

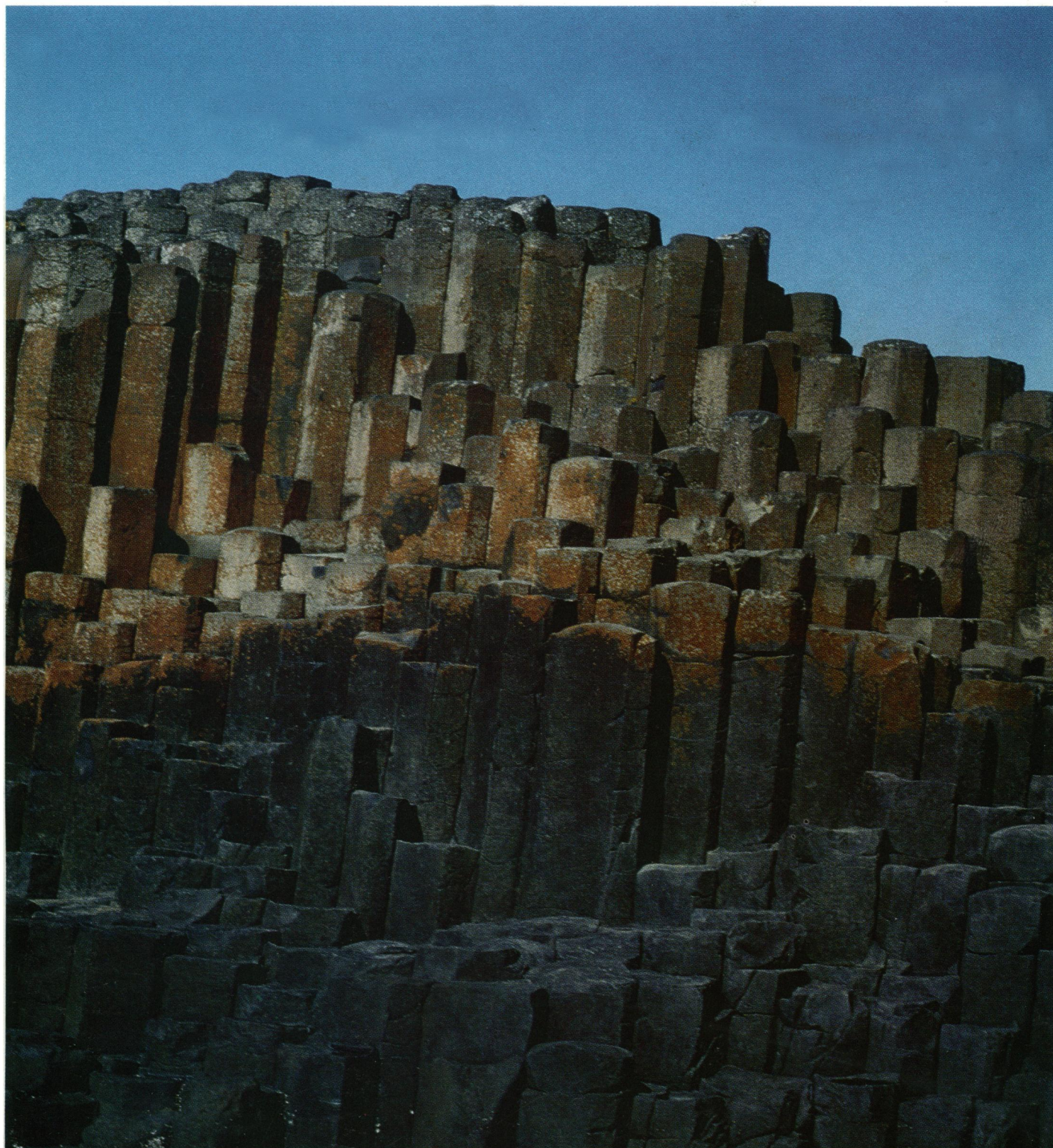
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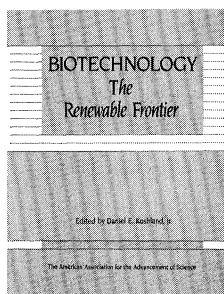
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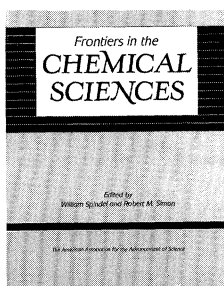
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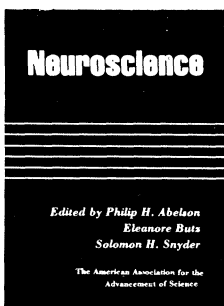
Biotechnology: The Renewable Frontier, D.E. Koshland, Jr., ed. Like its predecessor, this volume covers the latest and most important topics in biological R&D. It illustrates the extraordinary cross-disciplinary aspects of modern biology and its tremendous impact on the future with sections ranging from new techniques, immunology, developmental biology, cancer, hormones, sensory phenomena, and more.

