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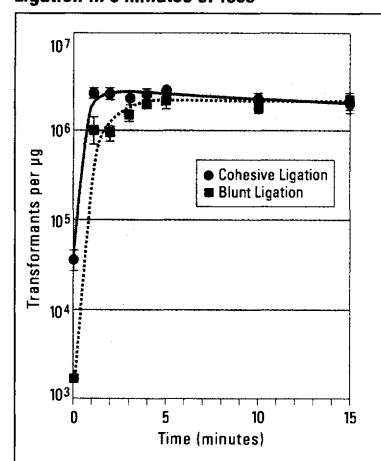
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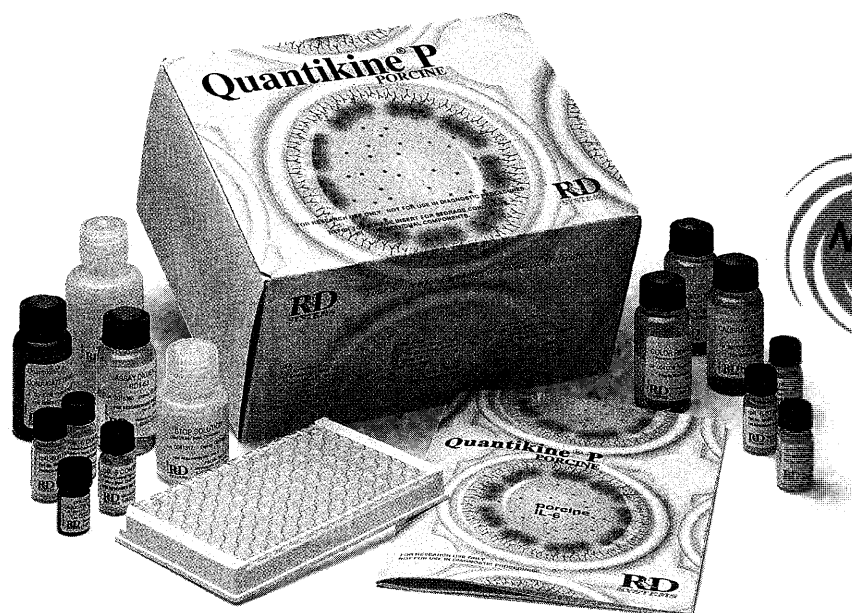


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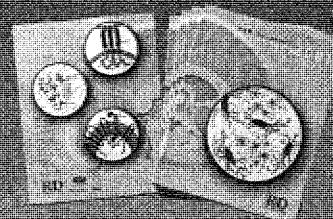
Interaction of Shiga toxins with human brain microvascular endothelial cells; cytokines as sensitizing agents. Ramegowda B., Samuel J.E. & V.L. Tesh (1999) J. Infect. Dis. 180:1205.

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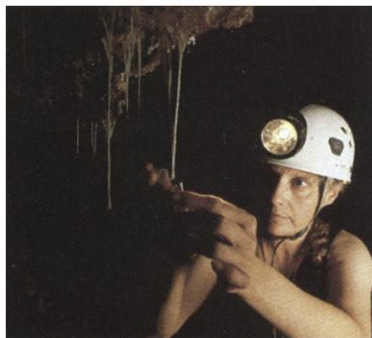
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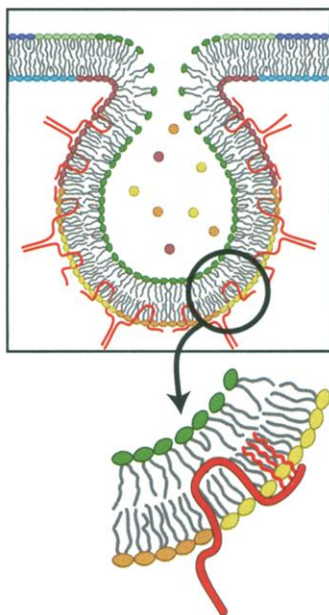
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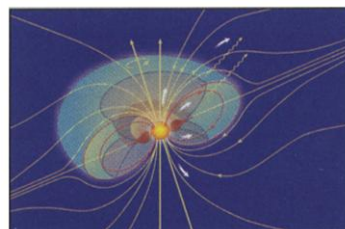
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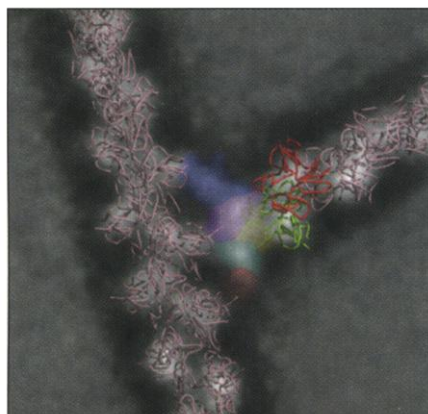
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Head start on sauropod evolution



COVER 2425

Johannes Vermeer's "The Painter in His Studio" (also known as "The Art of Painting") and an anatomical drawing from René Descartes' *Dioptrice et Meteora* illustrate human perception of objects. Distinct patterns of response are evoked in the human brain by perception of different categories of objects—for example, faces, chairs, and shoes. [Vermeer: Kunsthistorisches Museum, Vienna/Bridgeman Art Library; Descartes: 1677 edition, collection of David Foldi]



New on Science Express

Blood vessel signaling to the growing pancreas

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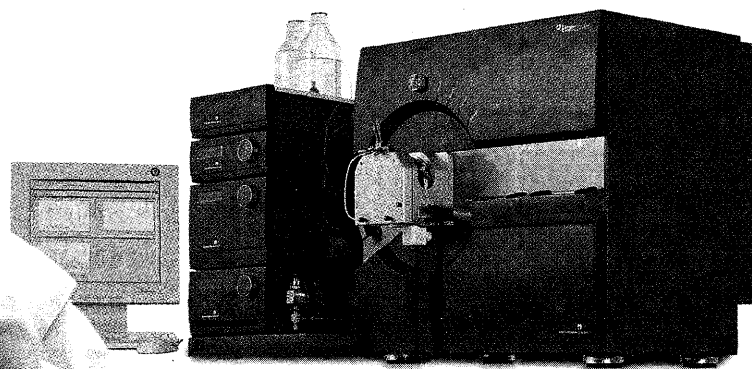
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Liver Organogenesis Promoted by Endothelial Cells Prior to Vascu-

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Induction of Pancreatic Differentiation by Signals from Blood Vessels

▼ E. Lammert, O. Cleaver, D. Melton

2365 Blood vessels provide sustenance and early signals for organ development.

Observation of Charge Transport by Negatively Charged Excitons D. Sanvitto *et al.*

Spectroscopic techniques are used to verify the existence of mobile negatively charged excitons moving in an electric field.

TECHNICAL COMMENTS

An Extraterrestrial Impact at the Permian-Triassic Boundary?

Becker *et al.* (Reports, 23 February 2001, p. 1530) presented geochemical evidence—based on isotope ratios of noble gases trapped in fullerene molecules—for an extraterrestrial impact at the Permian-Triassic boundary (PTB), which corresponds with the largest mass extinction in Earth history. Farley and Mukhopadhyay report that, in experiments on material from the Meishan, China, section examined by Becker *et al.*, they could detect fullerene-hosted extraterrestrial ^3He "neither in aliquots of the same Meishan material analyzed by Becker *et al.* nor in any samples of a second Chinese PTB section," and that they "thus find no evidence for an impact." Separately, Isozaki suggests that, for the Sasayama section in Japan, the sample that Becker *et al.* analyzed actually came "from at least 0.8 m . . . below the PTB." Becker and Poreda respond that the difference between their results and those of Farley and Mukhopadhyay likely stem from differences in "sample selection and preparation," and argue that their placement of the PTB at Sasayama is the best interpretation available "in the absence of any biostratigraphy and poor stratigraphic control."

The full text of these comments can be seen at www.sciencemag.org/cgi/content/full/293/5539/2343a

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Review: Combining Genetics and Cell Biology to Crack the Code of Plant Cell Calcium Signaling G. J. Allen and J. I. Schroeder

Generating and interpreting signals from calcium oscillations in plants.

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Germany: Academic Reform in Debate E. von Ruschkowski

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UK: Organic Farming—A Fertile Field of Research H. Marshall

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Advances in Genomics and Bioinformatics:

This special advertising section discusses advances in genome analysis, comparing data from different genomes, gene expression, and bioinformatics. Look for it on page 2491.

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THIS WEEK IN Science

edited by Phil Szuromi

A Hard Bargain

If you take a paper clip and slowly bend it back and forth, the process becomes increasingly more difficult, and eventually the wire will snap. Each cycle of deformation generates dislocations that get jammed against each other, causing the material to "work harden"—it becomes brittle and hard and resembles a ceramic. Hugosson *et al.* (p. 2434) use theoretical calculations to determine the energies for a number of metal carbide structures in order to find those that have similar energies but differing arrangements. They then show that if these different structures could be deposited as thin layers, dislocations would be fully pinned because the large number of interfaces would interfere with the different glide systems that move the dislocations. If such a material could be realized experimentally, it could have the potential to be a much harder coating material than existing carbides and nitrides.

Tropical Controls

What controls oceanic biological productivity on time scales of 10,000 to 100,000 years? Beaufort *et al.* (p. 2440) examined a series of deep-sea sediment cores from across the tropical Indian and Pacific Oceans that span the last 250,000 years and found that two independent forcing mechanisms are responsible for 60% of the long-term equatorial Indo-Pacific productivity dynamics. The first one is a 100,000-year signal linked to glacial-interglacial variability, and the second is a 23,000-year precessional response that precedes variations recorded by oxygen isotopes by about 2000 years and that appears to be independent of changes in the ice sheets. The El Niño-like dynamics of this variability provides support for the growing body of evidence that low-latitude climate has dynamics independent from those of high latitudes.

