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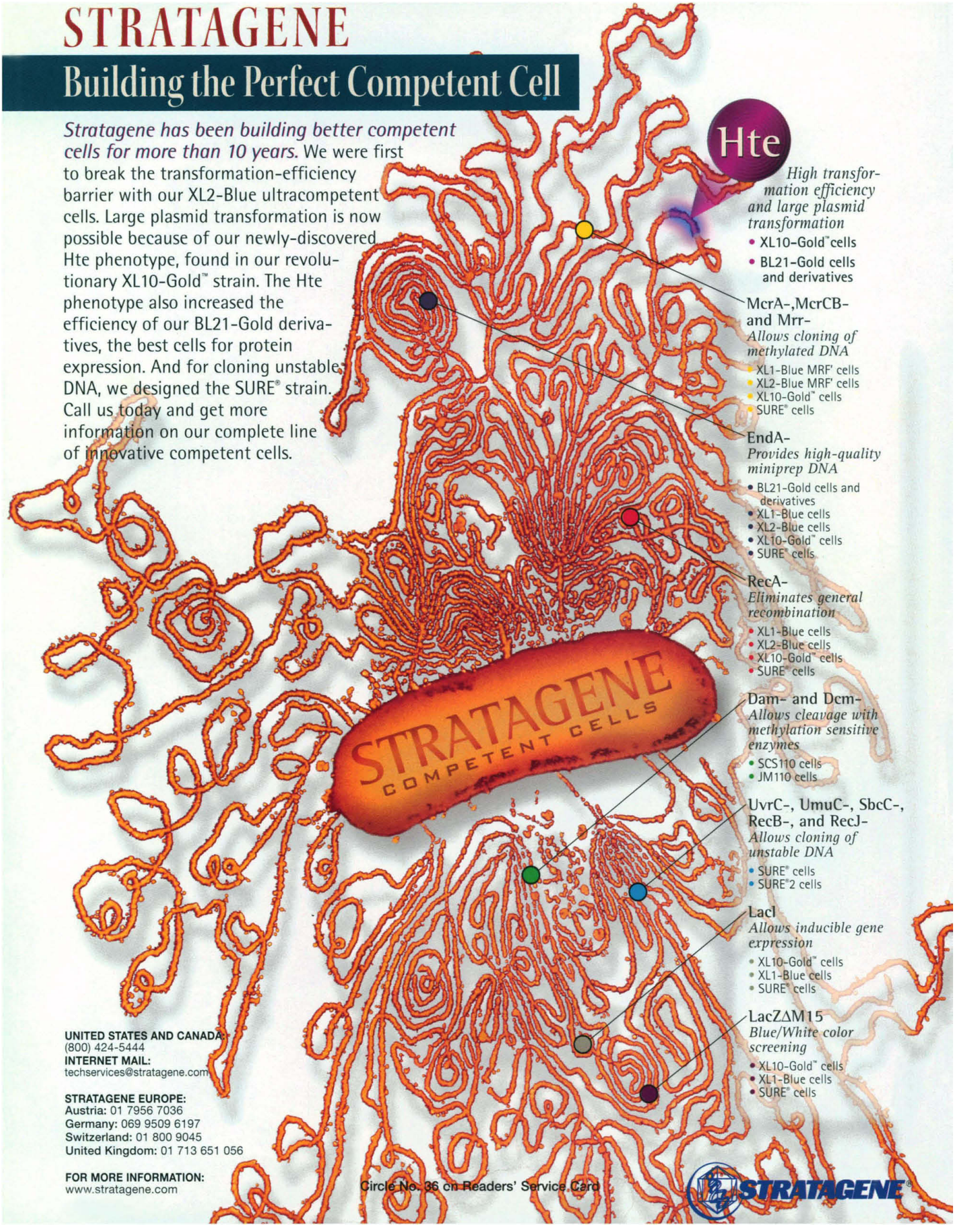

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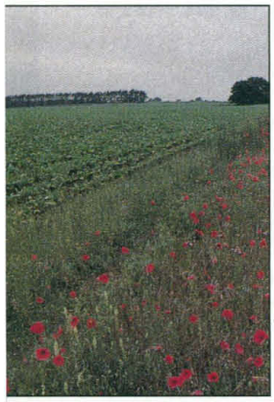
COVER Coarse residue from a Miocene limestone of New Zealand consists of skeletal fragments of cheilostomes and cyclostomes, two bryozoan groups that responded differently to the Cretaceous-Tertiary extinction. The diversity of both groups was reduced by the extinction, but while cheilostomes remained relatively more diverse, the cyclostomes became more abundant for several million years. [Photograph: H. Taylor]



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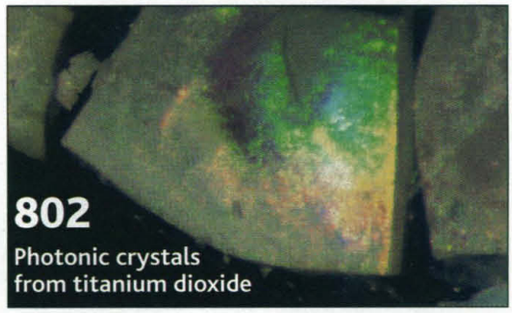
Hostile environment for genetically engineered crops



