

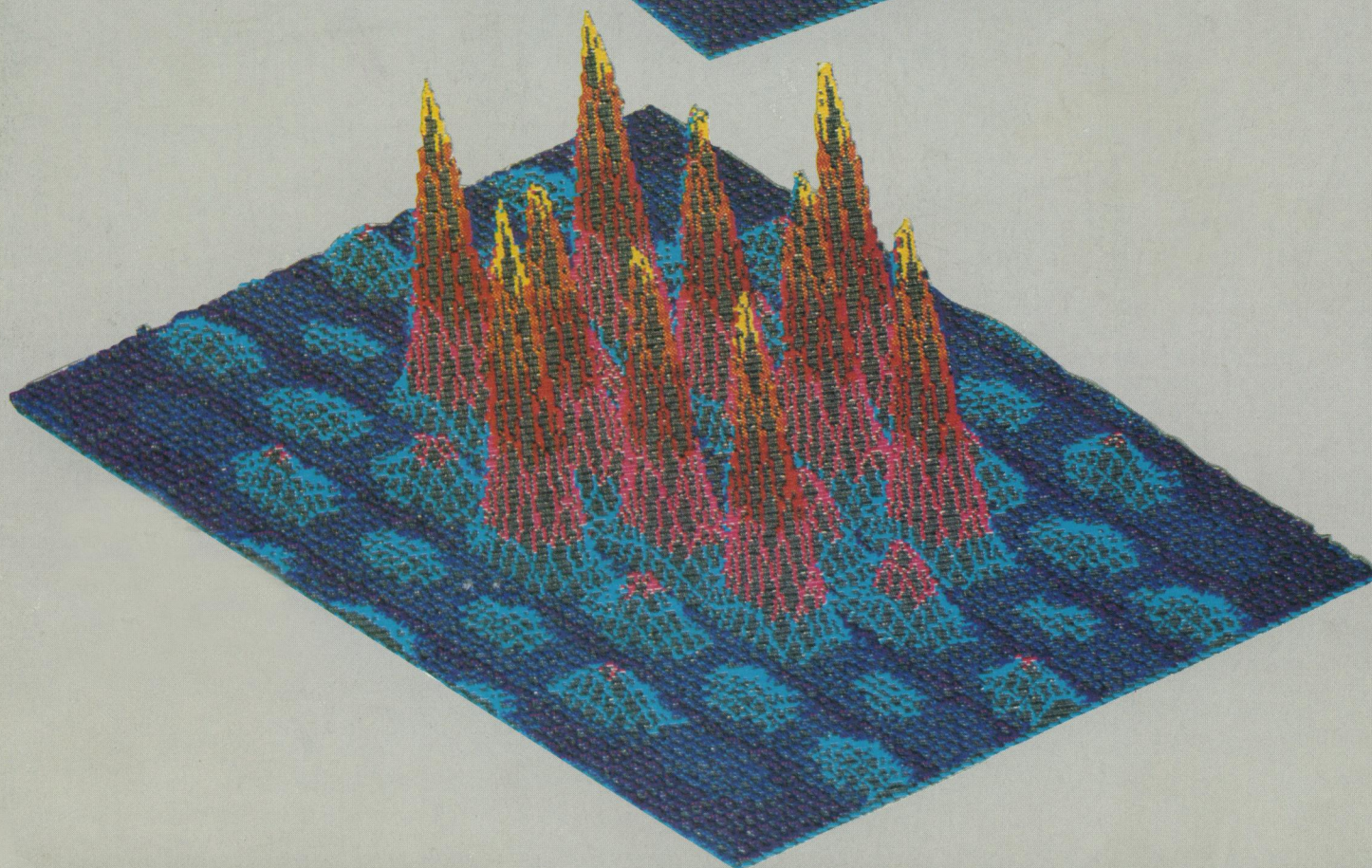
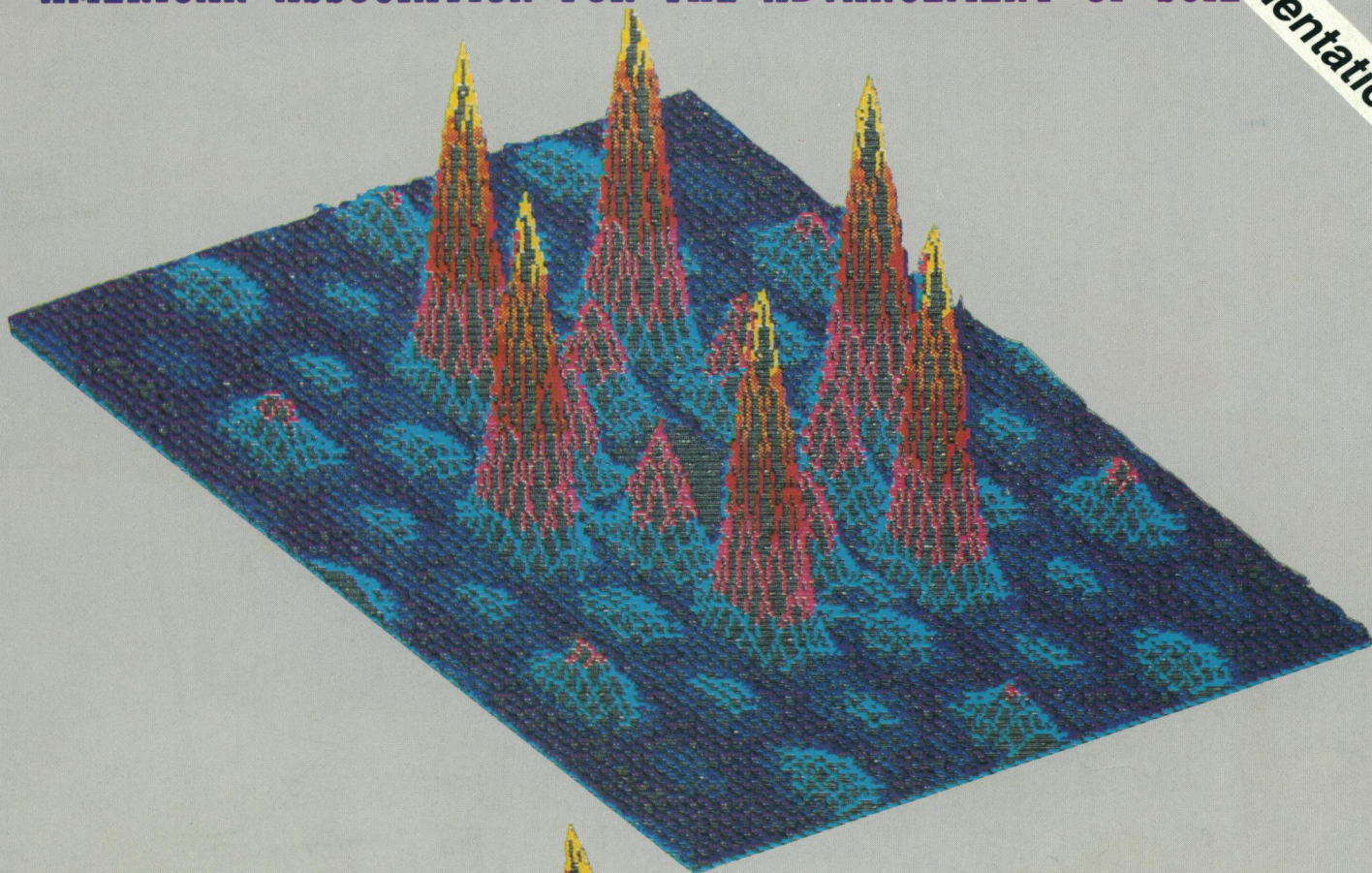
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Analytical Instrumentation







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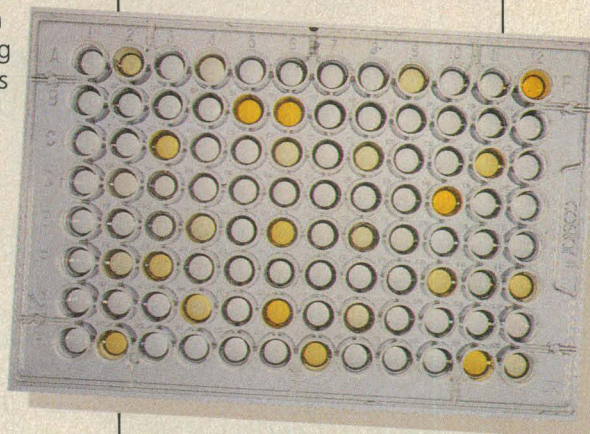
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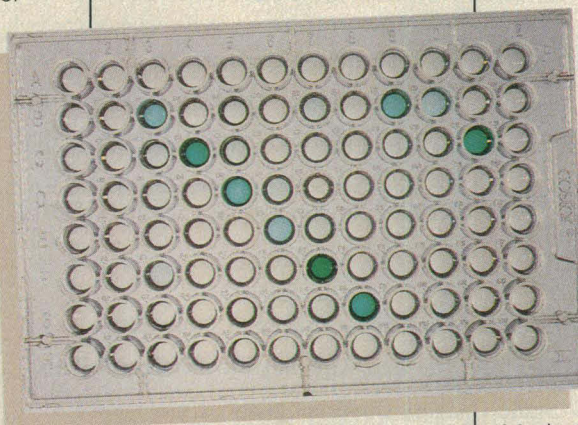
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## COVER

Small-angle neutron scattering patterns showing the symmetry changes induced in a colloidal crystal undergoing shear. Stress is relieved by populating fourfold sites, producing neutron peaks (lower figure) not observed in scattering from the original crystal (upper figure). See page 274. [J. B. Hayter, in collaboration with B. J. Ackerson and N. A. Clark, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831]



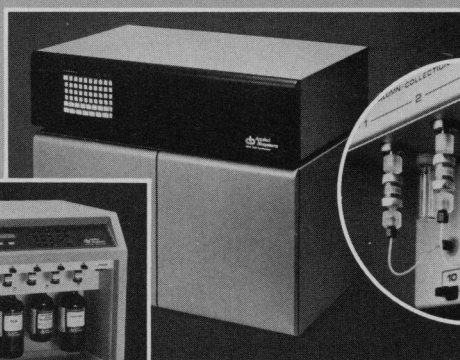
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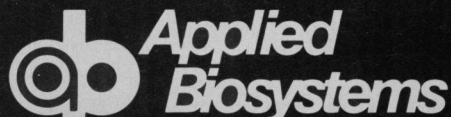
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### **Gene for colony-stimulating factor cloned**

The gene for the colony-stimulating factor CSF-1 has been cloned, opening the way for analysis of the structure and activities of this growth-promoting substance as well as for production of large amounts for possible therapeutic uses (for example, treatment of macrophage deficiency) (page 291). The glycoprotein CSF-1 is essential for normal maturation of macrophages and monocytic cells. Kawasaki *et al.* describe the steps in the isolation and cloning of the CSF-1 gene and in the production in culture of its protein product which, in structure and biological activity, was similar to authentic human and mouse CSF-1 protein. No significant sequence homology was found between CSF-1 and any other proteins. An extremely hydrophobic region of the molecule may be a membrane insertion region which, upon cleavage, might release a secretory form of the molecule. CSF-1 may contribute to regulation of neoplastic cell growth as well as normal cell growth; recently a close resemblance of the receptor for CSF-1 on macrophages and an oncogene product was found, suggesting that CSF-1 activity might contribute to cellular deregulation during oncogenesis.

