American Association for the Advancement of Science

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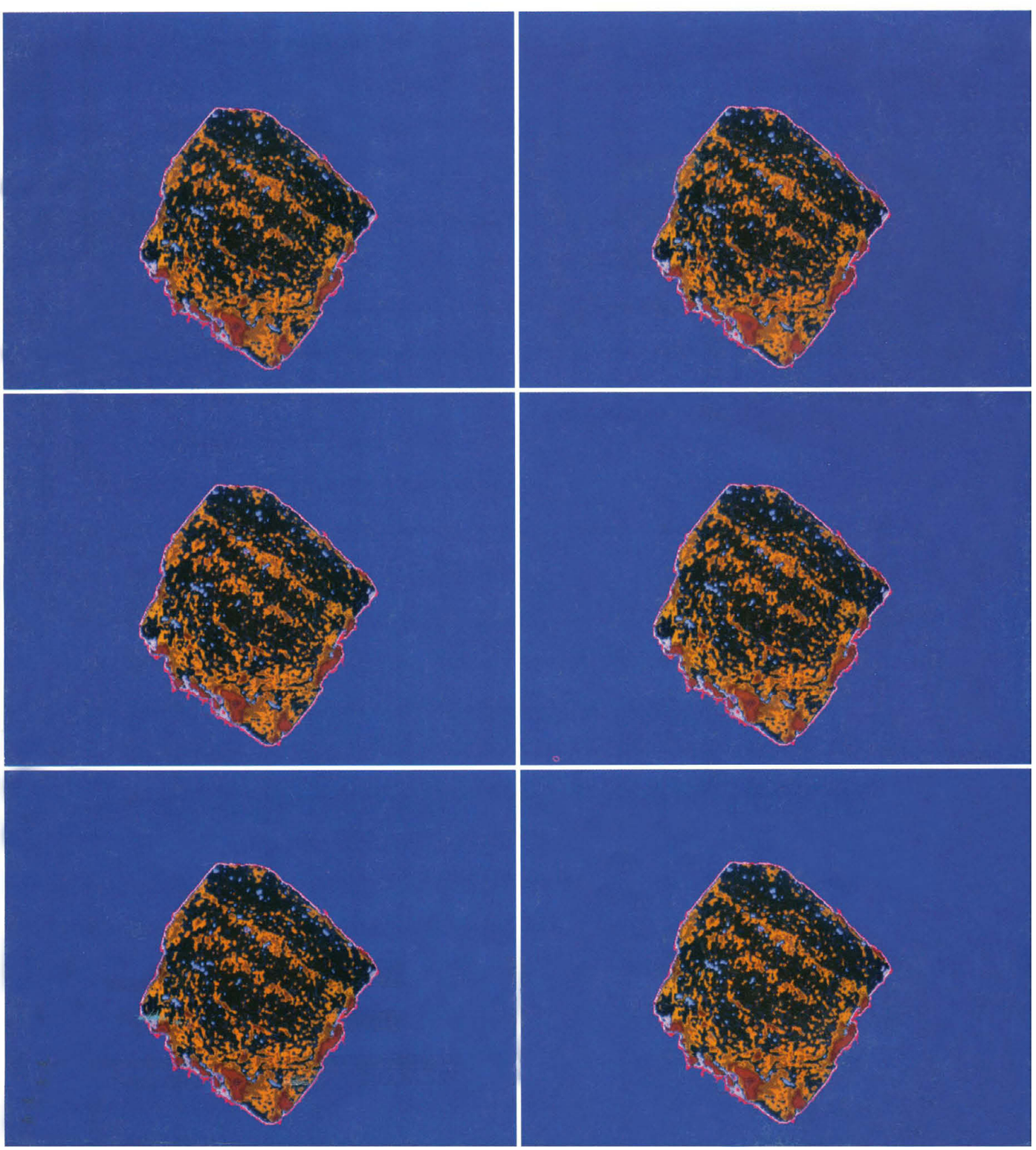

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SCIENCE

ISSN 0036-8075
18 SEPTEMBER 1987
VOLUME 237
NUMBER 4821

1395 This Week in *Science*

Editorial

1397 The DNA Dragon 1

Letters

1399 Cost of International Congresses: C. SCHUBERT ■ Risk Assessment: E. K. SILBERGELD; B. N. AMES, L. S. GOLD, R. MAGAW; R. WILSON AND E. A. C. CROUCH

Policy Forum

1401 A Competitive R&D Strategy for U.S. Agriculture: D. HOLT

News & Comment

1403 A $30-Billion Space Station?
1404 Federal Report on Acid Rain Draws Criticism
1406 Choppin Takes Reins at Howard Hughes
1408 A Close-Up Look at a Secret Soviet Radar
1410 The Odyssey of a Brochure on AIDS

Research News

1411 Human Genome: Questions of Cost
1413 Assessing the Risks of Microbial Release
1415 Microbes In or Near Field-Testing

Articles

1439 Three-Dimensional X-ray Microtomography: B. P. FLANNERY, H. W. DECKMAN, W. G. ROBERGE, K. L. D'AMICO
1445 The Cognitive Unconscious: J. F. KIHLSTROM
1452 After Insulin Binds: O. M. ROSEN

Research Articles

1459 Meiotic Recombination in Yeast: Alteration by Multiple Heterozygosities: R. H. BORTS AND J. E. HABER

Reports

1466 Refractory Interplanetary Dust Particles: M. E. ZOLENSKY
1468 Oxygen Isotopes in Refractory Stratospheric Dust Particles: Proof of Extraterrestrial Origin: K. D. MCKEEGAN

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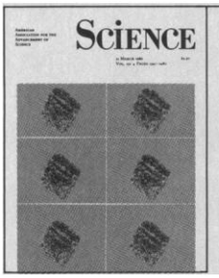

COVER Tomographic reconstruction of a planar section (0.5 millimeter) of a sample of Illinois no. 6 coal imaged on a grid of 512 by 512 pixels at a scale of 2.8 micrometers per pixel with synchrotron x-rays at 6.8 kiloelectron volts. False color highlights density fluctuations caused by features such as microscopic bedding planes and regions of enhanced iron (red) and sulfur (yellow). The image was obtained with a newly developed three-dimensional x-ray microtomography system that creates noninvasive images of the internal structure of small samples with resolution approaching 1 micrometer. See page 1439. [Corporate Research, Exxon Research and Engineering Company, Annandale, NJ 08801]

1471 A Simple Model for Neutrino Cooling of the Large Magellanic Cloud Supernova: D. N. SPERGEL, T. PIRAN, A. LOEB, J. GOODMAN, J. N. BAHCALL

1473 Differential Expression of c-*myb* mRNA in Murine B Lymphomas by a Block to Transcription Elongation: T. P. BENDER, C. B. THOMPSON, W. M. KUEHL

1476 Expression of an Exogenous Growth Hormone Gene by Transplantable Human Epidermal Cells: J. R. MORGAN, Y. BARRANDON, H. GREEN, R. C. MULLIGAN

1479 Uromodulin (Tamm-Horsfall Glycoprotein): A Renal Ligand for Lymphokines: C. HESSION, J. M. DECKER, A. P. SHERBLOM, S. KUMAR, C. C. YUE, R. J. MATTALIANO, R. TIZARD, E. KAWASHIMA, U. SCHMEISSNER *et al.*

1484 *Saccharomyces cerevisiae* Has a U1-Like Small Nuclear RNA with Unexpected Properties: P. G. SILICIANO, M. H. JONES, C. GUTHRIE

1487 A Sea Urchin Gene Encodes a Polypeptide Homologous to Epidermal Growth Factor: D. A. HURSH, M. E. ANDREWS, R. A. RAFF

1490 Acantharian Fluxes and Strontium to Chlorinity Ratios in the North Pacific Ocean: R. E. BERNSTEIN, P. R. BETZER, R. A. FEELY, R. H. BYRNE, M. F. LAMB, A. F. MICHAELS

AAAS Meetings

1510 *Forum '87: Students and Science Learning* ■ Advance Registration and Housing Form

Book Reviews

1515 The Launching of Modern American Science, 1846–1876, *reviewed by* L. D. STEPHENS ■ Victorian Anthropology, J. A. BOON ■ Satellites, J. S. LEWIS ■ Excitatory Amino Acid Transmission, A. MACDERMOTT ■ Books Received

Products & Materials

1519 Genetic Databases on Optical Disks ■ Colorimeter ■ Dideoxy Sequencing Enzyme ■ Electrophoresis Power Supply ■ Photomicrographic Instrument ■ Programming Language Pop-Up Help ■ Prepared Buffers for Electrophoresis ■ Entry-Level Color Plotters ■ Literature

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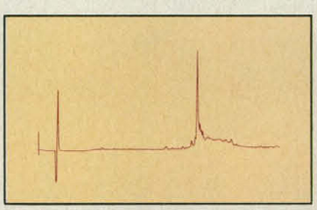
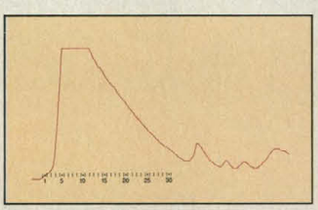


Analytical Screen of Crude Peptide



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This Week in
SCIENCE

Microtomography

THREE-dimensional x-ray microtomography is a new noninvasive technique for illustrating internal structure; images show internal density distributions and a map can be constructed of elements that have strong absorption features (page 1439). To generate the images, penetrating x-ray beams have been produced with conventional and synchrotron sources; data are obtained from many stacked coplanar sections simultaneously. The data are processed into a three-dimensional map by computers with extensive memory and graphical display capabilities. Whereas conventional computed tomography (CT scans) in use in hospital laboratories can resolve structures to 1 millimeter, three-dimensional microtomography has already achieved resolutions approaching 1 micrometer, a level comparable to the resolution obtained in two dimensions with the light microscope. Flannery *et al.* illustrate the technique with images of such materials as coal (cover), silica beads inside a glass tube, and porous rock, but the expected applications of x-ray microtomography extend to materials science, biology, and medicine.

