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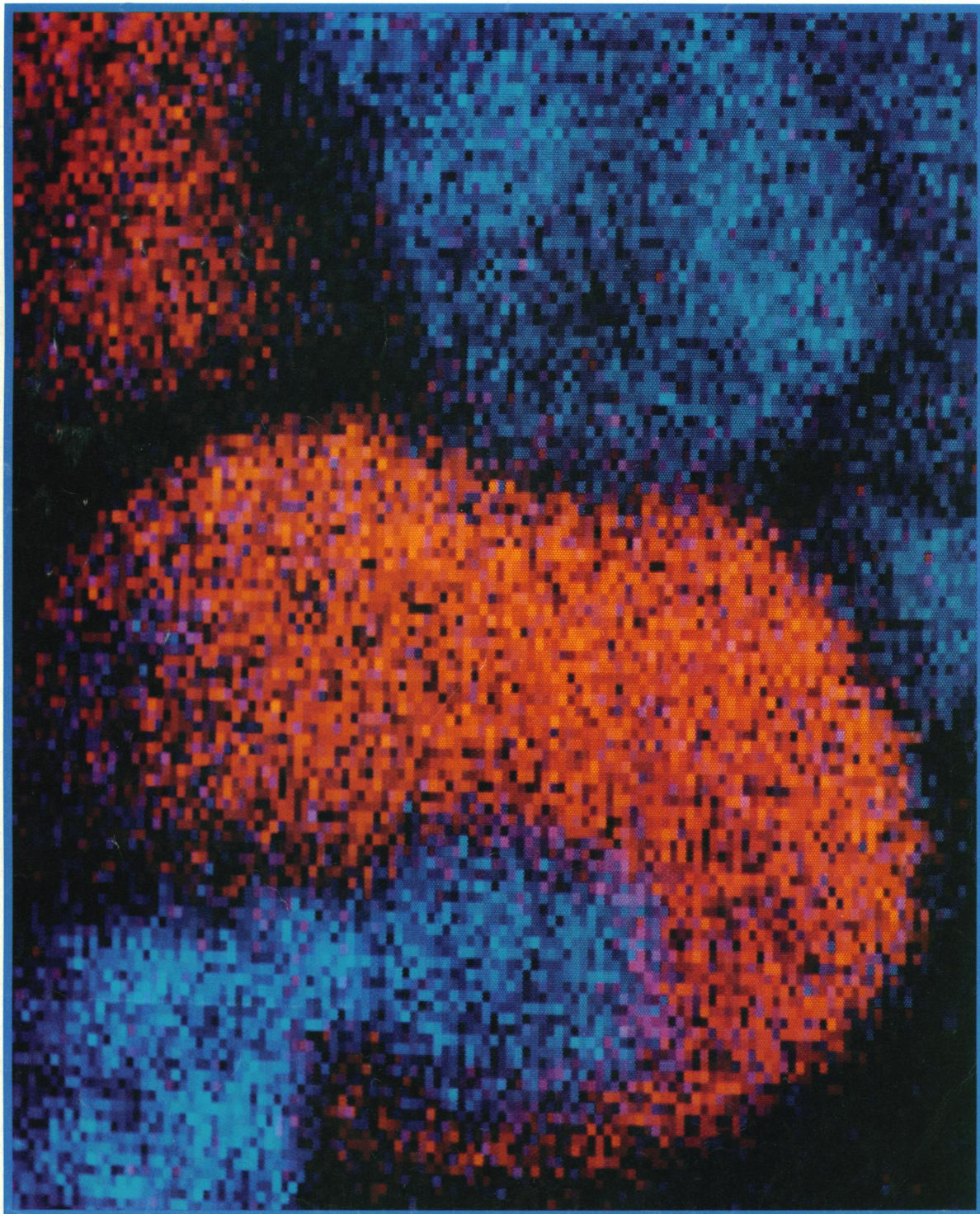
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PART I



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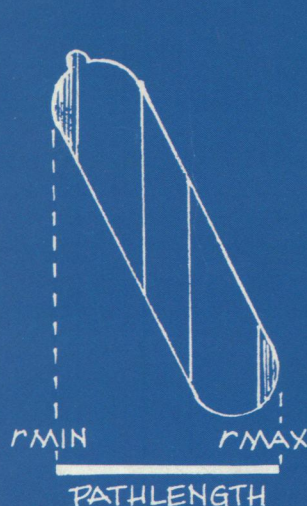
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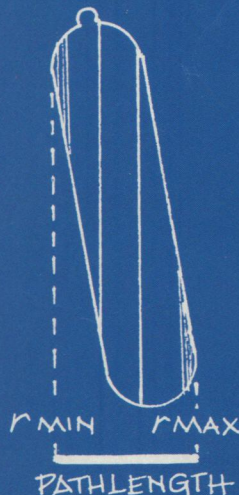
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Fixed Angle Rotor



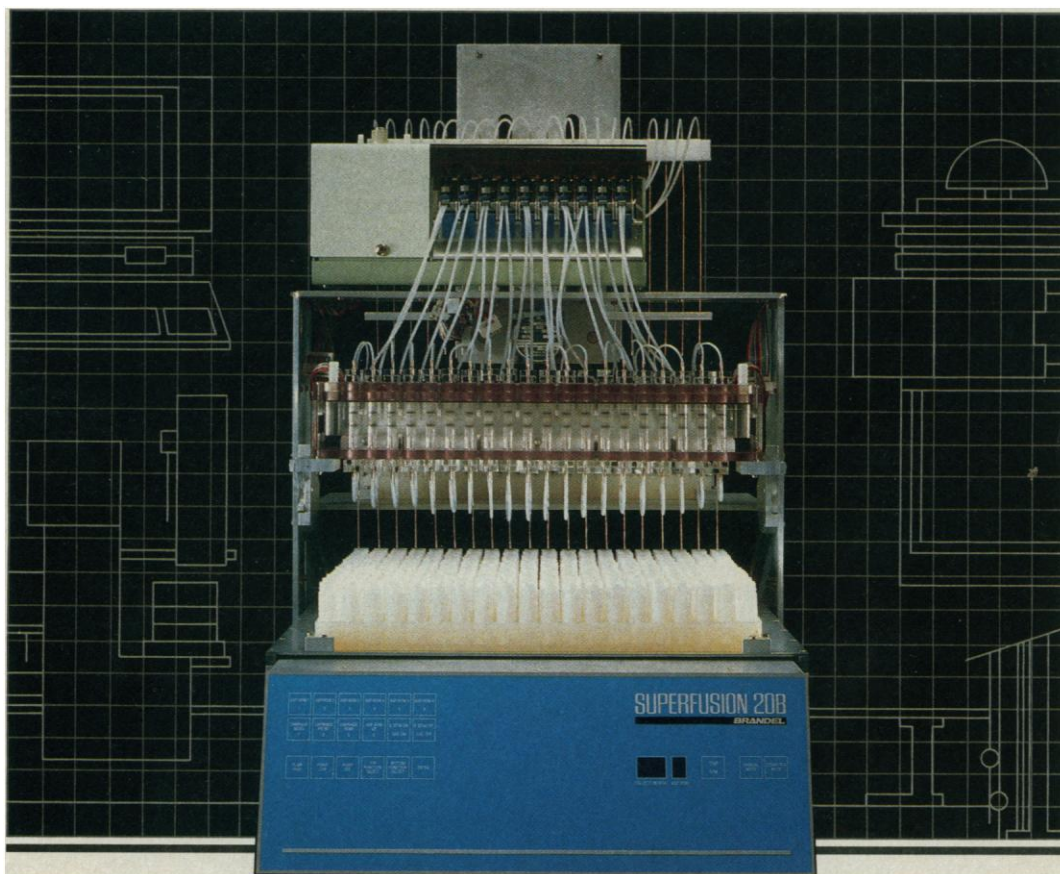
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1379 This Week in *Science*

Editorial

1381 Two Plus Two Equals Five

Letters

1385 Grant Financing: PI Salaries: R. M. ROSENZWEIG ■ Carrel's Cultures: J. A. WITKOWSKI ■ Asteroid Paradox: G. W. WETHERILL ■ The Antibiotic Record: H. T. SWAN ■ A Broken System?: C. S. FOOTE ■ Conservation of Rare Plants: R. W. KASTEN, JR.