### **Energy dissipation at the equator**

The dissipation of energy within the ocean at the equator is more closely related to local wind patterns than had been expected (page 315). The existence in both the Atlantic and the Pacific oceans of the equatorial undercurrent—a permanent subsurface current and energy generator—and occasional measurements of turbulent kinetic energy dissipation in ocean waters near the equator led oceanographers to suspect that dissipation at the equator might be greater than elsewhere. Moum and Caldwell describe a 12-day study during which pressure, temperature, electrical conductivity, and small-scale shear of the water, wind speed and direction, solar radiation, and other environmental parameters were measured. In the upper 110 meters of the ocean, energy dissipation showed a strong diurnal pattern reminiscent of patterns noted at ocean sites distant from the equator and at sites in lakes. When the diurnal effects were eliminated and daily averages calculated, the rate of energy dissipation in the ocean and the rate of energy input by local winds were linearly related. This unexpected, highly localized effect should have a major impact on models developed for understanding ocean currents and ocean-atmosphere interactions.

### **Prolonged nuclear winter**

A nuclear winter might persist longer than has been forecast, according to results obtained in a computer simulation (page 317). Malone *et al.* added to their model the effects that solar heating would produce on

the structure of the atmosphere and on the transport and removal of clouds of smoke from massive fires that might result from a nuclear exchange. Solar heat absorbed by smoke would induce upward currents, driving smoke-filled air into the stratosphere. There, precipitation could not remove the smoke, whereas it could remove smoke remaining in the troposphere. The tropopause, the atmospheric boundary between the troposphere (where temperature increases downward) and the stratosphere (where temperature increases upward), would be disrupted from its usual altitude, later reforming below the smoke layer. This downward displacement would decrease the atmospheric volume in which precipitation could effectively wash smoke away. The extent to which solar heating would extend the lifetime of smoke and prolong the nuclear winter is unclear; it would depend on in which season of the year smoke was produced and the (highly uncertain) mass of smoke generated.

### **Thyroiditis and dietary iodine**

There may be a direct link between the rising incidence of autoimmune thyroiditis in Americans and their consumption of large amounts (2 to 5 times the recommended daily allowance) of iodine (page 325). Bagchi *et al.* found that, in two genetically susceptible strains of chickens, development of autoimmune thyroiditis—inflammation of the thyroid brought on by antibodies directed against the gland—varied with changes in dietary iodine. In the strain with low incidence of mild disease, addition of iodine to the diet promoted disease; in the strain with severe disease culminating in complete destruction of the thyroid gland, blockage of uptake of iodine diminished thyroid-directed antibody responses. When iodine concentrates in the thyroid, it is incorporated into thyroglobulin molecules, altering their shape and probably increasing their immunogenicity. This may account for the enhanced production of antibody and the initiation of autoimmune disease.

### **Leukotrienes and tissue injury**

Leukotrienes, derivatives of fatty acids, may mediate both the local and the systemic effects that follow tissue injuries (page 330). Denzlinger *et al.* found that diverse tissue traumas—burns, bone fractures, and abdominal surgery—all produced a transient rise in endogenous leukotrienes or their metabolic breakdown products in blood and in bile. Similar elevations have been observed in other kinds of tissue injuries; injections of leukotrienes into animals have produced circulatory and respiratory dysfunctions and local inflammatory reactions that are like the trauma-induced effects. Therapeutic intervention with leukotriene antagonists may help modulate the damaging physiologic effects attributed to this common mediator.



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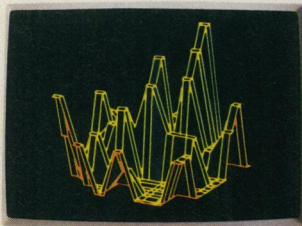
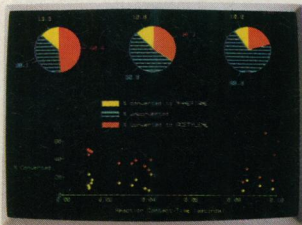
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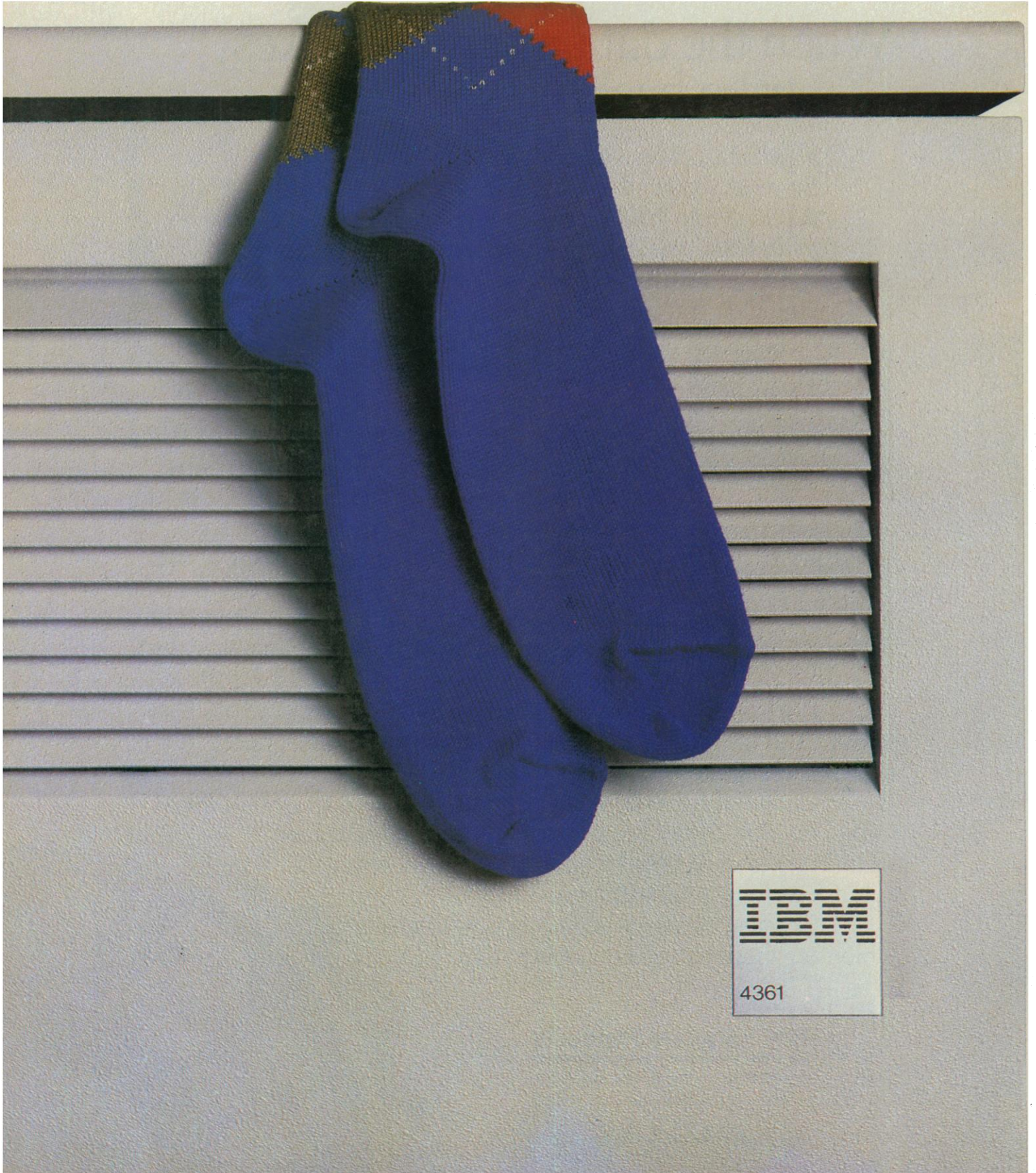
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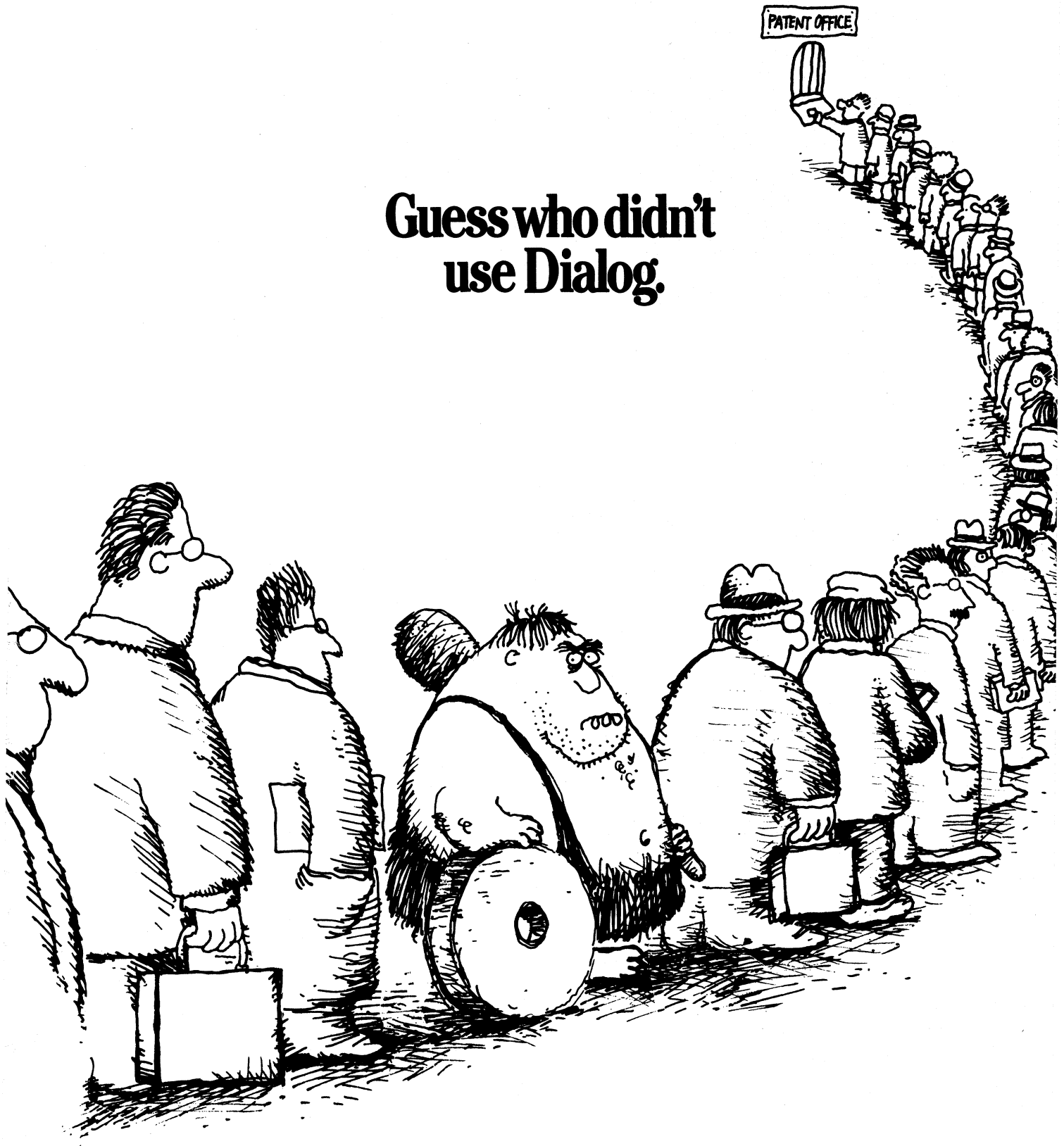
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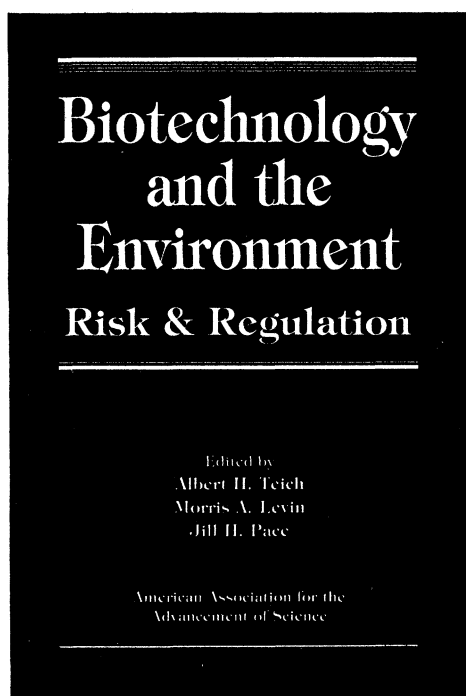
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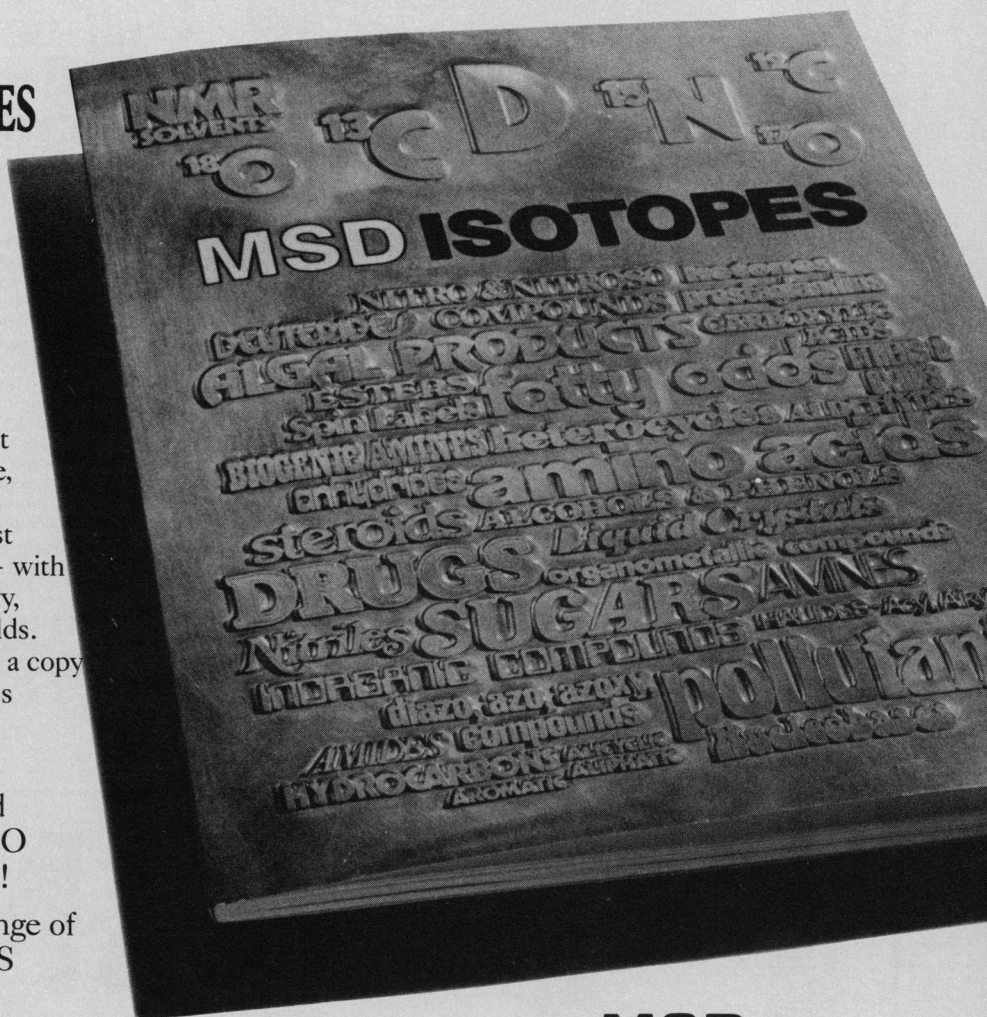


