

# SCIENCE

# EDITORIAL

**Publisher:** Richard S. Nicholson  
**Editor:** Daniel E. Koshland, Jr.  
**Deputy Editor:** Ellis Rubinstein  
**Managing Editor:** Monica M. Bradford  
**Deputy Editors:** Philip H. Abelson (*Engineering and Applied Sciences*); John I. Brauman (*Physical Sciences*); Thomas R. Cech (*Biological Sciences*)

## Editorial Staff

**Assistant Managing Editor:** Dawn Bennett  
**Senior Editors:** Eleanore Butz, R. Brooks Hanson, Barbara Jasny, Katrina L. Kelner, David Lindley, Linda J. Miller, Phillip D. Szuromi, David F. Voss  
**Associate Editors:** Gilbert J. Chin, Pamela J. Hines, Paula A. Kiberstis, Suki Parks, L. Bryan Ray  
**Letters:** Christine Gilbert, *Editor*; Steven S. Lapham  
**Book Reviews:** Katherine Livingston, *Editor*  
**Contributing Editor:** Lawrence I. Grossman  
**Editing:** Lois Schmitt, *Senior Copy Editor*; Douglas B. Casey, Valerie Jablow, Harry Jach, Erik G. Morris  
**Copy Desk:** Ellen E. Murphy, *Supervisor*; Joi S. Granger, Beverly Shields, Kirsten L. Wall  
**Editorial Support:** Sherryf Farmer, *Supervisor*; Carolyn Kyle, Michele Listisard, Diane Long, Patricia M. Moore, Melissa Quackenbos, Kameaka Williams  
**Administrative Support:** Leslie Blizard, Sylvia Kihara, Jeanette Prastein  
**Telephone:** 202-326-6501; **FAX:** 202-289-7562

## News Staff

**News Editor:** Colin Norman  
**Features Editor:** John M. Benditt  
**Deputy News Editors:** Tim Appenzeller, Jean Marx  
**News & Comment/Research News Writers:** Ivan Amato, Christopher Anderson, Jon Cohen, Faye Flam, Troy Gately, *copy*, Constance Holden, Richard A. Kerr, Eliot Marshall, Richard Stone, Traci Watson, *intern*  
**U.S. Bureaus:** Marcia Barinaga (Berkeley), Elizabeth Culotta (Durham, NC), Anne Simon Moffat (Chicago), John Travis (Boston)  
**Contributing Correspondents:** Joseph Alper, Barry A. Cipra, Robert Crease, Ann Gibbons, Virginia Morell, Robert Pool, Leslie Roberts, Gary Taubes, M. Mitchell Waldrop  
**Administrative Support:** Fannie Groom, Jennifer Hodgkin  
**Telephone:** 202-326-6500; **FAX:** 202-371-9227

## Art & Production Staff

**Production:** James Landry, *Director*; Wendy K. Shank, *Manager*; Scherraine Mack, *Associate*; Linda C. Owens, *Macintosh Operator*  
**Art:** Amy Decker Henry, *Director*; C. Faber Smith, *Associate Director*; Diana DeFrancesco, *Technical Illustrator*; Holly Bishop, *Graphics Assistant*

## Europe Office

**Senior Editor:** Richard B. Gallagher  
**Associate Editor:** Jeffrey Williams  
**News Editor:** Daniel Clerly  
**Correspondent:** Peter Aldhous  
**Editorial Associate:** Catherine S. Siskos  
**Business Manager:** Julie Eastland  
**Address:** Thomas House, George IV Street, Cambridge, UK CB2 1HH  
**Telephone:** (44) 0223 302067; **FAX:** (44) 0223 302068

## Science Editorial Board

Charles J. Arntzen	John J. Hopfield
Elizabeth E. Bailey	F. Clark Howell
David Baltimore	Paul A. Marks
William F. Brinkman	Yasutomi Nishizuka
E. Margaret Burbidge	Helen M. Ranney
Pierre-Gilles de Gennes	Robert M. Solow
Joseph L. Goldstein	Edward C. Stone
Mary L. Good	James D. Watson
Harry B. Gray	

