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Cuttlefish are just one of the organisms that will be catalogued in the Encyclopedia of Life (see article, page 2). Cover image taken at the Monterey Bay Aquarium by Ken Osborn using an Olympus 5050 digital camera.

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Bulletin

The American Society of Limnology and Oceanography is a membership-driven scientific society (501(c)(3)) that promotes the interests of limnology (the study of inland waters), oceanography and related aquatic science disciplines by fostering the exchange of information and furthering investigations through research and education. ASLO also strives to link knowledge in the aquatic sciences to the identification and solution of problems generated by human interactions with the environment.

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THE ENCYCLOPEDIA OF LIFE – NOT JUST ANOTHER WEB ENCYCLOPEDIA!

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THE BASIC IDEA

From the perspective of a systematist, ecology resembles a multidimensional Mandelbrot game where patterns of order are sought at all levels. This may be why black boxes are familiar within (or containers for) many ecological 'insights'. However, black boxes can hide relationships and effectively prevent a mechanistic understanding of what is going on between players. It is at a reduced level that the 1.8 million known players in the game (the species), and those myriads of unknown ones past and present, determine the transactions and interactions which constitutes the biosphere. The reductionists' model is assembled from these basic elements, tested by and used to test the models that include the black boxes. At this level there is a continuum between ecology and systematics. As pointed out by Charles Godfray (Godfray 2002), it behooves the systematist to find new ways to ease the tasks of the ecologist. Christine Hine (Hine 2008) tells us that the taxonomic community is responding to that call.

To get the reductionist part right, species need to be correctly identified – and not just the sentinels and keystones but the full cast of players. With an inventory of species names, we can, in principle, provide access to all associated knowledge. Until now, there has been no simple way to access this information. Surprisingly enough, we do not even have a place where there is a list of all species. Systematists traditionally have made even this elementary task hard by changing names in response to shifts in systematic and phylogenetic insights over time. Ecologists and others are currently obligated to keep track of these vicissitudes if they wish to demonstrate that they are aware of the prevailing taxonomic concepts, and the correct names for them. The Encyclopedia of Life is a new massive biodiversity project that is set to change things, and among its myriad benefits, can eliminate this chore from our lives.

Since Linnaeus' (1767) achievement of the last major encyclopedic compendium of all life, biology has expanded more rapidly than our capacity to organize the emerging knowledge. Fortunately, the e-world has recently matured sufficiently to provide the means of storage, communication, association, and social collaboration that can culminate in a single portal with a web site for each species (Figure 1) and with access to all information about those species

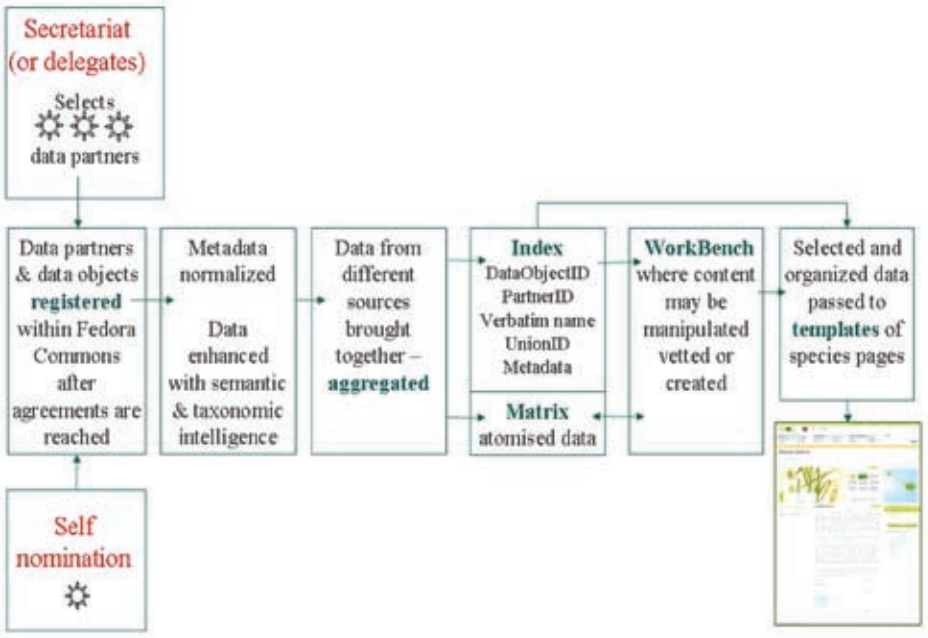


Figure 1. EoL data flow chart.

(Wilson 2003). The Encyclopedia of Life (EOL) project seeks to make this happen. It has made possible through financial support from the John D. and Catherine T. MacArthur Foundation and the Alfred P. Sloan Foundation. It will be both international and collaborative, but its initial course is being charted by the Smithsonian Institution, Marine Biological Laboratory (Woods Hole), Harvard University, the Field Museum in Chicago, and the multi-institutional Biodiversity Heritage Library.

EOL can take advantage of developments not available to previous efforts to realize the same vision. Internet bandwidth has expanded to allow images and other large digital objects to move freely. With the shift to the grid, computing power located remotely can offer synthetic and analytical services – such as Google Earth - that are more powerful and integrative than predecessors that were installed on desktops. Web 2. 0 technologies has had great success in projects such as *Flickr, YouTube, LibraryThing,* and *Wikipedia*. An EOL that is participatory will move quickly and will ensure that the product serves a wider array of users. The capacity to re-use content on the internet for new purposes is illustrated by the results page of a 'Google images' search. This is a composite of information drawn from by scraping from many other web pages. An EOL that uses more advanced 'aggregation' or 'mashup' will not be bottle-necked by the need to re-author information – but can progress quickly by collaborating with thousands of biodiversity web sites and merge pre-authored content. The Dutch national node of the Global Biodiversity Information Facility (NLBIF) data portal (www.nlbif.nl/) among others show that this approach is credible.

WHAT IS DIFFERENT? TAXONOMIC INTELLIGENCE

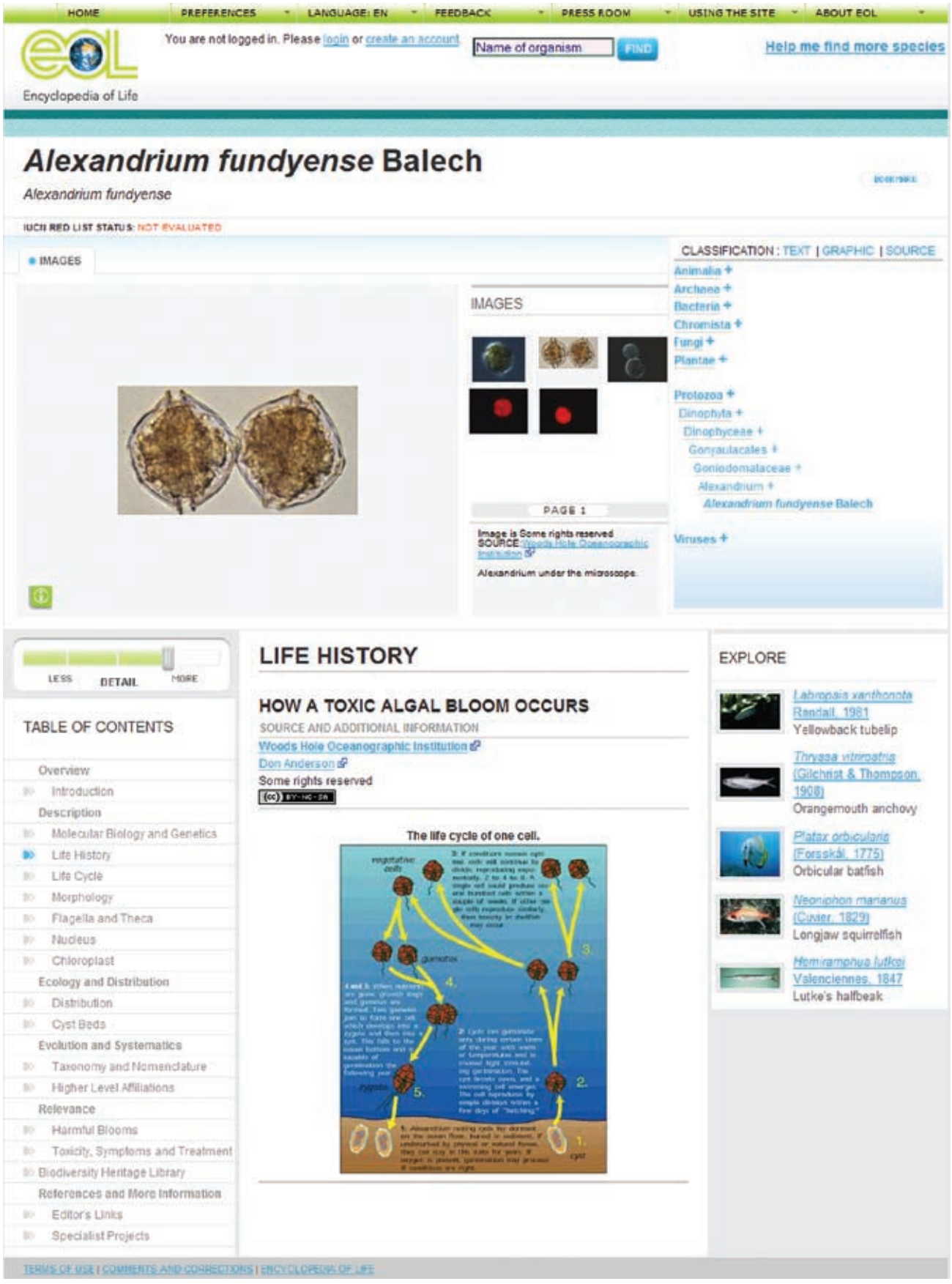
The truly critical advance that makes a unified on-line biology possible has been the intrusion of taxonomic thinking into the design of databases and services. 'Taxonomic Intelligence' refers to a growing collective of strategies that are designed around the expertise and activities of taxonomists. They serve to overcome uniquely biological problems in information management. Names are the key connector between observations and knowledge – in the world of informatics, they are a controlled vocabulary of metadata. Yet, as we all know, the use of names entrains an array of problems – the most significant being that names change with time. As a result, different databases may have different names for the same species. As machines use names to link different pieces of information on the same species together, this problem confounds the assembly of large-scale environment from all of the distributed parts. Until recently, the preferred solution to this names problem has been to push for the adoption of standard names. This is not scalable as we cannot change historical documents to replace out-of-date names with current ones, nor can we sustain the considerable burden of maintaining currency with taxonomic and phylogenetic research at all web sites. Taxonomic Intelligence is a different solution, that of placing all alternative names for the same entity into a 'reconciliation group'.

A query initiated with one name, whether current or obsolete, or whether scientific or vernacular or a mis-spelling or an aberration of machine-driven optical character recognition, can be first passed to the reconciliation group, and then expanded to allow the resulting action to query databases using all available names. If reconciliation is provided as a central service to the Internet, then only that service needs to maintain currency with changing names. The design of this element of taxonomic intelligence is not complex, but the assembly of the system requires over 100,000,000 different names and variants of names to be assigned to fewer than 2,000,000 reconciliation groups – at least. If this were not enough, what constitutes a species is typically not agreed, and so a process and a product must be designed to accommodate diversity and evolution of opinion. This process has begun and will mature over the next 10 years. As it matures, there will no longer be any need for users to keep track of nomenclatural changes, they can type in familiar names and the translation to current name will occur behind the scenes. Other benefits will also emerge. Interested users can receive alerts about new taxonomic concepts (how many entities are there in what we refer to as giraffe), or about new species that have recently been reported in habitats under study. These will promote taxonomic precision and accuracy in ecological research.

Ecologists will be one community who will be able to access biodiversity information that uses this new kind of bioinformatics infrastructure – one that permits a novel amalgam of participation and machine-to-machine communication using web services, one that is taxonomically intelligent, and one that takes us into the domain of the semantic web. The semantic web replaces idiosyncratic home-spun solutions to management of information about organisms on the internet with universal strategies. This will improve the visibility of information by making it more discoverable and so help in the shift from parochial to global. Semantic strategies include the use of persistent and globally unique identifiers for data elements, agreed definitions (metadata), and the common use of protocols to move information around. All of these are now penetrating into biology. Digital Object Identifiers (DOIs are a type of identifier used by the publishing world to refer to books and papers. LSIDs (life science identifiers) are resolvable GUIDs (globally unique identifiers) for biodiversity data objects. Resolvable GUIDs incorporate information that allow us to access the object itself. Services, such as those of CrossRef, can track references from one document to another, and from future documents to past documents. The result is that opening one document unlocks a matrix of cross-linked information – greatly diminishing the workload of discovering information or keeping track of it. Such systems do not need to be limited to documents. Data-sets could be assigned identifiers, and cross referenced – such that one day your efforts to analyse distributed data could be met with messages like: "Other limnologists who used this data set also used the following data sets." Add a little bit of del.icio.us style tagging, and information on quality, relevance, context will also be available.

DOES IT MATTER?

What EOL will deliver will depend on who you are, because EOL is committed to flexibility, offering different composites for different audiences. We can assume that there will be a default 'front page' for a species. At this stage, we expect the front page



Sample EoL page for the *Dinoflagellate Alexandrium fundyense*

to show media (images, videos, maybe even 3D zoomable type material), phylogenetic/taxonomic relationships, and text placed in chapters such as: overview; descriptions (which may include an array of descriptions from thumbnails to the original description to suit a diversity of users); ecology and distribution; evolution and systematics; conservation status; relevance, uses (and abuses); as well as additional resources such as web-links, taxonomically indexed RSS feeds from publishers and other media sources (see Figure 1). Content will be presented unadulterated (verbatim) from data partners, although Wiki environments and forum-discussion environments will allow for collective authoring of new versions of text and the formation of derivative versions of content. Content will be freely available. Creative Commons licenses that permit widespread re-use of content (and software) will be favored. It will take at least 10 years for the suite of front pages to be populated, and for the estimated 60% of species that have only ever been observed once, the amount of data may be minimal. Running in parallel and a little behind will be a system that makes deep links into data sets that are accessible through the web and draws selected content out of those resources for display on species pages. Teams within EOL and partnering groups will lead this process.

This is the modest vision. What is driving many of us is knowing that if a names -based infrastructure can build an encyclopedia of all life, then it can index, integrate, and organize any information about any species to contribute to any purpose. Biology can cease to be a parochial discipline of flimsy archipelagos of knowledge stretched thin in time and space. Rather, biology can become a cog in a grand machine. That cog might, for example, be the means of integrating biospheric knowledge with sociological, historical, economic, and geospheric knowledge as we develop full-scale models to explore and challenge global warming.

HOW WILL IT WORK?