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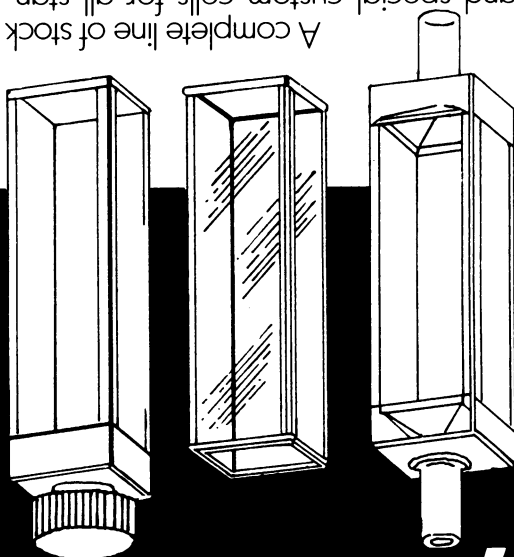
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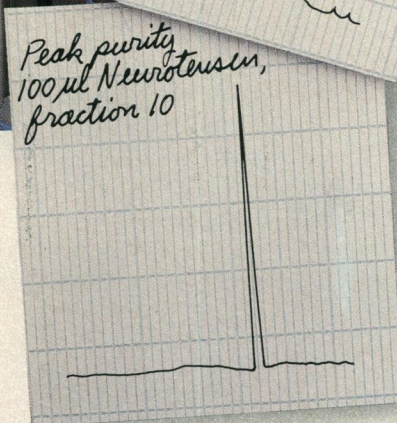
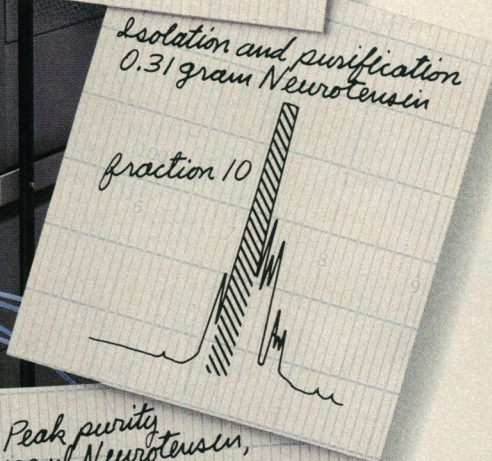
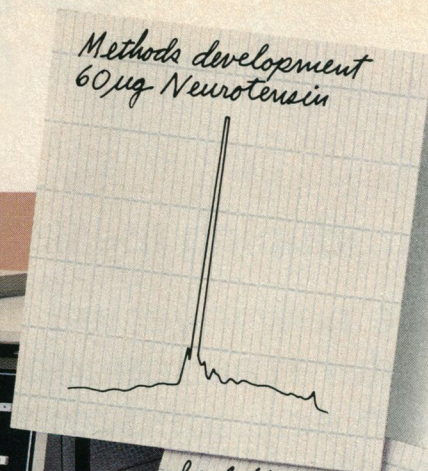
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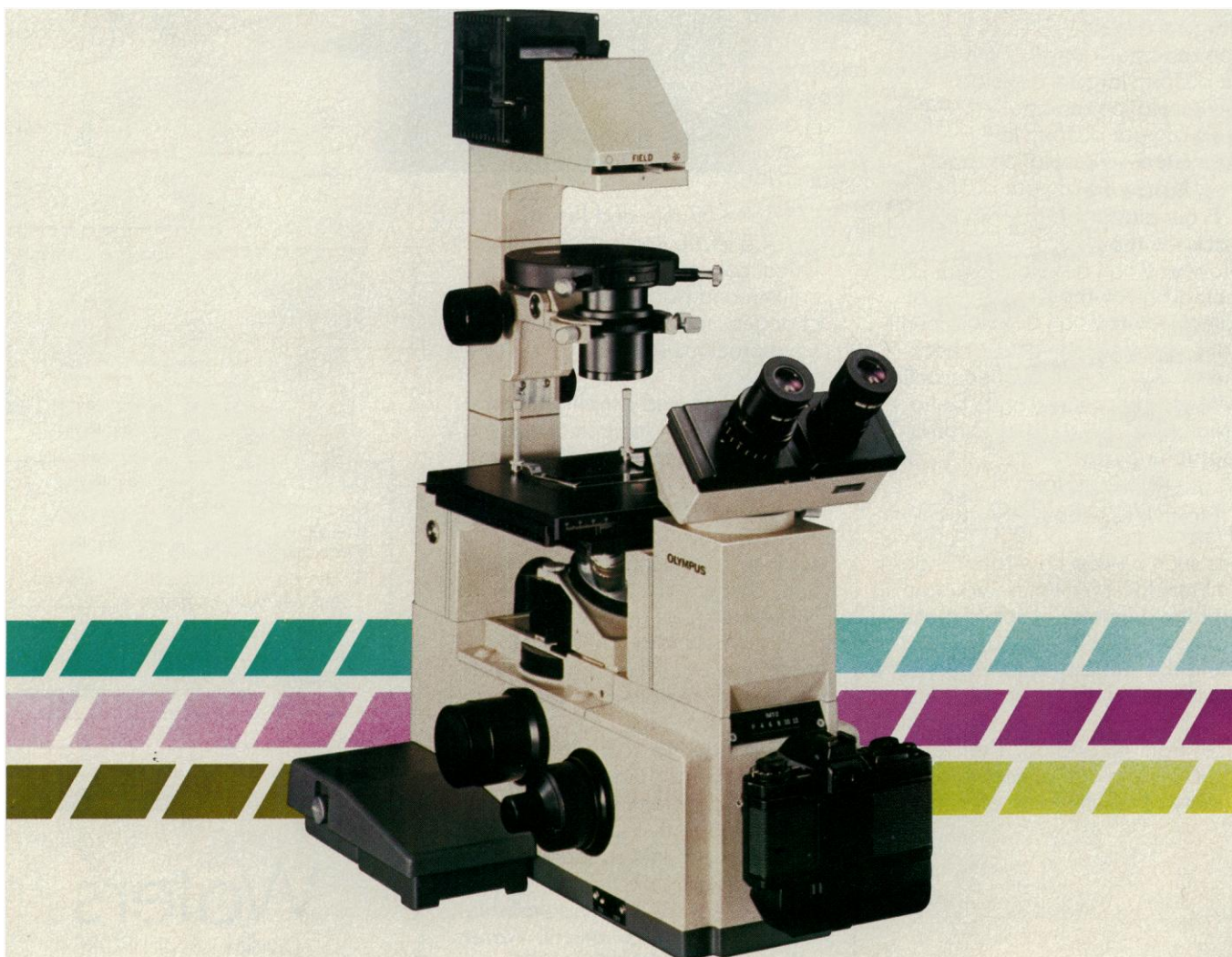
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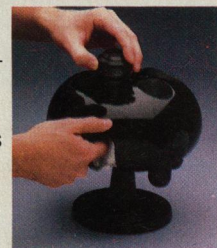
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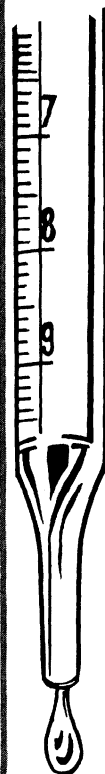
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rive from genetically engineered organisms, they almost certainly represent new combinations of DNA and underscore the authors' contention that "The forces that actually control a species in nature are, however, frequently elusive and can only be detected through intensive field manipulation." It would seem that only by using new and "sophisticated" techniques of field manipulation available only recently in "experimental community ecology" can we gather the risk assessment data needed "to provide sufficient quantitative information about the potential for negative effect."