1986; case \$29.95, \$23.95 for AAAS members; paper \$17.95, \$14.35 for AAAS members; 384pp



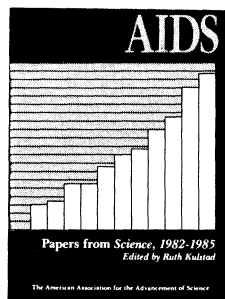
Frontiers in the Chemical Sciences, W. Spindel, R.M. Simon, eds. Focuses on the themes of fundamental chemical change and extreme molecular complexity. Details progress in all areas of chemistry, including new work in ultrafast reactions, catalysis, conduction organics, enzyme mechanisms, and materials and analysis.

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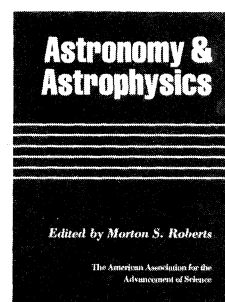
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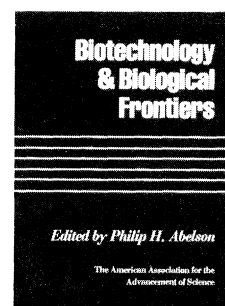
AIDS, R. Kulstad, ed. Research papers and reports on acquired immune deficiency syndrome (AIDS) published between August 1982 and September 1985 show how far AIDS research has come and provide an indication of the direction in which it might go. An overview of research in AIDS is provided by Myron Essex, chairman of the Department of Cancer Biology, Harvard University School of Public Health.

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COVER Prismatic rock columns of the Giant's Causeway, Northern Ireland, defined by a network of fractures formed during solidification and cooling of a basaltic lava flow. Nearly hexagonal columns in the flow interior have evolved from irregular tetragonal ones at the flow boundaries (not visible) by systematic changes in the orientation and spacing of column-bounding fractures as they grow inward. See page 471. [Atilla Aydin, Purdue University, West Lafayette, IN 47907]

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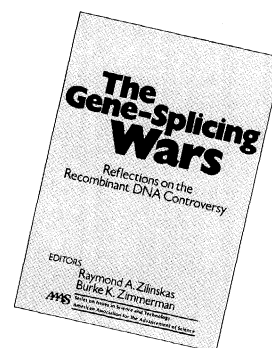
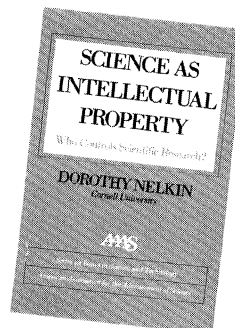
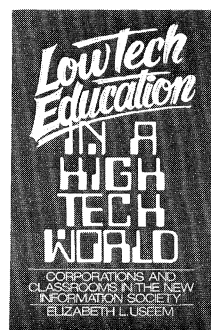
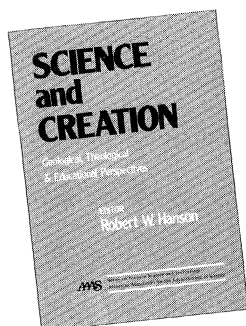
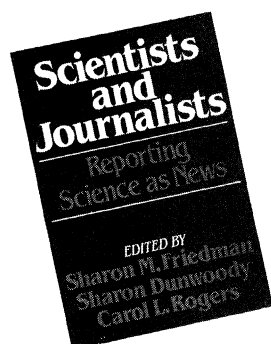
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*Edited by Sharon M. Friedman,
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The public is interested in science and depends largely on the mass media for the latest information. But how well do scientists and journalists connect to communicate to the public? This book examines the human aspect of the links between scientists and journalists through the eyes of both.