A less visible component of the project will be a workbench –a communal and virtual compilation of on-line tools that will allow any user to point to, annotate, associate, visualize, or analyze content (Figure 2). In a sense, the workbench is an open door to participation. The software will be in the form of modules that can interact through appropriate communications protocols and standards. Elements of this environment can be pipelined to allow for the progressive addition of value to data. The software of those modules will be placed in the public domain to allow communal ownership and to give EOL an ever-evolving character.

Early components of the workbench are likely to be places where teams can assemble species pages or sightings environments where folk can record the presence of individuals of any species. EOL will work with other compilers of georeferenced data such as the Ocean Biogeographic Information System (OBIS), the Global Biodiversity Information Facility, GBIF (http://www.gbif.org/), *eBirds* (http://ebird.org/content/ebird/index.html), or *ZipCodeZoo* (http://www.zipcodezoo.com). A simple sightings tool makes it clear that EOL is a participatory environment and opens up the project to widespread participation. Now we can attract data on the distribution and abundance of taxa, especially vulnerable ones, from thousands if not millions of users. Changes to temporal events such as flowering or migrations can be monitored on a scale much grander than was previously possible and correlated with other factors such as global temperatures.

WHAT CAN IT DO FOR YOU?

EOL has the potential to become the device that embraces all biodiversity knowledge, but it will only become that device if it is useful, reliable, and relevant. So what can EOL offer to users? Firstly, that tedious chore of tracking nomenclatural and taxonomic changes can be shed. As a reference work enriched with keys and cross-linked with environmental parameters and georeferences, species identifications will be accelerated, will be more precise, and will be more accurate. Portable high-speed barcoding devices will be able to access EOL and make the bridge between molecular and traditional approaches to biology. If, like GenBank or OBIS, EOL caches information, the resultant growing pool of data can allow research programs to shift from parochial to global, and will facilitate the property of emergence – new science that cannot be predicted from the sum of the parts. To this, add the benefits of the micro-contributions of vast communities of parataxonomists. Having a large pool of data with taxonomic sorting tools would bring back comparative biology that can reveal trends and challenges not even on smaller scales or through the detailed study of a few model species (a macroscope http://radio.weblogs.com/0104369/stories/2002/04/09/macroscope022702.htm). All of this describes a world of research that can be increasingly participatory and collegial – helping a shift from the competitive ethos of the baby boomers. Within ecology, there will be less justification for black boxes, and their number and size will diminish.

WHEN WILL IT BE AVAILABLE FOR USE?

This process became active in February 2008 when the beta version with content on 30,000 species was released for critical input. The remainder of 2008 will be used to gather feedback, appraise priorities, seek data partners, and users. A revised version will be expected early in 2009, and content and infrastructure will continue to grow over the following 5 years.

WHAT CAN YOU DO?

To be part of EOL, there are several things you can do. You can tell EOL developers what you would like to see in EOL (which species, what kind of content, what kind of features and functions), or you can offer content. Content includes text, images, videos, georeferenced data; features include things like – more classifications, comments functions, contributory functions, data visualizations). Please write to me (dpatterson@mbl.edu) in the first instance. Your requests about which species should be included first, the types of content that will be important to you, or the features you would like to see will impact our priorities. Similarly, if you have content ready, and are willing to allow the content to be available under an appropriately open Creative Commons license, then we can make your content visible within EOL. The most important first step in a names-based infrastructure is to establish the names of all relevant taxa within the indexing system, assembling the reconciliation groups, and getting the classification in line with current thinking. The tools for doing this will be available any day now.

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THE ETHICS FORUM: THE ETHICS OF CONDUCTING SCIENCE ABROAD

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[This column is intended to highlight a few issues related to conducting science and field science abroad and is not a comprehensive study.]

As aquatic scientists, many of us have the opportunity to conduct experimental research abroad. This may be at a collaborator's laboratory, at state-of-the-art institutes where regulations are well outlined and kept under check, or at remote field stations, or at laboratories spanning the globe from unpopulated environments to laboratories in developing nations.

The reasons for undertaking research in other countries are varied. Scientists are driven by the scientific quest and exploration of new habitats/organisms or areas under different environmental conditions, and the application of theoretical and laboratory experiments in natural field settings available only in other countries. Scientists also choose their research location by more pragmatic considerations such as access to funding and international collaboration, personal and commercial gains, and in some cases the ability to undertake research that would not be ethically or legally permitted in their home countries (Skene 2007). Whatever the reason, scientists are on the move, with research abroad making up a large part of many grant proposals and scientists' time-tables.

Imagine a seemingly simple scenario that raises a *mélange* of ethically related questions you may encounter on your next research foray abroad. You have a funded project that takes you to a marine station on an island somewhere in the middle of the Pacific. This is an area of great biodiversity and pristine waters, yet it is also the home of and source of livelihood for local populations including scientists that specialize and subsist on local research topics. Your funded grant overlaps with some of these local research projects and may impact populations such as subsistence fishermen or tour operators.

What obligations do you as a visiting researcher have towards the environment and the people? Is your science project designed only to further science, or is it beneficial mostly for your personal advancement? Does it take into account the benefits and/or damages the project will have on the local populations and environment? Does your research comply with local laws? Have you obtained the permits required by national and local authorities for collecting specimens? If experimental manipulation is involved how will it affect this environment on short-and long-term bases? Are local populations and local research activities affected by your plans?

Moreover, are you coming as a collaborator sharing equipment, data, and intellectual property rights? Are you paying for your use of the infrastructure, labor, and equipment? Is authorship on forthcoming publications to be shared with local collaborators, or are they left "to pick up the pieces" while the high-impact publications go to the well-funded scientists?

These questions and other ethically related dilemmas, arising from the situation of the scientist working away from his or her home turf, may be categorized into two broad categories which highlighted here: 1) ethics related to the environment itself, and to our exploitation (utilization) of it to advance science; 2) ethics related to the human environment and populations in the area which we come to discover/explore.

Ethical dilemmas arising from scientific exploration of the environment fall into the realm of environmental ethics. The discipline of environmental ethics has developed since the 1970's, and a large volume of literature is available on all aspects of environmental ethics. While environmental ethics is traditionally a "land ethics" (Dallmeyer 2003), human investigations and activities in aquatic systems, such as whaling and fishing, warrant the expansion of these traditional themes (Dallmeyer 2003). Moreover, despite the boom in environmental ethics, there are still apparently very few ethical guidelines available for ecologists and field (aquatic) researchers (Farnsworth and Rosovsky 1993; Marsh and Kenchington 2004). This is relevant for research both at home and abroad. In their review "The role of ethics in experimental marine biology and ecology" , Marsh and Kenchington (2004) argue that, these research areas lack definitions, for the most-part, on what constitutes appropriate (ethical) behavior for scientific exploration in areas such as biodiversity, habitat integrity, community dynamics, and manipulative schemes such as Fe-fertilization experiments. *"As a result, most experimental marine biologists and ecologists operate without ethical guidelines or scrutiny, despite intermittent community concern about their activities in response to specific controversies… This contrasts with the abundant and strict ethical guidelines available in many countries for health related research as well as that involving humans subjects and other sentient animals."* (Marsh and Kenchington 2004).

Thus, while at home legal bounds may protect and delineate what is permitted in terms of environmental and field research, the lack of ethical guidelines, combined with loose, or the absence of, legal regulation in many countries, may foster unethical scientific behavior. Scientists going overseas may collect rare specimens, apply manipulative treatments (changing pH, adding nutrients, radioactive materials, herbicides, etc.) and harm sensitive environments, and in general assume that their activities are justified for the sake of science. Marsh and Kenchington (2004) point out evolving measures that intend to limit unethical science and encourage appropriate behavior in experimental field work. These include ethical standards required from authors

by professional journals, guidelines such as that published by a working group of the Australian Science Technology and Engineering Council (ASTEC 1998) on Ethical Conduct of Research in Protected and Environmentally Sensitive Areas, and adoption of ethics codes for environmental research by management and conservation agencies.

A brief search of web sites of a few relevant societies for aquatic sciences showed very limited focus on the ethical dilemmas or subsequent guidelines for scientists working in the field/at sea. ASLO in its Code of Professional Conduct (adopted by membership in 1994) addresses this briefly "Promote environmental integrity and conduct research in a responsible and humane manner" (ASLO web site). In AGU's Guidelines to Publications of Geophysical Research (adopted in 1998) and in The Oceanography Society and its published journal *Oceanography*, no mention is made of the ethical responsibilities of either scientists or editors that are related to conducting or publishing environmental research (http://www.agu.org/pubs/pubs_guidelines.html). A more detailed directive is stated in the code of ethics published by the Ecological Society of America (http://www.esa.org/aboutesa/codeethics.php): *"Ecologists will conduct their research so as to avoid or minimize adverse environmental effects of their presence and activities, and in compliance with legal requirements for protection of researchers, human subjects, or research organisms and systems."*

In addition to considering our impact on the environment itself, when working abroad we must also consider the people who live in the area. What obligations do we have as scientists working in foreign environments away from our home institutes and especially what are the ethical responsibilities of the visiting scientists to the local populations (subsistence fishermen and others) and to the scientists of the countries in which they work?

These questions are especially pertinent when examining non-balanced situations, for example scientists from developed/affluent societies working in regions of the developing world. Moreover, the range of ethical questions that arise from these situations span a wide-spectrum of dilemmas from trivial and with little influence on the local populations to life-threatening examples such as testing of chemicals/drugs for medicinal or military applications.

In his essay "Undertaking Research in Other Countries: National Ethico-Legal Barometers and International Ethical Consensus Statements" Loane Skene examines the question: *"Is it ethical for scientists to conduct or to benefit from research in another country if that research would be unlawful, or not generally accepted, in their own country?"* (Skene 2007). Skene provides a national ethico-legal barometer that may be utilized as a tool when ethical dilemmas occur. Skene's barometer is divided into color zones: red (widely condemned activities prohibited by both national and international laws), orange (national laws –prohibited), yellow (permitted by national laws and ethical oversight), green (permitted by ethical oversight), and white (no specific laws or ethical oversight). Research that falls within either the "red" or "orange" zones (chemical warfare, painful animal research, human-animal hybrids, human embryo research) already has legal restrictions by many countries and should be ethically avoided as well. For most other cases, Skene argues, there exist no ethical reasons to prevent research abroad or use its products even though the home country might legally limit such research. While Skene uses the example of research on stem-cells, human embryos, etc., the barometer can be easily applied to many other areas including ecological, environmental, and aquatic research.

Thus, whether working at home or abroad, Marsh and Kenchington's conclusion can be heeded *"We urge experimental field ecologists to observe high standards of research ethics irrespective of where they are conducting their fieldwork. To take advantage of a lack of regulations in a developing country seems the worst kind of scientific hubris"* (Marsh and Kenchington 2004). Moreover, perhaps it is time to address and include some ethical guidelines for field and aquatic scientists in our respective societies' codes of conduct.

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WEB SITES

AGU - http://www.agu.org/pubs/pubs_guidelines.html
ASLO - http://aslo.org/information/code.html
ESA - http://www.esa.org/aboutesa/codeethics.php

PUBLIC AFFAIRS: YES, SCIENCE DOES MATTER!

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[In the most recent issue of the *L&O Bulletin,* I introduced the question "Does Science Really Matter?" In March, a panel of scientists and communicators addressed that question head-on in a two-hour event at the Ocean Sciences 2008 meeting in Orlando. Below is a summary of the event.]

While planning the Ocean Sciences 2008 conference, co-organizer Jonathan Sharp was enthusiastic about the scientific program but was concerned that scientists "primarily talk among ourselves." Sharp also felt that many scientists are "disappointed and perplexed by the apparent lack of concern by the public and politicians in major environmental problems that have significant bearing on the oceans." In hopes of addressing that concern and getting the community thinking about how it can improve the situation, Sharp organized a special event for Ocean Sciences

2008 conference: "Environmental Outreach to the Public: Does Science Really Matter?" The intent of the forum was to assemble a group of both scientists who have been proactive at outreach and some professional communicators to discuss the "problem" and explore the many ways that ocean scientists can help to translate results of our research to a larger audience.

Sharp recruited several facilitators for the event who helped assemble the panel; facilitators for the event were Rick Spinrad, Christophe Tulou, Sharon Franks, and myself. Sharp and the facilitators succeeded in creating a well-rounded panel of scientists and communicators, each with experience reaching different audiences through a variety of media including film, books, newspapers, and aquaria. Sharp and his fellow event organizers intentionally strove for a diverse panel in order to give the audience a broader perspective of what is meant by "outreach." While some outreach activities tend to focus on one audience (e.g., members of Congress or school children and teachers), this forum convened a panel that collectively has inspired and influenced economists, the mass media, Hollywood filmmakers, the scientific community itself, and the general public. Members of the panel were: Charles Hall, professor at SUNY-Syracuse and author of books on ecological economics and sustainability; Juliet Eilperin, science and political writer for the *Washington Post*; Jerry Schubel, former dean of the Stony Brook Marine Sciences Center and current President of the Aquarium of the Pacific; Randy Olson, former professor of marine science and current filmmaker; and Jeremy Jackson, world-renowned marine ecologist at the Scripps Institution of Oceanography.

THE PANELISTS

The evening began with a short presentation from each panelist. Charlie Hall discussed some of his work on the concept of EROI – Energy Return On Investment. As he discussed many of the issues surrounding energy policy, Hall lamented, "We've been through this before. Why did we stop talking about it in our universities and the media?" He currently has a manuscript under consideration that addresses this question and offers six hypotheses in response. Among the hypotheses is that scientists retreat in face of economic arguments, even if they (the economic arguments) are wrong.

Jerry Schubel's presentation focused on how scientists can have greater influence in environmental policy and decision-making. Schubel's blunt advice? "Pull up your socks, stop whining, and get in the policy game." He argued that scientists need to stop "obsessing" over how best to communicate science and instead focus on "developing appropriate mechanisms and strategies for scientists to collaborate with policymakers in their domain." Schubel emphasized that scientists need to be prepared to move beyond just handing facts to policy-makers and instead become true collaborators in the policy process.

Juliet Eilperin spoke to the role of scientists within the media, which is often referred to as "the fourth estate" due to its unique ability to heavily influence political thinking. Eilperin said that environmental scientists are lucky among the academic crowd because "what you do often has real policy implications." She said scientists should view that as a gift and an asset, rather than a burden. On the flip side, because what environmental scientists do has relevance for important questions being decided by policymakers, Eilperin says scientists have a responsibility to convey that information beyond the scientific elite.

