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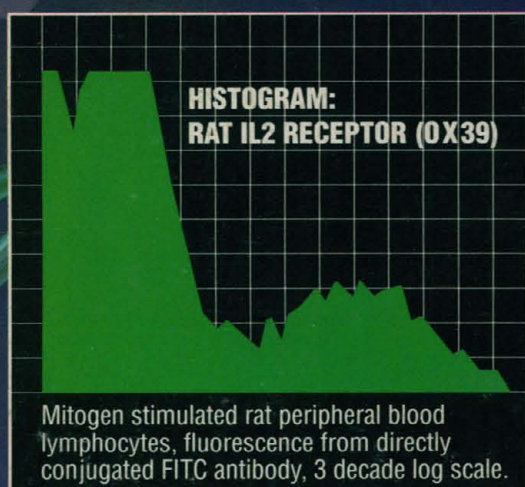
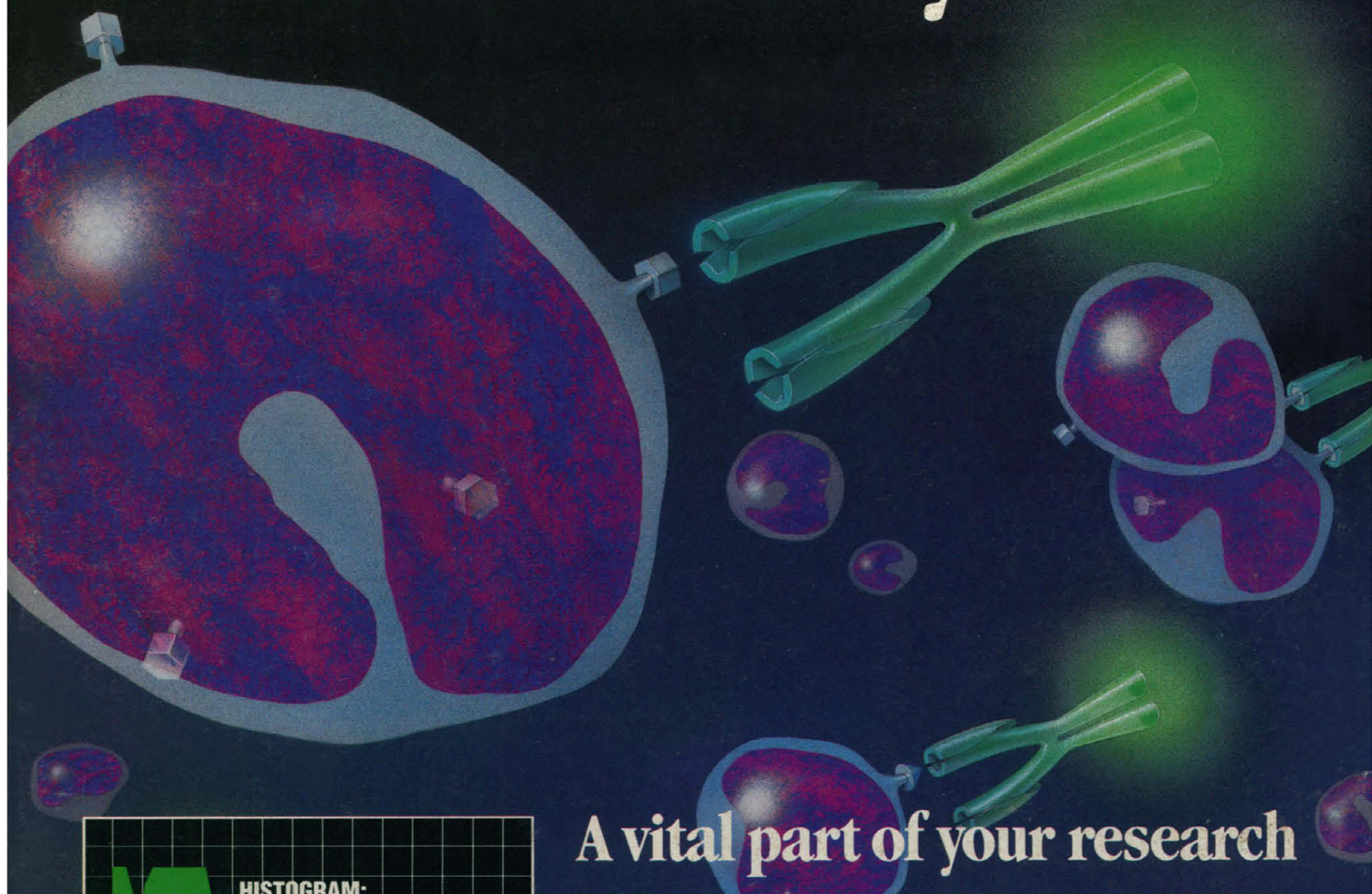
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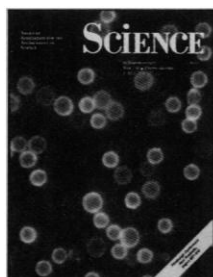
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**COVER** Subsets of developing T lymphocytes from a mouse, stained with fluorescently labeled monoclonal antibodies against the membrane glycoproteins, CD4 and CD8 ( $\times 2800$ ). Helper T cells (orange, CD4<sup>+</sup>), cytotoxic and suppressor T cells (green, CD8<sup>+</sup>), and immature blast cells and their progeny (yellow, CD4<sup>+</sup> and CD8<sup>+</sup>) each exhibit a characteristic pattern of ion-channel expression. See page 771. [Richard S. Lewis, University of California, Irvine 92717]