If one were to accept at face value the premises and the statements made in this letter, then the only rational response would be to call for a moratorium on the introduction of organisms with new combinations of DNA. Since every human baby contains a unique combination of DNA never before seen on the planet, we clearly could not permit the introduction of these ecological time bombs into polite society until the experimental community ecologists have given us a risk assessment in quantitative terms to ensure that no new Hitlers are in the offing. Immigration must be stopped immediately (the deliberate introduction of new combinations of DNA cannot be permitted). The nefarious activities of plant and animal breeders must come to a halt (that new variety of carrot might take over the planet). Regulations must be written to prevent mutation, unnatural exchanges of DNA in nature, and indeed evolution itself (enforcement admittedly will be a problem).

Does anyone else detect the musty aroma of the Luddites?

J. EUGENE FOX

*ARCO Plant Cell Research Institute,  
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### Restricting Immigrant Labor

In their article "The agricultural mechanization controversy" (8 Feb., p. 601), Philip L. Martin and Alan L. Olmstead state that a "rational strategy might be to phase out dependence on foreign workers" by taxing their employers and using the proceeds to fund mechanization research. However, they do not explain the normative assumptions of their proposal, which disregards the interests of those foreign workers whose unemployment they are promoting.

In general, schemes to restrict immigrant labor are subject to economic as well as moral objections (1). By inhibiting the free flow of labor, they encourage

inefficient allocation of capital and impede the efficient use and development of labor resources. From the moral standpoint, the problems are apparent as soon as one casts aside the blinders of chauvinism and considers the welfare of workers worldwide. Martin and Olmstead's allusion to "harvest-of-shame" wages is inadequate, given that the millions of illegal aliens who have eagerly sought work in this country would clearly be worse off if they lost their jobs. The logic of Martin and Olmstead's proposal might aptly be compared to that of taxing the employment of ghetto youths or other minorities hired at less than the minimum wage by an amount equal to the wage differential, and then using the proceeds to fund automation research to eliminate their jobs.

DALE H. GIERINGER

*Decisions and Ethics Center,  
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### References

1. D. Collard, *Economic Issues in Immigration* (Institute of Economic Affairs, London, 1970), pp. 65-87; W. H. Hutt, in *ibid.*, pp. 17-44.

In a world without economic or political imperfections, Gieringer's criticism of our proposal to tax the wages earned by temporary alien farm workers in order to accelerate laborsaving mechanization might be appropriate. However, his criticism is misdirected in the real world for economic and political reasons.

A practically unlimited supply of temporary alien farm workers is available at the federal minimum wage of \$3.35 hourly. When the supply of labor is perfectly elastic a wage tax will be paid by employers and not workers, so the tax will not lower workers' wages.

Nation-states are exclusionary—one of their purposes is to establish borders and separate "us" from "them." Nation-states have a universally recognized right to limit the access of temporary foreign workers to their labor markets. We recognize that one can build an argument showing that economic efficiency is maximized with no international barriers to the movement of capital or labor, but we also seriously doubt that an open border is a realistic policy option in the United States today.

PHILIP L. MARTIN

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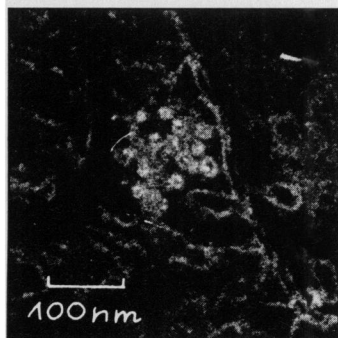
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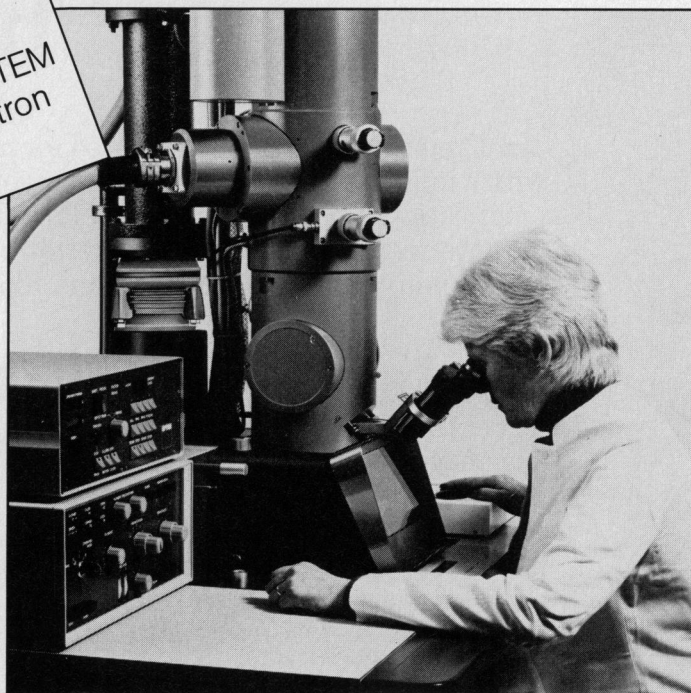
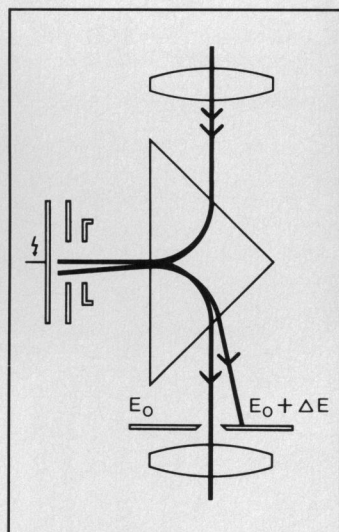


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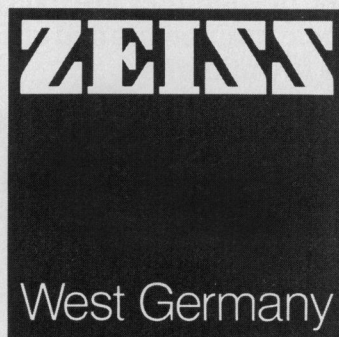
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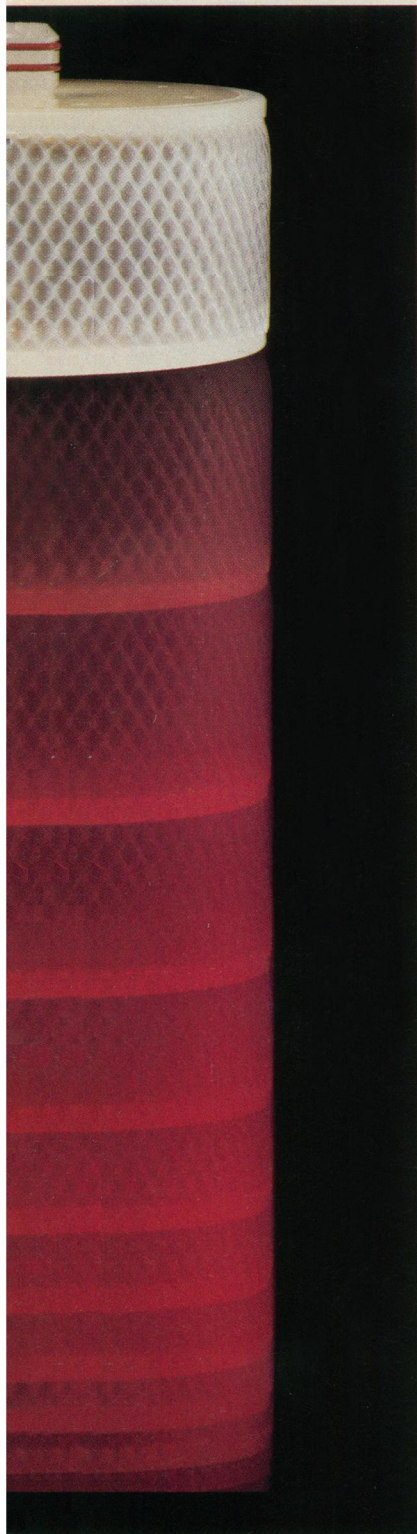
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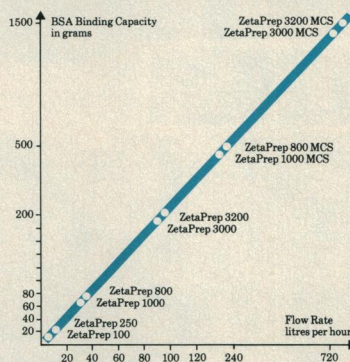




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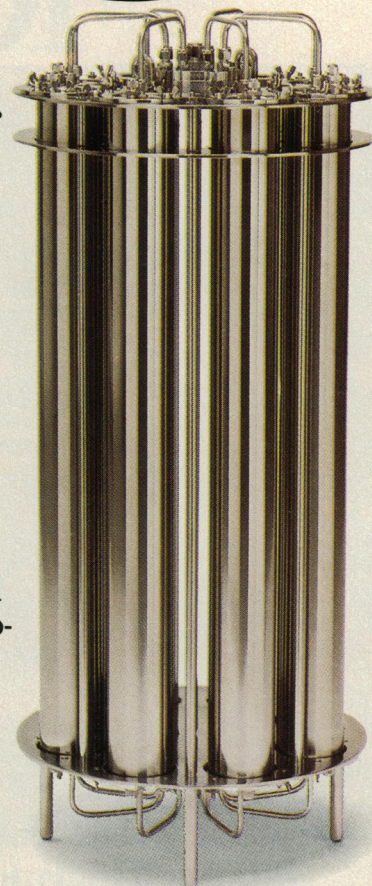


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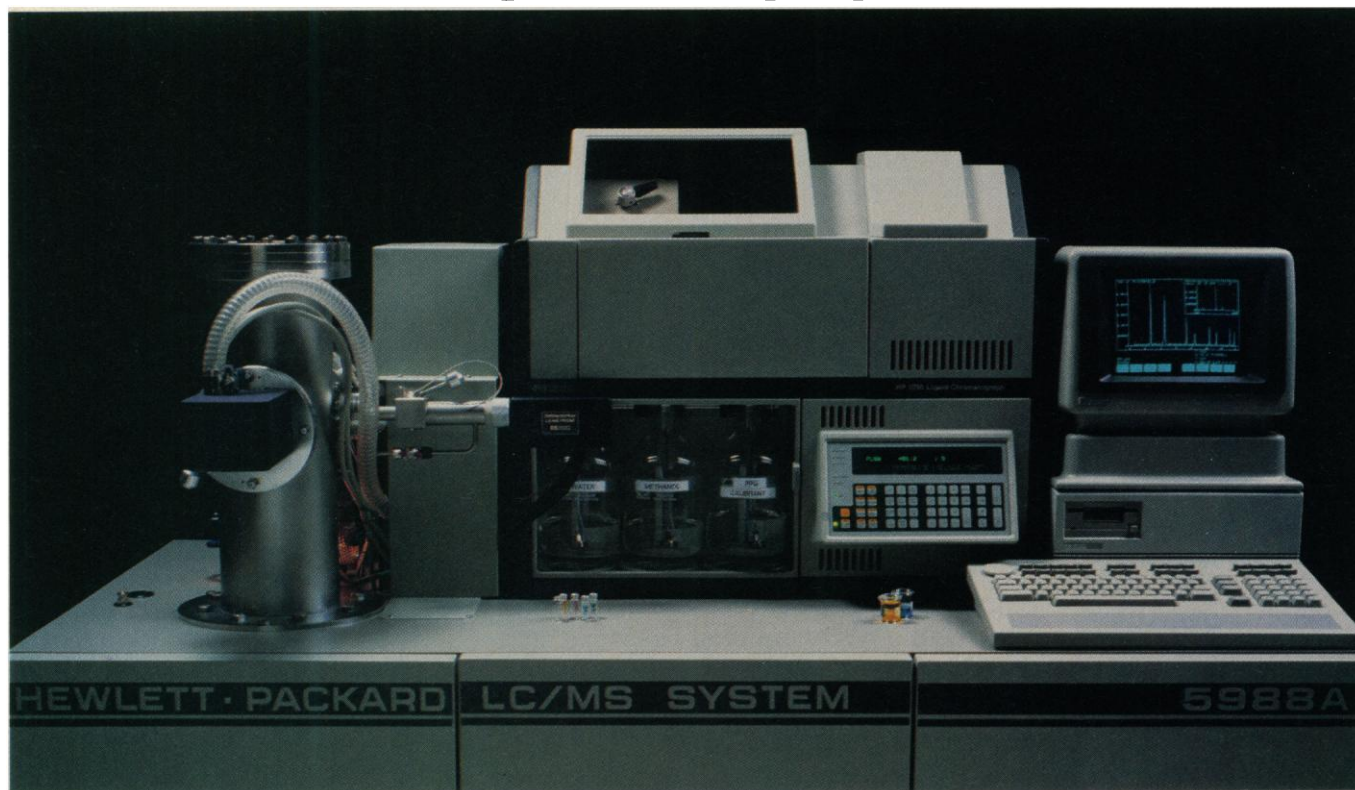
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Computers have and will continue to play a major role in the field of biotechnology, both as a support tool and as research tool. As the computer spans a vast range of activities in biotechnology, this conference will endeavor to provide timely presentations of the policy, resource, system, and applications areas which bear both on the immediate and long term activities in this fast growing, fast moving, and exciting field.

