

LIMNOLOGY AND OCEANOGRAPHY BULLETIN

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BOOK REVIEWS

BRUSCA, RICHARD C. and GARY J. BRUSCA. 2003.
Invertebrates, 2nd edition. Sinauer Associates, Inc., Publishers.
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At the beginning of the 21st century, the interdisciplinary field of invertebrate biology is thriving in research and being squeezed in the classroom. As the 20th century closed, the field was experiencing a renewal of interest in organism relationships, the origin and evolution of body plans, and gene expression, ecology, and physiology of invertebrate taxa, particularly their larvae. The emergence and domination of phylogenetic systematic methods (cladistics) as a toolbox for evaluating organism traits and the application of cladistics to newly available molecular sequence data has attracted many to re-examine evolutionary relationships of organisms. The discovery of Hox genes as master regulatory genes in patterning metazoan development and their conserved anterior-posterior expression in body plans of widely separated taxa such as arthropods and vertebrates has attracted developmental biologists into the field of invertebrate zoology. The application and dissemination of improved culture techniques has allowed many students to discover and explore the biology of the developmental and larval stages initially described over a century earlier.

These “new” efforts have contributed to already active areas of invertebrate research including community ecology, population biology, biomechanics, deep-sea biology, physiology, and endocrinology. When all of this intellectual activity is piled on top of the rich history of the study of invertebrate form and function (cf. Hyman 1940-1955-1967; Grassé 1948), the task of writing a textbook on the invertebrates is daunting, to say the least.

Then comes the pedagogic reality of teaching resources, faculty, and modern curricula, which often shorten or delete the opportunity to teach students about this vibrant and

fundamental area. This area intersects many of modern society’s concerns such as food resources, human disease, biodiversity, global change, and just plain understanding the world around oneself. Clearly, writing a textbook that can be used to teach invertebrate zoology today is an enormous challenge.

The second edition of *Invertebrates* by Richard C. Brusca and the late Gary J. Brusca combines old and new with great success and makes a strong and useful contribution to modern perspectives on the invertebrates. Following the first edition by 12 years, this edition is strengthened by many attractive color photographs of diverse organisms or structures, and it contains updated information for most phyla. The book follows the same format as its predecessor. All chapters contain a wealth of excellent, well-labeled illustrations that are especially useful in classroom lectures and laboratory sessions. The initial four chapters provide up-to-date but general background information about origin and habitats of invertebrates; about classification, systematics and phylogenetic methods for analyzing evolutionary relationships; about the bauplan concept (the unique structural design or body plan of the phylum) and organismic vital functions; and finally about development, life-histories, and how these topics may inform us on animal origins and relationships. One limitation of these chapters is that many of the animal examples will not be useful to students new to the invertebrates, and some sets of basic concepts are topics of whole undergraduate courses. Chapters 5 to 23 focus singly on major phyla or on traditional phylum groups, e.g., The Protists; Blastocoelomates and Other Phyla (a.k.a. Aschelminthes); and Lophophorates. In all, 17 protistan phyla and 34 multicellular animal phyla are covered. The 24th (and last) chapter presents a consensus tree cladogram of 31 of the multicellular phyla stemming from a choanoflagellate ancestor. The chapter then discusses the application and implications of this phylogenetic

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The *L&O Bulletin* publishes brief, peer-reviewed articles of broad interest to the ASLO membership, Letters to the *Bulletin* (typically responses to articles), as well as ASLO News on a quarterly basis. Information on the preparation and submission of articles and letters can be found on the ASLO web site (www.aslo.org). It is recommended that you contact the editor before preparing an article or letter.

hypothesis. It concludes by briefly summarizing and raising uncertainties about molecular phylogenies that present alternative phylogenetic hypotheses. It is clear that even in 2003, the evolutionary relationships among most invertebrate phyla are subject to a plurality of interpretations. The authors remain optimistic and look forward to new information and analyses that attempt to resolve these relationships.

This text offers an excellent and detailed coverage of invertebrate comparative anatomy with an emphasis on structures and traits of organisms. The organism-specific chapters each follow a consistent pattern, first describing the characteristics of the phylum, then giving a summary of its taxonomic history and classification, followed by a separate, current taxonomic synopsis. Next comes the main part of the chapter, a description of the phylum bauplan along with detailed explanations and illustrations of body regions, parts and vital systems, and some discussion of their function. The term bauplan is used broadly in this text, and readers may not recognize that it has distinct meanings to different biologists and can lead to confusion (Wray and Strathmann 2002). The chapters end with a phylogenetic summary and, when possible, a cladogram showing relationships of classes. Key terms and anatomical parts are identified in bold type and defined at first mention. Many footnotes provide additional background information, including the authors' perspective, on terms or concepts.

The way chapters on phyla are organized makes *Invertebrates* both an excellent reference for invertebrate practitioners and a difficult text with which to teach the uninitiated; chapter sections on bauplans intermingle what are often class-level differences in body organization and body-part function. For example, the presentation of the polypoid body plan of Cnidaria includes descriptions and anatomical terms for anemones, hard and soft corals, polymorphic hydroid zooids, and siphonophore complexes. This is followed by discussion of the medusoid form that covers the combination of scyphozoan and hydrozoan medusae. As another example, the explanation of mollusk body plans presents general anatomy for eight classes in five pages of text that refer to 11 pages of figures. The details of separate organ systems (e.g., gills, nervous systems) follow, each of which includes the anatomies of the classes lumped together in potentially bewildering comparison. Structuring a lecture to go with the textbook presentation is not easy. The juxtaposition of diversity highlights similarities and differences for scholars, but students often see the trees, not the forest, and can become overwhelmed.

This book's strengths lie in its phylogenetic approach, description and illustration of structural anatomy, and discussion of organism traits. Its weaknesses include the limited coverage of organism function, especially at the physiological and biomechanical levels. The functioning of excretory systems, blood proteins, hydrostatic skeletons, and the mechanisms of suspension feeding, for example, are only briefly covered as general topics in part of an introductory chapter. The emphasis on structure and its evolutionary analysis is made clear by the statement (p. 27) "Without systematics, the science of biology would grind to a halt, or worse yet, would drift off into pockets of isolated reductionist or deterministic schools with no conceptual framework of continuity." While it is obvious that many would take issue with this assertion, including readers of this bulletin, the good news is that invertebrates are enigmatic sources of inspiration on many biological fronts. I can highly and without further reservation recommend this book to all biologists and students interested in a modern perspective on invertebrate structure and evolutionary relationships.

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HANSELL, DENNIS A. and CRAIG A. CARLSON (eds.) 2002. **Biogeochemistry of Marine Dissolved Organic Matter**. Academic Press. ISBN 0-12-323841-2 (hardbound). xxii + 774 p. US \$89.95.

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Biogeochemistry of Marine Dissolved Organic Matter is a multi-author book, comprising some 16 chapters written by acknowledged leaders in the field. The book, without exception authoritative and up-to-date, impressed me in a number of ways. Many chapters contain comprehensive summaries of published work in concise and informative tables—these will be found to be invaluable and much thumbed. The text gives the impression of a strong steer from the editors. The chapters it would appear were sent out for peer reviewing, no mean accomplishment for a work of such size. The authors have maintained a high degree of consistency in the units used, which will be much appreciated by readers wishing to compare data from different chapters. (There is the occasional lapse into the SI-not-recommended Gtonne unit and one strange regression to Leslie Cooper's old and now redundant $\mu\text{g-at}$ unit.) The book is a great credit to the editors and their team of authors and those interested in the ocean's carbon cycle, and beyond, will find it a valuable addition to their bookshelves.