Insulin actions

MUCH is known about insulin and insulin receptors from structural studies and from natural and model systems (under normal and pathologic conditions) in which the hormone, its interactions with cell surface receptors, and its diverse physiologic effects have been observed (page 1452). Most vertebrate cells have receptors for insulin, with the number per cell ranging from 100 to 100,000. The receptors are glycoproteins that lie in the membrane. Each has four subunits (two alphas and two betas) that are linked together by disulfide bonds. When insulin binds to an extracellular α subunit, the protein tyrosine kinase of the β subunit is activated and autophosphorylates certain of the receptor's tyrosine residues; the phosphorylated receptor is then able to catalyze phosphorylation of other proteins that may be involved in insulin actions. The receptor and bound insulin are internalized, thereby clearing the cell surface of receptors (and thus of the ability to respond to additional insulin), and the activated kinase is positioned inside the cell where it may come in contact with substrates. Rosen reviews these and other aspects of the transduction of the insulin signal and describes current work that is helping to clarify the actions of this most important hormone-receptor system.

Interplanetary dust

IN previous studies of interplanetary dust particles, little attention was paid to tiny mineral-rich refractory particles in the stratosphere because those with an extraterrestrial origin could not be distinguished from those with a terrestrial source (rocket exhaust or satellite debris) (pages 1466 and 1468). Now some of these small particles have been positively identified as extraterrestrial, and their chemical compositions suggest that they may be among the most primitive samples left over from the time when the solar system formed. Morphologic and elemental analyses of samples in NASA's stratospheric dust particle collection revealed that some had unusual, nonterrestrial minerologic and structural features; Zolensky has therefore theorized that the origin was extraterrestrial. McKeegan has confirmed this theory by showing that the particles are enriched, as are other extraterrestrial materials, in oxygen-16. These particles may have been generated in the presolar period from the solar nebula out of which the planets are thought to have condensed.

Supernova 1987a

SUPERNOVA 1987a appeared in the sky late in February in the Large Magellanic Cloud (page 1471). At the same time, bursts of neutrinos were detected on the earth. These events provided astrophysicists with a rare opportunity to test previously formulated theories concerning how supernovae develop and decay; calculations by Spergel *et al.* show that existing physical models adequately account for the observed sequence of events (the cooling of the neutron star) and that it is unnecessary to invoke exotic physics or astrophysics. A supernova is a stage in the death of a star; it results when the star's core becomes so dense that it collapses in on itself. Electrons and protons merge in the core to form neutrons, and, with each merger, a neutrino is emitted and carries with it energy from the explosion. The standard star evolves in this way into a hot neutron star that then, lacking a source of nuclear energy in its core, must cool. Thus the neutron star will shine brightly for a time but then fades. Supernova 1987a is the brightest (about 10^{58} neutrinos were emitted in a few seconds) and the closest supernova that has appeared in this century.

Yeast U1 RNA

EUKARYOTIC organisms use small nuclear RNAs of the U series complexed with protein for splicing precursor messenger RNA molecules into functional messengers (page 1484). Siliciano *et al.* have identified an equivalent of human U1 RNA in extracts made from the yeast *Saccharomyces cerevisiae*. The yeast version of U1 RNA was fully sequenced; although its length is more than three times that of U1 RNA molecules of other organisms, it has a number of regions of significant homology with human U1 RNA and is organized in a similar fashion. One puzzling feature of the sequence was its incomplete complementarity with the splice site which it should recognize; in other organisms, perfect complementarity has consistently been found. Yeast sequences of both the splice site and the U1 equivalent are both highly conserved; thus questions arise as to whether an imperfectly bound pair constitutes an asset or a liability for an efficient splicing process.

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SCIENCE

18 SEPTEMBER 1987
VOLUME 237
NUMBER 4821

The DNA Dragon 1

I have decided to become a movie star. It is not because I feel obliged to donate my natural good looks for the benefit of mankind. Rather, professional necessity dictates this move. In a short period of time I have read that the Los Angeles district attorney is prosecuting scientists for minor infractions of radiation safety, that a judge has suspended research at a distinguished medical school because the laboratories allegedly threaten the environment of the neighborhood, and that a state safety officer has notified a university chemistry laboratory that even trivial amounts of ordinary chemicals could not be flushed down the drains into the city sewage system. A new toxic waste law requires users to prove that a compound is "safe." It struck me that, try as we might, scientists who attempt to cure the epidemic of safety sweeping the country are doomed to fail. Obviously, the alternative in a free-enterprise society is to profit from the situation. If the tiny amounts of leaking chemicals are hazardous to the outside world, then certainly the individual living and working in a laboratory each day is subjected to enormous dangers. With space shuttles being made as safe as grandma's rocking chair, the ingenious scientist can become the well-paid daredevil of the late 1980s.

My movie will open on a family breakfast scene featuring my daughter Camille, my son Tiny Tim, and my tearful wife Portia. When Tiny Tim asks mother why she is crying, she will say, "Because Daddy is going to work where he'll be exposed to radiation, toxic chemicals, and genetically engineered organisms. We may never see him again!" Camille begs to know why I expose myself to such perils. I reply calmly, "Because I'm determined to construct an organism that converts trichloroethylene into Gatorade and methane, thus cleaning up the environment, providing energy, and improving physical activity, all in one fell swoop." As I rise, saying I must go, the children grab my trousers, plead with me to stay home, and Portia throws her arms around me weeping uncontrollably.

In the next scene, I am entering the laboratory. My assistants help me into my lead-lined laboratory coat, tie on my gas mask, and zip up my protective boots. Strapped next to my heart is the black box recorder that will reconstruct events in case tragedy strikes. The left lapel of my laboratory coat is festooned with ribbons and medals, including the Distinguished Service Medal for valor during the great Bunsen Burner Flameout of 1976 and the Oak-Leaf Cluster for heroism during the Rubber Tubing Meltdown of 1981. Concrete doors, 6 feet thick, open to allow me to enter the inner sanctum, which is arranged so that air enters but does not leave. Background music, Wagner's "Ride of the Valkyries," becomes louder and louder as I walk between shelves of ominous-looking bottles labeled "benzene," "carbon tetrachloride," and "DNA." At this point there is a projection from the microscope of a giant-sized bacterium tethered to a cover slip, flailing around viciously. I turn to my faithful servant, Sancho Panza, saying, "Quick, Sancho, the needle!" With trembling hands, loyal Sancho hands me the syringe with deadly DNA. As the music reaches a crescendo, I plunge the needle into the bacterium with the élan of St. George slaying the dragon. The movie then shows the bacterium reproducing, but this part will be cut as being too pornographic to allow the coveted PG rating. Sancho and I then wash with soap and take a shower in 6 molar hydrochloric acid, before emerging to rejoin our tense laboratory group.

The scene now shifts to the district attorney who is organizing a posse to catch the culprit whose handwashing has allowed 25 counts per minute of radioactivity, 10 milligrams of phospholipid, and a few soapsuds to escape into the city sewage system. We are arrested and indicted for releasing unsafe chemicals into the environment. We are rescued by the friendly bacterium, who has found eating trichloroethylene far more of a gourmet delight than city sewage and in gratitude gobbles up the radioactivity and phospholipids just in time to allow us to return to our rejoicing families.

Because of this film scientists will undoubtedly displace astronauts as the most idolized of modern heroes. Bills to accord scientists hazard pay will be introduced in legislatures. The television scientist-villain will disappear. My first film will initiate a series, to be followed by DNA Dragon 2, 3, 4, and on. Just as I am beginning to exult in my well-earned profits, I get a phone call from the president of Supercolossal Studios, Inc., who urges, "Since you scientists are fast becoming a threat to the movie business, let's make a deal. If you guys will stay out of films, our actors will stay out of toxic waste." Some of my myopic, unadventurous colleagues might consider that a happy outcome.—DANIEL E. KOSHLAND, JR.

