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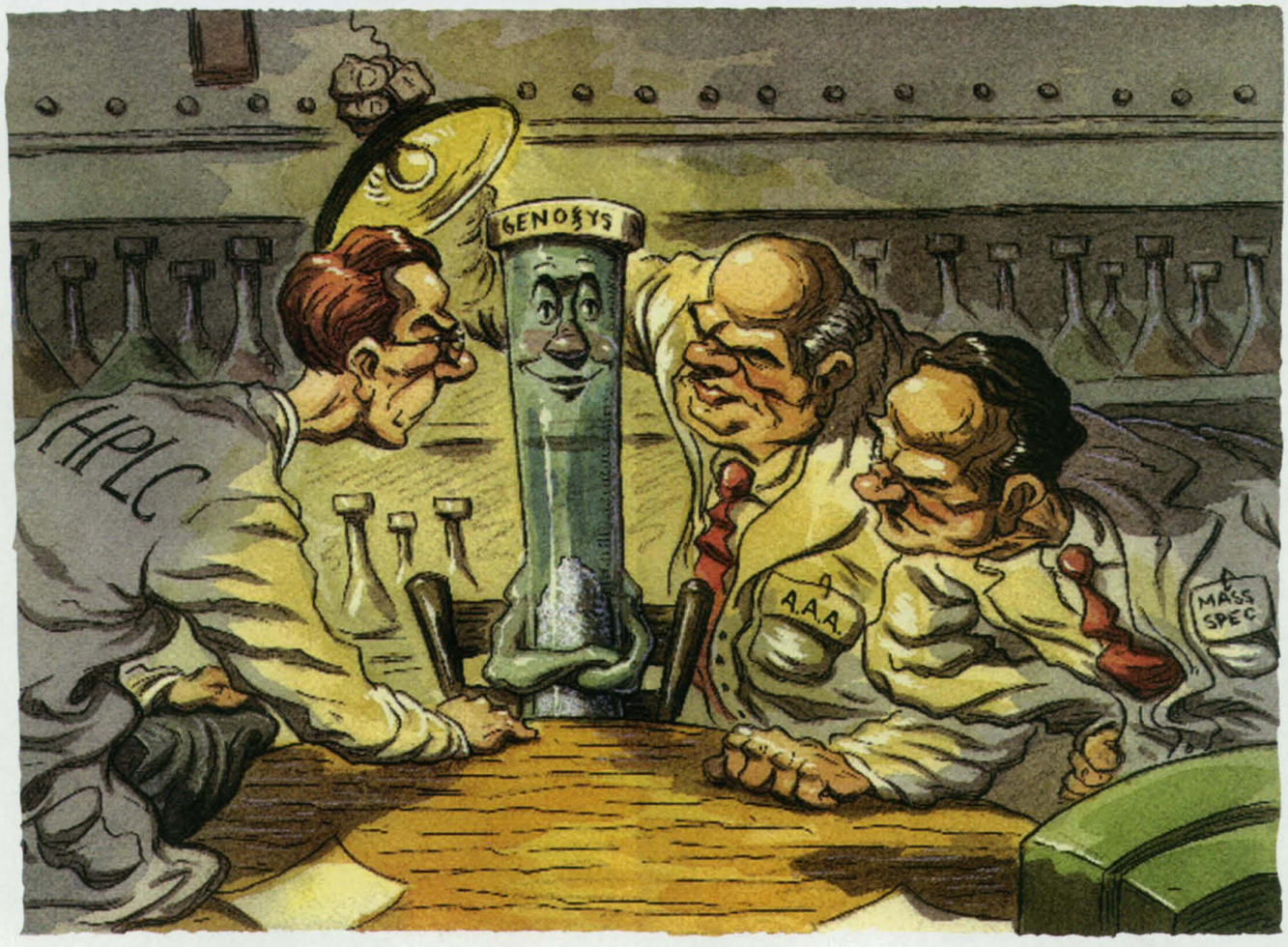

