

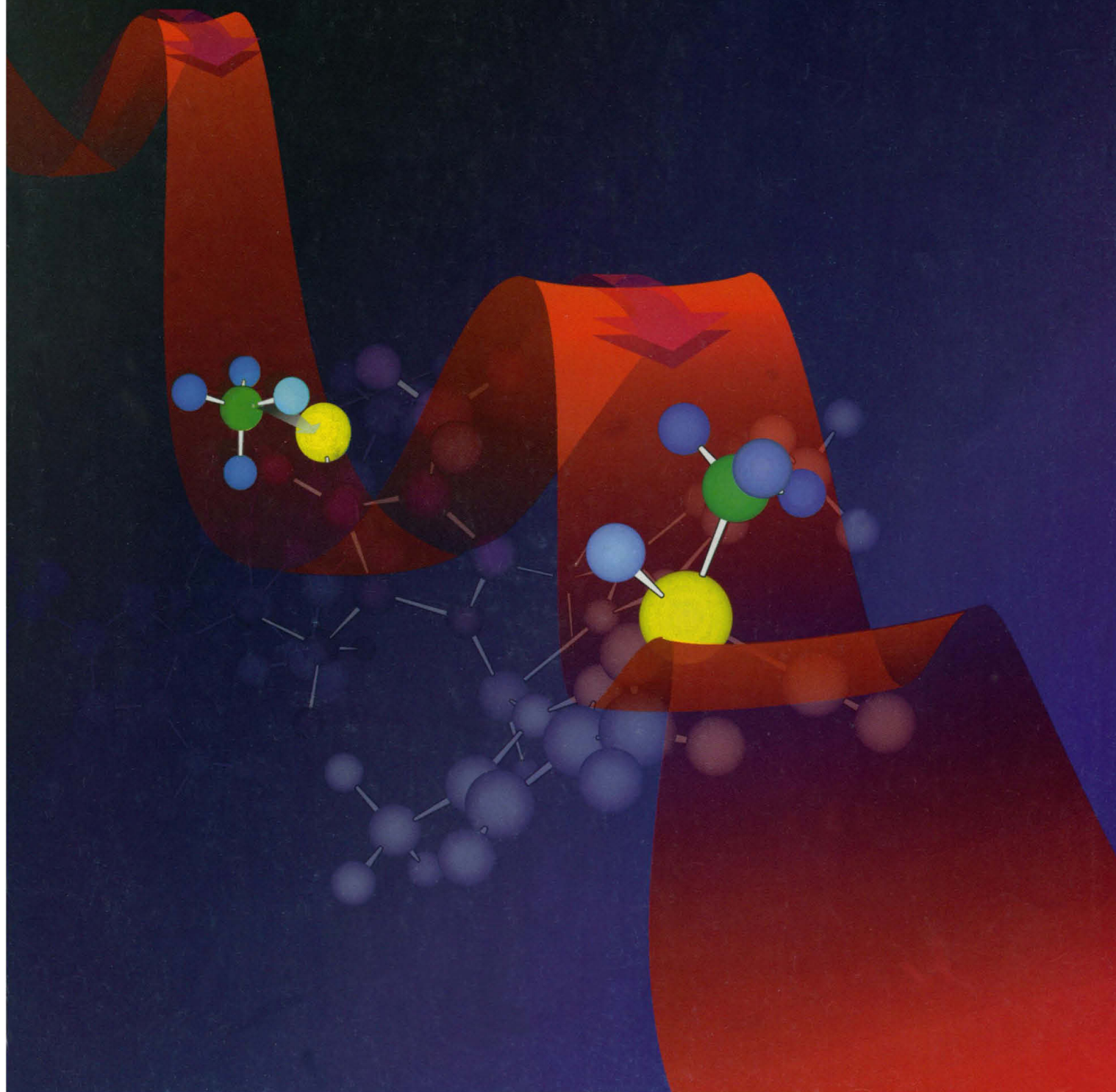


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1. "The I.M.A.G.E. Consortium: An Integrated Molecular Analysis of Genomes and their Expression", Lennon, G.G., Auffray, C., Polymeropoulos, M., and Soares, M. B. [1995] Genomics.

