



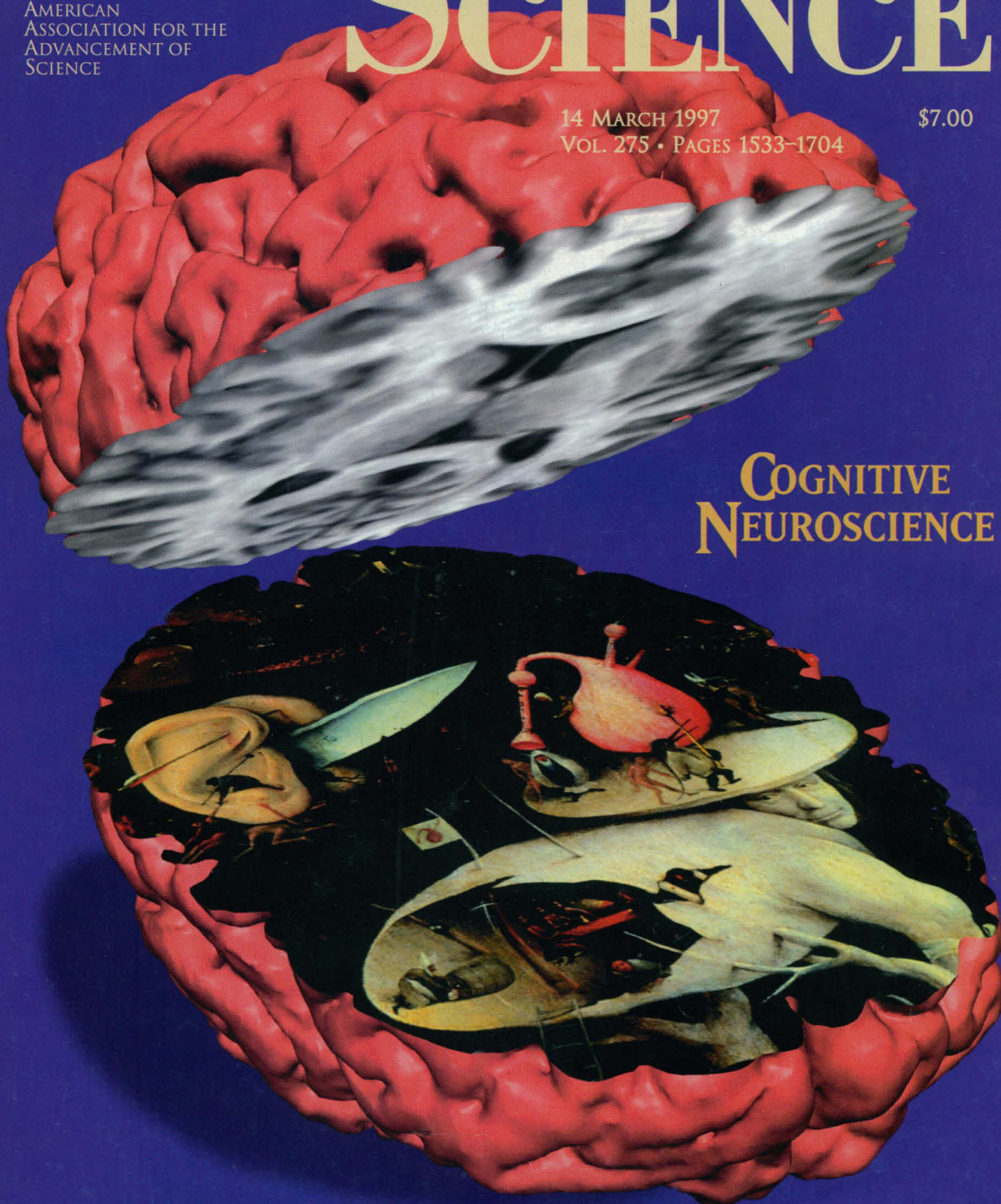
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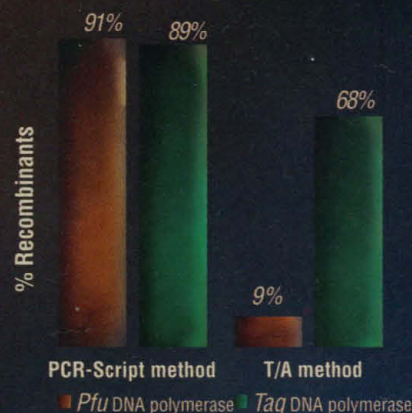
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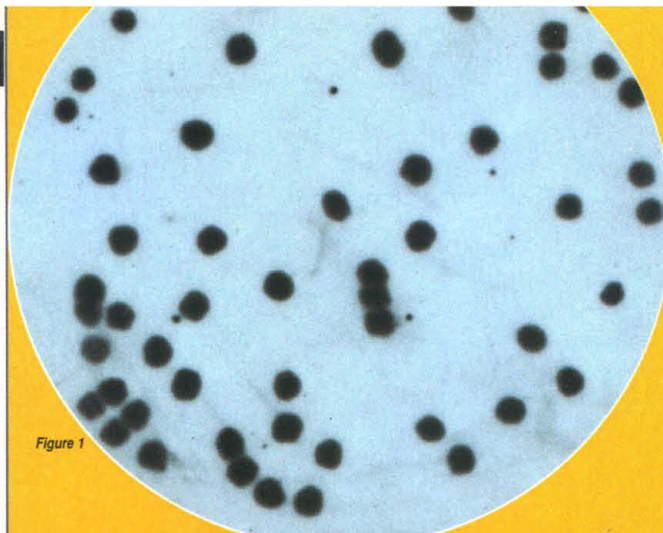


