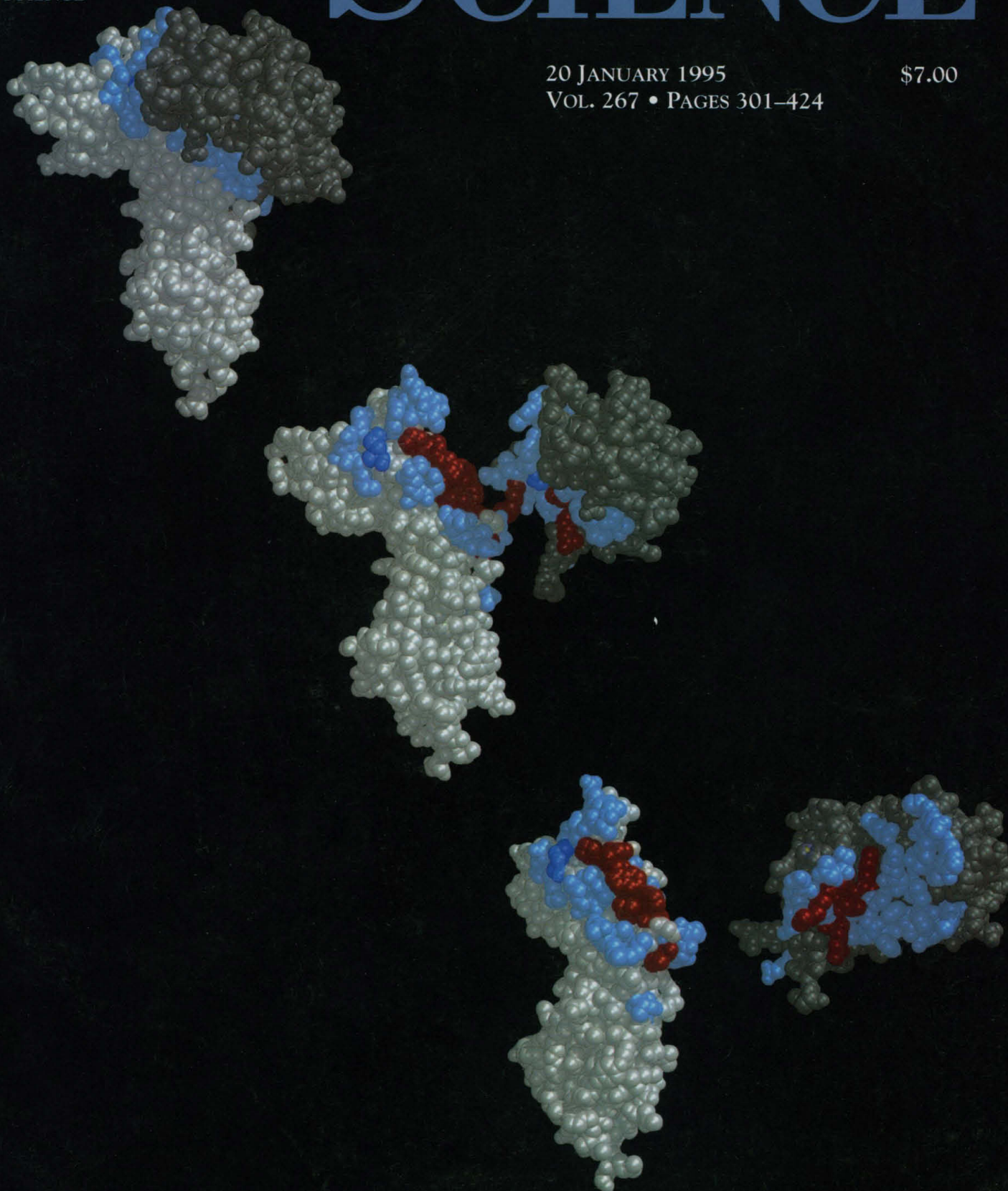


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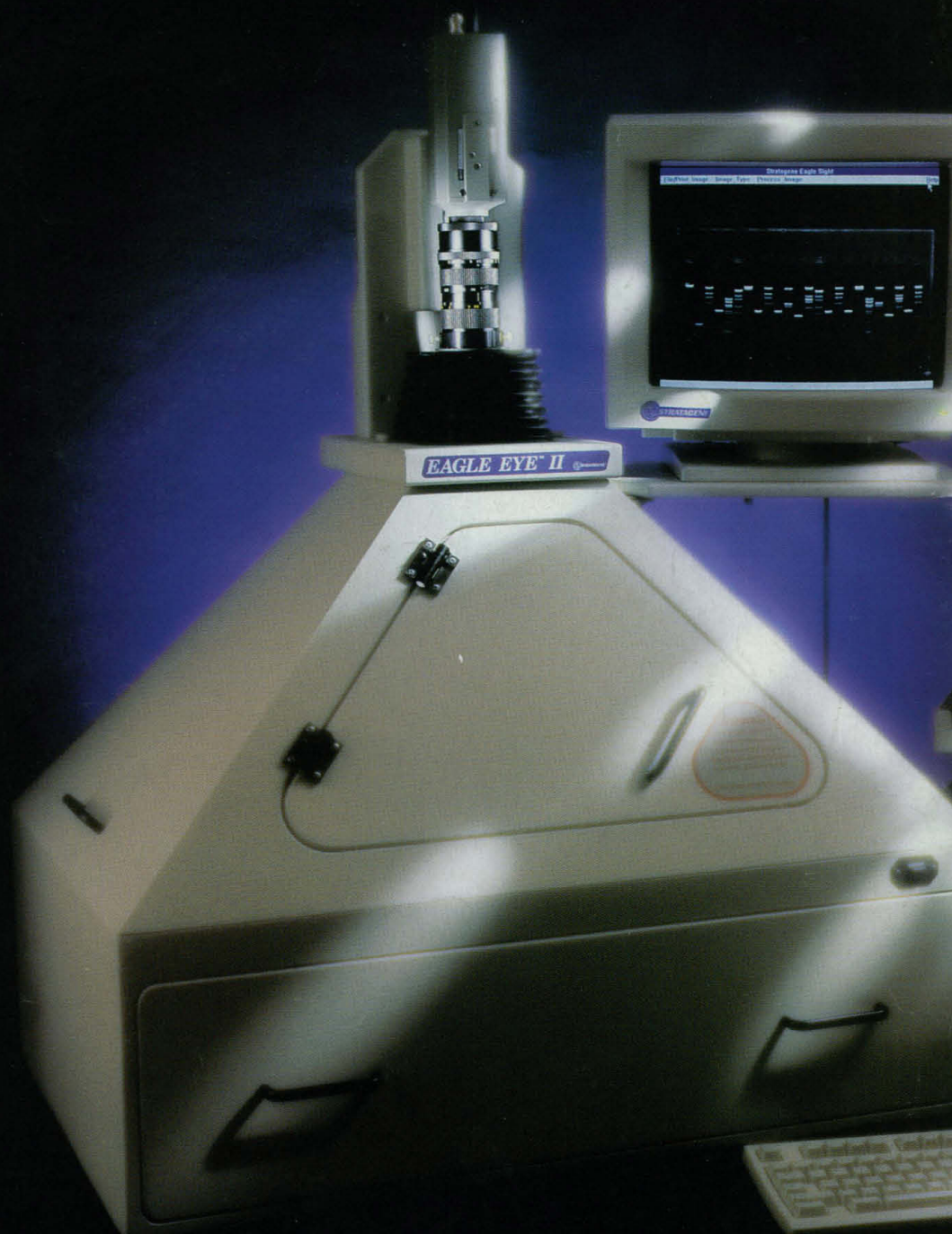