Randy Olson spoke to the role that film and television play in shaping public opinion. He showed a video created as part of the "Shifting Baselines" project in Washington State (http://www.shiftingbaselines.org). The program was initiated after past efforts failed to clean up Puget Sound. Olson said a large part of the problem in generating support for clean-up efforts was in public perception. While there was broad support for having a clean Puget Sound (90% of those polled want it protected), the public did not see the need since 70% of respondents believed the Sound was already "pristine." Olson argued that film – be it documentaries, movies, or commercials – is a tool with powerful impact that is woefully underutilized by scientists wishing to convey information to the public.

Jeremy Jackson, a partner of Olson's in the "Shifting Baselines" project, also spoke about how various media outlets shape public opinion. Using his 2001 *Science* paper on overfishing as an example, Jackson pointed out that what the scientific community considers an "overwhelming success" in regards to communication still may have little effect on the public. Armed with *Google* statistics for various search terms, Jackson emphasized the power of film, comparing the 1000+ citations of his overfishing paper with the 427,000 viewings on *YouTube* of a public service announcement regarding oceans starring Jack Black. (And that doesn't begin to capture the number of people who have viewed the clip on the big screen in Times Square or on the CNN Airport Network.)

GETTING INVOLVED: VOLUNTARY OR A SCIENTIST'S DUTY?

As diverse as the panelists were in their experiences, their reasons for becoming heavily involved in outreach had a common thread. As Jackson stated quite simply, "I do it because I care." He went on to say, "I watched everything I ever studied die," including eelgrass, turtle grass of Florida Bay, and coral reefs of Jamaica. For Charlie Hall, watching the environmental degradation of his hometown in Massachusetts – which he said was a paradise for a kid growing up – is what got him involved. Jerry Schubel offered a slightly different motivation: his graduate advisors were engaged in outreach and it was considered their responsibility as students in that lab.

For Schubel, it was a given that scientists should be involved, but many audience members lamented unsupportive institutions. A major point of discussion during the lively question and answer period was how scientists should deal with institutions that are unsupportive of time spent doing outreach. Charlie Hall felt their pain, telling the audience "I may be the only person ever to be denied tenure at an Ivy League University on the week I had the cover [article in an] issue of *Science*." Like many in the audience, Hall said he got "no credit, no money to do the analysis" and felt had to be "ashamed to talk about these things."

As a Washington, D.C. insider, Juliet provided a slightly different viewpoint suggesting that outreach wasn't an "extra," but rather a requirement: "If you've taken a federal grant in your entire life, you have an obligation to talk" to the press and

policymakers. Eilperin said the public isn't seeing evidence that science is a productive investment of tax dollars. As the number of environmental issues requiring scientific input continues to grow, Eilperin says the scientific community needs to work towards reestablishing science as an important priority for society investment. By limiting our outreach, we may be harming our own future as science depends on continued government support of research funding.

MISSED OPPORTUNITIES: BROADENING THE AUDIENCE AND VENUES

The panelists' presentations, as well as responses during the question and answer period, also addressed an issue rarely discussed among scientists: Are we barking up the wrong trees? Even with the specific goal of influencing policymakers, the panelists cautioned that there are more groups to talk to than just the policymakers themselves. Schubel emphasized this point, reminding the audience that an informed and knowledgeable public is "very important to the execution of good policies." Using climate change as an example, several panelists noted how policy discussions were at a standstill until Al Gore's film got the world's (particularly the public's) attention. While scientists had been talking to policymakers for decades on the issue, the conversation did not really begin moving forward until the will of the voters made it clear that it was time to address the issue.

So how can scientists better engage and inform the public? In his presentation, Jackson showed statistics that emphasize the preeminent role of television in relaying information to the public. Olson said if he were asked how to get attention on an issue, he would ask for $2 million to create a $50,000 commercial and spend the rest on thirty seconds of airtime during the Superbowl. "Television is the big venue, no one is trying to exploit that," Olson noted.

Other under-utilized venues are the free-choice learning centers such as aquaria and zoos, which are broadly located (in other words, you don't have to be in Washington, D.C. to have an influence!). Schubel pointed out that these institutions have more attendees each year than all professional sporting activities combined (with exception of NASCAR races). And while we tend to think of zoos and aquaria as havens for families and school groups, 30% of aquaria attendees are adults without children (that's a total of 1.5 million adults each year). While the scientific community tends to focus on school-aged children for outreach activities (and fulfilling NSF's Criterion II requirement), Schubel said scientists should broaden their thinking about outreach to include adults. Not to mention, adults are the ones voting and electing decision makers. As further incentive, Schubel noted that many of these institutions don't have a lot of bench strength and they would be willing partners in scientists' outreach activities.

DOING IT RIGHT

Throughout the evening, panelists also offered tips for being more effective communicators. They also addressed perennial questions such as how to deal with scientific uncertainties and how to draw the line between providing information and being an advocate. As those discussions have taken place time again, the many statements and suggestions offered by the panelists won't be repeated here. A statement by Eilperin probably best summarizes the conversation on these issues: "There are difficult lines to be negotiated, you need to figure out what *you* are comfortable with."

Eilperin also gave practical advice on how to address a non-scientific audience, urging scientists to remember that while the person may not be an expert in what you do, they likely are fairly well educated and can grasp information if it is clearly presented. She suggested that scientists think about how they would explain their work to a "smart friend" in a completely different line of work. Schubel's advice was to think about delivering something other than just the facts: hope. "Too often we do not provide hope…no strategy without hope is ever going to succeed." Schubel says scientists have an important role to play in policy and are well qualified to "provide and evaluate alternative policy options."

A question from the audience led Eilperin to encourage the audience to go beyond one-time communication and actually establish relationships with people such as congressional staffers and members of the media (be they reporters for national outlets such as *The Washington Post* or your local newspaper). She illustrated how having an open line of communication with the "gate keepers" of news outlets can have huge payoffs. So how can scientists begin building these relationships? Contacting reporters by email or organizing events such as field trips aimed particularly at those audiences have both been used successfully in the past by scientists eager to get the attention of people in positions of power.

As the question and answer session came to a close, it became clear that while members of the audience were convinced of the need (and perhaps the duty) of scientists to do a better job of reaching out beyond the scientific circles, there was still a sense of hesitation in the crowd. Be it from not believing they could truly have an impact or from feeling frustrated with trying to fit outreach into an already-packed schedule at institutions that (in most cases) do not acknowledge, let alone, reward outreach as a valid use of time. Perhaps sensing undercurrents of doubt and frustration, Jackson offered some words of hope to the audience: "I don't think it's hopeless, it's just not easy. It's not instant gratification."

WHAT'S NEXT?

The panelists, facilitators, and many members of the audience left the event further convinced of the urgent need for better communication. Neither Sharp nor the sponsoring societies want the panel discussion to be a one-time event that, while interesting, did not inspire significant change. We are working to ensure that the panel's discussion is archived and hope to make it available on the Internet. Beyond this particular event, there has been increasing activity within the sponsoring societies in the realm of outreach and we are optimistic that will continue.

ASLO hopes to make outreach more prominent at ASLO-sponsored conferences and is working to establish guidelines for outreach at meetings. On a smaller-scale, the ASLO Public Affairs Office is available to help ASLO members develop and conduct outreach activities featuring their research. In the past, the Public Affairs Office has worked with members to organize field trips for congressional staff to visit field sites, conduct science

courses for policymakers, and exhibit their research at poster sessions for members of Congress. ASLO is anxious to move its own outreach events beyond the "beltway" (which encloses the Washington, D.C. metropolitan area). If you have suggestions for activities or would like to partner with ASLO in these endeavors, please send them to me at sponberg@aslo.org or to the Informal Education and Outreach Subcommittee at informaled@aslo.org.

Have a question about aquatic science policy or outreach? L&O Bulletin is now accepting questions from ASLO members to appear in a new Questions & Answers column. Please submit your questions to bulletineditors@aslo.org.

ASLO NEWS

MESSAGE FROM THE EDITORS OF THE *BULLETIN*

***John Dolan**, Marine Microbial Ecology, Station Zoologique, Laboratoire d'Oceanographie de Villefranche, Universite Paris6 CNRS UMR 7093, 06230 Villefranche-sur-Mer, France; **Adrienne Sponberg**, ASLO Public Affairs Office, P.O. Box 8785, Silver Spring, Maryland 20907, USA; bulletin-editors@aslo.org*

We hope you enjoy this issue of the *Bulletin*. We hope to continue expanding the content of the *Bulletin*, but we can only get so far without your help! If you have ideas for articles you'd like to write or see in the *Bulletin*, please drop us a line and let us know. We'd also like to know if you or any of your colleagues have recently received an award or has accomplished a noteworthy achievement so we can include it in the Member Highlights section. We appreciate the input we've received from you so far and hope to hear from more of you soon!

MESSAGE FROM THE PRESIDENT

***Sybil P. Seitzinger**, Rutgers University, Institute of Marine and Coastal Sciences, Rutgers/NOAA CMER Program, 71 Dudley Rd, New Brunswick, NJ 08901, USA, ; president@aslo.org*

My 2-year term as ASLO President will be completed at the end of June. I'm happy to report to you that ASLO is on an even stronger financial footing, our publications continue to be ranked very highly and are expanding in number, our meetings continue to reflect the most exciting advances in aquatic sciences, we are planning regular meetings outside of North America to reflect the ASLO membership, a number of new initiatives are in progress to provide additional benefits to our members, and we are finalizing a new strategic plan which will provide guidance for Board decisions as we move forward.

I'll use my last message to you to provide an overview of some of the activities we have been working on. These are the results of the hard work of your ASLO Board, ASLO committees, and all ASLO members that have contributed to continuing to make ASLO the premier aquatic sciences society.

EARLY CAREER INITIATIVE

One of my commitments when running for ASLO President was to enhance professional opportunities for our early career members. In the past 10 years we greatly enhanced activities for students, but not necessarily for our members who were in the early years of their first jobs. ASLO now has an Early Career ad hoc committee (chaired by ASLO Board Member-at-Large (M-A-L) Carla Cáceres). Based on survey results from early career ASLO members on their needs and concerns, the committee is developing and prioritizing ideas for new professional growth opportunities (see their update p. 52). One of the clear messages from that survey was a request for travel support to ASLO meetings. The Board responded quickly and allocated funds for travel support to ASLO meetings and for networking activities for our early career members. Watch for announcements in the *Bulletin* and your inbox for how to apply for travel support, for networking activities at meetings, and for additional initiatives from this committee as they continue to develop services for our early career members.

EXPANDING PUBLICATIONS

ASLO is launching a new journal, *Limnology and Oceanography: Environments and Fluids* (tentative title) to complement the ASLO family of outstanding, high-impact journals. This new journal will examine the field of environmental fluid dynamics and aquatic systems processes, i.e. how fluid physical processes interact with aquatic system biology, chemistry, and geology. An outstanding group of scientists has recently been appointed to an Editorial Advisory Board who will finalize the scope of journal and chart the way forward. An Editor-in-Chief will be appointed in the near future by the ASLO Board. This project has been under consideration by the Board for a number of years, and an agreement with Duke University Press, who will assume the full costs of publishing the journal, is making it a reality. The first issue of the journal is likely over a year away….. watch for updates and consider submitting your work to this exciting new journal.

Electronic availability of journals has greatly increased ease of access to articles and provided additional opportunities for visualization of data and for including important supplemental material. I've long thought that books need to be available electronically as well. ASLO is now leading the way in publishing Web-based books. Our first book: *Methods in Aquatic Virology*, headed by Curtis Suttle is in the works. Paul Kemp (ASLO Board member, Editor-in-Chief of *L&O:Methods,* and ASLO web editor) is chairing a committee to establish guidelines for

web-based books, and it looks like 1 or 2 new proposals for web-based books are in the wings. If you have ideas for a web-based book, contact Paul (webeditor@aslo.org).

MEETINGS

ASLO meetings are a corner stone of ASLO activities. We are always looking for ways to improve them and to broaden participation. Meeting locations outside of North America are now regular parts of our schedule (e.g., Nice, France this winter) reflecting the geography of our membership. For the meeting in June in St. John's, Newfoundland, we are exploring videotaping plenary and awards talks in order to make them more widely available through the ASLO web site.

ENHANCING EDUCATIONAL PROGRAMS

Many ASLO members spend considerable time preparing lectures and teaching at the undergraduate and graduate level. Communicating science to the public and to schoolchildren is also important. The Education Committee has been reorganized and reenergized. You've heard in past messages from me about the on-line ULTRA lectures that will provide a range of general and special topic lectures (in PowerPoint format) in aquatic sciences available for use by ASLO members. Admittedly, it has taken a bit longer than anticipated to get the first suite completed, but the ULTRA committee assures me that an initial set will be launched later this summer. A second set is in planning.

The newly formed Informal Education and Outreach subcommittee (chaired by Janice McDonnell) has conducted a survey of members needs, is reorganizing and enhancing the ASLO web site to make the large number of existing resources scattered throughout the world-wide-web more easily available, and is assisting the Meetings Committee (chaired by Debbie Bronk) with developing guidelines for outreach activities for future ASLO meetings.

ASLO has a number of awards for scientific excellence, and soon we will also have an award for excellence in teaching. ASLO Board M-A-L Wayne Wurtsbaugh is leading that effort.

ASLO STRIVES TO BE GREENER IN ALL ACTIVITIES

ASLO is evaluating all our activities (i.e., meetings, publications, operations) and seeking ways to decrease our environmental impact. Of course, electronic publication of all our journals is one step that we have been doing for a number of years. But there is much more we can do. Board M-A-L Willem Granéli is leading the initiative to compile information and develop guidelines on how ASLO activities can have less impact on the environment. We are asking you to contribute your ideas (see call in this issue of the Bulletin) on how ASLO can be more green.

FINANCES

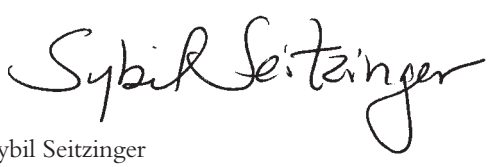
The ASLO Board has been working hard on many fronts to ensure the financial stability of your society. Sound accounting principles for non-profit organizations in the US, such as ASLO, suggest that they should have funds equivalent to one year's operating expenses in a long-term account. ASLO has been striving for a number of years to reach that goal, and we're delighted to report that we have now reached it. This provides ASLO with the flexibility to handle substantial changes in financial situations that are not under our direct control and/or that are unexpected (e.g., net loss of revenue on a meeting, decrease in revenue from library subscriptions or individual subscriptions) until alternative sources of revenue can be found, and very importantly to increase the amount of funding that can be used to develop new services for our members.

The ASLO Board is staying on top of developments in Open Access publication legislation in the US and Europe. We are taking a proactive approach to open access by decreasing the "lock up" period from 5 to 3 years for papers in *L&O* and *L&O:Methods*, and changing the financial structure of our journals including changing the price structure of library/institutional subscriptions and simplifying author page chargers. The Board also recently changed its policy regarding institutional repositories; authors of papers in ASLO journals may now post an electronic copy of their article in their own institution's repository (in additional to the author's personal web site). By instituting this change, ASLO journals meet the criteria for "green" open access, which is required for authors whose institutions have signed the Berlin Declaration on open access.