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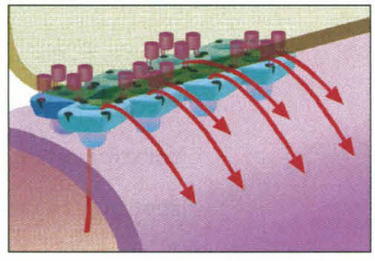

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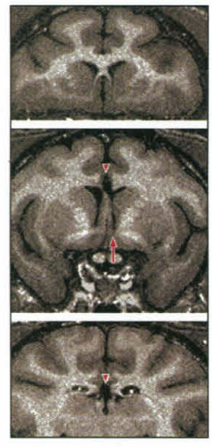

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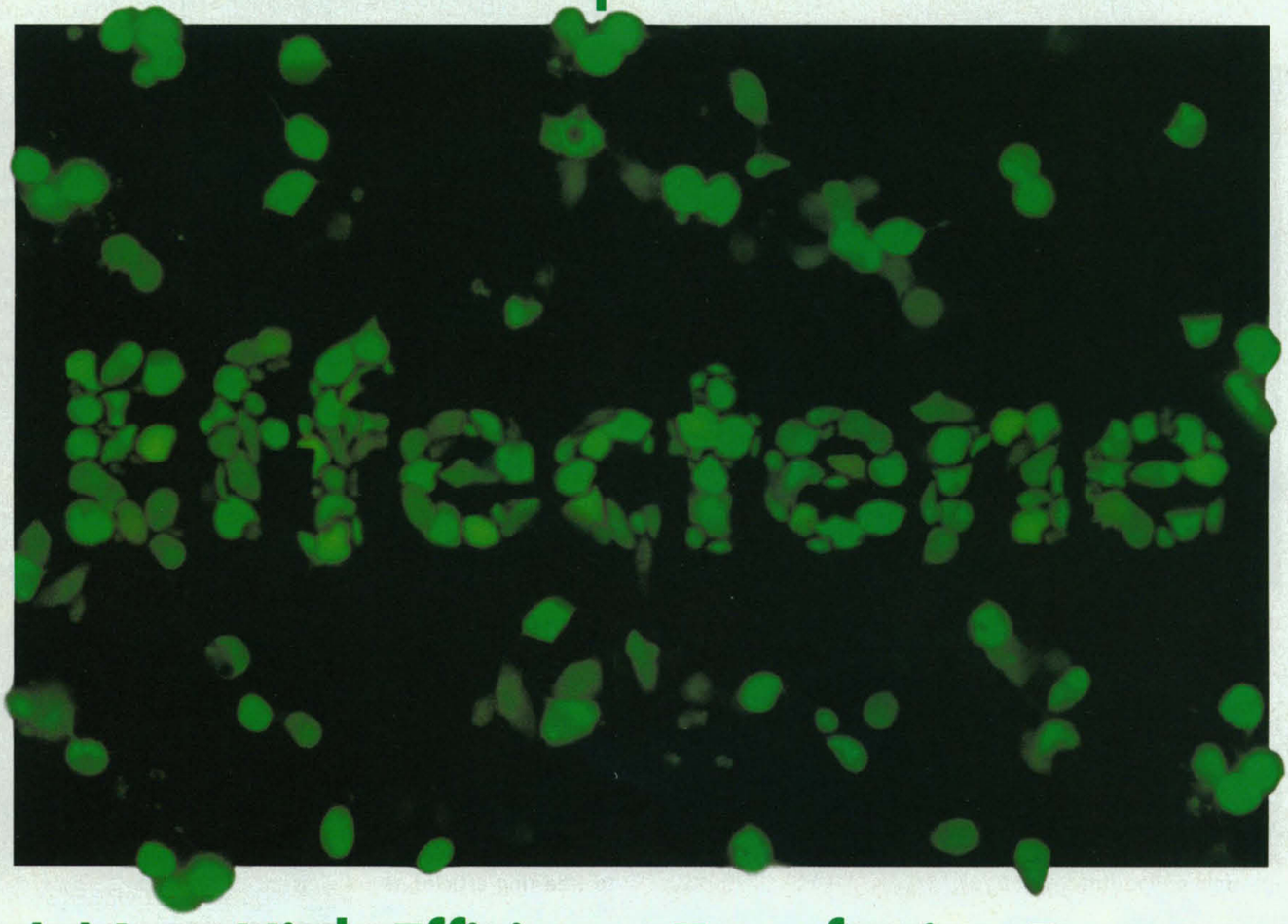

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STABILIZING MAGNETIC MEMORY DEVICES

Spin valve devices change their resistance by switching the magnetic alignment of one of two ferromagnetic films separated by a nonmagnetic metal film—the resistance is lower when the magnetizations are aligned. The change in resistance can serve as a memory element that remains even after power to the device is switched off. Improved performance has been seen in tunnel junctions, which replace the nonmagnetic metal with a thin oxide layer, but an outstanding problem is that switching one layer's magnetization can eventually demagnetize the reference film. Gider *et al.* (p. 797) show that a magnetically soft exchange-biased reference layer that was stabilized with an adjacent antiferromagnetic film was much more stable to repeated magnetization reversals (10^7) than was a single magnetically hard layer.