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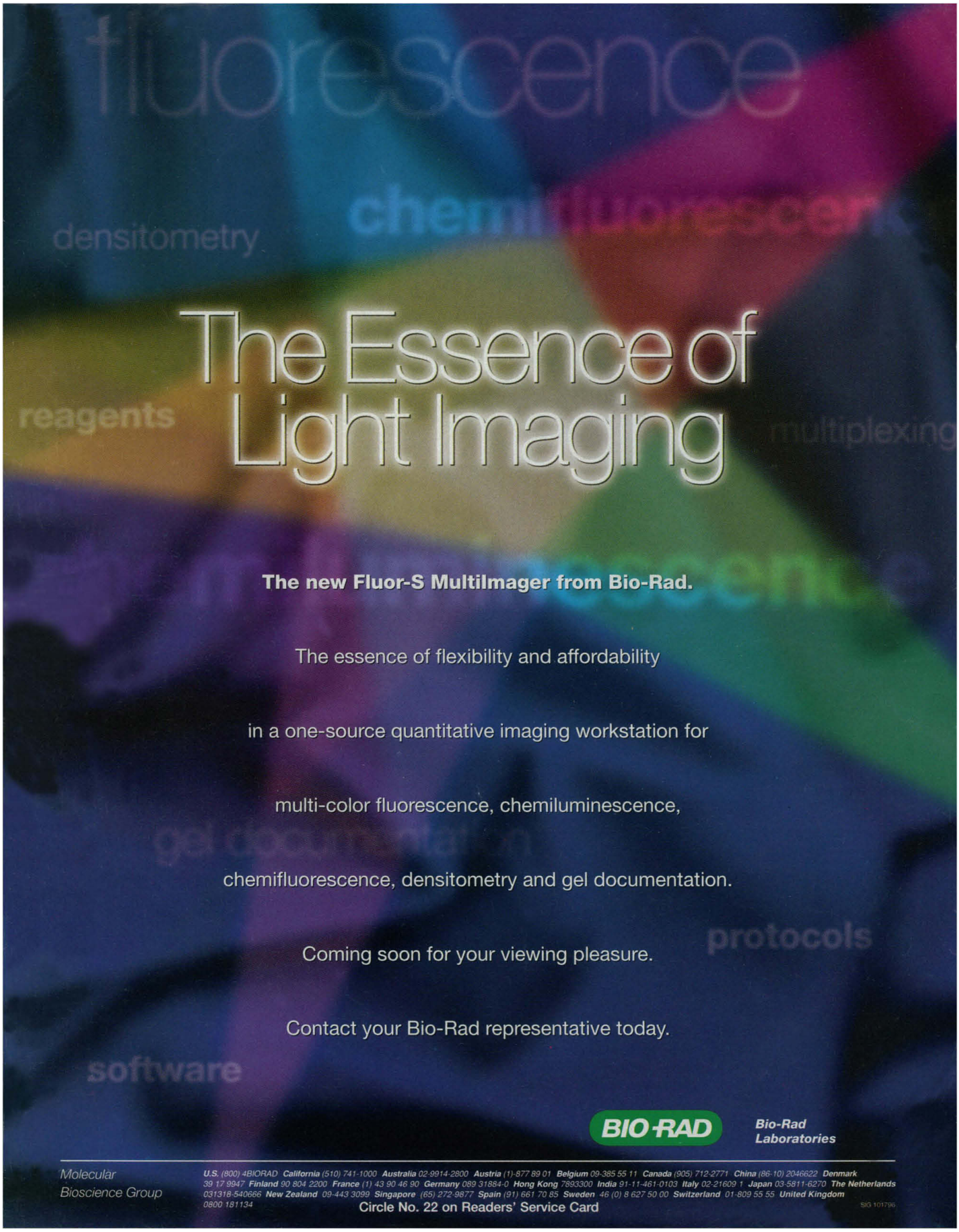