STRATEGIC PLAN

Strategic planning is important and often challenging for all organizations. At the March ASLO Board meeting, the ad hoc committee on Strategic Planning (chaired by Board M-A-L Patricia Matrai) presented a set of Guiding Principles to help the ASLO Board maintain a balance between reactive (responsive to members' needs and wishes) and proactive (anticipating new directions for aquatic science and emerging member needs) approaches to decision making. These principles will greatly assist the Board in anticipating its membership needs, will provide philosophical continuity for ASLO Board members, and will aid in making the difficult decisions about priorities on how to use the limited resources of time and money to reach the ASLO Missions Statement goals. Watch for publication of these Guiding Principles in the next issue of the *Bulletin*. The committee's next step is to identify gaps in current ASLO activities and to suggest and prioritize future activities.

The above are just a few of the many activities that your Board and ASLO Committees have undertaken in the recent past. By the time this issue of the *Bulletin* is published, the results of the election for new ASLO Board members (President-Elect, two Members-at-Large, Treasurer, and a Student Board Member) will be available. Please join me in welcoming them to the Board and give them your support as they work hard to continue to improve and expand services to ASLO members.



Sybil Seitzinger
ASLO President

MESSAGE FROM THE BUSINESS OFFICE

***Helen Schneider Lemay**, ASLO Business Office, 5400 Bosque Blvd., Suite 680, Waco, TX 76710-4446, USA; Tel.: 254-399-9635 or 800-929-2756, Fax: 254-776-3767; business@aslo.org*

DEAR ASLO MEMBER:

We hope that you have renewed your membership for 2008 – and are encouraging your colleagues to join or renew as well! It's not too late to renew or join for 2008!

With two meetings in 2008 (Ocean Sciences and the summer meeting)-we got the chance to see so many of you. It is always wonderful to talk with members and even more so, in person!

ASLO offers many benefits - the web site continues to grow and improve with many members-only sections, our journals are published on-time and provide excellent science, and ASLO meetings are a wonderful source for presenting your science, meeting colleagues and learning more about the aquatic sciences.

The upcoming meeting in Nice, France in 2009 will be an exceptional resource for many of our non-North American colleagues and is only the third time that ASLO has met outside of North America.

Our subscription base of libraries remains strong even as we sort through open access and other changing trends in publishing. If your library is not currently subscribing to the *L&O,* please encourage them to do so.

We realize there will be times you have questions about your membership or need help with an ASLO issue, so it bears repeating the different ways you can contact the business office. We are readily accessible by e-mail: business@aslo.org, or you can call us at 800-929-ASLO (within the United States) or 254-399-9635. You also can fax a message to 254-776-3767.

As the society continues to grow, we look forward to serving more of you and assisting you with your individual needs.

From all of us at the ASLO Business Office,

Helen Schneider Lemay
ASLO Business Manager

UPDATE FROM THE ASLO EARLY CAREER COMMITTEE

*ASLO Early Career Committee, **Gillian Stewart**, Earth and Environmental Sciences, Queens College CUNY, 65-30 Kissena Boulevard, Flushing, New York 11367, USA; career@aslo.org*

WHO ARE WE?

At the February 2007 ASLO Board meeting, an ad hoc Early Career Committee was established. The committee was charged with recommending and justifying a definition of "early career" in the ASLO context. This committee was then requested to determine the need for programs and initiatives targeted to benefit early career members and, if needed, to recommend appropriate options for implementing such programs.

The committee consists of six members (listed at the end of this article) and has established some guidelines for its activity. We first defined early career members as all non-student members within 10 years of their highest degree. We thought that this definition was broad enough to include people in both academic and non-academic fields, those who had multiple post-doctoral positions, and those who had taken time off from their careers for personal reasons.

WHAT HAVE WE DONE?

Following approval at the August 2007 ASLO Board meeting, we surveyed the early career members to gain a broader perspective of membership needs. Approximately 33% of the early career ASLO members responded to the survey (278 out of 841). The survey consisted of 8 questions and can be found at http://www.aslo.org/forms/earlycareersurvey.html.

Essentially, the first five survey questions were about the members themselves. From this part of the survey we learned that approximately 96% of respondents had PhDs. and that approximately 30% were assistant professors, 20% were post-doctoral researchers, and 20% were research scientists. Over 70% of respondents identified themselves as working within academia, with a further 18% working for the government and the rest mixed between industry and non-profit organizations. Over 60% of the respondents were from the United States, but 22 other countries were also represented. The survey asked respondents about their past participation in ASLO activities, as well as their interest in a list of possible future early career activities. There was interest in all programs suggested (Table 1), but travel funds to meetings received the most support, followed by teaching resources, Town Hall meetings, new awards, and

Table 1. Summary of the responses of early careers members to proposed future activities organized by ASLO.

Proposed Activity	*% of max possible score*
Funding for travel to ASLO conferences	78
Targeted Town Hall Meetings	69
Resources for sharing lecture notes or PowerPoint presentations for courses	69
Additional "Early Career" awards	62
Formal mentoring program	56
Early career members on the governing board*	65
Online career chat	38

** Although there is not a designated spot for early career members, there are currently early career representatives on the board.*

a mentorship program. An early career representative on the board and online chats received less support.

Finally, the survey asked for comments on their experience with other early career programs and how ASLO and this committee can best serve their interests. We received a huge response and some very constructive suggestions. With regard to previous early career activities, a high proportion of respondents had participated in DISCO, DIALOG, DIACES, and similar symposia for recent PhD graduates, as well as attending ICES/PICES Early Career Conferences. Some reported that NSF-sponsored programs such as ADVANCE or other institution-specific workshops were helpful.

Suggestions for the ASLO Early Career Committee to consider implementing in the future included: providing information on salary scales and placement statistics, designing a database of class materials for resource sharing, and facilitating networking and mentorship. Some respondents expressed their frustration with the current scarcity of research funding. While this topic is slightly beyond the scope of our committee, ASLO has been addressing this issue since 2001 through the activities of its Public Affairs Office.

ARE YOU AN EARLY CAREER MEMBER OF ASLO HOPING TO ATTEND THE 2009 NICE MEETING? ASLO HAS APPROVED TRAVEL FUNDS FOR EARLY CAREER MEMBERS – WATCH YOUR EMAIL FOR DETAILS ON HOW TO APPLY.

WHAT'S NEXT?

The ASLO Early Career Committee met in March 2008 to discuss the survey results and plan our course of action. In response to the perceived need for networking, the committee will organize early career "mixers" and other social events at the next two upcoming ASLO meetings (St. John's 2008 and Nice 2009). These mixers, while primarily social in nature, will also help the committee obtain further feedback as participants will be asked to discuss and report on various aspects of the "early career challenge": teaching, mentoring, funding, publishing, lab management, family balance, etc. While the committee agreed that the concept of formal mentoring had its merits, we all felt strongly that early career members could gain the most from interacting with people in or close to their current positions. In the future, we will consider a more formal mentoring program with senior scientists, but for now, we will focus on the strength within our own cohort.

In response to the strong demand in the survey, the ASLO Board has generously provided funds to be used to arrange early career events as well as to provide travel awards for early career members to attend upcoming meetings. We all agreed that travel to ASLO meetings is one of the most important opportunities that we can provide to members. Since the abstract deadline for the next meeting (St. John's) has already passed, we have decided to spend all of the money on $1000 travel awards to the meeting in Nice ($400 for registration and $600 towards offsetting travel and accommodation costs). We will be contacting early career members about this opportunity in the near future. For this first round of travel awards, we have decided to allocate the awards on a lottery basis, with some effort to distribute them as evenly as possible among broad geographic and research areas. We are asking that only the early career members who do not have sufficient funding from other sources apply. Further, we will remove the financial penalty of withdrawing an abstract for those who are not selected and who as a consequence are unable to attend.

In response to the need for Town Hall meetings and other discussion venues, we have early career workshops planned for both St. John's and Nice, and hope to host similar activities at future ASLO meetings. The specific focus of these events will be refined based on the invited panel of participants at each meeting, but topics such as funding, time management, publishing, non-academic careers, and the future of the field will be discussed in an open and casual atmosphere. We will do our best to have experts (program managers and journal editors, for example) lead these discussions, which will have broad appeal to both early career and student members of ASLO.

In response to the need for teaching resources to be more available to first-time lecturers and professors, we are exploring ways to facilitate the exchange of teaching materials. ASLO has committees discussing the possibility of a "peer-to-peer" exchange of PowerPoint slides in a variety of fields and at all academic levels (introductory undergraduate through graduate). As this resource develops, the Early Career Committee will do its best to keep early career members updated.

In addition to past early career symposia such as DISCO, DIACES, DISCCRS, and DIALOG, a new program: Eco-DAS specifically for recent graduates in any field of marine or aquatic ecology is being launched for Fall 2008. (See http://cmore.soest.hawaii.edu/eco-das/ for more details.) In response to comments on the survey from members outside of the United States, the ASLO board has approved funds that will allow two individuals working or studying in countries outside the US to participate in Eco-DAS. (Since the US government funds the program, international participants in these symposia must be funded by outside groups).

FOR MORE INFORMATION:

The ASLO Early Career Committee is in the process of developing a webpage where early career members can learn about our activities, find resources, and communicate with us. The web address is http://www.aslo.org/earlycareer/. We encourage early career and other members of ASLO to check it out and provide feedback.

As a newly formed committee, we are very open to input from members. Please contact us at career@aslo.org and tell us what we can do to help you. Also, let us know if you are interested in serving on any ASLO committees yourself or are willing to act as a mentor for other members. We look forward to hearing from you.

Gillian Stewart, Carla Cáceres (Chair), Beatrix Beisner, Letise (Houser) LaFeir, Brian Roberts, and Colin Stedmon

ASLO's Facebook Group Page

ASLO HAS A *FACEBOOK* GROUP

***John A. Downing**, ASLO Board Member-At-Large and Professor, Iowa State University, 253 Bessey Hall; Ames, IA 50011-1020, USA; downing@iastate.edu*

Communication is one of the most important things a professional society does. In the past, ASLO communication has been either one-to-one (e.g., personal e-mail), one-to-many (e.g., broadcast e-mail), or publication based (e.g., *Bulletin* or web site). These instruments often result in linear, unidirectional flow of information. Social networking is the fastest growing means of communication, with networking sites such as *Facebook*, *MySpace*, *YouTube*, and *Digg* allowing networked discussion and communication. These sites usually allow members to create a profile – a sort of web page that displays information about who you are and what you are interested in. This page is visible to people that you allow to view it ("friends") and a limited amount of information is shown to others. Communication within *Facebook* can either be networked (i.e., visible to all or only to friends) or private. Becoming a member is usually free and is quite easy. One can search for people with similar or interesting backgrounds and experiences and create a network of the people you want to be in touch with.

Another aspect of social networking sites is that some promote the creation of "groups" for discussions of particular topics or for people with particular interests. A few months ago, I created one of these groups for discussions about ASLO. It is called, *"American Society of Limnology & Oceanography (ASLO) discussion site"* open to any *Facebook* member who would like to join. My main interests in forming this group were to promote ASLO to young aquatic scientists, provide information about the benefits of ASLO membership, and to demystify ASLO's inner-workings. In up-coming months, I hope to open discussions about pending discussions of the ASLO Board, decisions we have made and how they might help members, meetings and events, and receive input and ideas about how ASLO might improve the careers of ASLO students and early career scientists.

Our group is small, so far, but growing rapidly. At this writing we have 83 members from around the world. Anyone is welcome and discussions can treat any topic that anyone would like to discuss. Please join! The bigger the membership, the more effective we can be!

GREENER MEETINGS FOR ASLO?

***Wilhelm Granéli**, Dept. of Ecology, Lund University, Ecology Building, SE-223 62, Lund, Sweden; wilhelm.graneli@limnol.lu.se*

A goal of ASLO is to promote sustainable use of aquatic resources. The society currently accomplishes this by striving for scientific excellence, by engaging the public, and maintaining a dialogue with politicians and policy makers. But what about ourselves? Is ASLO an environmentally friendly and climate smart organization? The most obvious and significant ASLO activity with a potential impact on the environment is our meetings. Much has already been done to minimize pollution and resource use at ASLO meetings, e. g. by choosing hotels which conserve water and by reducing the use of printed material. However, more could surely be done. By far, the highest environmental impact in connection to meetings is unfortunately caused by getting there and home again, especially if it is by air, which ads markedly to our personal CO_2 budget (see e. g. *Science* 318:36-38, 2007).

The ASLO Board is working on these issues, through its strategic planning process and through various committees, such as the meetings committee. But the ASLO Board would also like your opinion and suggestions. How shall we make the meetings even more environmentally friendly and how shall we deal with the climate and carbon footprint issue?

Please send your opinions and suggestions to green@aslo.org.

L&O FEATURED ARTICLE

***Everett Fee**, Limnology & Oceanography Editorial Office, 343 Lady MacDonald Crescent, Canmore, AB T1W 1H5, Canada; lo-editor@aslo.org*

Beginning with the May 1999 issue of *Limnology and Oceanography*, selected articles have been made freely available for reading or download on the *L&O* Web site a few weeks in advance of when the printed issue is mailed. Featured Articles receive no special attention in the printed issue. A paper may be featured for different reasons (e.g., to draw attention to an exceptional piece of research or to promote an area of research that the Associate Editor feels L&O readers should be more aware of). Each Featured Article is announced in the *Bulletin*, as well as to the LO-Feature Mailing List, and is accompanied by an introduction to the article by the Associate Editor who handled the paper discussing its significance.

The featured article for the March 2008 issue of *L&O* is:

Ciancio, J. E., M. A. Pascual, F. Botto, E. Frere, and O. Iribarne. 2008. Trophic relationships of exotic anadromous salmonids in the southern Patagonian Shelf as inferred from stable isotopes. *Limnol. Oceanogr.* 53(2): 788-798.