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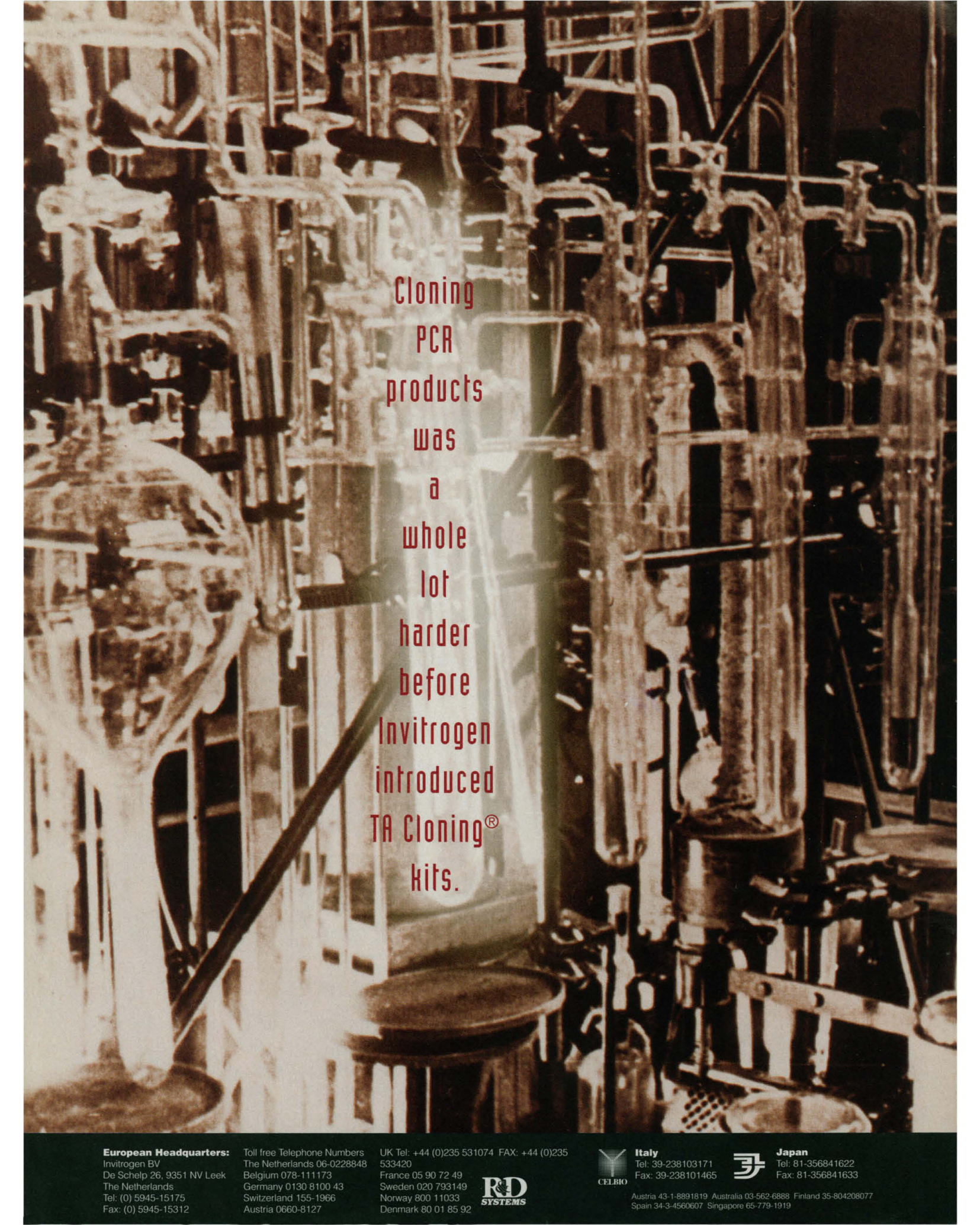
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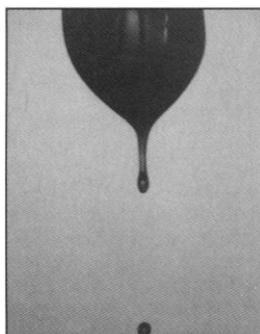
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327