News & Comment

1400 Head Start at 25: False Start, Sure Future ■ Can There Be "Success for All"?
1403 DOE's Born-Again Solar Energy Plan
1404 Who Should Study Radiation Effects?
1405 Stanford Psychiatry Deal Falls Through ■ Problem Foreshadowed at Harvard
1406 Trials and Tribulations of AIDS Drug Testing

Research News

1407 Paleontology by Bulldozer
1410 Physicists Tackle Theory, Tubes, and Temperature: Anyon Superconductivity? ■ 101 Uses for Tiny Tubules ■ Brrr! How Cold Is It?
1412 Fiber Fracas at FASEB
1413 "Rocking" on the Banks of the Columbia River
1414 *Briefings*: Outside SSC Funding Is Limited ■ Brits Cool to Physics Ad Blitz ■ Say What? ■ Slick Soviet Ads ■ China Scholar Drops Stanford Suit ■ New Grants from Rockefeller ■ England Versus the World's Worms ■ Protecting Software ■ A Big Bird in the Sky for Scientists? ■ Billions Needed for Child Care

Articles

1431 Observational Constraints on the Global Atmospheric CO₂ Budget: P. P. TANS, I. Y. FUNG, T. TAKAHASHI
1439 Sonochemistry: K. S. SUSLICK

Research Article

1446 Neurotrophin-3: A Neurotrophic Factor Related to NGF and BDNF: P. C. MAISONPIERRE, L. BELLUSCIO, S. SQUINTO, N. Y. IP, M. E. FURTH, R. M. LINDSAY, G. D. YANCOPOULOS

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COVER The micrograph on the cover shows interparticle collisions induced by ultrasound between tin and iron particles about 20 micrometers in size. The velocity of such collisions can be as high as 500 meters per second (1100 miles per hour). The elemental composition dot map was produced by scanning Auger electron spectroscopy and shows tin in orange and iron in blue. See page 1439. [Photograph courtesy of Stephen J. Doktycz on instrumentation in the Center for Microanalysis of Materials, University of Illinois at Urbana-Champaign]

Reports

- 1454 Tumor Cells Exhibit Dereglulation of the Cell Cycle Histone Gene Promoter Factor HiNF-D: J. HOLTHUIS, T. A. OWEN, A. J. VAN WIJNEN, K. L. WRIGHT, A. RAMSEY-EWING, M. B. KENNEDY, R. CARTER, S. C. COSENZA *et al.*
- 1457 Tumor Resistance to Alkylating Agents Conferred by Mechanisms Operative Only in Vivo: B. A. TEICHER, T. S. HERMAN, S. A. HOLDEN, Y. WANG, M. R. PFEFFER, J. W. CRAWFORD, E. FREI III
- 1461 Engineering Human Prolactin to Bind to the Human Growth Hormone Receptor: B. C. CUNNINGHAM, D. J. HENNER, J. A. WELLS
- 1465 Direct Gene Transfer into Mouse Muscle in Vivo, J. A. WOLFF, R. W. MALONE, P. WILLIAMS, W. CHONG, G. ACSADI, A. JANI, P. L. FELGNER
- 1468 Is Soot Composed Predominantly of Carbon Clusters? L. B. EBERT
- 1471 Thymic Epithelium Tolerizes for Histocompatibility Antigens: J. SALAÜN, A. BANDEIRA, I. KHAZAL, F. CALMAN, M. COLTEY, A. COUTINHO, N. M. LE DOUARIN
- 1474 The Calcium Channel Blocker Nifedipine Attenuates Slow Excitatory Amino Acid Neurotoxicity: J. H. WEISS, D. M. HARTLEY, J. KOH, D. W. CHOI
- 1477 HIP-70: A Protein Induced by Estrogen in the Brain and LH-RH in the Pituitary: C. V. MOBBS, G. FINK, D. W. PFAFF
- 1479 Isolation of a G Protein That Is Modified by Learning and Reduces Potassium Currents in *Hermisenda*: T. J. NELSON, C. COLLIN, D. L. ALKON

Book Reviews

- 1485 Down and Out in America, *reviewed by* D. A. SNOW AND L. ANDERSON ■
The Environmental Record in Glaciers and Ice Sheets, C. C. DELWICHE
■ Books Received

Products & Materials

- 1489 HPLC Solvent Mixer ■ Data Analysis and Graphing Program ■ Portable Spectroscopy Workstation ■ Universal Gradient System Controller ■ Floating pH Electrode Holder ■ Automatic Object Counter ■ Literature

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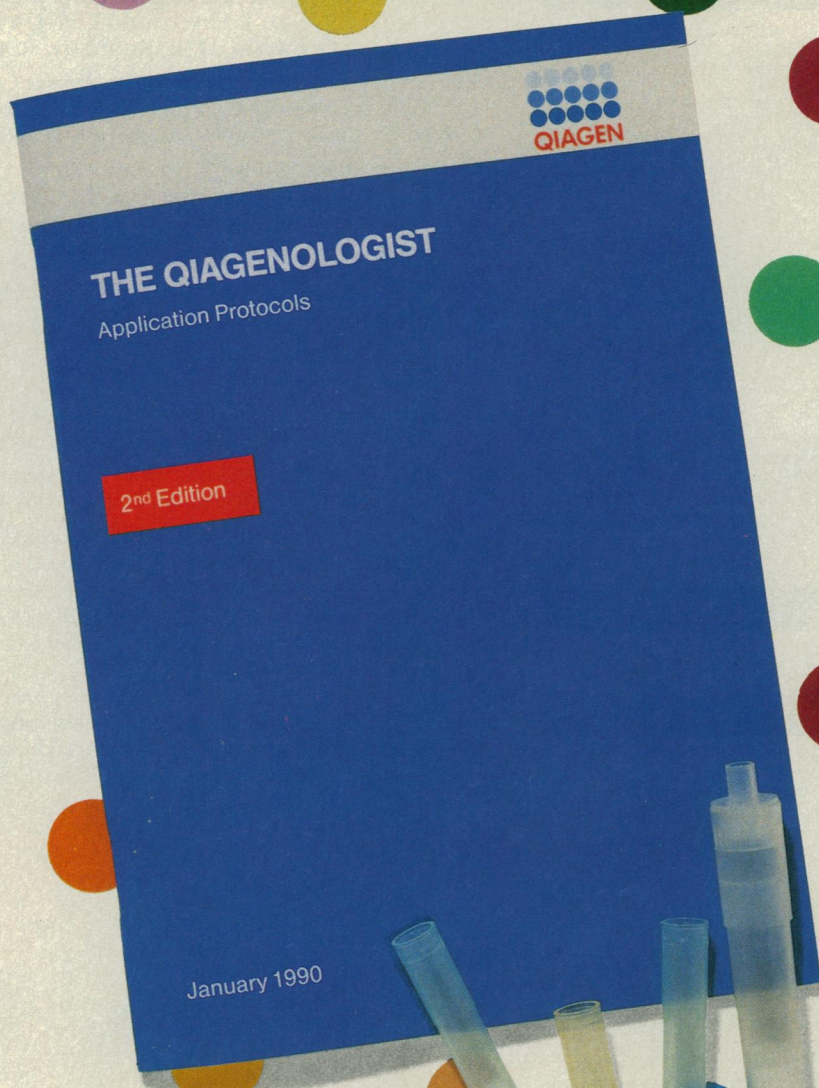
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This Week in SCIENCE

Carbon dioxide budget

ANTHROPOGENIC factors such as the burning of fossil fuels have led to rising carbon dioxide concentrations in the atmosphere; the continuing rises are expected to substantially alter global climate in the 21st century. An understanding of how carbon dioxide cycles between the earth and the atmosphere and knowledge of the identities and relationships of sources and sinks of carbon are essential for developing future management strategies and for predicting climate effects. Toward this end, Tans *et al.* have combined observations of carbon dioxide in the atmosphere and the world's oceans and simulations of carbon dioxide emissions, transport, and mixing throughout the year (page 1431). They conclude that a large terrestrial sink for carbon must exist at temperate latitudes in the Northern Hemisphere to account for the observed concentration gradient of atmospheric carbon dioxide between the two hemispheres. The Northern sinks evidently suck up more carbon dioxide than sinks in the Southern Hemisphere, and the oceans are not on their own adequate sinks for balancing the carbon dioxide-cycling equation.

New neurotrophic factor

SURVIVAL of cells of the nervous system is dependent upon exposure to neurotrophic or "survival factors," and these factors are made in only limiting amounts; thus death of nerve cells is a prominent feature of early development. The prototype neurotrophic factor is called nerve growth factor. It and a recently cloned related factor, brain-derived neurotrophic factor, have been used to identify a third factor, neurotrophin-3 (NT-3). The strategies for identifying NT-3, which depended on the homology of the other two, and for cloning the gene that encodes it are described by Maisonpiere *et al.* (page 1446). The three factors have sequence homology and overlapping but not identical stimulatory effects on nerve cells in culture. NT-3 is expressed in high amounts in adults and

newborns, whereas the other two are more commonly expressed in adults. The tissue specificities of the factors are also distinctive. Further comparisons among these factors will provide new insights into how the nervous system develops and is maintained. Such factors may have future uses in the treatment of neuronal degeneration.

Cell cycle protein

DURING the S phase of the normal cell cycle (this is the period when DNA is synthesized), a protein called HiNF-D is found in the nucleus of the cell; HiNF-D binds to DNA and is necessary for timely expression of the histone gene H4. In the preceding G1 phase of the cycle, little or no HiNF-D can be detected. The phase-dependent pattern characterizes HiNF-D in several types of cultured normal rat and human cells (page 1454). In tumor cells of both rat and humans, however, throughout the cell cycle, there is abundant HiNF-D in the nucleus; only if the tumor cell later goes on to terminally differentiate does the level of HiNF-D drop. HiNF-D is probably not the only "transcription factor" that is deregulated during transformation, and there may be many such factors that will be informative molecular markers of the changes that accompany the transformation process. Holthuis *et al.* hypothesize that, because the deregulation of HiNF-D production is not related to an inability of the cell to differentiate, it may be associated with aberrant cell growth control; but exactly how deregulation and transformation are related is not yet clear.

