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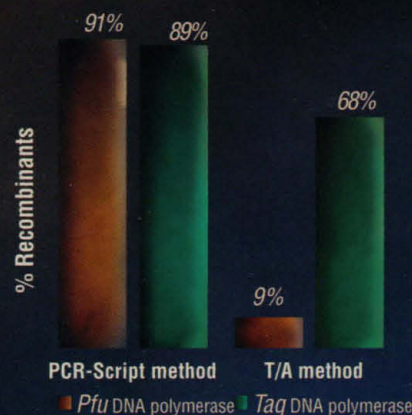


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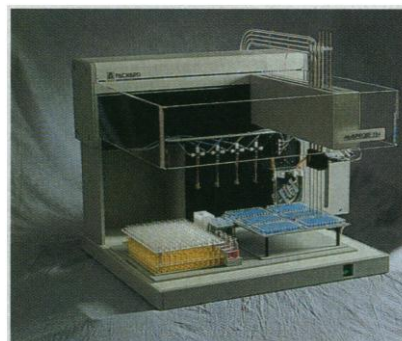
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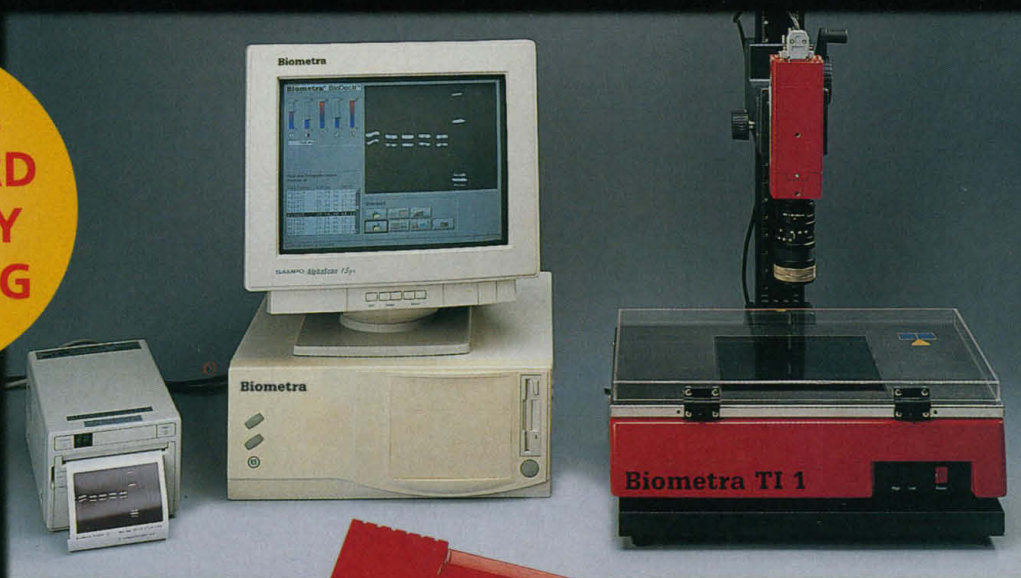
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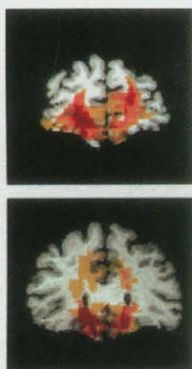


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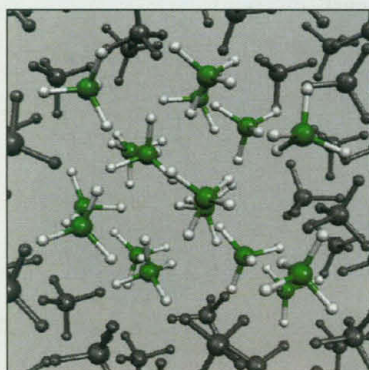
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COVER

One of the hundreds of explosive eruptions that occur annually at Sakurajima Volcano, Japan. These discrete explosive events are accompanied by shock waves and lightning. Eruption pressures of 0.2 to 5 megapascals (50 times atmospheric pressure) are estimated from

shocks recorded on microbarographs. See page 1290 and the Perspective on page 1278. [Photograph: Kazuhiro Ishihara, taken from the Sakurajima Volcano Research Center, 5.5 kilometers west of the summit at 23:03 Japanese standard time on 18 May 1991]



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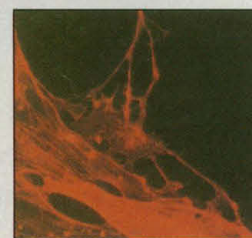
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Indicates accompanying feature