1985, 352 pp., hardcover; \$24.95, AAAS members \$19.95

Science and Creation: Geological, Theological, and Educational Perspectives

Edited by Robert W. Hanson

The creation/evolution controversy is examined by scientists, theologians, educators, and historians. These authors view the controversy as a false dichotomy and as an attempt to force a choice between two ideas that are not mutually exclusive. Includes case studies from several states.

1986, 240 pp., hardcover; \$24.95, AAAS members \$19.95

Low Tech Education in a High Tech World: Corporations and Classrooms in the New Information Society

Elizabeth L. Useem

Are students in the U.S. developing the skills necessary for a high technology society, or will it be technological boom, educational gloom? Useem examines education in California's "Silicon Valley" and Boston's Route 128, two of the country's leading high tech centers, and suggests ways for education and industry to forge a stronger partnership for the future.

1985, 256 pp., hardcover; \$19.95, AAAS members \$15.95

Science as Intellectual Property: Who Controls Scientific Research?

Dorothy Nelkin

Who controls research? A growing number of legal and administrative disputes raise critical issues of professional sovereignty, scientific secrecy, and proprietary rights. Nelkin offers cases illustrating the dilemmas that arise as the interests of scientists, the rights of citizens, and the security needs of government and industry come into increasing conflict.

1984, 130 pp., softcover; \$10.00, AAAS members \$8.00

The Gene-Splicing Wars: Reflections on the Recombinant DNA Controversy

*Edited by Raymond A. Zilinskas and
Burke K. Zimmerman*

Questions of safety and ethics about recombinant DNA techniques continue to surface. This book takes a look at historical, political, industrial, scientific, and international aspects of these issues. The authors show how lessons learned from the experience can be used to cope with similar issues in the future.

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This Week in SCIENCE

Welfare dependence

Is welfare an asset or a liability for recipients (page 467)? In analyzing this complex question, Duncan *et al.* focus on the Aid to Families with Dependent Children (AFDC) program that provides assistance mostly to single-parent families. AFDC assistance would promote good health and improve children's opportunities for education; opponents argue that it fosters dependence and encourages a "welfare culture" through succeeding generations. The analysis yielded some encouraging findings: for example, women who grew up in heavily welfare-dependent families did not necessarily depend heavily on welfare themselves when they had families of their own. On the minus side, about 30% of AFDC recipients were on welfare for more than 8 years (although another 30% received assistance for less than 2 years). For some individuals AFDC has succeeded well; for others it has failed miserably. It is unlikely that a single determination of welfare's worth can be made, but it may be possible to match the heterogeneous recipients with the right form of assistance with the goal of reducing dependency.

Dengue

DENGUE viruses can cause a severe disease in humans that may be fatal [dengue hemorrhagic fever/dengue shock syndrome (DHF/DSS)] and a benign disease (dengue fever) (page 476). The infectious viruses are transmitted by *Aedes aegypti* mosquitoes that live in the tropics and subtropics along with more than half of the world's population. DHF/DSS occurs mainly in Southeast Asia, whereas benign disease is common in American and African tropics; up to 100 million cases of dengue occur each year. DHF/DSS hits young children, particularly girls, the hardest; it develops in individuals during a second dengue infection or in babies whose mothers are immune to dengue viruses. Halstead explains how antibodies to certain

viral surface antigens heighten infectivity through the formation of complexes with the virus, thereby facilitating virus entry into cells for replication. Other "neutralizing" antibodies appear to dampen infection, and it is these antibodies toward which vaccine development will be directed. Enhancing instead of inhibiting infection will make dengue vaccine development tricky.