Drug-resistant tumor cells

CHEMOTHERAPIES sometimes fail because the target tumor cells become resistant to the drugs that are being used to halt their growth. Many experiments have been carried out in vitro with tumor cells to try to determine the molecular, genetic, or metabolic changes that accompany drug

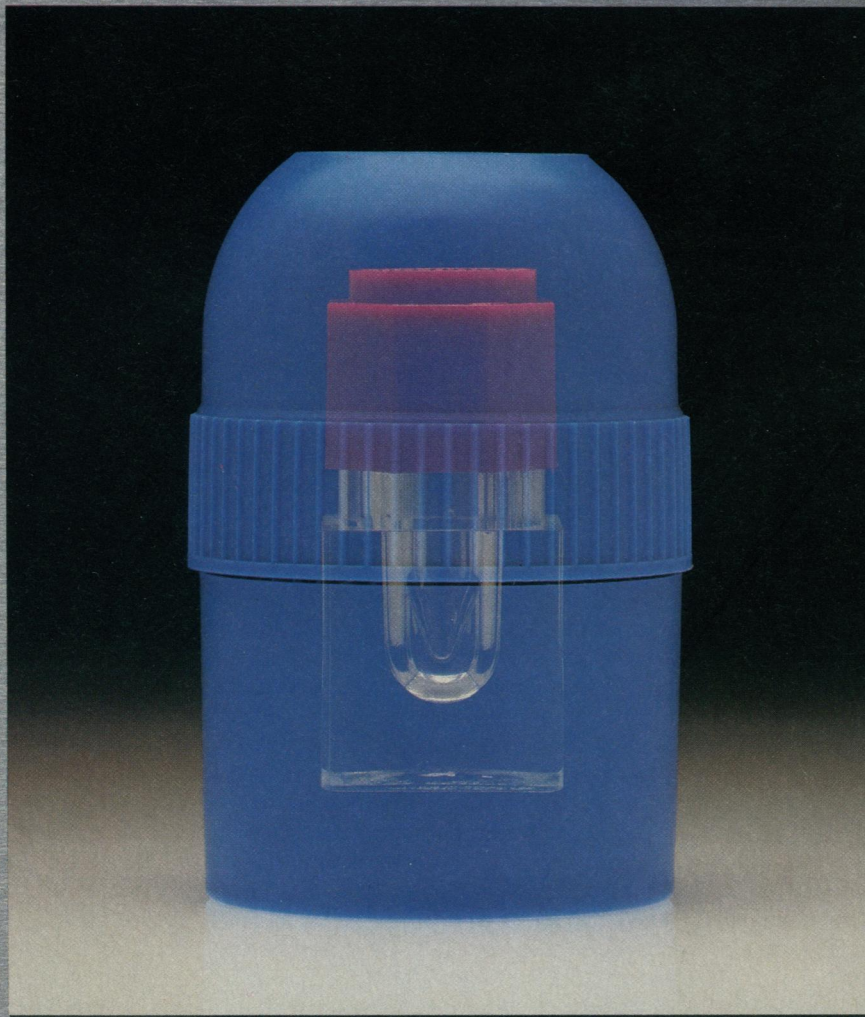
resistance. However, such experiments may not reveal prevailing conditions in situ or uncover what actually is causing resistance. Teicher *et al.* found that although mammary tumors growing in mice could be made resistant to any one of four different chemotherapeutic drugs (all alkylating agents), the cells showed no drug resistance when evaluated in vitro (page 1457). Yet if, after passage in culture, the tumor cells were injected into new hosts, they retained their strong drug-resistant properties. Furthermore, the drugs were seen to be processed differently in hosts with drug-sensitive tumors compared with hosts that either lacked tumors or had drug-resistant tumors. The establishment of drug resistance must therefore involve some interaction between the tumor cells and the normal host tissues.

Designer hormones

PROLACTIN and human growth hormone (hGH) are distantly related. Each hormone stimulates milk production by binding to lactogenic receptors on cells, but only human growth hormone binds to cellular hGH receptors to induce bone growth. However, Cunningham *et al.* found that it is possible to alter the prolactin molecule such that it can bind to the hGH receptor (page 1461). After eight critical mutations were made, prolactin molecules bound tightly to the hGH receptor even though the conformation of prolactin was not changed and even though overall sequence homology with human growth hormone was only 26%. The selection of residues to target for mutation was made on the basis of high-resolution functional data that had been previously obtained; it did not require high-resolution structural data for the hormone-receptor complex. Novel hormones that combine properties from different hormones within a family may have many pharmacologic uses, serving, for example, as agonists or antagonists of specific receptors. Furthermore, such chimeric molecules should help shed light on structure-function relations in hormones.