PHOTONIC CRYSTALS FROM TITANIUM DIOXIDE

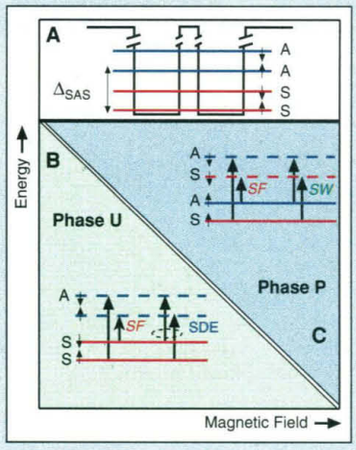
Photonic band gaps can be formed by creating ordered dielectric composite materials with lattice spacings on the order of the light's wavelength and are of interest because of their unusual optical properties. In the visible and infrared region, macroporous materials are being pursued as photonic materials; however, to exhibit strong photonic properties, the pore material needs to be formed from a material with a refractive index at least twice that of air. Wijnhoven and Vos (p. 802) have created photonic crystals from the anatase polymorph of titanium dioxide (TiO_2) using a colloidal crystal of nanoscale latex beads as a template; several reaction cycles were used to fill in the void space with TiO_2. The materials exhibit opalescence and are strongly photonic, showing Bragg reflection intensities nearly large enough to exhibit a photonic band gap, a particular frequency range over which light will not propagate through the crystal.

PERHAPS WETTER, BUT NOT COOLER

The Younger Dryas (YD) was a sudden return to glacial conditions during the last deglaciation. It is well recognized in the Northern Hemisphere; whether the event affected the Southern Hemisphere has been uncertain but is critical for understanding its origin. Earlier work showed that the Franz Josef Glacier in New Zealand advanced during the YD; this study has been considered as the best evidence for a YD event in the Southern Hemisphere. Singer *et al.* (p. 812) now present pollen records from glacial ponds in New Zealand that show little change in temperatures during the YD. The data suggest that if the YD occurred, it was perhaps associated with wetter, not cooler climates there.

QUANTUM PHASE TRANSITIONS AND SOFT MODES

At low temperatures, a two-dimensional electron gas (2DEG) can form quantum Hall states. The excited states of these systems are characterized by particle-hole pair formation, which can lead to low-energy collective-mode states (magneto-roton minima) at particular magnetic field strengths. Pellegrini *et al.* (p. 799) studied the interaction of two closely coupled



2DEGs by inelastic light scattering and found evidence for quantum phase transitions between three distinct spin phases as the energy of these collective excitations approached zero and became "soft" (that is, exhibited large fluctuations). The instabilities that drive such transitions arise from the interplay between Coulomb interactions and Zeeman splittings.

DIVERSE BUT NOT ABUNDANT

The long-term pattern of evolution and extinction has usually been interpreted in terms of the total diversity of different species, genera, or families. McKinney *et al.* (p. 807; see the cover) show that the pattern of ecological dominance may not be well represented by this metric. They examined the ecological dominance of two marine bryozoan clades over the last 150 million years by considering the skeletal mass preserved in continental shelf sedimentary rocks. The data show, for example, that immediately after the Cretaceous extinction, the diversity of one clade was not greatly affected but its ecological abundance was greatly reduced.

BRINGING BACK OLD MEMORIES

The inferior temporal cortex is the repository for memories of visual objects, whereas the prefrontal cortex has been implicated in executive processes such as retrieving visual memories. Hasegawa *et al.* (p. 814) examine the role of the corpus callosum (CC), the structure that connects the two hemispheres, in the transfer of memories. They find that a learned association between two visual objects that has been encoded in one hemisphere (by presenting both objects to the same visual field) can be learned quickly in the other hemisphere if the posterior CC (which carries fibers from the temporal cortex) is intact. They also find that an association between objects presented to opposite visual fields (and thus encoded separately in the temporal cortices) can be learned in the absence of an intact posterior CC, but that such learning requires the presence of an intact anterior CC (which carries fibers from the prefrontal cortex). These results suggest that visual memories can be retrieved unilaterally and then integrated in the prefrontal cortex.

ENDOCYTIC COAT ASSEMBLY

In the brain synapses, neurons release hundreds of vesicles containing neurotransmitters each time they are stimulated. This redistribution of membrane from internal vesicles to the neuron surface must be rapidly reversed to allow the vesicle membranes to be reutilized. This membrane recycling process involves rapid endocytosis of synaptic vesicle membranes via clathrin-coated pits and vesicles. Slepnev *et al.* (p. 821) found that the coat components of the clathrin-dependent endocytic machinery from rat brain assembled and disassembled in response to changes in their phosphorylation state. These results suggest that the rise in calcium that triggers synaptic vesicle release triggers dephosphorylation of the endocytic machinery, thus priming it for a wave of activity.

CONTINUED ON PAGE 751

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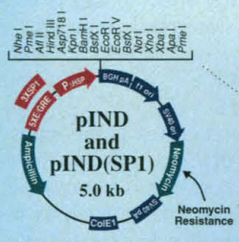