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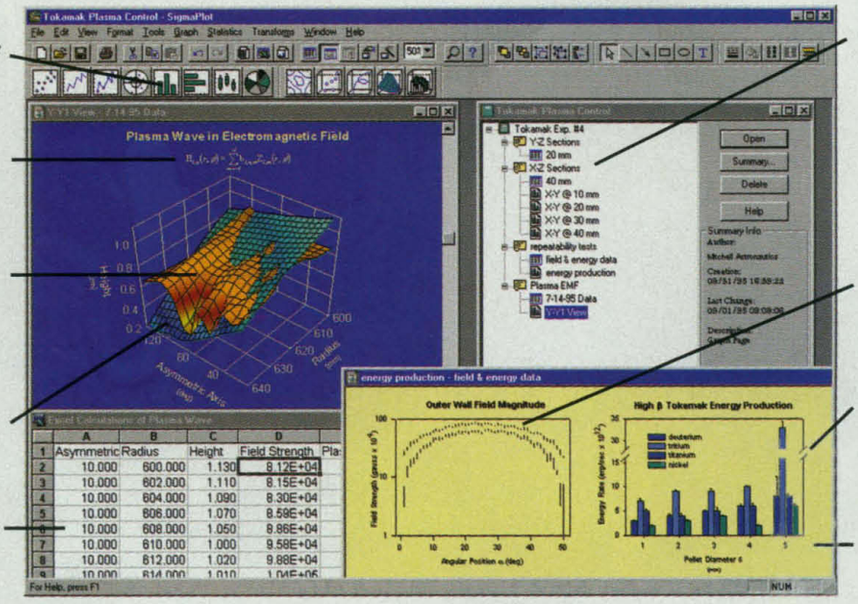

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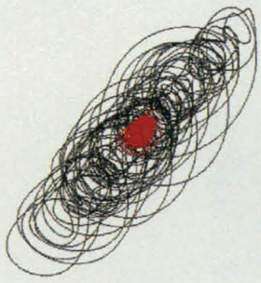
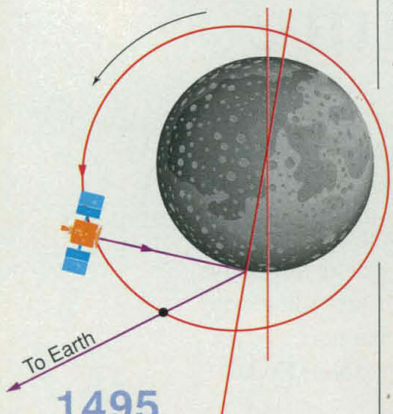


1470 & 1498
Calming down a chaotic laser



1495
Clementine gets a chilling lunar echo

NEWS & COMMENT

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PERSPECTIVES

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REPORTS

DEPARTMENTS

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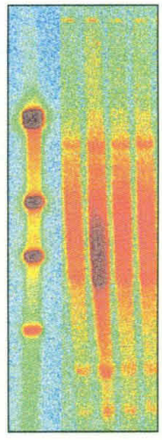
COVER

Scanning electron micrograph depicting developing female spikelets in maize homozygous for the *zag1-mum1* mutant allele (magnification ×115). The mutation results in a loss of floral meristem determinacy that is manifested by the production of extra silks from each floret. The mutant phenotype was uncovered through a recently developed reverse genetics approach in maize. See page 1537. [Image: B. A. Ambrose and M. Mena, University of California, San Diego]

TECHNICAL COMMENTS

1543
Telomere length and HIV infection



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THE MJ RESEARCH NOTEBOOK

Volume VI...No. 3b *A Bulletin of Technological Advance in Molecular Biology* *Summer 1996*

NEW ADVANCES EASE IN-SITU PCR; SLIDE SEALING ALMOST EFFORTLESS*

PTC-200 DNA Engine with Interchangeable Twin Towers™ *In Situ* Block

NEW TWIN TOWERS BLOCK FITS EXISTING DNA ENGINES

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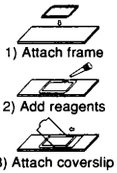
WATERTOWN, Mass. — MJ RESEARCH has announced the introduction of a whole new system for performing *in situ* amplification reactions. These especially sensitive assays—including *in situ* PCR and PRINS—are used to detect low-abundance nucleic acid targets in formalin-fixed tissues and cells, and their use has revolutionized understanding of HIV-1 pathogenesis,[1,2] as well as other disease and genetic processes.[3] Now a new system is available that addresses many of the technical difficulties that researchers have experienced. Its slide and sealing components even work well with most other makes of thermal cycler.

The system is centered around the new Twin Towers™ *in situ* block, which fits any new or existing DNA Engine™ or Tetrad™ thermal cycler chassis. This interchangeable block assembly features two independent towers, each of which can hold up to sixteen standard glass slides. Each tower can ramp at speeds up to 1.2°/sec, each has a thermal homogeneity within ±0.4°C slot-to-slot, and each features Peltier-Joule heat pumps with a range of 4°–105°C.