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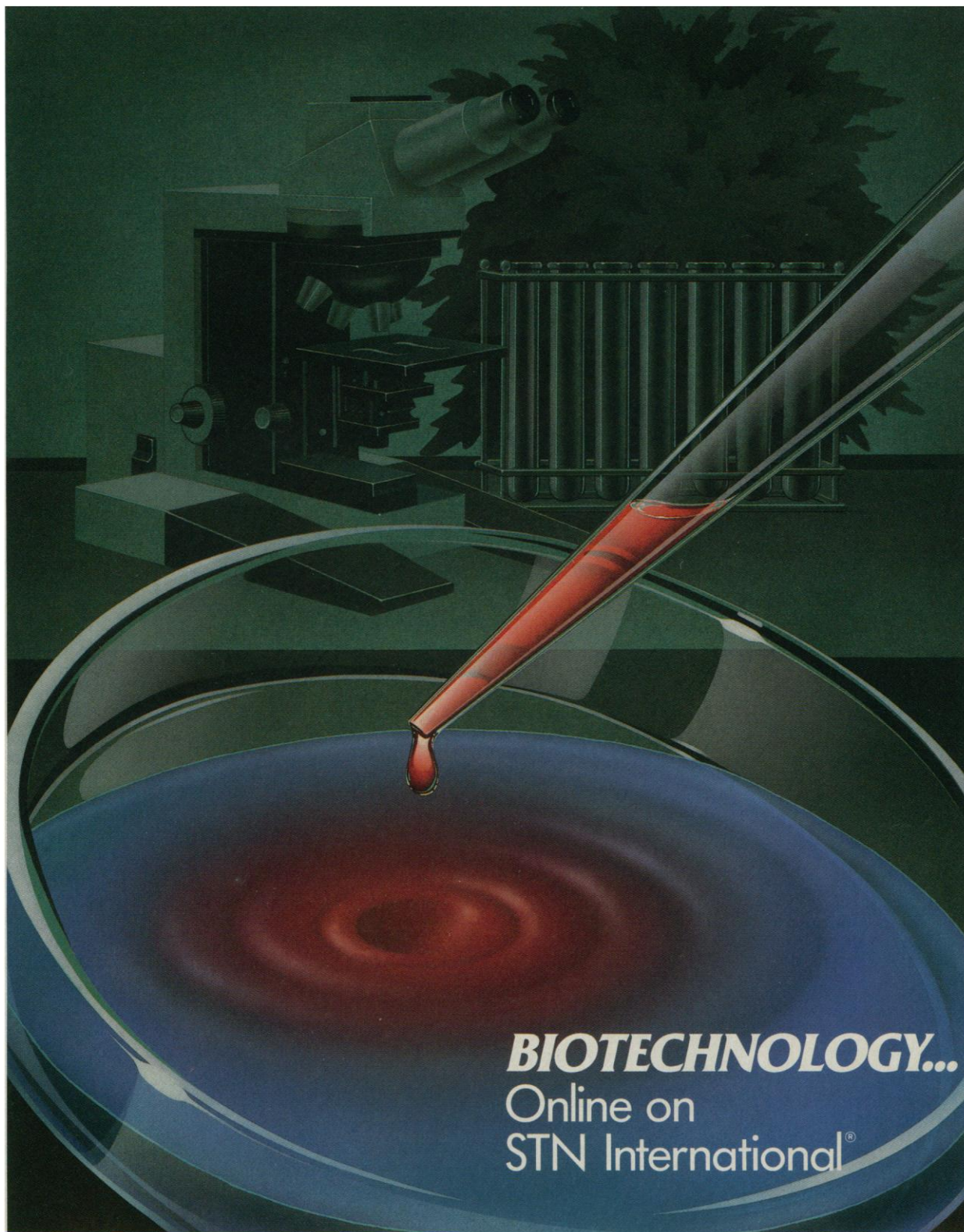
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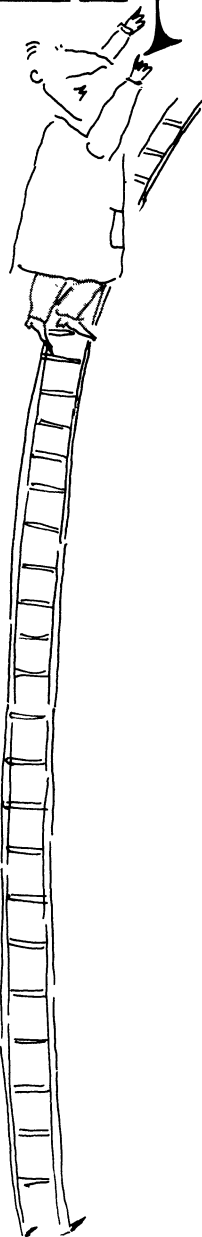
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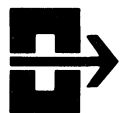
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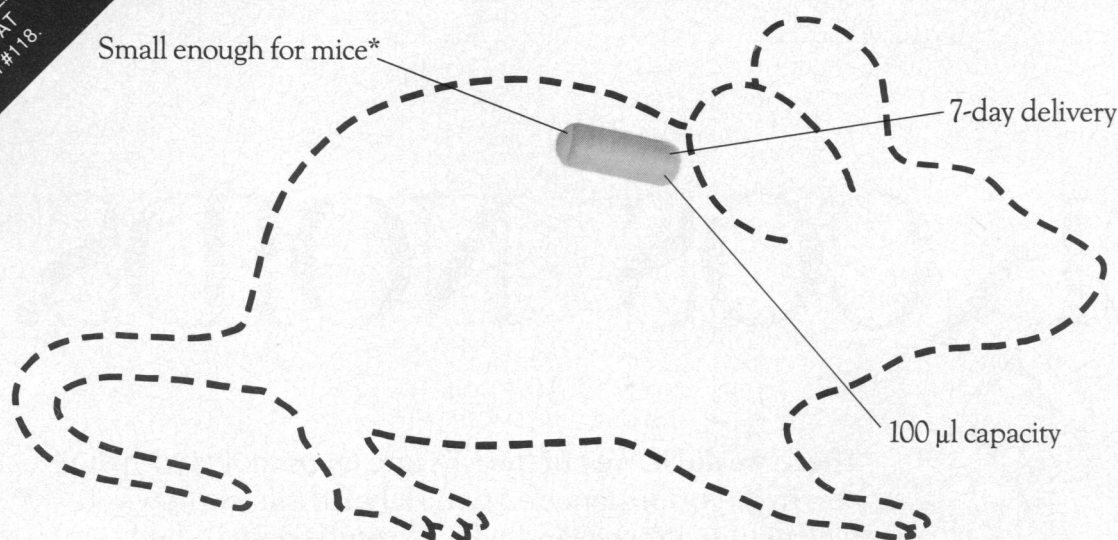
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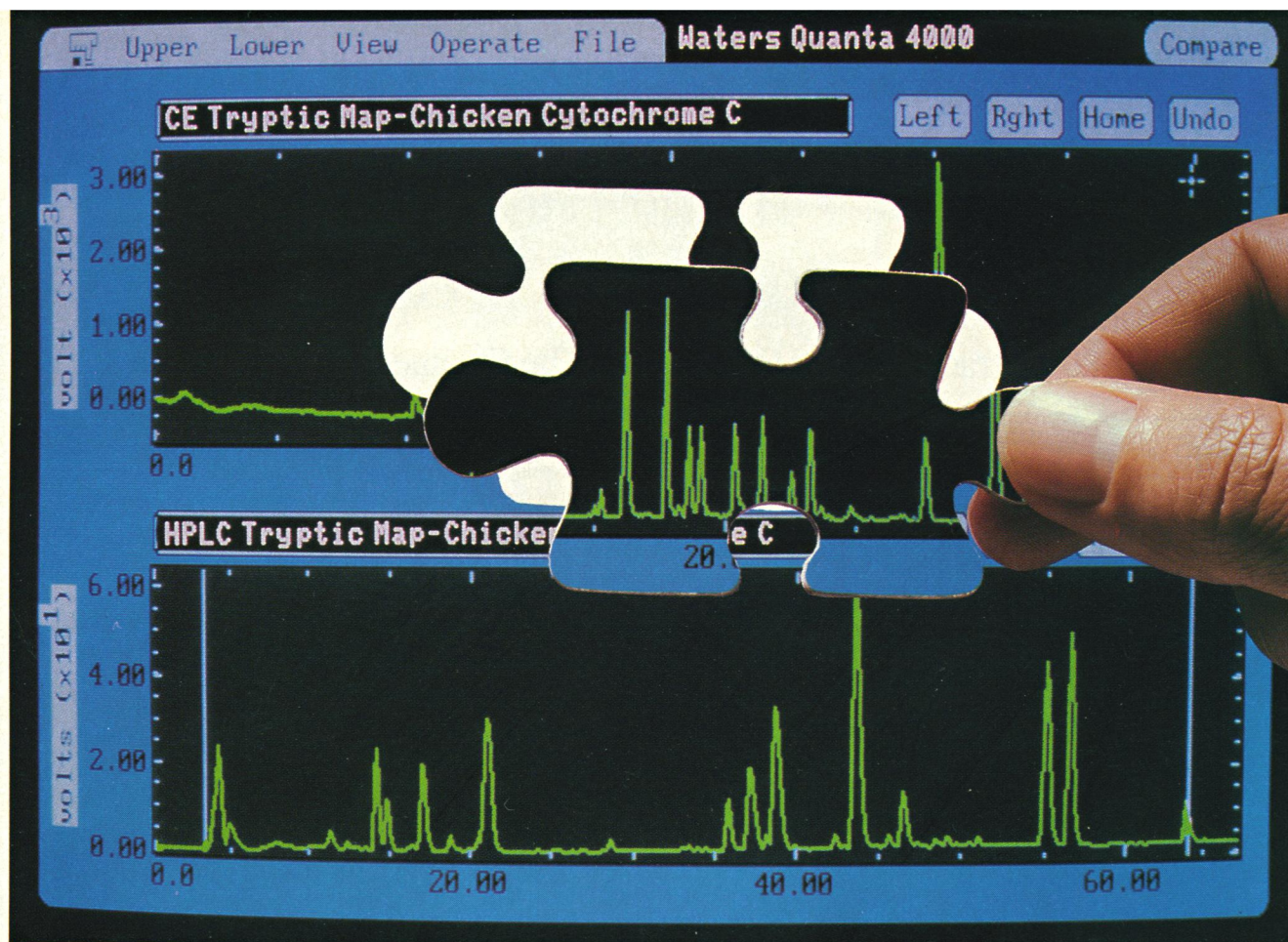
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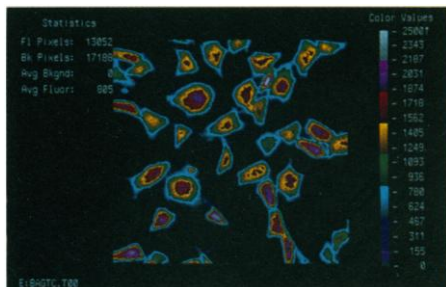
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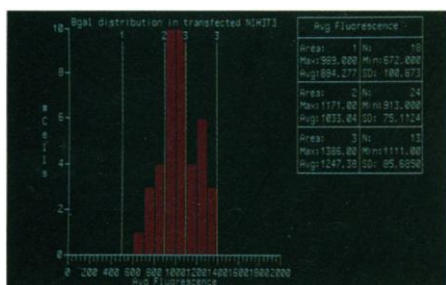
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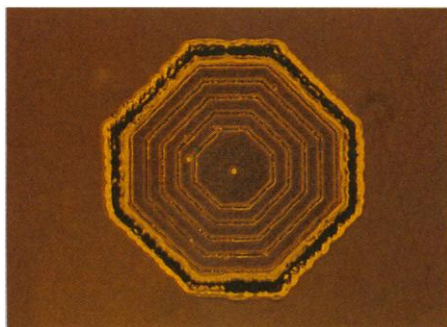
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Two-dimensional, pseudo-color fluorescence image of FDG-labeled, *lacZ*⁺ NIH3T3 cells.



Histogram display of β -galactosidase positive, NIH3T3 cells.



An example of ACAS cell sorting using the "Cookie-Cutter"™ technique to isolate single cells in culture while preserving their normal anchorage dependent growth state.

The ACAS is *the* pioneer instrument for Interactive Laser Cytometry, giving you new techniques for quantitative fluorescence analysis and adherent cell sorting.

It is the only instrument you can use for the automated selection and cloning of adherent cells in culture. With the ACAS you can:

- Screen cells,
- Sort cells in culture based on physical and biochemical measurements,
- Select mutant cells at frequencies of one in a million,
- Clone cells without altering morphology, phenotype, or viability,
- Isolate sub-populations of cells for quantitative fluorescence analysis and,
- Automatically store cell locations for repeated scans of the same cells over time.

Meridian Instruments Inc., introduces a major breakthrough in cloning transfected cells with the ACAS 570. The ACAS was used for the screening, selection, and cloning of transfected mammalian cells carrying the E. coli *lacZ* gene! The product of expression of the *lacZ* gene, β -galactosidase, was measured using the fluorescent probe fluorescein di- β -D-galactopyranoside (FDG)! Selected cells were easily isolated and

cloned using the patented ACAS "Cookie-Cutter"™ technique. The ACAS provided quantitative criteria to select *lacZ*⁺ and *lacZ*⁻ cells, and to distinguish between high and low expressers for cloning.

You can use this powerful interactive technique for the automated sorting and cloning of:

- Mutant cells
- Transfected cells
- Hybridomas
- Rare cells

In addition, you get *all* these reasons that make the ACAS 570 *the* cytometer for cell and molecular biology research:

- #1 - Interactive Laser Cytometry
- #2 - Quantitative Fluorescence Measurements
- #3 - Sensitive Fluorescence Measurements
- #4 - Comprehensive Interactive Software
- #5 - Versatile Integrated Instrumentation
- #6 - Quantitative Confocal Microscopy

Only the ACAS 570 brings the methods of cell sorting and analysis to your cells in culture. These are a few of the many reasons why the ACAS 570 is **The Cytometer For All Reasons**. Call us now at 800/247-8084, or in Michigan 517/349-7200, to discover your reasons.