Figure 1

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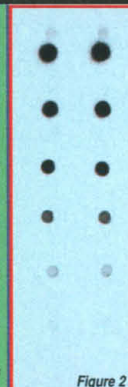


Figure 2

Figure 1. Colonies were screened for the TGF-β1 gene with a fluorescein-labeled oligonucleotide probe and Enhanced Luminol. This film demonstrates results obtained using the Renaissance 3'-End Labeling Fluorescein Kit with Antifluorescein-HRP (NEL823) and the detection substrate Enhanced Luminol (NEL201). Discs were exposed to Reflection film for 15 minutes.

Figure 2. Mouse B-actin was detected using a fluorescein-labeled ssRNA probe and ready-to-use CDP-Star. This film demonstrates results obtained using Renaissance RNA Fluorescein Labeling Kit with Antifluorescein-AP (NEL633) in conjunction with ready-to-use CDP-Star (NEL601). Blots were exposed to Reflection film for 5 minutes.

Figure 3. The v-Fos gene was detected in 125 ng of blotted mouse genomic DNA in less than 5 minutes using CDP-Star. This film demonstrates results obtained using the Renaissance Random Primer Biotin Labeling Kit with Streptavidin-AP (NEL604) in conjunction with ready-to-use CDP-Star (NEL601). Blots were exposed to Reflection film for 5 minutes.

Figure 3

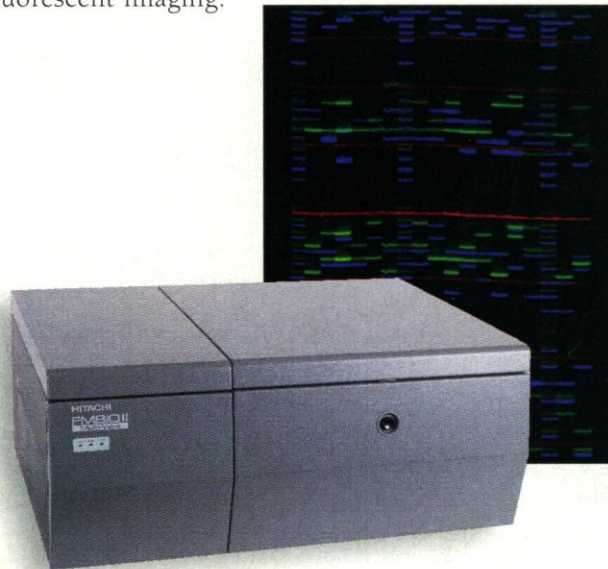
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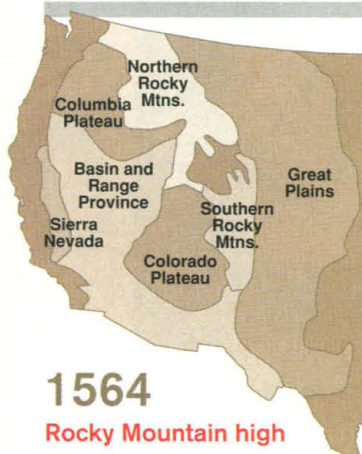
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FOUR RESCENCE



1564

Rocky Mountain high

NEWS & COMMENT

- Biology Departments Restructure 1556
- Space Station: Science Slides to Bottom of Schedule 1558
- Phylogenetic Analysis: Getting Its Day in Court 1559
- Spotting a Gamma Burst's Afterglow 1560
- Court Invalidates Expert Panel Report 1560
- Panel Approves Gene Trial for 'Normals' 1561
- Japanese Neuroscience: New Institute Seen as Brains Behind Big Boost in Spending 1562
- Internet: Domain Names Windfall Causes Flap 1563

RESEARCH NEWS

- Why the West Stands Tall Is a Great Plateau Slip-Sliding Away? 1564 1565
- Quantum Squeeze Wrings Uncertainty From Atom Waves 1566
- Superoxides Relay Ras Protein's Oncogenic Message 1567