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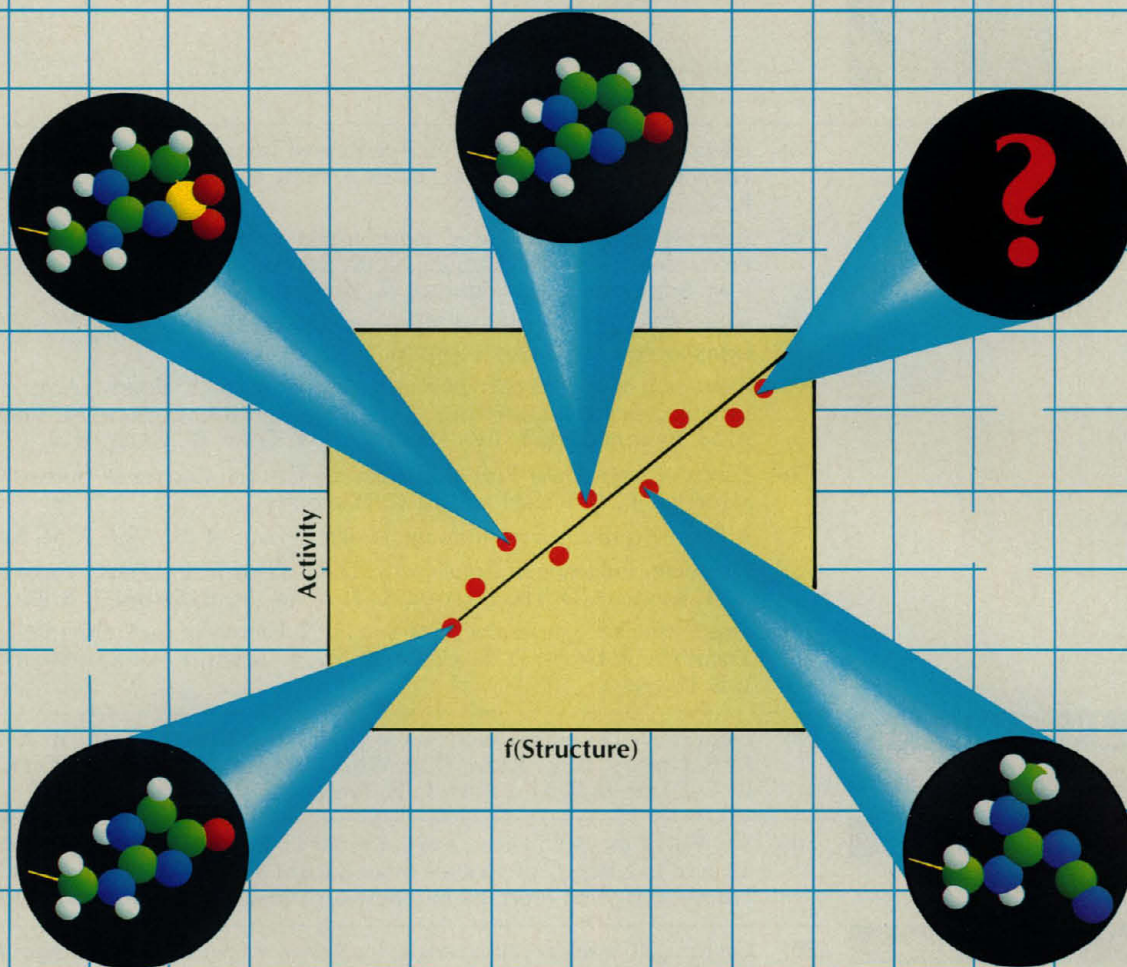
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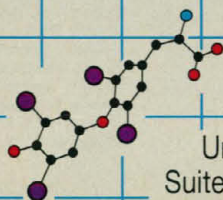
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## This Week in SCIENCE

### Family ties in the animal kingdom

**P**HYLOGENETIC trees that illustrate relations among the multicellular animals have acquired some new and different branch points as a result of comparisons of sequences of 18S ribosomal RNA molecules (page 748). Field *et al.* describe the strengths and limitations inherent in the ribosomal RNA sequencing method. One example of the power of this methodology over others is that suspected instances of convergent evolution can be ruled out with surety for pairs of organisms in which the 18S ribosomal RNA is found to be closely related. Branching patterns inferred from the large molecular study—ribosomal RNA was analyzed from individuals in 22 classes of 10 animal phyla—were compared and contrasted with those derived from morphologic data, embryologic data, and data from the fossil record. Under molecular scrutiny, many of the classically derived phylogenetic relations have withstood the test of time, but others appear to require recasting.

### Protein anchor structure

**S**OME proteins are held in cell membranes by a glycosyl-phosphatidylinositol (G-PI) anchor (page 753). The complete chemical structure of one G-PI is now known. Ferguson *et al.* combined chemical, biochemical, and analytical methods to obtain the structure of the G-PI of *Trypanosoma brucei* (a protozoan parasite); this G-PI is attached to an abundant surface glycoprotein (the variant surface glycoprotein that represents about 10% of the total protein of the cell), and large quantities of G-PI were available for isolation and study. Some novel molecular linkages were found in this G-PI, making it likely that novel enzymes will be discovered in the pathway of G-PI synthesis, and some structural heterogeneity existed, particularly in the sequence of sugars. Knowledge of the structure of this G-PI should facilitate studies of how G-PI anchors are synthesized and then get attached (apparently

as a unit) to proteins and how the anchor functions both to hold proteins in membranes and to release them in response to external stimuli such as serum phospholipases. The extent to which structure is conserved can be determined by applying the same analytical methods to G-PIs isolated from other types of cells.

### Air pollutants and grassland dynamics

**A**TMOSPHERIC pollutants can accumulate in grassland canopies just as they collect in forest canopies (page 764). How two of Western Europe's most destructive air pollutants (ammonium and sulfur dioxide ions) affect grasslands in the Netherlands (which along with croplands cover 70% of the countryside) has recently been assessed. Measurements of total precipitating pollutants and of the fraction of each that reached the ground indicate that the ammonium ions are heavily assimilated into the canopy in exchange for other cations whereas the sulfur dioxide ions are not taken up by the canopy. In nutrient-poor soils, fast-growing plants were found to benefit more from the excess of ammonium ions than did slow growers; Heil *et al.* propose that eutrophication (the nutrient enrichment brought about by the available ammonium ions) rather than acidification (a direct consequence of the captured sulfur dioxide ions) is adding to the decline in species diversity, giving fast growing plants an added competitive advantage in the race for space among plants.

### Neonatal experiences and aging

**A**N animal's experiences as a newborn can affect its development and behavior throughout life, including the speed with which it ages (page 766). Meaney *et al.* compared the neuroanatomies, the biochemistries, and the behaviors of rats that had and had not been handled for 15 minutes a day during the first 3 weeks of life and

linked the early experiential differences to differences in release, suppression, and effects of glucocorticoids (GCs). Normally GCs are released during stress and bind to receptors in neurons and other types of cells; feedback control stops further steroid secretion (and lowers stress). Late in life, reduced numbers of GC receptors and neurons in the hippocampus (a region of the brain involved in learning and memory), impaired feedback control, and excessive GC secretion collectively induce cognitive impairments and other changes associated with the aging process. Rats that had been handled in the neonatal period had normal numbers of hippocampal neurons at 6 months of age but had extra receptors for GC; at 2 years, the handled rats retained these neurons and receptors whereas controls lost both. The lifelong availability in the handled rats of receptors for GC appears to have lowered the animals' lifetime exposure to circulating GC molecules and to GC's negative effects.

### Alpine reptile embryo fossil

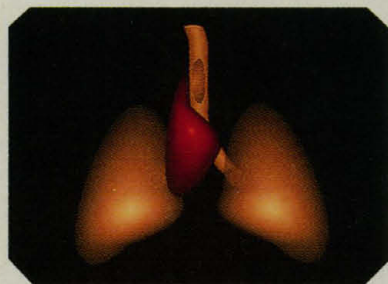
**T**HE bituminous shales from Monte San Giorgio in the Alps between Switzerland and Italy have yielded hundreds of reptile fossils; most of the specimens date from the Middle Triassic (about 230 million years ago) and are members of the species *Neusticosaurus*, a lizard-like animal that lived in warm shallow coastal waters and on land (page 780). The wealth of skeletons has made possible the cataloging of the developmental stages—hatchlings, juveniles, and adults—of this reptile and the identification of two sexes; a new, rare, and unusually small (51 millimeters long) specimen, labeled T 3705, is only two-thirds the size of the skeletons of *Neusticosaurus* hatchlings and has morphologic features consistent with its being the skeleton of a *Neusticosaurus* embryo. Sander points out that, although this recent discovery adds a piece to the puzzle of reptile ontogeny, the question of whether these animals laid eggs or gave birth to live offspring is still unresolved.