## Session Topics

### **POLICY ISSUES – Jerrold Roschwalb, National Assoc. of State Univ. & Land Grant Colleges**

This session will present the major and critical policy issues in Government support and interaction in the field. A panel discussion will follow the session. Speakers will include Dr. William Raub (NIH), Dr. Rick Weingarten (OTA), and Dr. David Kingsbury (NSF).

### **SYSTEMS and RESOURCES – Lewis Gevantman, National Bureau of Standards**

This session will present examples of computer systems and developments related to and supporting biotechnology. Speakers will include Professor Carver Mead (CalTech), Professor David Mount (Arizona State), Richard Feldmann (NIH), Dr. Kevin Ulmer (CARB), Dr. Charlotte Hollister (BBN), and Dr. Dennis Smith (Intellicorp).

### **APPLICATIONS IN AGRICULTURAL BIOTECHNOLOGY – Joseph Modelevsky, International Minerals and Chemicals, Northbrook, Ill.**

Agricultural biotechnology focuses on problems ranging from the level of the gene to the plant to the farm. Computer-based tools are applied by investigators working on the whole spectrum of problems. This session will address computer applications in genetic engineering and protein design, agricultural expert systems and computer-based tools to optimize production agriculture. Speakers will include Dr. Joachim Messing (Rutgers University), Dr. Ryszard Michalski (University of Illinois), Derek Crates (Imperial Chemical Industries), Dr. James Kendrick (AGNET).

### **CONTRIBUTED PAPERS – Dieter Soll (Yale University)**

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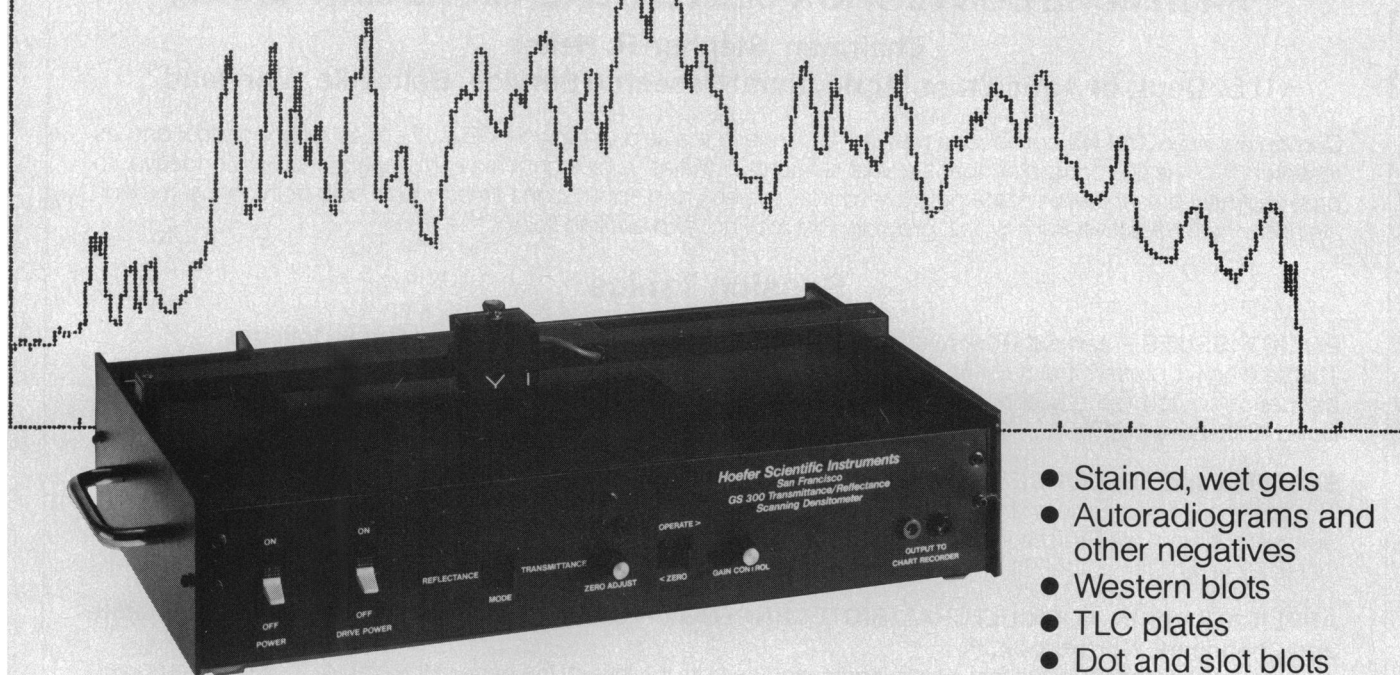
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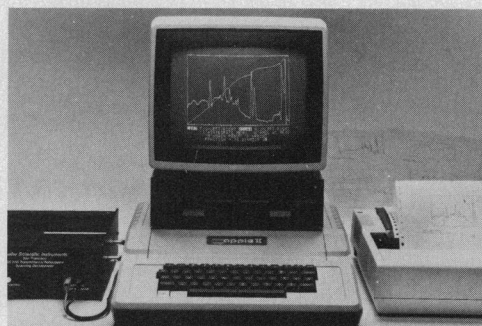
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## Instrumentation

Development of new equipment and new techniques continues to create opportunities in established fields and to make accessible new types of investigations. Currently, much of this progress is dependent on the availability of moderately priced computer power. Another important trend is the coupling of two or more instrumental components to achieve greater analytical capabilities.

In this issue Arndt-Jovin and colleagues describe powerful new tools for studying biological objects. Fluorescent imaging combines the use of lasers and fluorogenic substrates. In some instances the fluorophores are attached to monoclonal antibodies. Resultant fluorescent light is detected by electronic devices, and the information can be displayed on a video screen and stored. Advantages of the system include: (i) particular cellular constituents can be visualized in the presence of a large excess of other components; (ii) quantification is feasible at low concentrations because of the inherent sensitivity of emission as opposed to absorption; and (iii) discrete cellular components below the diffraction-limited resolution of the light microscope are detectable.

Ellis and colleagues describe equipment that can monitor surface reactions on a millisecond time scale. This represents an improvement in capabilities on the order of  $10^3$ . The experiments are performed under high vacuum and include use of a molecular beam that is adsorbed on a surface, high-resolution electron energy spectroscopy that employs many detectors, and a mass spectrometer to monitor products. Results include data about the role of transient species and elementary reaction pathways on a surface. Effects of surface topography defects, promoters and inhibitors, and composition on such reactions can be obtained.

Highly monochromatic dye lasers can selectively ionize elements and even their isotopes. This capability, when combined with mass spectrometry, introduces an entirely new procedure for chemical analysis. Fassett and colleagues discuss procedures for use of the combined techniques for analysis of inorganic mixtures by isotope dilution. They suggest that isotope abundance sensitivities in excess of  $10^{12}$  may be available and that elemental analysis by isotope dilution may be feasible at the subpicogram level.

Another example of the value of combining two techniques is provided by Eachus and Olm. They studied the effects of radio-frequency excitation on the intensity of electron spin resonance signals, in effect, performing simultaneous nuclear magnetic resonance and electron spin resonance experiments. Applications include the study of lattice defects in silver halides when transition metal ions are added as dopants.

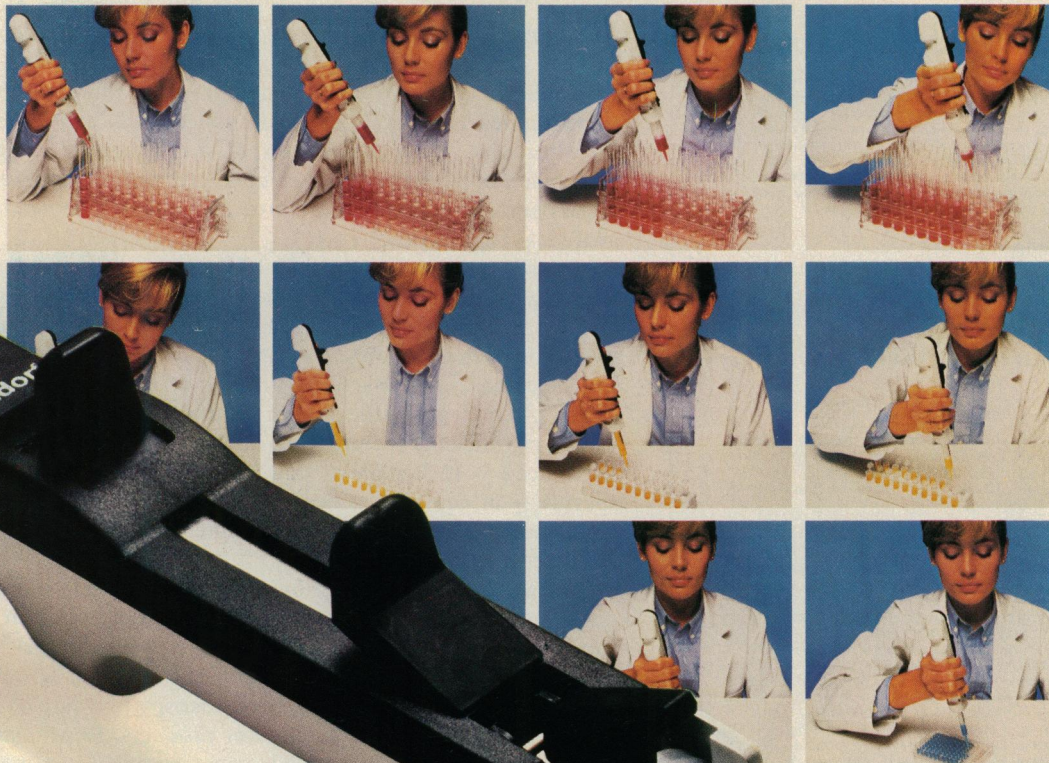
Slow neutrons have a wavelength of about 1 angstrom and are scattered by matter in ways that differ from x-rays or electrons. Moon describes how these properties are used in studies by an increasingly large and diverse group of investigators. The disciplinary mix includes condensed matter physics, 35 percent; chemistry, 23 percent; materials science, 16 percent; polymer science, 13 percent; and biology, 13 percent.