In a number of places, the book gives consideration to the title word "dissolved," but "organic" is taken as read. Many would relegate discussion of the distinction between the terms "organic" and "inorganic" as a mere matter of semantics; I would not. The compound in the grey area—urea—plays an important role in biogeochemical cycles. Unlike all other "true" natural organics, urea is hydrolyzed, rather than oxidized, to its inorganic constituents on decomposition. Despite this characteristic, it is commonly used as a test compound in organic analysis. In her chapter, Bronk acknowledges that some authors (rightly to my mind) regard urea as an inorganic excretion product. She finds herself forced to adopt the conventional, alternative view that it is an organic compound. We could be leading ourselves astray.

The book begins with an authoritative and beautiful account on the development and necessity of the subject by the late John Hedges. His chapter and the recent Citation for Scientific Excellence posthumously awarded by ASLO serve to remind us how much we miss John's thoughtful contribution to the subject. Then follows a chapter by Sharp on the methodology for DOM analysis. His Figure 2 shows the remarkable improvement in methodology since the HTCO fracas in the late 1980s. The striking thing that emerges is when it comes to getting the right answer, the analyst is clearly far more important than the analytical method. While this is certainly not a new finding, it stands in distinct conflict with Sharp's opinion (pp. 42–43) of "wet chemical oxidation methods which are not recommended for modern routine DOC analyses," an assertion that sent a shiver down my spine. Surely, if his Figure 2 tells us anything, it is that we should "not

recommend" the analyst before the analytical method. Sharp's valuable contribution to the improvement of DOM analysis over the past decade has been to focus on quality control and he discusses the notion of "community precision." In this he is reflecting a shifting mood internationally over the ownership of data from the individual to the community. In the former circumstance, quality is very much a personal choice; in the latter it becomes a matter of professional, if not contractual, responsibility.

The next chapter, written by Benner, begins with a thoughtful analysis of molecular-size distribution. He arrives at the interesting, and to me surprising, conclusion that the C:N:P composition of the high MW and low MW fractions are much the same. His pie charts in Figure 2 are a sobering portrayal of what we do not know. I found the section on NMR analysis especially valuable, as it brought together findings from a fast-developing field; the answers are there, if we can only interpret the signals. Benner is of the view that they point to carbohydrate being a major component of the high MW fraction. Having read his and Mopper and Kieber's later chapter on photo-oxidation, I wondered if we should not be giving more attention to organic acids and their condensation products. I was struck by the frequency with which they occurred as photo-oxidation products in Mopper and Kieber's Appendix 1. A better understanding of these compounds might help resolve the conundrum of recalcitrant-molecule production in the oceans.

Carlson's following chapter on production and removal processes contains tabular summaries of observations that will be of enormous worth. I would have valued some summary of the section on production of organic material; his assessment would have been helpful to the reader. Then follows a wide-ranging discussion of removal processes. He, like others in the book, casts his discussion in the framework of Kirchman et al.'s categories—labile, semi-labile, and refractory—as if molecular structure were the primary if not sole determinant of biological stability. As we now know that the inorganic nutrient environment on occasions appears to be the overriding factor, there is nagging doubt in my mind, as there appears to be in his, whether the separation into labile and semi-labile has merit—worse, it may constrain our thinking.

Then ensues a lively (what else would you expect from Debbie Bronk?) chapter on the dynamics of DON. She ends each of her sections with a short comment on research priorities, comments that are invaluable. I think few would question her observation "there has just got to be an easier way to measure DON."

The next chapter, a *tour de force* by Karl and Björkman on DOP, begins with an authoritative and fascinating account of the development of the subject. They argue that in the case of DOP assimilation, the conversion of polymers to monomers is the bottleneck controlling mineralization; there are strands of other evidence to suggest this is a more widespread feature. There is an extensive consideration of the analysis of phosphate and organic phosphorus. I found particularly interesting consideration of the co-analysis of arsenic; it is clear

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in the authors' minds there is still much, if not all, to learn regarding the biogeochemistry of arsenic in seawater. Then follows an analysis of a major DOP database the authors compiled and named GOOD (Global Open Ocean DOP). (Dave Karl is the undisputed master of the acronym, e.g., MAGIC, ALOHA, SANTA CLAUS, and HOTSEX, the last subsequently altered for reasons of political correctness.) The interesting thing that emerges from the analysis is the regional difference in deep-water DOP concentration.

Then follows a chapter by Wells on colloidal OM and trace metals, arguably technically and conceptually the most difficult aspect of the study of DOM. The author makes the point that we are caught between the limitations of the available methodology and the difficulty of working with extremely dilute solutions. Even to the novice the problems look formidable. Two interesting pieces of information I gained from the text were first, calculations imply a turnover time of "a few hours" for colloidal DOM, and second, the association of different metals to different size fractions of the colloidal DOM. It seems to me that this chapter, as many others in the book, will be a landmark paper.

Much the same comment applies to the chapter on isotope chemistry by Bauer. He brings together information on the ^{13}C and ^{14}C isotopes in a very accessible and informative manner. Most helpful to the non-isotope chemist is that the two isotopes are reported in the same units. Bauer discusses mass-balance analyses for the sources of DOM by solving a set of simultaneous equations. The calculations give the remarkable answer that the coastal ocean is the overriding source term for deep-water DOC, exceeding the input from the surface from 25 to 100-fold. Scaling calculations suggest that although this is a surprising result, it is not implausible, and will call for a major revision of our thinking about carbon transport to the deep ocean and its fate on arrival.

The chapter by Mopper and Kieber on photochemistry contains a wealth of information in four very valuable tables. The text begins with a thoughtful and timely discussion of the complex interactions between microbiological and photochemical processes. It was interesting to me that ammonia seems to be both produced and consumed photochemically. Mopper and Kieber leave us with the clear realization that with the photochemistry of sea water, there are more questions than answers.

The next two chapters consider the light-absorbing properties of DOM, the so-called "colored" DOM (CDOM). The first of these, by Blough and DelVecchio, focuses on the coastal zone and starts with a compilation of observations. The chapter is heavily empirical; what I missed was some physiochemical basis as a framework for the field observations. This bias is bound up with the origins of the subject, where the absorption of DOM was needed to correct satellite-color observations to extract the chlorophyll signal. Subsequently it was realized there was information in this correction term. In the second chapter, Nelson and Siegel consider CDOM in the open ocean and a number of remarkable facts emerge. First, whereas there is a positive and generally close relationship between CDOM and DOC in inshore waters, in the open

ocean the relationship is weakly negative. Second, they estimate CDOM accounts for 40–80% (ca. 50% on average) of the absorption of light in the open oceans. They show a remarkable map (Figure 5c) of computed DOC distribution, based apparently on a temperature algorithm, an image that struck me as a real glimpse into the future.