## Science and Society

The ways in which science and society are governed are quite different and the difference causes friction when scientific progress is of societal concern. Science is dealing with the unexpected, the frontier, the search for a new path, not with the predictable, the established edifice, the walk down the well-paved road. In the aggregate, science is designed to make great progress on a wide front, but to predict which individual area will deliver a new discovery tomorrow is impossible. In general, this is well understood by both parties, science and society; but when science is asked to solve a problem, its instinct is to start from fundamentals and proceed on its slow but inexorable timetable. When society—through its agent government—says “I need the answer now,” the two systems have serious misunderstandings. Science, trying to be accommodating, frequently says, “I’ll give you a progress report, but understand that we need more data to get a definitive answer.” The “but” clause soon gets forgotten, so science gives an educated guess as to whether saccharin is carcinogenic, or dioxin is deadly poisonous, or the climate is warming, and later revises the first estimate, bewildering the public and making it distrustful of science. A report on cholesterol in the diet needs volunteers and those at high risk are the most likely to volunteer, but scientists know that preliminary reports for a high-risk group are helpful but should not be overgeneralized until a more normal group (and the more difficult to study) becomes the focus of study. The subject is too interesting to prevent premature publication and premature conclusions, but the new facts require revisions which lead the public to say “the scientists should make up their minds.” At the frontier, scientists are individualists, not consensus groups, and science adds more facts and voices until a full understanding is approached asymptotically. The final value can be the truth at some level of detail but in some cases may simply reflect the exhaustion or exasperation of some of the participants.

In the course of a debate, not only do different scientists enter with different ideas, but new data are continuously uncovered. So science is not failing the public by changing its mind. Nor is it being irresponsible in volunteering a progress report. To refuse to give an educated guess to those who are paying the bill would be irresponsible unless the progress report is presented as though it were a final opinion. In a number of recent debates a premature release of a tentative conclusion became a congressional excuse for a final judgment, for example, in the case of the carcinogenicity of saccharine despite the inconclusiveness of the data.

The great discoveries of science are the result of a range of discoveries in which an initial notion was suggested, but the final understanding required lots of work. The societal problems of climate change, public health, economic efficiency, and so forth are even more complicated than the related pure science problems, and it should be expected that they would be equally prone to revision and updating.

A good example of this revisionism is reflected in a special series that ran in *The New York Times* the week of 21 March 1993, which reports that environmentalism is now showing a new trend toward cost-benefit analysis. The story gives an excellent account of excessive costs of some highly publicized risks and the past tendency of the Environmental Protection Agency to follow publicity rather than science in its approach to the environment. The change in sentiment is occurring because the evidence is accumulating that a “to hell with the cost” approach is impossibly expensive and the data on risks are now more definitive and less scary. Solid evidence can change minds, but getting the data requires time. Some scientists had explained that the early data were dubious, but they were ignored.

Scientists must assist in producing and explaining preliminary findings on scientific problems even if their instincts are to say “go away until I’ve solved the problem.” And politicians must understand that progress reports should not be used as laws that are not allowed to be modified. The alternatives are that government makes hasty decisions based on third-rate scientific advice and scientists refuse to give any opinions. Distrust between the partners arises when each forgets that the other is operating in an uncomfortable mode—scientists being forced to give premature conclusions, government being forced to delay decisions until evidence is acquired. This “odd couple” of science and government has produced an unparalleled standard of living for its people. It will produce even more if each partner seeks common ground and gives credit to its partner for willingness to compromise its normal operating procedures and to contribute toward a common goal.

Daniel E. Koshland, Jr.

# Science

## Science and Society

Daniel E. Koshland Jr.

*Science* **260** (5105), 143.

DOI: 10.1126/science.260.5105.143

### ARTICLE TOOLS

<http://science.sciencemag.org/content/260/5105/143.citation>

### PERMISSIONS

<http://www.sciencemag.org/help/reprints-and-permissions>

Use of this article is subject to the [Terms of Service](#)

---

*Science* (print ISSN 0036-8075; online ISSN 1095-9203) is published by the American Association for the Advancement of Science, 1200 New York Avenue NW, Washington, DC 20005. 2017 © The Authors, some rights reserved; exclusive licensee American Association for the Advancement of Science. No claim to original U.S. Government Works. The title *Science* is a registered trademark of AAAS.