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Novelty, Rigor, and Diversity

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Conservation Ecology is emphasizing three attributes in order to develop a specific niche in a rapidly changing area of fundamental science and fundamental policy. These attributes are novelty, rigor, and diversity. We want to encourage novel ideas and novel ways to communicate and educate. We want these efforts to be rigorous, in the face of a reality that procedures maintaining rigor can often destroy novelty. And we want diversity: international, interdisciplinary, interorganizational, and intersectoral. The goal is develop interactive communities among previously separate groups.

We certainly have not gone very far in achieving those attributes. But several experiments have shown what does not work and what does. The most successful device, by far, has been the Young Scholars Group, and the Young Scholars' Dialogues that they organize. Given two or three papers that highlight aspects of a large issue, the group of Young Scholars has invented a way to use the Internet and *Conservation Ecology's* software to generate constructive expansions that deepen and generalize a topic. A good example was in Vol. 1, Issue 2, in which climate change and adaptive ecosystem management were the topics (Garry Peterson et al., Uncertainty, Climate Change, and Adaptive Management). The group is international, interdisciplinary, and interactive. They are thoroughly professional, broadly read, and deeply trained. They are the ones who will help to shape science, scholarship, and practice in the 21st century.

This issue, the fourth that *Conservation Ecology* has published, continues to present results of some of these experiments. It continues two themes that were inaugurated one year ago in Volume 1, Issue 2, and launches a new theme with a series of papers in a Special Feature on Sustainability.

The two themes launched a year ago concerned global climate change and adaptive management. The climate change issue has had a greater influence on the environmental sciences than any other since WWII. It has stimulated grand, cooperative, and novel international research. It has stimulated interdisciplinary inquiry that, initially, bridged disciplines in the natural sciences, and now, with the program Human Dimensions of Global Change, integrates those with disciplines in the social sciences as well. The stage where all these issues of science, economics, institutions, and people converge is a regional one. And it is on a regional stage where adaptive management has evolved as a way to deal with uncertain issues of science and people under conditions of continual change.

If anyone is the guru of adaptive management, it is the irascible, brilliant, and ever−provocative Carl Walters. His Review of decades of experience inaugurated the Adaptive Management theme one year ago. It is a seminal article that has begun to trigger use of the response feature available at the end of each paper. That feature has been added to encourage "value−added" material that substantively deepens or extends the points made in an article. The hope is that a particular contribution would develop into a web of conversations on a theme, all of which are hyperlinked to the original article. Two responses appeared in Volume 2, Issue 1, and another appears in this issue. In it, Rogers describes experience in South Africa, where some of the problems that Carl Walters raises have been addressed in a partnership of scientists and managers: the Kruger National Park Science/Management Partnership. So far, all of the responses to Walters' article have been from scientists. We would very much like to hear from managers. We need the insight that they can add.

Some of those insights, as well as further ones from scientists, will appear in the next issue in a series of papers, organized by Barry Johnson, that form a Special Feature on Adaptive Management.

Adaptive management deals directly with uncertainty, unpredictability, and inevitable change. That is also at the center of understanding and managing climate change and its impacts. As a consequence, methods of analysis and synthesis and novel international organizations have had to be developed to understand what is known, what is uncertain, and what is unknown. That is within a tradition of what might be called adaptive inference. Its wedding with management actions that are designed to test hypotheses has created adaptive ecosystem management.

Such methodological developments vividly highlight a long history of two sometimes conflicting approaches: two cultures of science described in an editorial in this issue. One is a science of parts and one a science of the integration of parts. Both are essential to develop understanding. But practitioners of the science of parts have a particular responsibility to understand, if not practice, the science of integration of parts. Otherwise, narrow understanding will lead to suggestions for myopic policies, which will become ammunition for disinformation campaigns that are intended to advance narrow interests. The consequences of climate change mitigation policies provide plenty of depressing examples, none of which, I trust, will ever appear in *Conservation Ecology*.

The climate change theme continues in this issue, with an economic analysis of impacts of carbon mitigation policies by Bernow and Duckworth. That Perspective is meant as a balance to an earlier Perspective on the same topic by Holling and Somerville, which leads to an apparently different conclusion. Bernow and Duckworth conclude that carbon mitigation policies are likely to enhance regional economic activity. Holling and Somerville agree that this is the likely long−term consequence, but that there will be major economic dislocations and negative economic impacts during a 10−year transition. Those forecasts, of course, are as uncertain as are predictions of climate change, and they depend upon assumptions regarding the flexibility and adaptability of people, businesses, and institutions. Until recently, the fossil fuel industry's response, itself, has been so fossilized as to suggest that adaptive transition will be painful. Recently, however, British Petroleum has broken ranks, launching a program that shows great foresight and strategic sense. Yet, any transition as momentous as that anticipated by international climate change policies will have winners and losers−− between business and labor, between regions, between nations of the north and those of the south. Hence, understanding of politics is as essential as understanding of economies and of nature.