COGNITIVE NEUROSCIENCE



NEWS

- Getting a Grasp on Working Memory 1580
- Working Memory Linked to Intelligence 1581
- Visual System Provides Clues to How the Brain Perceives 1583

ARTICLES

- Linking Mind and Brain in the Study of Mental Illnesses: A Project for a 1586

- HOX Gene Links Limb, Genital Defects 1568
- Labs Take Aim at Rapid-Fire Lasers for Fusion Power 1569
- Taking 'Hard' Problems to the Limit 1570
- Chemical Elements: The Weighty Matter of Names 1570
- PERSPECTIVES
- Sea-Floor Depth and the Lake Wobegon Effect 1613
- S. Stein and C. A. Stein



1621

Sulfur cools the core

DEPARTMENTS

- THIS WEEK IN SCIENCE 1541
- EDITORIAL 1547
- The Science of the Mind
- M. S. Albert
- LETTERS 1549
- Forty-Something Breast Screening: E. A. Sickles • Predictive Value of *Drosophila*: R. DeSalle, R. Bang, M. Yudell, R. Meier • The Poetry Corner: "For Dolly": J. Knight; "The Nothing That Is": M. Grayson • Moore's Law: A. E. Brenner • Coffee Growing: Sun or Shade?: C. MacVean • "Atomfi Gonfi": U. Amaldi
- SCIENCESCOPE 1555
- RANDOM SAMPLES 1571
- Population Control for Docs • Women Not Short-changed in Trials? • Into the Air, Junior Robots • DOE Plans Bay Area Gene Works • Popeye the Miner • Shot in the Arm for AIDS Vaccine
- BOOK REVIEWS 1611
- Language in Cognitive Development, reviewed by C. Snow • The Acquisition of Motor Behavior in Vertebrates, T. Flash
- PRODUCTS & MATERIALS 1667

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COVER

Mental illnesses arise from the brain but are expressed in the mind. Shown is a surface reconstruction of a schizophrenic patient's brain. The top half shows the internal anatomy, including ventricular enlargement often seen in schizophrenia, and the bottom shows the "The Garden of

Earthly Delights" by Hieronymus Bosch, which suggests subjective features of the psychotic experience. See the special section (beginning on page 1579) and editorial (page 1547). [Image: T. Cizadlo, D. Heckel, G. Harris, N. Andreasen, Iowa MHCRC Image Processing Laboratory]



Scientific Psychopathology

N. C. Andreasen

A Neural Substrate of Prediction and Reward

1593

W. Schultz, P. Dayan, P. R. Montague

Language Acquisition and Use: Learning and Applying Probabilistic Constraints

1599

M. S. Seidenberg

Optimality: From Neural Networks to Universal Grammar

1604

A. Prince and P. Smolensky

Paths to Activation of Transcription

1614

E. P. Geiduschek

Tagging T Cells: T_H1 or T_H2 ?

1615

R. Gallagher

Earthquakes Cannot Be Predicted

1616

R. J. Geller, D. D. Jackson, Y. Y. Kagan, F. Mulargia

REPORTS

Borehole Temperature and a Baseline for 20th-Century Global Warming Estimates

1618

R. N. Harris and D. S. Chapman

High-Pressure Iron-Sulfur Compound, Fe_3S_2 , and Melting Relations in the Fe-FeS System

1621

Y. Fei, C. M. Bertka, L. W. Finger

Melting of $(Mg,Fe)_2SiO_4$ at the Core-Mantle Boundary of the Earth

1623

K. G. Holland and T. J. Ahrens

The Seismic 8° Discontinuity and Partial Melting in Continental Mantle

1626

H. Thybo and E. Perchuc

Paleomagnetic Evidence of a Low-Temperature Origin of Carbonate in the Martian Meteorite ALH84001

1629

J. L. Kirschvink, A. T. Maine, H. Vali

Low-Temperature Carbonate

1633

Concretions in the Martian Meteorite, ALH84001: Evidence from Stable Isotopes and Mineralogy

J. W. Valley, J. M. Eiler, C. M. Graham, E. K. Gibson, C. S. Romanek, E. M. Stolper

Vacuum Squeezing of Solids: Macroscopic Quantum States Driven by Light Pulses

1638

G. A. Garrett, A. G. Rojo, A. K. Sood, J. F. Whitaker, R. Merlin

Tyrosine Phosphorylation of Transmembrane Ligands for Eph Receptors

1640

K. Brückner, E. B. Pasquale, R. Klein

Spatially and Functionally Distinct Ca^{2+} Stores in Sarcoplasmic and Endoplasmic Reticulum

