With a little help from facilitators

ESA's Annual Meeting, Madison, Wisconsin, 2001 – all these ecologists, and scant discussion of the environment. This happens meeting after meeting, in spite of earnest efforts to encourage and plan interdisciplinary environmental research. While there are interesting and potentially fruitful thrusts here and there (eg urban ecology, biocomplexity, ecological economics), they only scratch the surface. In Madison I saw a glaring disconnect between ecology as scientists do it and Ecology as a potential management scheme for the human population, economic growth, climate change, politics, and equity – all governed by feedbacks, dynamics with momentum, and the complexity of human wants and drives. And why shouldn't I feel this way; I was presenting on trophic cascades in idealized food chains, while the air conditioner ran and the car was waiting.

There are two fundamental barriers to interdisciplinary cooperation on serious environmental issues: divisions between disciplines and the discipline vs discipline problem. The latter, although difficult enough, is the easier one. The far tougher nut is the presence of barriers internal to each of us, separating what we know, what we want, what we fear, what we obsess about at 3am, and what we think we can do. Most of us know that environmental problems are extremely serious and have far-reaching connections to everything from health to war. We sense that responsive solutions require measures that we find extremely threatening – consider "overconsumption", a term that buzzed about at the Johannesburg Summit on Sustainable Development. Hence we opt for denial or detachment, and as a result, interdisciplinary environmental activity represents a much longer leap than reconciling an entomologist's and a chemist's definition of good science.

What to do about it, other than wait for a real crisis? I propose that meetings (preferably small) to chart interdisciplinary ecological work be professionally facilitated to break down both kinds of barriers, with an emphasis on the second type, and that the form of such meetings be expanded to be consistent with the broader implications of interdisciplinary work. The outcome of such meetings should not be a grand, touchy-feely consensus which maximizes short-term bliss. Serious, professional facilitation would encourage a comprehensive, honest statement of the issues. While I propose this as an experiment worth trying, I am not certain of success, and am even suspicious of professional facilitators. I have been in two facilitated meetings – one worked, one did not. But we need a jolt to get us off the dime. The process may well take participants further in the direction of "community" than where they will end up, but that stretch is beneficial and consistent with what interdisciplinary research in ecology implies. I think we should all take that kind of chance.

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Improving the ecology–policy interface

Thank you for "The Ecology–Policy Interface" forum (*Frontiers* 2003; **1**: 45–50). Academic ecologists are showing a growing interest in environmental policy, so it is an appropriate time to examine their potential roles, and for those of us who have worked on this interface to offer advice. Here I share my perspective as someone who has published scholarly ecological research and also had active and extensive involvement in shaping ocean policy over the past decade.

Just as ecology is a complex, highly nuanced discipline, so too is environmental policy. Academic ecologists fear losing their credibility through advocacy, yet the real risk is in poor and naive communication that makes their input irrelevant. To be more effective, academic ecologists need to better convey their ideas to the policy audience, and provide advice that reflects the complexities and nuances of good environmental policy.

The policy process consists of many steps, including the identification of problems, the development of solutions, the analysis of alternatives, and the choice of regulations. So far, academic ecologists have played an important role by bringing problems to the attention of policymakers and society. They will need to invest more time and energy in the day-to-day policy process, however, if they wish to influence the subsequent steps as well.

The policy process can be designed to facilitate the participation of ecologists, particularly in the analysis of alternatives and in providing relevant advice. The process would serve managers and the public better if managers specified clear, measurable objectives, and if scientists analyzed and presented quantitative performance indices on the ability of alternatives to meet those objectives. This sort of analysis would inform policy-makers' decisions and make the decision-making process more transparent.