The consequences of global change impacts on nature largely emphasize ecosystem impacts. An example is the Synthesis article by Brian Walker and Will Steffen, appearing as part of the inauguration of this theme. It is the first published summary of a six−year international study of global change impacts on terrestrial ecosystems. One of its conclusions is unambiguous. That is, terrestrial ecosytems are becoming a net source of carbon to the atmosphere, rather than the sink that they had been. However, other impacts are also inevitable. In this issue, Rodriguez−Trelles, Rodriguez, and Scheiner discuss a way to monitor possible climate−induced genetic changes using existing international networks of researchers and their databases. They give an example with *Drosophila* and point out other opportunities using other species of plants and animals. We are familiar with the use of mussels as monitors of local environmental change. Here is an example of *Drosophila* and other species being proposed as monitors of planetary genetic change. The paper is a fine example of an Insight article−− a unique idea developed far enough to make the value clear.

One new theme concerning sustainability has been launched in this issue. It appears in the 11 papers prepared for a Special Feature on Sustainability in Boreal Regions. These papers had their origin in a workshop that was organized as part of a large international project: Resilience of Ecological, Economic, and Social Systems. That project's goal is to develop integrative theory, integrative methods, and illuminating cases. The theme in this Special Feature includes papers from ecosystem, economic, business, and management perspectives. Other papers consider sustainability of freshwater systems, birds, mammals, and people. It is a fine example of cooperative, multidisciplinary inquiry accessible to a wide audience.

We will have other Special Features in the future. Some will originate at workshops, but we recognize that papers submitted to a workshop or conference are rarely useful as a way to explore a theme. As in this case, however,

workshops can be the place to air perspectives and experience, out of which come papers specially prepared for the theme. The papers prepared for the Boreal Sustainability Feature were reviewed in the typical double−blind peer review procedure of *Conservation Ecology*. In order to assure integration, one of the two to three reviewers for each paper was a participant in the workshop, and the editors handling the reviews were the three people responsible for organizing the activity: John Pastor, Carl Folke, and Steve Light. John Pastor, the principal organizer, worked hard and long to encourage identification of common themes and synergism. As a consequence, the papers are not only of interest to those specifically interested in Boreal Regions. There are lessons and insights relevant for any region.

Not all papers appearing in *Conservation Ecology* are interdisciplinary or multidisciplinary, although I hope that all are accessible to such audiences. But all have to have some sense of novelty or of exploring relatively new directions. The papers by Bhar and Fahrig and by St. Clair et al. are examples of applied ecology with a theme of advancing fundamental science by dealing with behavior of organisms at a range of scales from local to landscape. Nocera and Taylor, show, for the first time, I believe, the effects of low levels of a heavy metal on the behavior of individuals in a population of wild animals, in this case, loons. And Merenlender et al. discuss a fine example in which local citizens are engaged as part of a monitoring scheme to evaluate impacts of resource extraction: in this case, impacts of land−clearing on lemurs in Madagascar. The place and the beasts are themselves evocative, but the novelty lies in this example of citizen science, in which partnering with local citizens contributes as much to sustainable practices as it does to understanding.

To this point, I have tried to allude to all papers but one that appear in this issue. It is unlikely that I shall attempt such a total review again, because the flow of manuscripts has increased so much. I have been as complete as I can in this commentary on papers published in this issue, in order to demonstrate, by example, the range of articles, the range of responses, and the style desired for *Conservation Ecology*.

The last contribution is a Response by Khanina to a paper, published in the inaugural issue by Giulio De Leo and Si Levin, concerning ecosystem integrity. The appearance of this contribution highlights three attributes that *Conservation Ecology* is emphasizing in order to develop a specific niche in a rapidly changing area of fundamental science and fundamental policy: novelty, rigor, and diversity.

In this case, the novelty lies in the demonstration of a body of research developed in one part of the world− Russia− that is largely unknown in another− the United States. Khanina draws on work that emerges from a very long tradition of Russian biogeography that has emphasized the role of both biotic and abiotic processes in developing self−organized, persistent patterns at various scales on landscapes. Such a focus has been a very recent development in western countries, but it has had a long tradition of excellence in Russia. The western work, although recent, has gained growing influence because it advances emerging theories of adaptive, complex systems that have such broad significance for economic, social, environmental, and ecological systems. My own research, and that of my collaborators, has recently concentrated in that area. The importance for ecology in the development of theory for adaptive, complex systems has been recently reviewed in a series of articles in *Ecosystems*, a journal that was born about the same time as *Conservation Ecology* and that covers some of the same ground. The overview of the contents can be found in Hartvigsen et al. (1998). Joining results from those geographically and intellectually isolated communities of research could develop a valuable synthesis. Such a synthesis would advance fundamental understanding useful for policies concerning global change, biodiversity loss, and landscape change.

