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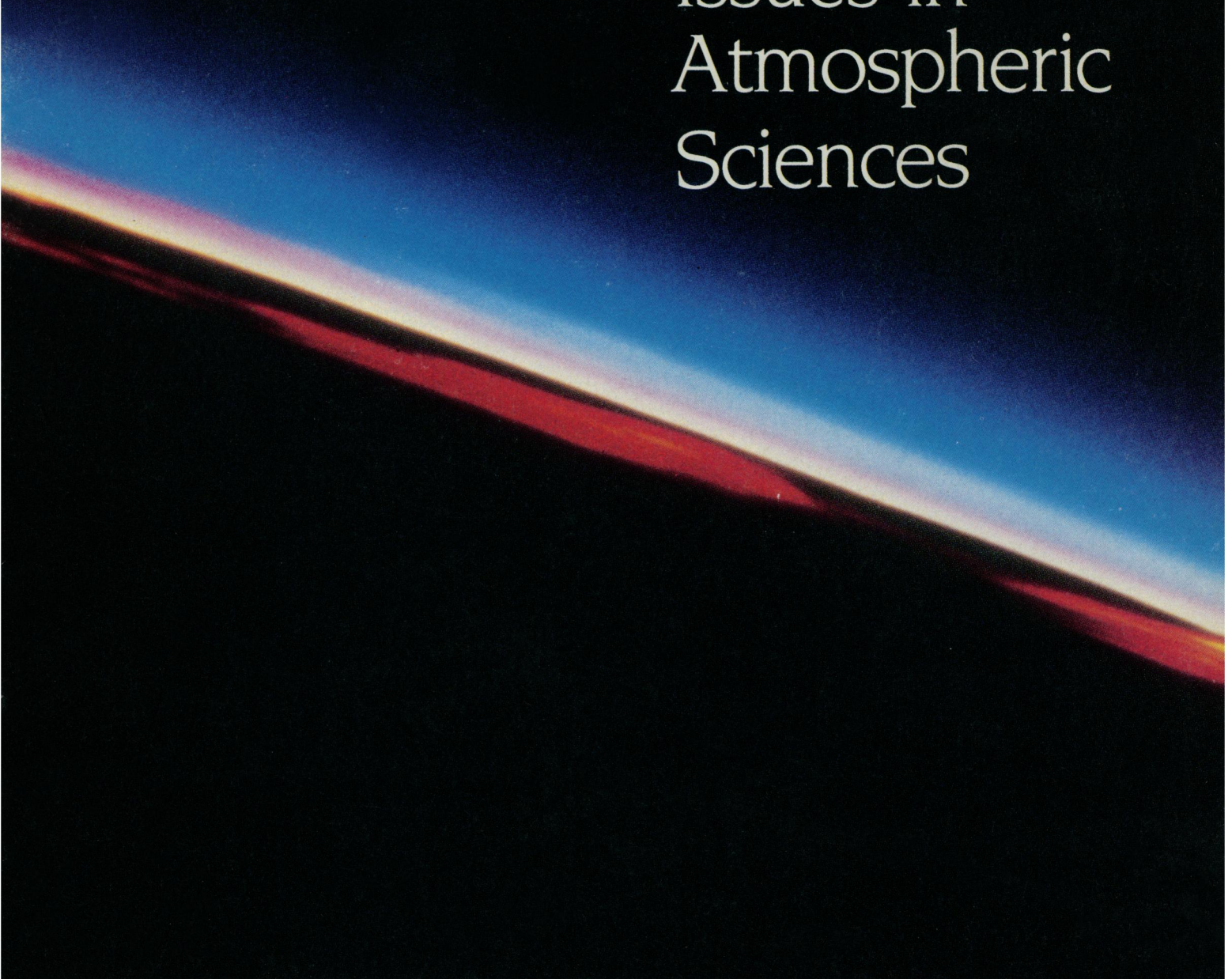
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**COVER** A cross section through Earth's atmosphere over the Pacific Ocean, from the Space Shuttle Challenger. Stratosphere is in blue, troposphere in white and pink. This low sun angle photograph was taken by Bob Crippen, STS-17 Mission Commander, on 10 October 1984 from an altitude of 123 nautical miles. See page 745. [NASA Earth photographs are available from EROS Data Center, Sioux Falls, SD 57198; provided by M. R. Helfert, Code SN15, NASA-Johnson Space Center, Houston, TX 77058]

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H. K. Naito, Applications Note DS-693. Beckman Instruments, Inc., Spinco Division, 1986.
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## This Week in SCIENCE

### Acid deposition

**P**UBLIC awareness of the impact of pollutants on atmospheric conditions and of the corollary—the impact of atmospheric pollutants on life on the earth—has skyrocketed in the last decade, but some of the problems have been around and even noted for quite some time. In the mid-19th century, for example, a publication reported the occurrence of regional acid rain in British towns close to coal-burning plants. The link between pollutant emissions and acid deposition is summed up in what Schwartz refers to as Newton's law of air pollution—what goes up must come down (page 753). How, where, and when acid deposition will occur are, however, all contingent on the form of the emitted substance, its chemical reactions in the atmosphere, and the physical processes that affect it. Since “every mole of sulfur or nitrogen oxides not emitted is a mole not deposited,” it is reasonable to develop interim emission-reduction policies even before a full understanding of source-receptor relations is at hand. Urban air pollution, the greenhouse effect, and the changing stratosphere are other atmospheric science topics addressed in this issue, and an overview of these features is presented in Brauman's editorial (pages 709, 745, 763, 771).

### Mantle elasticity

**C**HEMICAL and physical studies of inferred constituents of the earth's mantle and seismic and other remote geophysical measurements are the primary data contributing to an understanding of the nature of the earth's mantle. Upper mantle minerals are thought to undergo phase transitions at a depth of 670 kilometers, transforming to denser phases, mostly  $(\text{Mg,Fe})\text{SiO}_3$  in a perovskite structure and  $(\text{Mg,Fe})\text{O}$  magnesiowustite. A prominent seismic discontinuity occurs at this depth. The elastic properties of transparent single crystals of  $\text{MgSiO}_3$  perovskite under ambient conditions have now been determined (page 787);

by volume, about half of the earth is thought to be perovskite. Yeganeh-Haeri *et al.* compare these elasticity data, adjusted to mantle conditions, to mantle elasticity indicated by seismic data. The data match best if mantle conditions are close to those that would cause perovskite to twin; near such a transition, perovskite would be significantly softer.

### Stretch-inactivated channels

**I**ON channels that are activated when cells stretch have been found in all types of cells; ion channels that are spontaneously active when there is no tension and in which gates close when tension is applied (as the cells are sucked through a recording pipette) have now been detected in membranes of neurons (page 807). The stretch-inactivated channels are situated in close proximity to stretch-activated channels in cell bodies and in cellular growth cones, and both types of channels are permeant to potassium ions. Their coordinate mechanical actions suggest that a common underlying transducer, perhaps a previously identified submembrane filament network, is involved in their regulation. At intermediate tensions neither channel is especially active and potassium permeability is minimized; Morris and Sigurdson point out that these are the same conditions under which membrane excitation and calcium ion influxes are maximized. Feedback among calcium ions, membrane tension, and the stretch-sensitive channels may thus finely regulate cell morphology and motility at the local level; calcium ions have been known to be pivotal to both.

### Restoring brain power

**A**SSOCIATIVE learning is promoted in aging rabbits by a drug that increases cerebral blood flow and that blocks calcium channels in central nervous system neurons (page 809). When first used in aging humans to increase cerebral blood flow, the

drug nimodipine facilitated learning and sharpened memories. Deyo *et al.* found that, with this drug, aging rabbits learned a conditioned response—eye-blinking in response to the sound of a tone—more rapidly than did untreated animals. In fact, the performance of treated rabbits was comparable to that of young rabbits. Most of the untreated aging animals never learned the response, but the few that did required about twice as many training sessions as did drug-treated animals. Eye-blink conditioning is difficult not only for aging rabbits but also for aging humans; thus, the rabbit system is a good model in which to assess the efficacy of new drugs in promoting learning and memory in aging subjects.