"See a demonstration of the ACAS at the FASEB meeting, April 1-6, booths #1747 and #1749"

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Fax: 011-32-3-7781727

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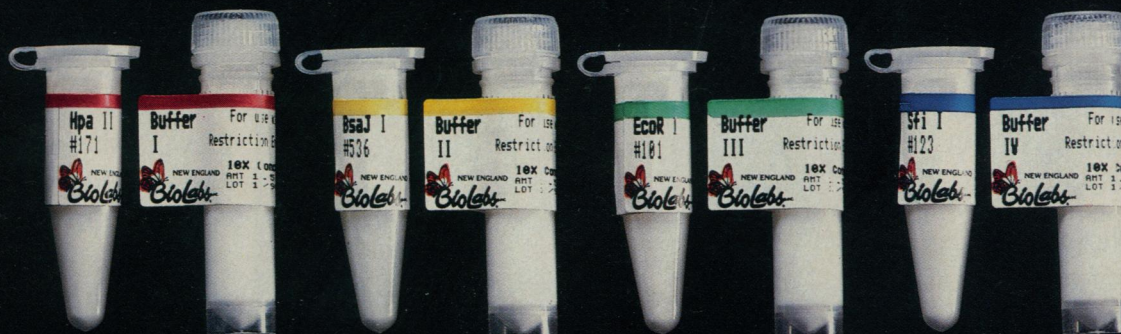
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¹Courtesy of James M. Wilson, Howard Hughes Medical Institute, University of Michigan, and Asmina H. Jiwa, Meridian Instruments, Inc.
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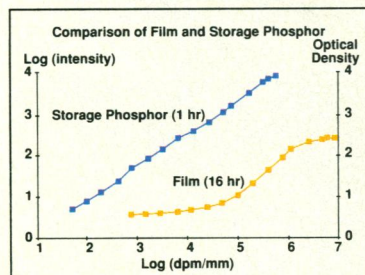
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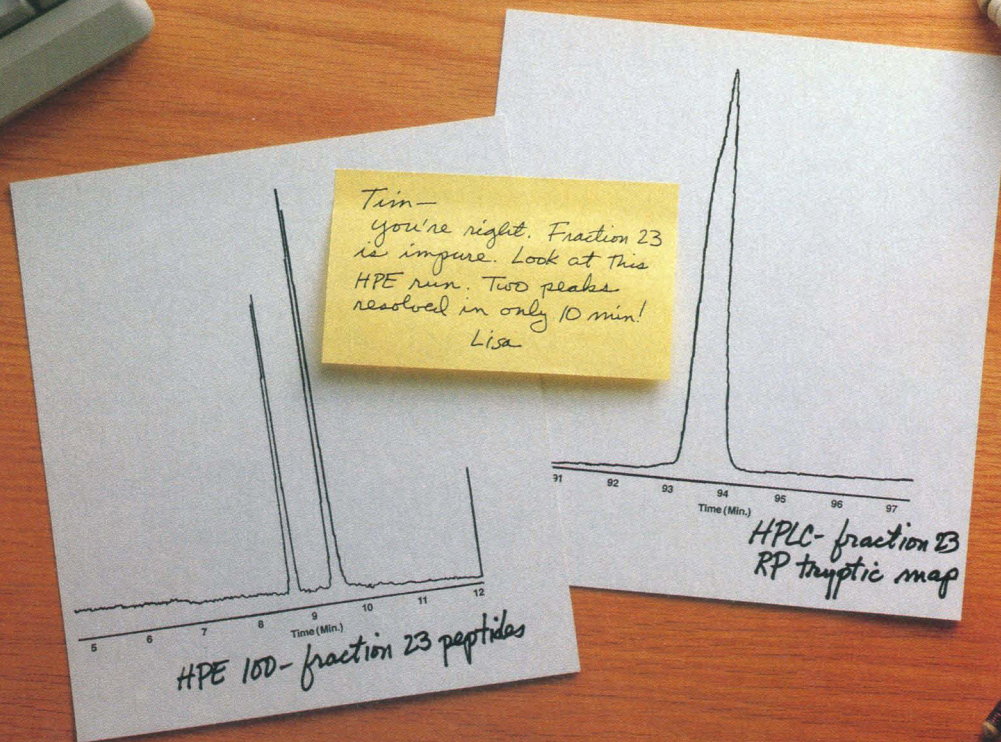
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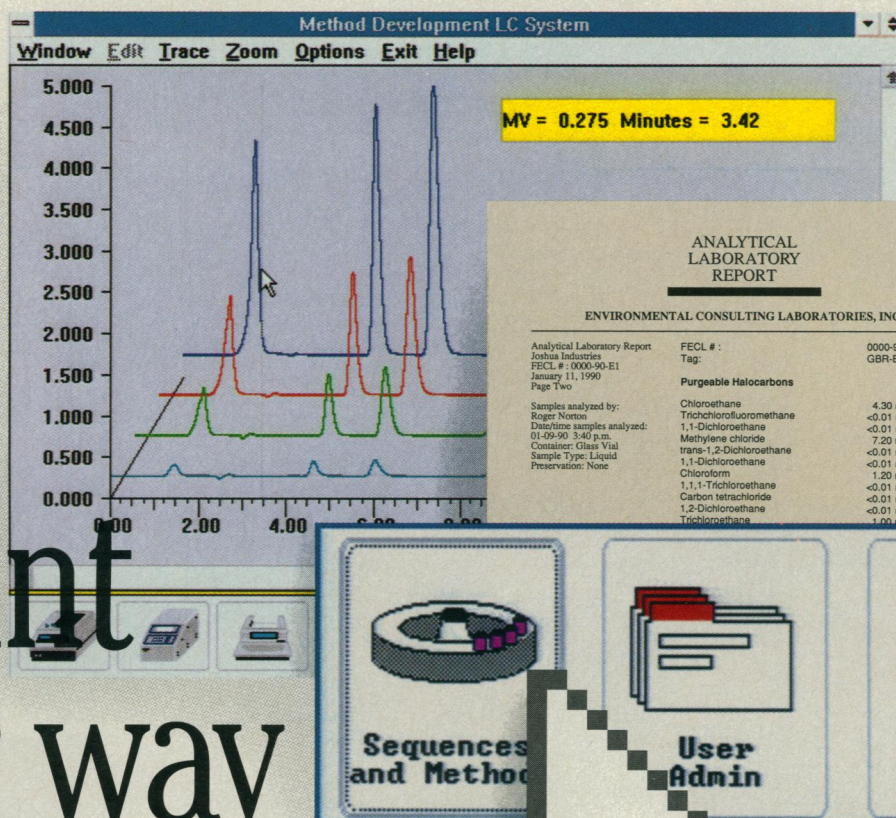
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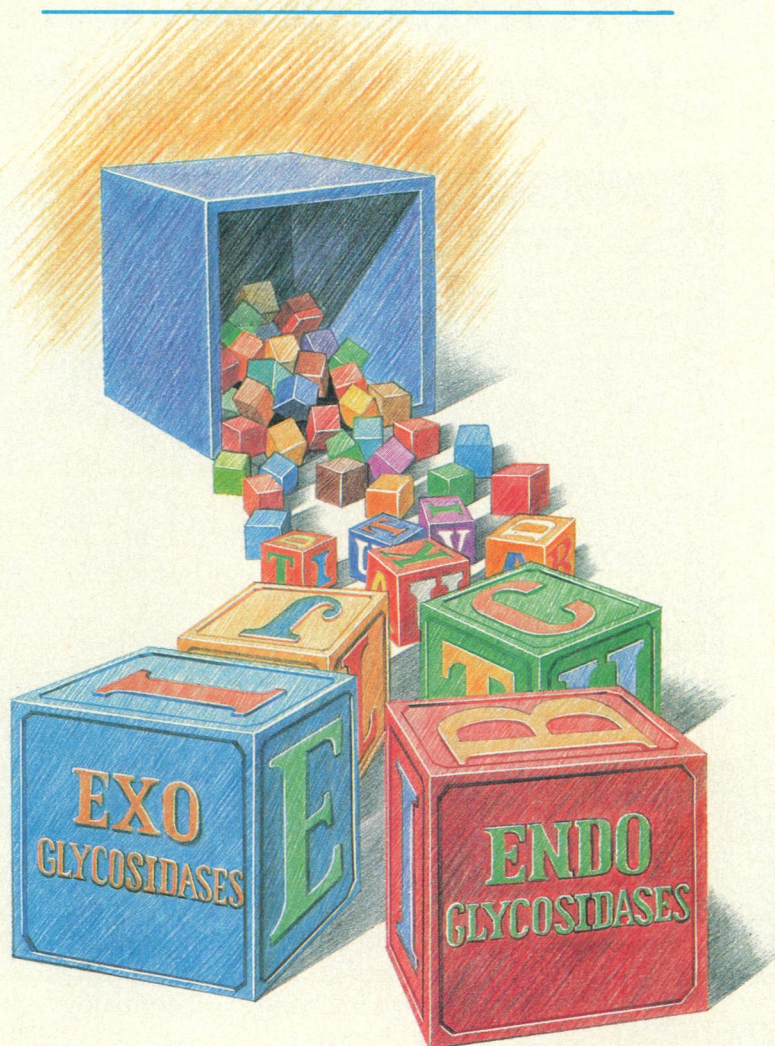
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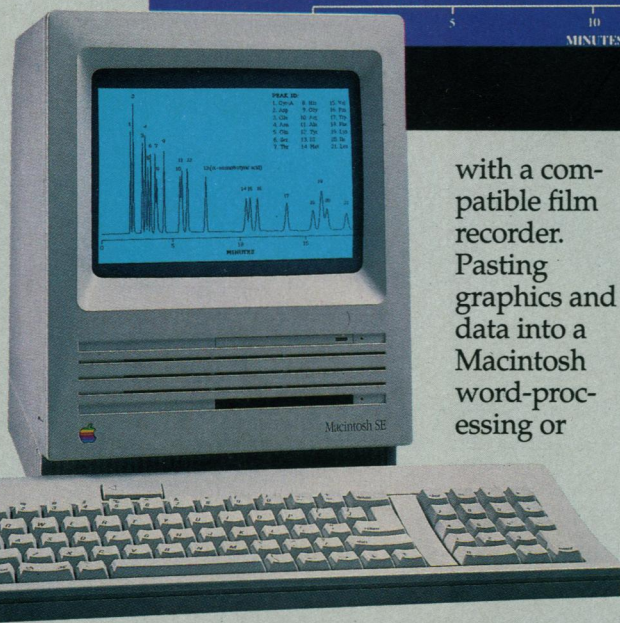