Better still are the multiplicity of sealing technologies that work well with this instrument. Of course one can use the tried-and-true method of a coverslip adhered with nail polish or rubber cement, but now two superior alternatives are available. The first, Frame-Seal chambers, employ an adhesive "frame" and polyester coverslip to create vapor-tight chambers on a slide. Even more novel is Self-Seal reagent, which is added to the reaction cocktail to seal slides and cover glasses automatically during the initial denaturation step. Both work well and outperform any other existing product.

Frame-Seal Chambers Offer Alternative for Sealing

One approach to sealing slides against vapor loss is the use of Frame-Seal™ chambers. First an adhesive "frame" is attached to a slide with mounted tissue and a release liner is removed. Reaction cocktail is added, a polyester cover slip is adhered, and the slide is then cycled. Afterwards, the whole assembly is pulled from the slide and one proceeds with hybridization.



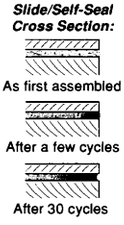
Twin Towers System Works Well for Hybridizations Too

No longer is a separate instrument needed to incubate slides for hybridization reactions (which are usually performed subsequent to amplification). The door of each Tower so effectively seals the slots from vapor loss at steady temperatures that the mere addition of a dampened towel to one of the slots creates a humidified environment that allows hybridization without the need for any sealing whatsoever. Rather, a simple cover glass will suffice.

Self-Seal Reagent Revolutionizes Slide Sealing

Polymers Added to Reaction Cocktail Control Evaporation Automatically

An exciting new alternative for slide sealing is Self-Seal™ reagent, which makes slide sealing automatic and which lends itself well to automated processes. The reagent is composed of polymers that do not disturb amplification reactions, and it is shipped as a 2X solution in pure water. It is added to the reaction mix and a cover glass is placed on top. The slides are loaded into the cycler, and upon the first denaturation step, evaporation around the periphery creates a clot-like seal. This vapor barrier limits subsequent evaporation and amplification proceeds readily. After cycling, the cover glass is removed by soaking the slide for a few minutes in aqueous solution.



This technique allows the use of ordinary slides and cover glasses, large areas of the slide can be utilized, cover glasses are easily removed without leaving residue, and the stuff works well with archival slides. Best of all, it's easy.

[1]Bagasra, Omar *et al., NEJM* (326) 1385-1391; 1992
[2]Embretson, Janet *et al., Nature* (362) 359-362; 1993
[3]Hindkjaer, J *et al., Chromosome Res* (3) 41-44; 1995

FOR A DETAILED PROTOCOL

Bagasra, Omar *et al.*, "In-Situ PCR and Hybridization to Detect Low-Abundance Nucleic Acid Targets," *Current Protocols in Molecular Biology*, Sec. 14.8.1-14.8.23; 1995

* PCR is covered by patents owned by Hoffmann-La Roche, Inc. & F. Hoffmann-La Roche Ltd. Users should obtain license to perform the reaction.

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THIS WEEK IN SCIENCE

edited by PHIL SZUROMI

Pool moves

The western equatorial Pacific Ocean is characterized by the warm pool, a region of higher sea surface temperatures. The warm pool drives the world's most intense atmospheric convection, and the migration of its eastern edge is an essential feature of the El Niño–Southern Oscillation. Picaut *et al.* (p. 1486) investigated the migration mechanism by deriving near-surface and surface current fields from buoy and satellite data, in combination with ocean model studies. Evidence for zonal convergence of water masses and a well-defined salinity front at the eastern edge of the warm pool was obtained, showing that zonal advection dominates the migration. The warm pool, composed of low-density fresher and warm water, is relatively isolated from the surrounding Pacific, explaining why it can easily be displaced by wind-driven currents.

■

Open-ocean climate record

Detailed climate records covering the last several hundred to thousand years are needed to provide a base line with which to evaluate the effects of anthropogenic emissions on climate. Although there are several detailed records available on land (ice cores, for example), records for the open oceans have been difficult to obtain because a core with a high sedimentation rate is required. Keigwin (p. 1504) now describes a record from the Sargasso Sea that has sufficient resolution. The record shows that sea surface temperatures were about 1°C cooler than today during the Little Ice Age (about 400 years ago) and about 1°C warmer than today during the Medieval Warm Period (about 1000 years ago).