Pattern and Object Recognition

The early stages of vision are largely a process of deconstructing a scene into component features, such as contours and color, and then reconstructing these into recognizable objects, such as faces. Recent work has indicated that the temporal cortex houses representations of these objects, but the precise nature of these representations (and whether they are localized or distributed) has been elusive. Haxby *et al.* (p. 2425; see the cover) have looked closely into the patterns of brain activations triggered by different classes of objects. They suggest that these patterns do in fact reveal the distributed representations of objects and that these patterns occupy overlapping territories within the temporal cortex at a subcentimeter scale. Extending earlier work that described an area specialized for responding to human faces, Downing *et al.* (p. 2470) provide evidence that parts of the human body also are afforded special treatment. In a Perspective, Cohen and Tong compare and contrast these

2437 Perovskite to the Core?

The mineralogy of the lower mantle is inferred from seismic data and high pressure and temperature experiments conducted at 50 to 120 gigapascals and 1600 to 2400 Kelvin. Debate continues on whether (Mg, Fe)SiO₃ perovskite or its dissociated products, MgO and SiO₂, dominate in the lower mantle (at depths below 1700 kilometers). Experiments by Shim *et al.* (p. 2437) confirm that perovskite is stable to at least 2300 kilometers, which reduces the possibility of free silica near the base of the mantle. Seismic observations will need to be explained by compositional or thermal effects rather than mineral transformations.

findings about object representation in the human brain.

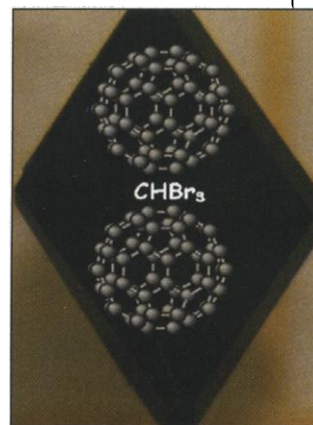
Benefits of Helping

In cooperative vertebrate societies, some individuals delay or forego reproduction and instead help to provision the offspring of other individuals in the group. Clutton-Brock *et al.* (p. 2446), adding a new chapter to their long-term studies of meerkats in southern Africa, show that helping benefits not only the helped, but the helpers themselves.

The presence of helpers has clear benefits for offspring in terms of growth and survival. This effect is magnified in larger meerkat groups, unlike in mammals where offspring are provisioned by the parents alone. Also, helpers themselves attain (and sustain) greater body mass, showing that helping behavior has mutual benefits.

The Straight Dope on Superconductivity

Chemical substitution has been the usual method for changing the doping levels in superconductors. Recently, it has been shown that samples can be doped directly in field-effect transistors, and this method has been used to improve and understand superconductivity in two noncuprate compounds (see the Perspective by Dagotto). The electronic density of states of C₆₀, a critical parameter in determining the superconducting transition temperature T_c , depends on the lattice constant of the C₆₀ crystal. Schön *et al.* (p. 2430) expanded C₆₀ crystals by intercalation with chloroform (CHCl₃) and bromoform (CHBr₃) and found that in the latter case, the T_c of hole-doped C₆₀ could be boosted from 52 to 117 K. The spin-ladder compounds have quasi-one-dimensional structures and present a simplified model system for investigating the mechanism of superconductivity in the planar cuprates. Schön *et al.* (p. 2432) show that the spin-ladder system [CaCu₂O₃]₄ can be made superconducting through the application of an electric field, thus verifying theoretical predictions that holes doped into these structures can pair and superconduct.



Life Without Caveolae

Caveolae are small, flask-shaped invaginations found in abundance on the plasma membrane of epithelial cells. They have been thought to play an important role in cellular signal transduction and transcytosis, and may also be important in tumor progression. Drab *et al.* (p. 2449; see the Perspective by Parton) describe a caveolin-1 knockout mouse. Surprisingly, the mice are viable, but totally

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lack morphologically identifiable caveolae. They do have pulmonary and vascular defects that are caused by problems with cellular nitric oxide and calcium signaling. The generation of an organelle knockout in an intact organism should shed light on the physiological pathways in which caveolae play a critical role. **X**

Embryonic Sauropod Skulls

Fossils of the long-necked and long-tailed herbivorous sauropods have been found on every continent except Antarctica and Australasia. Unfortunately, very few of the specimens are skulls, thus limiting our understanding of cranial development. Chiappe *et al.* (p. 2444; see the news story by Stokstad) have found embryonic sauropods with well-preserved skulls from the Late Cretaceous nesting site of Auca Mahuevo, Argentina. Examination of the skulls indicates that the retraction of the nasal cavity did not proceed as a result of the rotation of the braincase. These specimens may be the only complete skulls of titanosaurs, a ubiquitous but enigmatic group of sauropods.

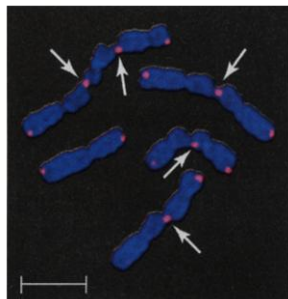
How to Make a Branch

Thin filaments are one of the primary components of the cytoskeleton, the intracellular mesh that provides structural support for the cell and a platform for future expansion. These filaments are helical polymers of actin, and they are known to form branched networks within lamellipodia, membrane-enveloped protrusions created at the front of moving cells. Arp2/3 is a complex of proteins known to mediate the initiation of a new filament at a branchpoint. From an electron microscopic analysis, Volkmann *et al.* (p. 2456) find that this complex first is activated by the Wiskott-Aldrich Syndrome protein and then binds to the side of an existing filament without penetrating into that filament. The Arp 2 and Arp 3 (for actin-related protein) subunits appear to serve as the first two monomers in the daughter filament. **X**

Fixing Folding

A class of amyloid diseases, including familial amyloid polyneuropathy are thought to arise from the misfolding of specific proteins to form amyloids—fibrillar aggregates that interfere with normal cellular functions. In purified preparations of the amyloid-forming mutant version of the protein transthyretin, Hammarström *et al.* (p. 2460) show that presence of a protein encoded by a second mutant allele prevents amyloid formation. This result may explain why heterozygous patients are protected from exhibiting symptoms of the disorder.

Disparate Ends



A long-standing debate among aficionados of eukaryotic DNA replication is whether the two telomeric ends of the chromosome—one of which is replicated by leading-strand synthesis and the other by lagging-strand synthesis—are identical. Bailey *et al.* (p. 2463) address this issue cytogenetically by analyzing the aberrant end-to-end chromosomal fusions that are generated in cells expressing a dominant-negative mutant of the telomere binding protein TRF2. The two chromosome ends do indeed differ from one another—end-to-end fusions almost exclusively involve telomeres that contain leading strands. These results indicate that the telomeres at each end of the chromosome are probably protected from inappropriate fusion events by different mechanisms.

Unusual Dendritic Inhibition

Dopaminergic neurons in the substantia nigra express dopamine transporters in their dendrites. However, their function is not fully understood. Falkenburger *et al.* (p. 2465; see the Perspective by Blakely) combined electrophysiology and amperometry to study dopamine-mediated inhibitory postsynaptic currents. Dopamine can be released from dendrites, and this release was inhibited by the reuptake blocker GBR 12935. In this preparation, a distinctive mechanism causes dendro-dendritic inhibition through reversal of normal dopamine transport.

CREDIT: BAILEY ET AL.