Blowing nanobubbles

NEWS & COMMENT

Malaria Vaccine Raises a Dilemma **320**
Just Sign on the Dotted Line **321**

U.S.—Russian Space Science: **323**
Joint Mission Gets Off to Slow Start

Astronomy: Panel Recommends **324**
“A Little Bit of Bitter Medicine”

Scientists' Champion Leaves Europe's **325**
Top Research Job
France's Firebrand Takes the Reins **325**

Italian Committee Loses Its Balance **326**

Biotech Regulations: Germany Loosens **326**
Some Red Tape

RESEARCH NEWS

Small Spheres Lead to Big Ideas **327**

Biggest Deep Quakes May Need Help **329**

St. Louis Meeting Showcases **330**
“Creature Features”

Mathematical Logic Flushes Out the **332**
Bugs in Chip Designs
Second-Guessing Intel **333**

PERSPECTIVES

Erupting Neighbors—At Last **340**
S. N. Williams

E-Cadherin: A Distant Member of the **342**
Immunoglobulin Superfamily
G. Wagner

ARTICLE

Photoemission Studies of High- T_c **343**
Superconductors: The Superconducting Gap
Z.-X. Shen, W. E. Spicer, D. M. King, D. S.
Dessau, B. O. Wells

REPORTS

Metastable Phases in Polar **351**
Stratospheric Aerosols
L. E. Fox, D. R. Worsnop, M. S. Zahniser,
S. C. Wofsy

Mechanisms of Argon Retention in Clays **355**
Revealed by Laser ^{40}Ar - ^{39}Ar Dating
H. Dong, C. M. Hall, D. R. Peacor, A. N.
Halliday

DEPARTMENTS

THIS WEEK IN SCIENCE **309**

EDITORIAL **311**
The Importance of Intelligence

LETTERS **313**
“The Duesberg Phenomenon”: Duesberg and Other
Voices: P. H. Duesberg; M. Delaney; F. A. Cline Jr.;
N. Birkett; S. A. Plotkin; J. Cohen • Chromosome
Behavior in Mutants Defective in DNA Meth-
ylation: Correction: H. M. Foss, C. J. Roberts,
K. M. Claeys, E. U. Selker • Sequence Correction:
S. W. Morris, M. N. Kirstein, M. B. Valentine,

K. Dittmer, D. N. Shapiro, A. T. Look, D. L.
Saltman

SCIENCESCOPE **319**

RANDOM SAMPLES **334**

BOOK REVIEWS **394**
Cancer from Beef, reviewed by W. P. Browne •
Planetary Systems, S. J. Weidenschilling • *Ecological*
Morphology, J. G. Kingsolver, H. A. Woods, G.
Gilchrist • Vignettes • Books Received

PRODUCTS & MATERIALS **399**

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COVER

The "hot spot" of binding energy in the complex between human growth hormone (dark gray) and the extracellular domain of its receptor (light gray). The amino acid residues that make contact across the interface are colored according to how much energy they contribute to the binding interaction (red, substantial

contribution; light blue, minor or no contribution; dark blue, not tested). Small complementary subsets of contact residues on each protein provide most of the binding energy. See page 383. [Graphics: Tim Clackson, Kerrie Andow, and James A. Wells]



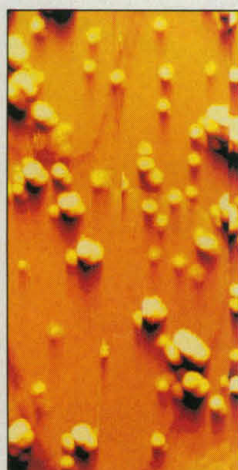
Proximity of Jupiter-Like Planets to Low-Mass Stars 360
A. P. Boss