In the creation of synthetic genes, 100 and more nucleotides are sequentially brought together. If the yield for each step were, for example, 95 percent, little final product would be obtained. Caruthers describes a synthetic process with coupling efficiencies of 99.5 to 99.8 percent. A nucleotide can be added every 6 minutes, with use of either manual procedures or a gene machine.

Hirschfeld, a longtime observer of the evolution of instrumentation, points to the importance of continuing trends in computers. Increasing power and lower costs make it inevitable that computers will play more roles in instrumentation and in the conduct of experimental procedures. Artificial intelligence will be more effectively applied. Sensors will be adjuncts to the computer in contrast to the case now, where the sensor usually comes first.—PHILIP H. ABELSON



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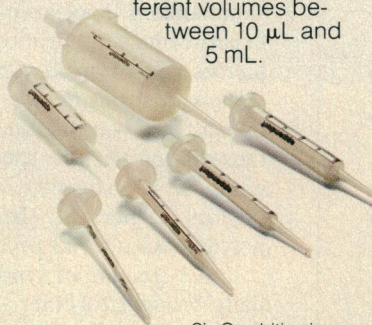
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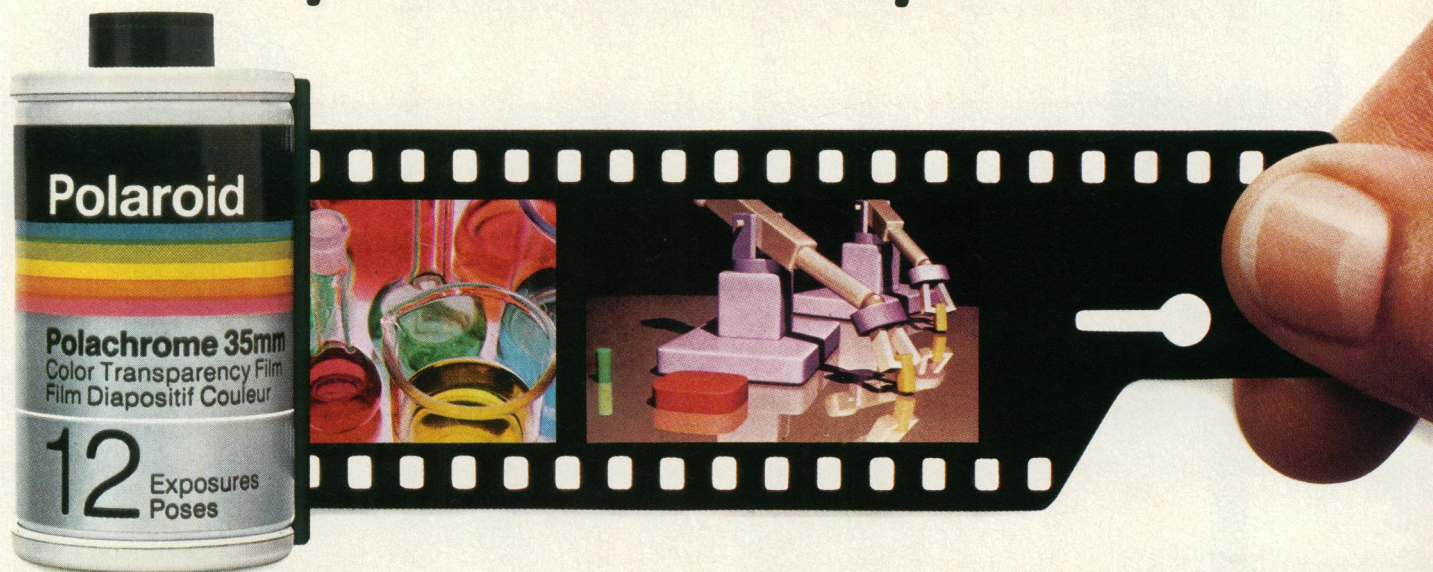
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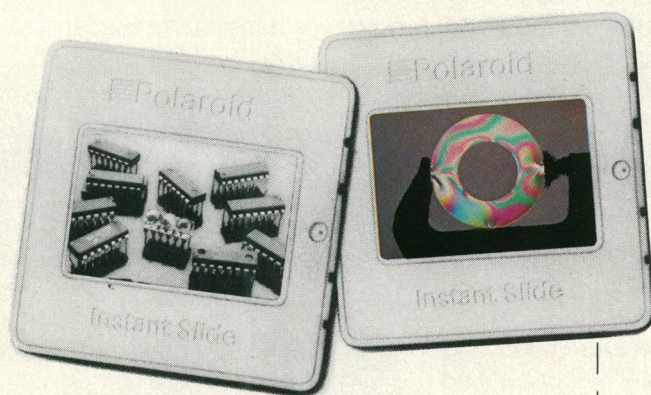
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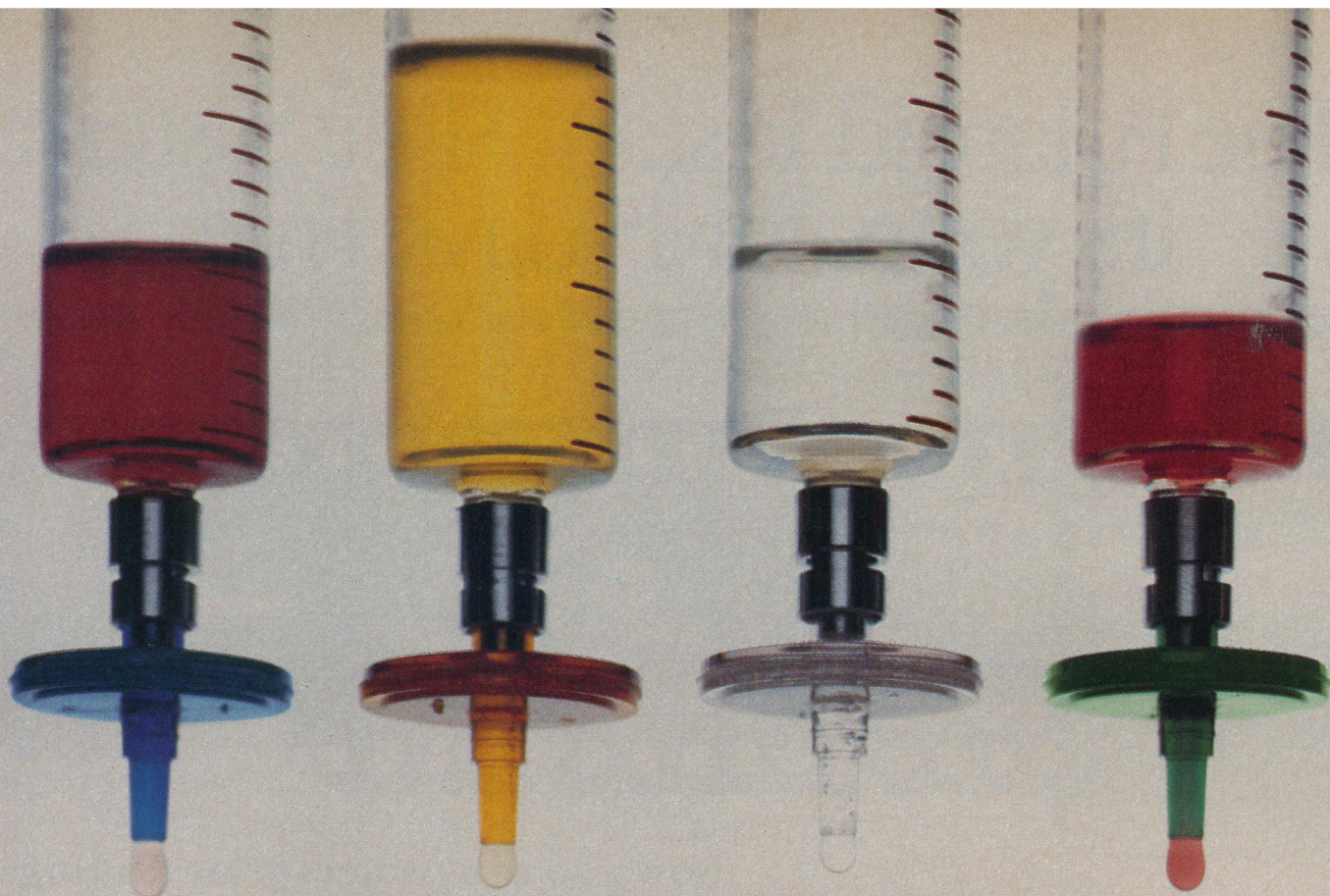
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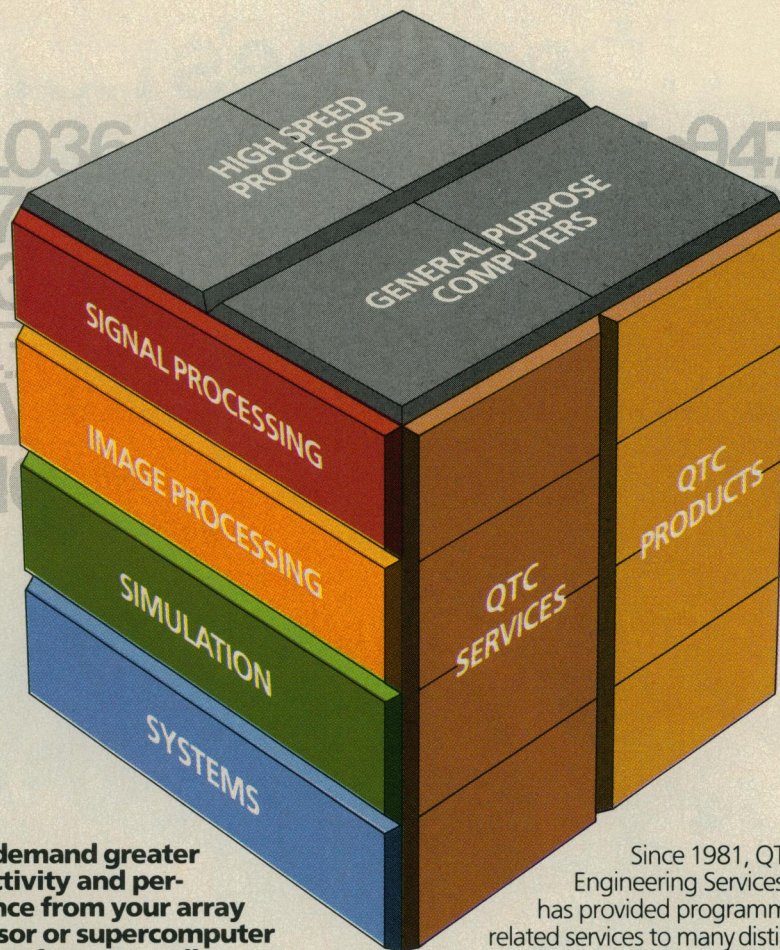
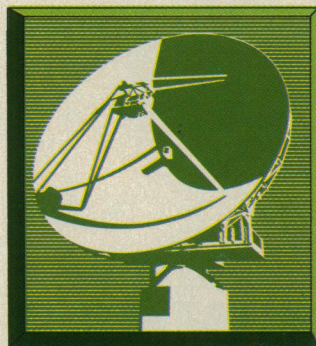
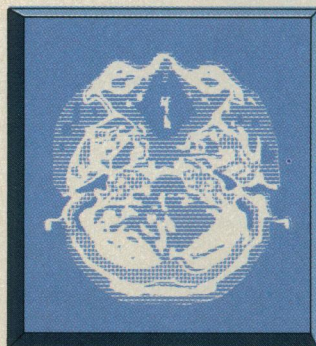
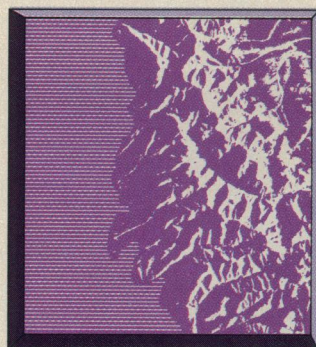
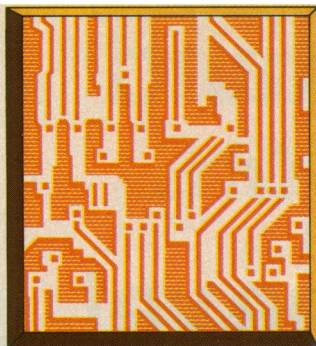
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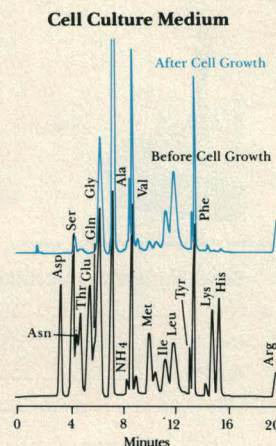