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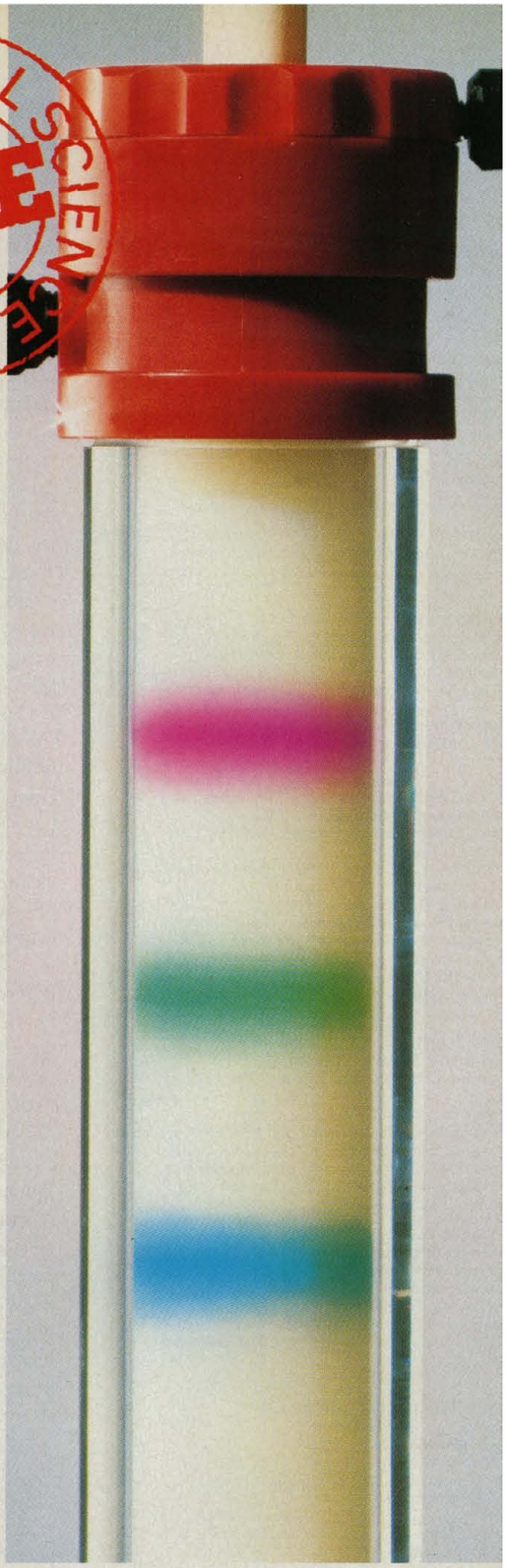

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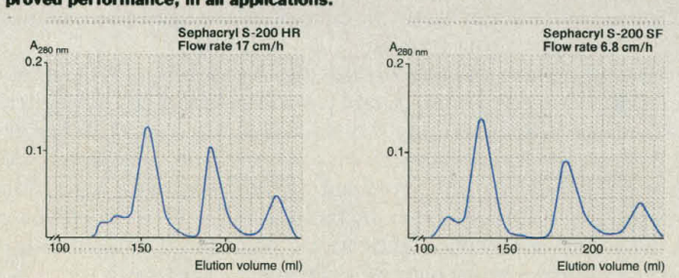

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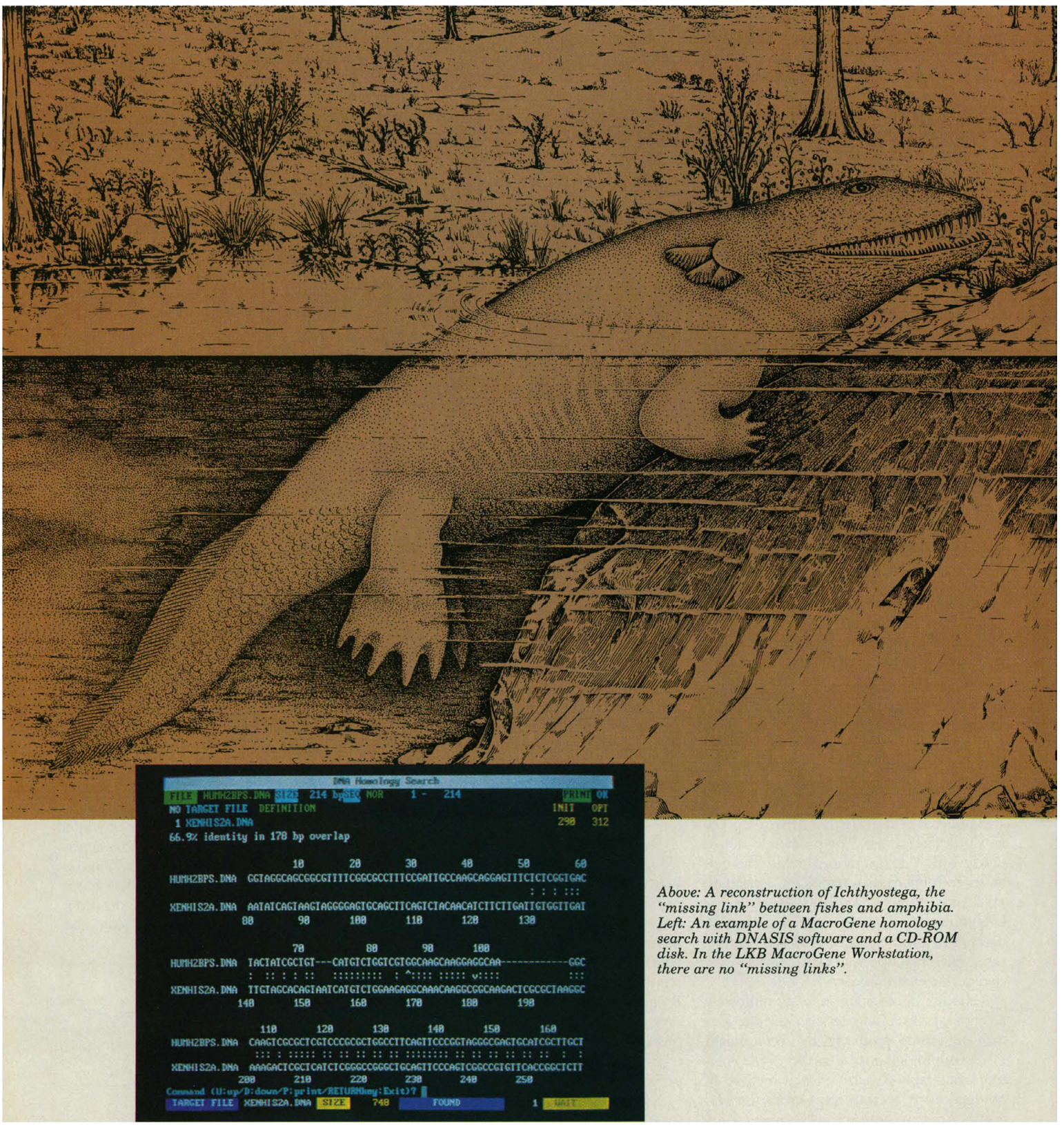

Above: A reconstruction of Ichthyostega, the "missing link" between fishes and amphibia. Left: An example of a MacroGene homology search with DNASIS software and a CD-ROM disk. In the LKB MacroGene Workstation, there are no "missing links".

The short-legged fish on the facing page is Ichthyostega, the oldest known four-footed animal. Until fossils of this meter-long creature were found, he was one of evolution's missing links. Too bad there's none of his DNA to analyze! On LKB's new MacroGene Workstation, his evolutionary relationships could be evaluated quickly with the sequence information on the unique CD-ROM Laser Reference Disk.

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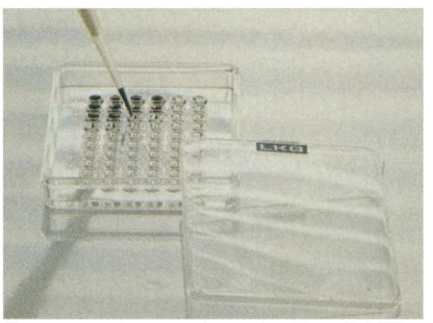

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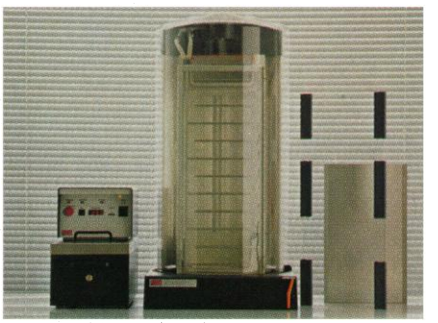

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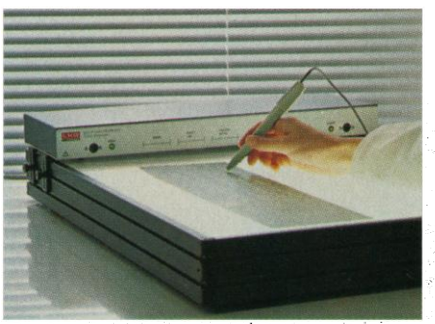

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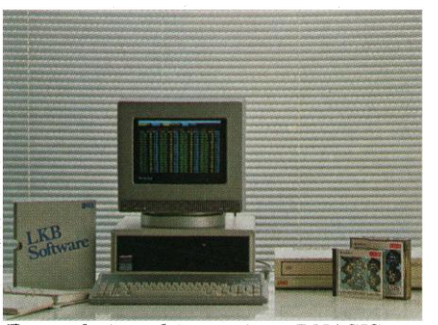

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Fellows will be expected to devote their entire fellowship period solely to research activity at the basic and/or clinical levels. During their fellowships period, they will work closely with their sponsors. It is anticipated that by the conclusion of the fellowship period, fellows will be able to begin independent research programs applying basic science to the solution of clinical problems.

AMOUNT OF FELLOWSHIP:
$40,000 per year for three years,
beginning July 1988
DEADLINE FOR APPLICATIONS:
November 16, 1987

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George Klein, M.D.
The Karolinska Institute

Joshua Lederberg, Ph.D.
The Rockefeller University

Albert H. Owens, Jr., M.D.
The Johns Hopkins University
School of Medicine

Henry C. Pitot, M.D., Ph.D.
McArdle Laboratory for Cancer
Research

Phillip A. Sharp, Ph.D.
Massachusetts Institute of
Technology Cancer Research
Center

Richard J. Steckel, M.D.
Jonsson Comprehensive Cancer
Center, UCLA

Haruo Sugano, M.D.
Japanese Foundation for
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Fred Hutchinson Cancer
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Rules and official application forms are available from: Secretary, Bristol-Myers Cancer Research Fellowships, 345 Park Avenue, Room 43-38, New York, NY 10154; Telephone (212) 546-4337.