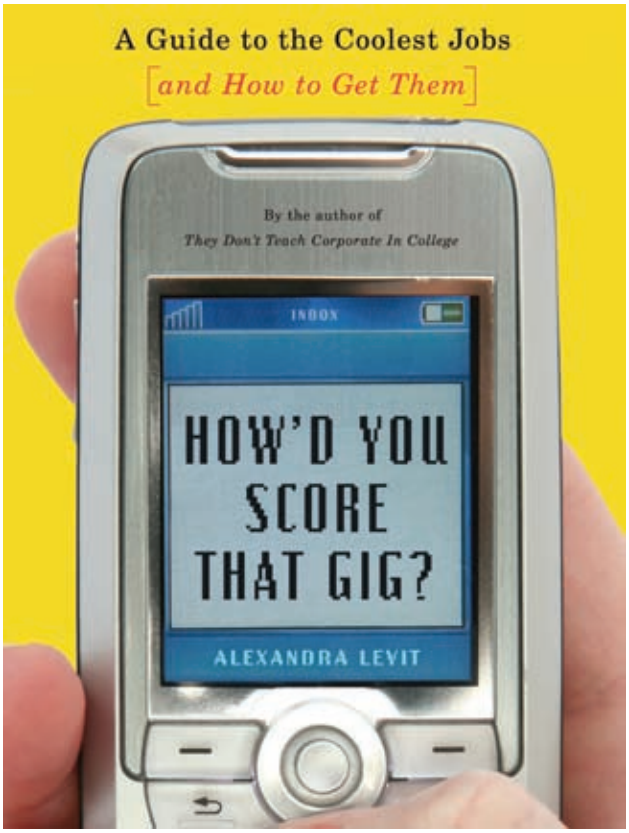
Introductory comments by Stephen Hamilton (L&O Associate Editor)

The global dispersion of salmonid fishes into new environments has been underway for a long time, and there is a plethora of studies of how these fishes affect ecological relationships in the waters to which they are introduced. People introduce these fishes for a variety of reasons, generally involving recreational and commercial fisheries, but all too often the costs of these introductions to native species and ecosystems only become evident in retrospect. In fresh waters, the profound effects of introduced salmonids on food webs and on native fishes have been well documented.

Salmonids native to the North Pacific and to the North Atlantic have now been widely introduced in southern South America, both for recreational fisheries and increasingly for marine net-pen aquaculture. Indeed, Chile now produces much of the "farmed" salmon that has flooded western markets. These introduced salmonids can sustain their populations where their

thermal ranges are adequate. Somewhat surprisingly given experience in other regions, introduced salmonids in Patagonia appear to be establishing anadromous populations. During their residence in the marine environment they potentially compete for resources with native species, and may prey upon commercially important species such as crabs and sprats.

This featured article by a team of Argentine scientists presents evidence for how the establishment of anadromous populations of Oncorhynchus and Salmo species along the southern Patagonian Shelf may affect endemic marine food webs. The vast extent of potential marine habitat was inferred from water temperature ranges. The authors examined the feeding habits of several species of exotic salmonids using stable carbon and nitrogen isotope ratios as tracers, together with stomach content analyses. The feeding habits of the newcomers are compared to their known habits in their native ranges, with some species appearing similar and others showing marked differences. Most importantly, comparison of the diets of introduced populations to those of native fishes, cephalopods, sea birds, and marine mammals identified several native species whose diets overlap enough to be in potential competition with the salmonids, including two species of penguins of conservation concern.



According to *How'd You Score that Gig?,* oceanography ranks as one of today's "coolest" careers. ASLO is mentioned in the book, which profiles 60 "coolest jobs" as ranked by 20 and 30 somethings. *How'd You Score that Gig?* (ISBN: 978-0-345-49692-4) is available from Ballantine Press for $13.95.

This paper adds to the very small number of studies on how exotic salmonids can affect marine ecosystems, and underscores the need for more research in this area. Introduced anadromous species represent another indirect environmental effect of salmonid aquaculture, which has come under increased scrutiny as it has grown in global importance.

OUTSTANDING *L&O* REVIEWERS

***Everett Fee**, Limnology & Oceanography Editorial Office, 343 Lady MacDonald Crescent, Canmore, AB T1W 1H5, Canada; lo-editor@aslo.org*

Peer review is a crucial component of modern science. The fact that *L&O* is able to utilize the services of the best scientists as reviewers allows it to be a leading journal in the aquatic sciences. However, these individuals seldom get the recognition they deserve for this selfless work. Therefore, each issue of the *Bulletin* will cite outstanding reviewers that Everett Fee, *L&O* Editor, feels deserve special recognition for their overall reviewing efforts. The ASLO membership extends its sincerest appreciation and thanks these two outstanding scientists.

D.V. HOLLIDAY

Van Holliday recently completed a 45-year career as Director of Research at BAE Systems (previously Tracor). He is now a senior marine research scientist at the University of Rhode Island's Graduate School of Oceanography and an adjunct professor of fisheries oceanography at the University of Massachusetts' School for Marine Science and Technology. A physicist with over four decades of field experience in oceanography, his principal research interests are in pure and applied acoustics, e.g., reverberation, ambient noise, propagation and signal processing. He develops and uses high technology instrumentation to measure, study and monitor life in marine ecosystems ranging from phytoplankton to marine mammals.

WILLIAM G. SUNDA

William Sunda is a research scientist at NOAA's Center for Coastal Fisheries and Habitat Research in Beaufort, North Carolina. A central focus of his research has been the influence of trace metals (iron, zinc, cobalt, manganese, copper, and cadmium) on the growth and species diversity of marine phytoplankton. He has also conducted studies of microbial oxidation of manganese and on the role the climatically active gas dimethylsulfide and related sulfur compounds as antioxidants in phytoplankton. Currently he is studying the complex sets of interactions that promote the formation of ecosystem disruptive algal blooms. He is particularly interested in the role of complex feedback interactions among bottom up controls by nutrients, top down controls by algal grazers, and grazing linked nutrient cycling in promoting harmful blooms.

GETTING TO KNOW YOUR *L&O* AND *L&O METHODS* ASSOCIATE EDITORS

***Everett Fee**, Limnology & Oceanography Editorial Office, 343 Lady MacDonald Crescent, Canmore, AB T1W 1H5, Canada; lo-editor@aslo.org and **Paul Kemp**, University of Hawaii at Manoa, 1000 Pope Rd, Honolulu HI 96822, USA; lomethods-editor@aslo.org*

The next time that you browse an issue of *L&O* or *L&O Methods,* we hope that you will take a moment to peruse the list of Associate Editors (AE) on the inside of the *L&O* front cover and on the *L&O: Methods* web site (www.aslo.org/lomethods/). These are the people whose hard work determines what is published in *L&O* and *L&O: Methods.* ASLO acknowledges the important work that these people do for the society; AEs are featured in each issue of the *Bulletin*.

The role of the AE is that of an impartial judge -- to fairly assess the reviewers' comments and guide the author's next steps. About every two weeks an AE is assigned a new manuscript. His or her first task is to select reviewers; this delicate job requires profound knowledge of both science and politics (the often conflicting relationships among people in a society). When the reviews are received, the AE digests that input along with his or her own assessment of the manuscript to arrive at a decision. It is unfortunately quite common for reviewers to recommend very different fates for a paper, which puts the AE in the uncomfortable position of having to make at least one of the reviewers and perhaps the author unhappy. For *L&O*, the AE's final job is to edit accepted manuscripts, suggesting wording and organizational changes to improve clarity. The *L&O: Methods* AEs often undertake this task as well, completing a thorough additional review focusing on improving the presentation of the authors' work.

L&O and *L&O Methods* AEs work at the highest level of our profession. Being an AE is a very demanding job, and we are extremely fortunate that these people devote so much time to the ongoing challenge of making *L&O* the leading journal in the aquatic sciences. *L&O: Methods* is only in its 6th year of publication and is already ranked #3 of 17 limnology journals and #6 of 48 oceanography journals, in large part thanks to the dedicated efforts of its Associate Editors.

LIMNOLOGY AND OCEANOGRAPHY

STEPHEN P. OPSAHL

Steve Opsahl is an Associate Scientist at the J. W. Jones Ecological Research Center in southwest Georgia. Steve is a broadly trained biogeochemist with research interests spanning the disciplines of biogeochemistry, microbial ecology, aquatic photochemistry, and organic geochemistry. In general, he studies how subsidies from the terrestrial environment support biological productivity, food webs, and biogeochemical cycling of key elements including carbon, nitrogen, and phosphorous in aquatic systems. He is particularly interested in the application of terrestrial biomarkers and stable isotope techniques for understanding sources and transformations of terrigenous dissolved organic matter (DOM). Currently he is studying surface water/ground water interactions and how the cycling of DOM, nutrients, and anthropogenic constituents are regulated at these interfaces. As an Associate Editor for *L&O*, Steve handles manuscripts on microbial and photochemical alterations of DOM, optical characterization of DOM, molecular biomarkers, C-N-P cycling in coastal systems, and groundwater biogeochemistry.

MIKHAIL V. ZUBKOV

Mikhail Vitalevich Zubkov works for the Natural Environment Research Council as a principal scientific officer leading the Atlantic Meridional Transect (AMT) observations at the National Oceanography Centre, Southampton, United Kingdom. Zubkov's research interests are aquatic microbial ecology and biogeochemistry; microbial nutrient acquisition and control in oceanic waters; protist trophic interactions with bacterioplankton communities, spatial and temporal variability of microbial communities, molecular identification and characterisation of microbes, molecular mechanisms of microbial cell recognition and methodology for studying microbial communities in situ. As an associated editor of *L&O*, he handles manuscripts related to microbial plankton ecology and biogeochemistry including trophic interactions with metazoa.

LIMNOLOGY AND OCEANOGRAPHY: METHODS

JULES JAFFE

Jules S. Jaffe is a Research Oceanographer in the Marine Physical Lab at the Scripps Institution of Oceanography, UCSD, La Jolla, CA. His main interest is in the development of underwater instruments for characterizing the marine environment. This includes both optical and acoustic systems for characterizing all sorts of marine organisms and the development of underwater optical imaging systems. He is particularly excited about the development of a next generation of small "smart" underwater vehicles that will form the backbone of a next generation of distributed sensing systems for pelagic studies. Dr. Jaffe is also enthusiastic about science outreach and participated last year in the "pulse of the planet" show that is broadly aired on NPR. For *L&O Methods*, Dr. Jaffe specializes in supervising the review of articles that have a primary focus on underwater instrumentation. These instruments often use acoustic techniques and/or optical imaging for in-situ remote sensing of either particulate matter or marine biota. Several articles have also have focused on sensing systems that use multiple moorings with networked instruments for real time data dissemination.

ADINA PAYTAN

Dr. Paytan is an Associate Research Scientist in the Institute of Marine Sciences at the University of California Santa Cruz. Dr. Paytan's principal research interests lie in the fields of marine biogeochemistry, chemical oceanography, and paleoceanography. The goal of her research is to understand marine biogeochemical cycles in the present and the past. She uses the chemical and isotopic record enclosed in sea water, marine sediments, aerosols and particulate matter to study present and past biogeochemical processes. This research spans a wide range of temporal (seasons to millions of years) and spatial (molecular to global) scales. An over-arching goal of this research is to link changing ocean composition to global changes in climate and tectonics. In addition Dr. Paytan is interested in natural and anthropogenically induced perturbation that effect biogeochemical processes in the ocean such as methane emission from wetlands, trace metal recycling in sediments, aerosol impact on marine biota, and coastal water pollution. For *L&O: Methods*, Dr. Paytan covers a wide variety of topics dealing with chemical paleoceanography, biogeochemistry, chemical and isotopic tracers in sea water and marine sediments, environmental chemistry including methane emission from wetlands, phosphate, nitrogen and trace metal recycling in seawater and sediments, aerosol chemical composition, and water pollution.

ASLO MEETING HIGHLIGHTS

OCEAN SCIENCES 2008 STUDENT PRESENTATION AWARDS

ASLO Student Representatives; ***Lynn Abramson****, Office of Senator Barbara Boxer, 112 Hart Senate Office Building, Washington, D.C. 20510; USA, and* ***Alexandre Poulain****, Department of Biology, Massachusetts Institute of Technology, 77 Massachusetts Avenue, Cambridge, MA 02139; USA; studentreps@aslo.org*

The following students were selected to receive Outstanding Student Presentation Awards at the 2008 Ocean Sciences Meeting in Orlando. These highly prestigious awards were given to approximately 6% of student presentations as evaluated based on the effectiveness of the presentation, quality of experimental design, clarity of conclusions, and scientific insight. Winners will receive a certificate and a $50 award co-sponsored by ASLO, AGU, TOS, and the Southern Association of Marine Laboratories. Congratulations to all recipients! Thank you to all who participated in judging student presentations; these awards would not be possible without your help. If you are interested in serving as a judge at future meetings, please send an email to studentreps@aslo.org for more information.

Poster Award Recipients:
Jessica Benthuysen
Melitza Crespo-Medina
Marianne Dietz
Jennifer Flannery
Nancy Gillis
Ragnhildur Gudmundsdottir
Sarah Hardee
Hristina Hristova
Sonia Ibarra
John Kirkpatrick
Eun Young Kwon
Deirdre Lockwood
Wilson Mendoza
Nancy Muehllehner
Remy Okazaki
Lara Polansky
Digna Rueda-Roa
Yoshi Sasaki
Matthew Stuckey
Kristi Valdmets
Xiaoqian Zhang

Talk Award Recipients:
Katye Altieri
Kathleen Bennett
Christina Bradley
Shih-Nah Chen
Xuehua Cui
Mark Halverson
Andrea Hougham
Jean-Olivier Irisson
Amy Kelly
Eric Moore
Clementina Russo
Andrew Steen
Natalia Stefanova
Stephanie Waterman
Eleanor Williams

ASLO NICE 2009: FROM THE RUSSIAN ZOOLOGICAL STATION (1885) TO THE OCEANOGRAPHIC OBSERVATORY OF VILLEFRANCHE (1989)

Isabelle Palazzoli*, CNRS-University of Paris6, Laboratoire d'Océanographie de Villefranche, BP 28, 06230 Villefranche-sur-Mer, France; palazzoli@obs-vlfr.fr;* ***Jean-Claude Braconnot****, CNRS-University of Paris6, Laboratoire d'Océanographie de Villefranche, BP 28, 06230 Villefranche-sur-Mer, France; braconnot@obs-vlfr.fr; and* ***Paul Nival****, CNRS-University of Paris6, Laboratoire d'Océanographie de Villefranche, BP 28, 06230 Villefranche-sur-Mer, France; nival@obs-vlfr.fr*

The Observatoire Océanologique de Villefranche-sur-Mer began as the Station Zoologique. It owes its existence to the richness of the planktonic fauna in the Bay of Villefranche, a consequence of the geological and hydrological characteristics of the area. The Bay of Villefranche, in the N.W. Mediterranean Sea, is surrounded by elevated summits. There is virtually no shelf; the hills plunge into very deep bottoms waters which are easily accessible from the coast using small boats. The Ligurian current hugs the coast, and runs from east to west. The bay then constitutes a sort of 'appendix' of the nearby deep open waters offshore, and so contains an exceptionally diverse pelagic fauna ranging from macroplankton like meduses, ctenophores, siphonphores, mollusks, tunicates, to annelids as well of course the micro-, nano-, pico-, and femtoplankton.