### Growth factor expression in psoriasis

**C**LINICAL signs of the skin disease psoriasis include angiogenesis (new blood vessel growth) and abnormal proliferation of epidermal cells; both of these effects can be induced by transforming growth factor  $\alpha$  ( $\text{TGF-}\alpha$ ). Elder *et al.* show that in fact  $\text{TGF-}\alpha$  is overexpressed in the epidermis of psoriatic skin: both messenger RNA molecules for  $\text{TGF-}\alpha$  and the protein  $\text{TGF-}\alpha$  itself were detected in excess amounts in psoriatic lesions, whereas the normal-appearing skin of patients with psoriasis and skin samples from normal individuals showed normal expression of both messenger RNA and protein (page 811). The messenger RNA molecules for the transforming growth factor  $\text{TGF-}\beta 1$ , which in contrast to  $\text{TGF-}\alpha$  is an inhibitor of epidermal growth, is present in comparable amounts in all three types of skin, indicating that the proliferative flare-ups in psoriasis do not result from a local deficiency of this inhibitor. Because no evidence was obtained suggesting either that the  $\text{TGF-}\alpha$  gene had undergone a rearrangement or that the gene had been amplified in psoriatic lesions, it appears likely that the actual regulation of the  $\text{TGF-}\alpha$  gene may be faulty in involved cells in psoriasis.



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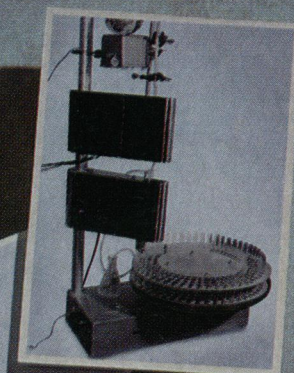
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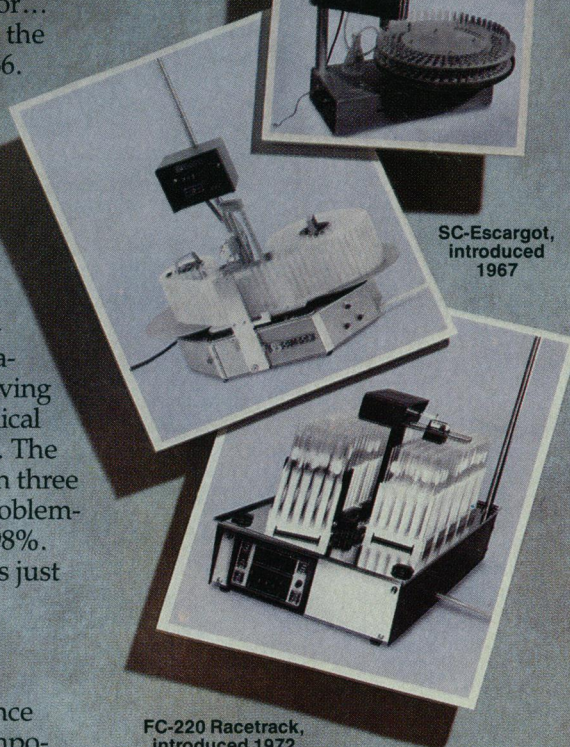
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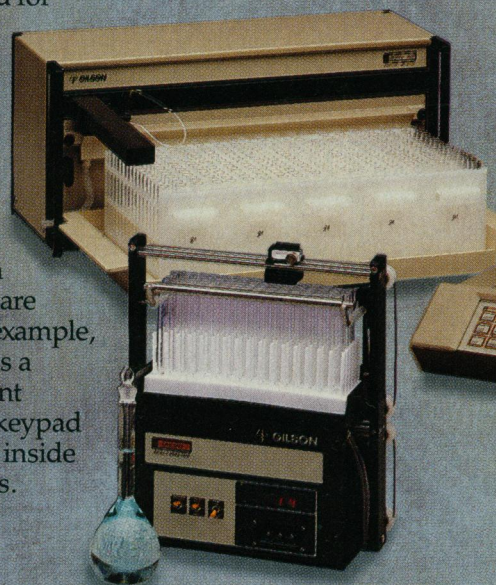
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## Issues in Atmospheric Science

“Everybody talks about the weather, but nobody does anything about it.” Atmospheric science includes understanding and predicting weather, of course, but it encompasses much more than that. Many chemical reactions in the atmosphere involve very small concentrations and occur at conditions of pressure and temperature that are difficult to obtain in laboratory measurements of rate constants. Coupled with complicated mass transport as well as photochemistry, this makes for an extraordinary set of problems, requiring both exotic laboratory procedures and great physical insight. *Science* regularly reports significant advances in all of the atmospheric sciences; the AAAS-Newcomb Cleveland prize for outstanding articles published in *Science* was awarded recently for two papers (one authored by Molina, Tso, Molina, and Wang; the other by Tolbert, Rossi, Malhotra, and Golden) in the atmospheric sciences that address the problem of important reactions occurring on particulate matter, especially ices, in the stratosphere.

In spite of the rather fatalistic remarks about doing nothing about the weather, in recent years we have actually been doing quite a lot. And much of what we have been doing about the atmosphere and our climate is apparently undesirable. In this issue on atmospheric sciences we present overviews of four areas in which major advances have occurred in our understanding of the chemistry of the atmosphere and the impact that various human activities are having on it. The articles view aspects of atmospheric problems on scales that range from local urban areas to the entire global atmosphere. In this all-encompassing view, we see, for example, that ozone can be both good and bad. It acts as a significant pollutant locally, while at high altitudes it provides a valuable photochemical screen whose destruction plays an important role in overall global climate warming. Each of the authors addresses not only the causes and consequences of various activities, but also possible ways of attacking some of the problems.

Seinfeld discusses urban air pollution, a critical problem for everyone who lives in a large city. Seinfeld characterizes the urban atmosphere as a giant chemical reactor in which a variety of undesirable materials are formed. A good deal of what is occurring is now well understood, but uncertainties remain. Schwartz deals with a regional problem: acid deposition. In this arena of regional-scale air pollution, the difficulties are magnified because of the high density of emission sources and mutual zones of influence. Although much is now understood about the basic nature of the problem, it is not yet possible to put forward a credible source-receptor scientific model. It is clear that reduced emissions will, however, result in reduced deposition. McElroy and Salawitch address the changing composition of the global stratosphere. Models show excellent agreement for many of the species. Ozone is a key compound here, and the effects of human activity, especially with regard to halocarbons, play an important role in the chemistry.

Finally, Schneider addresses global climate warming, the “greenhouse effect.” Is there one? What are its consequences? It is clear from other work, some recently published in *Science*, that short-term climatic problems, such as last year’s drought, are a result of other effects. Schneider, however, makes the case that we are likely to see a rise in global temperature, and even a modest increase is predicted to have a substantial impact. Consequences and ways of dealing with the problems are presented. Atmospheric science is an area in which scientific understanding is critical to our long-term quality of life. The progress that has been made recently has been remarkable. We need to respond now to what we know, while continuing to develop the knowledge base. Simply describing what is happening, however, should be only part of the story.