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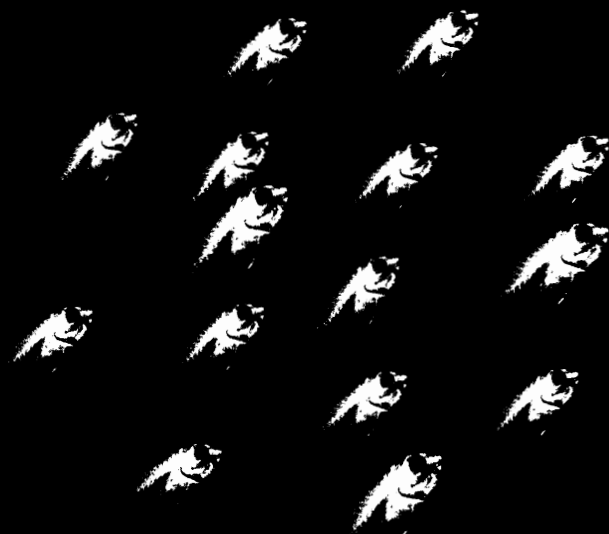
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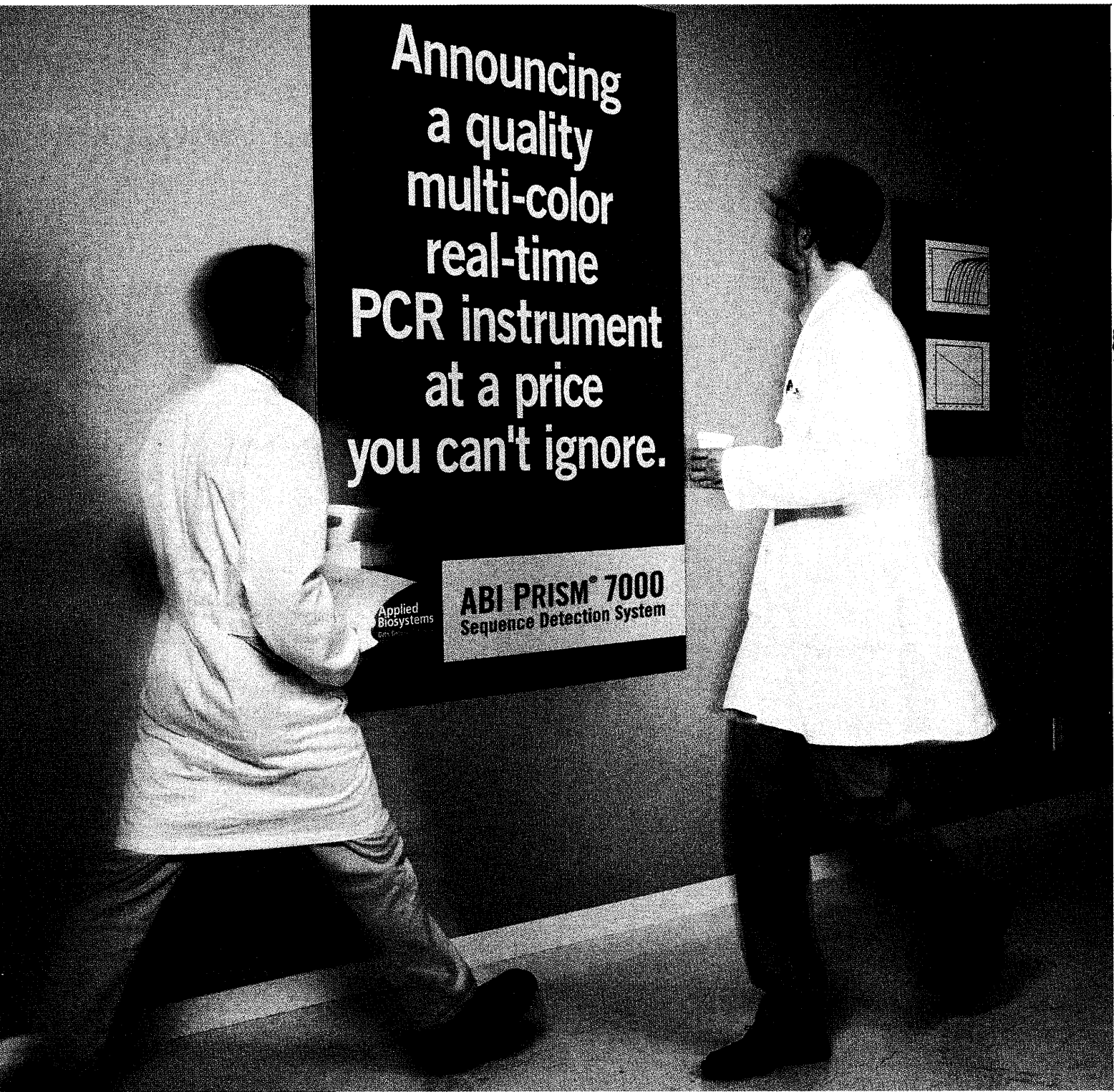
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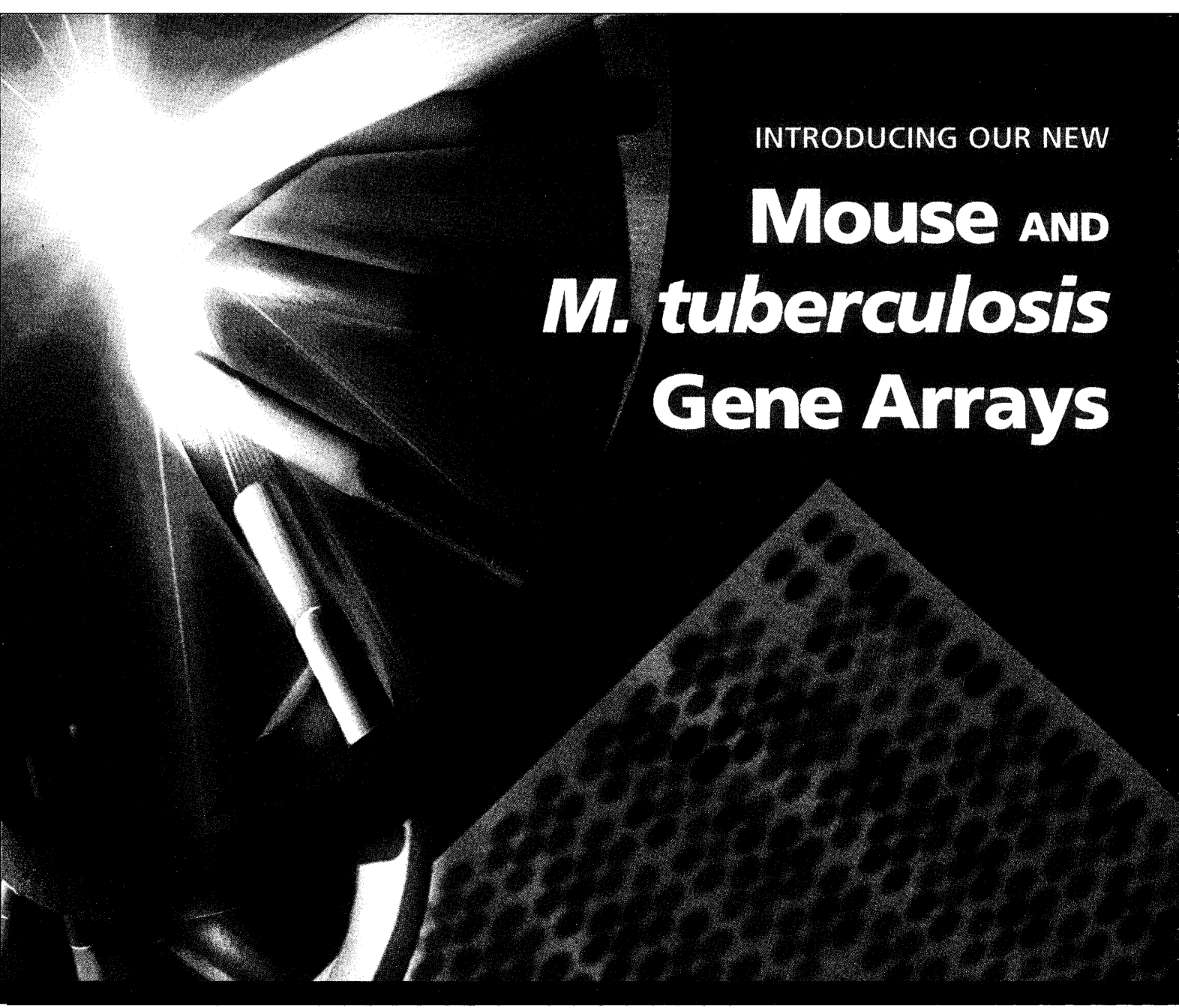
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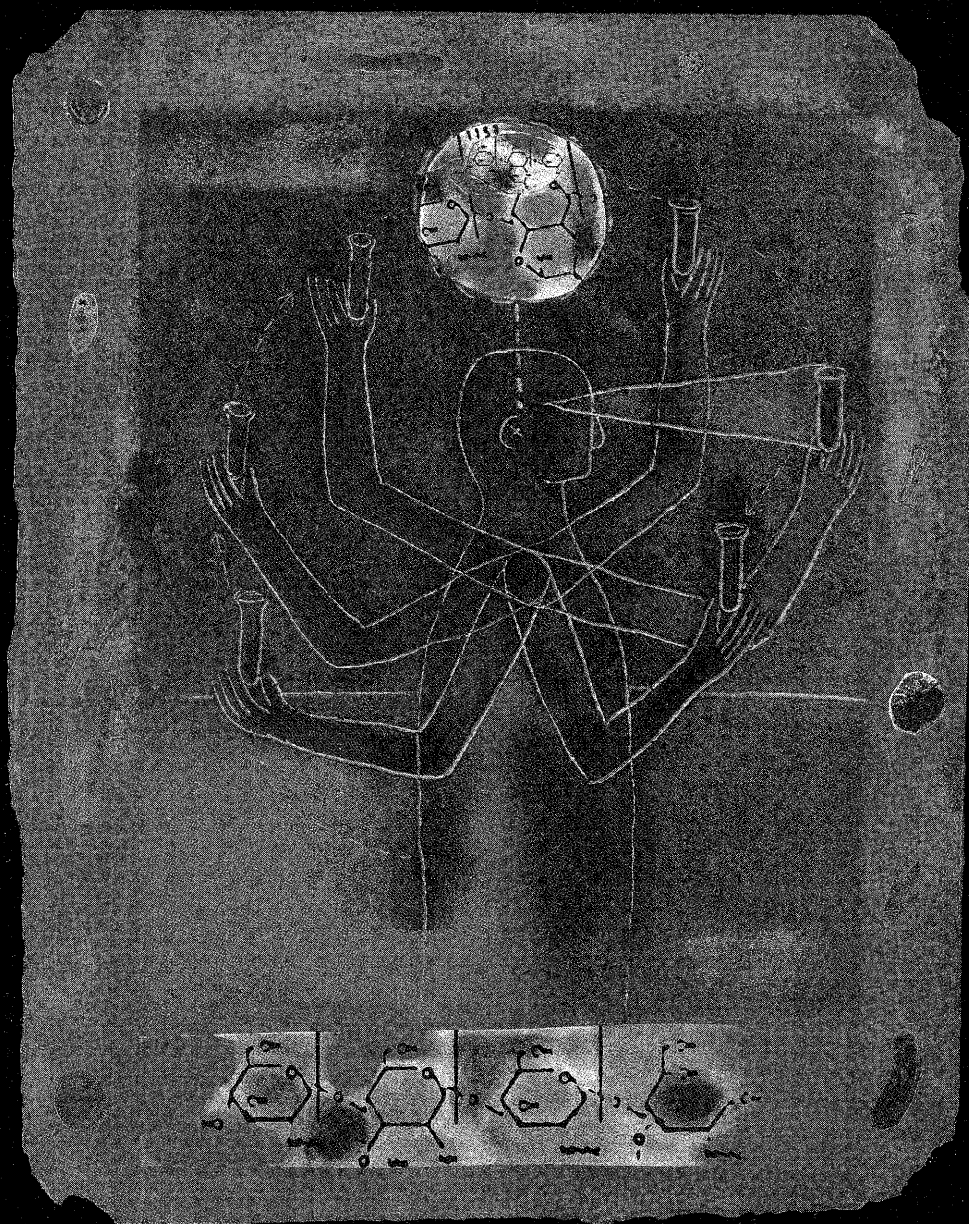
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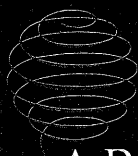
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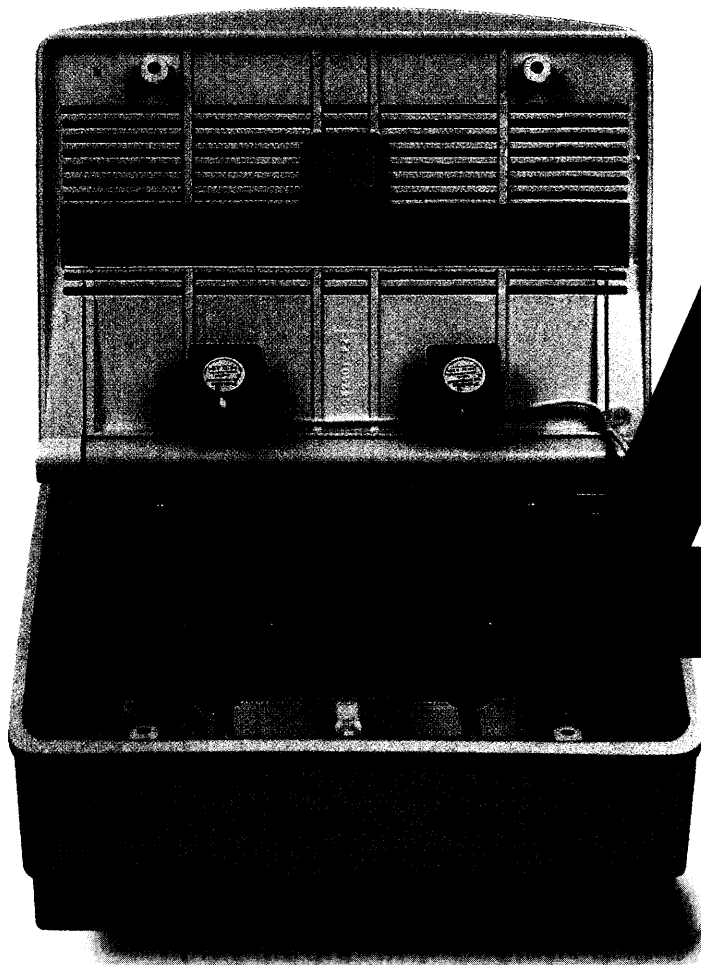
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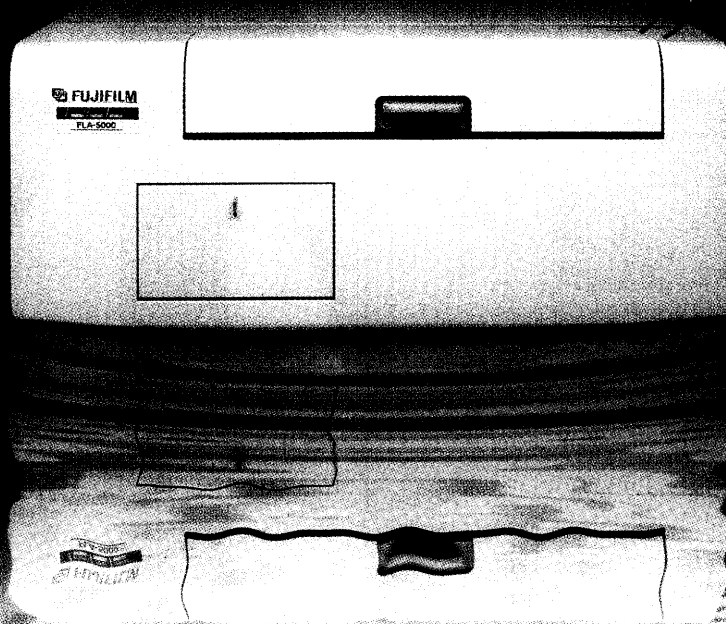
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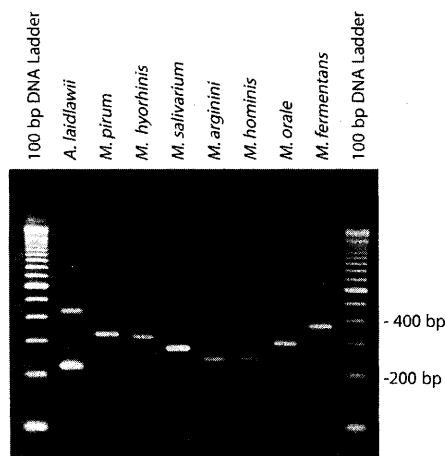
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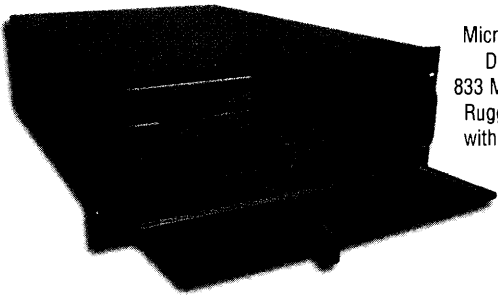
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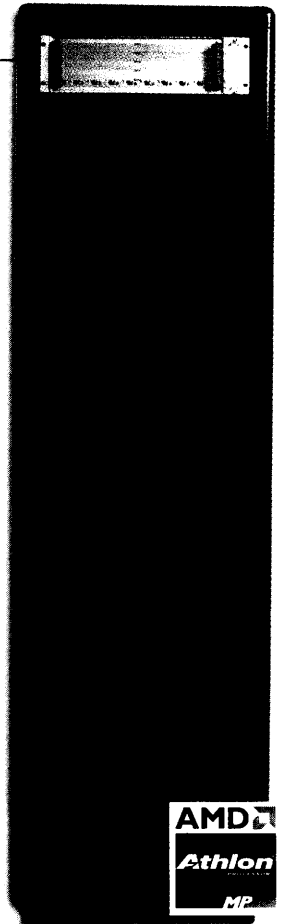
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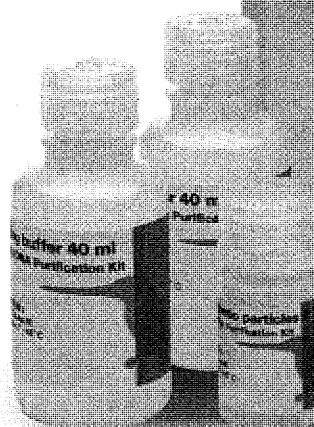
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1) Nat. Biotechnol. 18, 630-634 (2000)