1643

V. A. Golovina and M. P. Blaustein

Mitogenic Signaling Mediated by Oxidants in Ras-Transformed Fibroblasts

1649

K. Irani, Y. Xia, J. L. Zweier, S. J. Sollott, C. J. Der, E. R. Fearon, M. Sundaresan, T. Finkel, P. J. Goldschmidt-Clermont

A Member of the Frizzled Protein Family Mediating Axis Induction by Wnt-5A

1652

X. He, J.-P. Saint-Jeannet, Y. Wang, J. Nathans, I. Dawid, H. Varmus

RNA Polymerase B' Subunit: A Target of DNA Binding-Independent Activation

1655

A. Miller, D. Wood, R. H. Ebright, L. B. Rothman-Denes

Unusual Oligomerization Required for Activity of NtrC, a Bacterial Enhancer-Binding Protein

1658

C. Wyman, I. Rombel, A. K. North, C. Bustamante, S. Kustu

TECHNICAL COMMENTS

Stress and Glucocorticoid

1662

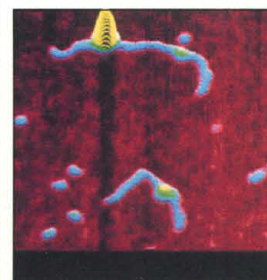
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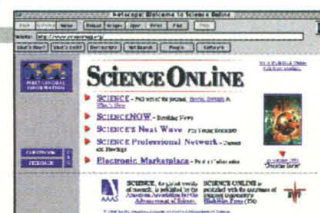
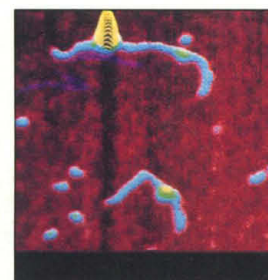
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1614 & 1658

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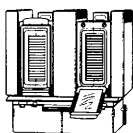
Intuitive Programming Especially Easy

WATERTOWN, Mass. — In late 1994, MJ RESEARCH introduced a revolutionary new line of thermal cyclers for PCR* and cycle sequencing. Called the “DNA Engine™” line, this new design builds upon experience the company had

Twin Tower In Situ Alpha Fits DNA Engines & Tetrads

The versatility of the DNA Engine system is well illustrated by the Twin Tower™ *in situ* Alpha. Two new methods of DNA amplification—*in situ* PCR* and PRINS—have recently come to common usage, but they usually require a specialty thermal cycler that processes only glass slides.

But not with the DNA Engine or Tetrad. Instead, a “swappable” dual block, called the Twin Tower, can be put into either chassis, and each Alpha cycles 2 x 16 glass slides rapidly, accurately, and precisely.



Accuracy & Data Export Needed for Diagnostics

Medicine is on the cusp of a new era when diagnosis of disease will be based increasingly upon the analysis of amplified DNA. But the thermal cyclers that actually do the amplification must be of specific and certifiable quality.

The College of American Pathologists and the NCCLS have chosen to focus upon two criteria for particular attention: accuracy and the recording of thermal data from every run. Each DNA Engine has NIST-traceable & field-verifiable accuracy. Thermal data may be continuously reported via serial or GPIB ports, or sent to a printer for hard copy, in order to record data.

gained manufacturing its pioneering PTC-100™ and MiniCycler™ instruments. Improvements included increased speed of ramping, higher precision and greater accuracy—as well as a new “swappable” block format. But perhaps the most significant advances were in the software, for these allowed easier user interface and better thermal control—as well as communication between cyclers and other digital devices.

The new software was the culmination of years of effort by engineers Joe Pacatte and Andrea Wolga. Building upon the intuitive concepts of PTC-100 software, they managed to create a powerful new system that allows for expansion, revision, and network communications via IEEE-488 or RS-232 ports—features that would impress any engineer. But they concentrated their efforts on the needs of users, creating a whole host of features to allow smoother functioning in the lab. These include the ability to store programs in individual folders, edit one program while another is running, choose from 3 different methods of thermal control, and calculate total run time from entered parameters. These and many other software features make DNA Engines a joy to use.

Other engineers did their jobs well too. In particular, the modular design of swappable blocks (called “Alphas”) allows configuration for different vessels—96 or 384-well plates, 0.2 or 0.5ml tubes, for example. Last but not least, two available sizes of chassis—one holding 1 Alpha and the other 4—allows maximum flexibility in planning, purchase, and expansion.

Tetrads Lead the Charge into Genomics

High-Capacity Yet Compact—Cycler Holds Four 96 or 384-well Plates

A recent development in biology is an unrelenting surge of interest in genomics. Already increasing knowledge of the human and other genomes has had major influence upon the biotech, pharmaceutical, and medical industries, and Wall Street seems to be betting on further advances. According to a recent series of articles in *Science* (275, 767-782, 7 Feb 97) the pharmaceutical industry alone has invested at least \$1 billion into genomics companies.

