

SCIENCE PROMPTS  
NEW DIALOGUE  
*ON GLOBAL ENVIRONMENTAL ISSUES*

BY MARIO C. AGUILERA



Charles Kennel (top left, facing camera), director of Scripps Institution of Oceanography, meets with academic and administrative colleagues in Washington, D.C.

**F**IFTY YEARS AGO the relationship between science and government was shrouded in cold war secrecy. The Americans and the Soviets kept their scientific achievements under lock and key.

Today, scientific projects regularly cross political and scientific borders. Science is more open, and research is both interdisciplinary and international in scope. Spurred by issues such as global warming, ozone depletion, pollution, and changes in sea level, the global environment has become a major topic of both scientific and political interest.

The public also is being exposed to these issues. There have been four meetings of the Conference of the Parties of the United Nations Framework Convention on Climate Change. The last two meetings—in Kyoto in 1997 and Buenos Aires in 1998—attracted significant publicity.

In January 1999, the American Geophysical Union, a nonprofit scientific organization, released to the public its

first position statement regarding climate change. It highlighted a “compelling basis for legitimate public concern over future global- and regional-scale changes resulting from increased concentrations of greenhouse gases.”

Explorations magazine brought the topics of science, government, and international cooperation to Scripps Director Charles F. Kennel and Richard C. J. Somerville, a professor in Scripps’s Climate Research Division.

**EXPLORATIONS:** There seems to be an increasing interrelationship between scientific research and government policy decisions at all levels and more public interest in these activities. Why is this?

**Charles Kennel:** During the cold war there was a critical role for science in the development of nuclear weapons and national

Richard Somerville, a professor in the Climate Research Division, being interviewed in his Scripps office.



defense. However, defense issues were closely controlled within the national government and scientific communities. Much information was classified, so the public aspect of the debate was muted.

Now we’re concerned with scientific issues of global dimensions, especially concerning the environment. And the dialogue has changed. The global environment affects everyone worldwide, and everyone has a concern. The way to deal with this is not through secrecy, but through complete and open

discussion. As a result, public discourse is quite complicated and includes many different voices.

**Richard Somerville:** I don’t think there’s any one reason why climate change has come to the fore. It’s simply that the problem won’t go away. I mean that in a technical sense. The scientific community has been seriously interested in this problem and attacking it with a range of models and theoretical tools for 20 years.

Rather than any single blockbuster event, there has been a gradual realization on the part of the scientific community that the climate change issue is serious.

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CHARLES KENNEL

**EXPLORATIONS:** How is scientific evidence transformed into public policy? How does it get from Scripps into the public domain?

**Kennel:** It’s a very complicated process. One of the main products of our research is understanding based upon hard evidence and peer-reviewed research. Sometimes scientific understanding is extremely arcane and quite



technical, and it is difficult for the public to discern what is good science and what is not.

We have a responsibility not only to achieve the understanding, but to make sure it is communicated actively to those who need it. Recently we sent a team of Scripps scientists to Buenos Aires for the UN Framework Convention on Climate Change to work in a personal way—with the confidence of personal contact—with policy makers.

Probably the most sophisticated example of providing objective scientific advice about a controversial issue has been the Intergovernmental Panel on Climate Change. This is a group of scientists from around the world—from rich countries, poor countries, island countries, oil-producing countries, and so on—that gets together and debates the scientific issues associated with climate change. They publish reports that represent

a collective, international view. Their purpose is to give policy makers an objective view of what the broad scientific community has concluded about key issues. It was this intergovernmental panel

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Kennel in Washington, D.C.

that concluded, just before the Kyoto conference, that they could see a discernible human influence on climate.

Scripps also works at the national level with various government agencies to create programs that reflect new possibilities for interdisciplinary research. For example, the Consortium on Oceanographic Research and Education (CORE) involves almost all of the ocean research groups in the country. CORE is starting to work toward comprehensive collection and distribution of data about the oceans.

As an institution, Scripps, of course, contributes to these studies. We also try to convey to the public an objective view of the state of scientific knowledge on important issues.

**EXPLORATIONS:** What are the challenges of communicating scientific evidence to the public?

Congressman Jerry Lewis, chair of the House Appropriations Subcommittee on Defense, meets with Kennel.





**From left,** Kennel; James D. Watkins, president, Consortium for Oceanographic Research and Education; Otis B. Brown, dean, Rosenstiel School of Marine and Atmospheric Science, University of Miami; Peter Eisenberger, vice provost, Columbia Earth Institute, and director, Lamont-Doherty Earth Observatory, Columbia University; D. James Baker, U.S. Department of Commerce undersecretary for oceans and atmosphere and NOAA administrator; W. Stanley Wilson, deputy chief scientist, NOAA; David L. Evans, NOAA assistant administrator for oceanic and atmospheric research; Robert B. Gagosian, director, Woods Hole Oceanographic Institution; and Arthur R. M. Nowell, dean, College of Ocean and Fishery Sciences, University of Washington.