■

T cell turnover in HIV-1 infection

One theory for why $CD4^+$ cell counts decline during the course of HIV-1 (human immunodeficiency virus–type 1) infection is that rapid turnover in the effort to replace these T cells exhausts their regeneration capacity. If so, then one would expect that the length of telomeres, the structures at the ends of chromosomes, would decrease in $CD4^+$ cells over time. Wolthers *et al.* (p. 1543) examined telomere length in $CD8^+$ and $CD4^+$ cells from samples obtained over a several year period in HIV+ individuals and found that while telomere lengths decreased in $CD8^+$ cells, there was no significant change in $CD4^+$ cells. This difference was not caused by some change in telomere processing, as $CD4^+$ cells from these individuals did show decreases in telomere length after division in cell culture. These results suggest that HIV-1 infection may interfere with cell renewal in $CD4^+$ cells.

Ice on the moon?

The Clementine spacecraft performed a bistatic radar experiment to identify the structure and composition of the lunar poles. Nozette *et al.* (p. 1495) believe that the same-sense polarization enhancement of the radar echo they observed in the permanently shadowed regions of the south pole are caused by the presence of ice, possibly mixed or covered with the rocky regolith. Although icy patches may not provide a unique solution for the radar signal, the authors suggest a mechanism for their presence: Volatiles, which degassed from the proto-moon or were brought in by comets, condensed and concentrated in the permanently shadowed patches of the lunar poles.

■

Fast, tiny dust

The cosmic dust detector on board the Ulysses spacecraft detected 11 streams of dust before, during, and after its closest approach to Jupiter in 1991 and 1992, most of which appear to emanate from the direction of Jupiter. Zook *et al.* (p. 1501) simulated the trajectory of the particles that impacted the detector backward in time to a specified point of origin near Jupiter and found that those dust grains that fit their model had to be faster and much smaller than had been previously thought. These simulations provide a more accurate estimate of the particle characteristics and indicate the strong influence the solar magnetic field can have on accelerating jovian dust grains away from their source.

■

Carbohydrate library

Cell surface carbohydrates play an important role in biological recognition processes. Screening strategies to identify carbohydrate derivatives that bind to particular protein targets are hampered, however, by the synthetic difficulties because, unlike peptides and nucleic acids, stereochemistry must be controlled as monomers are added to a carbohydrate chain. Liang *et al.* (p. 1520) describe the use of anomeric sulfoxides to produce a solid-phase library of about 1300 di- and trisaccharides. They identified two ligands that bind more strongly to the *Bauhinia purpurea* lectin than does the natural ligand.

■

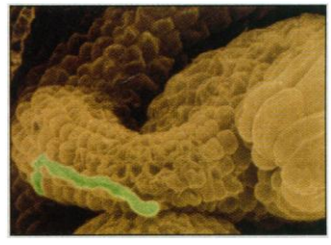
Snail neurotrophic factor

The existence of substances in mollusks that promote neuronal growth has been controversial. Fainzilber *et al.* (p. 1540) describe the isolation of a peptide from snails that can cause neuronal sprouting and growth. The new factor binds to one of the mammalian neurotrophic factor receptors—known as p75—but the factor itself shows no homology to any previously identified neurotrophins.

■

Special delivery

Fertilization in higher plants depends on growth of the pollen tube, through which sperm cells are delivered to the ovule. Wilhelmi and Preuss (p. 1535) have identified two genes in



Arabidopsis that, when mutated, disrupt the guidance mechanisms that direct each pollen tube to an available ovule. That both pollen and pistil tissue must carry the mutant genes in order for guidance to be disrupted suggests the genes may encode molecules that mediate cell-cell adhesion.

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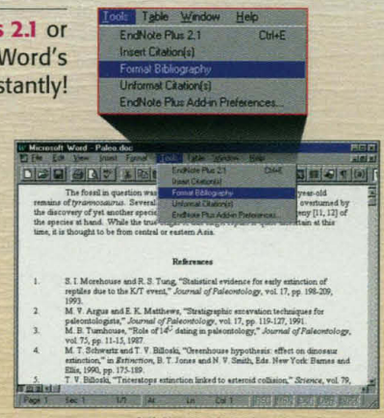

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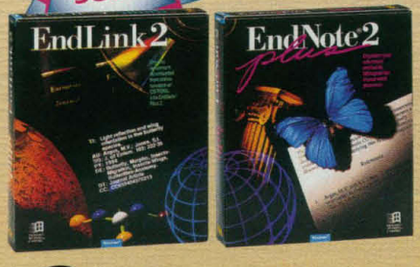