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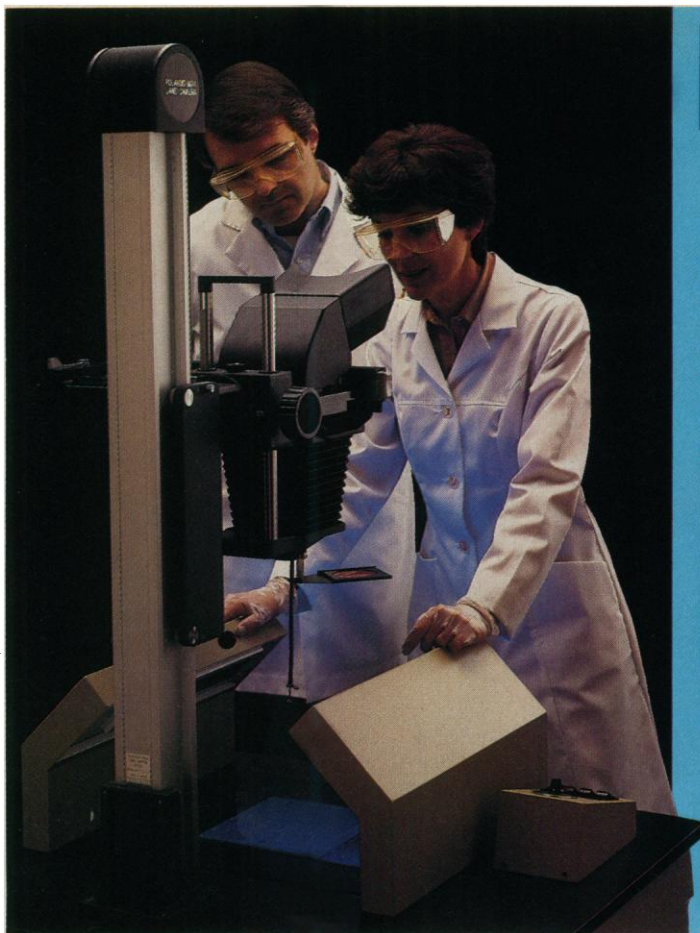
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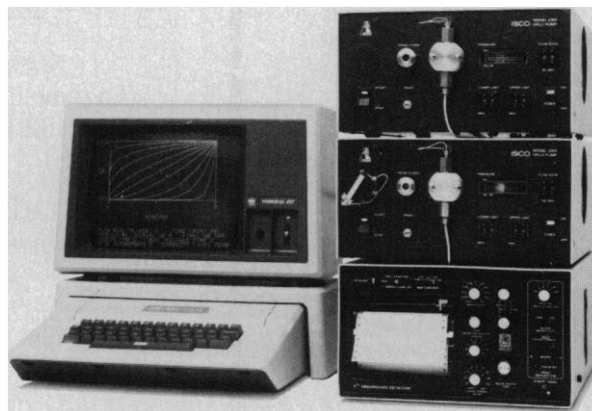
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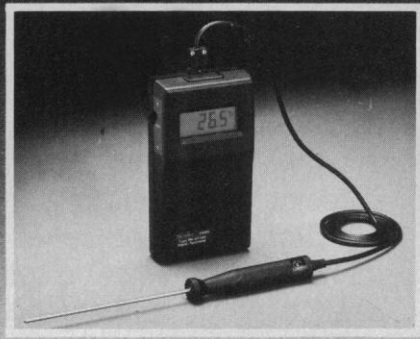
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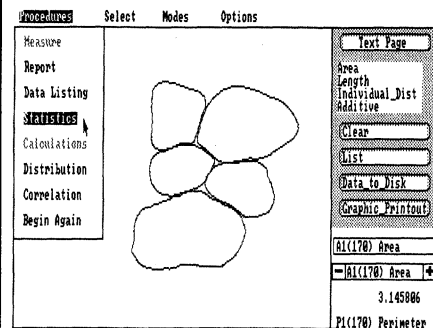
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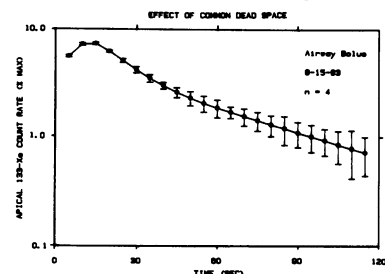
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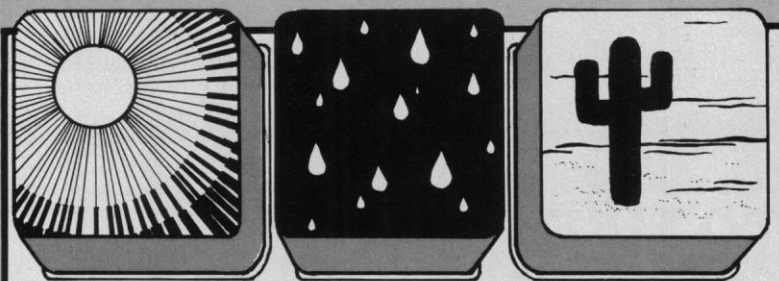
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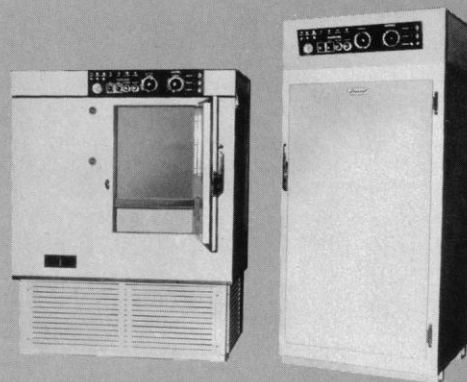
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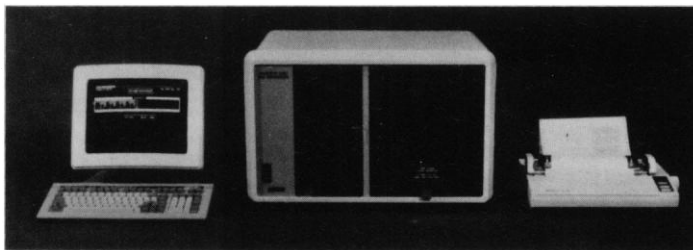


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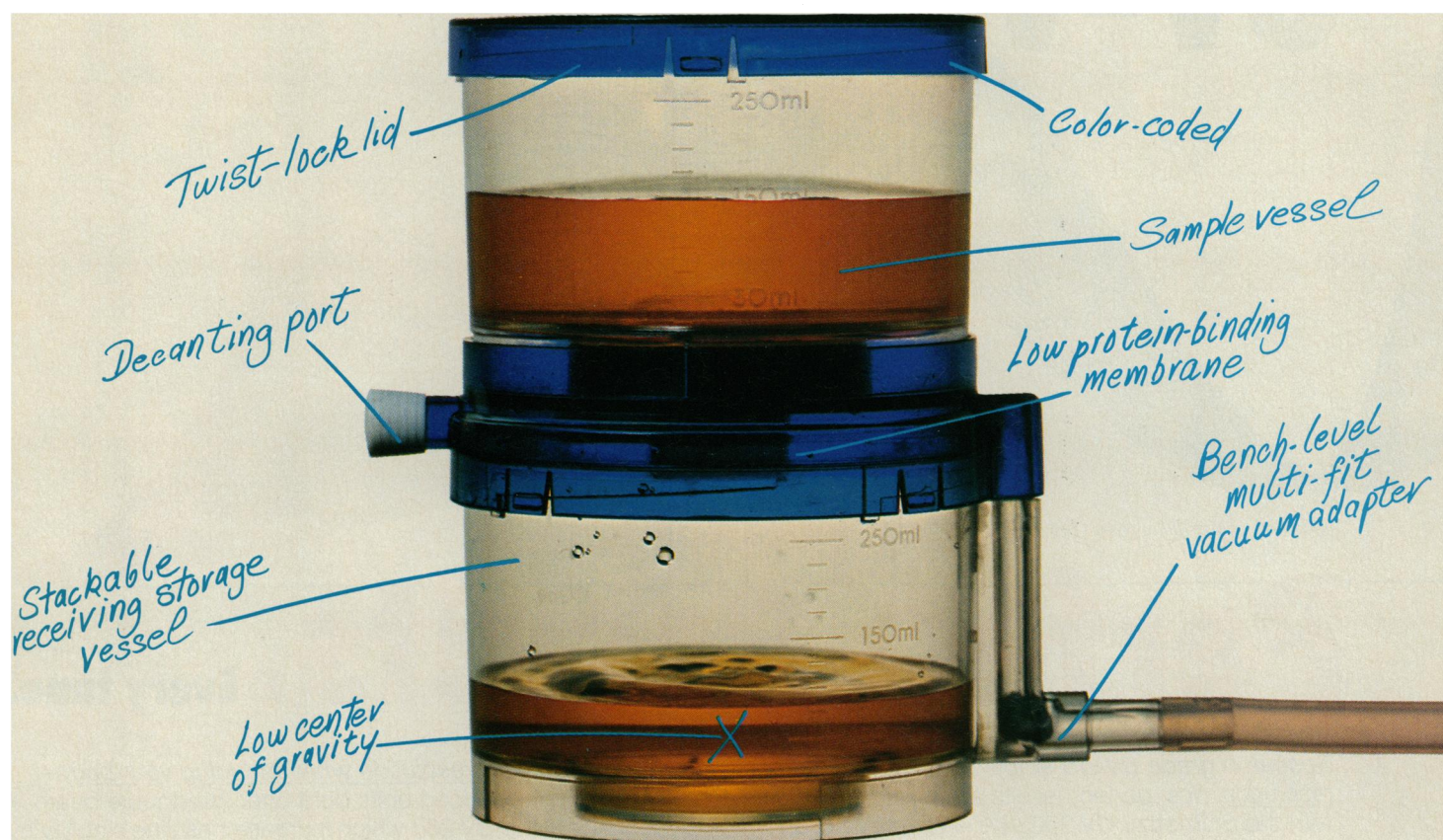
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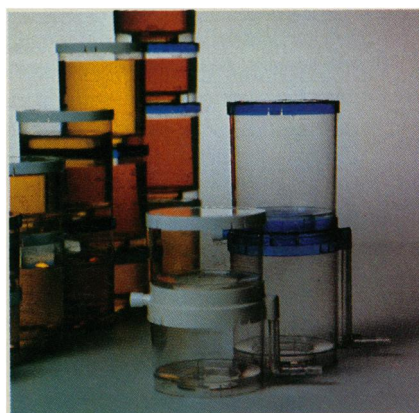
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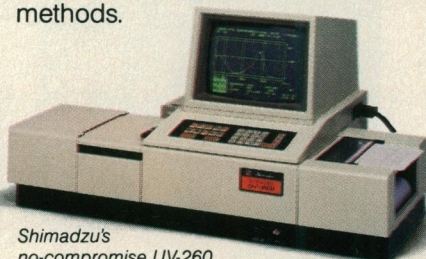
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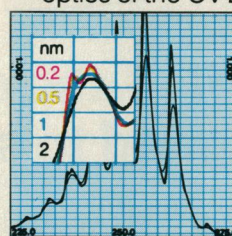
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**The Grizzlies of Mount McKinley.** Adolph Murie. University of Washington Press, Seattle, 1985. xviii, 251 pp., illus. Paper, \$9.95. Reprint, 1981 ed.