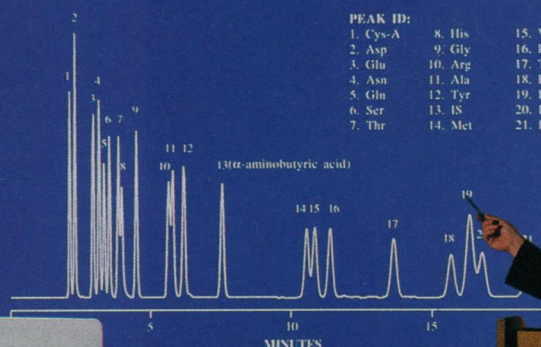
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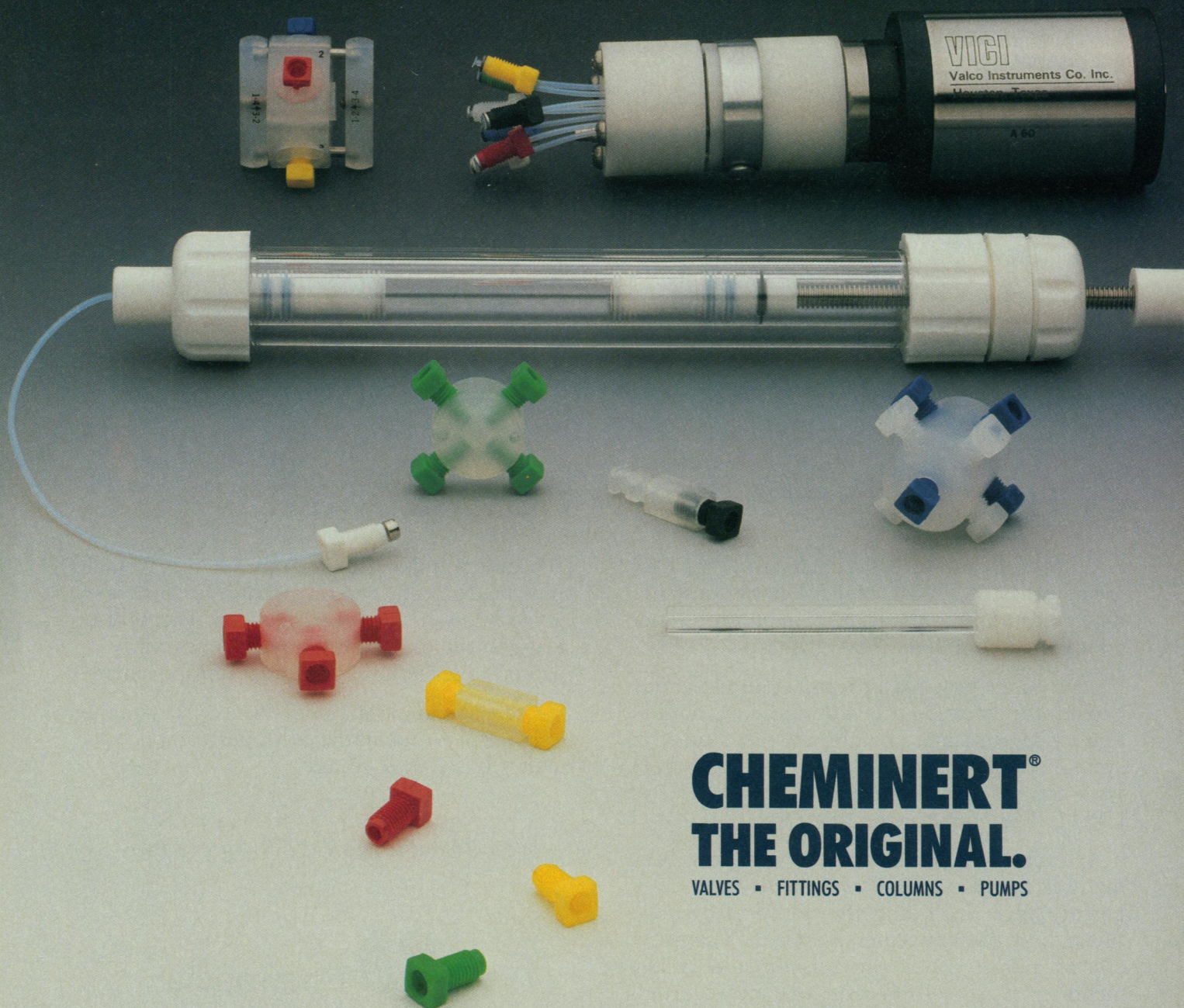
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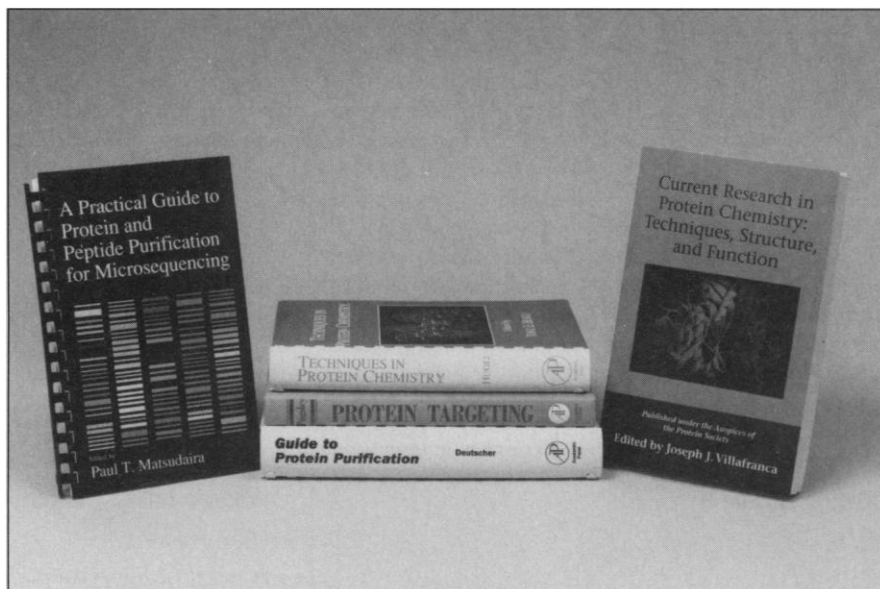
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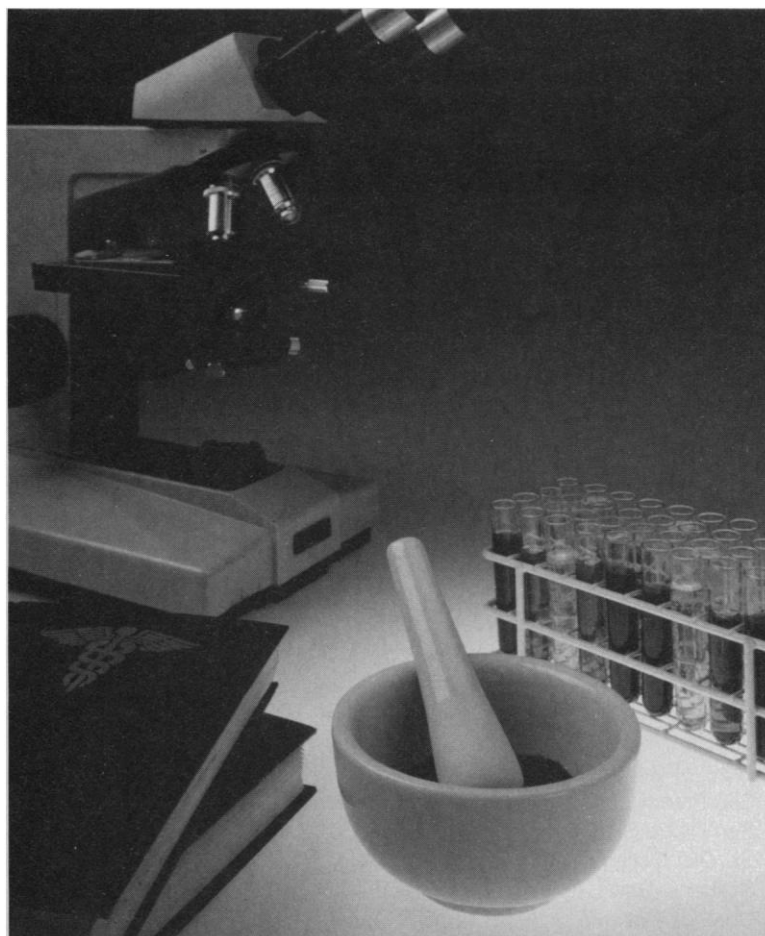
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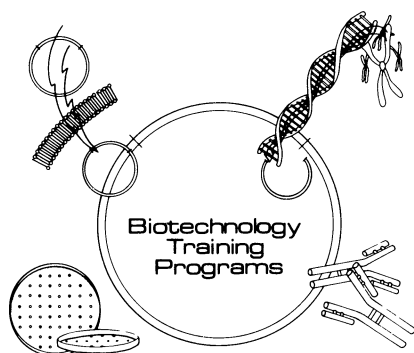
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6/12-15	Lewis & Clark College	Portland, OR	-restriction enzyme digests
6/19-22	Cal State Univ.	Los Angeles, CA	-agarose gel electrophoresis
7/31-8/3	St. Olaf College	Northfield, MN	-transformation of E coli
8/7-10	St. Louis Univ.	St. Louis, MO	-plasmid purification
8/14-17	SUNY, Stony Brook	Stony Brook, NY	-Southern analysis (non-isotopic)
12/11-14	Florida International	Miami, FL	-maximum enrollment, 16 -tuition, \$750.00

Hybridization Analysis (Plants), Tamsen de Valoir, Ph.D.

