is essential that it be addressed using the most intelligent and creative methods available. In their Policy Forum "Sustainability science" (Science's Compass, 27 Apr., p. 641), Robert W. Kates and co-authors seem to suggest applying natural systems methodology—that is, an observational approach—to human systems. Indeed, studying nature allows us to capture the problem of sustainability, but it gives us no insight into the solution. We suggest complementing the observational approach with a more active, solution-driven approach.

A conceptualization of the solution-driven approach is embodied in the field of industrial ecology (IE), which has been defined as the "science of sustainability" (*1*). The systems approaches of IE help in understanding and minimizing the burdens imposed by society on nature through methods such as material and energy flow studies, dematerialization and decarbonization, life-cycle assessment, design for the environment, product stewardship, eco-industrial parks, Earth systems engineering/management, product-oriented environmental policy, and eco-efficiency. Some of the approaches are technical; some involve policy. In concert with sustainability science, IE also aims, as Kates *et al.* say, to "understand the fundamental character of interactions between nature and society."

Since its beginnings in the late 1980s, the IE community has been interdisciplinary, including engineers, physicists, ecologists, economists, sociologists, and other scientists working in government, academia, and industry. Two Gordon Conferences, *The Journal of Industrial Ecology*, and the recent formation of the International Society for Industrial Ecology have played a major role in crystallizing the "science of sustainability." We can all benefit from the synergism of many minds. In the spirit of cooperation, we invite the nascent sustainability science community into a dialog with our community. We see the two groups as proposing complementary and, in some cases, similar pathways toward a scientific approach to sustainability.

"The systems approaches of [industrial ecology] help in understanding and minimizing the burdens imposed by society on nature... "

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References and Notes
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Separate Identity, Separate Career

WE WERE HONORED BY THE NEWS FOCUS article on our careers in physics and astrophysics ("Twin stars of astrophysics make room for two" by M. Sincell, 10 Aug., p. 1040). The article itself illustrates some of the challenges we have faced as identical twins attempting to forge separate professional identities and overcome the distraction that our special relationship creates for others.

Not only were our identities reversed in the caption of the photograph that accompanied the article, but space was devoted to describing several twin incidents at the cost of barely mentioning the individual scientific contributions of one of us (FKL). We would like to mention a few highlights for the record.

In early 1972, FKL proposed that the recently discovered x-ray pulsars are accreting magnetic neutron stars. With his Illinois colleagues and students, he developed the theory of such stars. With his student Pranab Ghosh, he also developed the standard theory of disk accretion by spinning magnetic stars. FKL not only played an important role in the conception, development, and operation of NASA's Rossi X-Ray Timing Explorer mission, but also, with his students, developed a theory of the kilohertz brightness oscillations of neutron stars and black holes that were discovered with the Rossi Explorer. He and his students have shown that these oscillations can be used to determine how matter and radiation move in the strong gravitational fields near neutron stars and black holes and to constrain the properties of the ultradense matter in neutron stars.

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The State of Coral Reef Science

IN THEIR REPORT "REGIONAL-SCALE ASSEMbly rules and biodiversity of coral reefs" (25 May, p. 1532), David R. Bellwood and Terry P. Hughes make several statements that warrant rebuttal. First, they say that "our understanding of regional-scale patters of biodiversity on coral reefs...has changed little since the seminal work of Stehli and Wells...." This comment disregards a 30-year-long research program conducted by the Australian Institute of Marine Science (AIMS), which effectively follows on from where Stehli and Wells (1971) left off (*1*). Second, the authors say that "the processes that shape [biodiversity gradient] patterns [on coral reefs] remain elusive," yet the geological background and the role of ocean currents in dispersion, genetic connectivity, temperature, and habitat variation have all been well addressed in more than 100 publications. And third, Bellwood and Hughes suggest that their work is the "first" to quantify the "biogeographic variation in species composition...along biodiversity gradients." I spent 20 years doing precisely that for corals.

Since the late 19th century, fish and coral data have led the marine contribution to biogeographic and evolutionary debate. Now, at least 90% of species likely to be encountered on any reef have been described and their distribution ranges recorded. This information is available in Geographic Information Systems (GIS) databases, which permit the sorts of sophisticated analyses that support terrestrial biogeography. Of the 31 references in Bellwood and Hughes' report, 23 were published in the 1980s or earlier, and all (including those of the present author) have been superseded, both taxonomically and biogeographically. The major marine conservation organizations, working with GIS databases (of reefs, corals, fish, and molluscs), are going to considerable lengths to preserve both credibility and accuracy (*2*), but Bellwood and Hughes appear to have drawn little upon these extensive resources.

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References and Notes
1. The wealth of coral biogeographic publications that have changed every aspect of this thesis is summarized in J. E. N. Veron, *Corals in Space and Time: the Biogeography and Evolution of the Scleractinia* (Comstock, Ithaca, NY, 1995), which received the Australian National Marine Science Award for 1996.
2. For example, high-resolution biogeographic studies that support marine conservation will be highlighted in a forthcoming World Heritage Tropical Marine Biodiversity Assessment Workshop sponsored by the UN, UNESCO, NOAA, the World Conservation Monitoring Centre, and IUCN.