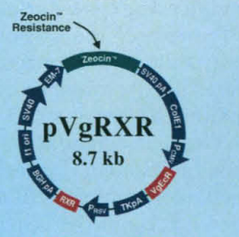

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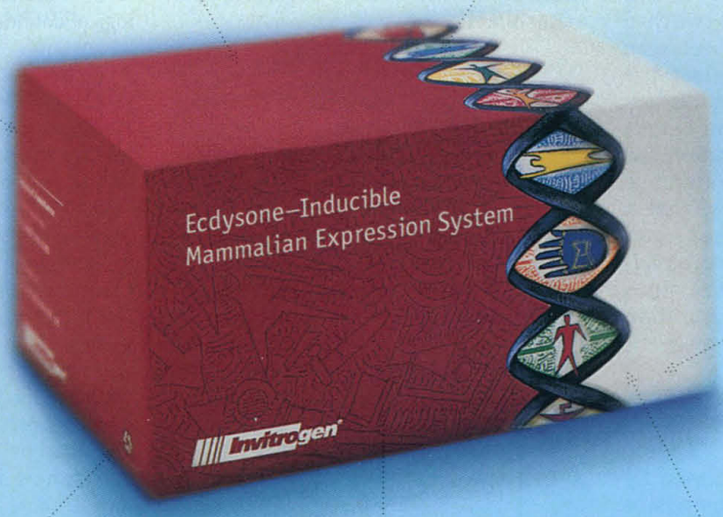

INDUCE WITH PONASTERONE A OR MURISTERONE A
CHO cells stably transfected with pIND(SP1)/Hygro/*lacZ*.
Lane 1 and 2: Uninduced
Lane 3: Induced with Muristerone A
Lane 4: Induced with Ponasterone A

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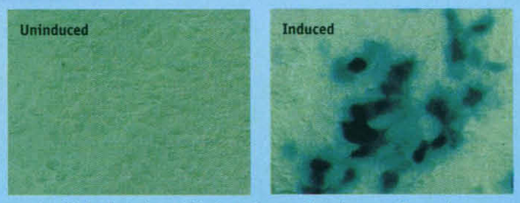

Uninduced and induced transiently transfected 293 cells stained with X-gal.

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THIS WEEK IN *SCIENCE*

CONTINUED FROM PAGE 749

ACTING ALONE AND IN GROUPS

Contraction of skeletal muscle in response to neuronal stimulation requires release of calcium from intracellular stores through channels known as ryanodine receptors (RyRs). The RyR1 complex contains four RyR1 subunits and four molecules of the protein FKBP12 (so called because it binds the immunosuppressant drug FK506). RyR1 complexes are opened in response to activated voltage-dependent calcium channels (VDCCs), apparently through direct protein-protein interaction. However, only half of the cell's RyRs appear to be directly associated with VDCCs. Marx *et al.* (p. 818; see the Perspective by Bers and Fill) report that RyR1 channels do not necessarily act independently. Rather, they sometimes undergo synchronous gating (opening and closing). Such coupling of RyR1 channels is promoted by FKBP12 and may explain how an activating signal is spread to those RyRs that are not in contact with VDCCs.

MORE HEAT THAN LIGHT IN SETTING CLOCKS

Circadian clocks help to keep organism metabolism in tune with the changes in light and temperature during the course of the day and through changing seasons. The role of light in entraining the clock has received much more attention than that of temperature. Liu *et al.* (p. 825) now show that ambient temperature can play a greater role in clock resetting than light. Concentrations of key proteins that oscillate during the day-night cycle are interpreted by the organism to indicate different parts of the circadian day depending on the ambient temperature. Shifting the temperature up or down can shunt the clock forward or backward almost immediately, independent of light conditions, and even against contradictory light-induced signals.

RNA-ACTIVATED TRANSCRIPTION

The genome of red clover necrotic mosaic virus consists of two RNAs called RNA-1 and RNA-2. The viral coat protein is translated from a small subgenomic RNA that is generated from RNA-1 by RNA-dependent transcription. Sit *et al.* (p. 829) show that this transcription is activated by a specific base-pairing interaction between RNA 2 and RNA 1. Trans-activation of transcription thus appears to be yet another example of a cellular function that, although typically performed by proteins, can also be performed by RNA.

A HANDLE ON CELL ADHESION

A mechanism by which the small guanine nucleotide binding proteins Cdc42 and Rac1 may regulate cell-cell adhesion has been demonstrated by Kuroda *et al.* (p. 832). Control of such adhesion mechanisms is important for cellular processes, including pattern formation in development, establishment of cell polarity, and some aspects of tumorigenesis. Rac1 and Cdc42 can inhibit cell adhesion mediated by membrane proteins known as cadherins and associated proteins called catenins. A guanosine triphosphatase–activating protein IQGAP1, which is a target of both Cdc42 and Rac1, appears to bring about the effects of Rac1 and Cdc42 on cadherin-mediated adhesion. IQGAP1 is shown to cause dissociation of α-catenin from cadherin-catenin complexes in vitro and in vivo.

TECHNICAL COMMENT SUMMARIES

The full text of these comments can be seen at www.sciencemag.org/cgi/content/full/281/5378/751a

Allometric Scaling in Biology

G. B. West *et al.* (Reports, 4 Apr. 1997, p. 122) discussed "the 3/4 power law for metabolic rates ... characteristic of all organisms," and they proposed "a general model that describes how essential materials are transported through space-filling fractal networks of branching tubes."

H. Kurz and K. Sandau comment that fractal scaling "may not be an unequivocal prerequisite" and that "a nonfractal model" fits the data as well. T. H. Dawson states that assumptions made in the report contradict "basic cardiovascular design and physiological processes of mammals." He presents alternative "scaling laws" for structure and function.

In response, J. H. Brown *et al.* (West and his colleagues) agree with Kurz and Sandau that biological networks "are not perfect fractals" in some respects. In response to Dawson, they state that "empirical measurements" favor the "zeroeth-order model" of their report.