2) Proc. Natl. Acad. Sci. USA 97, 1665-1670 (2000)

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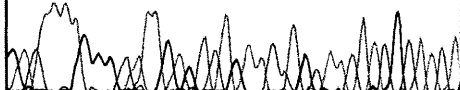
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Fig. 1. Fluorescent sequencing results of a 100 bp pUC18 PCR fragment sequenced with a -20 Fwd primer using the DYEnamic ET Terminator Cycle Sequencing Kit (Amersham Pharmacia Biotech). Data generated for USB by Cleveland Genomics (clevelandgenomics.com), a research service company. PCR clean-up performed with: (a) ExoSAP-IT; (b) a column designed for PCR clean-up. Base miscalls in (b) are due to inherently low yields of short PCR products when using columns.

Fig. 2. Autoradiograms of a 20.7 kb Lambda PCR fragment sequenced with MBL202 Fwd primer using USB's Thermo Sequenase Radiolabeled Terminator Cycle Sequencing Kit. PCR clean-up performed with: (a) ExoSAP-IT; (b) a column designed for PCR clean-up.

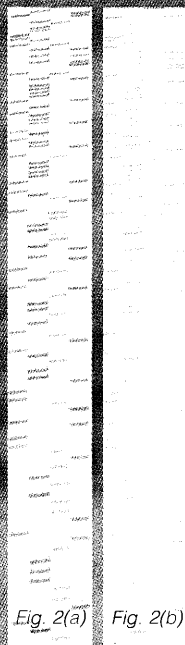
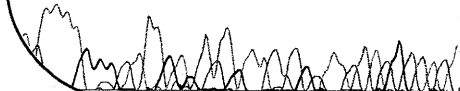
GATCCCGGGTACCGAGCTCGAATTCGTATCATGTCTATA
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Fig. 1(a)