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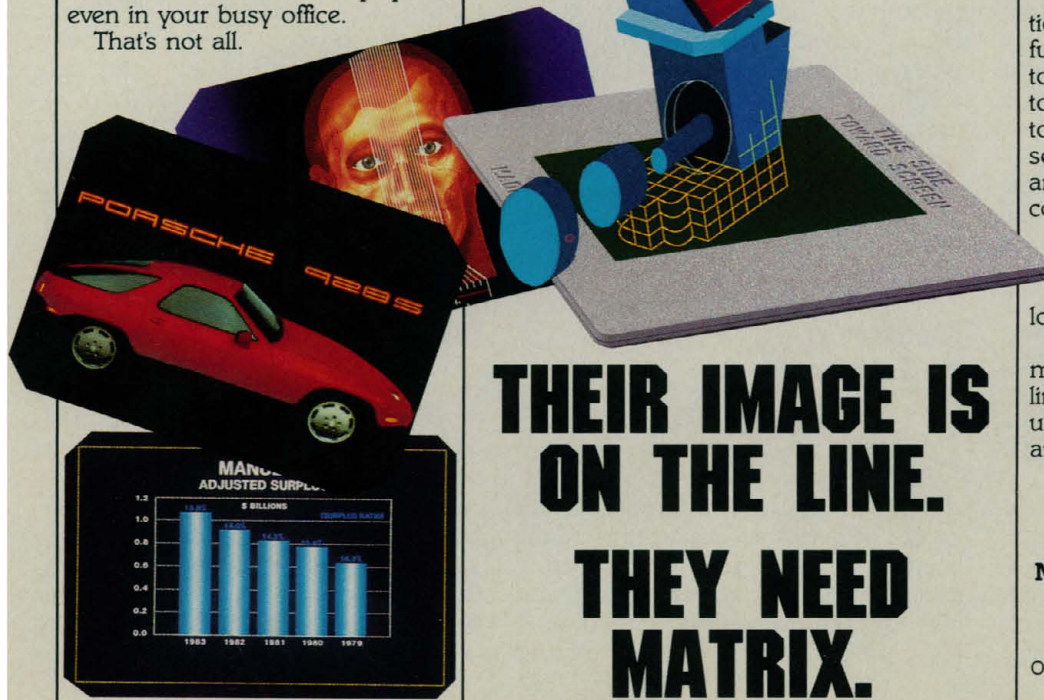


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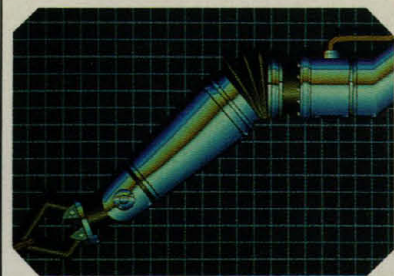
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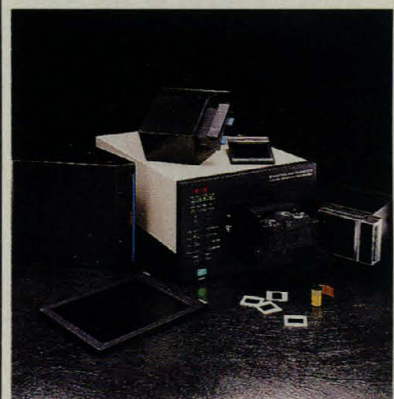
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## Science at the Four-Year and Master's Universities

The system of higher education in this country has gradually undergone a profound change from what existed a generation ago. Schools that were small teachers' colleges have metamorphosed into large comprehensive universities. They now offer broad curricula that include science and engineering. In general, they have few or no Ph.D. programs, but their faculties consist largely of professors who received their doctorates from research universities. The 601 comprehensive universities grant the majority of masters' degrees and about half of the baccalaureate degrees in this country. Their alumni are an expanding fraction of the students who complete the doctorate at research universities. They are increasingly active in cooperating with industry and in public service. They have important roles in the education of minorities, the economically disadvantaged, and late bloomers. If the scientific illiteracy of this country is to be ameliorated, they will be important partners in the effort.

The comprehensive universities vary in sponsorship and size. Some are private, but most (427) are state schools. The largest enrollment (35,000) is at San Diego State University. A minor fraction of the schools have succeeded in obtaining substantial funds for research through contracts and grants from industry, states, and the federal government. But most of the comprehensive universities, and especially the state schools, are handicapped in their functions of educating scientists and engineers. Typical teaching responsibilities average around 12 units. There are limited institutional funds for equipment, supplies, or travel. A relatively small number of their professors obtain federal grants. A National Science Board report\* outlining deficiencies in undergraduate education contained comments particularly applicable to many of the state schools:

*Laboratory instruction*, which is at the heart of science and engineering education, has deteriorated to the point where it is often uninspired, tedious, and dull. Too frequently it is conducted in facilities and with instruments that are obsolete and inadequate. . . .

*Faculty members* are often unable to update their disciplinary knowledge continuously or maintain their pedagogical skills. . . .

*Courses and curricula* are frequently out-of-date in content, unimaginative, poorly organized for students with different interests, and fail to reflect advances in the understanding of teaching and learning.

Lack of equipment and inability to update their disciplinary knowledge are particularly frustrating to individuals who were indoctrinated in ways of the research universities. A substantial number of them have become deans, provosts, and presidents of comprehensive universities. In late January of this year, some of them from 27 states participated in a 3-day conference held in Long Beach, CA, and entitled "Science Research in the Comprehensive University," organized by the Chancellor's Office of California State University.

The conference included plenary talks and working sessions designed to lead to a document stating the case for enhanced support of research for these institutions. Among the speakers was Representative George E. Brown, Jr. (D-CA), who is an influential member of many of the top science-related committees. In a lecture he said, "All parts of the educational system should not have identical roles, but research should not be confined to the research universities. Research is an integral part of education. Mere assimilation from authorities is sterile. Education that does not build on natural curiosity can never be education of the highest kind."

The National Science Foundation has established a number of programs, such as matching instrumentation grants, designed to help undergraduate science. But the sums allocated to them are small. The National Science Board report recommended substantial support for improvement of teaching of undergraduate science and engineering, and that should be implemented. The states also have responsibilities. The quality of education of their scientists and engineers will be enhanced if professors are provided with the circumstances that enable them to lead a life of learning. In pursuing their goal to integrate research and teaching more effectively, the comprehensive universities are on the right track. Their cause merits support.—PHILIP H. ABELSON

\*National Science Board, "Undergraduate Science, Mathematics and Engineering Education" (Washington, DC, March 1986).