Algorithm for color vision

STRAWBERRIES by a window will appear red throughout the day and night whether illuminated by bright sunlight, a setting sun, or artificial indoor lighting (page 482). How the eyes are able to compute and see a constant color despite changes in illumination and in the light reflected from the strawberries has long been a puzzle. Hurlbert and Poggio describe a computational procedure for separating illumination and inherent reflectance, features that the eyes naturally are able to compute. An image called a Mondrian, a geometric design with varying degrees of "lightness" and modeled after the style of the artist, was used; inputs (intensity signals) were paired with outputs (surface reflectances) for many of the rectangles in the design, and a linear "operator" was derived that connected input and output pairs. The derived algorithm had approximately the same arithmetic structure as an operator derived previously in psychophysical experiments on humans. It may be possible to use a similar strategy to derive algorithms for solving other puzzles about the visual process.

Acid rain in the Cretaceous

AMONG the unusual "signals" in the stratigraphic record that mark the Cretaceous-Tertiary boundary (the time of dinosaur extinctions) is a spike in the ratio of seawater strontium-87 to strontium-86 (page 485). Except for this spike, the ratio has been increasing steadily during the past

100 million years. Macdougall hypothesizes that there was a massive influx of strontium into the sea from the land at the end of the Cretaceous; such an influx could fit with the impact theory of the extinction event because shock waves from a comet hitting the earth would have heated the atmosphere, nitrogen oxides would have formed and precipitated as strongly acid rain, and the rain could have leached strontium from continental rocks. (The comet itself would not have contained sufficient strontium to account for the elevated amounts directly.) Similar events may have occurred at other times (earlier than the Cretaceous) during the history of the earth and may likewise be detected as spikes in the geologic record.

Eurasian snow and global climate

CLIMATES around the world are affected by the depth of the snow in Eurasia; a computer simulation illustrates these relations (page 504). The sequence of causality seems to be the following: spring snow cover in Eurasia affects the strength of the Asian summer monsoon, local monsoon circulation influences circulation in the upper atmosphere, and this atmospheric effect is felt globally. Barnett *et al.* describe some of the links between melting and evaporating snow and warming and cooling of the Eurasian landmass (which includes the East Asian highlands, the world's most elevated heat source) and how these factors affect the land-sea temperature contrast and hence the monsoon circulation. Deep snow results in a poor monsoon (reduced winds including the easterly jet, reduced rainfall, and a reduced atmospheric temperature gradient); light snow is associated with a good monsoon. Monsoon failures are felt both locally and around the globe and may play a part in El Niño-Southern Oscillation events, which have been thought to be triggered by air-sea, not land-air-sea, interactions. Patterns of atmospheric anomalies generated in the simulations are like patterns observed in nature.

Nuclear Arms Control:

Can the U.S. and Soviet Union Trust Each Other?

This question is explored in a new videotape, ***Fear of Cheating, Fear of Spying***, produced by the American Association for the Advancement of Science. The 40-minute program illustrates the wide spectrum of views of leading arms control experts, scientists, and administration officials on the important issue of verification and alleged Soviet cheating.

Some of the issues and arguments presented are: verifiability of arms control agreements, acceptable risks, trust and negotiation, a history of U.S. and Soviet compliance, the current controversy over alleged Soviet violations, the adequacy of technologies for verification, and arms control challenges for the future. Participants include such well known experts as Sidney Drell, Herbert Scoville, Jr., Sidney Graybeal, Colin Gray, and Condoleezza Rice.

The tape is accompanied by a discussion guide containing introductory readings, suggested group discussion questions, and a bibliography. A transcript and glossary are also included.

Fear of Cheating, Fear of Spying is a valuable learning tool for college classes, high school audiences, and any groups interested in promoting citizen awareness and public discussion of nuclear arms control issues. To order this informative program for your institution, just complete and mail the form below.

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Homo photosyntheticus

In a recent television commercial for a computer company, a young student stated that she was morally opposed to dissecting a frog in her high school class and suggested that an equally good alternative to such animal experiments was a computer program. At first glance one might scoff at such an approach, but on consideration it raises a number of intriguing issues. Aristotle, many years ago, emphasized deductions about science at the cerebral level, devoid of the unpleasantness of actual experiments. This television advertisement is probably a logical evolution of such thought, and reveals a type of Utopia that is worth pondering.