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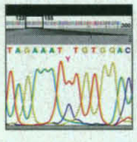

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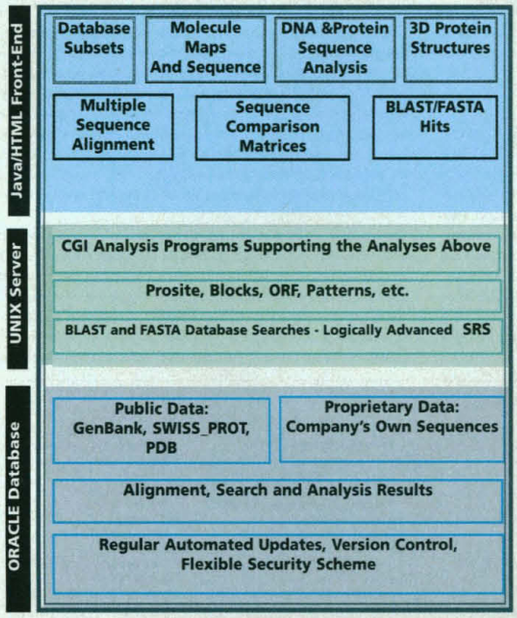

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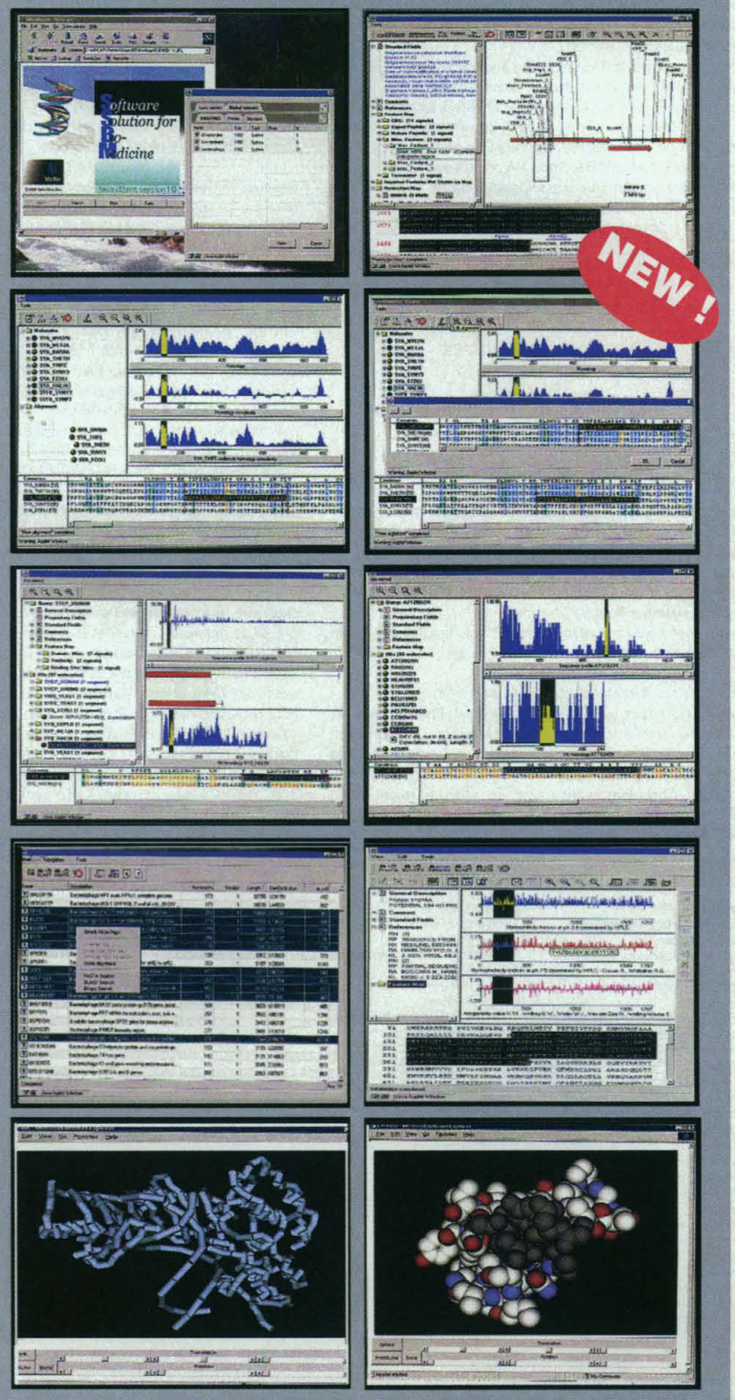