—JOHN I. BRAUMAN

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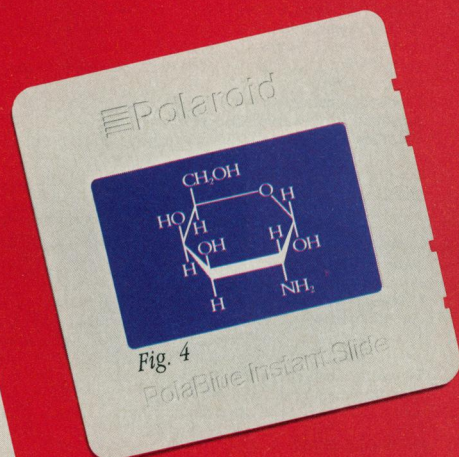
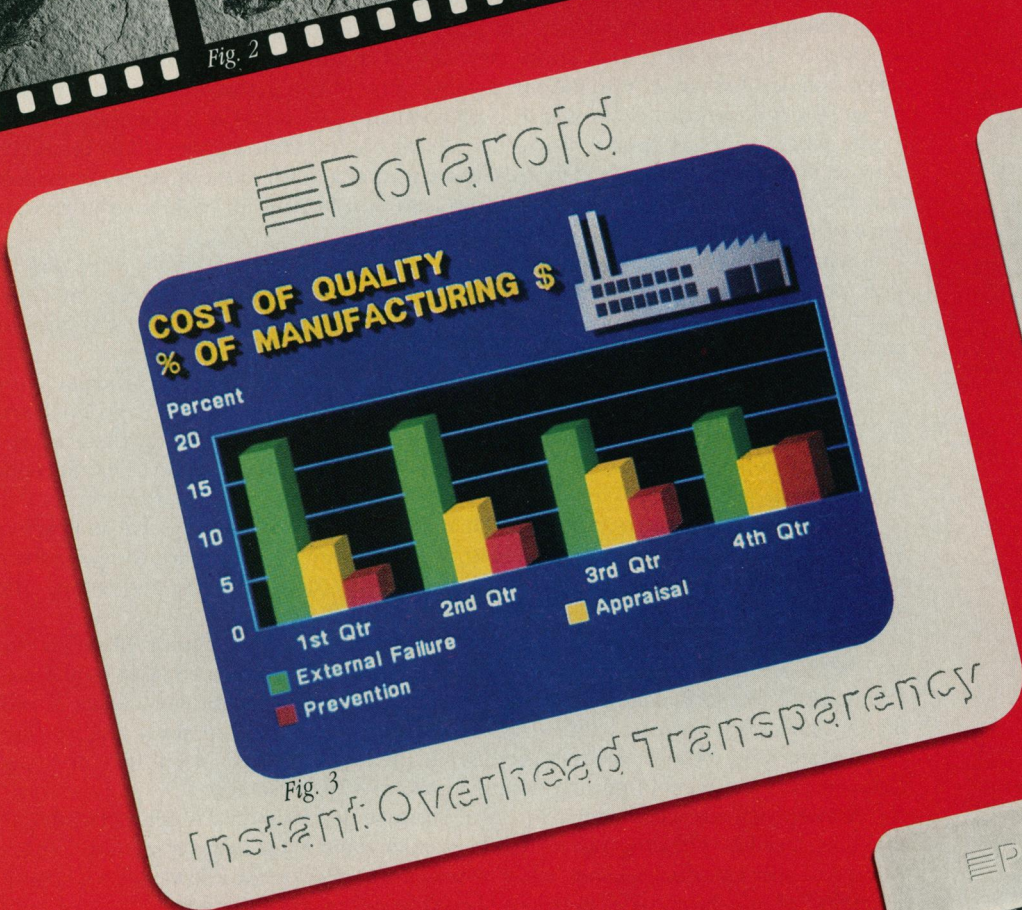
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EDITORIAL 709







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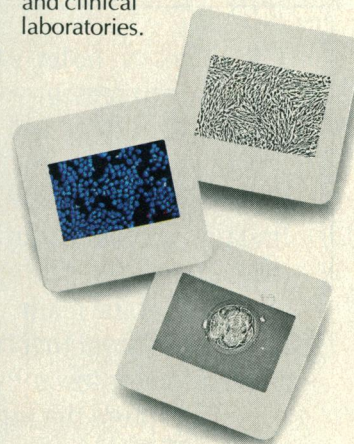
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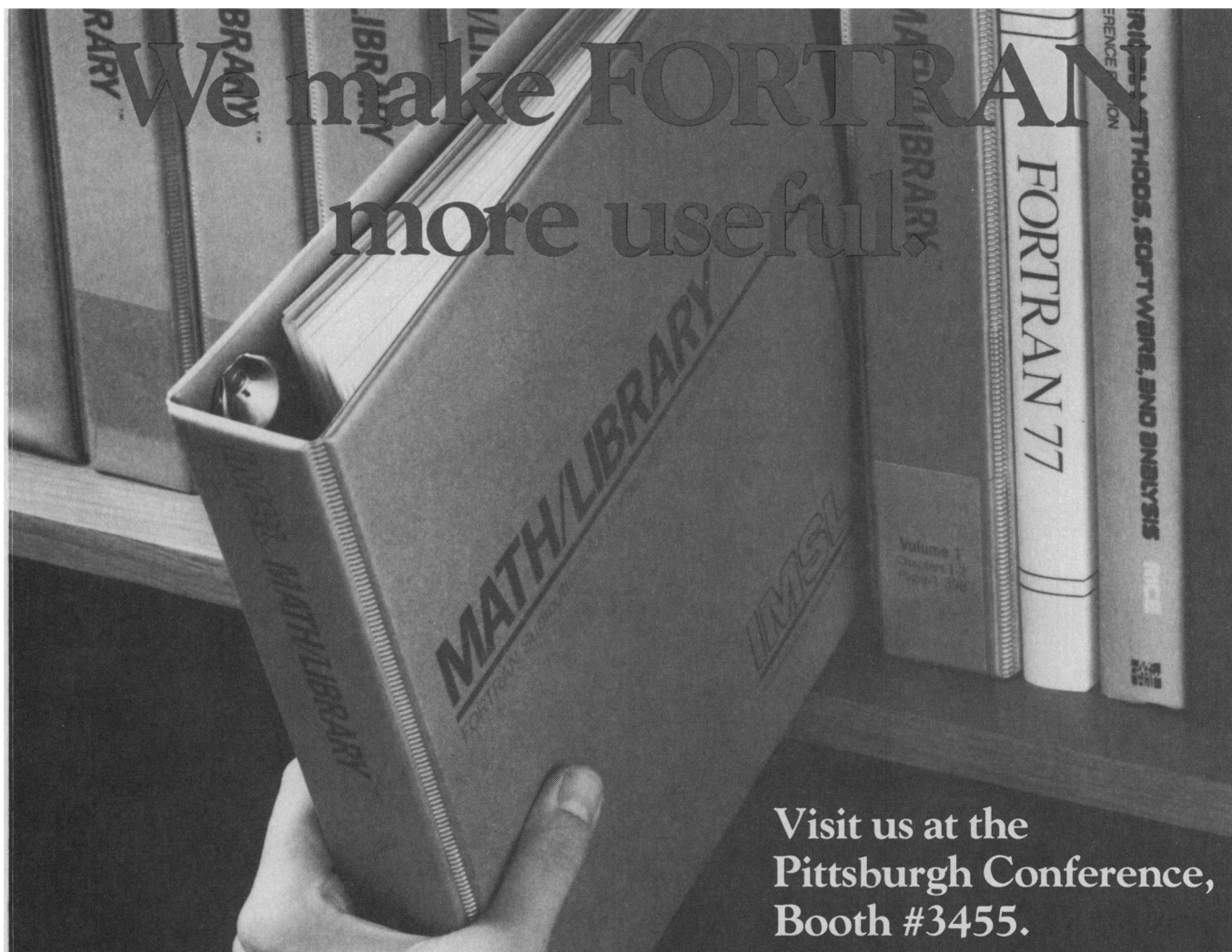
Abstracts may be submitted for inclusion in the above symposia or in the contributed sessions. For information concerning the scientific program, contact the Program Chair: Prof. Ross Johnson, Univ. of Minnesota, Dept. of Genetics and Cell Biology, St. Paul, MN 55108  