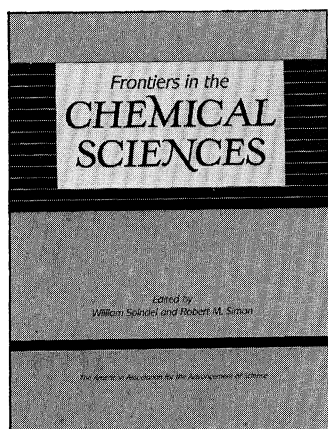
Frogs are of course one of the more obvious species for application of such a strategy. There are a number of clues about the insides of a frog, such as that it arises from a tadpole, that it causes warts, and that it may turn into a Prince Charming when kissed by a beautiful princess. From such data, a moderately well-trained student should easily be able to deduce what the interior of a frog looks like. On the other hand, there are many other species for which an equivalent amount of information is not available. Those species could be studied at more advanced levels, after students have been exposed to a lot of life by watching daytime television.

Even if the pedagogical problem is solved by computers, there is the annoying problem of getting the Food and Drug Administration approval of new drugs. There seem to be some silly congressional requirements mandating animal testing in order to show whether chemicals are carcinogenic or teratogenic. Replacement of costly and time-consuming animal experiments by computer programs is likely to be greeted with great enthusiasm by industry. If the FDA should take the stodgy position that research is required on animals, the FDA itself could be replaced by appropriate computers, and any computer expert who could not devise a better software program than the U.S. Congress would be fired on the spot.

The computer encroachment need not stop at these simple levels. There are a number of instruments of torture far more inhumane than dissecting an anesthetized frog—for example, the mousetrap and flyswatter. These devices have no redeeming social value, such as advancing teaching or research, but merely represent domination of one species over another. A good software program should eliminate the need for mousetraps and thus prevent the maiming of many mice. In regard to flies the problem is more difficult because flies have few neurons and may not be diverted by a simple algorithm. One could at least enact legislation requiring that flies be anesthetized before they are swatted.

Even if animal experiments have to be done for research, it is questionable whether students should be asked to repeat them. A good clean simulation is superior to a bloody real experiment. Consider, for example, the moral shock of the young student who finds that the stomach of a real frog contains mosquitos, flies, and small grasshoppers. Far from being the beloved and harmless frog that she imagined, she finds a predator actually eating other species with no regard whatsoever for their rights. Letting that frog live condemns many mosquitos, flies, and other insects to their deaths. This moral trauma is inappropriate for an immature student who may then conclude that the world is not nearly as simple as she had imagined. A computer simulation could replace the stomach contents with materials such as potato chips, soda, and other emotionally neutral nutrients. At some point the advanced high school student, however, is going to be concerned by the large number of fish, cows, and pigs that are sacrificed for mere food, and the large number of abandoned dogs and cats killed simply because they are too expensive to keep. People who talk to plants will insist that the biochemistry of animals and plants is so similar that eating plants undoubtedly induces pain at the molecular level.

The obvious answer is to develop genetically engineered human beings who photosynthesize their own food. There might be some minor life-style inconveniences, such as the need to sit under a lamp for several hours on foggy days, but there is little doubt of the moral superiority of this solution. Whether such a human can be engineered from computers alone is a problem, but fortunately there are lots of flotsam and jetsam of society—lawyers, homeless people, and stockbrokers, for instance—who are less likable or less protectable than frogs and can be used experimentally in this good cause. The only moral problem remaining is to prevent insiders from taking their money out of restaurants and investing in sweetened CO₂.—DANIEL E. KOSHLAND, JR.



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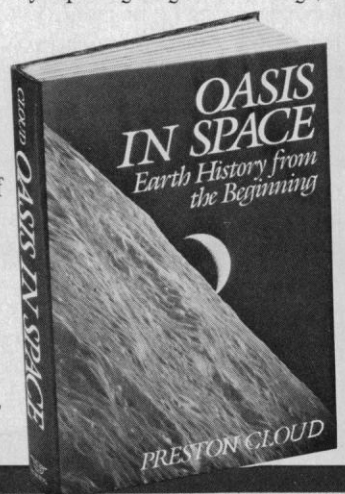
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