Rigor, the second attribute we encourage, is an attribute sought by every scientific journal. But the *Conservation Ecology* experiment has shown that ways to assure rigor through the traditional critical peer−review process almost always eliminate novelty. Early papers in the first issue of *Conservation Ecology*, for example, were solicited from colleagues in a novel international research program that sought to develop integrative theories appropriate for linked ecological, economic, and social systems. Reviewers rejected every paper. That was all the easier because we have a double−blind peer review system that hid the distinguished names of the authors from reviewers. Traditional peer review concentrates on what is wrong with articles. It therefore fills the essential need to eliminate bad science and scholarship. Scientific journals take pride in high rejection rates for manuscripts. But I believed that a 100% rejection rate of papers written by deeply and broadly experienced leaders in the field was,

perhaps, going too far. In Kenneth Boulding's terms, that carries rigor to the point of rigor mortis.

The solution was to request editors to be particularly alert to and sympathetic toward novelty in papers and, in particular, to encourage reviewers and editors to work actively and positively with authors so that novel ideas and papers are developed as rigorously as possible. In addition, a special category of papers called "Insight" was added to nurture novel ideas early in their development, ones that promised to open new directions for research, education, or action.

By the traditional review criteria, the first version of the Khanina contribution would have been rejected instantly because the author is unfamiliar with English and the ideas are unfamiliar to North American, and even to some European reviewers. But there seemed to be the seeds of something useful, so I asked two colleagues familiar with the topic and familiar with European cultures and languages, to work with the author. They actually rewrote the piece in the manner they understood, and several subsequent revisions led to the present Response. It is an extreme example of a more general "culture" that is developing in *Conservation Ecology*, one that combines cooperative mentoring of ideas with rigorous critique. It can only be done by having a very large Board of Editors, so that each editor has fewer than five papers to review in a year. Our rejection rate has gone from 100% to a more acceptable 74%.

Diversity is the final attribute that we emphasize. Although the Khanina contribution does not particularly reveal the benefit of interdisciplinary or interorganizational activity, it does highlight the benefit of international collaboration and international conversations. The Khanina contribution would not have appeared if subscribers had to pay for the journal and if the journal was a paper one. Free subscription, accessibility on the web, and a culture of web−based experimentation provide access to people and places that otherwise would be isolated. Paper journals published in the West are a vanishing commodity in Eastern Europe. Paper journals published in the North have never been easily accessible in developing nations. The web changes that. And we are developing a plan that will maintain free subscriptions while still providing the financial stability needed. More on that will be described in the next issue of the journal.

The full range of papers in this issue of the journal gives some sense of the international possibilities. In addition to papers from authors in the United States, we have ones from authors in seven other nations: Canada, Finland, Madagascar, Russia, South Africa, Spain, and Sweden. Of our subscribers whose location is identifiable, 44% are from nations other than the United States. That is still not the balance we seek, but it is notably better than the membership of our sponsoring Society, the Ecological Society of America (ESA), where only 18% of the members are from non−U.S. locations. Moreover, 24% of our subscribers come from sectors of the population not widely represented by ESA members: the commercial sector (21%) and the non−educational, nonprofit sector (3%). Now that we have developed a sustaining momentum, our target is to expand significantly the range of nations and organizational sectors represented by our subscribers and authors.

Novelty, rigor, and diversity are attributes not easily achieved as a synergistic set. But the needs for fundamental examination of science, scholarship, and policy in issues of sustainability, provide a fresh venue to discover how. And the Internet and web have stimulated a series of low−cost experiments that are forgiving of error. *Conservation Ecology* is slowly developing a broad community of those wishing to explore and disseminate novel ideas and novel practices in novel ways. MacLuhan, the provocative and sometimes provoking philosopher of communication, was perhaps correct. The medium IS the message.

RESPONSES TO THIS ARTICLE

Responses to this article are invited. If accepted for publication, your response will be hyperlinked to the article. To submit a comment, follow this link. To read comments already accepted, follow this link.

LITERATURE CITED

Hartvigsen, G., A. Kinzig, and G. Peterson. 1998. Use and analysis of complex adaptive systems in ecosystem science: Overview of special section. *Ecosystems***1**: 427−430.

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