Records of scientific interest in the pelagic fauna go back to the early 1800's. The zoologist François Peron and his 'painter' Charles Alexander Lesueur visited the area in 1809 based on reports and aquarelles found in the archives of the Natural

History Museums of Paris and Le Havre. Much later, several scientists re-discovered the richness of the fauna in Villefranche. Carl Vogt, from the University of Geneva, on a journey back from Rome, made a stopover in Villefranche, where he saw fishermen on the beach bringing in gelatinous animals in their nets. Enthusiastic, he returned several years later and remained until the publication in 1868 of his monograph « Sur les animaux inférieurs de la Méditerranée » (On the lower animals of the Mediterranean), i.e. salpes and siphonophores. Voigt advocated the creation of a permanent laboratory in Villefranche. The first such attempt was by Jules Barrois of the University of Lille and his collaborator Hermann Fol of the University of Geneva who installed in 1882 a marine laboratory in a small tower of the Villefranche "lazaret" (a former quarantine building). As Barrois was a renowned scientist, Charles Darwin himself responded favorably to his request to support the installation of a marine laboratory in Villefranche.

The foundation of a permanent installation finally occurred through the efforts of Alexis Korotneff of the University of Kiev. The Russian Navy had use of ' galleys' (reportedly prisons) built by the Duke of Savoy on the bay. The Russian Navy had used the buildings for storing coal and as a hospital, which become known as 'The Russian House'. Standing empty for many years, Korotneff appealed to the Russian Navy and was granted use of the buildings for the installation of a marine laboratory in 1884. He invited Barrois and Fol to join him. However, the collaboration was short-lived. In early 1888, Fol vanished rather mysteriously in the Atlantic and Barrois retired to his property on the bay, where he continued research in his private laboratory.

As Korotneff was alone, " The Russian House" became the Russian Zoological Station (Fig. 1) and with meager means welcomed students and scientists from around the world. The day to day direction of the laboratory was left to Michel Davidoff who perfected techniques of preserving biological specimens and won prizes in shows in St. Petersburg, Bordeaux, and Marseille. The Station acquired a motorboat the 'Velelle'. The station scientists undertook soundings of the Bay of Villefranche to produce charts of the bay topography; they began systematic sampling of the plankton and recording of salinity and temperature data.

The year 1915 marked the death of the Korotneff in Odessa, Russia and the arrival in Villefranche of Grégoire Tregouboff who studied first in Kiev and then at the University of Montpellier. He managed to keep the Zoological Station alive through the Russian Revolution and World War I. In 1931, the station became finally French. It was ceded to the Faculty of Sciences of Paris which was responsible for the administration of two other marine laboratories: one on the Atlantic coast in Roscoff and the other in Banyuls on the Mediterreanen coast near the border with Spain. The Zoological Station was administratively part of the Arago Laboratory in Banyuls. Tregobouboff presided over the Zoological Station until 1956, when he retired from administrative duties. However, he continued research in his own fashion. He made deep dives in his capsule « Galeazzi », then in the bathyscaphe FNRS III. In 1957, he published with support of CNRS (the national science agency of France), a massive handbook on the Mediterranean plankton, which is still a vital classroom resource.

Paul Bougis, replaced Trégouboff as head of the Zoological Station. He managed the aquisition of a 20 m oceanographic vessel, *N.O. Korotneff,* and in 1974 brought together the separate research laboratories of geology, physics, chemistry, embryology, and oceanography with the creation of the 'Station Marine of Villefranche.' In 1989 the Station Marine was officially made a field campus of the University of Paris: l'Observatoire Océanologique de Villefranche-sur-Mer. First run by Jacques Soyer, then Micheal Glass, the campus is now under the direction of Fauzi Mantoura. It is the most important oceanographic institute in France with a permanent personnel of approximately 150 and about 75 temporary personnel, which are distributed in three 'laboratories', or super-departments, of Oceanography, Developmental Biology, and Geology.

The Entrance of the Station circa 1899 and 2008

ASLO MEMBER HIGHLIGHTS

CARLOS DUARTE RECEIVES PRESTIGIOUS SPANISH SCIENCE AWARD

In October 2007, King Juan Carlos of Spain presented ASLO President-elect Carlos M. Duarte with the Premio Nacional de Investigación in a ceremony in Madrid. Duarte was one of five scientists to receive the award in 2007. The Spanish science prize has been awarded by Spain's Ministry of Education and Science since 2001. Each prize winner receives €80,000. The prize is awarded to Spanish researchers whose work has benefited science at an international level and has led to the benefit and progress of humanity, sustainable development and technology transfer.

The jury of the Spanish science prize said that Duarte was one of the leading researchers on the marine ecosystem. The work he has conducted over the past few years forms the basis for further research into global climate change. After completing a doctorate in limnology, the study of inland waters, in Montreal (Canada), Carlos Duarte returned to his native Spain and worked as a postdoc at the Institute of Marine Sciences in Barcelona. Since 1989, he has been conducting research in various posts for Spain's highest scientific research council, the Consejo Superior de Investigaciones Científica (CSIC). Since 1999, he has been working at the Instituto Mediterráneo de Estudios Avanzados in Mallorca, an institute for advanced studies attached to the University of the Balearic Islands.

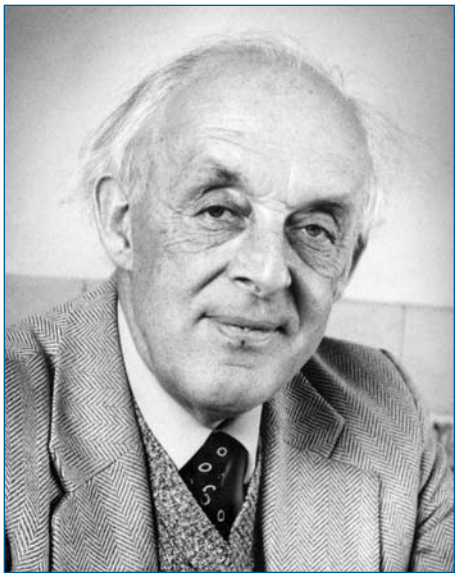
Have you or a colleague recently received an award or prestigious appointment? Send your news to bulletin-editors@aslo.org.

ASLO President-elect, Carlos M. Duarte (right), with Spain's Minister of Education (left), King Juan Carlos (2nd left), Queen Sofía (3rd left) and Secretary of State of Universities in the ceremony where he was presented with the 2007 National Research Award on Natural Resources.

OBITUARY

DAVID CUSHING, 1920-2008

*Contributed by **Trevor Platt**, Bedford Institute of Oceanography, Dartmouth, Nova Scotia B2Y 4A2, Canada; tplatt@dal.ca*



David Henry Cushing, who died on March 14, 2008 (on his 88th birthday), was a towering figure in the history of marine science. A prodigious worker, he made fundamental research contributions in several important areas of marine ecology and fisheries, wrote numerous textbooks, founded and edited the *Journal of Plankton Research*, and was a scientific Civil Servant for 34 years. In addition, he was a significant force behind the scenes, pushing international marine science forward in a rational, coordinated manner. For example, he was active in the planning as well as the execution of the International Indian Ocean Expedition; he was an organizer of the landmark Symposium on Marine Food Chains (Aarhus, Denmark, 1968); and he was a prime mover in establishing the international GLOBEC project, which went on to become so successful.

David was born in a small town in the North of England: his father was a schoolmaster, his mother a nurse. He studied at Oxford University, where he had contact with many prominent marine scientists. After completing a doctorate, he joined the Fisheries Laboratory in Lowestoft, the base for all his major contributions to science.

David's style was to think for himself until he was able to frame a research question with total clarity, design a set of observations, and pursue them with indomitable energy until a successful outcome had been achieved. If iconoclasm were needed, so be it. Following this approach, he helped turn the field of plankton ecology (including the planktonic stages of fish), into a quantitative science. In doing this, he was by no means an ivory-tower recluse. On the contrary, he spent considerable time at sea, including the running of a famous three-month, two-ship expedition to follow the dynamics of a zooplankton patch off the English coast (1954), an observational design that would be accepted as cutting-edge even today. Long experience in projects such as this enabled him to write important syntheses on the nature of production in the sea, including the growth of phytoplankton and the loss due to grazing by zooplankton.

Another subject to which David made fundamental contributions was the counting of fish by acoustic sensing. He was

involved with this as early as 1951, working in the English Lake District using dead fish fixed in a drift net suspended in the water. Though his transmitter was primitive, his observations were organized in a systematic way that permitted significant conclusions such as the elucidation of the importance of the swimbladder in the acoustic return from fish. Nowadays of course, multifrequency acoustic survey of fish is highly developed and it might be easy to overlook the massive contributions of the pioneers. But an enormous debt is there nevertheless. Interestingly, perhaps because of this background, David was later to become one of the first scientists to apply the Coulter Counter to the problem of the abundance and growth of phytoplankton.

As a Civil Servant, David played an important role in the fisheries arena, particularly in the specialist committees of the International Council for the Exploration of the Sea (ICES). Here, in the late 1950s, he promoted field work to investigate the causes of mortality in herring, including mortality through fishing. These included tagging experiments on both the adults and juveniles, a method of research hitherto only very rarely (if ever?) applied to a marine organism, and certainly not to herring. David's ability to achieve and to lead international cooperation in the study of these politically-sensitive issues is a measure of the respect he commanded in the marine science community.

David wrote many textbooks. Here, like J.Z. Young, his teacher at Oxford, he demonstrated a formidable strength as a synthesizer of information from many fields. As an example, we may take "*Marine Ecology and Fisheries*" (1975) which ranged over production cycles, primary and secondary, relation between fish and plankton, population dynamics of fish, and the marine food web in general. He also discussed climate change, and the influence of man as a predator in the sea, topics that became fashionable only much later. One of his most enduring legacies as a synthesizer is his famous match-mismatch hypothesis linking interannual variability in the phenology of the vernal phytoplankton bloom with fluctuations in the survival of larval fish.

As a journal editor, David came into contact with many scientists around the world who will remember him with considerable affection. He founded the *Journal of Plankton Research* only after his official retirement. He ran it for some twenty years: it is by now one of the leading journals in the field. As an editor, he was unfailingly sympathetic to the author, and especially so to authors from developing countries and authors without English as a mother tongue.

David was a highly cultured person with an extremely broad knowledge of many subjects, not just science. But he carried his wisdom lightly, without any arrogance. He was an intellectual giant, always years ahead of the crowd in the choice of the fruitful questions for research, immensely industrious, always interesting to talk to, always a gentleman. He has left an indelible mark on aquatic science.

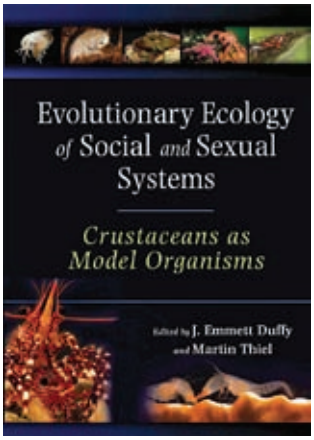
REFERENCES

Cushing, D.H. 1975. Marine Ecology and Fisheries, Cambridge University Press.

BOOK REVIEWS

DUFFY, EMMETT D., AND MARTIN THIEL (EDS.). 2007. **Evolutionary Ecology of Social and Sexual Systems. Crustaceans as Model Organisms.** Edited by J. Emmett Duffy and Martin Thiel. Oxford University Press. ISBN 0-19517-992-7. 502 p. US$59.50.

Reviewed by ***Anson H. Hines*** *and* ***Paula Rodgers,*** *Smithsonian Environmental Research Center, PO Box 28, 647 Contees Wharf Road, Edgewater, Maryland 21037, USA; hinesa@si.edu; rodgersp@si.edu*



This stimulating book certainly achieves its main objective of highlighting crustaceans as model organisms for the study of behavioral ecology. It covers an extensive diversity of crustacean species and summarizes the majority of important research to build a compelling case: crustaceans provide rich opportunities – approaching that of insects and birds - to advance fundamental understanding of social and mating systems. Almost 16 years after the publication of *Crustacean Sexual Biology* (edited by R.T Bauer and J.T. Martin), and much anticipated by carcinologists, this new book extends well beyond the format and content of the earlier volume to present research questions and modern tools applied across evolutionary lineages and ecological habitats. The chapter authors include an international crew of experts who have led the advances over the past 20 years. At the same time, the broad interests of the organizing editors have produced a book that should appeal to general ecologists, behaviorists, and evolutionary biologists, as well as carcinologists.

Duffy and Thiel have organized the book into five sections on introductory background, communication, mating and courtship, social systems, and synthesis. While it is not necessary to read the chapters sequentially, there is a clear cumulative order within each section. The editors have applied unusual discipline to constrain all chapters to approximately the same length (10 pages plus references). As a consequence, the book provides concise chapters with even distribution of coverage across the major topics; but the level of detail varies considerably among chapters, depending on the amount of information available on that particular taxon or topic. The focus of the chapters allows references to be cited at the end of each without creating much redundancy among the lists of literature cited. The book has good illustrative materials with many useful tables, photos, diagrams, figures, and illustrations, along with a good subject index.

The introductory section provides valuable background and theoretical information on crustaceans and on behavioral ecology. Shuster provides a highly useful mathematical model based upon the "operational sex ratio" for measuring the intensity of sexual selection, a key step in the analysis of mating systems. The reader can refer to Shuster's book for additional details on how his model differs from the more conventional models based on

optimization or parental investment. Neigel and Mahon's chapter on molecular approaches serves as a manageable introduction with good references to tools used in genetic and phylogenetic studies. They advocate critical caution about currently burgeoning conclusions that may over-extend analysis of single genetic markers. They correctly urge greater rigor to assess multiple genetic loci and to seek additional information about limitations as well as strengths of molecular tools.

The communication section opens with a clear description of the decapod neural system by Herberholz that links morphology to neurochemistry as a regulator of behavior. This is extended with a chapter by Moore focused on intrinsic and extrinsic factors regulating crayfish agonism, which provides context for social pheromones and olfaction linked to the neuron-endocrine system. In a chapter on American lobsters, Atema and Steinbach effectively drive home the certainty that chemical communication in crustaceans is as important as in insects; but they also emphasize a key point that unless the chemistry catches up with the biology, we will remain ignorant of the true extent of chemical signaling in crustaceans.

The central section on mating behavior and courtship is organized around several major taxonomic groups (amphipods, isopods, crabs, caridean shrimp) by various authors. These chapters cover a wide range of topics influencing sexual selection, including ecological context, sexual conflicts, sperm allocation, predation, social structure, hermaphroditism, and symbiotic associations. The many similarities between mating and agonistic behaviors across crustacean groups indicate the evolutionary importance of suppressing aggression during mating and the general neuro-endocrine control mechanisms regulating these behaviors. This book provides essential ground work for such connections, emphasizing again that the chemistry of the signals is a crucial gap limiting progress that has been achieved for insects.