**Somerville:** There are many scientists, I think, who believe that they serve society best if they don't attempt to influence policy or engage in any activities that might generally be classified as education and outreach.

These scientists think that when they have completed a research project and published the results in peer-reviewed, technical literature, then their job ends. They feel anything more would compromise their objectivity. Scientists often feel uncomfortable venturing out-

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side the range of their expertise, and they're leery of those who do. For example, Carl Sagan and Jacques Cousteau often were not rewarded by the science community for their outreach efforts.

I think one has to respect scientists who feel that way. It's a personal conviction. But it is certainly clear in the area of climate change that a lot of scientists are edging toward—and a few are enthusiastically embracing—the idea that they have a responsibility to the public, and they are uniquely placed to do more than research.

More frequently than before, when a scientist discovers something that has policy import or that he or she feels should be more broadly known, that scientist is willing to write a popular article or a newspaper piece, offer congressional testimony, or do other kinds of outreach to bridge the big gulf between the science community and the policy world.

The tough part, I think, is to speak in a clear way while retaining the scientific objectivity, standards of clarity, and precision of science, and, at the same time, be

intelligible to nonspecialists. That's a huge challenge—for journalists, scientists, and teachers.

**EXPLORATIONS:** Can scientists express opinions in a way that serves society?

**Somerville:** Yes, but I think that one must qualify one's statements carefully. If I say that my climate model predicts this or that response to carbon dioxide, then that is a research statement. But, if I then say that, based on the results of my research, I advocate that the nation should work toward more energy conservation and efficiency, or I advocate a certain proviso or treaty, then I need to say that I've now stepped back from the objective research and am making a policy recommendation involving my personal values and priorities—and maybe my politics and religion. A scientist must make that differentiation clear. It is quite reasonable that two scientists or two policy makers equipped with the same results from the laboratory could come to very different conclusions.

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From left, Watkins, Kennel, Baker, Gagosian, Brown, and Nowell participate in an informal discussion between meetings at the U.S. Senate office building.

**EXPLORATIONS:** How are the issues in ocean research changing, and what is the role of Scripps Institution?

**Kennel:** Scripps is the largest oceanographic institution in the United States. On our campus we have scientists who are thoroughly cognizant of the research in almost all areas of earth science. This gives us at Scripps a good perspective on the national research agenda.

In the last ten years the ability of scientists in various earth science disciplines to work together has greatly increased. This is because scientists can now share and exchange information so efficiently that they now cross interdisciplinary frontiers smoothly.

Recently, we at Scripps discussed whether it would be possible to create a program to develop a comprehensive numerical model of

the entire Pacific Ocean. This is a project that we could only have talked about ten years ago, but now scientists are actually considering doing it. And we have many of the techniques already in hand.

The main issue now is not the technology of doing it, or understanding how to do it, we know how to do it. The issue now is social organization.

**Somerville:** Although we still have an idealized image of science being Albert Einstein sitting by himself with his pen and paper, much of our current efforts are “big science.” This is science that costs a lot of money, involves a lot of people, and may be driven by huge government programs and agencies. It’s really hard to imagine doing science today without computers and satellites. This takes many millions of dollars, and you can’t do that without talking to the government. There are political considera-



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tions involved in big cooperative programs, committees and the rest of it. You can't run a place like Scripps, with an annual budget of \$100 million, without involving the government.

**EXPLORATIONS:** Do you see science and government moving in this direction—more cooperation on global, international, and interdisciplinary levels?

**Kennel:** As the world enters an era of increased globalization, the scale of enterprise goes up, and the requirement for institutions to work together goes up. Modeling the entire Pacific Ocean is a project far beyond even Scripps, or any other single institution; it's an international project. Our job as the largest and most comprehensive U.S. oceanographic institution is to play a leading role in getting it done.

In the future we will have instrumented more of the earth, be able to make more

elaborate predictions of "next year's climate," and be able to convey to the public the implications of long-term climate change. We will know much more clearly how to characterize the health of all marine ecosystems. We will understand through measurements and modeling how human beings living on the coasts and their neighboring marine environments are affecting one another. We'll understand all of these things better, because we have to. Certainly the global problems are going to be there. Dealing with these issues is not really an option, if you start thinking about the long-term future of our civilization. So we'll have to do it, whether it's 10, 25, or 50 years from now. 🌐



U.S. Capitol, Washington, D.C.