A chapter by Cauwet provides a very thoughtful review of DOM in the coastal zone. He compiles the discharges of DOC by major river systems. What surprised me was how poorly European rivers were characterized by comparison with those of other continents. There is a very detailed discussion of the removal process in estuaries and the point is made that circumstances are more complex than the simple passage through this zone. Cauwet offers us the delightfully muted observation (pp. 588–589) that "In the estuarine flocculation literature it appears that each author has seen what he expected, relative to his own field," a generalization that goes well beyond DOM flocculation in estuaries!

Burdige's chapter dealing with pore-water DOM begins with a discussion of modeled profiles using an advection-diffusion model. It's an unfamiliar field to me; I found the chapter interesting but hard going, mainly, in my case, sorting out the meaning of the various constants. It's all there, but if you are a beginner, you simply have to work hard at it. His Figure 9 is probably a pointer to the level of complexity we may need to embrace when modeling DOM decomposition in the water column.

Then follows a chapter by Leif Anderson that stands out as the only one having a focus on a specific geographical area, the Arctic Ocean, which at first sight seems out of line with the structure of the book. However, Anderson convincingly makes his case that as a major site of deep-water formation, this ocean requires special consideration. The chapter starts with a very helpful discussion of the hydrography of the Arctic Basin and follows with a discussion of the sources of DOC; the more extensive coverage of the Arctic rivers nicely supplements Cauwet's chapter. Anderson's chapter concludes with a remarkable budget (Table III) for DOC fluxes in and out of the Arctic Ocean. The total flux is of the order of 100 Tg C per year, which he is able to quantify with a precision of slightly better than 10%. If nothing else in the book convinces you of progress made over the past decade, this result surely must.

In Chapter 15, Hansell puts all the pieces together. He starts with a very lucid summary of global DOC and its seasonality, then goes on to discuss net DOC production, net community production, and new production. The material is brought together very nicely and the conclusion is that the net production of DOC is a not insignificant proportion of net community production. Then follows an analysis of the export of DOC, the point being made that the timing of DOC mineralization in relation to period of mixing is critical. The chapter leaves us feeling, quite rightly, that we now have a good understanding of the mechanism and scale of DOC export out of the euphotic zone and its subsequent fate. The chapter ends with valuable, broad pointers to the future.

One might expect Hansell's chapter to be the finale, however, it is followed by Christian and Thomas Anderson's chapter on modeling marine DOM biogeochemistry. Relegating them to "tail-end Charlies" seemed a little odd to me; maybe it is part of a move within the marine DOM community to let modelers know where their place is! Whatever the reason, we are treated to a considered and accessible review of the structure of models by the authors. One is left with the impression that biogeochemical models have passed a major divide and are now important sources of understanding. The chapter brings the curtain down on a high note with a thoughtful discussion of the future of the subject.

There remains one fascinating and as-yet-unanswered question—if the correct blank had been established when the HTCO method was first developed in the mid-1980s, would we have ended up knowing as much about DOM as we currently do? Maybe somewhere in an almost parallel universe they got the blanks right the first time, and I'll bet a bottle of good malt that the equivalent book there is much thinner. Funny old world, isn't it!

Note from the Associate Editor: See the previous issue of the Bulletin, 12(2), pages 38-39, for a review of a related book on fresh- and brackish-water systems, Aquatic Ecosystems: Interactivity of Dissolved Organic Matter, edited by S. Findlay and R. Sinsabaugh.

CRAMER, DEBORAH. 2001. **Great Waters—An Atlantic Passage.** W.W. Norton & Company, Inc. ISBN 0-393-02019-3 (hardbound). 442 p. US \$27.95.

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It is daunting even to consider reviewing a book that has won high praise in premier literary circles. How many accolades could I add, and would they matter? I initially took some comfort imagining this review would be written by someone more versed in oceanography than the staff of the London Times or the Washington Post Book World. Even in that regard, however, I learned I had been scooped (McNutt, 2001). My purpose, therefore, is less to continue adding laurels to Cramer's crown, however well deserved, and more to convince the *Bulletin's* readership that this 12-chapter book is to be savored as much for its brilliant writing as for its scientific syntheses.

The vehicle for Cramer's narrative is her three-week "Atlantic passage" from Woods Hole, Massachusetts, to Bridgetown, Barbados, aboard the SSV *Corwith Cramer* (no relation), a brigantine used by the Sea Education Association. As the ship sails south and east, the author considers the characteristics and inhabitants first of nearshore waters and sediments, then in turn those of the continental slope, the Gulf Stream, the Sargasso Sea, and finally the Caribbean Sea. Her words encompass far more than this particular cruise; the book holds regional, even local, interest for readers on both sides of the ocean.

She is as voluble in describing deep-water thermohaline circulation as in detailing navigation in sea turtles, in recounting the coming apart of paleocontinent Pangea as in cataloging metals within the Red Sea's hydrothermal fluids. Her lyrical overviews of the ocean's physics, biology, geology, and chemistry are delightful. Consider, for example, one sentence within her summary of the North Atlantic Bloom. "Populations of drifting plants surge and die away, soar and then diminish, timed to the coming and going of light, and to fluctuation in the supply of salty nutrients." With reference to oxygen isotopic signatures in foraminifera, she writes, "Global truths reside in tiny sea animals." A section on ocean-atmospheric interactions describes a "gentle song of the sea, dryly known as the North Atlantic Oscillation, (which) swells and subsides, rises and falls, and the climate adjusts."

In her first chapter, "Waters of life," Cramer introduces a glorious array of topics, including the colligative properties of water, mixotrophy, dimethylsulfide production, sulfide oxidation, gelatinous zooplankton, diel vertical migration, and more. Yet for each example cited here, she employs a non-scientific vocabulary; the words listed in the previous sentence do not appear in the text. In chapters titled, "The moving earth beneath the sea" and "Atlantic's primordial ancestors," she provides sweeping, evocative descriptions of Earth's origin, tectonic processes, and the evolution of life. Credit Cramer with providing a better understanding of geology's "deep-time" than I have experienced ever before. She has an extraordinary talent to convey natural phenomena in prose more comprehensible than the expertise-laden argot most of us produce.

Interspersed are her clarion calls for a stronger and more widespread environmental ethic. Indeed, Cramer sets a tone in her introduction when she asks, "What hope is there for the sea if we do not love, nurture, and protect its life-giving waters?" Her strong feelings reflect more than warm recollections of her childhood on the New England coast. She calls this ocean "Atlantic," rather than "the Atlantic," dropping the definite article to impart "more accurately the idea of a living Atlantic and a wellspring of life." She sees excessive anthropogenic influence on the oceans as irresponsible, even immoral behavior. In a chapter on fish and fisheries, "A diminished thing," she punctuates her argument with a damning, perhaps inflammatory sentence. "Today's fishermen are engaged not in a harvest, or even a hunt, but in a slaughter." She is unsparing in her criticism of the fishing industry and of politically mediated regulations that contradict scientific advice, for example, the taking of fish before they are sexually mature.

Her stand in related matters is clear. With reference to international agreement about deep-sea mineral resources, she declares, "The far-reaching vision of the Convention on the Law of the Sea offers a powerful opportunity for the nations of the world to cooperatively manage and conserve the ocean's resources, and the United States' refusal to participate is an embarrassment."