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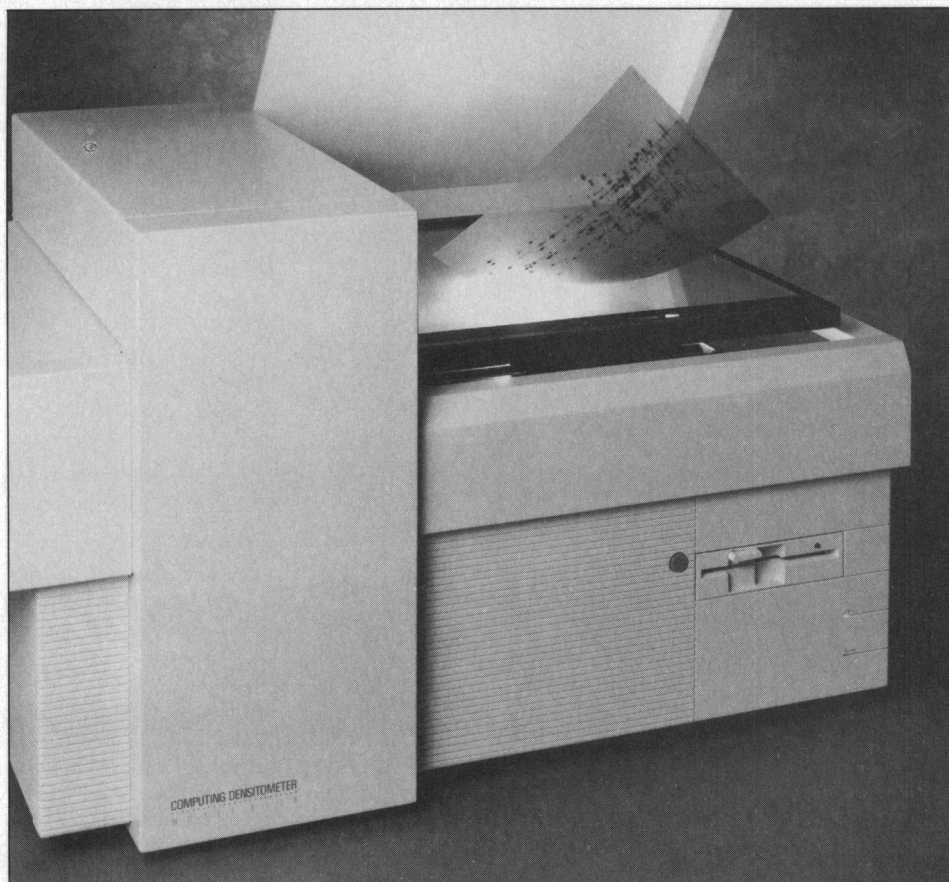
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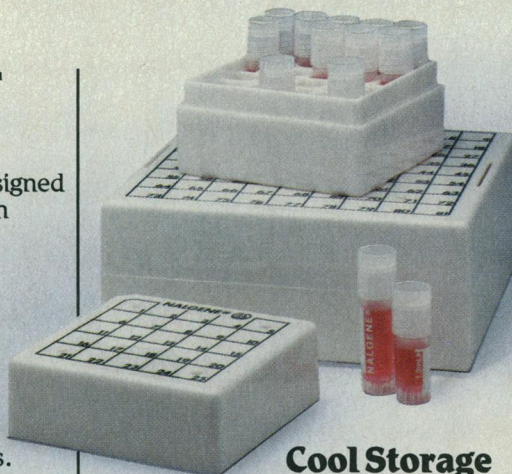
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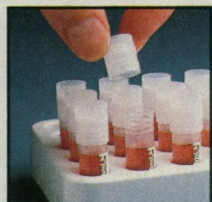
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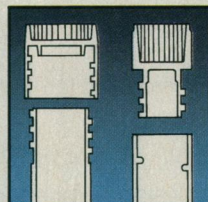
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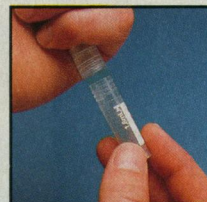
Nalgene Cryovials are non-cytotoxic, non-pyrogenic, radiation sterilized. Available in 1.2- and 2-mL sizes. Recessed bases interlock firmly with Nalgene Cryovial Holder.