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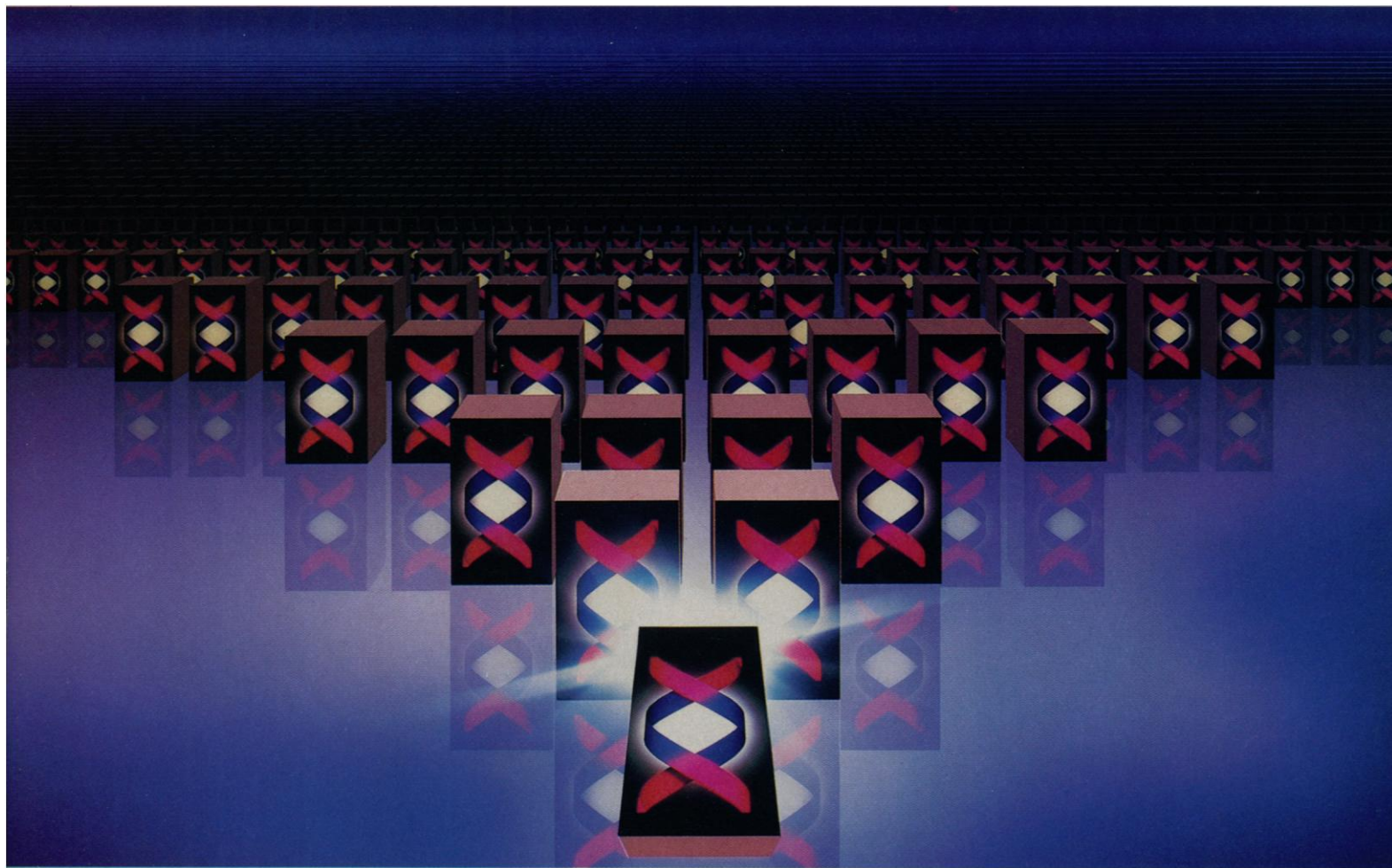
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\*PCR is covered by U.S. Patent Nos. 4,683,195 and 4,683,202 issued to The Cetus Corporation. Patents pending on *Taq* Polymerase and its use. Patents in Europe and Japan applied for.

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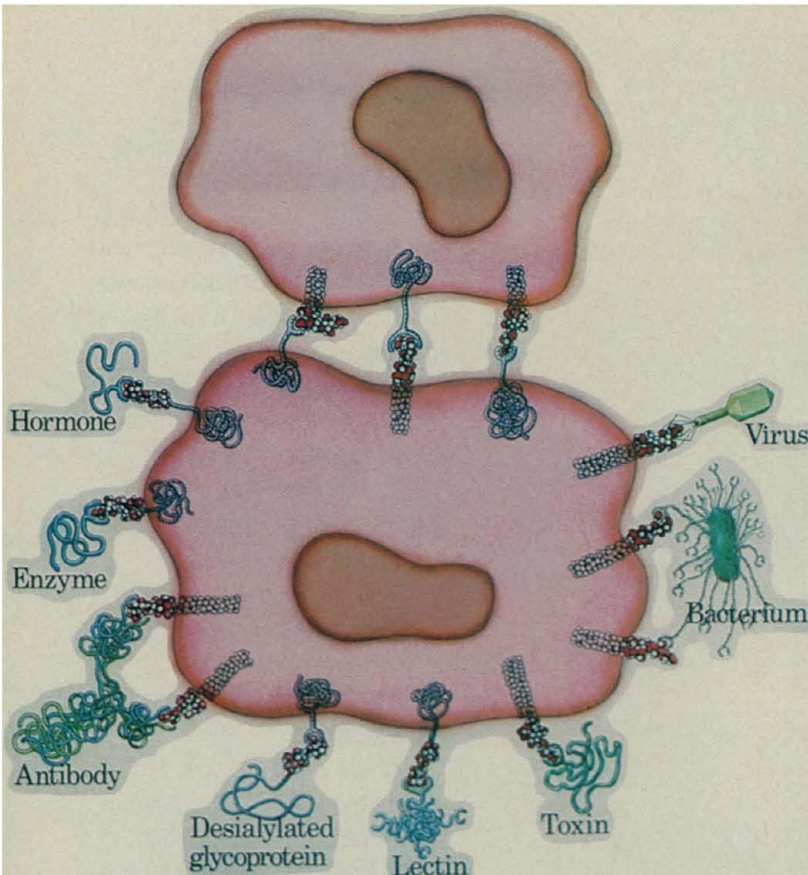


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**PROGRAM**

- |  |            |  |           |
|--|------------|--|-----------|
| • <b>Welcome and Opening Remarks</b>   | 9:00 A.M.  | • <b>Coffee Social</b>   | 2:30 P.M. |
| • <b>"Asymmetric C-C Bond Forming Reactions"</b>   | 9:15 A.M.  | • <b>"Flexibility and Rigidity, Requirements for the Function of Proteins and Protein Pigment Complexes"</b> | 3:00 P.M. |
| Professor Albert I. Meyers (Colorado State University)                                       |            | Professor Robert Huber (Max-Planck Institute, Munich)  |           |
| • <b>Coffee Social</b>   | 10:15 A.M. | • <b>"Studies in Asymmetric Synthesis"</b>   | 4:00 P.M. |
| • <b>"Pharmacologic Intervention Against HIV" (AIDS Virus): An Optimist's Point of View"</b> | 10:45 A.M. | Professor David A. Evans (Harvard University)  |           |
| Dr. Samuel Broder (National Cancer Institute)  |            | • <b>Wine and Cheese Social</b>  | 5:00 P.M. |
| • <b>Lunch</b>   | 11:45 A.M. |  |           |
| • <b>"New Approaches Toward the Design of Biological Catalysts"</b>                          | 1:30 A.M.  |  |           |
| Professor Peter G. Schultz (University of California, Berkeley)                              |            |  |           |