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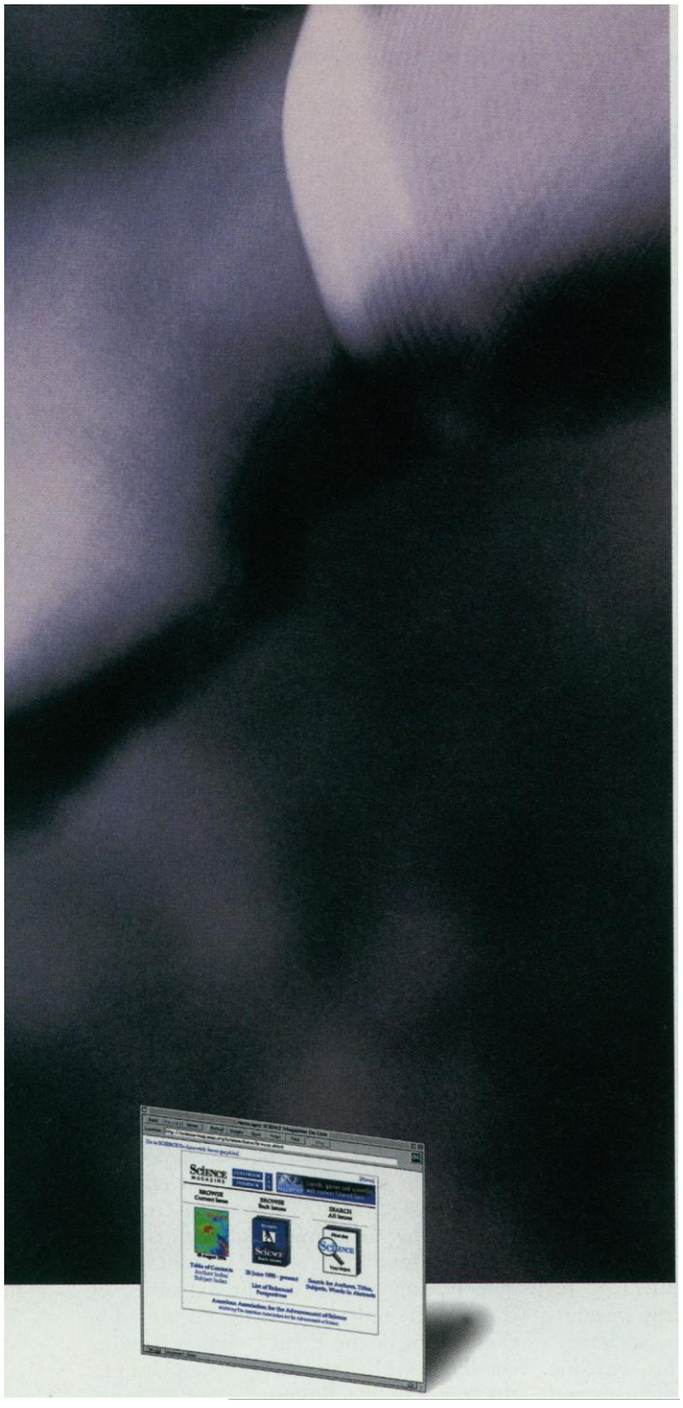

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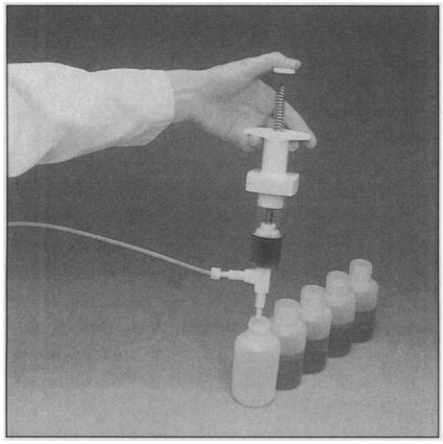

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Data Acquisition and Analysis Software

Snap-Master version 3.1 is data acquisition and analysis software for Windows95, Windows 3.1, and Windows for Workgroups. This new version has a Sensor Database; expanded analysis functions, including sensor management; and improved data presentation and reporting elements. The Sensor function performs linear data scaling and conversion to engineering units, assigns channel numbers to incoming data, and manages the Sensor Database. In addition to the standard arithmetic, trigonometric, calculus, and statistical functions, Snap-Master includes 12 logic functions, 18 filter functions, and many more, for a total of more than 50. **HEM Data Corp. Circle 140.**