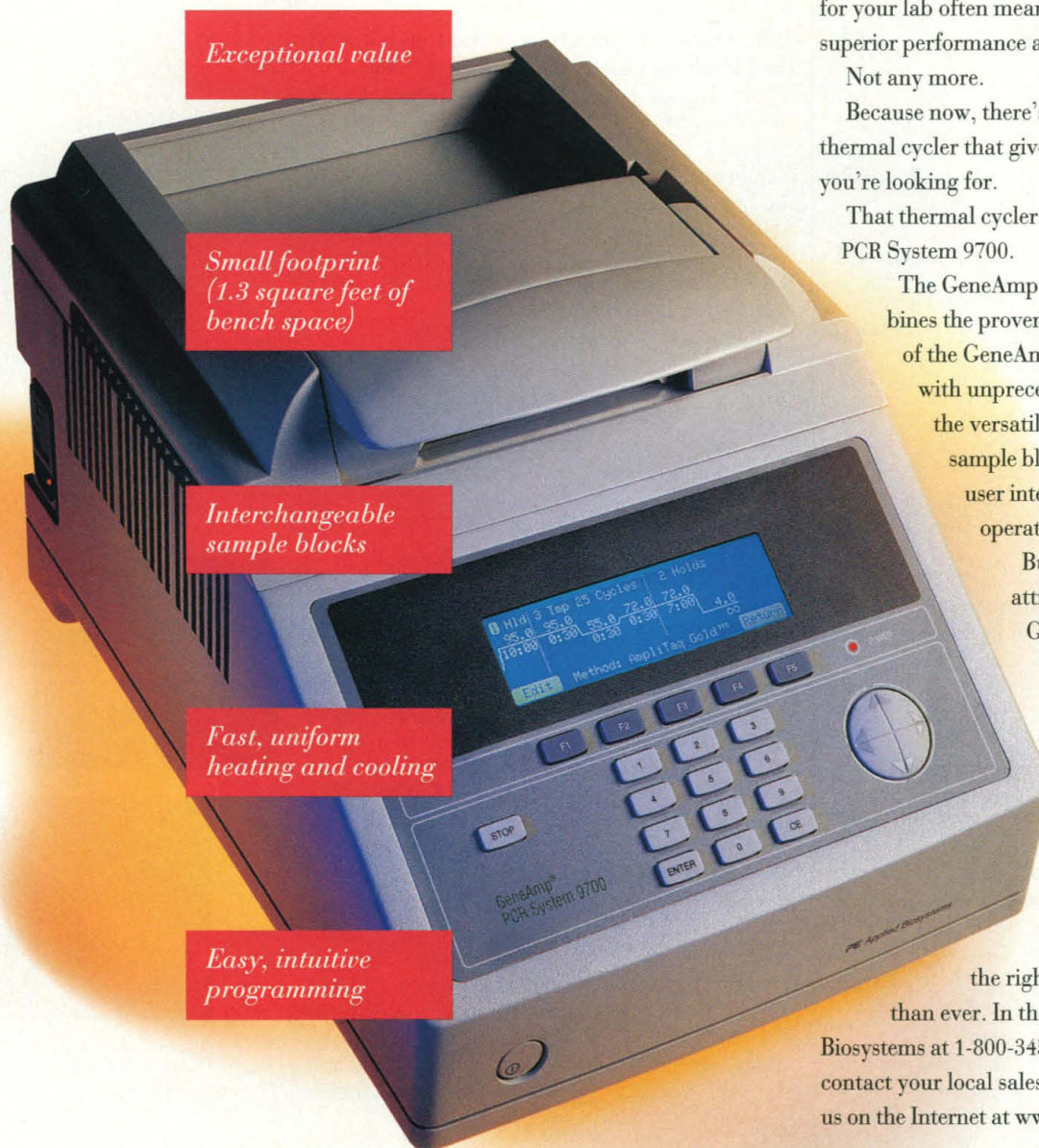
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THIS WEEK IN SCIENCE

edited by PHIL SZUROMI

Filling in the band gap

Materials that can totally reflect electromagnetic radiation propagating in any direction for specific frequency bands, so-called photonic band-gap structures (PBGs), have potential applications in the fabrication of perfect mirrors, optical wave guides, and lasers. The current challenge is the fabrication of three-dimensional PBGs with band gaps in the infrared and visible range. Wanke *et al.* (p. 1284) show that laser-induced direct-write deposition from the gas phase allows construction of periodic structures with transmission minima in the infrared. Dopants or defects can be introduced easily, and structures can be grown around existing devices.

Methane chemistry (I)

Several routes for converting methane to higher hydrocarbons have been proposed that involve oxidation, a route that competes with total oxidation to CO and CO₂. A low-temperature route (400° to 600°C) for incorporating methane into higher hydrocarbons makes use of alkenes or higher alkanes as coreactants is described by Choudhary *et al.* (p. 1286). An H-galloaluminosilicate zeolite catalyst was used to help facilitate hydrogen-transfer reactions.

Methane chemistry (II)

The giant outer planets, Uranus and Neptune, have a middle icy layer composed of methane, ammonia, and water, stable at high pressures (20 to 300 gigapascals) and high temperatures (2000 to 6000 kelvin). These

Siberian outpost

Artifacts were discovered at the Diring Yuriakh archaeological site in northeast Asia in 1982, yet their age has been difficult to determine because of lack of suitable material for dating; estimates have varied from 15,000 years to more than several million years ago. This site may mark the early migration of peoples into northeast Asia, an expansion that eventually led to migration into North America. Waters *et al.* (p. 1281; see the news story by Holden, p. 1268) show that the artifacts are associated with windblown deposits and were thus able to date the deposits and bounding strata using thermoluminescence to more than 260,000 years ago.

extreme conditions are difficult to reproduce in the laboratory but were simulated in molecular dynamics calculations by Ancilotto *et al.* (p. 1288; see the Perspective by Hubbard, p. 1279). They found that methane will form more complex hydrocarbons, such as ethane, before it dissociates into hydrogen and carbon (precipitated as diamond). This additional mechanism for producing ethane may help explain the estimated overabundance of ethane on Neptune's surface if convection carries this ethane from the interior to the surface.

Volcanic boom

An explosive volcanic eruption results when gas bubbles form in a magma chamber and conduit and rapidly expand as pressure drops. Obtaining accurate measurements of this process has been difficult but is a key test for models and theory and inferring the size of eruptions in remote areas. Morrissey and Chouet (p. 1290; see the cover and also the Perspective by Vergnolle, p. 1278) show that gas concentrations in the magma and burst pressures can be inferred from remote measurements of the atmospheric shock waves produced by the eruption.

In the know

Reasoning our way through a new situation where we learn through experience, such as a complex game or puzzle, requires us to develop strategies for winning. Bechara *et al.* (p. 1293; see the news story by Vogel, p. 1269) found that normal individuals, when learning a gambling task, were using effective strategies (winning money) before they were consciously aware of it. Well before they verbally reported a strategy (knowing which deck to pick cards from), they had sweated (showed a skin conductance response, or SCR) before making a high-risk move in the game. Patients who had suffered prefrontal cortex damage and who suffered from decision-making defects did not develop anticipatory SCRs, even when they knew consciously that they were making risky choices.