Her penultimate chapter, “Fraying Edges,” considers case histories of so-called “dead zones” in the Gulf of Mexico and the Baltic Sea; invasion of the Mediterranean by the alga *Caulerpa*; plights of hermatypic corals in the Caribbean Sea and the Gulf of Mexico; chemical contaminants in the North Sea; associations between hog manure and toxic phytoplankton blooms in North Carolina’s estuaries; and the demise of oysters in Chesapeake Bay. Her prognoses for remediation—or even amelioration—of these environmental perturbations are not optimistic, but probably realistic.

Although two years have passed since its publication, the book is impressive in its currency. It is eminently worthy of review by Ph.D. students prior to their candidacy examination. While it has a very good index, the book’s principal appeal to oceanographic scholars resides in what she understatedly calls “Notes,” fully 54 pages of references to the cornucopia of subjects she embraces. Her sources are diverse in origin, and many are peer-reviewed publications in the scientific literature, challenging reads outside of one’s field under any circumstance, and most impressive given the scope of this book.

While first thumbing through the book, I recalled Cramer had contacted a departmental colleague about microorganisms in ships’ ballast water. A reference to that effect is one of 17 she cites in considering invasion biology, itself one of multiple topics covered within just one chapter. If my experience is representative and my extrapolations valid, then Cramer may well have personally contacted a significant portion of ASLO’s “marine side!”

There are few errors in the text, testament to her manifold interactions with ocean scientists in addition to those she cites in her acknowledgements. I mention these quibbles as a point of obligation, not to imply they detract seriously from the value of her book. For example, water does not dissolve salts through magnetism (p. 25); the Great Lakes lie within Canada as well as the United States (p. 124); sulfide-oxidizing bacteria do not produce carbon “from hydrogen sulfide” (p. 226); and it is decidedly not a Darwinian precept that “evolution proceeds in an orderly, predictable way” (p. 281).

Comparisons of Cramer to Rachel Carson are inevitable. Is Cramer this generation’s Carson, as at least one reviewer has intimated? While the stylistic comparisons are very strong, Cramer is not Carson in a strict sense—she is not a career scientist enamored of the sea, but a poet enchanted by it. Indeed, it is arguably all the more impressive that someone who is not a scientist has succeeded so well in interweaving our stories with her own.

I finished this book convinced that Cramer understands more about the ocean than I do. At least, her holistic comprehension of nature surpasses my scientific perceptions, seemingly reductionist by comparison. Read this book, revel in its luminous and compelling composition, and share Cramer’s senses of wonder and concern about Atlantic.

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ASLO NEWS

MESSAGE FROM THE PRESIDENT

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Your Board has been busy. We have embraced change in a new way. Instead of commissioning new recommendations on the future of ASLO, the Board has accepted full responsibility for long-range planning. The reason is simple: change occurs so rapidly in scientific organizations, and particularly in scientific publishing, that we cannot expect the products of long-range planning to be up-to-date unless we revisit them at least semi-annually. If you have a long-range vision for ASLO, please share it with the current Board, or nominate yourself to run for election next May.

The revised mission statement for ASLO enacted with your votes last May is a succinct statement of the Board’s vision: “The purpose of ASLO is to foster a diverse, international scientific community that creates, integrates and communicates knowledge across the full spectrum of aquatic sciences, advances public awareness and education about aquatic resources and research, and promotes scientific stewardship of aquatic resources for the public interest. Its products and activities are directed toward these ends.” We encourage you to hold us to this vision and to notice when we fall short. One inadvertent shortfall has been insufficient appointment, election and nomination of non-biologists to committees, to the Board and for awards, respectively. We solicit your help in volunteering and nominating — and your consciousness of this issue during elections — to remedy this situation.

Because of the need to re-assess finances after the loss of revenue to RoweCom’s bankruptcy (noted in my column in the previous issue), we met 9-10 August at O’Hare Airport in Chicago. I am pleased to report that Lynda Shapiro has stayed the same steady course set by Russ Moll with ASLO finances and has made some improvements by investments. The result is that despite this large loss, ASLO is able to forego increases in member dues and journal costs for 2004 and at 7% will need an increase in library subscription costs still below the 16-year average for society journals (7.5% cf. Kean 2003), let alone for-profit journals. Moreover, the Board has elected to make *Limnology and Oceanography: Methods* available free of charge to members and nonmembers alike through calendar

year 2004. We believe that this trial access will convince users of the value of this new journal in its novel format. If you have not taken a look, please do so on the ASLO website. I know that you will be pleased by the content, look, and editorial quality of this product.

All is not rosy. For three years in a row (2000–2002), *Limnology and Oceanography* (L&O) experienced a steady slide downward in print journals taken by members that was exactly balanced by member purchase of electronic access. This pattern was expected and is a net financial benefit to ASLO, as print subscriptions cost more to service than electronic. This year the linear decrease in print-reading members continued, but electronic access leveled off. In 2003, an unprecedented total of 166 additional members opted to drop journals altogether. Are we worried? Yes. Do we know what it means? No. One possibility is that so many papers in L&O are now “Free Access Publications” or FAPs that members no longer feel obliged to buy the remainder. We will be watching these numbers carefully next year.

One great benefit from ASLO’s membership in the Council of Scientific Society Presidents (CSSP) is that we get to compare notes with what all the other societies are worrying about and doing. Everyone is worried about how much subscriptions to their journals costs and whether electronic publishing is a major risk or major opportunity (or both) to their income streams. As Bill Lewis (2001) has recently analyzed for ASLO, most scientific societies obtain the bulk of their operating funds from library subscriptions. The pricing reflects what it costs to maintain the structure needed to review, edit and produce the journal, including the scientific societal activities such as meetings that fuel the creativity at the core of scientific advance. The average subscription (library) price for scientific society journals in our category (Math, Earth/Life Sciences, General Sciences) in 2003 is about \$650 (Kean 2003) vs. ASLO’s \$378. As Adrienne Froelich (2003) has written, there is a strong move afoot to make government-funded research available free of charge to citizens. This policy already has been instituted in Canada for its largely government-funded journals.

Although providing free access to society journals sounds like a good idea, we cannot yet see “how to get them from here,” as they say in Maine. We have been conducting an experiment in charging authors for “free access publication (FAP)” in L&O. Authors are charged a fee that has been equivalent to the cost of 100 paper reprints in order to make “pdf” files of their papers available to anyone via the web, without further charge or access restriction. This approach was first tried by entomologists, and it is interesting to compare their and our evolving versions of the concept (<http://csssivr.entnem.ufl.edu/~walker/epub/>). Currently, nearly 70% of papers in L&O are FAPs. Paul Kemp’s analysis of downloads reveals that the value to authors far exceeds the cost of 100 reprints, so the Board voted to increase the costs to something near \$300 for an article of typical length, beginning in 2004. The model of having the author bear the costs of distributing his or her information has definite attraction, but to support the real costs of the journal, the price per article

would have to be an order of magnitude higher. Thus moving to an author-pays rather than a library-pays system is not a short-term option, although it may not be out of reach on a decadal scale, especially with active participation by foundations and funding agencies. Even then, it will require some means to prevent de facto censorship of authors who lack funds.