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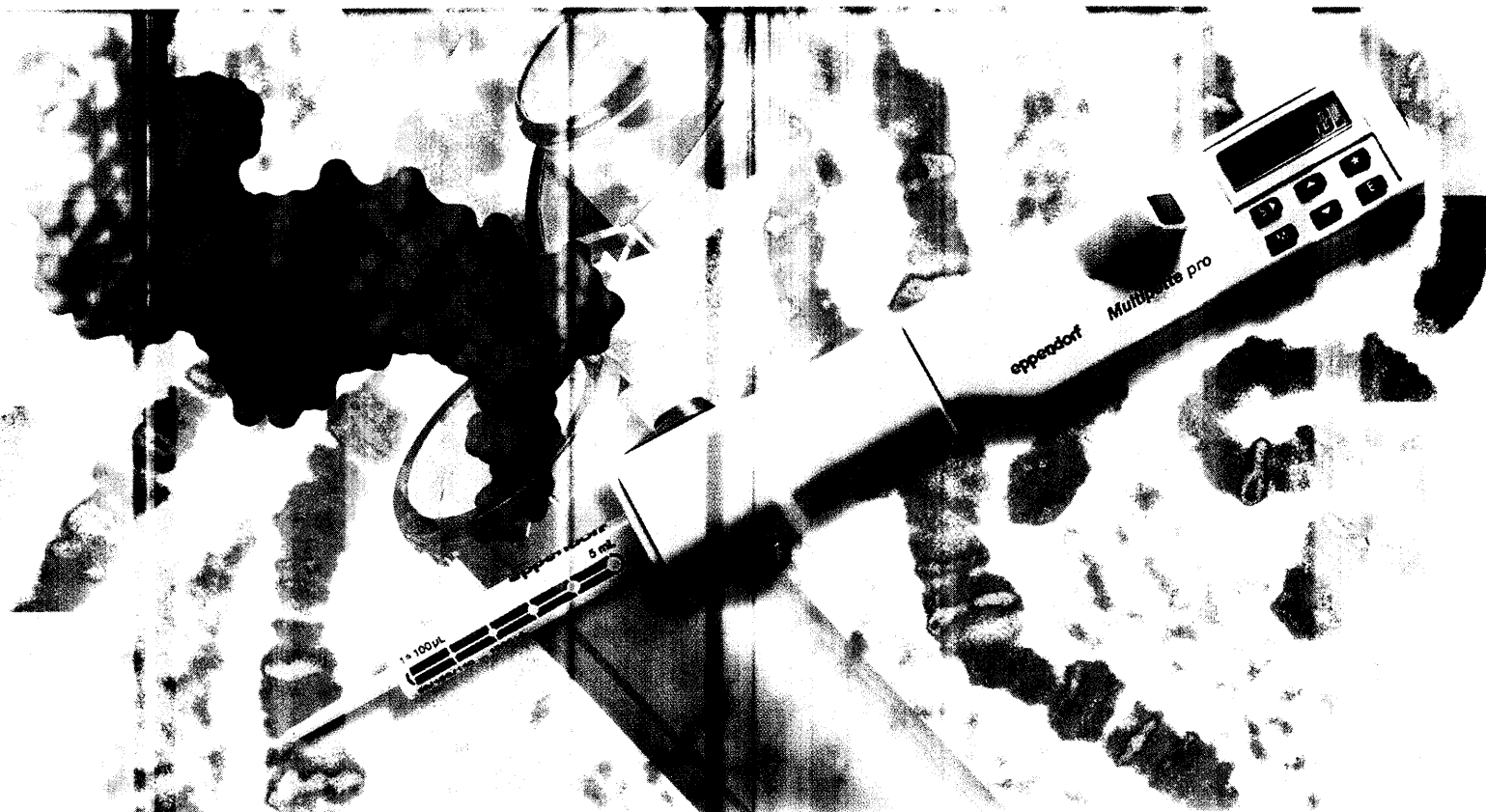
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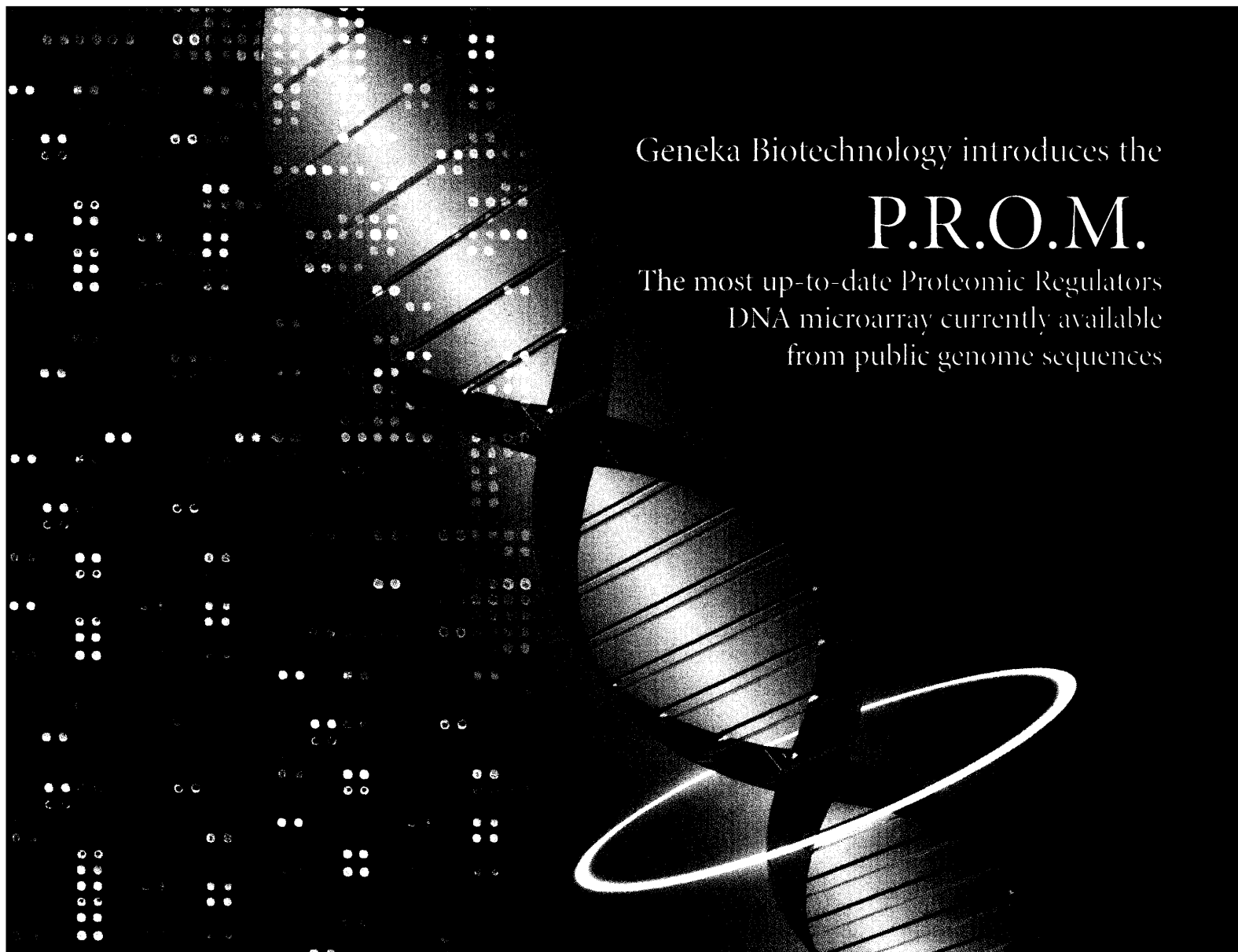
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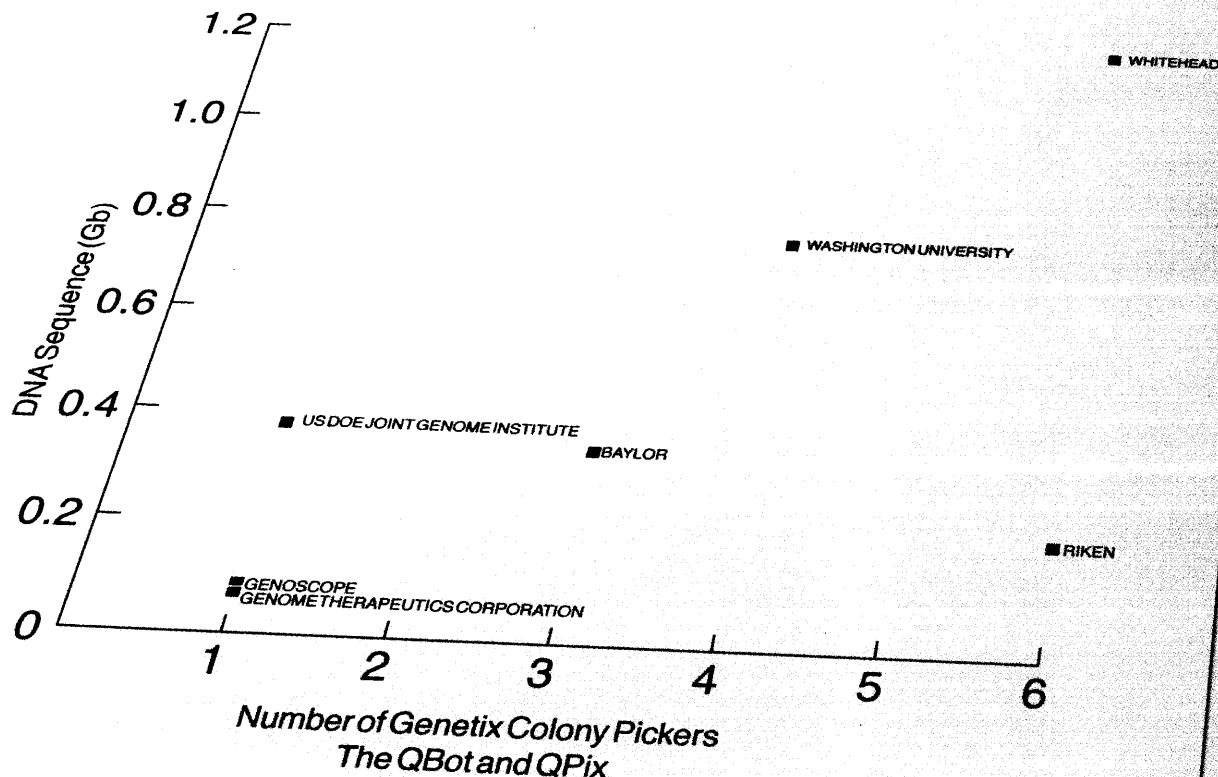
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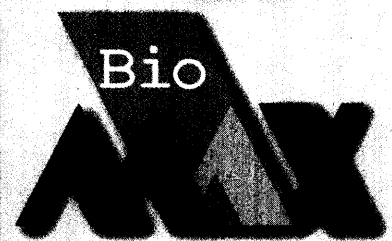
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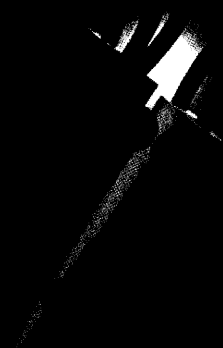
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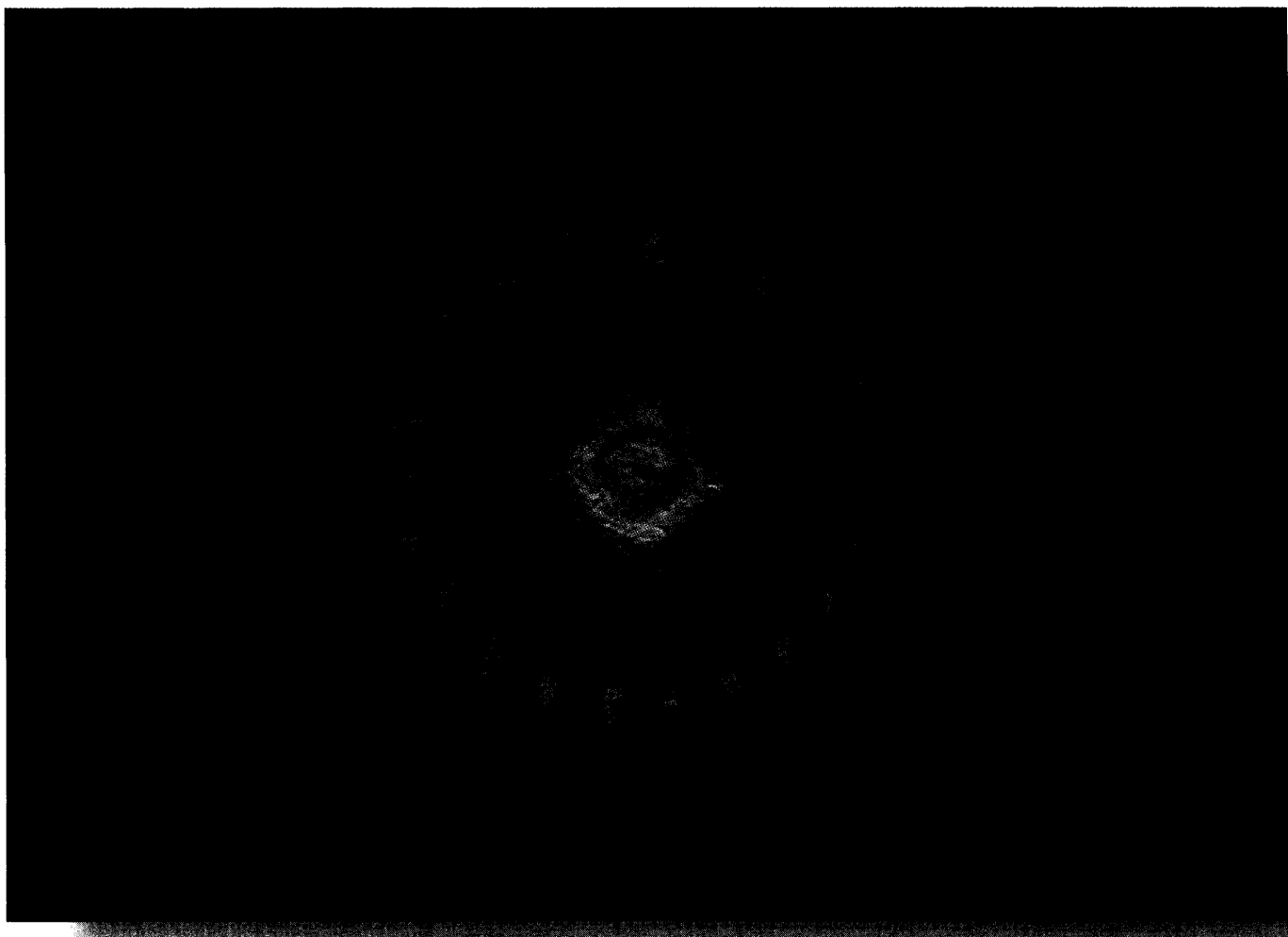
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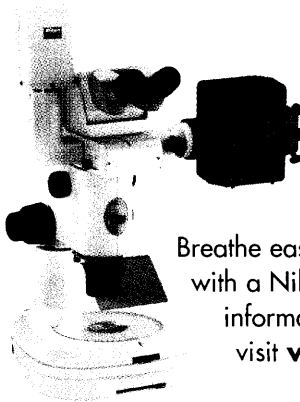
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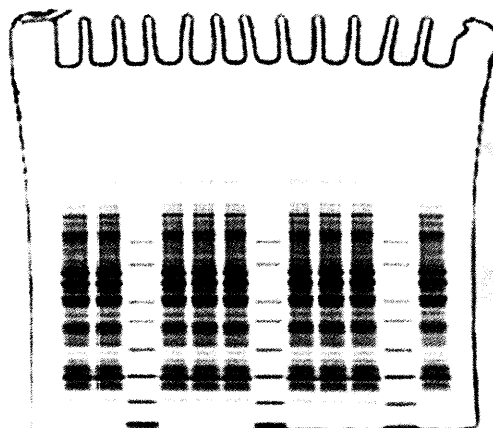