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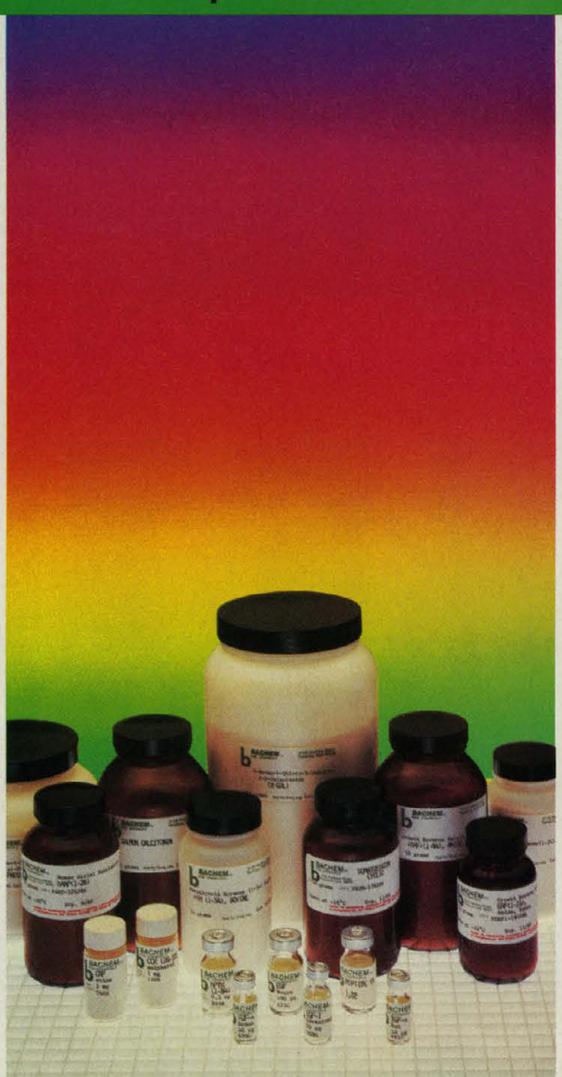

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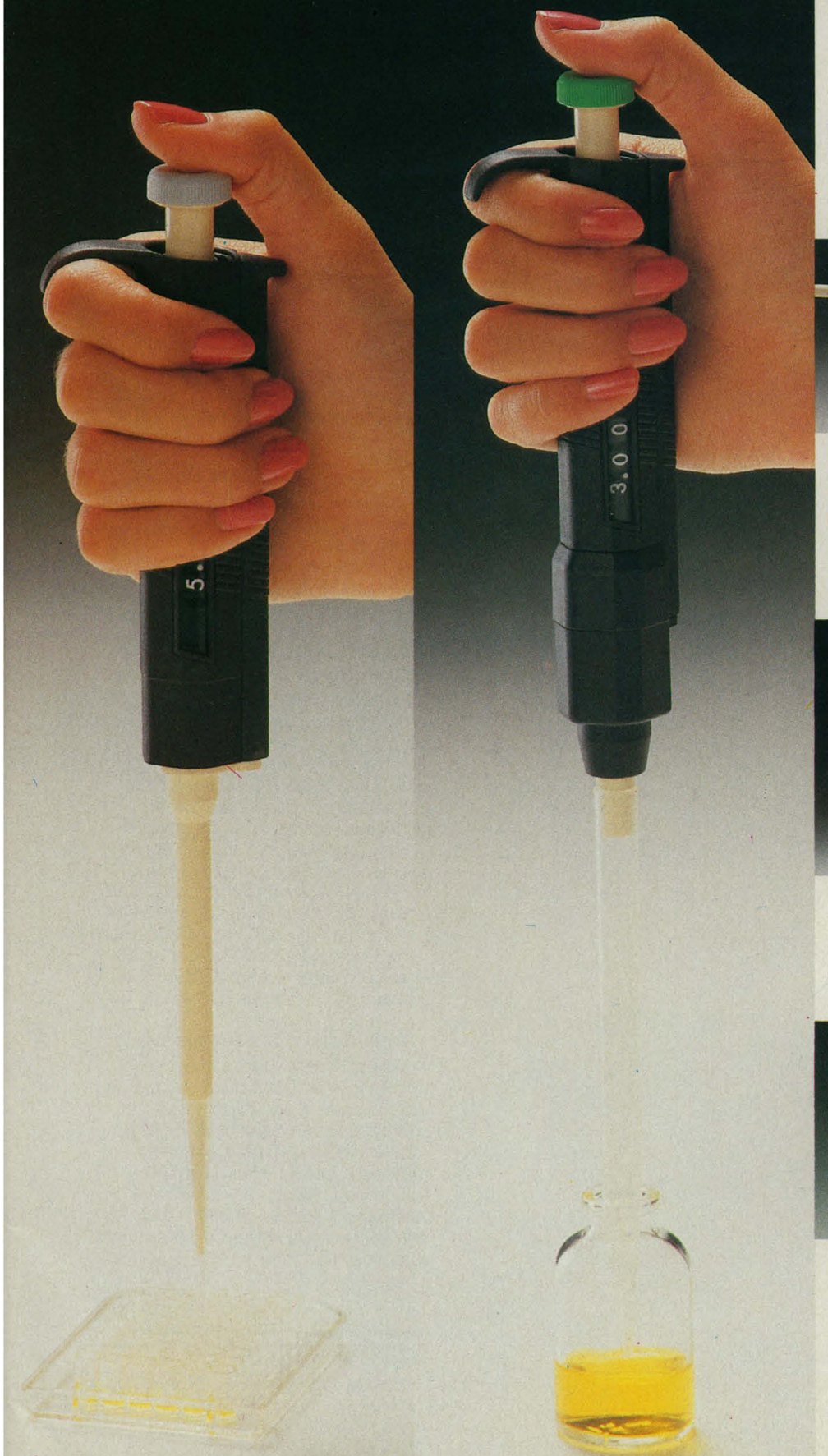

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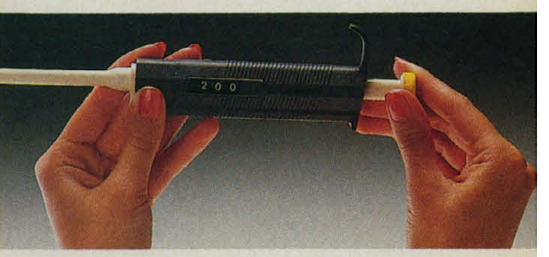

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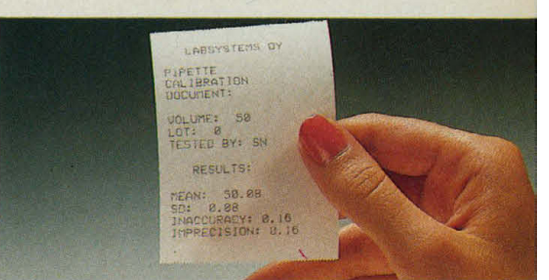

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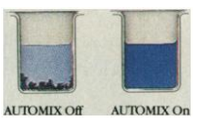

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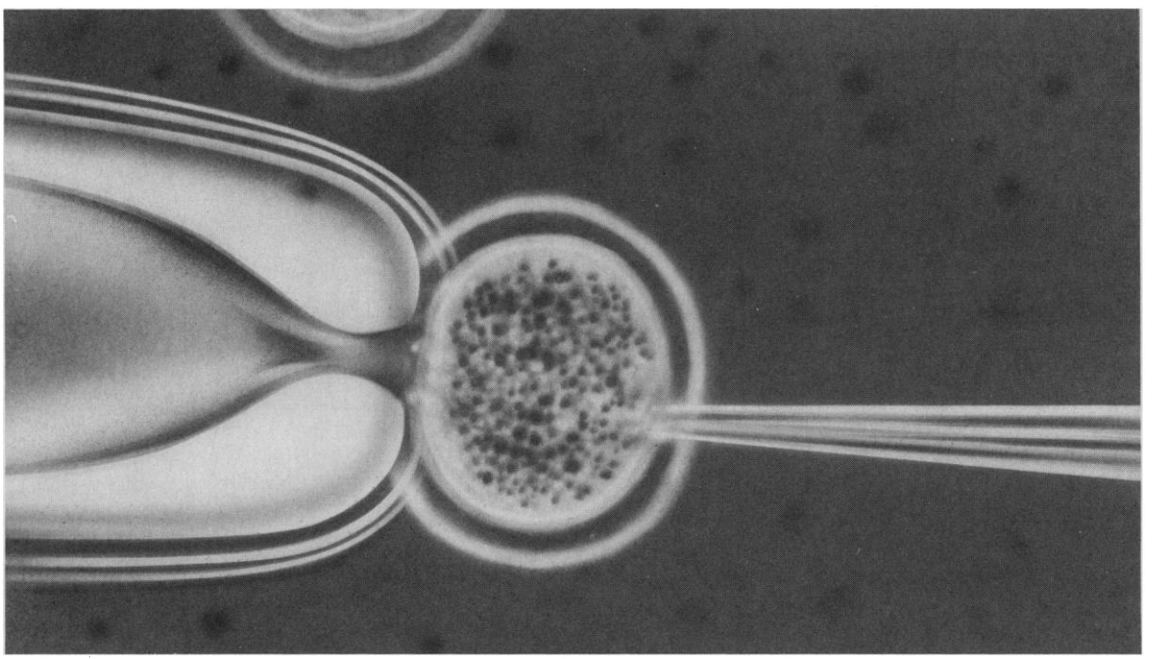