The Board struggled again with the risks and benefits of joining BioOne or GeoSciences World, two consortia that bundle or agglomerate society journals in biology and earth sciences, respectively. The consortium sets the price for the bundle, assures consistency in file structures and hot-links references across the journals in the package, just as commercial equivalents (e.g., ScienceDirect) do. Because ASLO journals are near the front of the pack in terms of e-publishing, the Board still regards the risk in loss of control of pricing of our journals to outweigh the benefits. For those societies that have not moved to electronic publishing on their own, the benefits are much greater. As an upshot of the discussion, however, Paul Kemp has taken on the task of hot-linking all ASLO journal references to each other, and we will explore the possibility of hot-linking to other environmental sciences journals. Your journals editors are constantly seeking means to improve the products that they deliver, and they have a new source of help.

Thanks to your positive votes, the publications committee is now a standing committee, but they won’t be standing still. In addition to helping the Board and our editors evaluate quality, pricing and policies of our own journals, the committee will continue to entertain suggestions for new publishing endeavors. Send Mike Pace your comments and suggestions on publishing issues.

The membership should be excited by ASLO’s schedule of future meetings. First let me explain the usual pattern for ASLO meetings, which may not be obvious. In odd-numbered years, we hold a February Aquatic Sciences meeting that serves members irrespective of salinity, so there is no necessary, additional meeting. Instead, the Board is opportunistic about adding a meeting in the odd-numbered summers when it may serve the membership. The Ocean Sciences meeting (in 2004 replaced by the Ocean Research Conference) in winters of even-numbered years serves primarily the salty members of ASLO, so the official annual meeting of ASLO in even-numbered years is the summer meeting (next in Savannah). ASLO will return to Salt Lake City for the Aquatic Sciences meeting in winter of 2005, but we are investigating the possibility of Santa Fe for 2007. ASLO returns to Europe (Spain) in summer of 2005 for the first time since 2000 (Copenhagen). If you are trying to follow the pattern, this one is an opportunistically added meeting. For winter 2006, we are still on track in negotiations to return to Hawaii with the American Geophysical Union (AGU) and The Oceanography Society (TOS). Our goal is to have an agreement finalized when AGU officers next gather in San Francisco for the fall AGU meeting. For the needed summer meeting in 2006, we are looking at a possible return to Victoria or a new venue in Banff. For summer 2007, we are

exploring options for meeting with SIL (The International Association of Theoretical and Applied Limnology) in Montreal in August. For winter 2008, we favor a venue other than Hawaii, which is difficult to reach for Europeans and difficult to afford for students. The meetings committee and Board welcome your inputs on future meeting venues and formats and past meeting performance. The Board has endorsed the meetings committee's recommendation to limit oral presentations to 12 minutes of presentation to allow time (3 minutes) for questions, beginning in earnest at the Savannah meeting.

ASLO's efforts in policy, education, and human resources have been largely focused during the past year on ensuring that limnology gets the attention and resources that it deserves. Wayne Wurtsbaugh spearheaded an effort to articulate "Emerging Research Questions for Limnology, The Study of Inland Waters." The report of this large group of limnologists from ASLO and beyond is now posted at the ASLO website. It was presented in July to the U.S. National Science Foundation and was very well received. We have reason to believe that this report and allied efforts will enhance limnology funding at the Foundation as future initiatives and budgets are considered. Ray Drenner and his education subcommittee have been working ardently to design and begin to populate web pages of educational and outreach value in limnology in particular and in aquatic sciences in general. Please surf this ASLO site and give us your comments and appropriate materials to post; we will send out a request for specific items this fall. Adrienne Froelich and I are in the early stages of a new endeavor, and that is to work with staff in Senator Olympia Snowe's office to develop legislation launching a U.S. Commission on Inland Waters Policy, analogous to its ocean counterpart. Despite the critical need for evaluation of inland water resources and water-related research, no such national commission has ever been constituted.

We are beginning to settle into a policy approach at ASLO. We will not pick up every policy issue in aquatic sciences, but rather we will choose a few and follow through. You should expect to hear more about our freshwater initiatives during my remaining year as president. As the Pew Oceans Commission findings are digested and as the U.S. Commission on Ocean Policy findings are released, we anticipate choosing one or a few issues close to the expertise and interests of our membership. Coastal eutrophication is the most likely issue to have such resonance with ASLO's past efforts, current member interest and future potential, and indeed the policy committee already has endorsed the development of a national research plan for the U.S. in this arena. Not by chance, planning for a special issue of *L&O* is already underway on "The History and Current Status of Eutrophication in Freshwater and Marine Ecosystems."

If you have read this summary in its entirety, I encourage you to look back again at our mission statement. Is it a good summary, and, if so, are we following the best strategies to reach our goals? Please let your Board know what you think.

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Peter A. Jumars
University of Maine

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



By the time you receive this *L&O Bulletin*, summer will be over, and we will be on our traditional fall schedules. One of those "traditions" is that it is renewal time for your ASLO membership. Soon you will be receiving a notice, and we will look forward to receiving your renewal.

As Pete Jumars, ASLO President, mentioned in his article in this *Bulletin*, there is no dues increase for members, and you will continue to have access to *L&O Methods* at no charge during all of 2004. This exciting new electronic journal will be posting new articles so be sure to visit the ASLO web site (www.aslo.org) periodically for this and other society news and information.

We have also added a new category of membership, emeritus membership with electronic journal access only for \$35.00. This special category will be similar to the student category with electronic journal access only. For our senior members, an emeritus membership is available to those ASLO members over 65 years of age and having continuous membership in ASLO for 25 years.

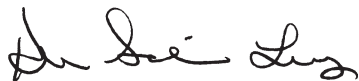
Your first notice will be notification via e-mail, and we hope that you will consider renewing online whenever possible. Of course, hardcopy forms will be sent to any ASLO member either on request or with follow-up notices. By renewing online, you help to keep expenses for the society as low as possible.

ASLO also has several exciting meetings coming up, again as outlined by Pete Jumars. The business office will be at the various meetings – either at registration or in the ASLO booth, so be sure to stop by, introduce yourself, and let us

know how we can further be of assistance. We are here to serve you, our members.

One of the valuable resources that ASLO members are afforded are the job listings on the ASLO website. In order for this to be of the most value to you, individual members and nonmembers may post job listings at no charge. Be sure to explore this great resource!

Contact us if we can help you – and we look forward to seeing you in 2004 in Honolulu or Savannah!



Helen Schneider Lemay
ASLO Business Manager

2004 ASLO AWARD NOMINATIONS

John R. Reinfelder, ASLO Awards Committee Chair, Dept. of Environmental Sciences, Rutgers University, New Brunswick, NJ 08901 USA; reinfelder@envsci.rutgers.edu

NOMINATION DEADLINE: NOVEMBER 1, 2003

ASLO awards are an important way our society provides special recognition of outstanding achievement by young, mid-career, and senior aquatic scientists. Nominations are sought in four award categories (see below), and awards will be presented at the ASLO summer meeting in Savannah, Georgia, in June 2004.

Please see the ASLO web site (www.aslo.org/information/awards.html) for information about each award's nomination package. All nominations must be submitted to the ASLO business office (business@aslo.org).

RAYMOND L. LINDEMAN AWARD:

This award recognizes an outstanding paper first-authored by a young aquatic scientist. Eligible papers must deal with aquatic sciences, be written in English by an author who was no older than 35 years in 2002, and must have been published in a 2002 volume of a peer-reviewed journal.