A series of chapters spanning several specialized crustacean groups (spiny lobsters, semi-terrestrial crayfish, terrestrial isopods, freshwater crabs, snapping shrimp), again by key experts, illustrates the evolution of sociality involved in aggregations, migrations, parent-offspring interactions, subsocial behavior, and eusocial systems. One aspect of crustacean social interactions is not directly addressed – the tendency of many crustaceans to exhibit strong agonism, especially cannibalism, particularly on molting individuals, as an obvious behavior that needs strong inhibition in the evolution of cooperation. A central theme here is how ecology has shaped social interactions through variation in optimal decisions for dispersing, care of the offspring, group defense, and division of labor. Crustaceans illustrate well the independent evolution of social systems, providing strong comparative research material for evolutionary themes that have typically focused on insects or vertebrates, culminating in evolution of tight controls of individual behavior in eusocial systems.

The book closes with three synthesis chapters to overarch the more narrowly focused central chapters. Van Son and Thiel describe how anthropogenic impacts - fishing, habitat destruction, and pollution - can alter mating strategies and social behavior through direct and often strong indirect processes. Crespi links crustacean systems to other groups, particularly insects by referring to crustaceans as "water breathing insects" (although we would argue that insects are "air breathing crustaceans!"). The final chapter by the editors highlights the importance of understanding in future work how social and sexual behaviors interact and in turn are shaped by ecology.

While the book focuses on the best studied decapod groups ranging from shrimps to crayfish and crabs to lobsters, it also summarizes extensive information on isopods and amphipods. One group noticeably lacking from the book is the stomatopods. It would have been useful to update Caldwell's earlier review of stomatopod mating systems and to assemble the extensive behavioral data for this group into this book. Coverage of copepod, cladoceran and branchiopod (brine shrimp) behavior and mating is also missing. However, many chapters include sections on comparative studies and there are several chapters that provide broad comparative studies across crustacean groups and briefly relate the crustaceans to other well-studied groups including insects. As a result, information on a large number of species is presented. Appropriately, the reviews span the full breadth of habitats exploited by crustaceans, including marine, freshwater, terrestrial – even desert dwelling – to symbiotic species and even a crab species that live solely on bromeliad plants.

The book focuses on the results of research from the past 15 years, as indicated by the extensive references for each section, but it also refers to the underlying theories, and references key papers from the earlier literature. Many of the fundamental concepts taught in an introductory behavioral ecology course with vertebrate examples, are also fully covered in this book using crustaceans as a model, providing a non-vertebrate view of these behaviors. Since the majority of the chapters serve as a synthesis of decades of work, it reads less like a compilation of research articles and more as a comprehensive guide of the current understanding of crustacean behavior. As such, it is not written solely for graduate students, but as an excellent reference for established carcinologists. One of the primary assets of this book is the large number of review tables that summarize various behaviors and their correlates across different species. This serves as an extensive database that scientists from various fields will find as a useful tool for their own work, in particular for comparative studies.

A major strength of this book lies in its critique of our current knowledge of crustacean behavior, identifying gaps and places for improvements. Chemical analysis of the signaling molecules is a one such gap that is inhibiting progress. Recent advances are starting to overcome other long-standing difficulties, such as the phylogenic mysteries that have limited evolutionary comparisons but are now clearing rapidly. The straightforward tone of this assessment conveys the authors' enthusiasm for using crustaceans as model systems. Speckled with beautiful photos, a plethora of diagrams, and excellent research, the combination of authoritative reviews and critical analysis results in a book that is likely to become a useful reference for graduate students and advanced researchers alike. Moreover, the surprisingly affordable price of this book makes it an unbeatable value.

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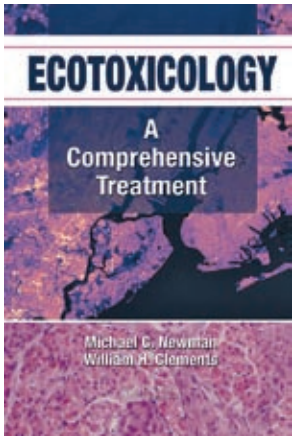
NEWMAN, MICHAEL C., and **CLEMENTS, WILLIAM H.** 2008**. Ecotoxicology: A Comprehensive Treatment.** CRC Press. ISBN978-0-8493-3357-6 (hardcover) 852 p. US $139

Reviewed by ***A. Russell Flegal****, Department of Environmental Toxicology, University of California, Santa Cruz, 1156 High Street, Santa Cruz, CA 95064, USA; flegal@etox.ucsc.edu*



Nearly three decades ago I received a call from a colleague who chaired a large, multi-disciplinary program at a premier research university. He told me that they had been authorized to hire an ecotoxicologist, and he wanted me to tell him how to describe the position for their search. He assumed that I would be able to provide him with that information because I was in the process of establishing our nascent Department of Environmental Toxicology at the University of California, Santa Cruz. Unfortunately, I had to tell him that I hadn't really been able to come up with a good description of an ecotoxicologist, but that I hoped that he would find someone else who had – because we were also supposed to recruit an ecotoxicologist for our program.

I mention this shared ignorance, because I now find myself in awe of the breadth and depth of the new book by Newman and Clements (2008), *Ecotoxicology: A Comprehensive Treatment*. As the book extensively details, ecotoxicology is a new and still evolving science that synthesizes the complex fields of ecology and toxicology – which are themselves both multi-disciplinary and inter-disciplinary sciences. The book is simply the best that I have encountered in providing an integrative presentation of the vast amount of knowledge required to practice ecotoxicology. Moreover, the authors go to great lengths to provide both (1) an historic background of the evolution of the science to date and (2) comments, suggestions, and predictions on how the science will continue to evolve. Their orientation is evidenced by the book's concluding paragraph, which states:

> "Ecotoxicology's ambitious goals, immediate obligations to society, and unquestionable success in generating a rich information base have created the need for integration of information and explanations into a congruent whole…. We suggest that the Strongest Inference Possible approach is the most effective approach currently available."

This conclusion is, of course, most fitting for a book that begins with an Overview in Chapter 2 that states,

> "Conceptual consilence is not an intellectual nicety: it is vital to the health of any science. Without consistency among theories and facts, there is no way for the ecotoxicologist to choose from among many the explanation for providing the best foundation for predicting pollutant effects."

This excellent book is obviously the product of careful work by two recognized experts in the field. They appear comfortable providing their opinions and perspectives, in addition to the facts found in most textbooks. Their design is immediately evident in the Preface, where the authors state that the book "is intended to bridge a widening gap between ecotoxicology textbooks and technical books focused on specific ecotoxicological topics." As they then note, there are plenty of narrowly focused books on different aspects of ecotoxicology that are written for experts in those areas, and an increasing number of texts that "are often broad-brush treatments of the field of ecotoxicology". In contrast, their book is designed to provide greater depth than other texts on ecotoxciology, while still maintaining a focus on the paradigms and fundamental themes of the science.

I found the orientation wonderfully refreshing, albeit challenging. Each chapter begins with a brief overview and then immediately goes into a relatively rigorous discussion. While many terms are defined, others are not – with the assumption that the reader is familiar with the argot and methodologies of each topic. Fortunately, each chapter then ends with a summary of bullets that synthesize the critical points covered in the chapter. Each chapter also has a list of references that is remarkably current and comprehensive. Consequently, while there may be few individuals that are fully conversant, much less expert, in all of the disciplines covered in the thirty-six (36) chapters of the long (852 page) book, it systematically provides summaries of the important points of each chapter and a wealth of references for further reading on each subject.

The book is further organized into six (6) sections. These are titled "*Hierarchical Ecotoxicology*," "*Organismal Ecotoxicology*," "*Population Ecotoxicology*," "*Community Ecotoxicology*," "*Ecosystem Ecotoxicology*," and "*Ecotoxicology: A Comprehensive Treatment – Conclusion*." As previously indicated, each of those sections contains chapters that provide relatively rigorous, albeit terse, discussions using the argot and methodologies practiced by experts in the diverse disciplines. But what is relatively unusual about the different chapters with widely different topics is that the authors continually show how all of the material connects, routinely referring to related material in preceding and succeeding chapters. As a result, the book is both comprehensive and integrative (e.g., a population ecotoxicologist can appreciate the importance of a molecular toxicologist for their research and *vice versa*).

The first section on "*Hierarchial Ecotoxicology*" is short: only 1 chapter and 10 pages long. It begins with the definition of ecotoxicology by Newman and Unger (2003): "Ecotoxicology is the science of contaminants in the biosphere and their effects on constituents of the biosphere, including humans." The chapter then illustrates the "unfixed cause–effect-significance concatenation" scheme applied to hierarchical subjects (e.g., from molecules to the biosphere). For example, toxicity observed in an organism may be explained by a toxic effect at the lower, suborganismal level and may be significant at the higher, population level. Consequently, the science of ecotoxicology needs to extend from the molecular level to the ecosystem level.

The second section on "*Organismal Ecotoxicology*" focuses on factors influencing toxicity from molecular to cellular to tissue to organismal levels. When appropriate, the impacts of that toxicology are briefly extended to population and community

and ecosystem levels. However, most of the discussion is on biochemical and physiological processes involved in the accumulation, distribution, metabolism, and elimination of toxicants in cells, tissues, and individuals. The basic concepts of toxicology (e.g., bioavailability and bioaccumulation, dose-response curves, acute and sublethal toxicity) are also presented in this section.

The third section on "*Population Ecotoxicology*" shifts to more mathematical models used in population biology and epidemiology. As the authors note, regulatory efforts are now primarily designed to protect populations from pollutants, using knowledge primarily derived from autecological studies. This incongruity both justifies the importance of the preceding section on organismal ecotoxicology and establishes the need to develop the emerging field of population ecotoxicology. Consequently, the section begins with a discussion on inferences within and between biological levels (e.g., individuals and populations) and then extends to a discussion of disease in populations (epidemiology). This sequencing is followed by the development of models of populations and of the effect of pollutants on populations, including models of population genetics and the phenogenetics of exposed populations. Again, this section employs the vocabulary and analytical methodologies used by researchers in population ecotoxicology, which are markedly different than those used by researchers in organismal ecotoxicology – but the authors systematically show how the two areas of research are closely connected.

The fourth section on "*Community Ecotoxicology*" is more closely connected to the preceding section, in terms of argot and methodologies. Those two sections, along with the subsequent section on ecosystem ecotoxicology are what I have - apparently mistakenly - believed defined the range of ecotoxicology. Community ecotoxicology is also what I believed - apparently correctly - a relatively new focus for studies on the impacts of pollutants. As pointed out by the authors, while toxic effects are best understood at the lower levels of biological organization (e.g., molecular, cellular, and organismal), the adverse effects of toxicants may occur at broader spatial and temporal levels at higher levels of organization (e.g., population, community, and ecosystem) which may have greater ecological impact. This hierarchical concept is illustrated with discussions of principal biotic and abiotic considerations of factors governing community composition, the effects of toxicants on communities, biomonitoring communities, experimental studies of toxicants in communities, and whole ecosystem manipulation. These assessments build on models presented in the previous section, as well as numerous models presented within chapters in this section and an entire chapter on the application of multimeric and multivariate approaches in community ecotoxicology. The section then concludes with numerous examples of anthropogenic perturbations on communities (e.g., climate change, ozone depletion, acid deposition, and food web disruption). Consequently, I was pleased with the structure and depth of this section.

The fifth section on "*Ecosystem Ecotoxicology*" extrapolates the concepts and methodologies of the preceding two sections to a more global scale. While the authors note that some ecologists consider ecosystems to be the fundamental units of nature, they concede that quantifying the effects of contaminants on ecosystems is extremely difficult – hence not routinely assessed. They then show the importance of global approaches to ecotoxicology, primarily though discussions on perturbations of biogeochemical cycles (e.g., C, N, P) and the resulting impacts on ecosystem productivity, composition, and health. There is also a chapter on the use of microcosms, mesocosms, and field experiments to assess ecosystem responses to stressors, including toxicants. After having been exposed to all of the terms and methods in the preceding sections, this section proved to be very easy to read and a wonderful conclusion to the book.

However, there was yet another, sixth section on "*Ecotoxicology: A Comprehensive Treatment – Conclusion*," which I had no interest in reading but felt obligated to read for this review. Fortunately, the section consisted of a single (1), short (12 pages) chapter. And even better, the chapter was full of ideas and suggestions on how the science of ecotoxicology is evolving and how to optimize that evolution to benefit both science and society. The summary was essentially limited to the first paragraph of the chapter which stated that (1) the twin goals of differentiation and integration were presented in the first 35 chapters of the book and (2) "Facts and paradigms relevant to each level of the biological hierarchy were presented and then interconnected as much as presently possible." Then as previously indicated, the rest of the chapter provided metrics and concepts on what was needed for ecotoxicology to emerge as a "self-consistent science" and be of most value in addressing and resolving the increasingly complex and global environmental problems society now faces.

While the brief concluding chapter could be the basis for an entire course, the utility of the book as the text for a course is more problematic. As I have repeatedly indicated – the book is quite long. The authors state that the book is "designed to be flexible enough to meet a variety of instructional vantages, subsets of chapters may be used while de-emphasizing others," and they provide two examples of selected chapters for a 3-credit ecotoxicology course. They also suggest the entire book could be covered by a 4 credit course. However, I doubt that there are many faculty with the breadth and depth of expertise of the authors, who could teach the course. But I believe that the book would be ideal for a course that is team-taught by someone with an expertise in basic toxicology (i.e., molecular, cellular, and organismal toxicology) along with another person with an expertise in ecological toxicology (i.e., population, community, and ecosystem ecotoxicology). Alternatively, the course could be taught by an ecotoxicologist – now that I have a better understanding of what that job description entails.

Some final comments. (1) The book is extremely well written. I specifically looked for flaws in science and composition, and I found few of either. (2) For such a long book, the wording is terse. Entire concepts and studies are presented in phrases. As a result, even reading short chapters can be exhausting. (3) Fortunately, the authors have gone to great lengths to provide both classic and new references to expand on the material covered in each chapter. (4) As the authors state in the final chapter, the book provides differentiation and integration of various aspects of ecotoxicology, and facts and paradigms of ecotoxicology are systematically presented and interconnected the text. In summary, it is - in my opinion - the definitive book to date on the complex and emerging science of ecotoxicology.