The greatest challenge lies in developing potential policy solutions, a process which would benefit from greater input by academic ecologists. However, effective involvement will require greater commitment from individual scientists and their universities and departments. For example, I played an instrumental role in the creation of the Red Hind Bank Marine Conservation District in the US Virgin Islands. Through relationships and trust built over several years with the local fishing community, I helped them devise a scientifically credible proposal in response to strong govern-

ment interest in creating a marine reserve. If academic ecologists wish to take on similar roles, they need to understand complex, nuanced environmental policy processes and build effective relationships within these arenas. Universities and departments need to recognize the commitment necessary to take on these roles, and value such commitment when hiring and rewarding faculty.

This role need not be limited to academic ecologists. A handful of conservation groups have made sufficient investment in science to allow their staff to play this role effectively. However, most are wary of providing the resources for scholarly work beyond literature reviews. Government scientists, who are also in a position to play this role, may not have the political support to freely pursue innovative solutions. We will all benefit from a more effective ecology–policy interface, and I encourage ecologists and their departments and universities to help bridge the gap.

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Doubts about "Certainty"

In "The committee furor and the Certainty Principle" (*Frontiers* 2003; **1**: 4), Donald Kennedy originates a new catchphrase, the "Certainty Principle", to describe a reaction to the "Precautionary Principle". Some history of risk–benefit–cost analysis may be useful in judging between these alternative approaches with their cryptic names.

It was just over 50 years ago that SV Ciriacy-Wantrup promoted the "safe minimum standard" (SMS) of resource conservation (Ciriacy-Wantrup 1952). SMS requires that whenever there is uncertainty about thresholds of degradation, exploitation be voluntarily reduced "to the extent that it is cost-effective or economically feasible". Since then, many variations of this sort of regulatory assistance have been promulgated, yet in half a century none of these narrative prescriptions has produced objective decision-making or operating guidelines.

These approaches, including Kennedy's "Certainty", require a contemporary generation of technocrats to judge the proper balance of risk between immediate gains and lost long-term natural resource potential. They distinguish, somehow, between conservation costs that are intolerable and those that are merely substantial. They imply a confident prediction of worst-case consequences which have seldom been documented. They depend on measuring the proximity to degradation thresholds, because the cost usually varies strongly with the degree to which exploitation is foregone. They do not tell us how much of the resources (or which adverse outcomes) are most important, and they do not state which mitigating measures should be taken.

Rather than encourage assessment committees to use a balance of these clumsy labels of inferred bias, ecologists should promote the process theme of "The ecology–policy interface" forum (*Frontiers* 2003; **1**: 45–50), especially as expressed by Harold Mooney – a science assessment process of critical evaluation of peer-reviewed literature, plus a measure of the certainty of conclusions, and an expression of the current weight-of-evidence in terms relevant to policy choices, particularly scenario building of possible futures.

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Keeping the faith

Katherine Elllison's "A question of faith" (*Frontiers* 2003; **1**: 56) was a surprising and refreshing contribution to the inaugural issue of *Frontiers*. As an ecologist involved in global change research, and as a person of faith, I'm delighted when the scientific community recognizes the value of environmental initiatives that lie outside the general purview of science.

At first blush, religiously inspired optimism and hope do indeed seem absurd in the face of dire environmental conditions. Yet, for a couple of reasons, they are not. First, everyone probably agrees that environmentally conscious decisions at the individual level would go a long way towards ameliorating many of our most vexing environmental problems. People make such choices not on the basis of what they know, but of what they believe. The historical record demonstrates that religious teaching and leadership have a powerful influence on individual values and behavior (Sagan 1990).

Second, without a substantial element of hope or "faith", problems can appear so monumental as to engender apathy and paralysis. The research of Jim Collins (2001) is particularly significant in this regard; he noted that one of the signature characteristics of human organizations that make the leap from simply "good" to enduringly "great" is the ability to simultaneously confront the brutal facts and maintain unwavering faith. Either alone is insufficient.

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It's seals on the rocks for polar bears

A news article in the February issue of *Frontiers* (2003; **1**: 10) stated that "Global warming could drive polar bears to extinction within 100 years." This isn't possible; both the bears and the seals that they eat are too adaptable.

