is also important. As scientists, we spend years learning the language of our trade. In communicating with the public, we must do away with the jargon and forego the technical details we, as scientists, find so fascinating and focus on what the public will understand and find compelling.

EFFECTIVE OUTREACH AND EDUCATION

As in the past, we face many challenges in reaching the public. Some have changed due to the nature of society today, others remains as difficult as ever. One area in which significant progress has been made is in informal education. Today, there are more aquariums, nature parks, and opportunities for people to learn about the ocean than ever before. An estimated 135 million people visit

"OUT OF SIGHT, OUT OF MIND" remains the biggest challenge in getting ocean stories into television news. "Once you scuba dive," said famed ocean advocate Jean Michel Cousteau in a recent TV interview, "you become an ambassador of the seas." But the challenge remains to excite all those people who haven't yet seen the ocean from under the waves. And that, in turn, becomes the big challenge for television reporters who want to air more ocean-related stories.

As a reporter based in Miami and surrounded on three sides by ocean, marine issues are literally all around me. Yet news managers or the "gatekeepers of the news" hold on to the misperception that, given the vastness of the ocean, there couldn't possibly be a real crisis. To be sure, it is a parallel to the challenge scientists face with the general public.

What helps to get ocean-related stories assigned? A front-page display on *Nature* or *Science* or another peer-reviewed journal helps convince news managers. Because the news business is often a victim of group think, once an ocean issue lands on the cover of a weekly news magazine (see *US News's* "Empty Oceans") or the top of the *The New York Times* front page, then other media outlets quickly race to report on it.

Then there's the "gee whiz" factor: a story so cool that it cannot be missed. When I was invited to do a live broadcast from inside Aquarius, the world's only undersea research laboratory, managers couldn't resist. So, while the "gee whiz" was winning the attention of viewers (and news managers), I included in the story a heavy dose of bona fide news about ocean science.

Scientists shouldn't have to convince TV reporters or their news managers of bona fide stories. But here's what helps:

- Provide hard-to-get video.
- Offer a scientist or researcher who can give a good television interview.
- Make contacts with television reporters whose work you think is better than the others, and develop those contacts over time.
- Exclusivity helps.
- The story must be new or must have a significant new development.
- Is there a villain such as a major polluter or someone who's done something wrong? Perhaps there is an investigative element.
- Will it have a direct impact on viewers (i.e., seafood, closed beaches, boating restrictions, the economy, coastal development)?
- If the reporter has time, take him/her out in the field.

The pendulum is swinging back toward more stories about science and the environment. So, act now. Don't wait for someone to call you.

BOX 4. FINDING GOOD OCEAN INFORMATION ON THE WEB

By Alan Boyle, Science Editor, MSNBC.com

All of us are swimming in a rising sea of information nowadays. So, how do we keep from drowning? Over the past decade, the rise of the Internet has made the bounty of scientific research more accessible—so much so that it is easy to get overwhelmed. Just looking at the 33,000 e-mail messages currently sitting in my in-box is overwhelming, even though I know a lot of them are flotsam and jetsam that I haven't gotten around to cleaning out. So it is with the Internet: lots of information is of dubious

scientific value, but there are also pearls out there just waiting to be picked up. Here are a few suggestions for finding the richest beds:

- Rely on trusted guides. Science writers (and science-minded readers) often build up a trusted network of sources that can point them toward the good stuff. For writers, these might be experts on oceanography or climatology who have proved helpful in the past. For readers, these might be publications that do a good job of sorting

through complex topics and offering up the freshest, tastiest, meatiest morsels. (Put MSNBC.com on your list!)

- Find an online habitat. An entire ecosystem is growing up around the news in the form of social networking sites such as Facebook as well as discussion forums such as Newsvine. Track down a forum or a blog that caters to your topic of interest (The Plankton Forums? Oceana?), find out what people are talking about—and then jump in!

zoos and aquariums each year, and research suggests that they come away better informed, feeling more connected to nature, and seeing themselves as part of the solution in conservation (Falk et al., 2007). Aquariums now host education programs specifically directed at school children and provide excellent hands-on inquiry and experiential learning opportunities. Due to budget and liability issues, however, field trips to centers of informal education have become more difficult for educators to undertake. Meanwhile, as Richard Louv (2002) describes in his book, *Last Child in the Woods*, fewer and fewer kids now have the opportunity to experience nature firsthand. Spending time as a child outdoors in relatively wild places can help to build an appreciation for and curiosity about the environment, and, according to Louv, may also combat problems of obesity and possibly attention deficit syndrome. Many ocean scientists cite childhood experiences in

nature among the main reasons they chose science as a career (Gladfelter, 2002). We need to continue to support and further invest in places of and programs for informal ocean education and opportunities for people of all ages to experience nature firsthand.

Formal Education

Today, there are numerous challenges to be met in the arena of formal education with regard to ocean science. One of the biggest is just getting the topic into the curriculum. In Box 1, ocean education expert Sarah Schoedinger, from the National Oceanic and Atmospheric Administration, takes a look at some of today's challenges and solutions with regard to ocean science and formal education.

Working with the Media

If information and reach are power, then the media reign supreme. In Boxes 2–4, Dan Vergano of *USA Today*,

Jeff Burnside of WTVJ/NBC 6, and Alan Boyle of MSNBC write of the challenges involved and provide excellent advice about bringing ocean science to the public through print, broadcast, and Internet outlets. Though to some it may seem blasphemous, we should also try to work more closely with the entertainment industry to embed ocean science—as accurately as possible—into popular film, television, and online programming.

INCREASED VALUE

Lip service is simply not enough! The rhetoric about the importance of ocean outreach and education has grown significantly in the past decade, yet the investment in related activities remains far less plentiful. To improve the nation's ocean science IQ, we need to invest in the people, programs, and activities to do so. Support is needed to sustain and expand existing efforts that have proven effective. Funding is also needed to try new and innovative things. Within our



The author face-to-face with a goliath grouper at the underwater habitat Aquarius, where outreach and education are part of the mission. Photo courtesy of Stephen Frink

Scientists go black tie. CNN's Miles O'Brien moderates a panel on ocean issues and exploration with Sylvia Earle, Larry Madin (WHOI Director of Research), author Ellen Prager, and underwater photographer David Doubilet during a 2008 event for the Explorers Club. Photo courtesy of Craig Chesek



own community, outreach and education efforts need to be valued above a pat on the back. Related and effective activities should be viewed positively in tenure evaluations, promotions, and proposal reviews. Criterion Two (Broader Impacts) on National Science Foundation proposals (see www.nsf.gov/pubs/gpg/broaderimpacts.pdf) should be taken seriously, and partnerships with educators or outreach specialists should include funding for their efforts. Outreach and education should also be seen as a worthy and respectable career path for young scientists. This is not to say that every ocean scientist should be doing outreach and education, but those who have the communication skills and desire should receive encouragement, support, and investment.

CONCLUSION

Having a public that is informed and engaged in ocean science does not have to be a thing of fantasy or fiction, but

it won't happen on its own. In the real world, we can only reap what we sow. Get out there and talk to groups outside the ocean science community. Visit your local Rotary or garden club, offer a presentation to regional leadership groups, and make yourself available as a resource to your local school boards, business community, and political representatives. Give a talk at a nearby school and invite local media to a luncheon discussion of regional issues or potential stories. And if you are in a position of leadership, say a dean or department chair, take the reins and increase the worth of outreach and education efforts, reward those who are effective, and invest for the future. Only by engaging the public in ocean science and making a convincing case for its importance can we garner the support and get the influence, students, and investment we so desperately need. 📺

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