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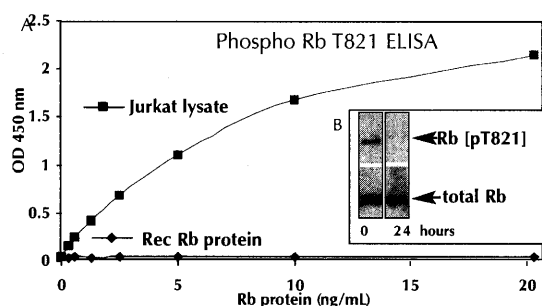
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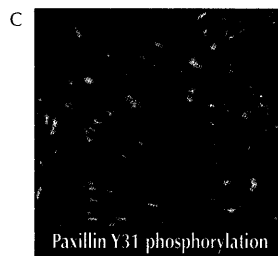
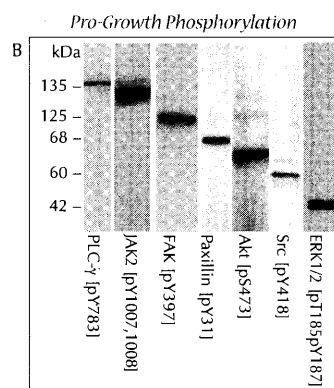
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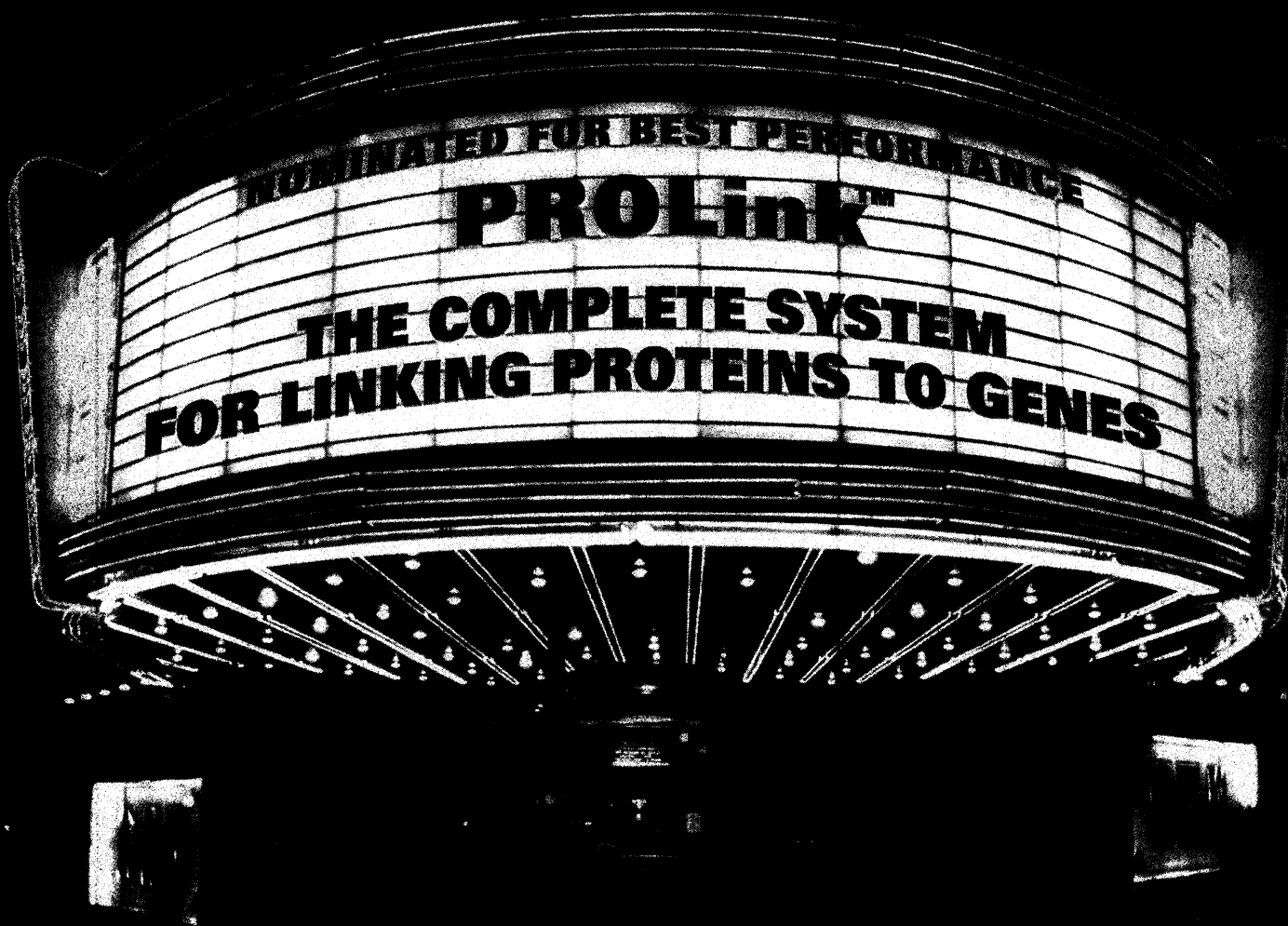
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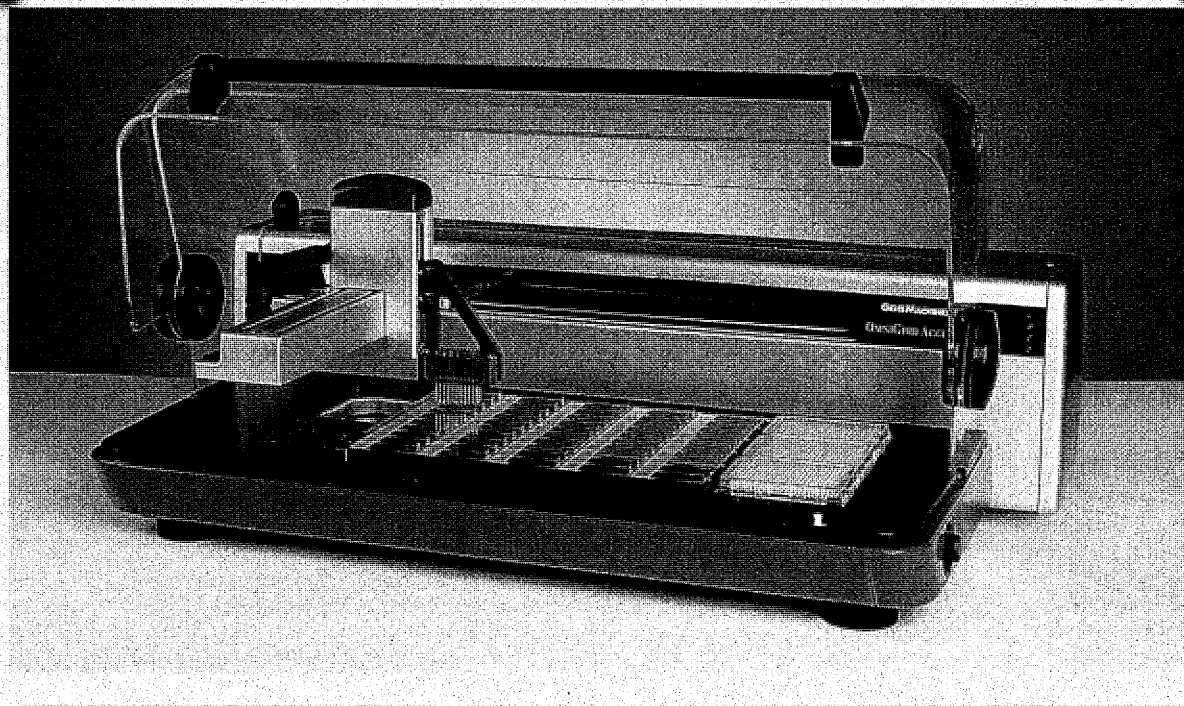
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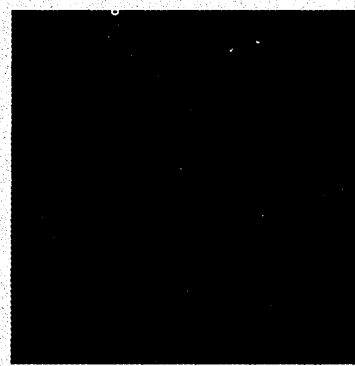
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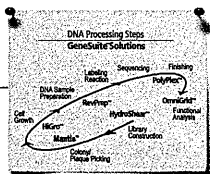
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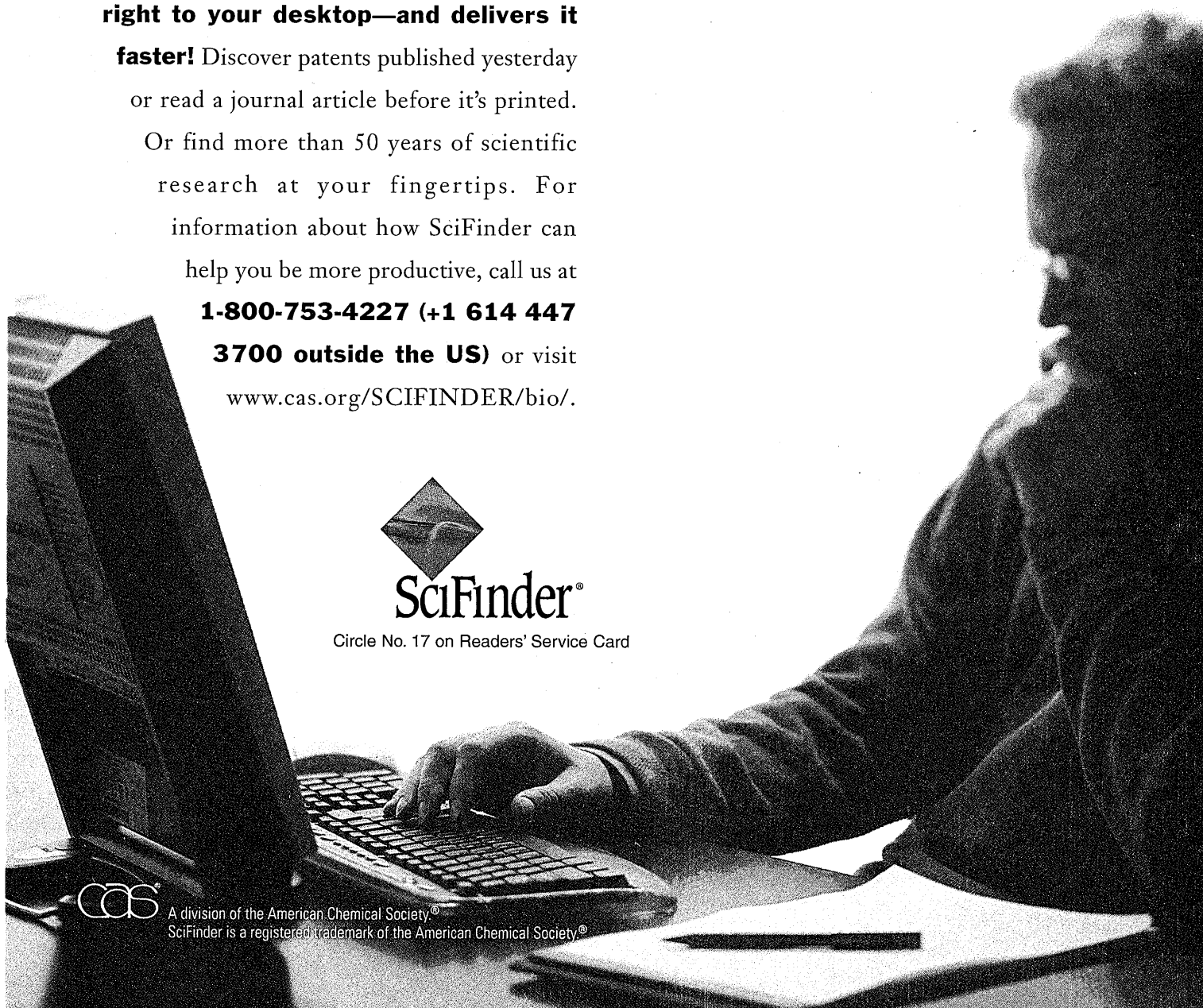