Synthesis of Linear Acetylenic Carbon: The "sp" Carbon Allotrope 362
R. J. Lagow, J. J. Kampa, H.-C. Wei, S. L. Battle, J. W. Genge, D. A. Laude, C. J. Harper, R. Bau, R. C. Stevens, J. F. Haw, E. Munson

Visualization of Surfactants on Nanostructured Palladium Clusters by a Combination of STM and High-Resolution TEM 367
M. T. Reetz, W. Helbig, S. A. Quaiser, U. Stimming, N. Breuer, R. Vogel

The Structure of Confined Oxygen in Silica Xerogels 369
B. S. Schirato, M. P. Fang, P. E. Sokol, S. Komarneni

Host Range of a Plant Pathogenic Fungus Determined by a Saponin Detoxifying Enzyme 371
P. Bowyer, B. R. Clarke, P. Lunness, M. J. Daniels, A. E. Osbourn



Mechanisms of Rhodopsin Inactivation in Vivo as Revealed by a COOH-Terminal Truncation Mutant 374
J. Chen, C. L. Makino, N. S. Peachey, D. A. Baylor, M. I. Simon

Measurement of Lactose Repressor-Mediated Loop Formation and Breakdown in Single DNA Molecules 378
L. Finzi and J. Gelles

Activation of RET as a Dominant Transforming Gene by Germline Mutations of MEN2A and MEN2B 381
M. Santoro, F. Carlomagno, A. Romano, D. P. Bottaro, N. A. Dathan, M. Grieco, A. Fusco, G. Vecchio, B. Maťošková, M. H. Kraus, P. P. Di Fiore

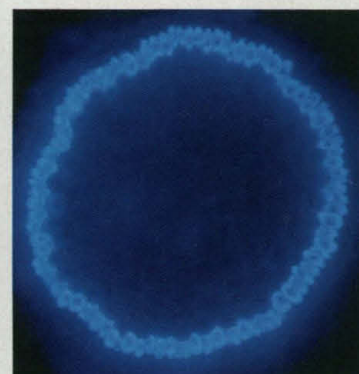
A Hot Spot of Binding Energy in a Hormone-Receptor Interface 383
T. Clackson and J. A. Wells

Solution Structure of the Epithelial Cadherin Domain Responsible for Selective Cell Adhesion 386
M. Overduin, T. S. Harvey, S. Bagby, K. I. Tong, P. Yau, M. Takeichi, M. Ikura

Transcription Factor ATF2 Regulation by the JNK Signal Transduction Pathway 389
S. Gupta, D. Campbell, B. Dérjard, R. J. Davis

Correction

The title of the report by M. Travisano *et al.* was incorrect in the 6 January Table of Contents on page 7. It should have been "Experimental tests of the roles of adaptation, chance, and history in evolution." The report appeared on page 87.



371
Detoxification

367
Seeing surfactants

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Dating clays

A long-standing geological problem has been how to obtain credible dates for the time of diagenesis of ancient sediments. Accurate dates would provide information on hydrocarbon maturation, the history of ancient basins, and the processes of diagenesis itself. Dong *et al.* (p. 355) studied whether useful ages might be obtained from the Ar-Ar method, for which a seemingly intractable difficulty is that laboratory irradiation releases ^{39}Ar from clays. Their results, however, imply that loss is from low retentivity sites and that it parallels the natural loss of radiogenic ^{40}Ar , so that the measured isotopic ratio can be predictably interpreted.

Far away or close?

Searches for planets outside our own solar system have of necessity focused on nearby stars, the majority of which are smaller than the sun. By modeling both hydrodynamics and radiation effects in protoplanetary systems, Boss (p. 360) argues that Jupiter-mass planets are likely to form at orbital radii of a few astronomical units, as in the solar system, even when the mass of the central star is as little as one-tenth the mass of the sun. Such a planet would more easily be found by looking for a wobble in the spatial position of the star around which it orbits than by looking for a periodic Doppler wobble in the star's velocity.