And what is the thermal cycler of choice among these companies? Why, the MJ RESEARCH



Tetrad cycler with four swappable blocks Tetrad. This thermal cycler has all the features of the DNA Engine—and it also offers 4 independent blocks in one compact chassis. It fits easily inside robots, it can be controlled manually from its keypad or digitally through its ports, and when fitted with Power Bonnets, it can be operated without manual intervention.

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THIS WEEK IN SCIENCE

edited by PHIL SZUROMI

Phonon squeezing

Heisenberg's Uncertainty Principle states that we cannot know simultaneously the values of conjugate variables (such as position and momentum) to arbitrary accuracy; the product of their errors must always exceed a certain value. However, experiments can be designed that reduce the error in one variable below the quantum limit—"squeezed states" of photons have been produced for some time. Garrett *et al.* (p. 1638; see the news story by Cleary, p. 1566) have created a nearly periodic squeezed state of acoustic-mode phonons (lattice vibrations) in crystals of KTaO_3 . Femtosecond laser pulses induced counterpropagating phonons that select for a high density of phonon states. The variance in atomic displacements as the atoms vibrate dips below the quantum limit for half of each cycle.

Borehole baseline

One problem in interpreting currently observed global warming is that earlier temperature records for comparison are scarce. Harris and Chapman (p. 1618) show that temperature estimates from boreholes can provide a baseline that is also tied to the current observational record. Data from a borehole and meteorological network in Utah show that temperatures in the 19th century there were about 0.6°C below recent mean temperatures.

Sulfur in the core

Determination of the melting temperature of Earth's iron outer core requires a knowledge of how other elements such as

Off-site transcriptional activation

Activation of transcription requires proteins that bind DNA near the promoter sequence and recruit RNA polymerase (RNAP) and others that function at distant sites. Studies of bacterial transcription have begun to reveal the importance of protein-protein interactions. Wyman *et al.* (p. 1658) show that the transcriptional activator NtrC (nitrogen regulatory protein C) forms large oligomers at a distant DNA enhancer site. The non-DNA-binding components of these NtrC oligomers are essential for activation, possibly because they interact with RNAP at the promoter site. Miller *et al.* (p. 1655) show that bacteriophage N4SSB (single-stranded DNA binding protein) activates transcription not through its DNA binding domain but rather one that binds to RNAP β' . In a Perspective, Geiduschek (p. 1614) speculates that NtrC and N4SSB may both reconfigure the RNAP complex into a transcriptionally competent form.

sulfur can form stable phases with iron at high temperatures and pressures. Fei *et al.* (p. 1621) conducted multianvil experiments and found an additional phase, Fe_3S_2 , near 14 gigapascals. The presence of Fe_3S_2 suggests that the temperature of the core may be overestimated by extrapolation from a simple Fe-FeS binary eutectic.

Cooler carbonates

The temperature of formation of carbonate minerals precipitated on fracture surfaces in the martian meteorite ALH84001 has been controversial and is key for understanding the early evolution of Mars as well as whether the meteorite might contain traces of early life. Two reports provide evidence that the carbonates formed at low temperatures. Kirschvink *et al.* (p. 1629) show that the magnetic directions of pyroxene grains across a fracture are rotated. Magnetic directions should have been reset if the rock was heated above a few hundred degrees Celsius. The data also imply that early Mars had a substantial magnetic

field. Valley *et al.* (p. 1633) show that the oxygen isotope compositions of the carbonate minerals are high and variable, suggesting that the minerals precipitated at low temperatures and in disequilibrium.

Under continents

The upper mantle beneath continents differs from that beneath ocean basins for reasons that have not been clear. Thybo and Perchuc (p. 1626) examined long-range seismic reflections profiles from several continents where the source and receiver were separated by at least 700 kilometers (8°). The sections imply that the mantle beneath the continents may be a region of partial melting; it is stratified to at least 100 kilometers above a zone of low seismic velocity.

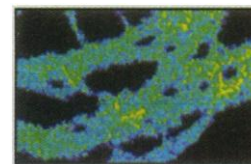
Reactive oxygen and cell proliferation

Reactive oxygen species (ROS) are produced by some cancer cells, and antioxidants appear to protect against some forms of

cancer. However, the role of ROS in controlling cell proliferation is largely unknown. Irani *et al.* (p. 1649; see the news story by Pennisi, p. 1567) found that cells transformed by a constitutively active form of the Ras guanosine triphosphatase produced increased amounts of superoxide. Proliferation of Ras-transformed cells was inhibited by a chemical antioxidant or transfection of cells with catalase. The findings indicate that production of ROS is necessary for enhanced cell proliferation induced by an oncogenic form of Ras and also provide a hypothetical mechanism for some of the observed anti-proliferative actions of antioxidants.