Heart in the right place

On the outside, vertebrates exhibit bilateral symmetry, but on the inside some organs, like the heart, must develop asymmetrically—thus the tube in embryos that becomes the heart loops around to the right. Before such looping occurs, signaling molecules, such as Nodal, a mem-

ber of the transforming growth factor- β family, are expressed on only one side of the embryo. Isaac *et al.* (p. 1301; see the Perspective by Robertson, p. 1280) show that in the chick embryo, cSnR, a member of the Snail



zinc finger proteins, is expressed opposite of Nodal (on the right side). Interruption of its expression randomized heart development, indicating that it operates downstream of these other signals.

Proteolysis and cell division

Recent evidence indicates that regulated proteolysis is a key mechanism by which cellular processes are controlled. A complex of proteins that mediates such controlled destruction is known as the anaphase-promoting complex (APC) for its role in regulating the exit of cells from mitosis. However, few of the key targets of the APC are known. Juang *et al.* (p. 1311) report that one such target is the protein Ase1, a microtubule-binding protein that is a component of the mitotic spindle. Degradation of Ase1 is apparently necessary for normal assembly and disassembly of the spindle. The results indicate that, like phosphorylation mediated by the cyclin-dependent kinases, proteolysis mediated by the APC is a critical regulatory mechanism for multiple steps in the cell division cycle.

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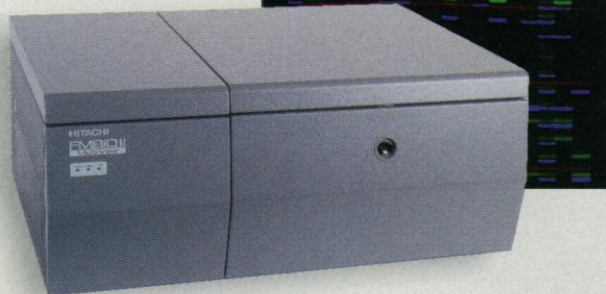
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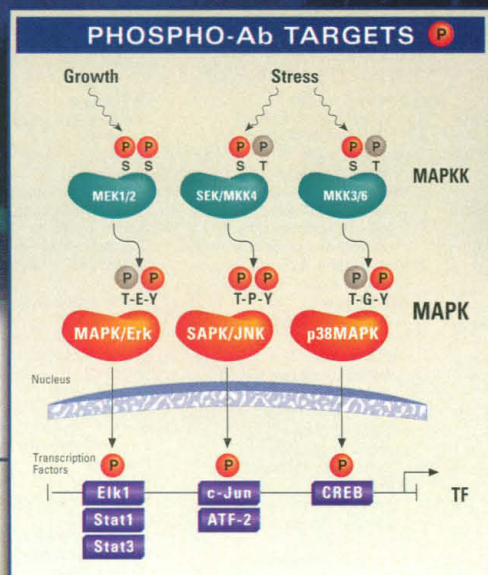
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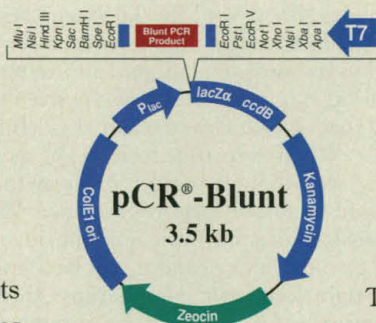
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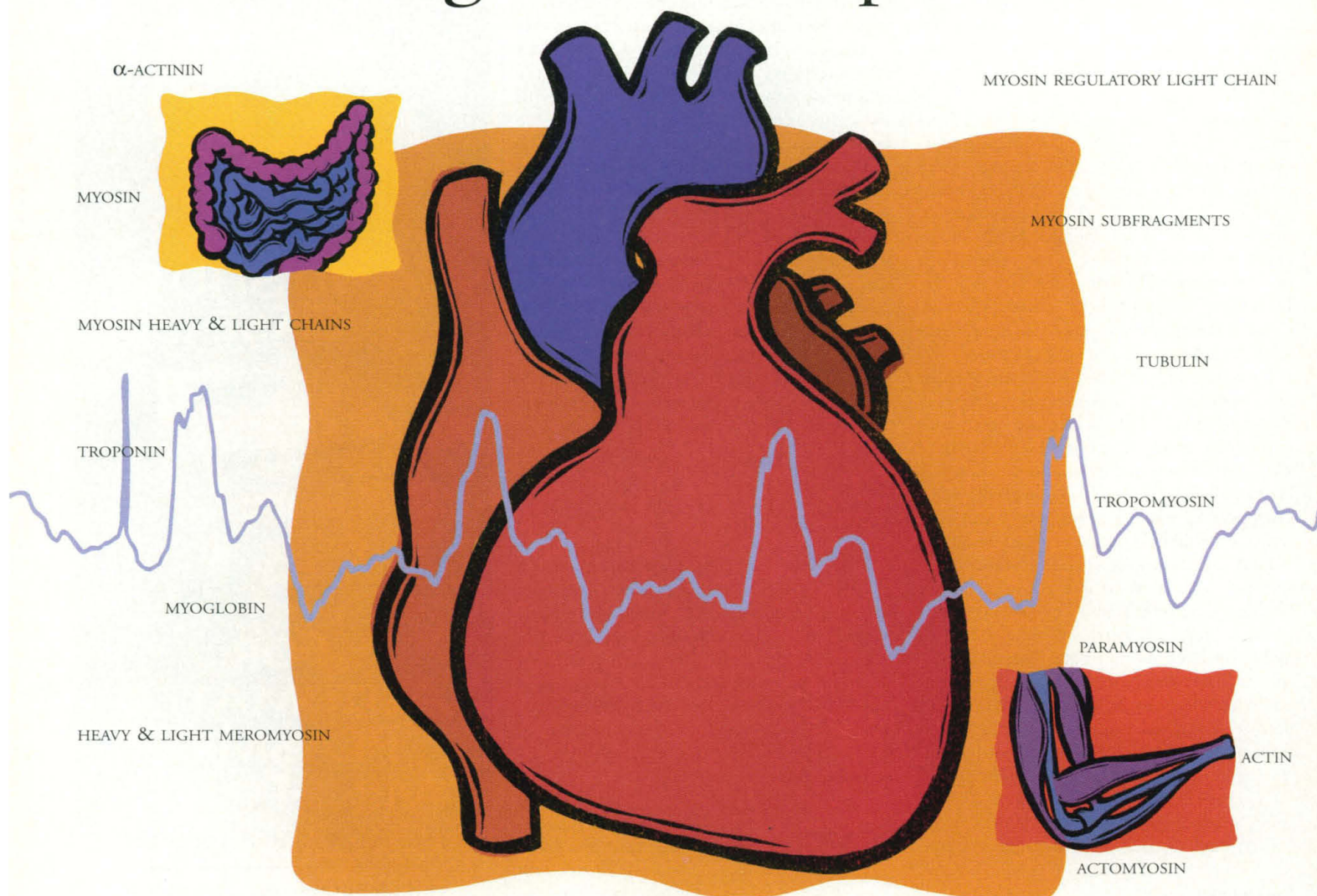
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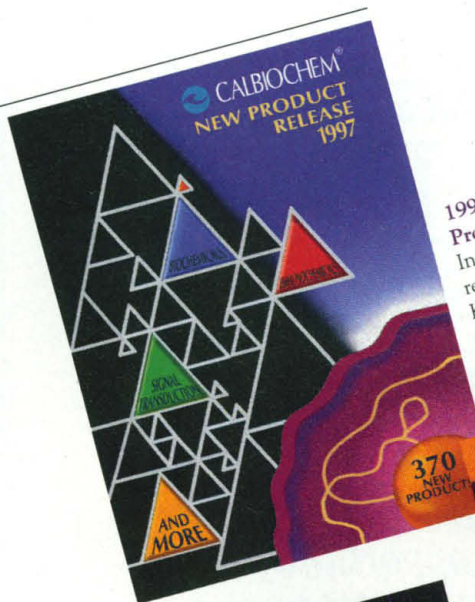