Radical stabilization

In most carbon allotropes, the number of covalent bonds formed by each carbon atom is either four (as in diamond) or three (as in graphite and fullerenes). Lagow *et al.* (p. 362) de-

Superconducting symmetries

Condensed matter physicists agree that cuprate superconductors have unusually high transition temperatures and that the electrons are paired, but the nature of the pairing mechanism and the details of the transport remain controversial. One way to probe the electronic structure of these materials is through photoemission, in which the surface of a superconductor is bombarded with energetic photons to knock out electrons whose energies are recorded. Shen *et al.* (p. 343) present a critical review of recent photoemission studies with a particular emphasis on the implications for theory. The weight of the evidence seems to favor the so-called *d* wave pairing state, but as the authors observe, the debate is not over.

scribe the synthesis of a carbon allotrope in which the carbon atoms are covalently bound to just two other carbon atoms. Such a form would normally be unstable, as the ends of these acetylenic chains are reactive free radicals. Synthetic conditions that would usually generate fullerenes from graphite produce this novel linear allotrope when species such as nitrile groups are present to stabilize the reactive ends of the carbon chains. Unlike fullerene soot, this material readily dissolves in common organic solvents.

Oat attack

Plants have evolved a variety of mechanisms to defend against disease, including the accumulation of saponins toxic to the invading pathogen. Such a pre-established defense is responsible for the resistance of oat plants to attack by certain fungi: A saponin produced in oat roots is toxic to fungi that do not have their own counterattack. However, as Bowyer *et al.* (p. 371) show, fungi that encode the appropriate saponin-degrading enzyme are able to inactivate the plant's defense and infect the oat roots. Wheat, which does not produce saponins, is susceptible to infection by both types of fungi. The presence or

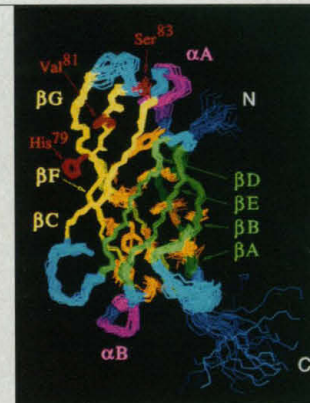
absence of the detoxifying capability in the fungus then determines the range of plants it can invade.

Return of RET

To date, the causal mutations in inherited human cancers have been shown to function by inactivating genes that suppress cancer development (tumor suppressor genes). Santoro *et al.* (p. 381) demonstrate that inherited human cancers can also be caused by mutations that convert normal genes to dominant transforming genes. Mutant alleles of the *RET* receptor tyrosine kinase gene, found previously in patients with multiple endocrine neoplasia types 2A and 2B (MEN2A and MEN2B), were found to transform cultured fibroblasts through constitutive activation of the kinase. The MEN2A mutation resulted in aberrant dimerization of the kinase, and the MEN2B mutation altered its catalytic properties.

To bind or not to bind

Cell adhesion molecules (CAMs) are membrane proteins that control which cells coalesce to form tissues and which are cut adrift. One family of CAMs is the cadherins, so-



called because they require calcium to function. Overduin *et al.* (p. 386; see also the Perspective by Wagner, p. 342) present the structure of a repeating domain of the cadherin found in epithelial cells. The structure reveals the adhesive surface that a cadherin molecule uses to bind to a similar molecule on another cell; calcium appears to rigidify the domains and to protect them from proteolytic attack. Tumor cells that have lost their complement of epithelial cadherin are known to have an increased potential for invasion.

New light on JNK

Activating transcription factor-2 (ATF2) participates in regulation of several genes including those encoding transforming growth factor- β 2, interferon β , and E-selectin. Activation of transcription by ATF2 is enhanced by its interaction with the tumor suppressor gene product Rb or with the adenoviral oncoprotein E1A. Gupta *et al.* (p. 389) present evidence that ATF2 is phosphorylated and activated by the protein kinase JNK (c-Jun NH $_2$ -terminal protein kinase). JNK is activated in response to pro-inflammatory cytokines or ultraviolet irradiation of cells, suggesting that activation of ATF2 by JNK may contribute to the increased transcription of particular genes in response to such stimuli.