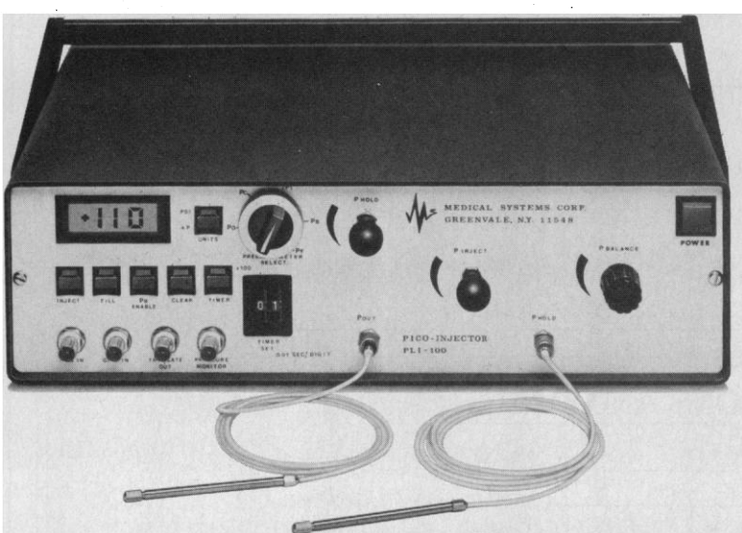

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- Interactive Laser Cytometry
- Quantitative Fluorescence Analysis
- Applications of Photobleaching
- Cell Surgery and Poration
- Cell Ablation and Selection

LOCATIONS AND DATES

New York	Monday, September 28, 1987
Boston	Friday, October 2, 1987
Baltimore	Tuesday, October 13, 1987
Research Triangle Park	Thursday, October 15, 1987
Houston	Tuesday, October 20, 1987
Los Angeles	Monday, October 26, 1987
San Francisco	To be Announced
Chicago	Monday, November 23, 1987

Workshops will be from 9:00 a.m. to 4:00 p.m. To ensure your place at one of these workshops, please telephone your reservation to Tammy as soon as possible.

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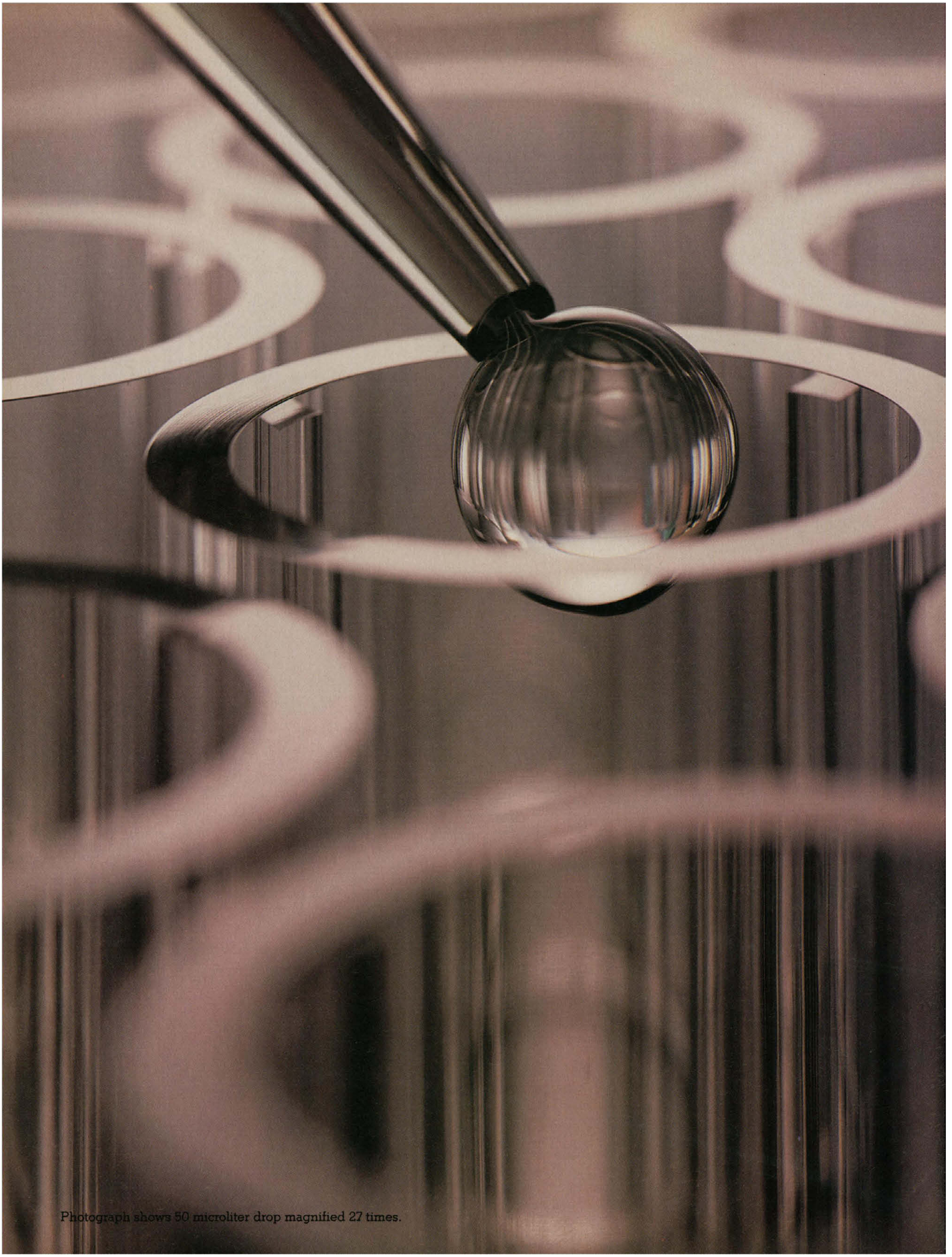

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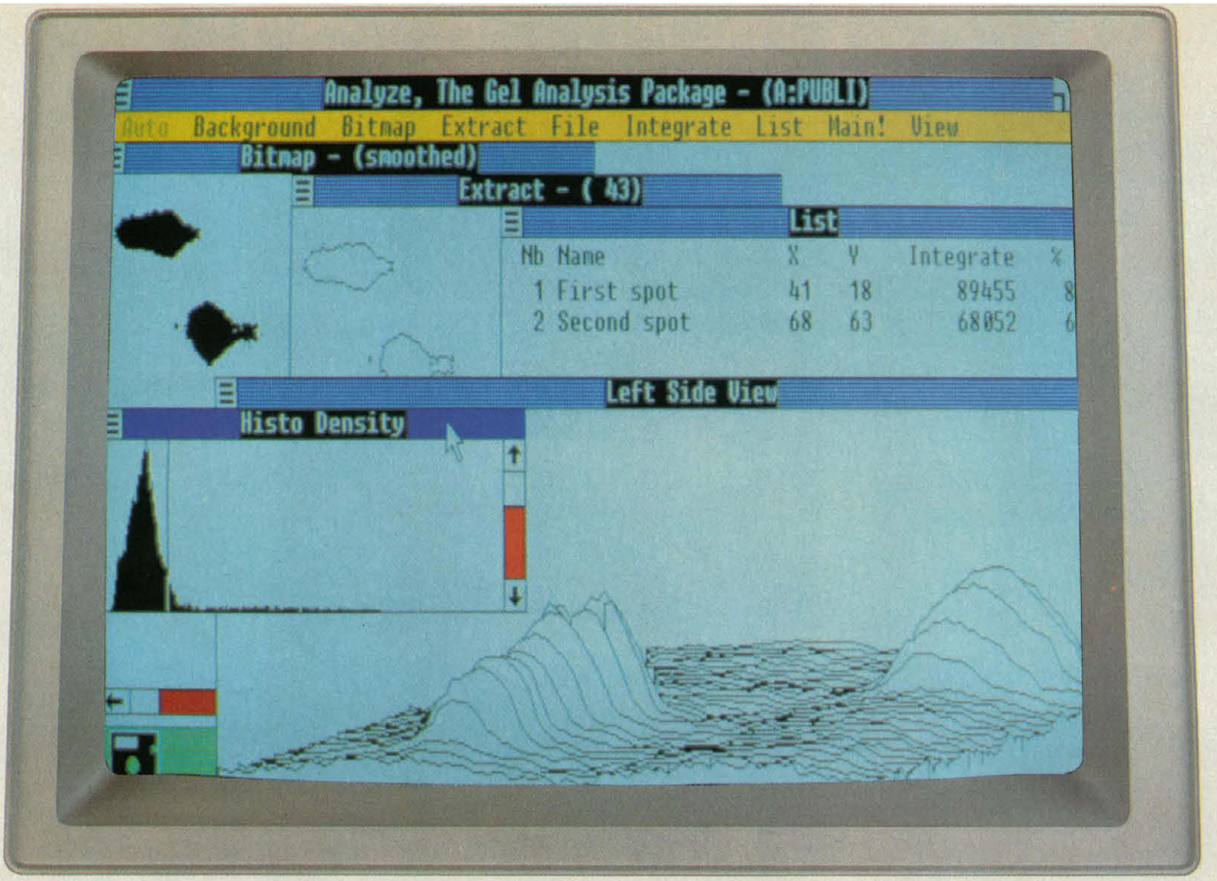