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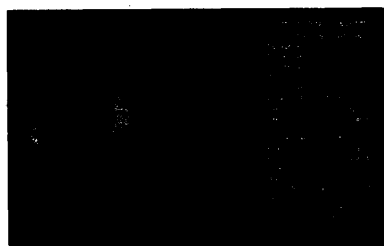
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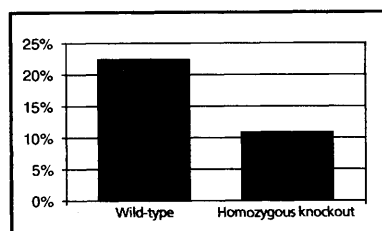
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Gene: G protein-coupled receptor



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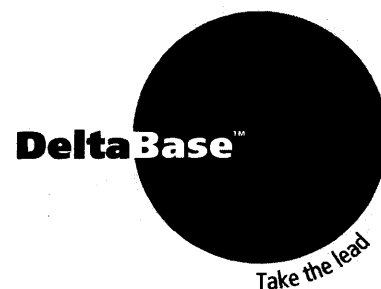
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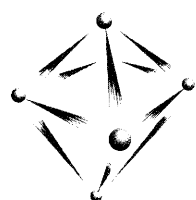
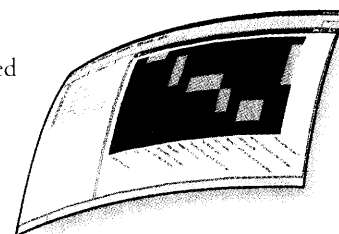
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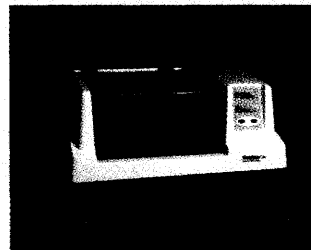
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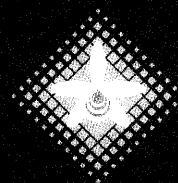
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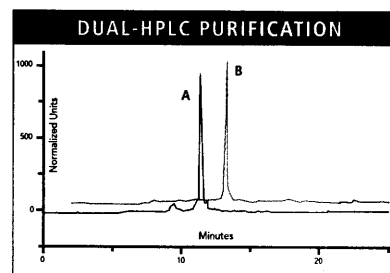
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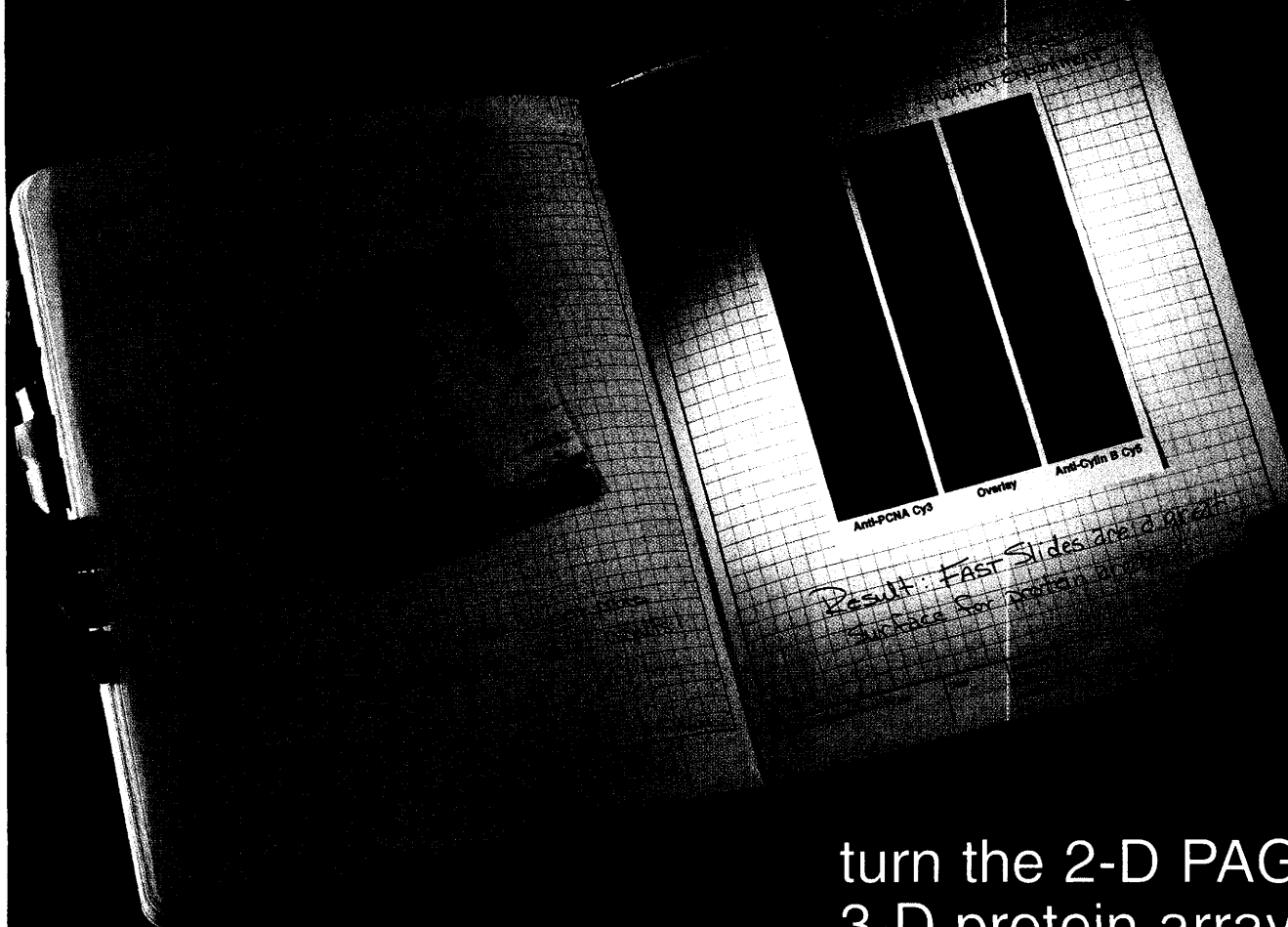
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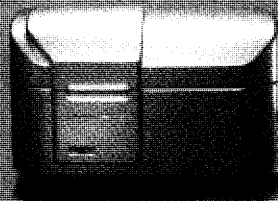
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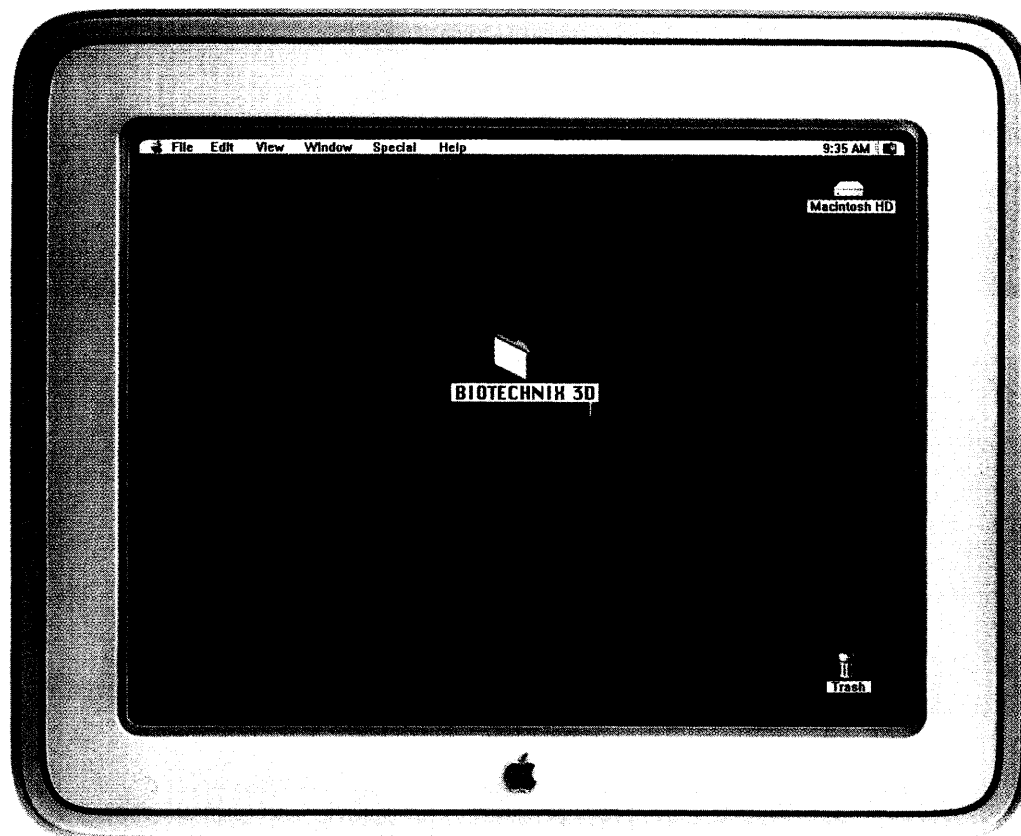
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New tools in this version of HyperChem include Ray-Trace to generate POV-Ray input files for high-quality visualization. The bioinformatics-related tools, such as a Sequence Editor for manipulating amino acids and reading of FASTA files, are welcome. The program will also compare the similarity of polypeptides using a Dayhoff matrix.