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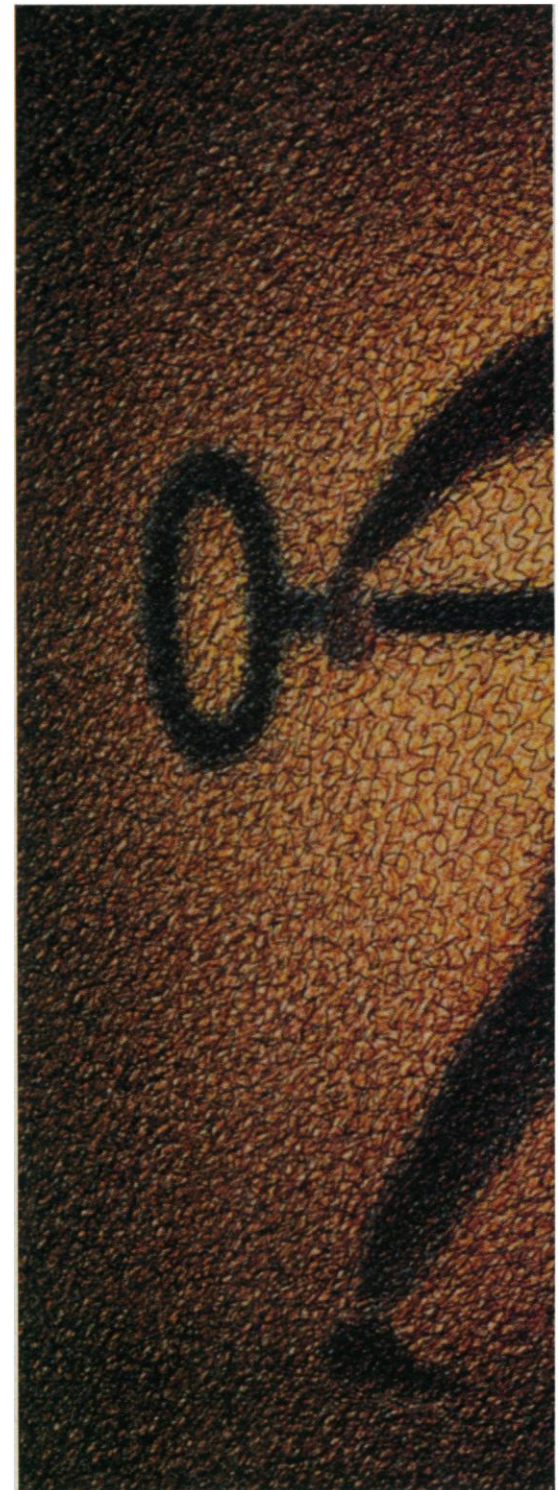
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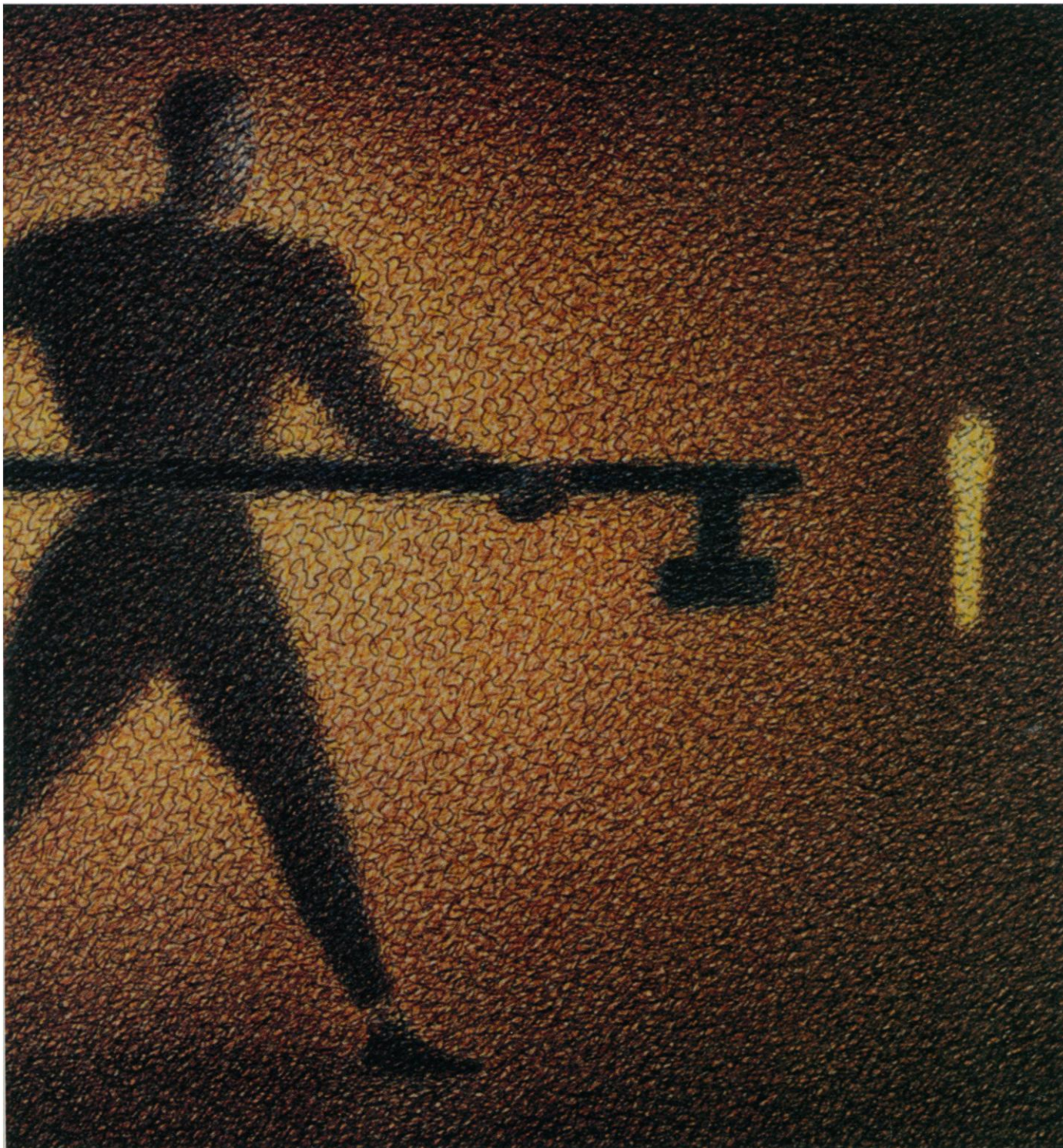
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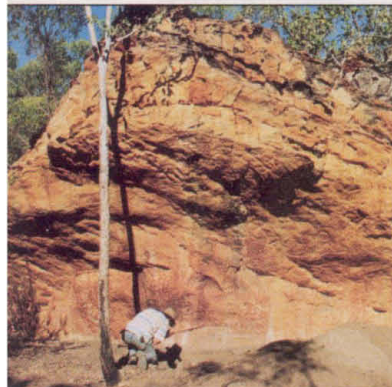