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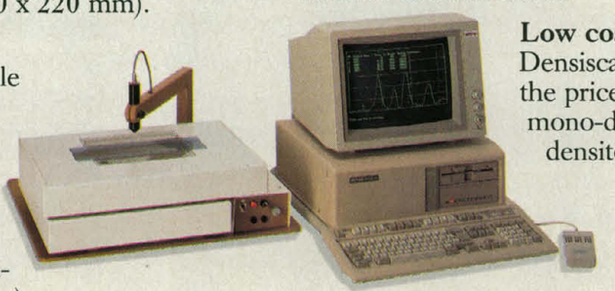

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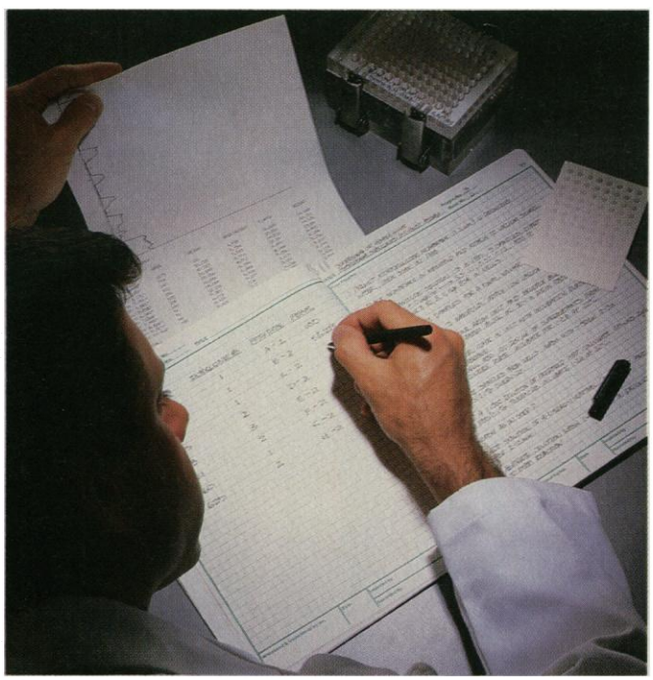

We at S&S had a head start in developing an efficient and economic alternative to standard ELISA testing.

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FIND OUT ABOUT MINIFOLD I.

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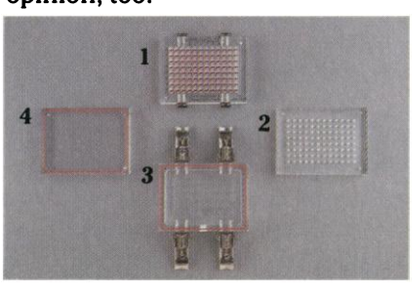
That's because in addition to finding out what a protein might tell us, we're interested in your opinion, too.



The Minifold I consists of (1) the 96-well sample plate, (2) the filter support plate and (3) the vacuum plenum. The accessory incubation plate (4) replaces the filter support during incubation.

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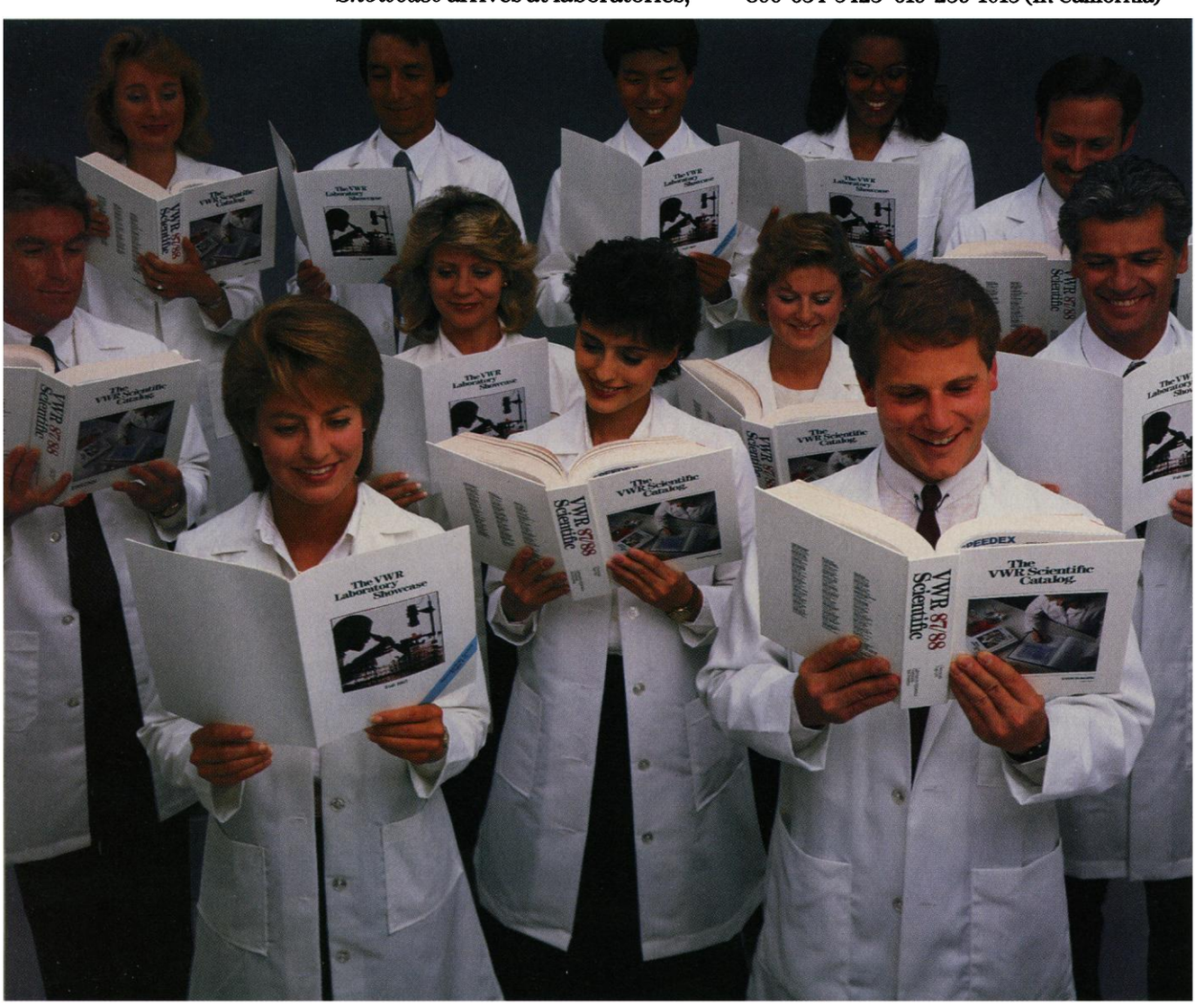

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Conference Chairmen: M.F. Shlesinger, ONR; A.J. Mandell, UCSD; J.A.S. Kelso, FAU

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Requests for further information and 250 word abstracts should be sent no later than October 1, 1987 to:

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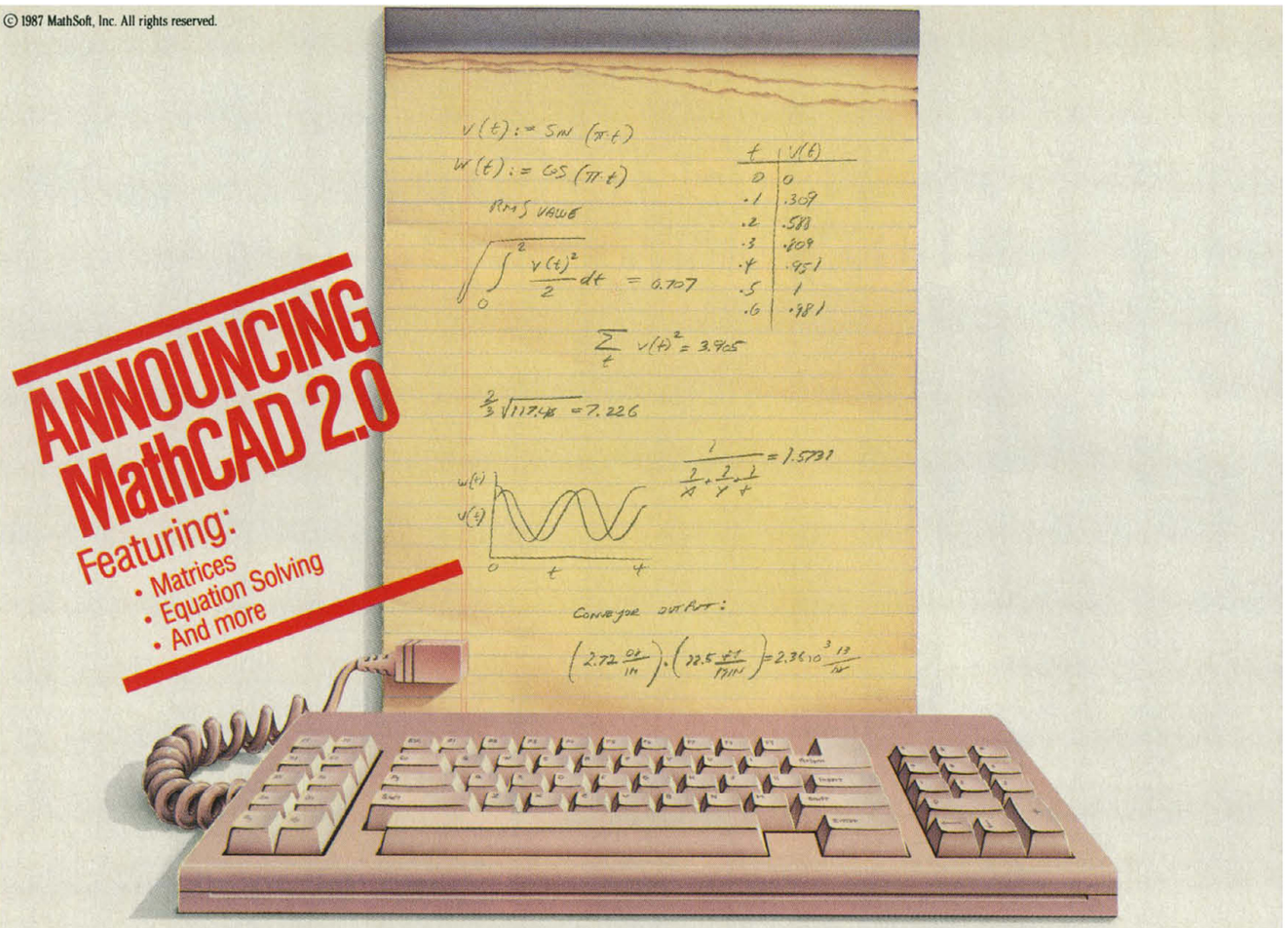