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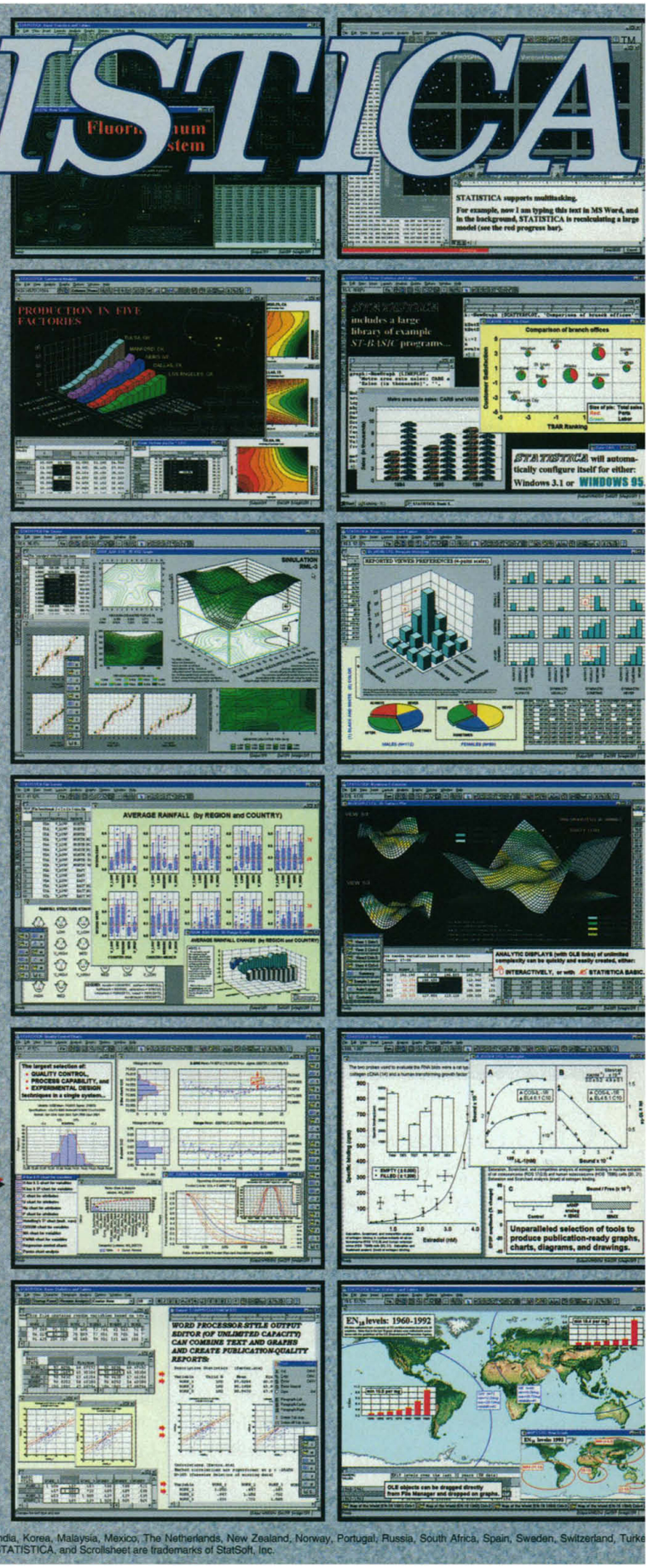

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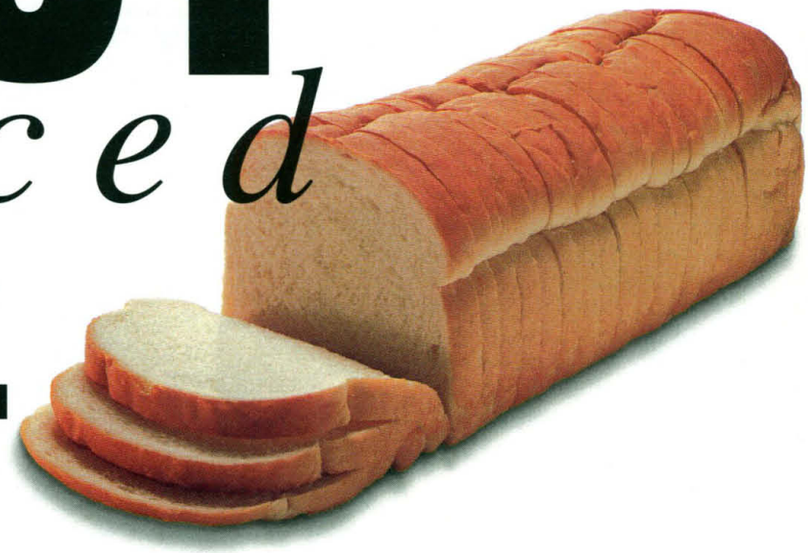