Past awardees: James W. Ammerman, Marlon R. Lewis, Cabell S. Davis III, James J. Elser, Bart T. De Stasio, Jr., Sherry L. Schiff, John R. Reinfelder, David C. Smith, Ulf Riebesell, Deborah A. Bronk, Christopher Freeman, Kathleen R. Laird, Carla E. Cáceres, Dennis McGillicuddy, Jennifer Cherrier, David M. Post, and Jules M. Blais.

G. EVELYN HUTCHINSON AWARD:

This award recognizes a mid-career aquatic scientist who exemplifies the standards of scholarship and creativity set by Professor Hutchinson's work in limnology and oceanography. Emphasis in selection will be given for work done in the preceding 5-10 years or for contributions of an active scientist whose work continues to be recognized for its importance in aquatic sciences.

Past awardees: Gene E. Likens, John E. Hobbie, Richard W. Eppley, David W. Schindler, Eville Gorham, Lawrence R. Pomeroy, Trevor Platt, Daniel A. Livingstone, W. Thomas

Edmondson, Richard C. Dugdale, Robert G. Wetzel, Timothy R. Parsons, Peter A. Jumars, Farooq Azam, Robert E. Hecky, Bess B. Ward, David M. Karl, Stephen R. Carpenter, Paul Falkowski, Carlos M. Duarte, Louis Legendre, and Hans W. Paerl.

LIFETIME ACHIEVEMENT AWARD:

This award recognizes and honors major, long-term achievements in the fields of limnology and oceanography, including research, education and service to the community and society. Emphasis in selection will be given for contributions of any aquatic scientist who (1) has demonstrated significant achievements in limnology, oceanography, or related fields, (2) whose work has contributed to the stature of those fields, and (3) who may be regarded as a role model for those at earlier career stages.

Past awardees: Kenneth H. Mann, Clifford H. Mortimer, Ruth Patrick, Alan R. Longhurst, Karl Banse, Charles S. Yentsch, Ramon Margalef, Jack Vallentyne, John J. Magnuson, and John J. Gilbert.

RUTH PATRICK AWARD:

This award honors outstanding research by a scientist in the application of basic aquatic science principles to the identification, analysis and/or solution of important environmental problems.

Past awardees: Edward D. Goldberg, John Cairns, Jr., and Claire L. Schelske.

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A NEW ASLO EDUCATION WEBSITE

Ray Drenner, Chair, Education Subcommittee, Biology Department, Texas Christian University, Fort Worth, TX 76129 USA; r.drenner@tcu.edu; Lesley K. Smith, Cooperative Institute for Environmental Sciences, University of Colorado, Boulder, CO 80309-0216 USA; smithlk@cires.colorado.edu; Wayne Wurtsbaugh, Aquatic, Watershed & Earth Resources Department, Utah State University, Logan, UT 84322-5210 USA; wurts@cc.usu.edu

In June 2002, the ASLO Education Subcommittee was created and charged with developing strategies for ASLO to advance education in limnology and oceanography. Members of the subcommittee include: Ray Drenner (Chair), Doretha Foushee, Maria Gonzalez, Dave Hambright, Jeremy Long, Chris Luecke, George Matsumoto, Thomas Mehner, Marianne Moore, Weston Nowlin, Cliff Ochs, Ashanti Pyrtle, Daniel Schindler, Kim Schulze, Lesley Smith, Val Smith, Katherine Webster and Wayne Wurtsbaugh.

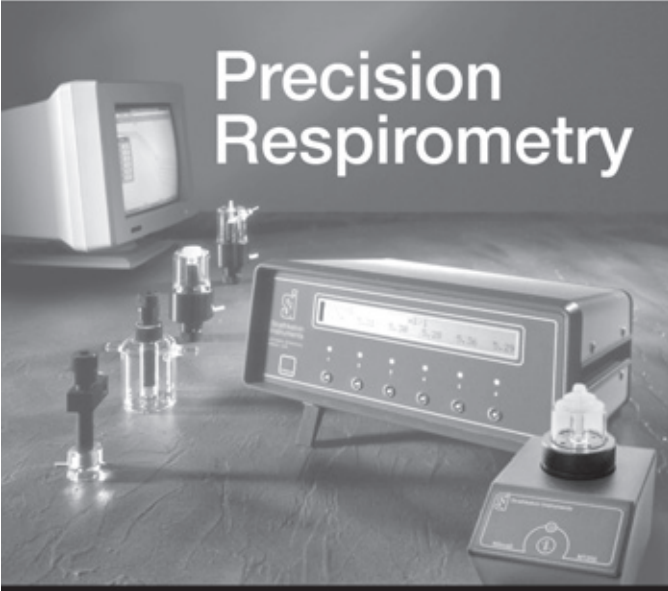
During its first year, the subcommittee focused on developing a new ASLO website on Aquatic Science Education Resources. The stated mission of the website is “to advance kindergarten through graduate education in the scientific fields of limnology and oceanography and related aquatic sciences.” The committee aims to develop this website for a broad audience both within and beyond ASLO. We envision that non-ASLO users might include school teachers, agency scientists, and conservation groups.

The website contains five major areas:

- **Image Library** – This area provides a collection of images for use in educational activities. ASLO members can donate and use images in a variety of categories including lakes, rivers, wetlands, estuaries, oceans, organisms, sampling techniques, and people.
- **Outreach Activities** – This area provides scientists and educators a listing of education outreach programs and activities that have been developed by ASLO members. Members can use this site to discover the innovative programs their colleagues have developed, as well as to identify mentors or partners that can provide expertise for their own outreach programs.
- **Related Links** – This area provides links to academic programs and websites providing educational resources in the aquatic sciences.
- **Teaching Tools** – This area provides educators with a list of instructional materials developed by ASLO members for educating students about limnology and oceanography.
- **Web-Based Courses** – This area contains a description of web-based courses in aquatic sciences.

The education website offers many benefits for ASLO members. In addition to the functions listed above, this site may also help investigators meet Criterion 2 requirements of NSF concerning the broader impacts of the proposed research activity. At a recent AGU meeting, Margaret Leinen of NSF stated that, “It is beginning to be the case that the difference between an excellent proposal and an excellent proposal that will be funded is the quality of the response to Criterion 2 – the broader impacts of the research.” In other words, a research proposal with a strong education or outreach component will be more competitive for funding than an equally sound proposal that lacks these components. In the future, the education website can serve as an outlet for teaching and outreach resources developed to meet Criterion 2 requirements.

The success of this website is critically dependent on support from all members of ASLO and their willingness to contribute to the endeavor. Directions for submitting images, outreach activities, teaching tools, and related links are available at the website. We encourage all ASLO members to help us in this important effort to advance aquatic science education. Please submit information related to any of the five topics areas, or use the information provided for your own education programs. In addition, tell your colleagues, academic or non-academic, about this important resource. The website can be found at: <http://www.aslo.org/education.html>.



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OUTSTANDING L&O REVIEWERS

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 two 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 to these two outstanding scientists.



ANNELIE SKOOG

Annelie Skoog is an assistant professor with the Department of Marine Sciences at the University of Connecticut. She has broad research interests focused around organic biogeochemistry of aquatic systems. Current projects in her group include the cycling of biologically

labile organic matter in hydrothermal systems and in the Arctic Ocean, the effect of anoxia on fluxes of reduced compounds over the sediment-water interface, the role of aggregation in biogeochemical cycling of labile organic matter in the coastal ocean, the role of dissolved organic matter in cycling of styrene in the surface ocean, and the effect of sonoluminescence on the cycling of organic matter in the surface ocean.