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5/15-18	Loyola Univ.	New Orleans, LA	-introductory level
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6/5-8	San Francisco State Univ.	San Francisco, CA	-RFLP analysis with non-radioactive hybridization probes
6/12-15	San Diego State Univ.	San Diego, CA	
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8/14-17	St. Louis Univ.	St. Louis, MO	-demonstration of PCR
8/28-31	Univ. of Alabama	Birmingham, AL	-applications to human genetics
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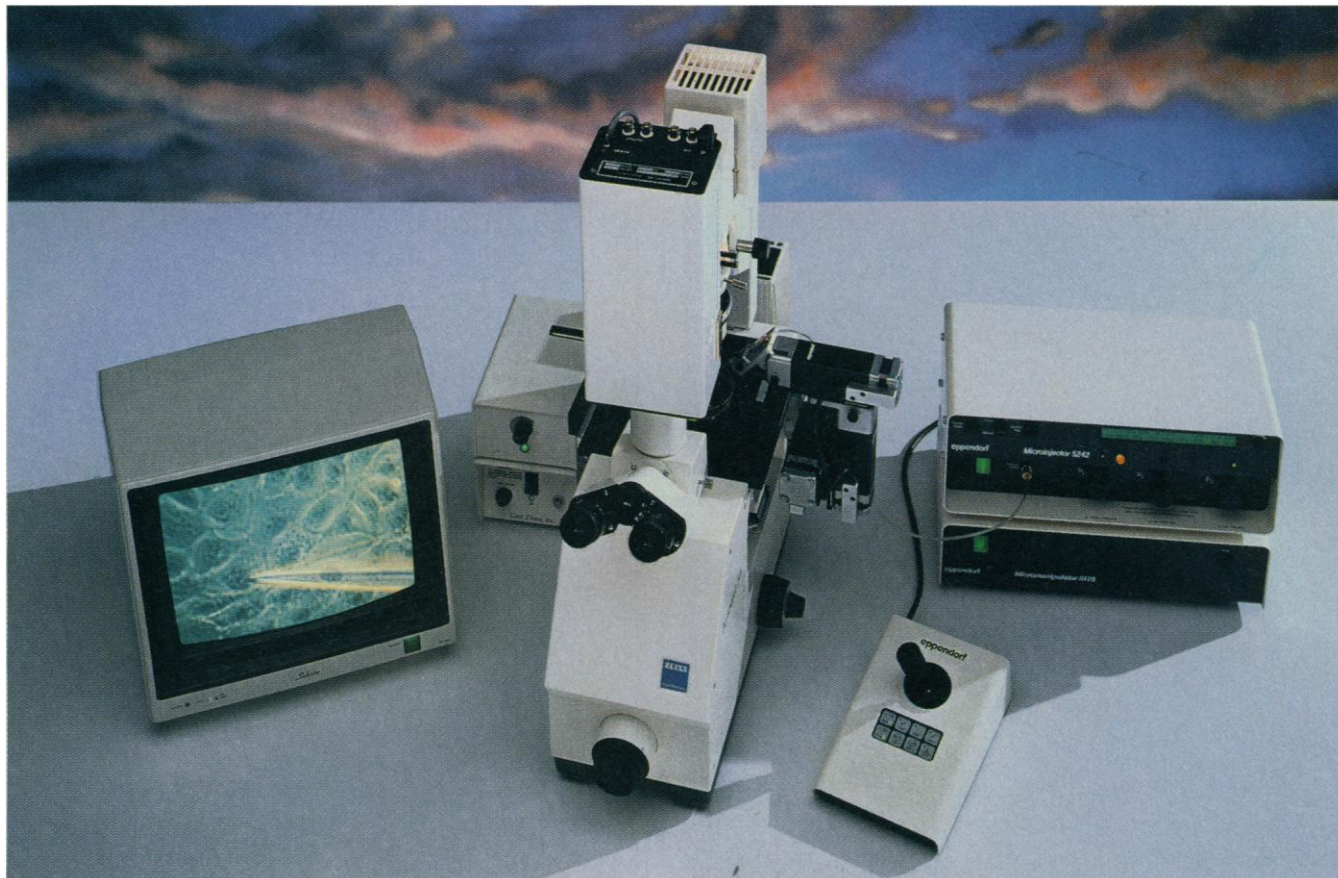
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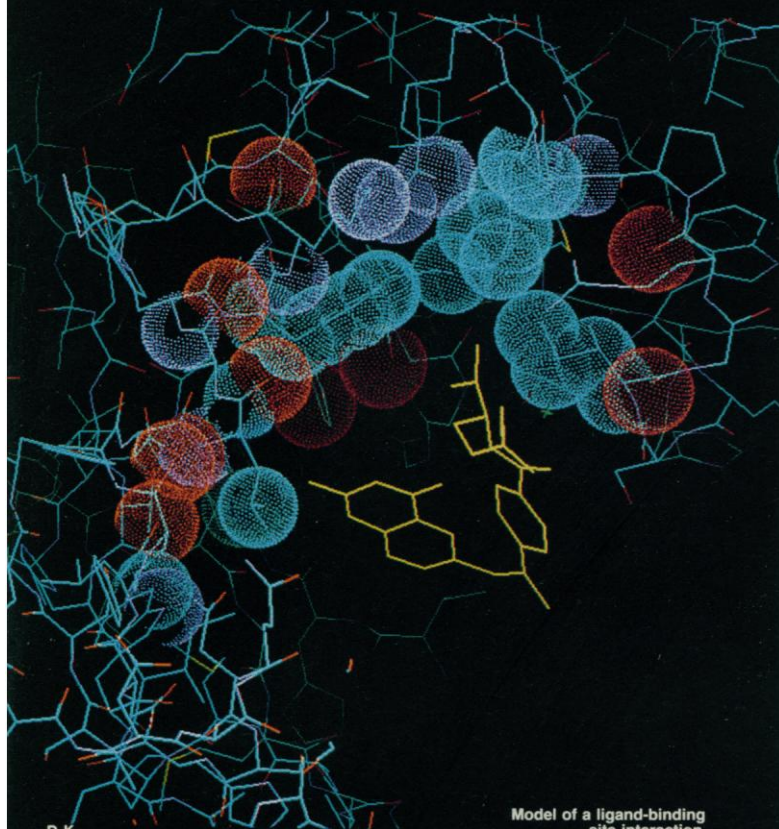
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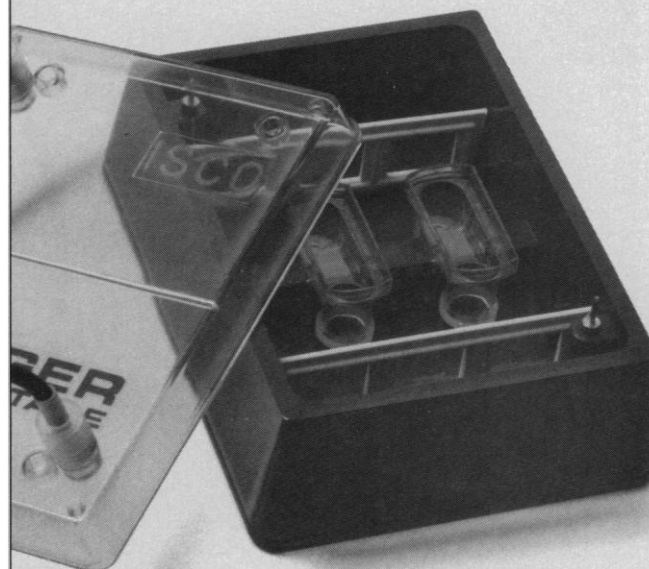