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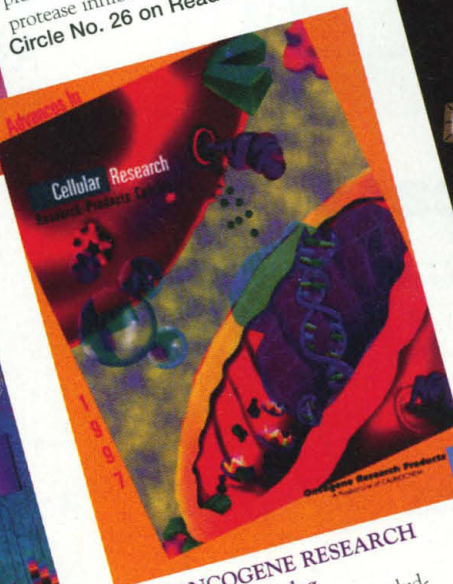


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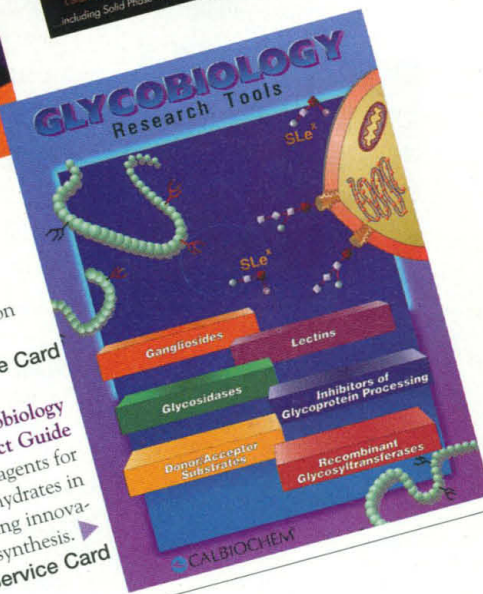


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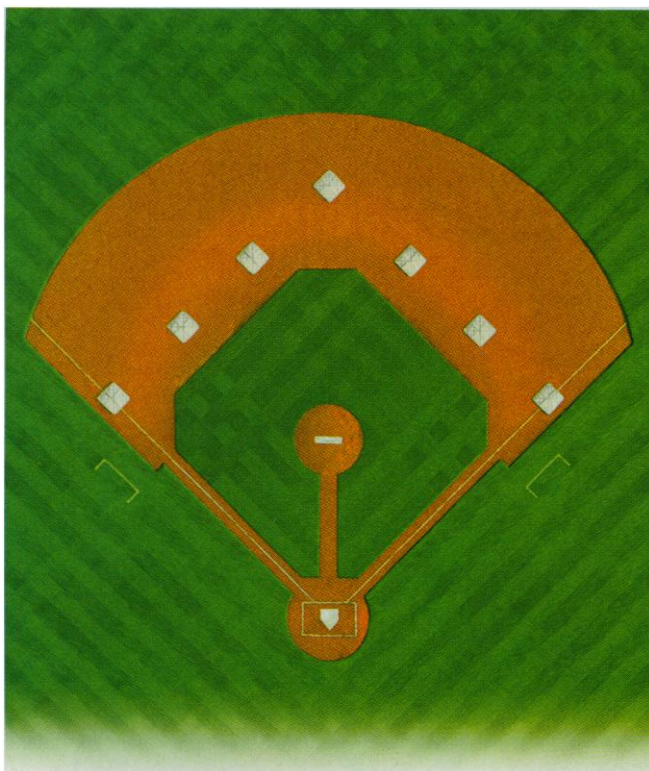
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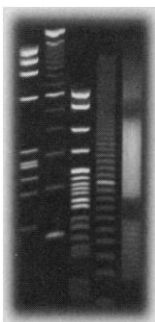
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Version 9.0 of the Wisconsin Package is a suite of software programs that enables researchers and genetic engineers to analyze DNA and protein sequences as well as query genetic databases, either locally or over the Internet. Version 9 includes SeqLab, an interactive multiple sequence editor and project management tool. Among the new features are the ability to manipulate alignments, annotate sequences, integrate non-GCG programs, and import sequences from other popular file formats (FastA, GenBank, GDE). SeqLab provides a friendly interface to more than 100 Wisconsin Package pro-