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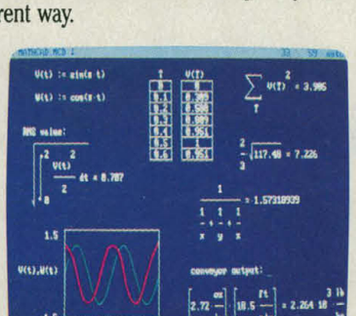

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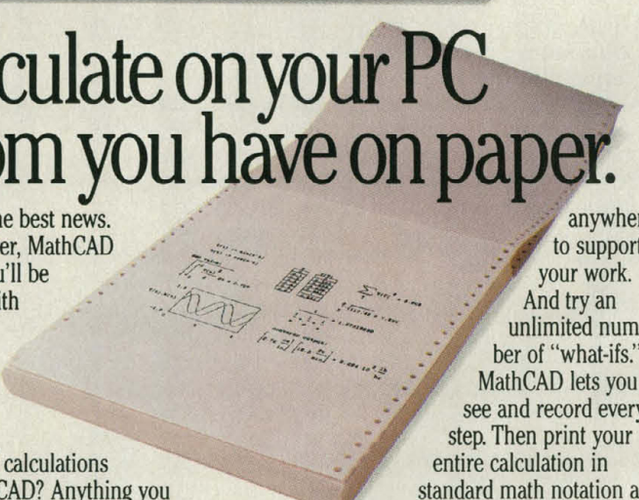

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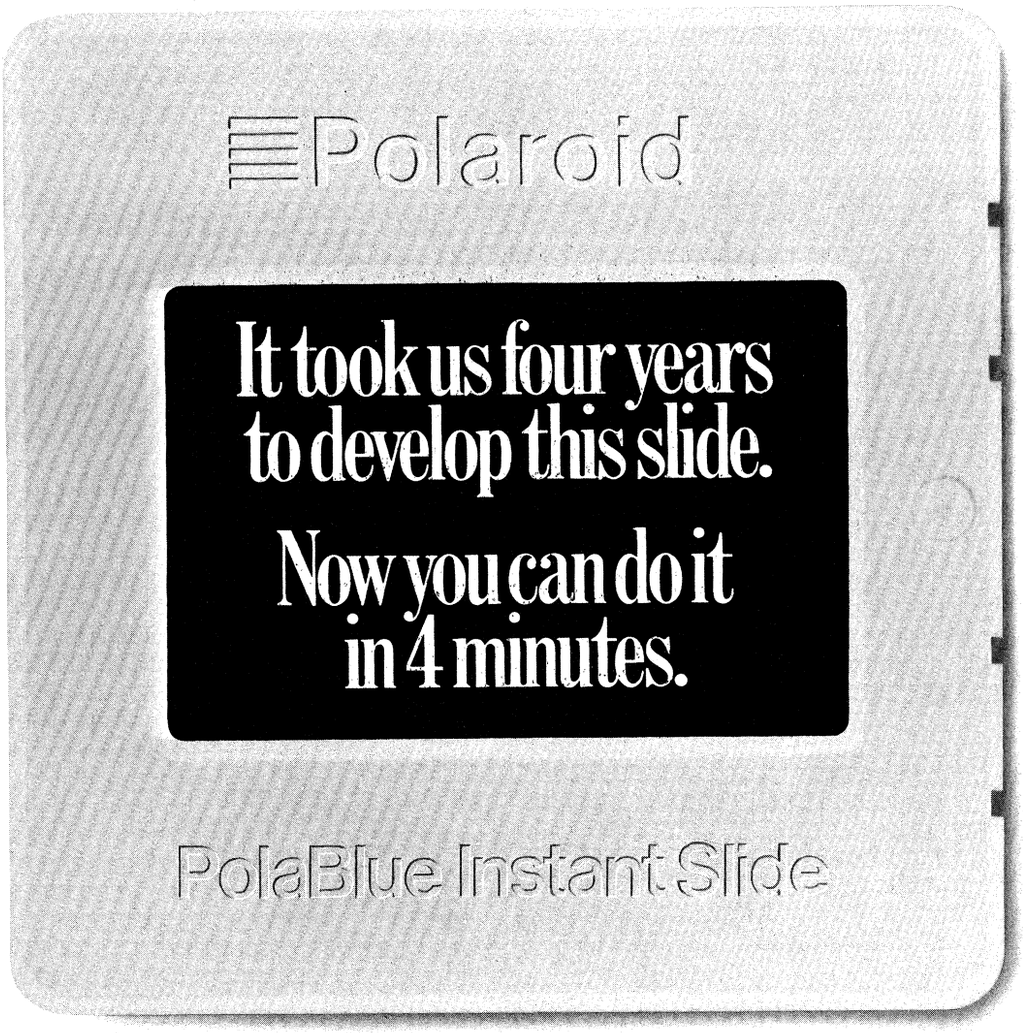

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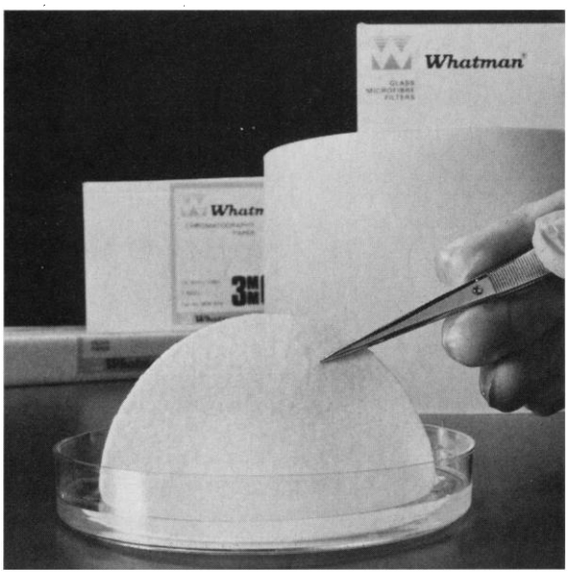

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[1] Aebersold, R.H., Teplow, D.B., Hood, L.E., and Kent, S.B.H. (1986) *J. Biol. Chem.* **261**, 4229-4238.

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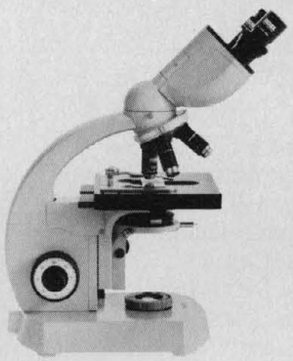

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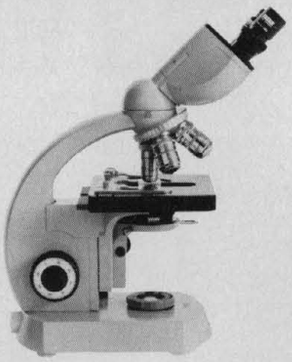

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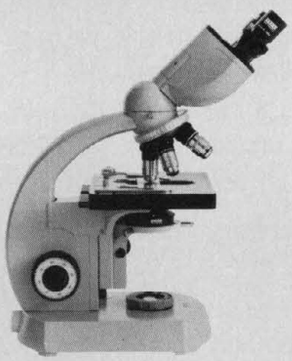

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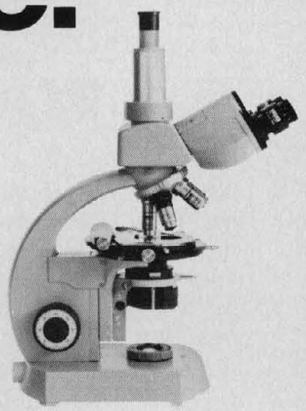

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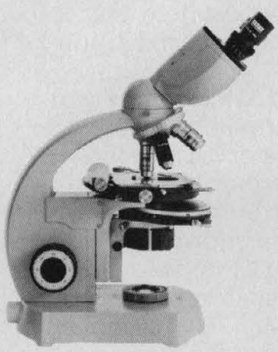