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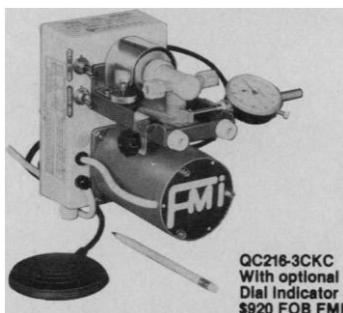
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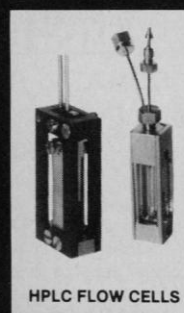
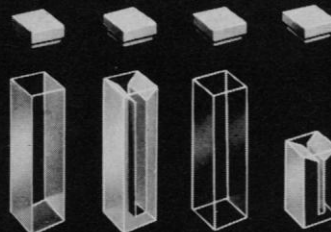
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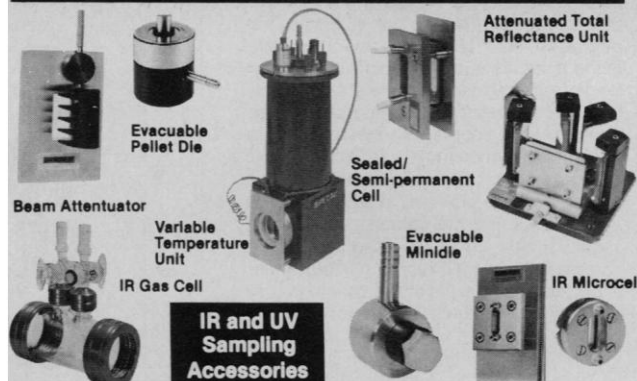
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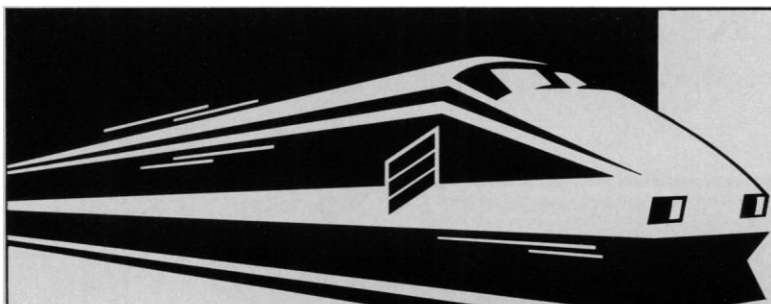
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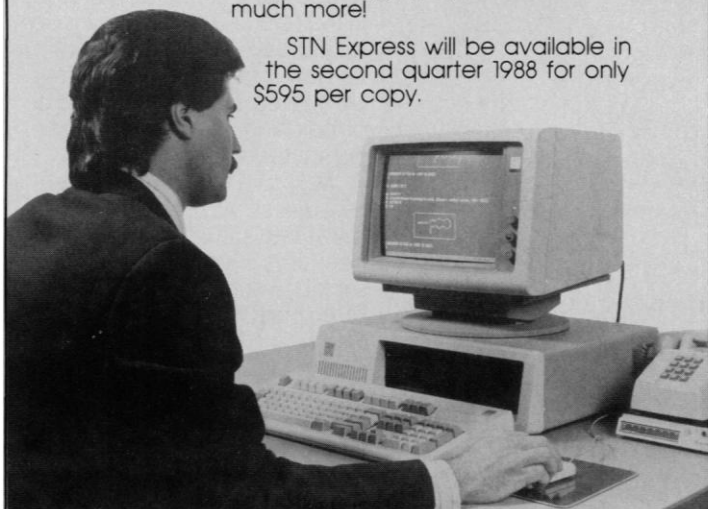