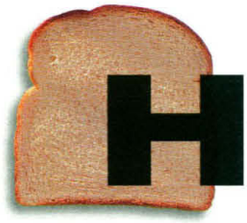

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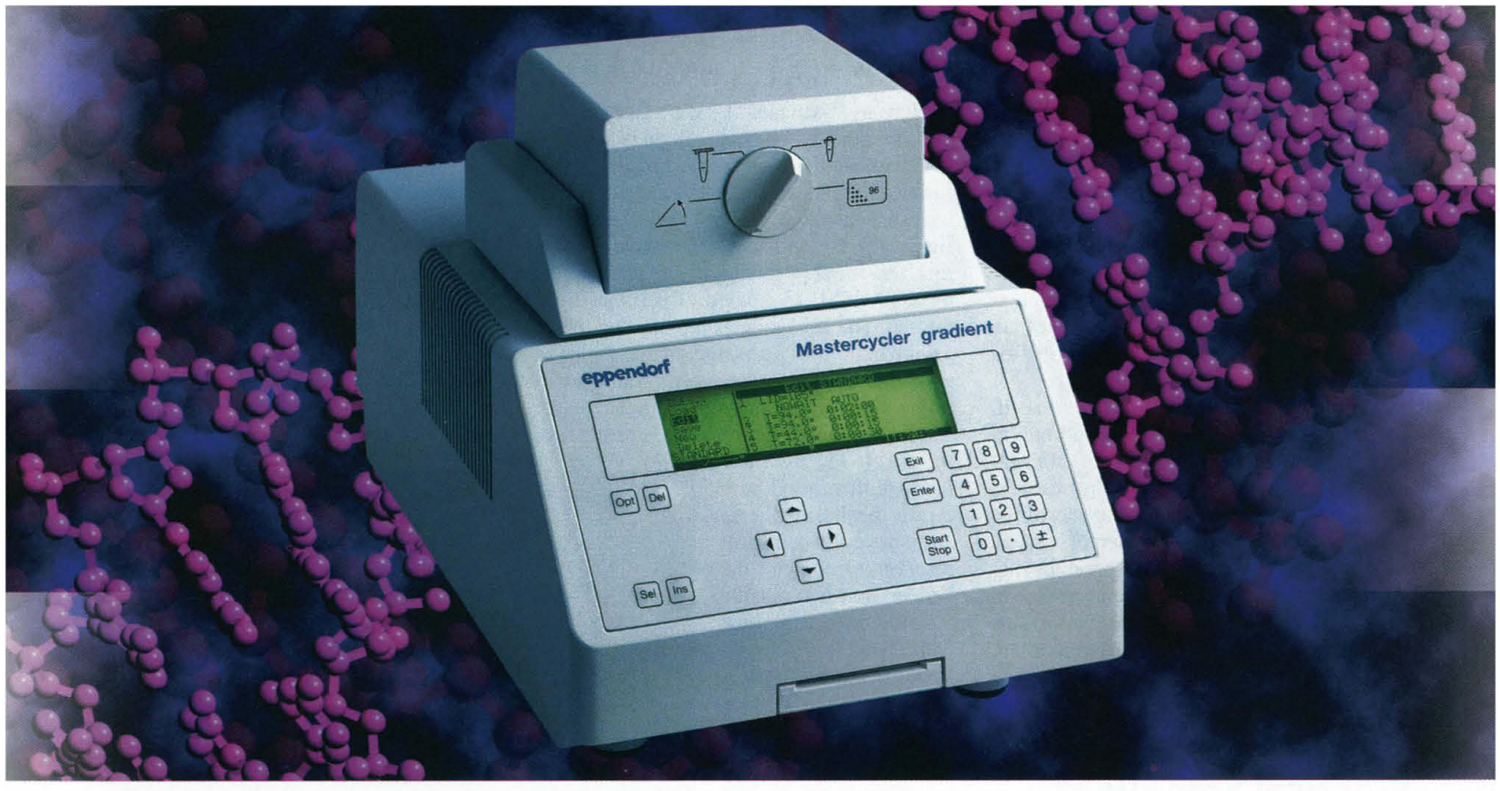

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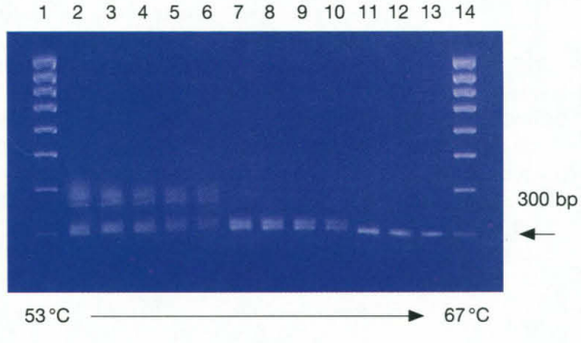

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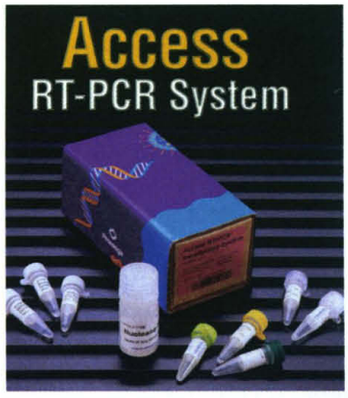

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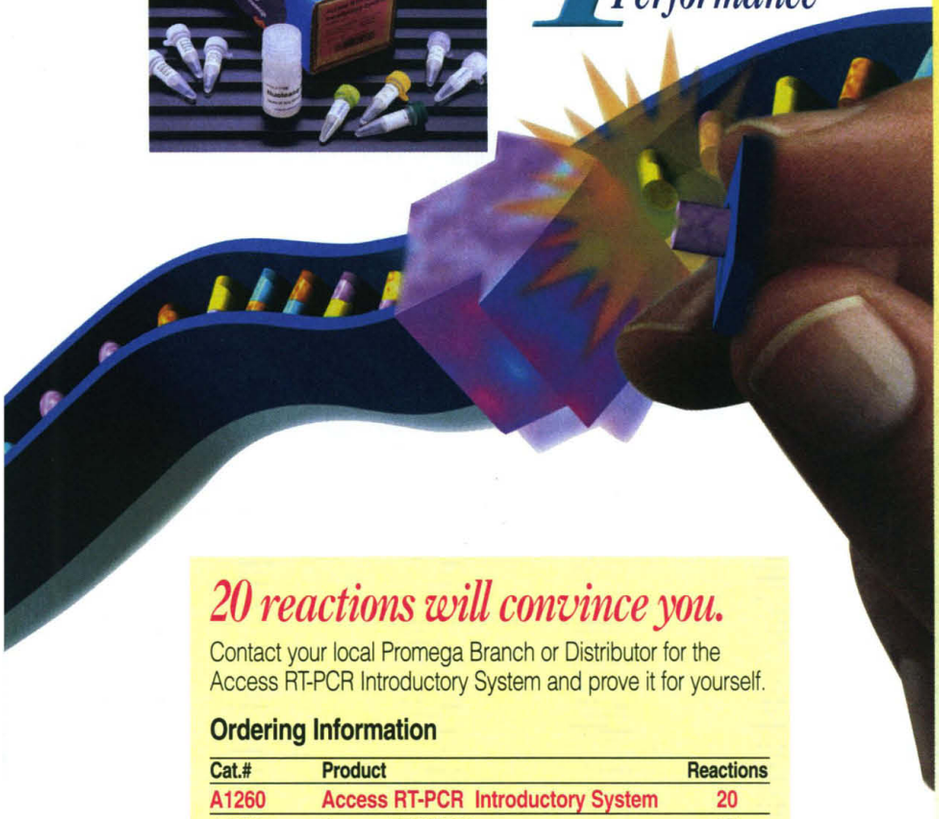