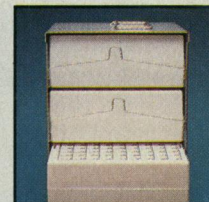
All-plastic Nalgene Cryovial Holder locks Nalgene Cryovials firmly in place for single-handed opening of closures.



Outside thread design on Nalgene Cryovial (left) reduces possible sample contamination. Inside thread of conventional vial (right) increases contamination risk and sample hang-up.



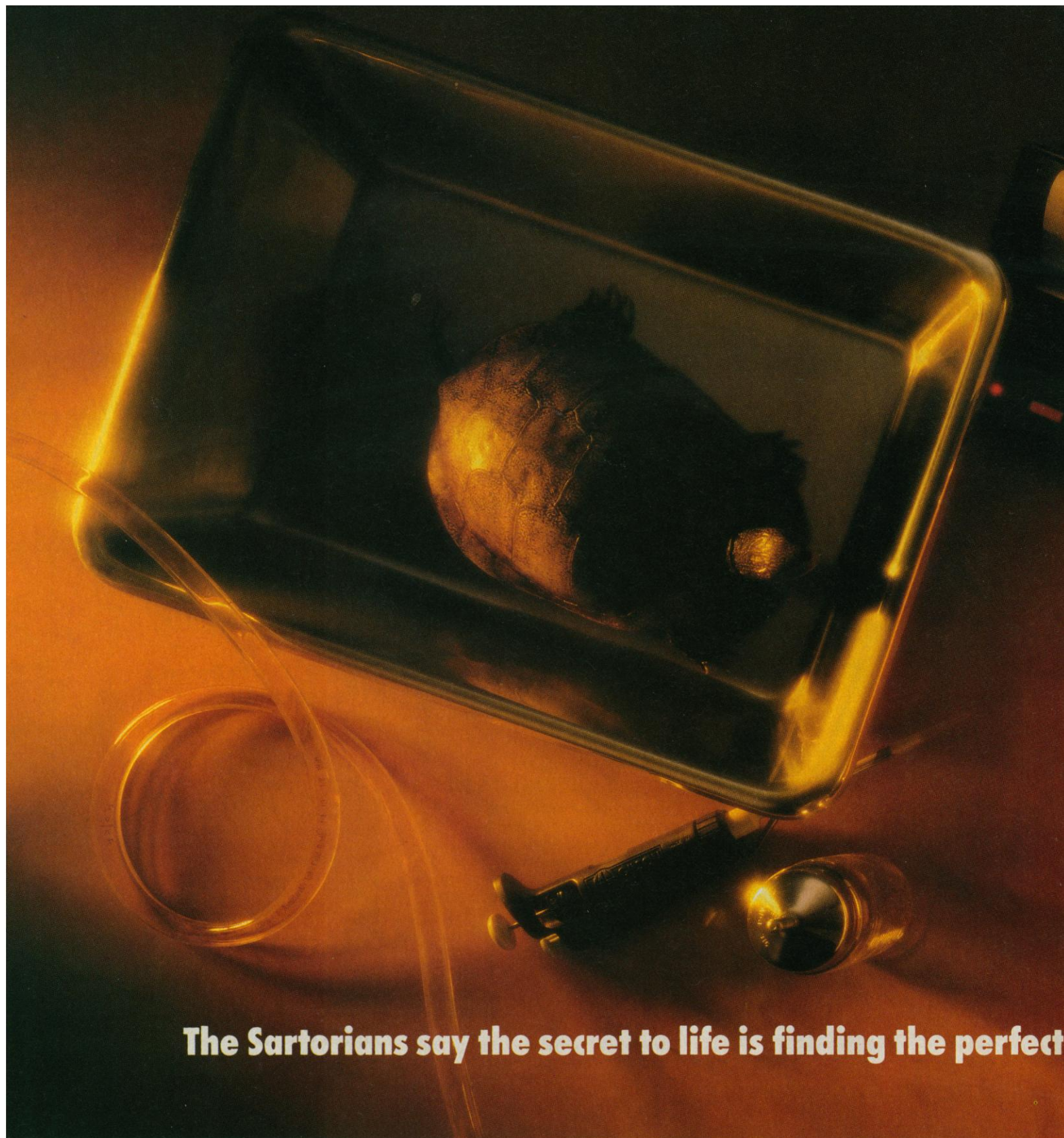
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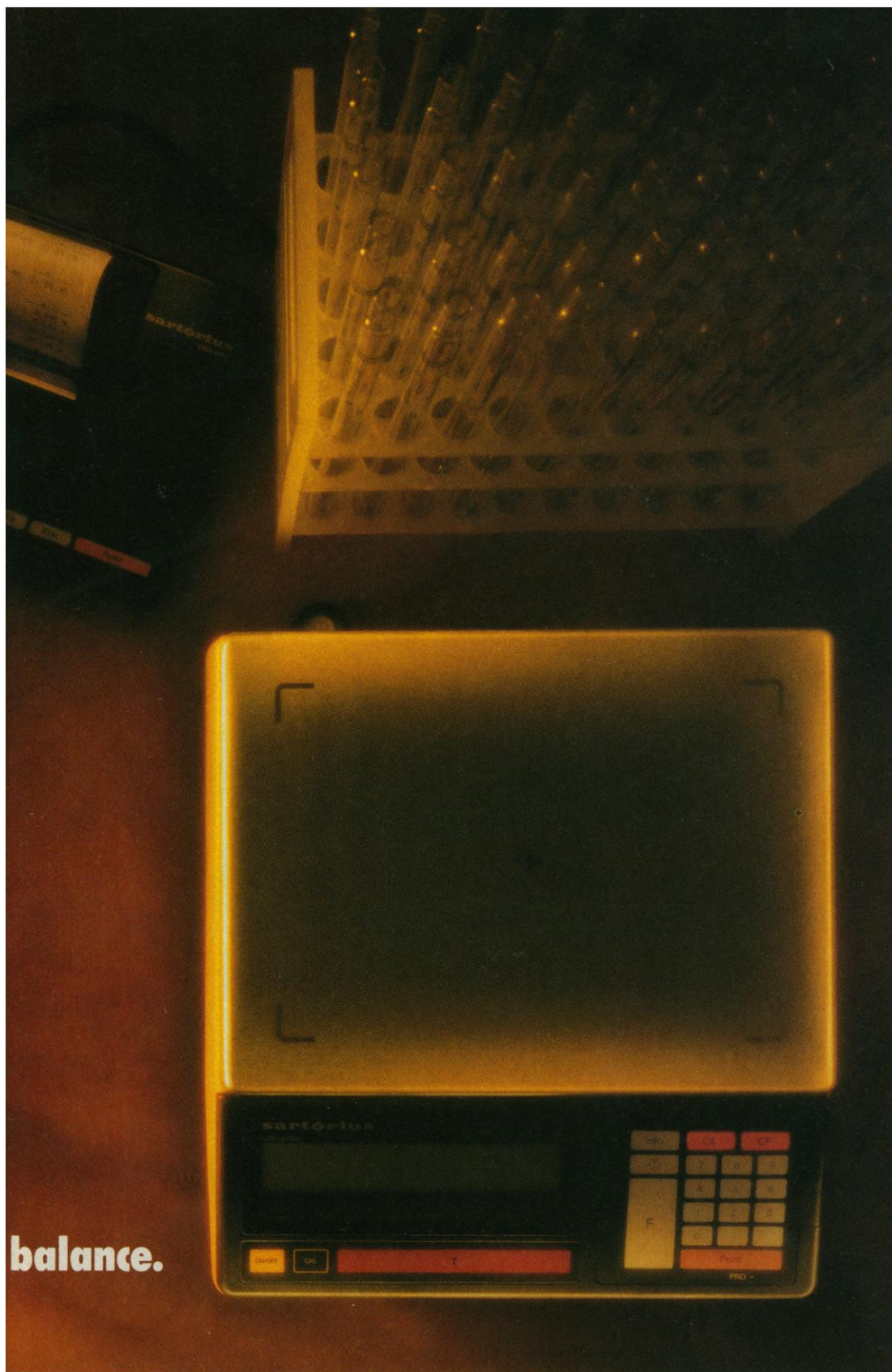
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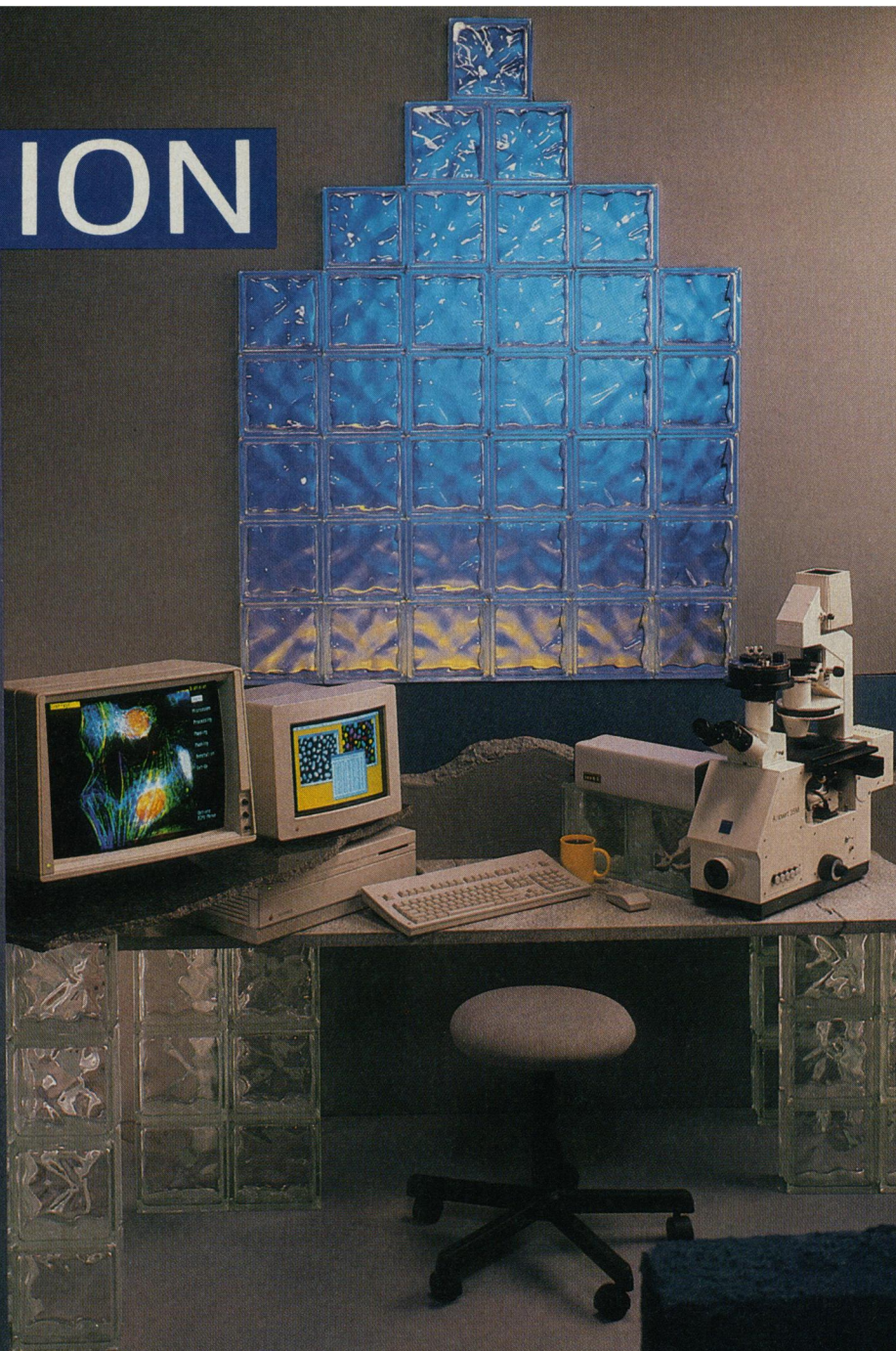
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# IBI DNA SEQUENCING WORKSHOP