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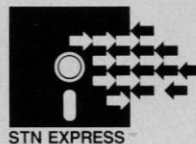
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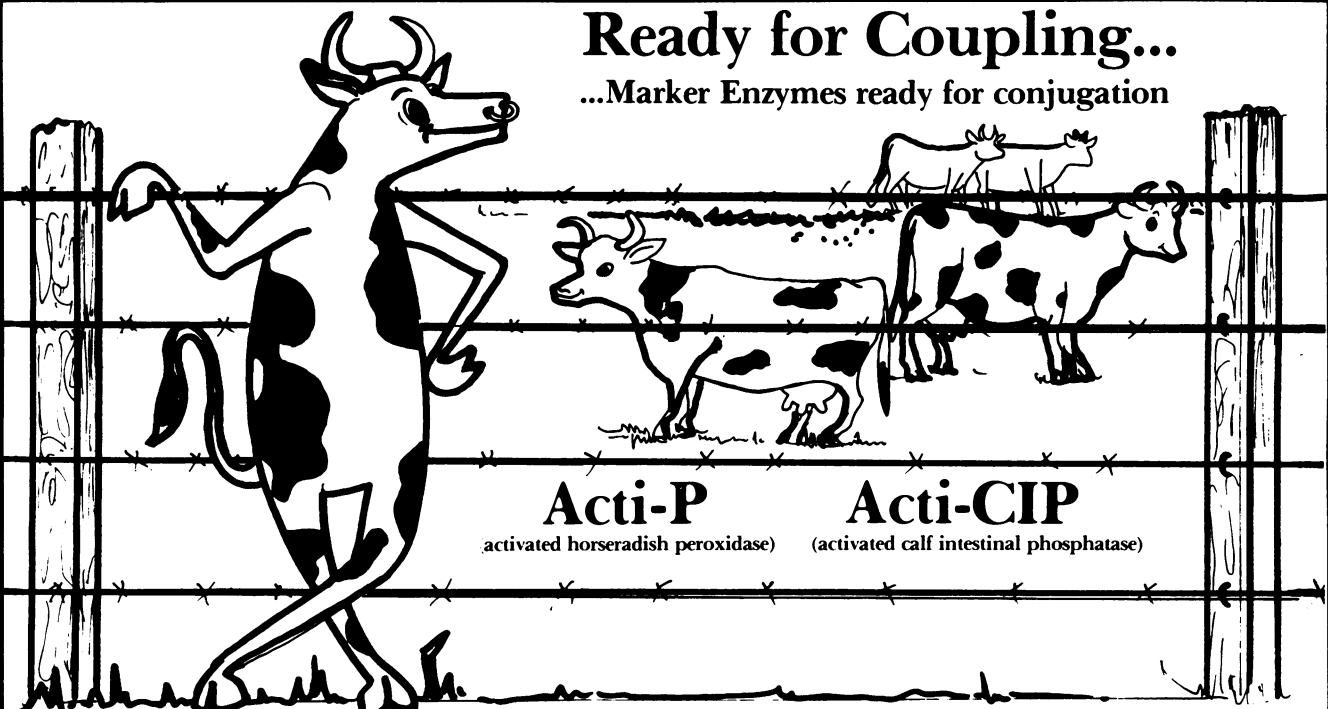
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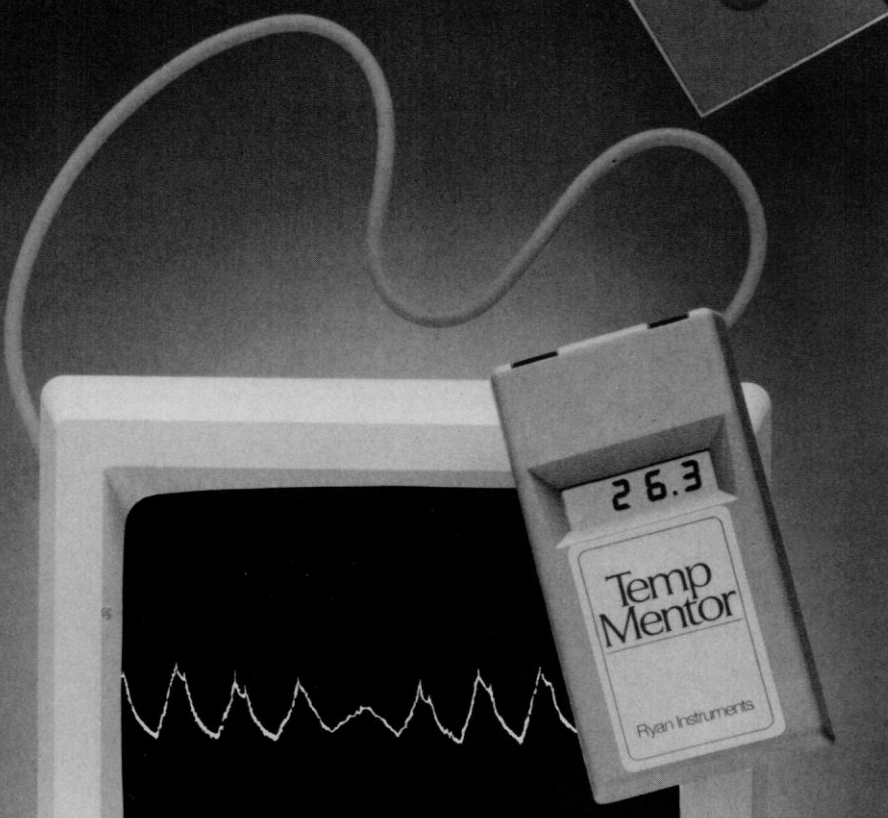
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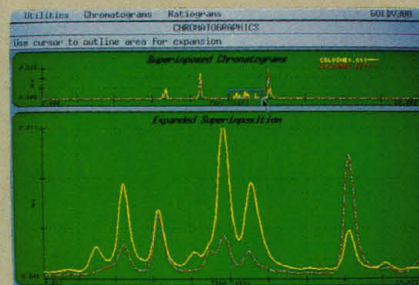
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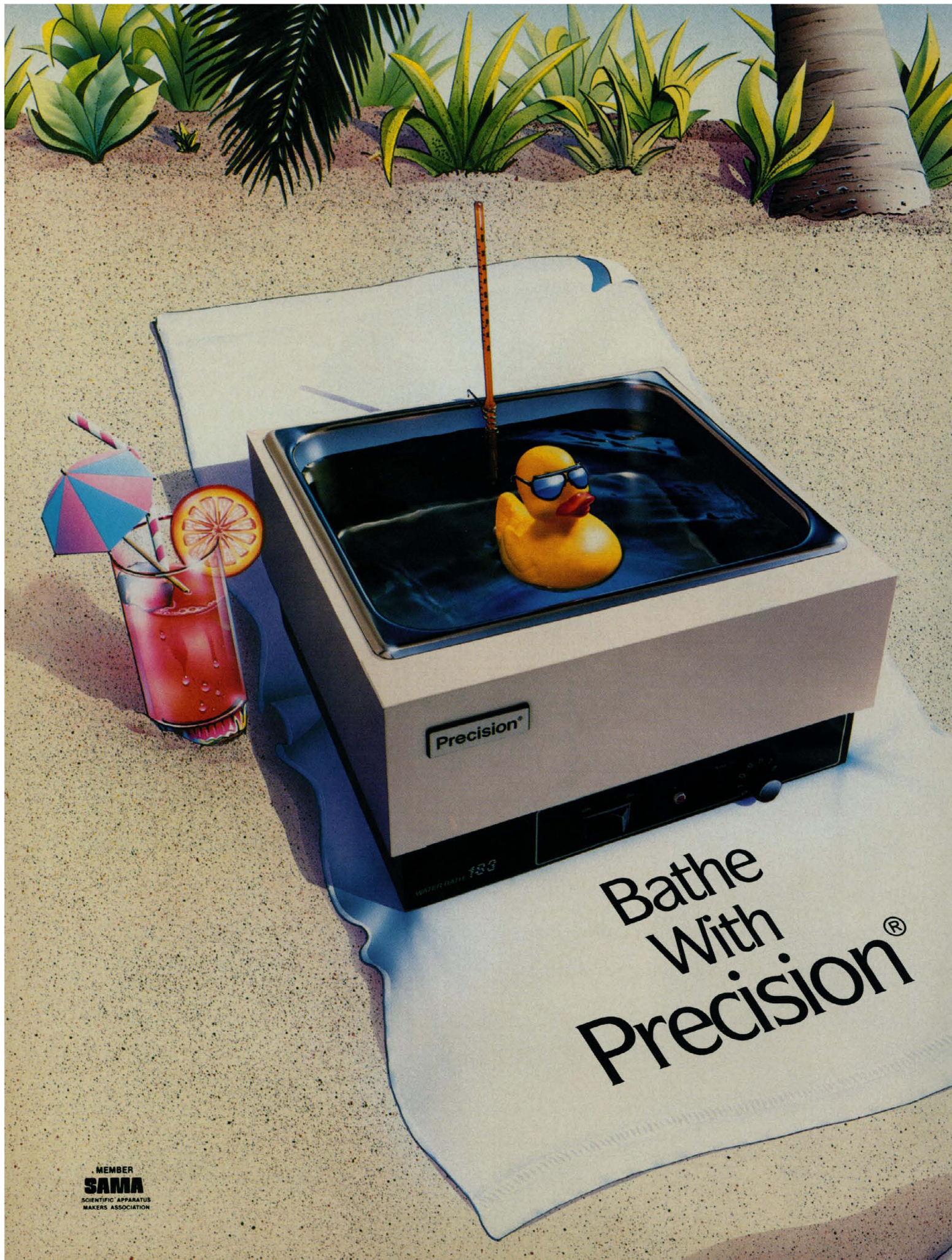
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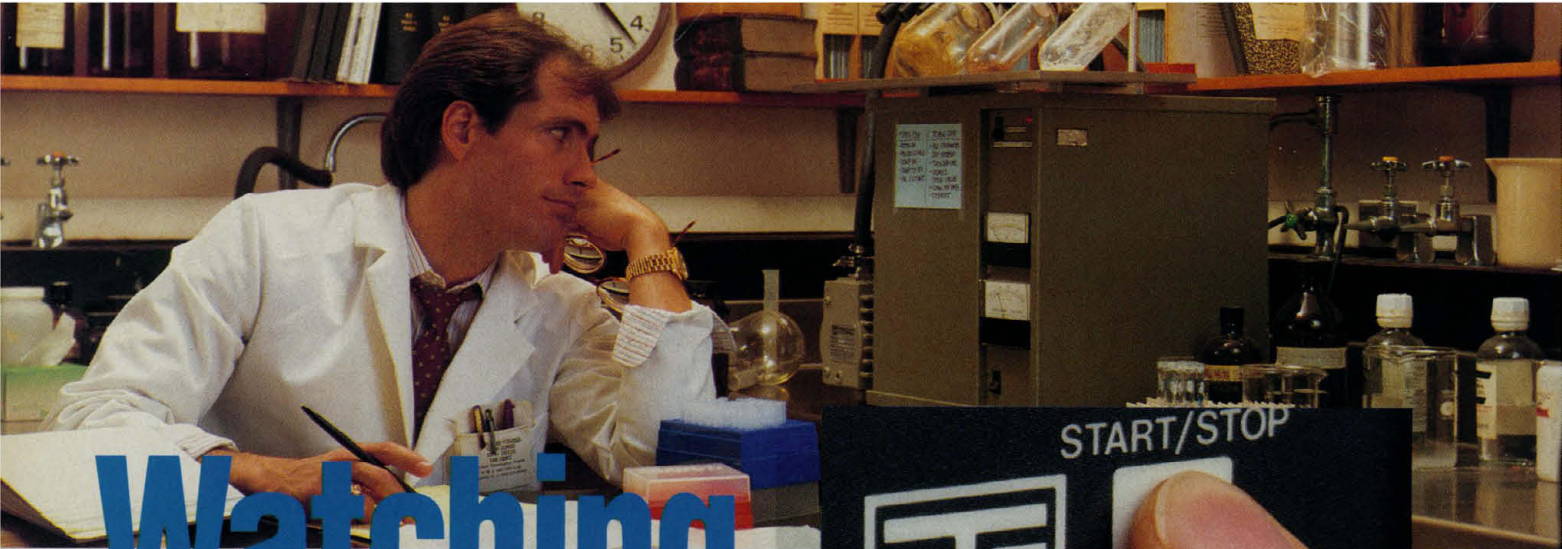