# SCIENTISTS EXPLORE AN ALIEN WORLD



BY RICHARD C. J. SOMERVILLE

An impenetrable forest of acronyms was the first obstacle to understanding the proceedings at the November 1998 climate change negotiations in Buenos Aires. A banner outside the conference

hall announced UNFCCC COP-4, or just "COP-4" to insiders. This stands for the Fourth Conference of the Parties of the United Nations Framework Convention on Climate Change. The framework convention is a document that calls for "the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system."

Between the media frenzy at the Earth Summit in Rio de Janeiro in 1992, and the staid opening of COP-4, some 175 nations agreed to the terms of this convention. At COP-3 in Kyoto in 1997 negotiators agreed to reduce the rate at which greenhouse gases are emitted into the atmosphere by the industrialized countries to achieve, by about 2010, roughly a five percent reduction below 1990 levels. Goals for COP-4 were to agree on timetables, mechanisms, and other details.

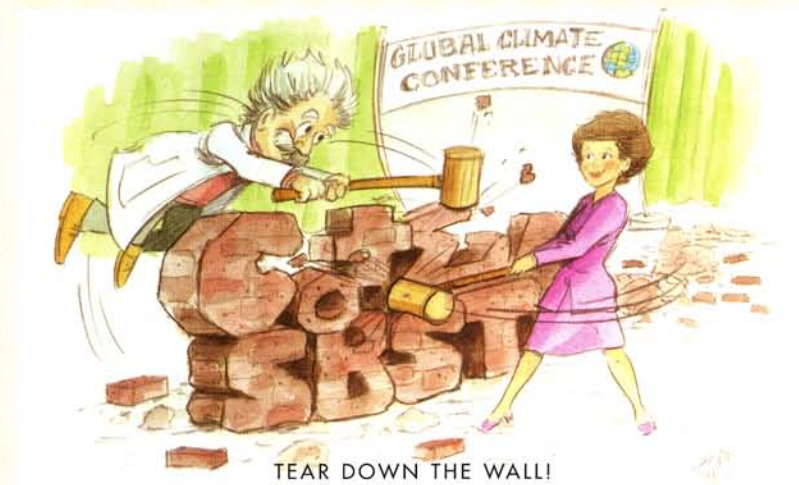
Our tiny band of scientists came to Buenos Aires to join thousands of diplomats, lobbyists, journalists, and business people. Our group was an NGO, or "nongovernmental organization." Environmental organizations like Greenpeace are NGOs, and so are coal-industry lobbying groups. We were probably unique in that we had no political agenda to advance. We were there to supply current, accurate scientific information to anyone who wanted to listen. Our purpose was purely to be an objective, policy-neutral resource.

While trying to communicate our knowledge and understand the concerns of the negotiators, the cultural gulf between us became vivid. As scientists, most of us arrived in Buenos Aires with a fragmentary concept of what negotiators do. In truth, a lot of it is hidden behind closed doors. When countries' delegates huddle to find a unified position on a contentious issue, nobody with an NGO badge is in the room.

By contrast, the public sessions at COP-4 had all the trappings of a UN General Assembly meeting, including simultaneous translation, mysterious acronyms, and the numbing formalities of parliamentary procedure.

Delegates rose to say things like, "Israel agrees with Indonesia that sentence two of subparagraph four of the section under consideration is inconsistent with Article 4.2 (a) and (b)." The SBSTA met jointly with the SBI. Meetings of AOSIS and JUSSCANNZ were closed to outsiders. We could, however, attend the forum on ALGAS.

If we scientists found it difficult to comprehend the work of the negotiators, they must have found us equally alien. With few exceptions, they came from nonscientific backgrounds. Our jargon and mathematical mode of thought were serious barriers to communication. Although these negotiators had produced the Kyoto agreement (based firmly on climate science data), sci-



ence was almost invisible at COP-4. Instead, the focus was on costs, business risks, domestic political considerations, and ideological convictions.

The impression I had was that the world of politics and diplomacy, as evidenced by this conference, is another planet from the world of scientific research. This is an unfortunate state of affairs, and ultimately a dangerous one. COP-4 is a milestone on what is likely to be a very long road. The Kyoto agreement will not, by itself, spare the world from "dangerous anthropogenic interference with the climate system." It is only a first step.

For sound science to serve society, researchers will need to become more cognizant of the broader implications of their work and more skilled in communicating their results to policy makers and the general public. At the same time, those charged with reaching international agreements and executing them must become more familiar with the relevant science. As a scientist among the negotiators at Buenos Aires, I came to regard our equations and their acronyms as symbols of a wall that must be torn down. 