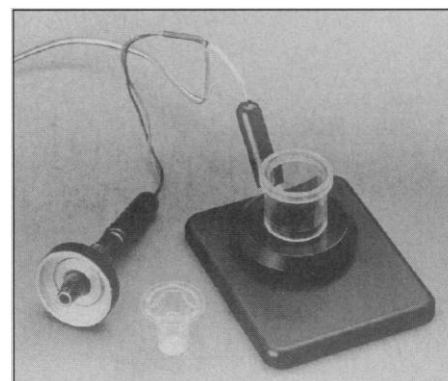
grams, including database, reference, motif, and pattern searches. The major databases are included with the package, including GenBank, EMBL, PIR, SWISS-PROT, and Prosite. The package runs on Digital AXP, IBM RS/6000, Silicon Graphics, and Sun computers. **Genetics Computer Group.** For information call 608-231-5200 or circle 142 on the reader service card.

Apoptotic Cell Detection

APO-DIRECT and APO-BRDU are new kits for the detection of apoptotic cells. APO-DIRECT is based on labeling the 3'-hydroxyl termini of DNA fragments with FITC-dUTP in a single step. APO-BRDU is a two-step procedure in which the 3'-hydroxyl termini are labeled with Br-dUTP and detected with FITC anti-BrdU. APO-BRDU offers greater sensitivity and more tests than other standard apoptotic flow cytometry detection systems. Annexin V-FITC is an additional product used to quantitatively determine the percentage of cells undergoing apoptosis. It relies on the property of cells to lose membrane asymmetry early in apoptosis, which allows the test to identify cells in an earlier stage of apoptosis than assays based on DNA fragmentation. **PharMingen.** For information call 619-812-8800 or circle 143 on the reader service card.

Tissue Resistance Measurement Chamber

Endohm-6 fits 24-well cell culture inserts from Falcon (6.25-mm membrane area) and Costar Transwell (6.5-mm area). Culture



cups can be transferred from their wells to Endohm chambers for more accurate membrane resistance measurements than with hand-held electrodes. Concentric electrodes with large surface areas are situated closely above and beneath the membrane, reducing background resistance. **World Precision Instruments.** For information call 941-371-1003 or circle 144 on the reader service card.

Amplification of cDNA Ends

The 5' RACE System for Rapid Amplification of cDNA Ends (RACE) allows the user to amplify rare messages for which little sequence information is available and capture the 5' end information of mRNA. It is a rapid procedure to capture full-length mRNA sequence information using the polymerase chain reaction. The products of the reaction can be cloned, directly sequenced, used to prepare probes, or combined to generate full-length cDNA. **Life Technologies.** For information call 800-828-6686 or circle 145 on the reader service card.

Transfected Cell Selection Kit

The MACSelect system is for fast and easy magnetic isolation of stably and transiently transfected cells. A pMACS plasmid encoding a cell surface marker is cotransfected with the plasmid of interest by any standard transfection method. After a short incubation, transfected cells can be enriched to high purity using the colloidal MACSelect MicroBeads. The system is compatible with all commonly used transfection methods and a wide range of cells from different species and tissues. The system allows transfectants to be isolated and analyzed from such difficult sources as most primary cells. **Miltenyi Biotec.** For information call +49-2204-8306-0 or circle 146 on the reader service card.

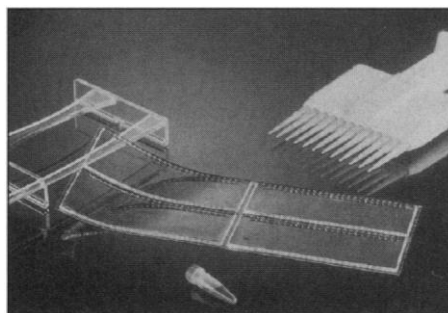
Modular Cell Culture System

A new modular system for complete control of cell culture experiments allows cost-conscious biotech professionals to start off small and add modules as requirements expand. The system provides total environmental control from mammalian, insect, and plant cell culture to fermentation in one vessel. Four major system modules are available for controlling temperature, pH, pO₂, and foam level. The modular system is easy to install

and operate. Each module contains a local selectable digital readout for net point, Delta, and actual process data. **Bellco Glass.** For information call 800-257-7043 or circle 147 on the reader service card.

Precast Submarine Gels

Wide Mini Poly(NAT) gels are intended for the analysis of DNA fragments in applications that require high resolution and high throughput. The gels are produced in two formats and in three concentrations, and cover the size range from 10 to 20,000 bp. Size differences of 1 to 2% can be detected in the range between 60 and 2000 bp on Wide Mini S-50 gels, which have a running path of



8.7 cm and contain 50 sample wells. The running path is 4.0 cm in S-100 gels. Both S-100 and S-50 gels consist of separate 25-well sections, which can be run independently after cutting off the plastic backing to which the gel is covalently linked. Sample loading is fast with a 12-channel pipettor. **Guest Elchrom Scientific.** For information call (41) 41 741 47 48 or circle 148 on the reader service card.