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Monoclonal Antibodies

Three new epitope affinity-purified monoclonal anti-phosphotyrosine antibodies for signal transduction research are available together in a cocktail or as horseradish peroxidase or Sepharose conjugates. **Zymed Laboratories. Circle 141.**

Monoclonal antibody (mAb) Kay-10 reacts with mouse Fas ligand expressed on activated T lymphocytes of selected strains of mice. The antibody is suitable for use in flow cytometry. Other reagents for apoptosis research include antibodies to Fas, bad, bak, bcl-2, bcl-x, PARP, and human Fas ligand. **PharMingen. Circle 142.**

New mAbs to c-*erb*B-2, c-*erb*B-3, epidermal growth factor receptor, and c-*myc* can be used in the study of oncoproteins. The mAb SMMS-1 can be used to stain the heavy chain portion of smooth-muscle myosin. The mAb BGX-PR88 can be used to stain progesterone receptor in formalin-fixed, paraffin-embedded tissue sections. The determination of the status of this and other steroid hormone receptors has become widely used in research into hormone-related cancers. **BioGenex. Circle 143.**

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Microscope Digital Camera System

Pixera Professional is a digital camera system for microscope imaging that delivers 24-bit color images in resolutions up to 1

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million pixels. It bundles a digital camera with software imaging processing and applications that enable the capture, manipulation, enhancement, and management of high-resolution microscope images. **Pixera. Circle 144.**

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Stackable Shaking Incubator

The Multitron Orbital Shaking Incubator saves valuable floor space. Each shaker offers independent microprocessor control that can be individually programmed to allow simultaneous experiments at different temperatures and shaking speeds. Single units can be rolled under a bench or mounted on a platform and used as a tabletop. A new tray holder releases the slide-out tray as the door is opened for easy loading of samples and flasks. Shaking trays are available with a wide range of clamps and accessories. **Appropriate Technical Resources. Circle 145.**

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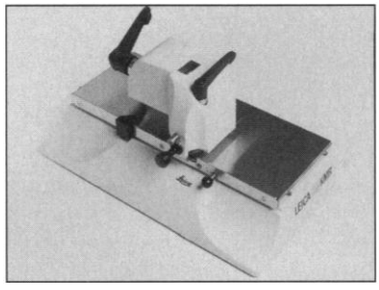
Knife Maker

The Leica EM KMR balanced break glass knifemaker features a new breaking mechanism, simple alignment, and ergonomic design. Users can produce optimal knives for semi-thin light microscopy sectioning or for cutting ultrathin sections for ultramicrotomy and cryo-ultramicrotomy. The unit features a new kind of scoring wheel, harder



and smaller than conventional scoring wheels, mounted in a self-adjusting cartridge that makes breaking even thick glass easy under controlled, even pressure for a clean final break. **Leica. Circle 146.**

■

Literature

Implementation of a Robotics System for High Throughput Screening Utilizing Glow Luminescence highlights the time-saving advantages of combining cell-based assays with automated liquid handling, multi-detector luminescence measurements, robotic integration, and automated data processing. *Expanding the Frontiers of Microsample Analysis* is a brochure on the TopCount microplate scintillation and luminescence counters. Features include counting of up to 12 samples at a time for radioisotopic and luminescent labels and counting samples in 384-well microplates. Options include stacker cassettes for up to 40 microplates and a selection of crosstalk-free microplates. **Packard. Circle 147.**

MultiScreen Assay System brochure provides information on a 96-well filtration system designed to simplify all types of separations, including biochemical assays, nucleic acid purifications, and drug discovery techniques. The system is offered with a choice of membranes and plate materials for various applications. **Millipore. Circle 148.**

Hermle/Labnet Centrifuges describes a line featuring compact microcentrifuges, general purpose centrifuges, and high-performance models. **National Labnet. Circle 149.**

A User's Guide to Gel Permeation Chromatography (GPC) reviews the practical and theoretical aspects of GPC, including sample considerations, mobile phase selection, and calibration procedures. It includes an extensive library of GPC applications. **Phenomenex. Circle 150.**