**Groups and Geometry.** Roger C. Lyndon. Cambridge University Press, New York, 1985. xii, 217 pp. Paper, \$19.95. London Mathematical Society Lecture Note Series, 101.

**Growth and Maturation Factors.** Vol. 3. Gordon Guroff. Wiley-Interscience, New York, 1985. xiv, 346 pp., illus. \$74.50.

**Growth, Cancer, and the Cell Cycle.** The Molecular, Cellular, and Developmental Biology. Philip Skehan and Susan J. Friedman, Eds. Humana, Clifton, N.J., 1984. xiv, 353 pp., illus. \$54.50. Experimental Biology and Medicine. From a conference, Banff, Canada, April 1984.

**Grundlagen der kybernetischen Evolution.** Eine neue Evolutionstheorie. Ferdinand Schmidt. Goecke & Evers, Krefeld, Germany, 1985. 500 pp. DM 168.

**Guide to Standard Floras of the World.** D. G. Frodin. Cambridge University Press, New York, 1985. xx, 619 pp. \$175.

**Guidelines for Drinking-Water Quality.** Vol. 2, Health Criteria and Other Supporting Information. World Health Organization, Geneva, 1984 (U.S. distributor, WHO Publications Centre USA, Albany, N.Y.). x, 335 pp. Paper, \$17.50.

**Handbook of Applied Meteorology.** David D. Houghton, Ed. Wiley-Interscience, New York, 1985. xviii, 1461 pp., illus. \$84.95.

**Handbook of Canadian Mammals.** Vol. 2, Bats. C. C. van Zyll de Jong. National Museum of Natural Sciences, Ottawa, Canada, 1985 (U.S. distributor, University of Chicago Press, Chicago). 212 pp., illus. Paper, \$19.95.

**Handbook of Charcoal Making.** The Traditional and Industrial Methods. Walter Emrich. Published for the Commission of the European Communities by Reidel, Boston, 1983 (distributor, Kluwer, Hingham, Mass.). xvi, 278 pp., illus. \$39.50. Solar Energy R&D in the European Community, Series E, Energy from Biomass, vol. 7.

**Handbook of Discourse Analysis.** Vol. 2, Dimensions of Discourse. Teun A. van Dijk, Ed. Academic Press, Orlando, Fla., 1985. xviii, 279 pp., illus. \$53.50.

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**Mathematics and the Search for Knowledge.** Morris Kline. Oxford University Press, New York, 1985. viii, 257 pp. \$19.95.

**The Media, Social Science, and Social Policy for Children.** Eli Rubinstein and Jane D. Brown, Eds. Ablex, Norwood, N.J., 1985. xvi, 240 pp. \$32.50. Child and Family Policy, vol. 5.

**Medical Rehabilitation.** Lauro S. Halstead, Martin Grabois, and Carol A. Howland, Eds. Raven, New York, 1985. xiv, 354 pp., illus. \$55.

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**Methods of Satellite Oceanography.** Robert H. Stewart. University of California Press, Berkeley, 1985. viii, 360 pp., illus., + plates. \$38.50. Scripps Studies in Earth and Ocean Sciences.

**Microiontophoresis and Pressure Ejection.** T. W. Stone. Wiley-Interscience, New York, 1985. x, 214 pp., illus. \$54.95. IBRO Handbook Series, vol. 8.

**Microprocessors.** O. A. R. Cornillie. Pergamon, New York, 1985. x, 442 pp., illus. \$80. EPO Applied Technology Series.

**Modern Science and Human Values.** William W. Lowrance. Oxford University Press, New York, 1985. xiv, 250 pp. \$24.95.

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**The Physiology and Biochemistry of Plant Respiration.** J. M. Palmer, Ed. Cambridge University Press, New York, 1985. x, 195 pp., illus. \$59.50. Society for Experimental Biology Seminar Series, 20.

**Platelet Membrane Glycoproteins.** James N. George, Alan T. Nurden, and David R. Phillips, Eds. Plenum, New York, 1985. xx, 419 pp., illus. \$59.50.

**The Political Economy of Growth.** Dennis C. Mueller, Ed. Yale University Press, New Haven, Conn., 1985. viii, 285 pp. Paper, \$9.95. Reprint, 1983 edition.

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ington, D.C., 1985. x, 446 pp., illus. \$79.95. ACS Symposium Series, 280. From a symposium, St. Louis, Mo., April 1984.

**The Polysaccharides.** Vol. 3. Gerald O. Aspinall, Ed. Academic Press, Orlando, Fla., 1985. xiv, 473 pp., illus. \$85. Molecular Biology.

**Potential for Field Beans (*Phaseolus vulgaris* L.) in West Asia and North Africa.** Centro Internacional de Agricultura Tropical, Cali, Colombia, 1985. iv, 143 pp., illus. Paper, \$9.50. From a workshop, Aleppo, Syria, May 1983.

**Power Semiconductors.** M. Kubát. Springer-Verlag, New York, 1984. xxvi, 507 pp., illus. \$39. Translated from the Czech edition.

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**Tropical Rain-Forest.** The Leeds Symposium. A. C. Chadwick and S. L. Sutton, Eds. Leeds Philosophical and Literary Society, Leeds, England, 1984. xvi, 335 pp., illus. \$50.

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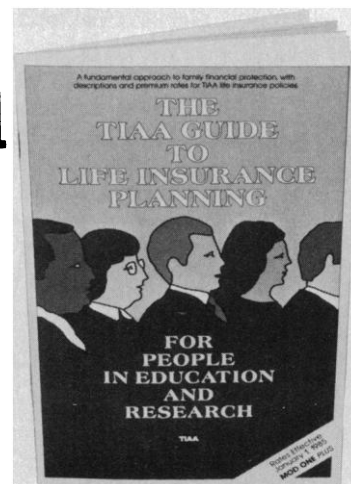
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**Works of Man.** Ronald W. Clark. Viking, New York, 1985. 352 pp., illus. \$24.95.

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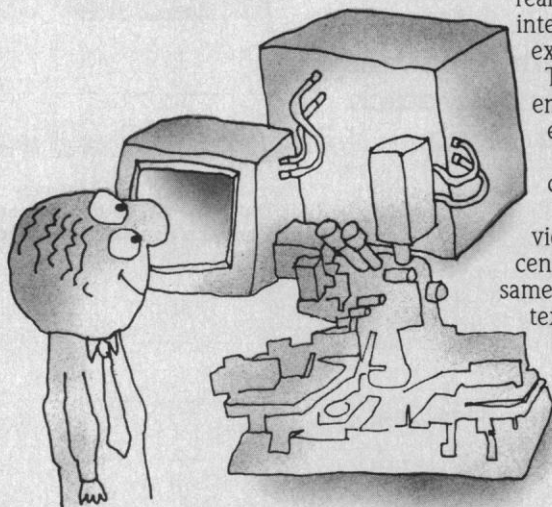
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COLLEGES AND UNIVERSITIES**

The National Institutes of Health (NIH) announces a second opportunity for submission of grant applications for the support of health-related research projects proposed by investigators in baccalaureate degree granting institutions.

Academic Research Enhancement Awards (AREAs) provide funding for feasibility studies, pilot studies and other small-scale research projects. Awards are made in amounts of up to \$50,000 in direct costs (plus applicable indirect costs) for periods not to exceed 24 months.

**Eligibility Criteria:**

Eligible institutions are those that offer baccalaureate degrees in the sciences related to health but did not receive an NIH Biomedical Research Support Grant (BRSG) in FY 1985.

Eligible investigators are those who, at the time of award of an AREA grant, neither have active support from NIH/ADAMHA (Alcohol, Drug Abuse, and Mental Health Administration) nor will be applying for competing continuation of such support. Applicants for AREAs are not eligible to submit a regular NIH or ADAMHA research grant application for essentially the same project.

**Award Criteria:**

Funding decisions are based on the research project's scientific merit and relevance to NIH programs, and the institution's contribution to the undergraduate preparation of doctoral-level health professionals. Among projects of essentially equivalent scientific merit and program relevance, preference will be given to those submitted by institutions that have granted baccalaureate degrees to 25 or more individuals who, during the period 1977-1984, obtained academic or professional doctoral degrees in the health related sciences.

**APPLICATION RECEIPT DATE**

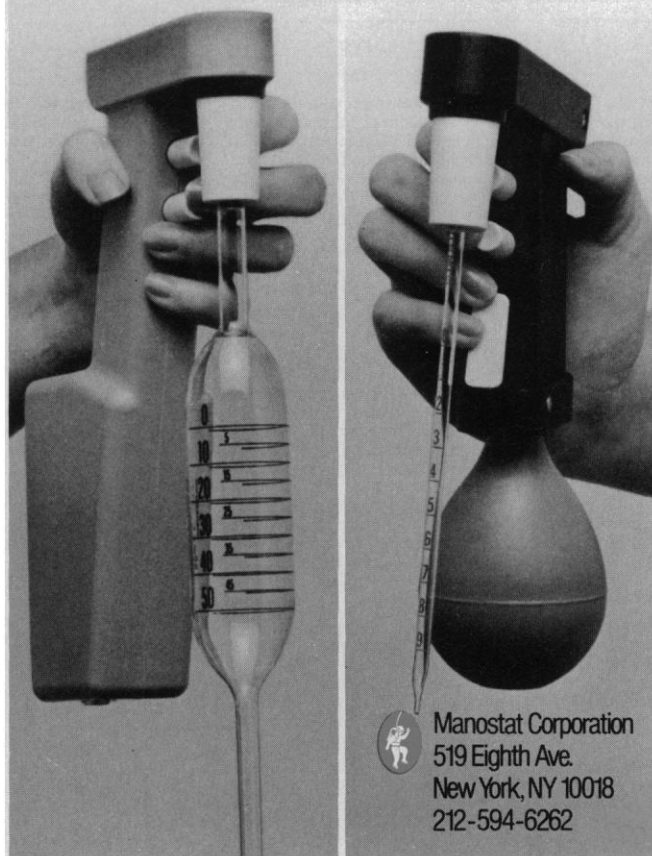
**January 15, 1986**

Anticipated Number of Awards: Up to 75 grants

For information and application materials, contact:

**Office of Grant Inquiries  
Division of Research Grants  
National Institutes of Health  
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Bethesda, Maryland 20892  
(301) 496-7441**

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