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214 & 245

Prusiner, prions,
and the prize



220

Old dates in a new light

NEWS & COMMENT

- Need a Reagent? Just Sign Here ... 212
Devilish Details 213
- Prusiner Recognized for Once-Heretical
Prion Theory 214
- Europe Set to Try Again With Ariane 5 215
- Mars Has Magnetic Spots 215
- Panels Lead the Way on the Road
to Kyoto Conference 216
- AIDS Research Chief Bows Out 218
- Fabulous Sum for a Fearsome Fossil 218
- Fossil Hunters Seek Ways to Bring
Their Field Alive 219

RESEARCH NEWS

- Doubts Over Spectacular Dates 220
- Probing a Star's Heart of Crystal 222
- How the Malaria Parasite Manipulates
Its Hosts 223
- Fractions to Make an Egyptian Scribe
Blanch 224
- Fishing for Answers to Whirling Disease 225

- Theorists Nix Distant Antimatter Galaxies 226

PERSPECTIVES

- Io and the Plasma Torus 237
M. A. McGrath
- Reuse of B Lymphocytes in Germinal
Centers 238
Y.-J. Liu
- Good Pain, Bad Pain 239
M. J. Iadarola and R. M. Caudle
- Do Continents Part Passively,
or Do They Need a Shove? 240
R. W. Carlson

POLICY FORUM

- Preserving Biodiversity in Korea's
Demilitarized Zone 242
K. C. Kim

ARTICLE

- Prion Diseases and the BSE Crisis 245
S. B. Prusiner

REPORTS

- Conductance of a Molecular Junction 252
M. A. Reed, C. Zhou, C. J. Muller, T. P. Burgin,
J. M. Tour