WARWICK VINCENT

Warwick Vincent is Canada Research Chair of Aquatic Ecosystem Studies at Laval University in Quebec City, Canada. He works on the influence of the physical environment on microbial communities and processes, with emphasis on the comparative ecology of

three functional groups of cyanobacteria: mat-formers, bloom-formers, and picoplankton. He has a special interest in the optical characteristics of freshwaters, including historical changes in underwater irradiance (paleo-optics). Warwick and his students have research projects at a variety of sites, but much of their work is towards understanding how high-latitude ecosystems respond to climate change.

GETTING TO KNOW YOUR L&O ASSOCIATE EDITORS

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Canada; lo-editor@aslo.org*

The next time that you pick up an issue of *L&O*, I hope that you will take a moment to peruse the list of Associate Editors (AE) on the inside of the front cover. These are the people

who decide what is published in *L&O*. 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. If a paper is accepted, the AE's final job is to edit the manuscript, suggesting wording and organizational changes to improve clarity.

L&O 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.



EVELYN BROWN SHERR

Evelyn Brown Sherr received a Ph.D. from Duke University in 1974, supervised by Professor R.T. Barber. Until 1990, she was a research scientist at the University of Georgia Marine Institute on Sapelo Island, Georgia. She then moved to the College of Oceanic

and Atmospheric Sciences at Oregon State University, where Dr. Sherr and husband Barry are currently full professors sharing one position as a "mom and pop" research team. They have broad interests in biogeochemical cycles and in microbial ecology. The work in their laboratory focuses on the roles of heterotrophic bacteria and of phagotrophic protists in aquatic systems. Their most recent projects include variability of cell-specific activity in marine bacterioplankton and assessment of the roles of herbivorous protists in the Oregon upwelling ecosystem and in the Arctic Ocean. As an AE, she handles manuscripts in the general area of microbial ecology.

FROM THE EDITOR'S IN-BOX

THE EU-US PROGRAMME ON HARMFUL ALGAL BLOOMS: A JOINT INITIATIVE BY THE EUROPEAN COMMISSION – ENVIRONMENT AND SUSTAINABLE DEVELOPMENT PROGRAMME AND THE UNITED STATES NATIONAL SCIENCE FOUNDATION

*Submitted by Patricia Glibert, Horn Point Laboratory,
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For decades harmful algal blooms (HABs) have been studied on both sides of the Atlantic, but the underlying reasons for these blooms, the ability to predict their occurrence, and the means to mitigate them when they do occur, have not been well known. For the first time, a joint research program in Europe and the US is being proposed to address these problems of mutual concern, through financial support from the European Commission (EC) and the US National Science Foundation (NSF). Several efforts have been launched the past decade to bring coordinated research, technologies, and shared resources to the issue of harmful algal blooms. These form an excellent foundation for the proposed EU-US HAB effort. It is now well recognized and accepted that our understanding of the population dynamics of organisms, their impacts, and the potential management implications, is dependent on working within a global arena. Although HAB impacts may be local, solutions may be found in distant locales.

One of the challenges of designing and implementing a collaborative program on HABs is the identification of areas where such collaboration will lead to significant progress that would not be possible if similar studies were undertaken independently. There are several areas where research would clearly benefit from collaborative efforts. First, there are comparative environments in the EU and in the US where comparisons of similar processes controlling bloom dynamics should lead to new understanding. Second, apparently similar species occur in the EU and in the US, but they differ in growth dynamics and expression of harmful attributes. Third, major anthropogenic and/or natural forcings, such as nutrient loading and climate variability, appear to have some differing impacts on HAB bloom dynamics in the EU and the US, and understanding this gradient of responses may lead to better insight and better management of HAB events. Thus, the rationale for comparison of similar harmful algal events and taxa across environmental and species is compelling. Advances will be mutual, and both research communities will benefit.

Research in HABs, as in many fields of geo- and biological sciences, has advanced tremendously in recent years through the introduction of new methodologies and technologies. These technologies now allow us to address questions – and pose solutions – that were previously not possible. From identification of species, and their rapid enumeration, to our ability to monitor physical dynamics of properties on scales relevant to organismal dynamics, and to model these processes, the advancements have been large. This is in part due to the national and multi-national ECOHAB and EUROHAB programs and other efforts from related fields. These efforts can now best be advanced through international collaborative studies.

The collaborative EU-US Programme on HABs builds on a joint workshop that was held in September 2002 in Italy to plan for the implementation of this program. The outcome of that workshop was a planning document that is intended to outline the exciting opportunities provided by a program such as this. A draft of this report may be found on the website of the National HAB Office (<http://www.who.edu/redtide/>).

We welcome public comment on this document and the program, and we encourage participation in the program when available funding is announced.

SCENARIOS FOR THE FUTURE OF NORTHERN WISCONSIN LAKES

Contributed by **Steve Carpenter**, Center for Limnology, University of Wisconsin-Madison, Madison, WI 53706 USA; srccarp@wisc.edu

Many limnologists have witnessed long-term changes in the lakes we study and become involved in public outreach aimed at improving the condition of lakes and the lands around them. Engagement in political processes is often frustrating. We become impatient with gridlock caused by polarized positions and find it difficult to explain the richness of scientific findings to the public. A fundamental problem is that the future consequences of present events are complicated, and the very complexity of the situation is a barrier to understanding and action. With many changes happening at once, it is hard to think about the future in a coherent way. Researchers at the Center for Limnology are exploring the use of scenarios as a tool to envision alternative futures, organize complex information, evoke constructive conversation (instead of unproductive argument), and stimulate more useful scientific research. We are working in Wisconsin's Northern Highland Lake District (NHLD), which contains thousands of lakes in the vicinity of Trout Lake Biological Station, in Boulder Junction.



Graduate Student Fellowships

Integrated Graduate Training and Research in Biogeochemistry and Environmental Biocomplexity

The Cornell University Program in Biogeochemistry and Environmental Biocomplexity (BEB) will award several research fellowships to new graduate students beginning Fall, 2004. This interdisciplinary endeavor, funded by the National Science Foundation, focuses on research in several broad areas: 1) Sources and cycling of nutrients and metals in the environment; 2) Nitrogen in the terrestrial environment; 3) The effects of genetic diversity on ecosystem functioning; and 4) Understanding complex systems through the coupling of mechanism that operate in simpler systems.

Students enter the BEB Program by applying to a graduate field central to their research. These fields range from Evolutionary Biology and Natural Resources to Engineering and Microbiology. For more information and application guidelines, visit our website: www.biogeo.cornell.edu. Minorities and women are encouraged to apply.

Review of applications will begin December 15 for students applying to the graduate field of Evolutionary Biology. Review of applications for all other graduate fields will begin January 15, 2004.

In summer 2003, as in past years, thousands of vacationers poured into the forested lakeshores of the NHLD. Visitors saw a different place than they would have seen 25 years ago. The number of permanent residents has almost doubled over that period. There are more lakefront homes, and the houses are bigger. There are more bikes, boats, cars and ATVs. Invaders such as rainbow smelt, rusty crayfish and Eurasian milfoil have reduced the quality of fishing and boating. Features of suburban life, such as chain stores and traffic jams, are more common. The character of the region is changing, and many residents, visitors, and scientists are concerned that the changes are for the worse. Will it be possible to preserve the best of the past while making best use of the opportunities created by change?