Calcium control

In many cells, release of calcium from intracellular stores is a critical step in regulating various processes. Golovina and Blaustein (p. 1643) used high-resolution imaging and calcium-sensitive fluorescent dyes to visualize calcium storage and release of calcium in stimulated



cells. Calcium exists in small spatially and functionally distinct compartments that can respond in distinct ways to physiological stimuli—the concentration of calcium in some stores even increased while others released calcium. Such local control of the concentration of intracellular calcium apparently allows calcium-dependent regulation of multiple processes within a single cell.

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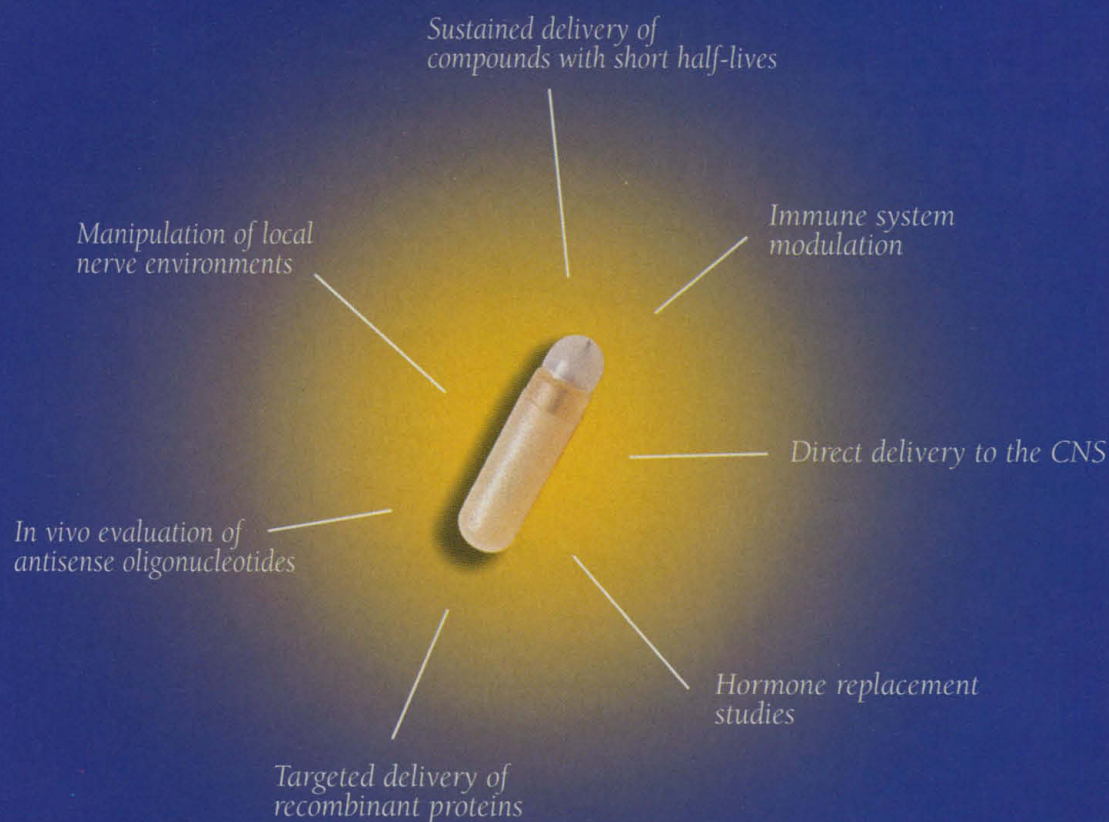