It is true that arctic seals use ice, not only as a place to have babies, but also to sun themselves. From 1961 to 1977, I was fortunate to have laboratory space at the Naval Arctic Research Laboratory. In the spring, from our laboratory door we

could count hundreds of seals on the ice near the shore. At that time and place there were no babies; the adults had hauled themselves out for sunning. In the distant future, when the polar ice is gone, the seals will have to haul out on rocks and beaches. They will have babies on rocky islands, just as they do in New England and Scotland, and the bears will prowl the islands.

I have had many trips to Churchill, sometimes to take blood from polar bears. The last time, we watched a polar bear eating a seal it had just killed on the sandy shore. There was no ice in view. I predict that in the future seals and polar bears will still survive, but with changed habits.

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Reply

Professor Folk's belief that polar bears could not be driven to extinction by climate change misses the point of my talk, due to both his and the media's focus on the issue of extinction. The presentation at the Biology of the Canadian Arctic symposium explored how climate warming could impact polar bears and how these impacts may be predicted using our existing knowledge of the species and its ecology. The issue of extinction was a minor aspect and only the most extreme scenario.

Nevertheless, polar bears are highly specialised predators, dependent primarily upon ringed and bearded seals, and all three species are currently reliant on sea ice. Should sea ice disappear altogether, evolution to a life dependent on terrestrial habitat is possible. However, considering the apparently limited time remaining before the arctic ice pack is severely reduced or eliminated, and the rate at which these species with long generation times would need to evolve, such rapid and radical evolution is unlikely. Furthermore, ecologically specialised species are considered particularly vulnerable to extinction through habitat loss, and polar bears fit my definition of such a species. Nobody knows though, and thus Professor Folk's assertion remains a hypothesis.

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Making it off the list

The *Frontiers* March editorial and Douglass Rohrman's "Laws of Nature" column (*Frontiers* 2003; **2**: 3, 51) both point out that despite the best intentions, only about 30 animals and four plants have recovered as a result of the Endangered Species Act. More than 1200 species are covered by this law, yet recovery is still far away for most of them. Clearly, more than good intentions and the requirements of the act are needed.

To revive rare species we need to consider and respond to a few other important facts. First, for most endangered species, improvement can only happen as a result of active management and restoration; simply prohibiting further harm will not suffice. There is no legal "magic wand" that can compel good management. Second, most endangered species are dependent on non-federal (principally private) land for their habitat, many entirely so. Recovery efforts, in many cases, will require private landowners to be willing and active participants in this essential enterprise.

Unfortunately, as the editorial noted, the incentives are few and disincentives many. Private landowners whose active management increases endangered species' utilization of their land face greater legal restrictions on that land. Only recently, with the first "safe harbor" agreements, has this impediment to landowner action begun to be addressed. Initial responses to the safe harbor test indicate it is a powerful tool to enlist landowners as key stewards of conservation, rather than as reluctant opponents.

While overcoming regulatory disincentives is an important step, it is not enough. Significant positive incentives are needed to encourage and reward private actions that further the public good. There is some promise, but little funding yet, in federal government programs to enlist landowner stewardship of rare plants and animals.

Yet, as Aldo Leopold pointed out, recovering rare species should not be exclusively the government's responsibility. Private parties can succeed where government help is unavailable or unwanted. Instead of facing a loss of choices and diminished land value, landowners can be offered more choices and a positive economic outcome for managing for species recovery. Our two private organizations, Sand County Foundation and Environmental Defense, recently committed a million dollars of private funds to aid landowners willing to further the conservation of imperiled species. This partnership is called the "Leopold Stewardship Fund", and along with other private initiatives can help encourage stewardship and leverage public funds, when they are forthcoming.

A more complete species conservation program that includes both intelligently crafted regulatory controls and meaningful incentives, will speed the recovery of rare species. Private landowners enabled and encouraged in rare species habitat enhancement are an essential means to success. Making the list, after all, is not the objective – making it off the list is.

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