## Schedule for 1989

**March 21 - 24**

Wesleyan University, Middletown, CT

**APRIL 4 - 7**

Washington University, Saint Louis, MO

**MAY 23 - 26**

University of Hawaii, Honolulu, HI

**JUNE 13 - 16**

Rutgers University, New Brunswick, NJ

**JUNE 27 - 30**

San Francisco State University, San Francisco, CA

**NOVEMBER 14 - 17**

Iowa State University, Ames, IA

**NOVEMBER 28 - DECEMBER 1**

Baylor Center for Biotechnology, Houston, TX

**DECEMBER 12 - 15**

Rutgers University, New Brunswick, NJ

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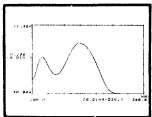
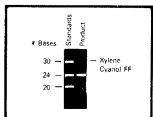


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| <b>Quality Control</b> <ul style="list-style-type: none"> <li>Monitoring method</li> <li>Documentation provided</li> <li>All oligos fully deblocked and detritylated</li> </ul> | <ul style="list-style-type: none"> <li>Trityl fractions monitored</li> <li>Spectrophotometric scan of product</li> </ul>  | <ul style="list-style-type: none"> <li>Visualization of single-band purity on ethidium-stained polyacrylamide gel</li> </ul>  |
| <b>Application</b>                                                                                                                                                              | <ul style="list-style-type: none"> <li>Routine running of experiments</li> </ul>                                                                                                                           | <ul style="list-style-type: none"> <li>Establishing experimental protocol</li> </ul>                                                                                                                           |

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## Brain Structure, Learning, and Memory

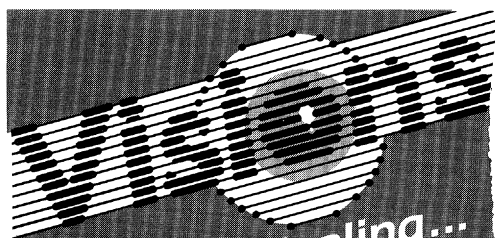
Edited by Joel L. Davis and Robert W. Newburgh, *Office of Naval Research*, and Edward J. Wegman, *George Mason University*

This new book, based on a AAAS Annual Meeting symposium, explores the connections between cellular and computational approaches to understanding the neural basis of learning and memory. Incorporating such diverse ideas as invertebrate and computer-based models, cerebellar involvement in motor engrams, learning, and the sensory sciences; nonstationary point processes; and models closely tied to vertebrate neural nets, the contributors not only shed new light on important brain functions but also provide an example of how neuroscience research should be structured.

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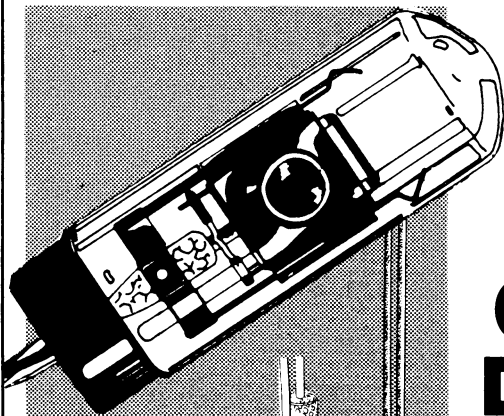
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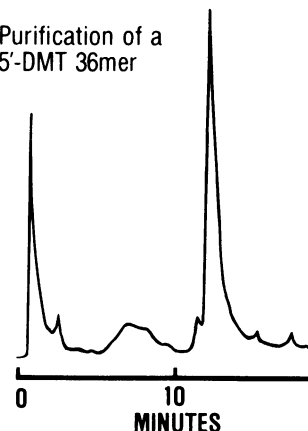
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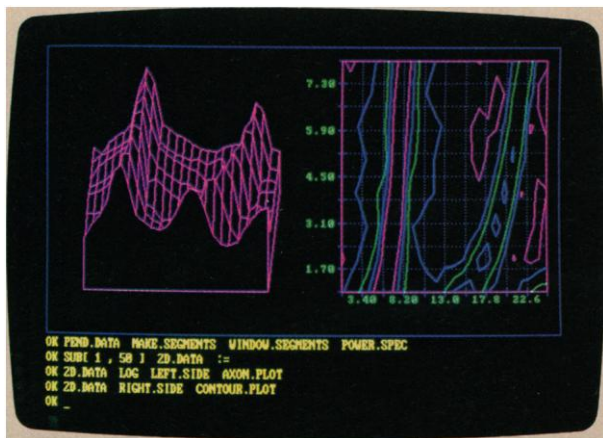
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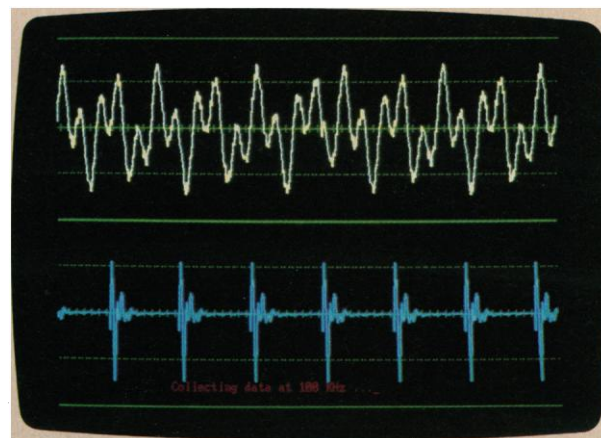
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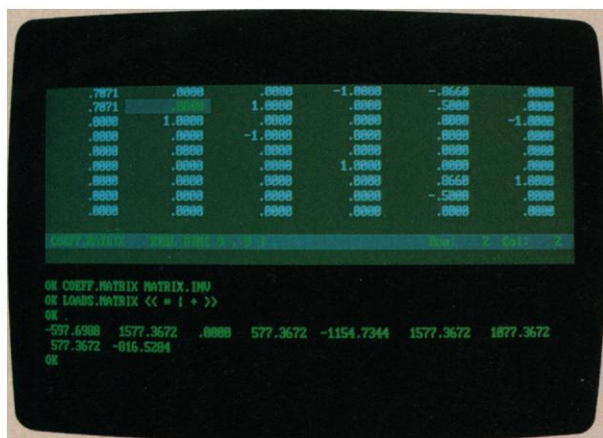