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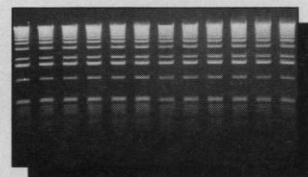
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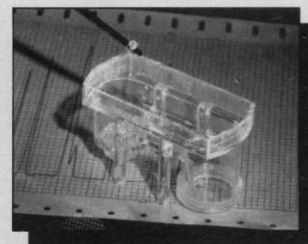
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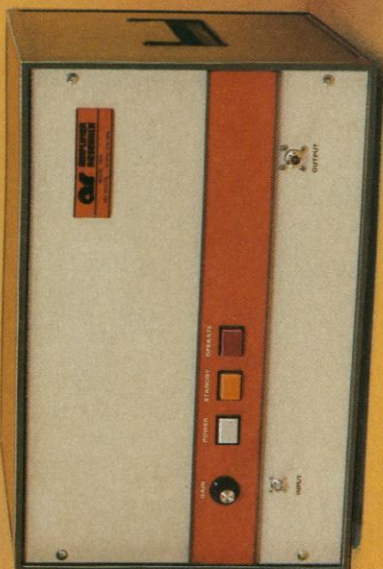
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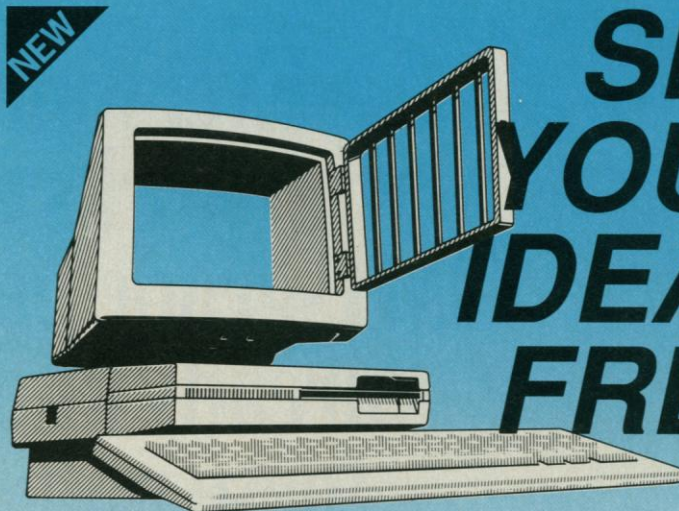


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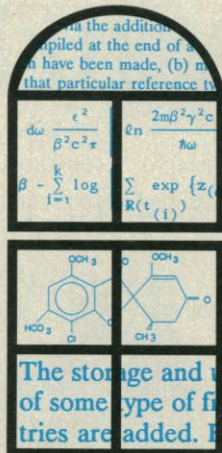
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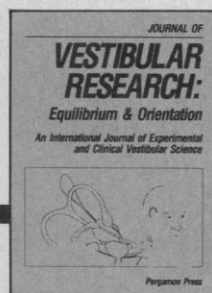
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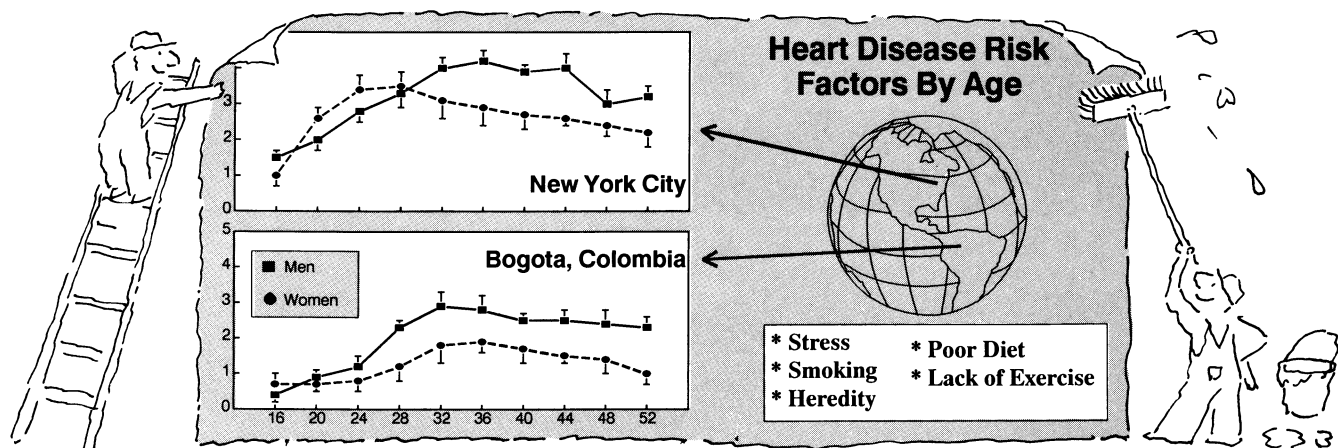
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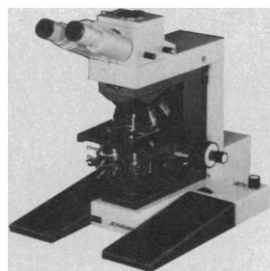
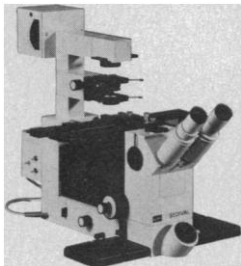
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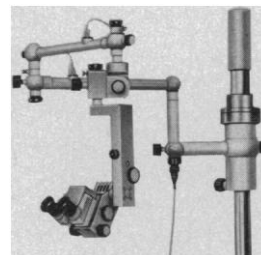
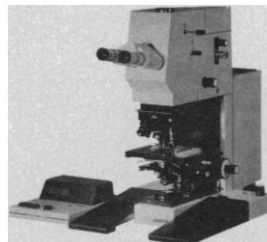
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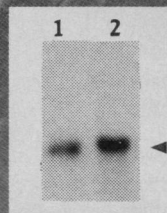


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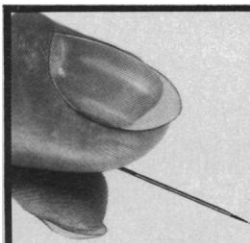
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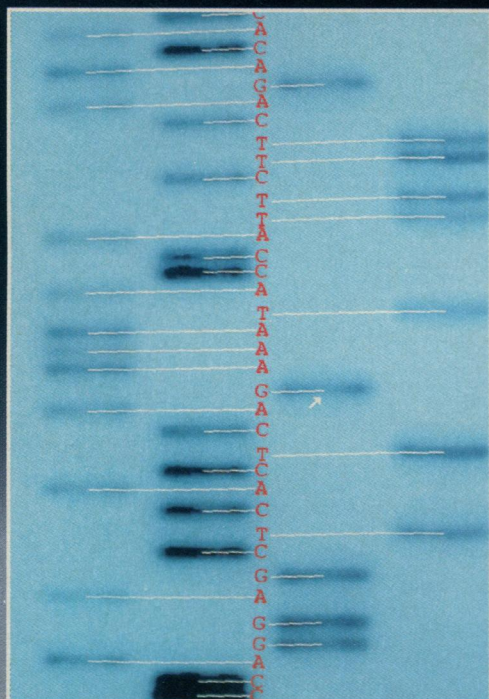
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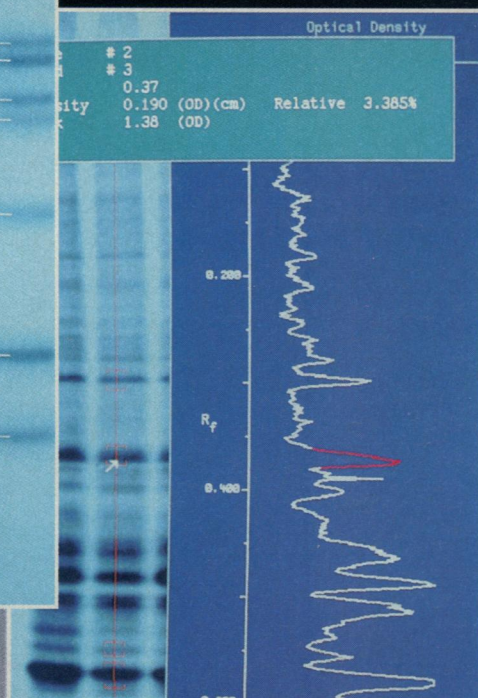
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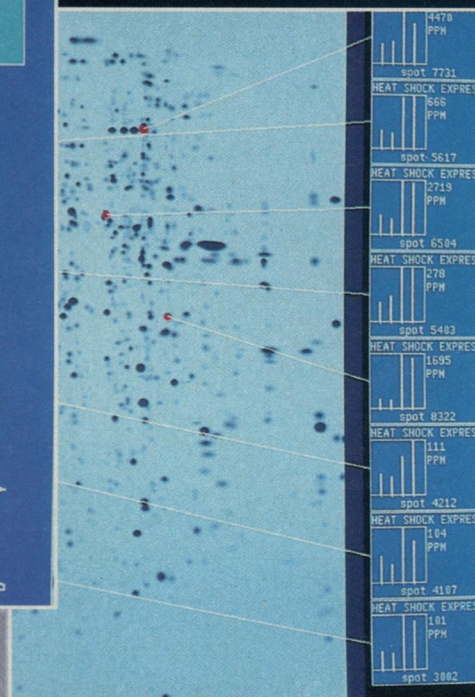
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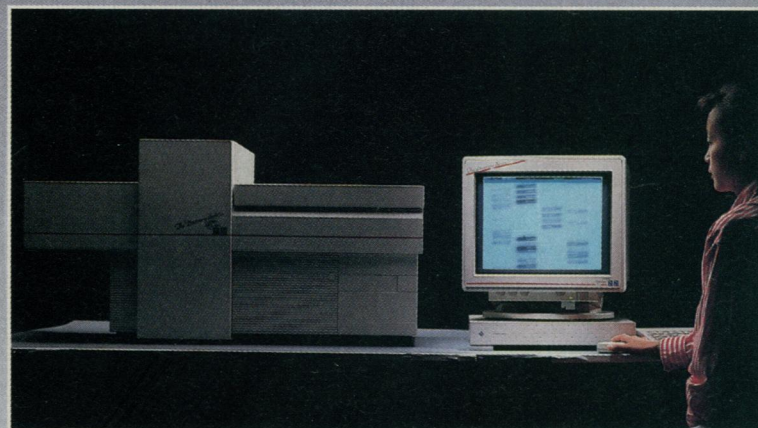
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