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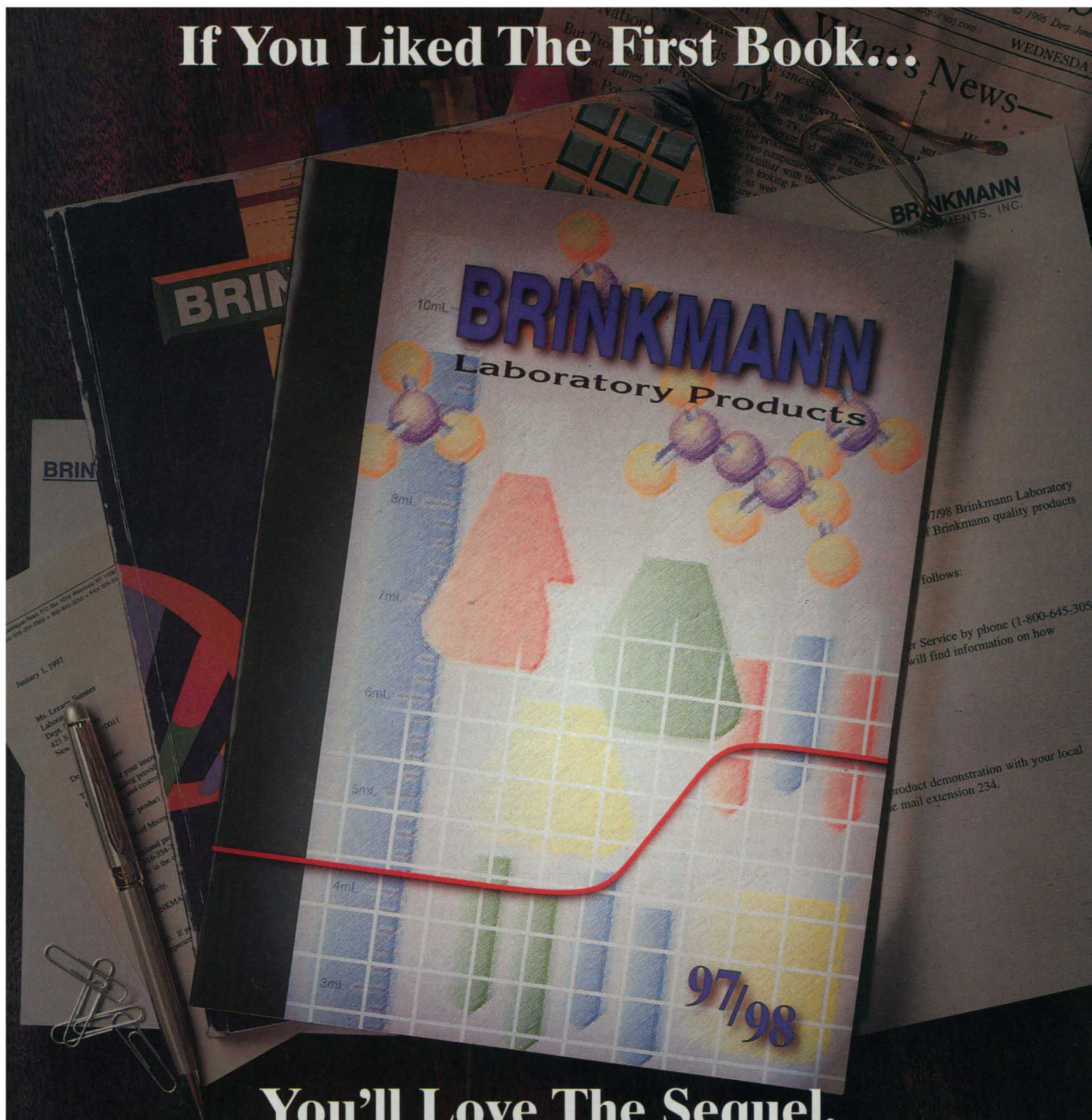
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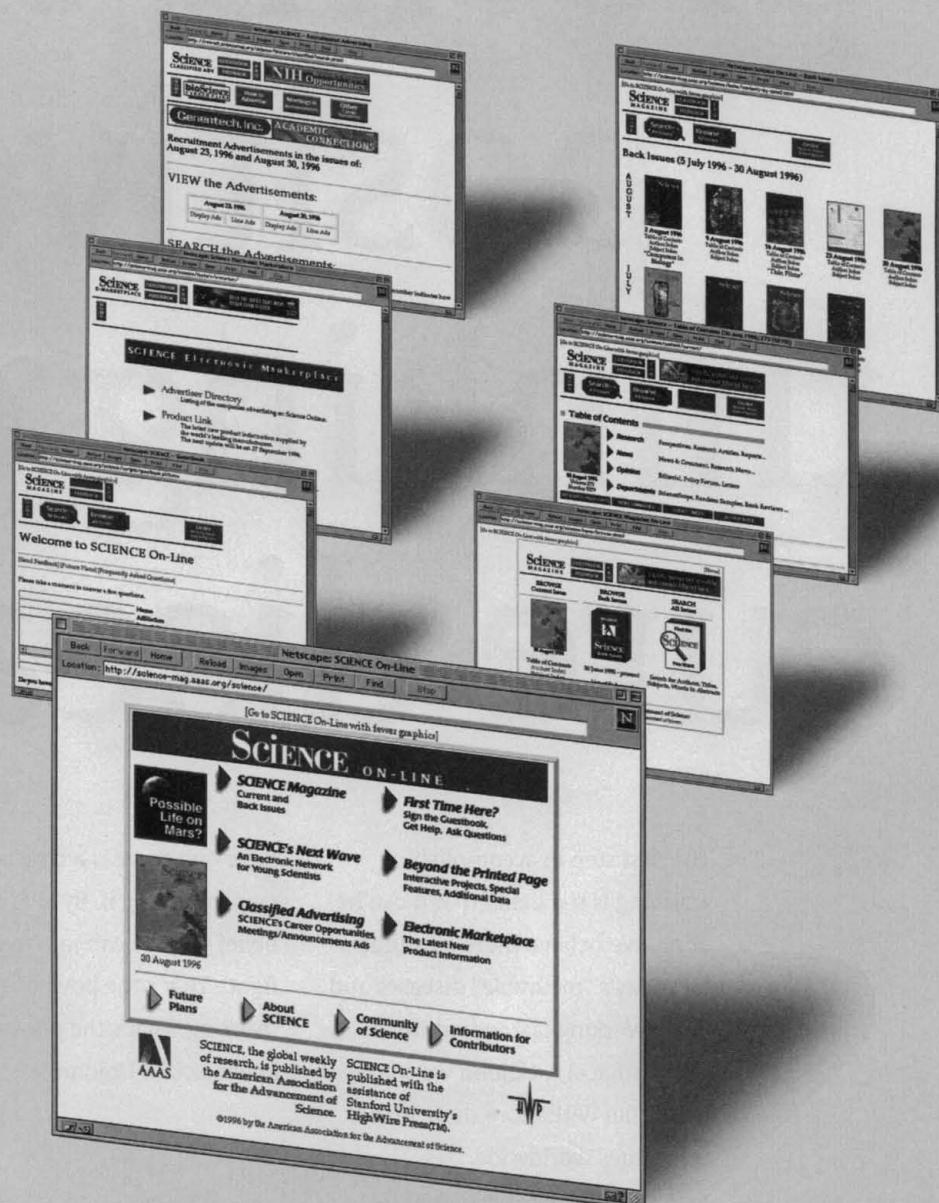
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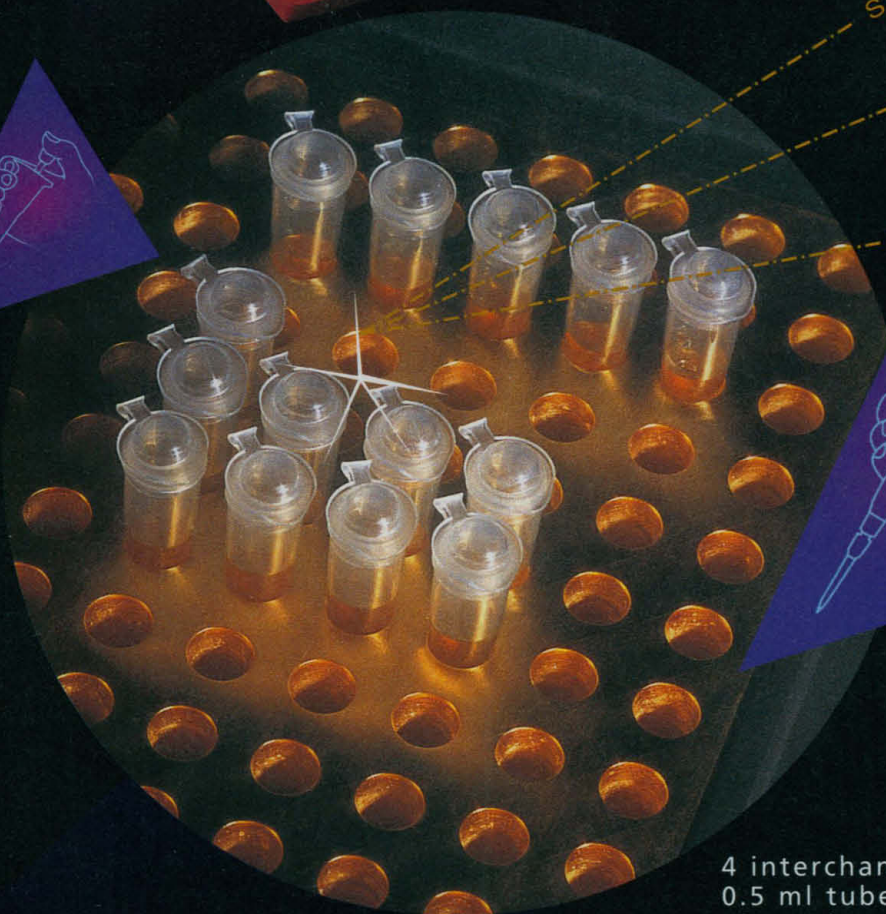
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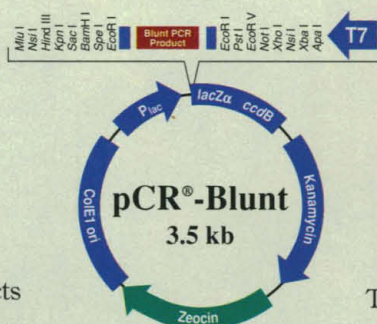
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