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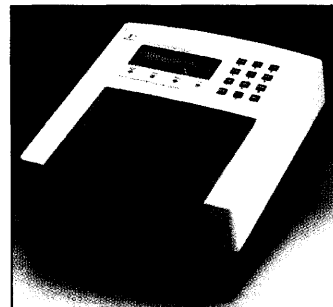
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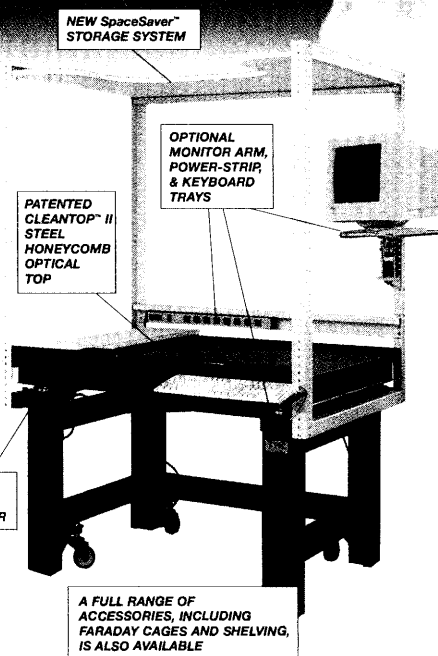
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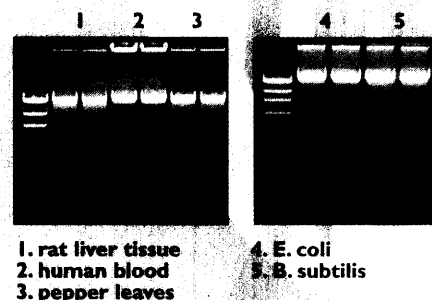
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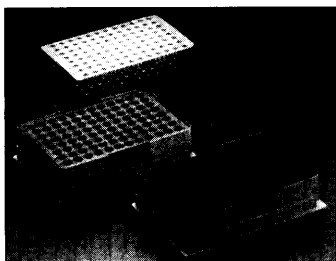
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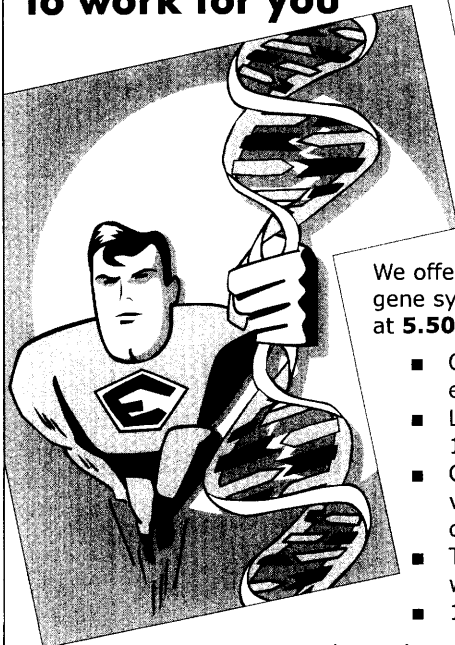
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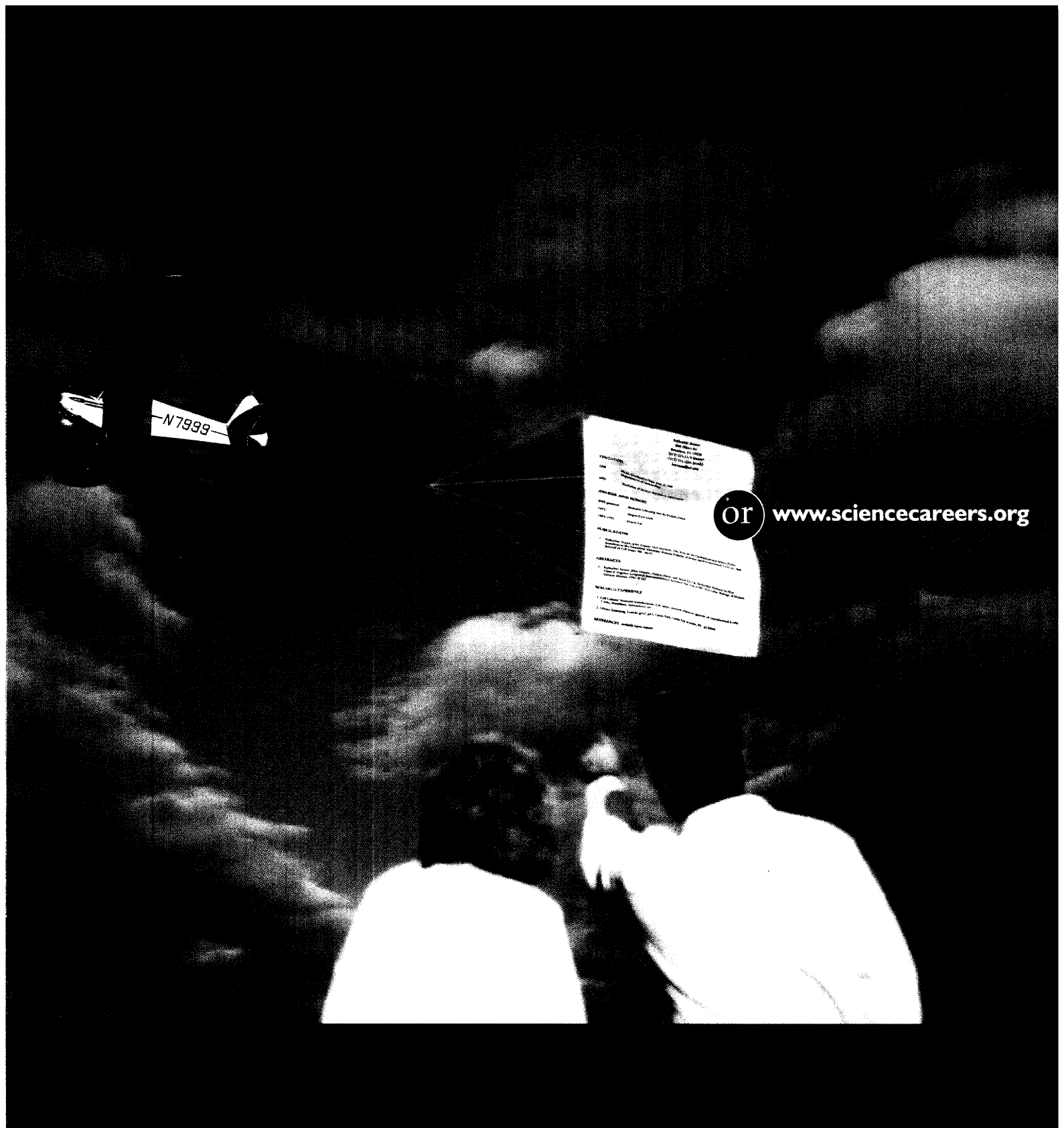
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