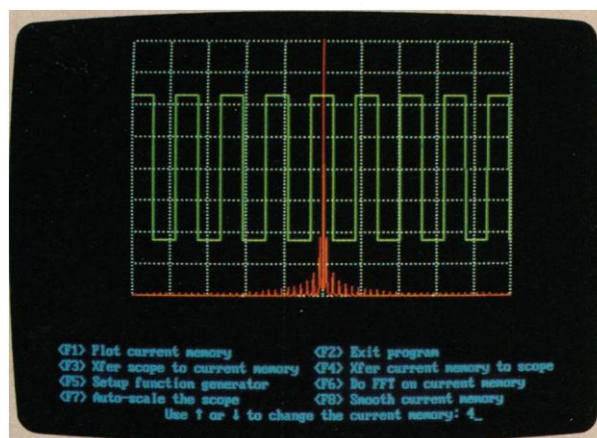
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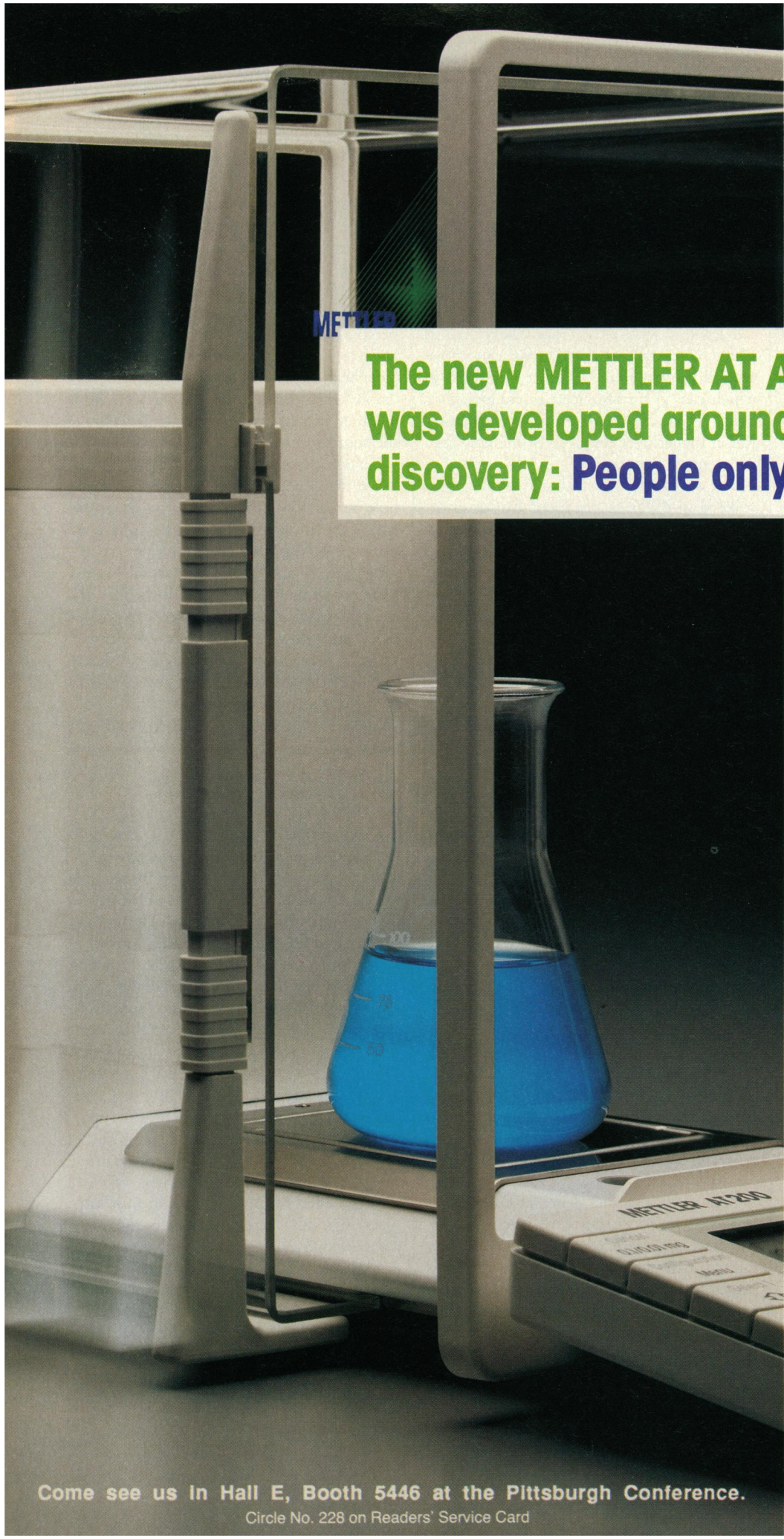
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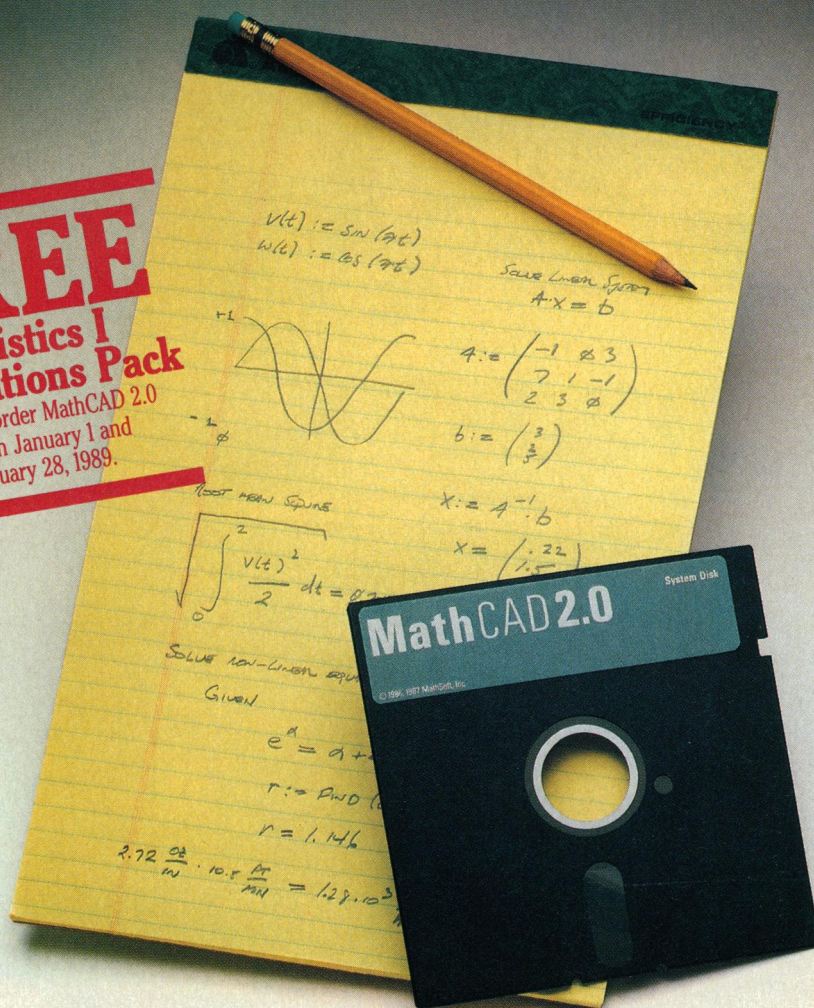
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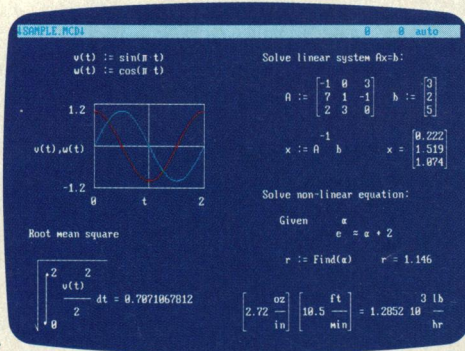
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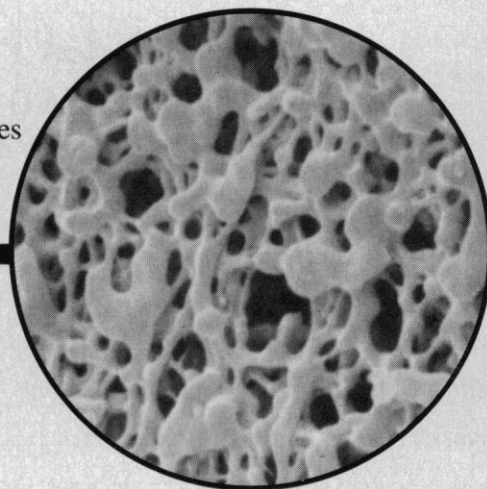
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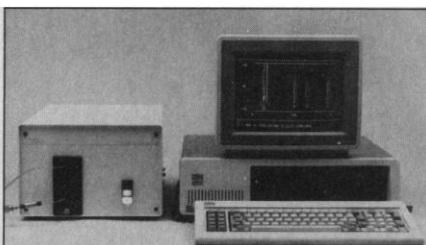
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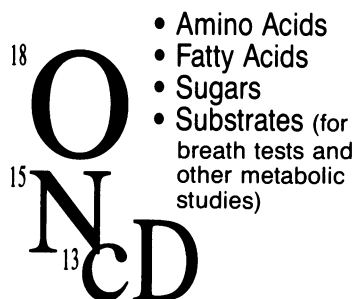