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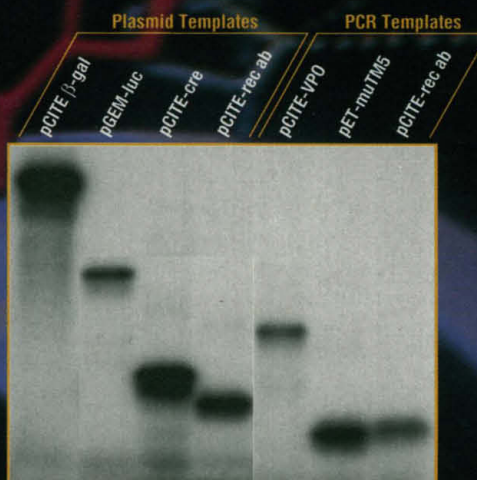
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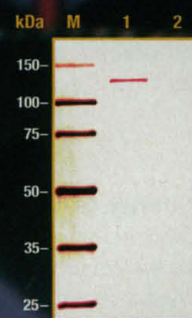
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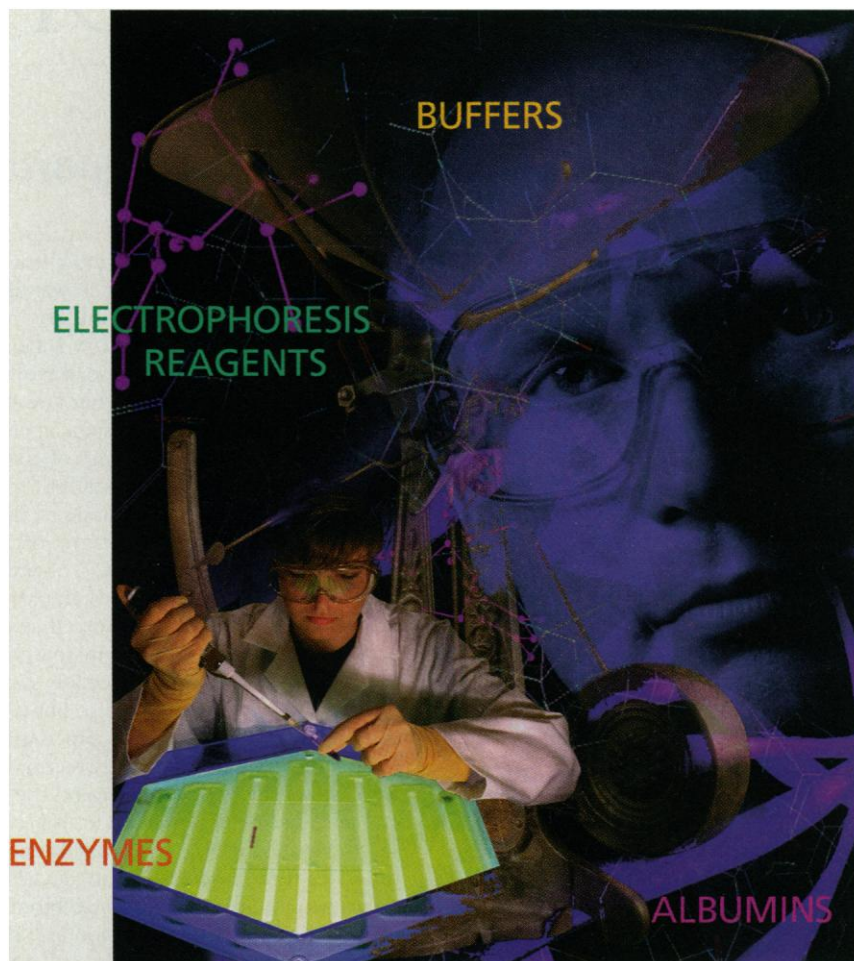
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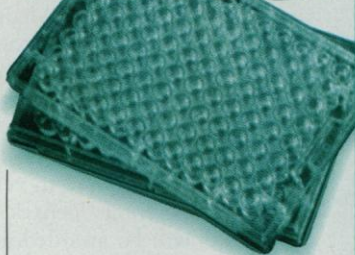
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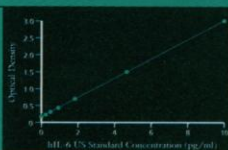
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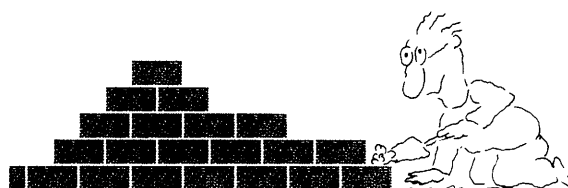