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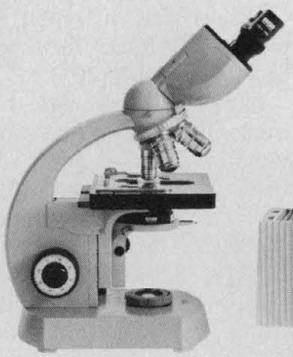

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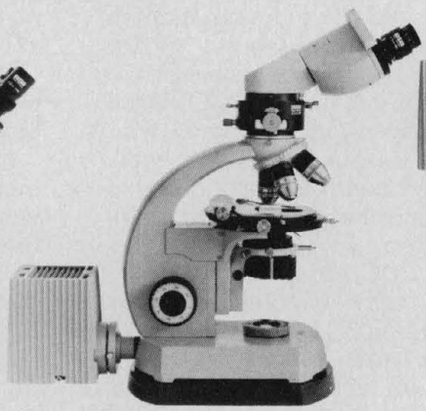

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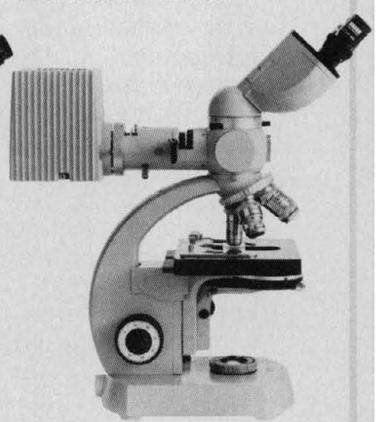

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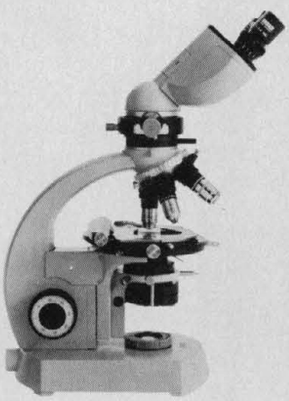

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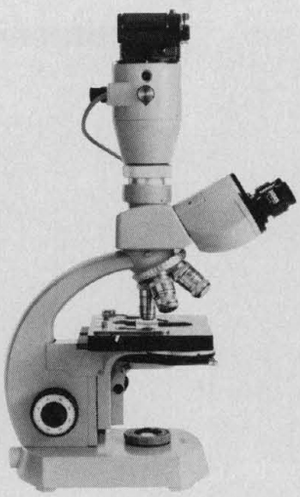

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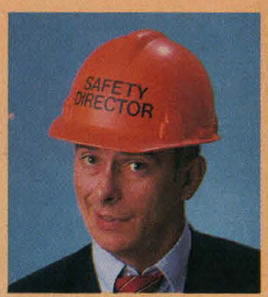

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20 – 21 November 1987 ✦ Hyatt Regency Crystal City, Arlington, VA

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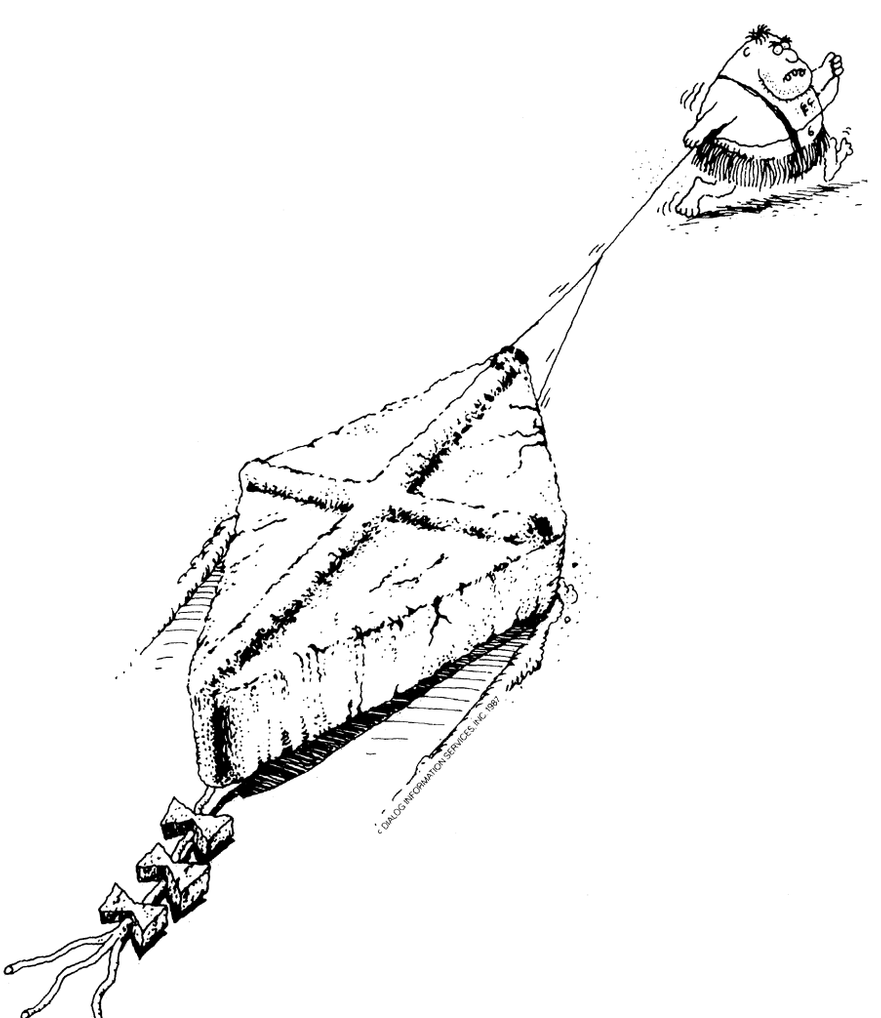

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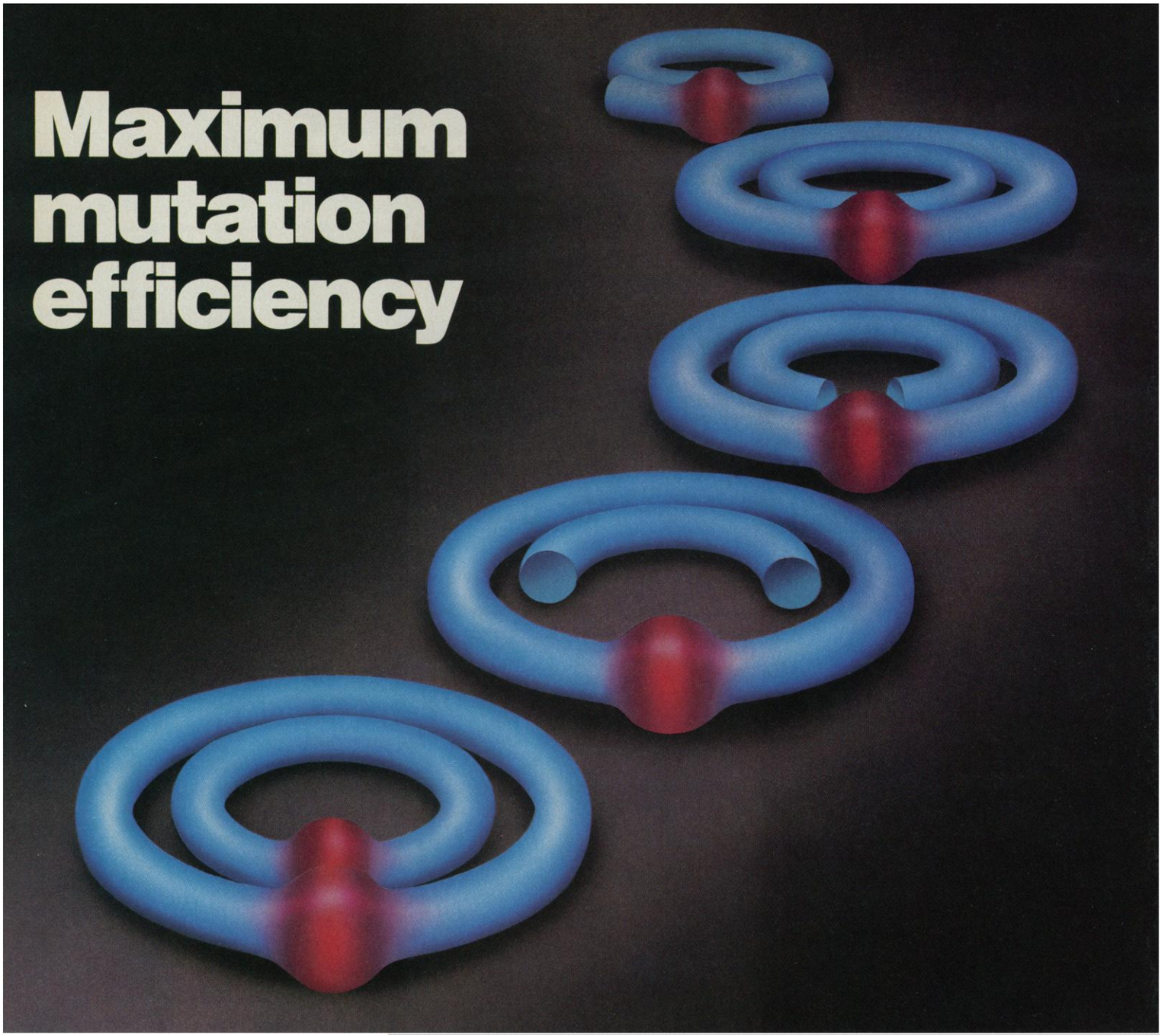

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