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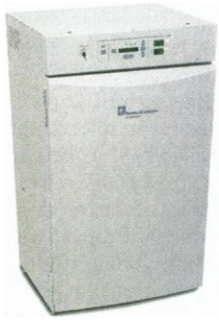

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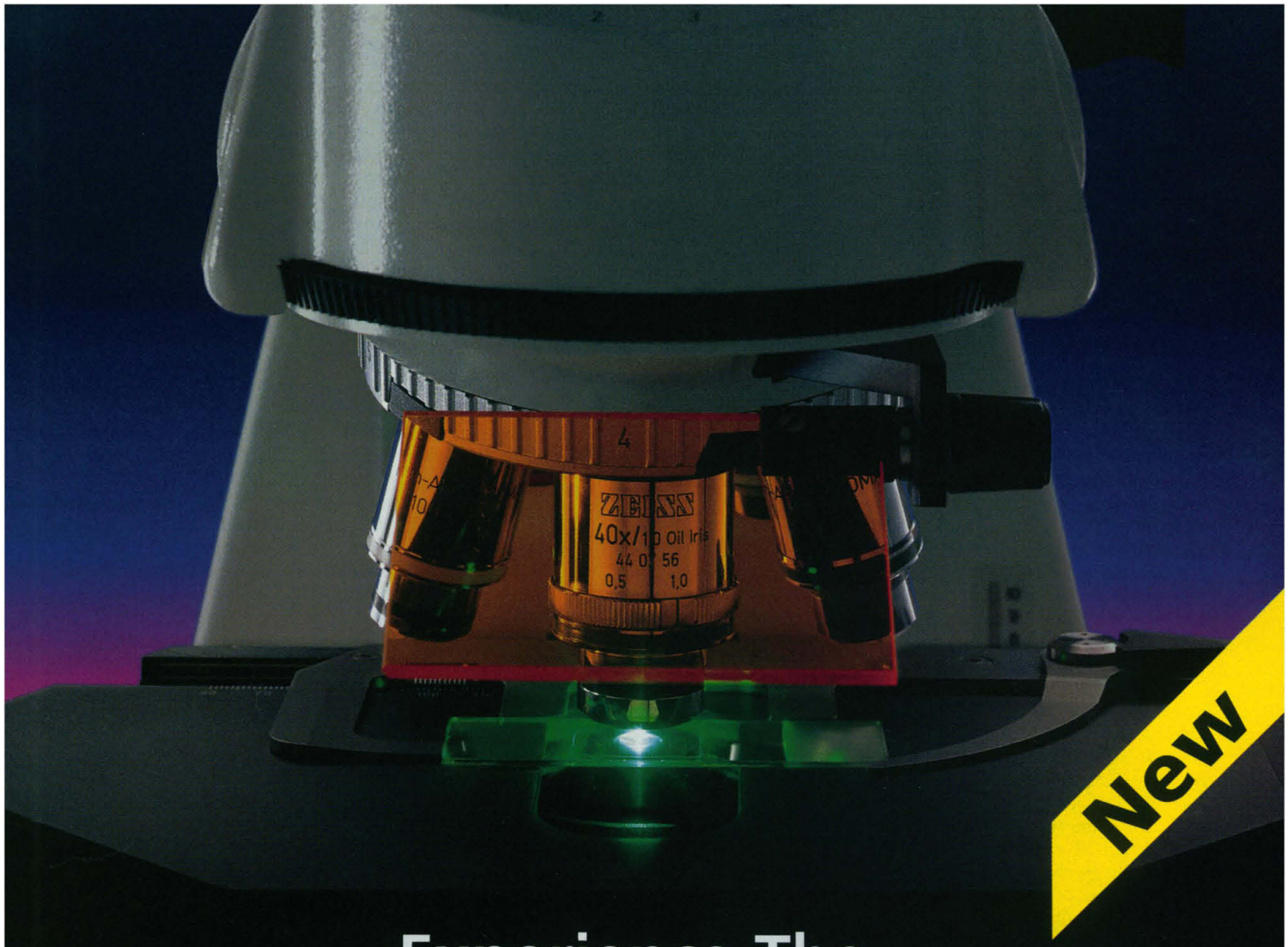

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