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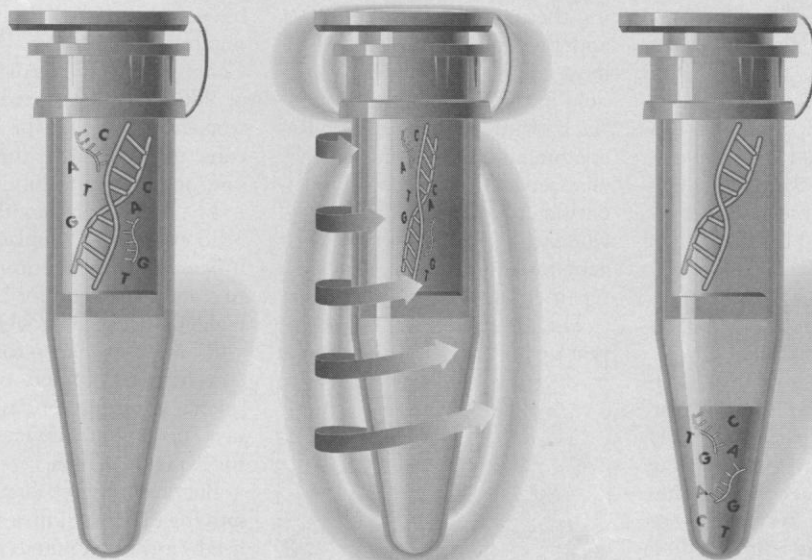
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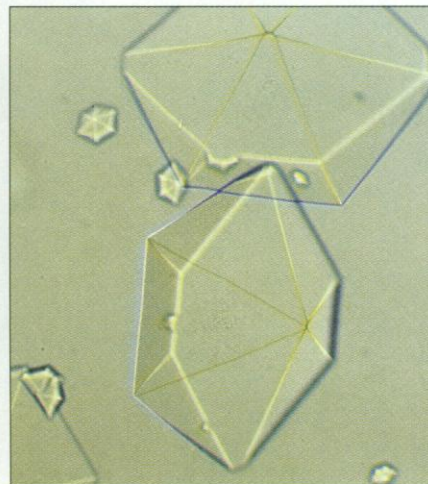
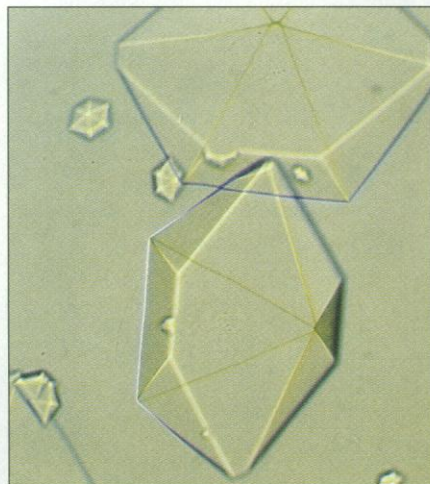
Pictured: Turnip yellow mosaic virus crystal. LWD 10x objective. The 3D perspective provides a clear understanding of the crystal structure that cannot be obtained from a single, 2D photo. (Dr. Yuri Kuznetsov, UC Riverside.)



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