To understand how the northern lake region might change during the next 25 years, U.W.-Madison researchers met with residents and visitors to assess the future. Participants included businesspeople, Native Americans, lake shore residents, politicians, and managers. The group used scenarios to think about a wide range of plausible future changes. The scenarios are based on well-understood trends, ongoing scientific research, and simulation models, as well as careful thinking about unpredictable events, vulnerabilities, and sources of resilience.

Four different scenarios (downloadable from <http://www.lakefutures.wisc.edu>) were developed for the Northern Highland. Each starts from the same trends during 2002–2007. Then, each scenario traces a different sequence of events from 2007 until 2027. Each scenario explores what could happen if certain trends, such as the spread of invasive species, become dominant. While no particular scenario is likely to come true, the future is likely to include some aspects of the scenarios.

We have named the scenarios Anaheim North, Walleye Commons, Northwoods Quilt, and Refugee Revolution. In Anaheim North, the region develops rapidly as tourism expands around theme parks in population centers. In Walleye Commons, unexpected environmental problems lead to a decline in population followed by gradual reorganization around tribal initiatives. In Northwoods Quilt, growth and diversification of the population lead to resource conflicts which are resolved by allocating recreational lands and lakes for certain specified uses. In Refugee Revolution, terrorism in Chicago leads to population growth as well as more governmental control of resource use.

The scenarios, which were widely covered in local media, have evoked thoughtful and impassioned responses from people in the region. We will continue to receive and organize responses through the winter. The discussions have prompted new analyses of data from the North Temperate Lakes LTER site (<http://lter.limnology.wisc.edu>) as well as a new, spatially-explicit simulation model of the demography, economy and limnology of the NHLD (prototype on [\[biocomplexity.limnology.wisc.edu\]\(http://biocomplexity.limnology.wisc.edu\)\). We are in the process of converting the model to a computer game for use in workshops as a tool to focus discussion of management options.](http://</p></div><div data-bbox=)

Ecological scenarios are also used in the Resilience Assessment and Management (RAM) process pioneered by the Resilience Alliance (<http://www.resalliance.org>) and in the Millennium Ecosystem Assessment (<http://www.millenniumassessment.org>).

For further reading about ecological scenarios, see:

Bennett, E.M., S.R. Carpenter, G.D. Peterson, G.S. Cumming, M. Zurek and P. Pingali. 2003. Why global scenarios need ecology. *Frontiers in Ecology and the Environment* 1: 322–329.

Peterson, G. D., T. D. Beard Jr., B. E. Beisner, E. M. Bennett, S. R. Carpenter, G. S. Cumming, C. L. Dent, and T. D. Havlicek. 2003. Assessing future ecosystem services: a case study of the Northern Highlands Lake District, Wisconsin. *Conservation Ecology* 7(3): 1. [online] URL: <http://www.consecol.org/vol7/iss3/art1>

Peterson, G.D., G.S. Cumming and S.R. Carpenter. 2003. Scenario planning: A tool for conservation in an uncertain world. *Conservation Biology* 17: 358–366.

FROM LAND TO SEA - FROM SCIENCE TO MANAGEMENT: DISSOLVED ORGANIC MATTER (DOM)

Contributed by **Morten Søndergaard**, *Freshwater Biological Laboratory, University of Copenhagen, Helsingørsgade 51 DK-3400 Hillerød Denmark; msondergaard@zi.ku.dk*

An International Conference, 26 - 28 November 2003, Horsens, Denmark

Over the past decade researchers in several EU projects and also worldwide have increased our knowledge on DOM export, its fate and effects, but a gap between the more fundamental sciences and environmental management can be identified. With focus on a European dimension but also with a global outlook, we invite you to participate in this DOM conference either with an oral or a poster contribution.

It is the purpose of the conference to present state-of-the-art knowledge on sources, fate and effects of DOM in coastal ecosystems and to explore how land use and agriculture practices have consequences for export of DOM, both with respect to quantity and quality. Furthermore, we want to explore and discuss how administration/regulation of land use at the catchment level affects the marine environment.

The main themes of the conference are: DOM export from the catchment with focus on land use, vegetation, agriculture and climate; the fate and effects of DOM in aquatic environments; and DOM in a management perspective.

For more information and registration, go to www.domaine.ku.dk

DIALOG VI

Dissertations Initiative for the Advancement of Limnology and Oceanography

Program for Recent Ph.D. Recipients across the Aquatic Sciences and Related Disciplines

The DIALOG goal is to catalyze interactions and understanding across the aquatic sciences. Recent PhDs are targeted to introduce new graduates to the community, forge lasting collegial bonds across peer groups and foster early career development.

Ph.D. DISSERTATION REGISTRY

The registry encompasses *all* aquatic science disciplines. Dissertation abstracts are posted on-line in a fully searchable format, providing a concise overview of the field and highlighting individual accomplishments.

Graduates completing PhD requirements after April 1, 2003 are invited to register. Citations submitted within 3 months of PhD will be published in the *L&O Bulletin*. Participants will receive an abstract book, peer directory and a demographic report on their 2-year cohort.

ELECTRONIC COMMUNICATION

Once registered with DIALOG, graduates are placed on an e-mail list to foster cross-institutional communication and distribute job and other information. Anyone may submit job and other announcements for posting. Submissions should be sent to dialog@whitman.edu. Brief summaries

**Submit job and other
announcements to
dialog@whitman.edu**

are encouraged, with web addresses for details. Please do not send attachments.

SYMPOSIUM

"I suspect that, in years to come, the familiarity with distant specialties and connection to the top young scientists in diverse fields will greatly impact my own research and teaching."

Past DIALOG participant

The DIALOG symposia catalyze early career development with a focus on interdisciplinary understanding and peer networking across the full spectrum of aquatic sciences.

DIALOG VI will bring together 40 recent grads from around the world. Both oral and poster sessions will be used to relate each participant's dissertation research and current interests. Working groups will discuss emerging aquatic-science research, education, career and societal issues. Agency representatives will describe interdisciplinary and international aquatic science research opportunities. While the format is intense, there will be time for informal as well as formal interactions. Past participants agree this opportunity for information exchange and developing an international peer network should not be missed:

"I am positive that my perspective of science was changed by this meeting. It has already proven to be a milestone in my career."

"This is exactly the sort of thing we need to bring the newest generation of aquatic scientists together."



Symposium Eligibility

DIALOG VI+ is open to
PhDs completed

April 1, 2003 - March 31, 2005

in any subject *within* or *relevant* to the biologically oriented aquatic sciences. Selection will favor applicants who plan to engage in interdisciplinary aquatic science research. Graduates from all nations are eligible. A committee will select 40 participants based on the application materials submitted. Travel subsidies are available for most countries

SYMPOSIUM Dates & Location

Fall, 2005

Check website below for details

Application Deadline

May 1, 2005

HOW TO PARTICIPATE

Abstract Registration Forms

•
**Symposium
Application Instructions**

•
PhD Dissertation Registry

<http://aslo.org/phd.html>

Questions

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