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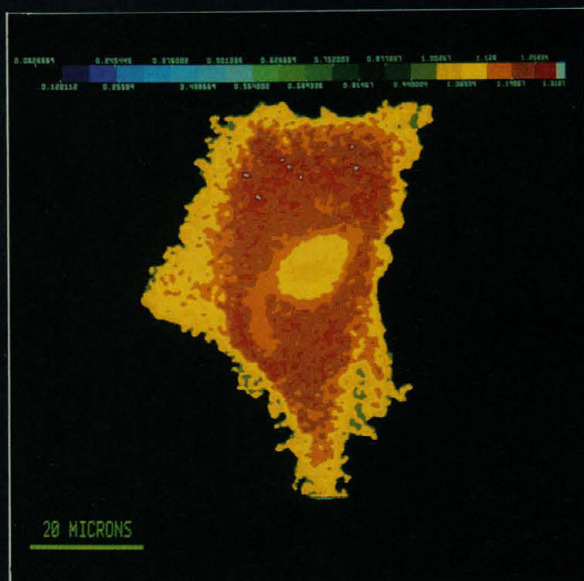
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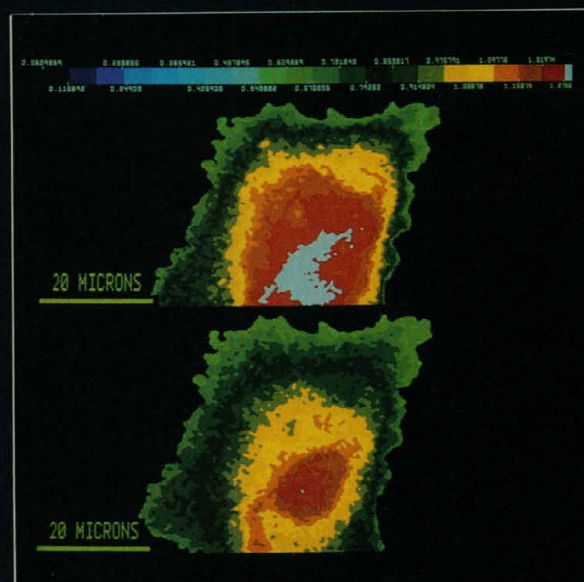
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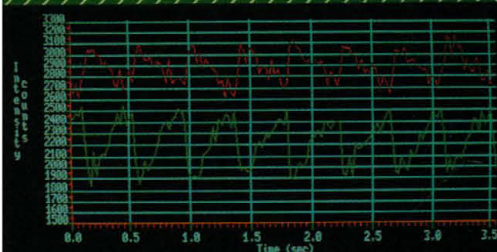
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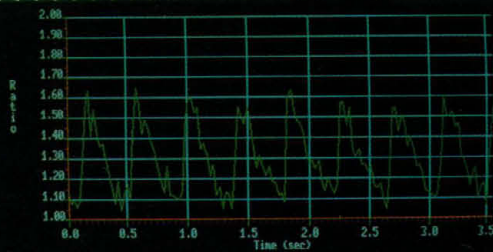
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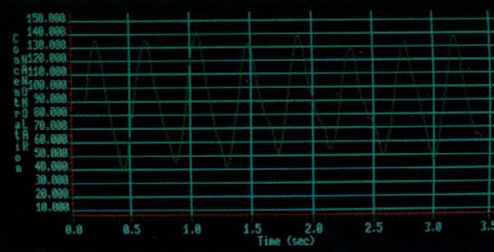
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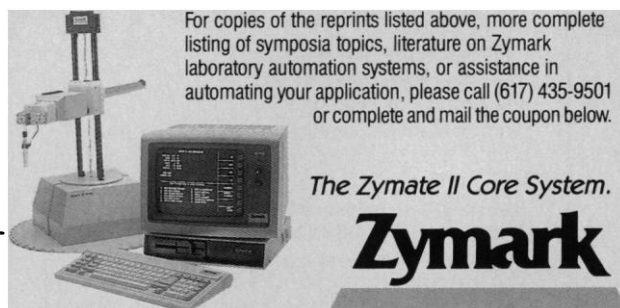