Literature

A Mechanically Refrigerated Cryogenic Freezer Using the Compliant Scroll Compressor for Air Phase Storage of Biologicals at -140°C and -150°C without Liquid Nitrogen is an illustrated technical report on the Cryostar line of storage freezers. **Harris Manufacturing.** For information call 800-221-4201 or circle 149 on the reader service card.

Software (and Hardware) for Science is a comprehensive catalog of more than 1200 scientific and technical software and hardware products for DOS, Windows, Macintosh, and UNIX workstations. **SciTech.** For information call 312-486-9191 or circle 150 on the reader service card.

Newly offered instrumentation, apparatus, and laboratory materials of interest to researchers in all disciplines in academic, industrial, and government organizations are featured in this space. Emphasis is given to purpose, chief characteristics, and availability of products and materials. Endorsement by *Science* or AAAS is not implied. Additional information may be obtained from the manufacturers or suppliers named by circling the appropriate number on the Readers' Service Card and placing it in a mailbox. Postage is free.

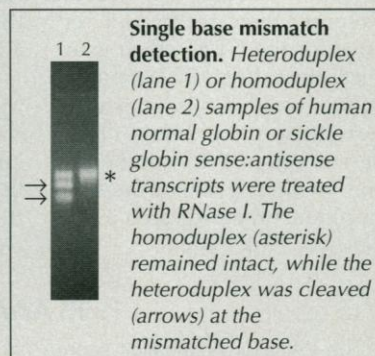
RNase I

better than RNase A

Epicentre's highly purified RNase I degrades RNA (preferentially single-stranded) to 3' mononucleotides regardless of the nucleotide sequence. Unlike RNase A, RNase I is thermolabile and completely inactivated by heating at 70°C for 15 minutes, avoiding the need for organic extractions.

RNase I is useful for:

- **RNA removal from DNA preparations.** RNase I degrades contaminating RNA more completely than RNase A.
- **Mismatch detection.** As shown below, RNase I can be used in RNase protection assays to detect single basepair mismatches in RNA:RNA and RNA:DNA hybrids.



If you are not satisfied with any Epicentre product, we will refund your money.



Circle No. 23 on Readers' Service Card

RNase I

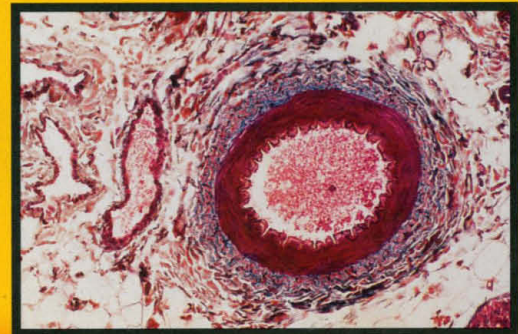
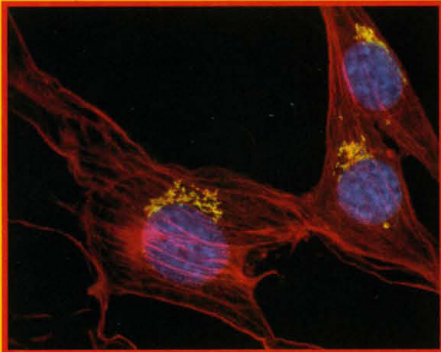
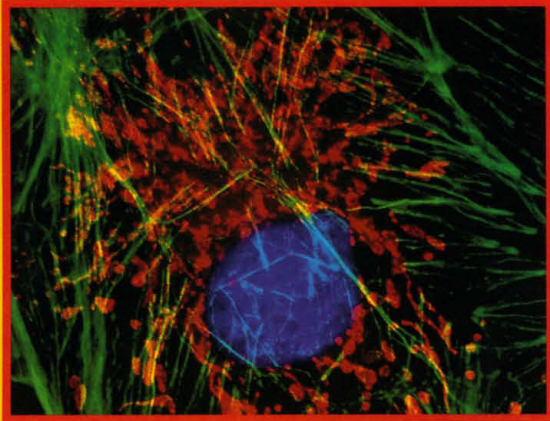


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**Until Nikon redefined infinity,
no infinity optical system
could do all this.**



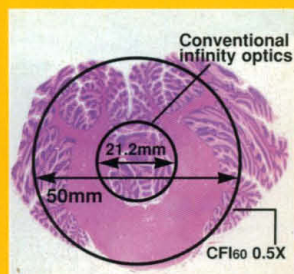
The Eclipse E800™ with CFI60™ optics redefines research microscopy.

Infinity optics took a quantum leap with Nikon's revolutionary, new CFI60™ technology. Longer working distances, higher numerical apertures and the widest magnification range and documentation field sizes ever achieved through infinity optics give you brilliant images of breathtaking sharpness and clarity, from ultra-low to the highest magnifications.



The new performance standard for every research application.

With Nikon's recent introduction of the Eclipse E800™ and E800M™ microscopes,



you have all the advantages of infinity optics without the limitations of conventional infinity systems. For example, the E800M's exclusive 0.5X objective lets you quickly and easily produce 1:1 specimen documentation while still being able to insert a wide variety of accessories directly into the optical path.