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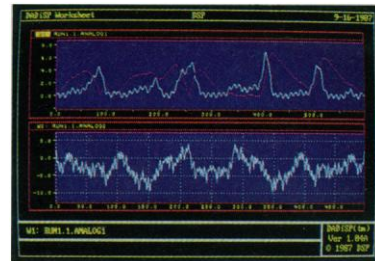
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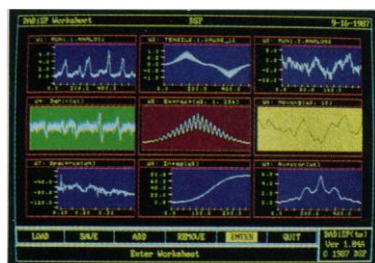
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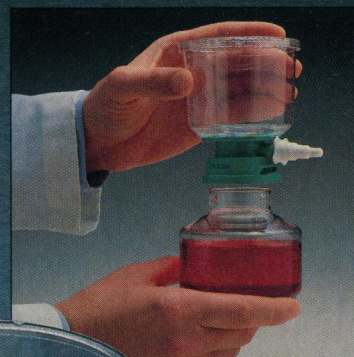
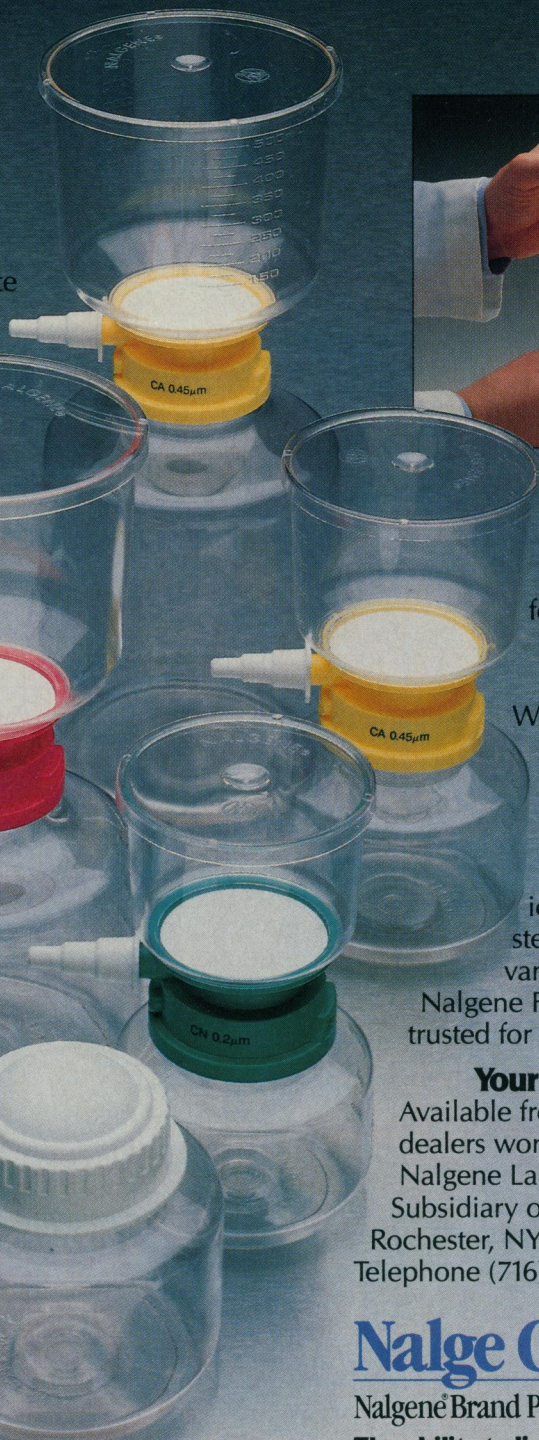
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## Ecosystem Analysis

**Concepts of Ecosystem Ecology.** A Comparative View. L. R. POMEROY and J. J. ALBERTS, Eds. Springer-Verlag, New York, 1988. xii, 384 pp., illus. \$72. Ecological Studies, vol. 67. Based on a conference.

E. P. Odum has long been a creative and influential ecosystem ecologist. His publications are often provocative in the best sense of the word, in that they call forth experimental tests and competing syntheses. It would be asking a great deal to hope that this volume, a collection of papers honoring Odum on the occasion of his retirement from the University of Georgia, could synthesize the current status of ecosystem ecology or provoke a new round of research. Not surprisingly, the volume does a better

job reflecting modern ecosystem ecology in its strengths and weaknesses than it does of pulling the field together or pushing it forward.

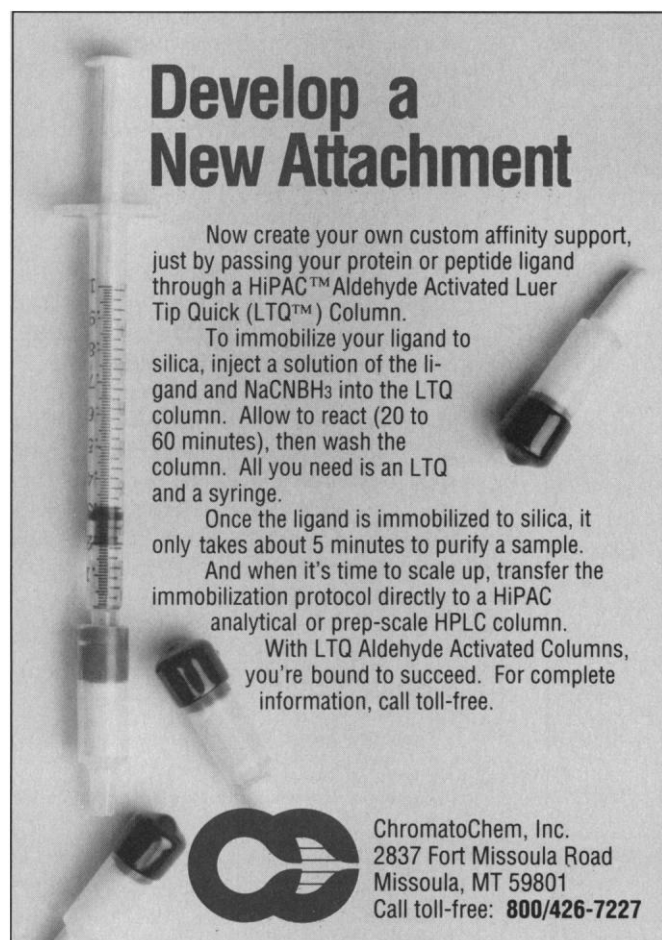
Because of the way the volume is organized, the weaknesses are apparent first. Ecology has been accused of being the only field with the courage to call a spade a geotome, and we continue to find complex ways of making relatively simple points about energy flow, spatial and temporal scales, and hierarchies. More important, the book starts with too much amateur philosophy of science (fine between consenting adults in private), and, most serious, several of the contributions have a defensive tone about working in difficult-to-control complex systems, as against the supposed simplicity of subcellular biology.

The strengths of the field become evident later in the volume. Papers that exemplify them include an informed (although jargon-ridden) ecological analysis of conventional versus zero-tillage agriculture (Coleman and Hendrix), an interesting discussion of grazer-grassland interactions and the ways in which grazing could increase primary production (Detling), a provocative treatment

of alternative ways to analyze the dynamics of marine ecosystems (Mann), and an outstanding synthesis of the biogeochemistry of coral reef ecosystems (D'Elia). I don't know if a marine ecologist would be equally impressed with the last; to one who works in forests, it was extraordinarily instructive.

I mention these papers in particular among a number of good ones in the volume because they have several features more or less in common: first, a large and interesting question; second, the willingness and ability to pursue the answer whether it lies in physiological ecology, population biology, systems analysis, geochemistry, or interactions of any of these; third, an inclination to consider the consequences of human manipulations of ecosystems; and fourth, the courage to suggest tentative (and testable) generalizations based on controlling mechanisms. Add a developing concern with global change and with long-term ecosystem dynamics, and these papers represent many of the best features of modern ecosystem ecology.

Overall, I learned something from the papers in this volume; I believe that most ecologists would. However, I would not



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*...a must for policy makers, students, employers, and anyone interested in gaining insight into science policy programs.*

1986; 168 pp.; softcover \$10.00 (\$8.50 for AAAS members).

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