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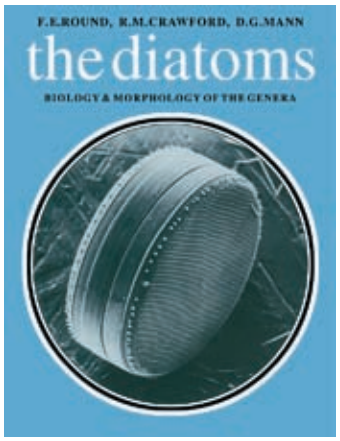
Reviewed by ***Wiebe H.C.F. Kooistra****, Stazione Zoologica Anton Dohrn, Villa comunale, 80121 Naples, Italy; kooistra@szn.it*



Cambridge University Press has brought out a softbound, affordable reprint of the 1990s hardcover book *The Diatoms: Biology and Morphology of the Genera* by Frank Round, Richard Crawford and David Mann. What a great idea! My 1990's copy shows signs of intensive usage and a new copy is more than welcome.

Why a book about diatoms? Diatoms are probably the most species-rich group among the planktonic and benthic microalgae. These organisms may be microscopically small, but they are major primary producers and play a crucial role in the biogeochemical cycling of carbon and silica. The hallmark of these microscopically small organisms is their beautiful and often lavishly ornamented compound silica cell wall, called a frustule, and these cell wall elements are especially lavishly illustrated throughout the book.

The introduction is densely informative, and beautifully illustrated with several photos in light- and scanning electron microscopy and line drawings. Following a brief oversight of the history of diatom studies, the authors present the biology and ecology, various ways to grow them in culture, and preparation methods for light- and electron microscopy observation. Then follow descriptions of various ultrastructural details of the diatom frustule, resting spores, and components of the protoplasm. There is also a thorough explanation of the vegetative and sexual part of their life cycle.

The overarching goal of the book is to provide a taxonomic oversight of the genera and the bulk of this vast tome is devoted to that. Almost every genus known in 1990 is included; each of them is presented in two pages, including half a page with concise information on the morphology, frustule ultrastructure, ecology, taxonomy, and an oversight of the relevant pre-1990 taxonomic literature. The remainder of the two pages is illustrated with a series of excellent photographs showing the diatom as a whole as well as all the characteristic ultrastructural details of the frustule. In most cases the authors have included pictures of living cells or of cleaned frustule elements in light microscopy so that those without an electron microscope at hand will be able to recognize the species. Unfortunately, the photos lack scale bars, but the authors explain why they were omitted. Several genera are morphologically highly diverse (e.g., *Chaetoceros, Cocconeis, Thalassiosira, Nitzschia, Fragillaria, Synedra*). Nevertheless, the authors devote also only two pages to the description and illustration of these genera, but have taken this diversity into account by providing illustrations of multiple species.

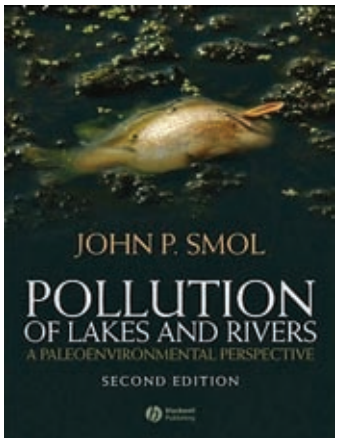
There are three appendices, one with all new taxa (as of 1990), one with genera excluded from this tome, but with their references, and one with all the included genera and their references. The book is also indexed thoroughly, based on taxonomy and subject.

The largest flaw of this book is that it is simply a reprint of the 1990 version meaning that neither post- 1990 taxonomic changes and descriptions of new genera are included, nor are insights gained since original publication from the extensive literature on molecular phylogenetics of the diatoms. So, it is not surprising that their classification disagrees in some details with recent molecular phylogenetic insights. However,, most of the taxonomy still holds, and from a practical viewpoint, it provides an ordering into generally easily recognizable groups of genera.

The book is, for me, a treasure of information for students and researchers of microalgae and for those monitoring the biodiversity of water bodies. I also highly recommend it to material scientists and architects of large public spaces such as railway stations, airport lobbies, sport stadiums, concert halls, and conference centers. Many of their more daring designs -and structural solutions- seem to have walked straight out of this book; often in the most startling details. Last but definitely not least I warmly recommend the book to any naturalist who enjoys looking through the microscope at the amazing diversity of the microscopically small.

SMOL, JOHN P. 2008. **Pollution of Lakes and Rivers - A Paleoenvironmental Perspective** 2nd edition. Blackwell Publishing. ISBN-13: 978-1-4051-5913-5. 396 p. US$ 59.95

Reviewed by ***Sonja Hausmann,*** *University of Arkansas, Fayetteville, Arkansas 72701, USA; shausman@uark.edu*



The textbook *Pollution of Lakes and Rivers - A Paleoenvironmental Perspective* by John Smol presents a wide variety of methods applied in paleolimnological studies under the aspect of human impact on lakes and rivers. The impact studies span from airborne pollution, such as acid rain, to metals and persistent organic pollutants, to erosion and eutrophication that reflect human impact in the watershed. The last third of the book discusses human impact on aquatic ecosystems in a broader sense: impact of invasive species imported by humans, human induced climate warming, thinning of the ozone layer, and the combined effect of several stressors (nemesis effect). If you are not yet convinced that paleolimnology can provide answers to many questions in global change, you will change your opinion while reading this book.

The textbook is excellently suited for beginning paleolimnologists, water quality students, and advanced paleolimnologists who are looking for a summary of what is going on in their colleagues' labs. Students will understand when they work with lake sediments as environmental archives that they have a tool to study a wide range of pollutants. The book provides 800 references, a 22 page long index, explains 190 terms in the glossary, and includes 144 images. For your teaching the figures are available as PowerPoint files.

Every chapter gets introduced with a "thought *du jour*" ranging from Shakespeare to Churchill, which is very appropriate for an Arts and Sciences College. I also like the personal touch of this textbook, when in Chapter 1 "There is no substitute for water," John Smol compares the health of an aquatic ecosystem with human health. When we go to the doctor, he/she can ask how you feel. We have memories and lakes have sediments as memories. The textbook teaches us how to read them. Another example is when he visualizes heat capacity with a hot water bottle (box 1.1) or when the author compares a muffle oven with a self-cleaning kitchen oven. It is not surprising that Smol received five teaching awards. I especially enjoyed expressions like: "Examining paleolimnological data feels like browsing the Internet. I am thirsty for knowledge but am drowned in information. Or some people say the data speak for themselves. I often hear nothing." (Chapter 5). By sharing his experiences the author provides more than scientific information. He guides the reader through a roller coaster of paleolimnological ups and downs.

"The farther backward you can look, the farther forward you are likely to see." (Churchill). The red thread through the book is the need to know the natural baseline conditions of aquatic ecosystems in order to set mitigation goals. How was the lake before invasive species introduction, before European settlement, before acid rain?

In Chapter 3 "Sediments: an ecosystem's memory" and Chapter 4 "Retrieving the sedimentary archive and establishing the geochronological clock: collecting and dating sediment cores," Smol introduces sediments from lakes, reservoirs, rivers, and oxbow lakes as environmental archives. He presents different coring and dating techniques. Next to radioisotopic methods, he mentions indicator pollen for the first Europeans in America and the presence of DDT, which indicates that the sediments are younger than AD 1939, when it was first applied.

Chapter 5 "Reading the records stored in sediments: the present is a key to the past" discusses different proxies ranging from microscopic analyses to a wide variety of biogeochemical techniques. Most of the studies are based on changes of diatom assemblages deposited in lake sediments. Diatoms are one of Smol's favorite proxies.

Chapter 6 "The paleolimnologist's Rosetta Stone: calibrating indicators to environmental variables using surface-sediment training sets" provides an overview how past changes of biological remains can be translated into a paleo pH-meter or paleothermometer.

Smol's heart is really in Chapter 7 "Acidification: Finding the 'smoking gun'". He and his colleagues at his lab PEARL were able to prove that some lakes were 'sick', that industrial acidification exceeded natural variability, that lakes could recover, and that liming gives only a temporary relief.

Chapter 8 "Metals, technological development, and the environment," Chapter 9 "Persistent organic pollutants: industrially synthesized chemicals 'hopping' across the planet," and Chapter 10 "Mercury – 'the metal that slipped away'" continue with airborne pollution. The global distillation effect of persistent organic pollutants teaches us the lesson that pollution in industrial areas can impact remote areas.

In Chapter 11 "Eutrophication: the environmental consequences of over-fertilization," the author demonstrates the vast range of applications of nutrient reconstructions in lakes, rivers, and reservoirs. With 49 pages, it is the longest chapter. John Smol emphasizes that past eutrophication studies are still underrepresented in developing countries. Especially there, cost efficient methods such as diatom analyses could help enormously to assess eutrophication trends. He talks about airborne and direct pollution of lakes and reservoirs and rivers. It always boils down to the message that the instrumental record is too short, so we need to study sediments to define background values.

Chapter 12 "Erosion: tracking the accelerated movement of material from land to water" is about erosion as an indicator of human disturbance. Erosion is discussed in relation with floods, agriculture, and mining.

In Chapter 13 "Species invasions, biomanipulations, and extirpations," the discussion of pollution extends to the impact of invasive species of aquatic ecosystems. "One gram of chemical pollutant will not reproduce itself to become two grams or ten grams of pollutants." But invasive species, without natural predators, can grow exponentially and alter an ecosystem dramatically.

The book about how lake and river sediments record human impact is rounded up with Chapter 14 "Greenhouse gas emissions and a changing atmosphere: tracking the effects of climatic change on water resources." We learn about the impact of human induced climate change on lakes and how we can disentangle the effects of climate and land use on aquatic ecosystems. Smol compares the impact of climate warming on a closed-basin lake with a pot of soup left on the stove, becoming saltier as the volume of liquid is reduced. Old exposed beaches are compared with bath tub rings. Everybody can understand that.

In Chapter 15 "Ozone depletion, acid rain, and climatic warming: the problems of multiple stressors" we learn about the combined effect of ozone layer thinning, acidification, and drought, which all affect DOC concentrations of a lake. DOC acts like a natural sunscreen. The late paleolimnologist Platt Bradbury used to say, "you have to think like a diatom." How does the diatom perceive the world? It sees DOC changes, by changes of wavelength. This can have different causes: Drought, acidification, migration of tree line, changes in lake production.

Chapter 16 "New problems, new challenges" is more about exploratory studies and gives suggestions for future research. Smol mentions that sediment deposits of springs can reveal information about past ground water pollution.

Bravo to John Smol who shared his vast experiences in paleolimnology with the rest of the world. The textbook reflects that John Smol was editor of the *Journal of Paleolimnology* for 20 years, and was nominated in 2004 as Canada's top scientist. It is a great gift that will allow students to share the spirit of the beginning of paleolimnology. It reads like the memoirs of a community that fought together for the better. The book is a must for paleolimnologists, and definitely worth reading for neolimnologists and oceanographers, and a textbook the students will read and keep.

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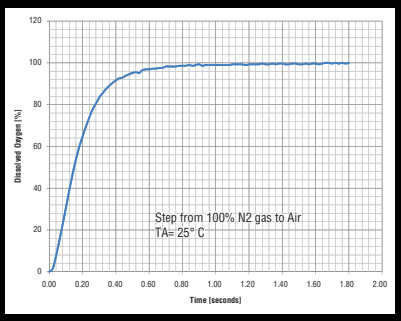

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2008 Tyler Prize

Professor James N. Galloway

Department of Environmental Sciences,
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Professor Harold A. Mooney

Department of Biological Sciences,
Stanford University

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The Tyler Prize was established in 1973 by the late John and Alice Tyler as an international award honoring achievements in environmental science, policy, energy and health of worldwide importance conferring great benefit on humanity. The Tyler Prize consists of a cash award of $200,000 and a gold Tyler Prize medallion.

The Tyler Prize Executive Committee announces the awarding of the 2008 Tyler Prize for Environmental Achievement to Professors James N. Galloway and Harold A. Mooney, for their contributions to earth system science through their research on local and global biogeochemical processes as modified by human impact, and alerting the international community to the environmental consequences of these modifications.

James N. Galloway is recognized for his quantitative characterization and detailing of biogeochemical cycles, the multiple impacts of human inputs to them, and the consequences for the global environment, particularly as illustrated by his development of the "nitrogen cascade".

Harold A. Mooney is recognized for his contributions to community ecology by integrating population and physiological studies at the global scale, the application of convergent evolution to community structure, and as a central figure in launching many major international ecology programs.

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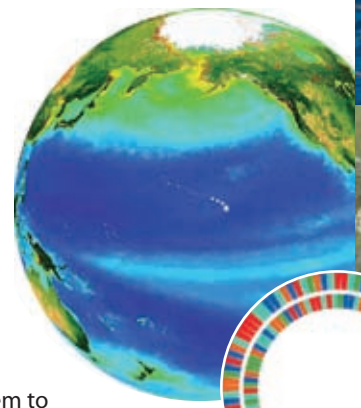
Eco-DĀS VIII

Ecological Dissertations in the Aquatic Sciences

East-West Center, University of Hawai'i at Mānoa

11–16 October 2008



Ecological Dissertations in the Aquatic Sciences (Eco-DĀS) VIII continues the series of symposia formerly known as **DIALOG (Dissertations Initiative for the Advancement of Limnology and Oceanography),** but takes that series in new directions. Key elements of the remodeled symposia include:

1. Fostering sustained, cross-disciplinary interactions among the top new researchers in ecological oceanography and limnology, to the benefit of both the science and the researchers.
2. Increasing the success rate of new researchers seeking funding to build their research programs, by familiarizing them with the diversity of available research opportunities, and introducing them to representatives of funding agencies with whom they will interact in future.
3. Increasing the likelihood of professional success for these new researchers by:
   a. Highlighting their initial work through high-visibility, open-access publication of a formal symposium proceedings volume;
   b. Focusing that volume on interdisciplinary and collaborative aspects of their work; and
   c. Establishing mentoring relationships between participants and established scientists.

Symposia are currently funded for fall of 2008, 2010, and 2012. The 2008 symposium will be held at the East-West Center, University of Hawai'i at Mānoa campus, 11–16 October. Applicants for the fall 2008 symposium must have received their PhD on or after 30 April 2007, or expect to receive it before 30 April 2009. The dissertation work of the applicant must deal with an important ecological problem in oceanography or limnology. Applications will include: a current resume, a letter of support from the applicant's current (graduate or postdoctoral) advisor, a personal statement regarding the applicant's goals and reasons for applying, and a substantive outline of a proposed chapter to be included in the formal symposium proceedings.

Applications are due by 30 April 2008. For more information regarding the symposium, including application requirements and procedures, see cmore.soest.hawaii.edu/eco-das/.

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Above images by participants in 2007 Hawai'i Summer Session in Microbial Oceanography.

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ASLO 2008 Summer Meeting
June 8-13, 2008 in St. John's, NL, Canada

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January 25-30, 2009 Nice, France

ASLO 2010 Summer Meeting
June 6-11, 2010, Santa Fe, New Mexico

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