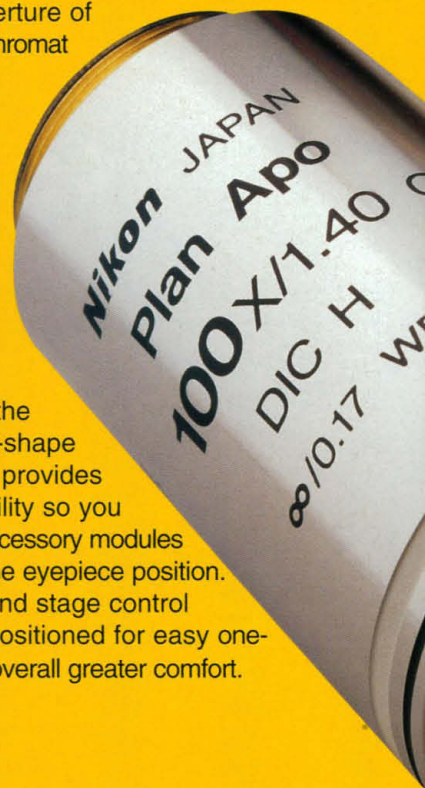


The E800 Micro/Macro System.

You can easily examine even the thickest specimens. The E800's expanded parfocal length of 60mm, increased objective diameter and optimum 200mm focal length tube lens provide you with a working distance up to 210µm at the maximum numerical aperture of 1.4, as with our Plan Apochromat 60X oil objective.

Exceptional ergonomics as well as superb optics.

The Eclipse E800 and E800M offer a full range of exclusive ergonomic features. With the widest base and arm dimensions in the industry and a unique T-shape configuration, the stand provides incomparable stability so you can add different accessory modules without affecting the eyepiece position. In addition, focus and stage control knobs are carefully positioned for easy one-hand operation and overall greater comfort.



The redefinition continues...



The new Eclipse TE300/200™ redefines inverted microscopy.

Imagine Nikon's renowned Diaphot inverted microscopes with even greater flexibility, improved ergonomics, more stability plus the unparalleled performance of CFI60 optics. That's exactly what you get in the Eclipse TE300™ and TE200™ microscopes. Both feature the highest numerical apertures and longest working distances in their categories. Both come with standard 100-watt or optional 30-watt illuminators. And, whether you select the Eclipse TE300 with its full complement of features or the economical Eclipse TE200, each represents the highest magnitude of stability and functionality in inverted microscopy.

Maximum control of light for the brightest, most precise images.

The Eclipse TE300's exclusive 4-position beam-splitter lets you select the amount of light distributed to the eyepieces, side imaging port and the built-in, front-mounted 35mm SLR port. The TE200 offers a simpler 2-way light path, so you can choose to send light to the eyepiece, or to both the eyepiece and side-mounted port.

The Eclipse TE300 offers a bottom-mounted image port option for the highest light throughput possible, while the Eclipse TE200 offers an optional 100% side port. Both models feature shorter optical paths with less glass, and the ability to accept our exclusive 0.8X side port

for the brightest and widest fields in the industry. The newly designed high efficiency epi-fluorescence attachment, which can hold up to four filter cubes, utilizes a quick-change linear slider rather than the slower turret type of most competitive models.

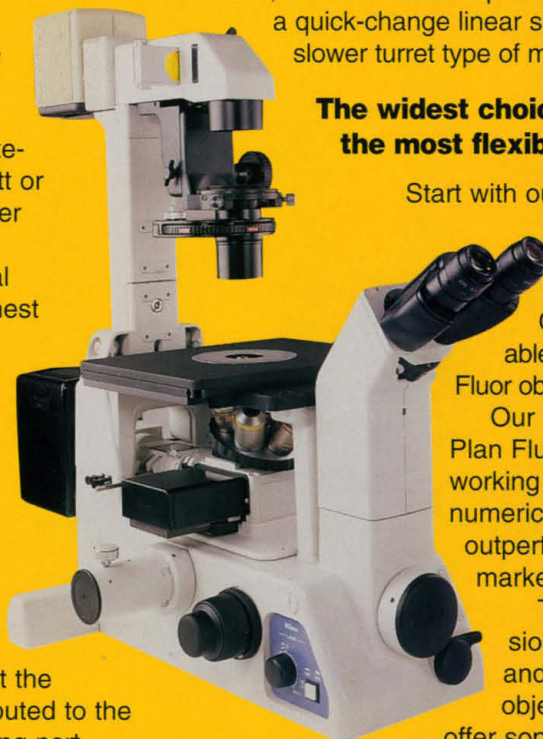
The widest choice in objectives for the most flexible upgrade path.

Start with our basic level Achromat series, including LWD versions for brightfield and phase microscopy. Or select our incomparable high transmission Plan Fluor objectives.

Our newly designed ELWD Plan Fluors—with extra long working distances and higher numerical apertures—will outperform anything on the market.

The 60X water-immersion Plan Apo objective and 20X multi-immersion objective for water or oil offer sophisticated approaches to high NA requirements and top spherical correction.

This extensive multi-imaging capability and flexibility, along with so much more comfort and ease of use, make the TE300/200 series ideal for everything from tissue culture to UV fluorescence, *in-vitro* fertilization, high resolution video microscopy, patch clamp techniques, microphotometry and confocal laser scanning microscopy.



The epi-fluorescence module has the brightest illumination and 4 filter cube capability.



Eclipse inverted microscopes offer the most extensive line of objectives available.

Compare the advantages of the Eclipse Series with other infinity microscopes.

Outstanding Optics

	<u>CFI60</u>	<u>Others</u>
Largest magnification range for both observation and documentation.	Yes	No
Highest numerical apertures and longest working distances for sharper images and thicker specimens.	Yes	No
60mm infinity objective design for superior performance characteristics.	Yes	No
CFI chromatic aberration corrected infinity objectives.	Yes	No
Widest viewfield at 1X for maximum specimen viewing area.	Yes	No
Plan Fluor objectives with the brightest UV transmission for superior fluorescence.	Yes	No
60X Plan Fluor 0.85 dry and 60X Plan Apo 0.95 dry.	Yes	No
"Fast focus" correction collar design with minimum focus shift for easy use.	Yes	No

Superior Epi-Fluorescence

	<u>Eclipse</u>	<u>Others</u>
4 filter cube linear slider for fastest switching between wavelengths.	Yes	No
Front-mounted shutter for maximum ergonomics.	Yes	No
CF corrected collector lens for even illumination at all visible wavelengths.	Yes	No
Upfront labels with filter cube specifications for easy identification.	Yes	No
3 built-in neutral density filters for precise illumination control.	Yes	No
UL/CE listed fluorescence illuminator for safety assurance.	Yes	No

Which Nikon Eclipse is right for you?