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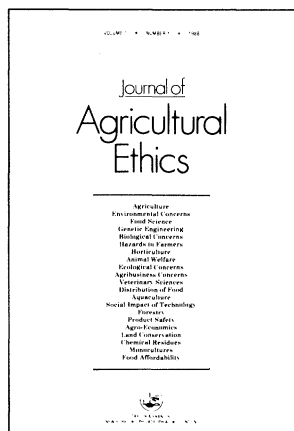
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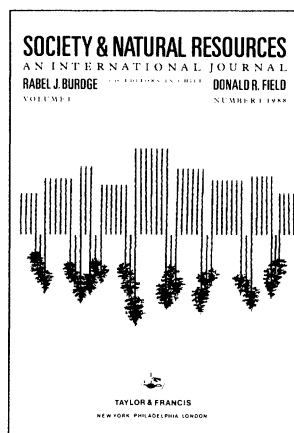
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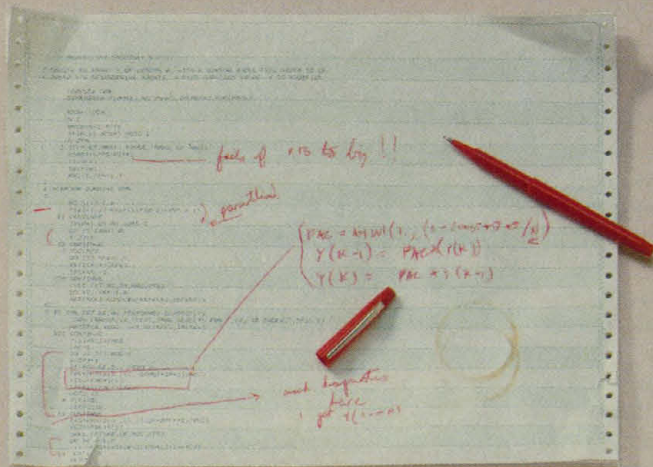
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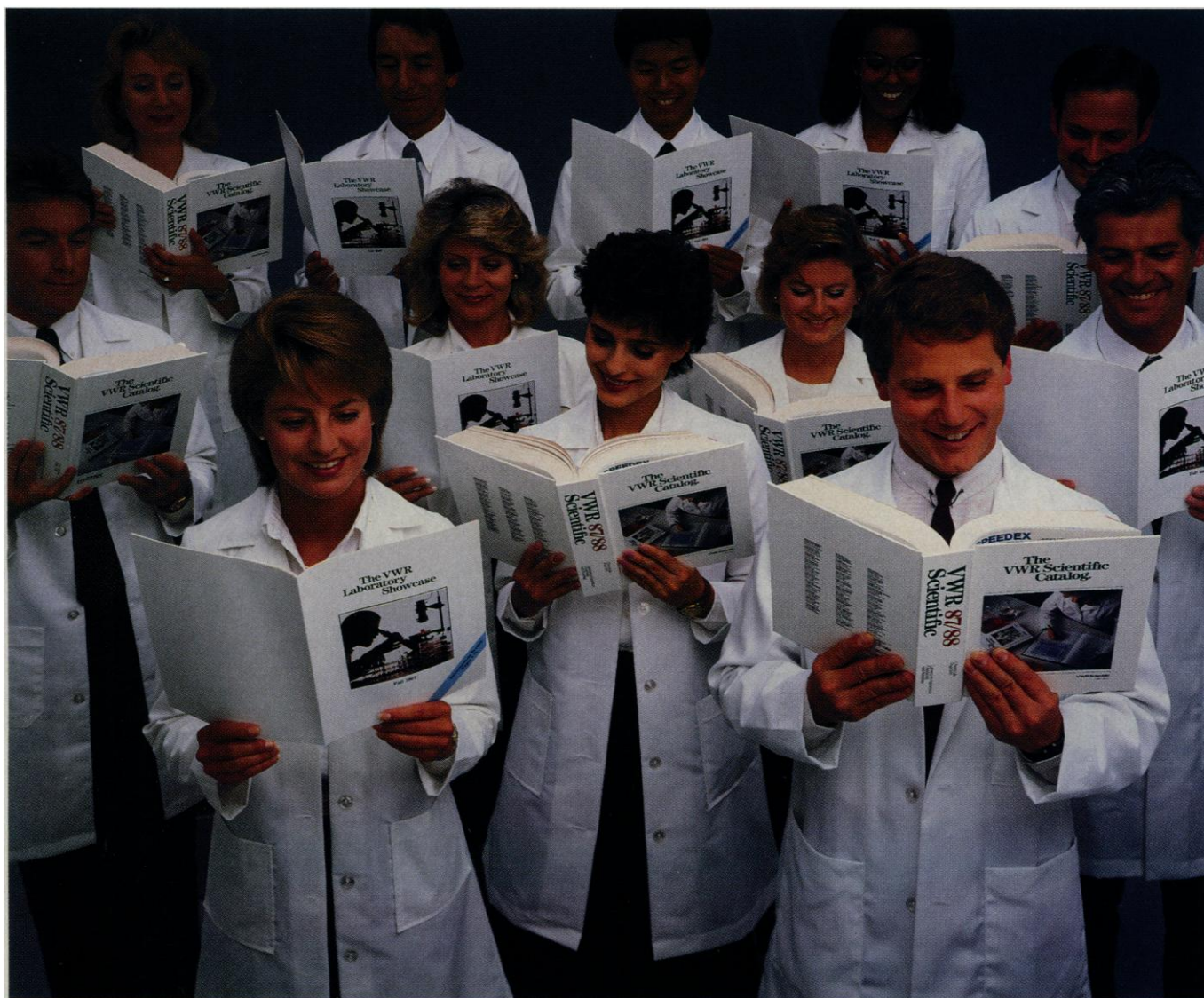
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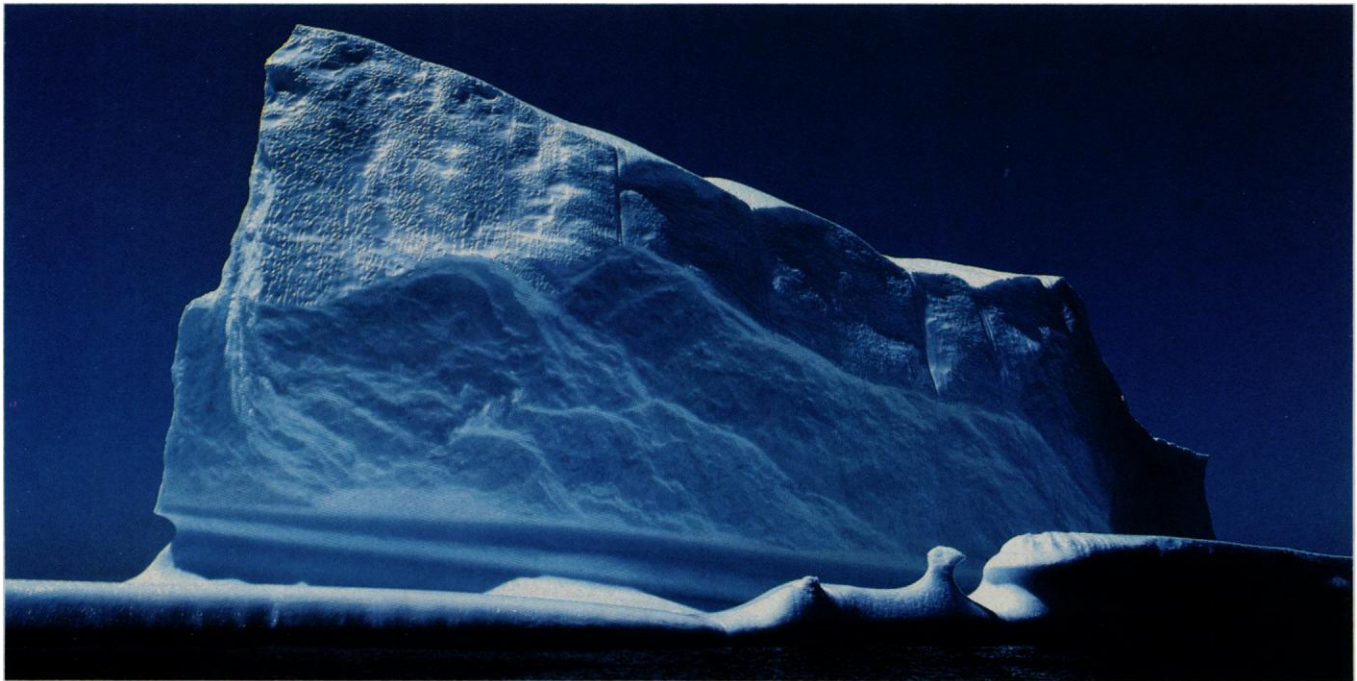
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