Regardless of your research area or what applications you are pursuing, there is an Eclipse microscope for your requirements. See for yourself the dramatic advances in optics, modularity and ergonomics that Eclipse CFI60 offers. Whether you choose the remarkable E800/E800M for advanced research, the versatile E600 with its superior epi-fluorescence, the powerful TE300/TE200 for inverted microscopy applications, or the economical E400 for basic research and clinical examination, there is an Eclipse model that's just right for your lab.

Don't take our word for it. Have one of the highly experienced sales engineers in our national dealer network help you choose exactly the right instrument for you. See what a difference Eclipse can make in your microscopy. Just call **1-800-52-NIKON, ext. 318**, to schedule a demonstration with your local dealer.

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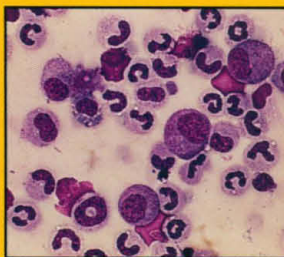
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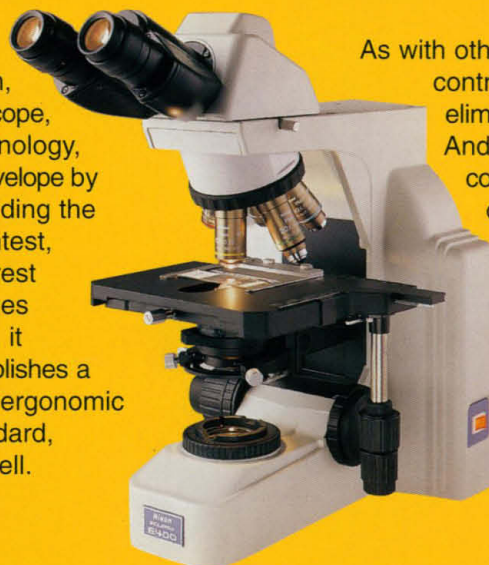
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The new Eclipse E400™ redefines comfort and performance.

When it comes to basic research or clinical evaluation, the new Eclipse E400™ microscope, with breakthrough CFI60 technology, not only pushes the optical envelope by



providing the brightest, clearest images ever, it establishes a new ergonomic standard, as well.



As with other Eclipse models, all basic controls are located up front to eliminate uncomfortable reaching. And the fine focus and stage control knobs permit one-hand operation. The stage is 20mm lower and eyepieces are inclined at the new 25° ergonomic standard for the most comfortable viewing experience ever. A unique variable angle tilting binocular body tube, with adjustable eyetube position, will be available soon.

Nikon advances photomicrography.

Nikon's powerful, new H-III camera, or the more advanced U-III, will give you the best photos ever. And they'll do it faster, easier and less expensively, without the long learning curve other cameras require. Among the U-III's full complement of features which, along with your photographic data, can be accessed from your PC are:

- 5 exposure metering modes, including 2 scanning types.
- LCD prompting display.
- An auto bright viewfinder that minimizes the effect of room light during composition.



The new U-III and H-III photo systems offer an array of advanced features to enhance documentation.

- Advanced auto bracketing and manual exposure systems.
- Simple macro programming capability.
- Data printing on photos.

The choice is obvious.

Spend your time perfecting your technique with other cameras, or document your work faster, more easily, more effectively, and at lower costs with Nikon's U-III or H-III cameras.



Nikon®

Redefining Infinity

The new Eclipse E600™ redefines research versatility.

The unprecedented acceptance of the E800 underscores the enormous benefits of CFI60



Unique 4-filter linear slider features a front-mounted shutter.

technology. For those who don't require the advanced features of the Eclipse E800, but want maximum flexibility in configuring a microscope for a multitude of research applications, Nikon introduces the Eclipse E600™ microscope.

This mid-sized, fully featured microscope offers a full array of accessories to support all optical techniques including DIC, dual-viewing, multi-viewing, double port, drawing tube, magnification changer, and the brightest epi-fluorescence available.

Furthermore, it's so versatile you can virtually custom design it to meet both your current and future needs...simply, easily and economically.

Chromatic-aberration-free optics.

The superiority of CFI60 optical technology provides extreme sharpness and color focus over the entire field of view, and you can utilize multiple contrast techniques both individually and in combined applications with new universal Plan Fluor objectives.

A microscope that grows as your needs grow.

Start with the Eclipse E600 main body, which establishes a new standard for ergonomics and mechanical/thermal stability. Next, choose from over 60 new CFI60 objectives, including Plan Apochromats, Plan Fluors, Plan Achromats and super Flat Field Achromats, as well as specialty objectives, such as water immersion or the only 1X objective available in the industry.

Then add the options you need, most of which are compatible with all other Eclipse models.

More choices; better performance; an appropriate price.

Before you consider any research microscope, compare it—feature for feature, benefit for benefit—with the remarkable Eclipse E600:

- Highest signal-to-noise fluorescence.
- In-line focusing and stage controls.
- More comfortable 25° binocular viewing angle.
- Ultra-wide 25mm standard field of view on trinocular body.
- Stage height 20mm lower than previous models.
- Adjustable X,Y stage controls positioned low for comfort and ease of use.