DEPARTMENTS

- THIS WEEK IN SCIENCE** 197
- EDITORIAL** 203
- Tobacco Control: The Dramatic Choice
W. D. Novelli
- LETTERS** 205
- Man and His Dog: N. E. Federoff and R. M. Nowak; J.
P. Scott, O. S. Elliot, B. E. Ginsburg; *Response*: C. Vilà,
J. Maldonado, I. R. Amorim, R. K. Wayne, K. A.
Crandall, R. L. Honeycutt • Mass Balance of North
Greenland: N. Reeh, H. H. Thomsen, O. B. Olesen,
W. Starzer; *Response*: E. Rignot, S. P. Gogineni, W. B.

Krabill, S. Ekholm • Squirming over "Grant Writing"; W. S. Wooster; Eds.

SCIENCESCOPE 211

RANDOM SAMPLES 227

BOOK REVIEWS 235

A Commotion in the Blood, reviewed by I. Löwy •
Natural Hybridization and Evolution, D. A. Levin •
Browsings • Vignettes

TECH.SIGHT: PRODUCTS 309

GORDON RESEARCH CONFERENCES 312

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COVER

The reaction intermediates of the proposed C-H bond activation mechanism of $\text{Tp}^*\text{Rh}(\text{CO})_2$ ($\text{Tp}^* = \text{HB-Pz}_3^*$, $\text{Pz}^* = 3,5\text{-dimethylpyrazolyl}$) in alkanes. The first energy minimum (back) shows the metal-alkane complex poised for bond cleavage (note blue arrow). Carbon, hydrogen,

and rhodium are green, blue, and yellow, respectively. The second minimum shows the activated alkane after dechelation of the pyrazolyl ligand (monochrome atoms). The product (not shown) is stabilized by rechelation of the ligand. See page 260. [Graphics: Haw Yang]



Depth Extent of the Lau Back-Arc Spreading Center and Its Relation to Subduction Processes

D. Zhao, Y. Xu, D. A. Wiens, L. Dorman, J. Hildebrand, S. Webb

Microscopic Molecular Diffusion Enhanced by Adsorbate Interactions

B. G. Briner, M. Doering, H.-P. Rust, A. M. Bradshaw

The Mechanism of a C-H Bond Activation Reaction in Room-Temperature Alkane Solution

S. E. Bromberg, H. Yang, M. C. Asplund, T. Lian, B. K. McNamara, K. T. Kotz, J. S. Yeston, M. Wilkens, H. Frei, R. G. Bergman, C. B. Harris

Magnetic Field Alignment of Ordered Silicate-Surfactant Composites and Mesoporous Silica

S. H. Tolbert, A. Firouzi, G. D. Stucky, B. F. Chmelka

The Response of Jupiter's Magnetosphere to an Outburst on Io

M. E. Brown and A. H. Bouchez

Organics and Other Molecules in the Surfaces of Callisto and Ganymede

T. B. McCord, R. W. Carlson, W. D. Smythe, G. B. Hansen, R. N. Clark, C. A. Hibbitts, F. P. Fanale, J. C. Granahan, M. Segura, D. L. Matson, T. V. Johnson, P. D. Martin

Inhibition of Hyperalgesia by Ablation of Lamina I Spinal Neurons Expressing the Substance P Receptor

P. W. Mantyh, S. D. Rogers, P. Honore, B. J. Allen, J. R. Ghilardi, J. Li, R. S. Daughters, D. A. Lappi, R. G. Wiley, D. A. Simone

Preserved Acute Pain and Reduced Neuropathic Pain in Mice Lacking PKC γ

A. B. Malmberg, C. Chen, S. Tonegawa, A. I. Basbaum

Structural Requirements for Glycolipid Antigen Recognition by CD1b-Restricted T Cells

D. B. Moody, B. B. Reinhold, M. R. Guy, E. M. Beckman, D. E. Frederique, S. T. Furlong, S. Ye, V. N. Reinhold, P. A. Sieling, R. L. Modlin, G. S. Besra, S. A. Porcelli

Structure-Based Analysis of Catalysis and Substrate Definition in the HIT Protein Family

C. D. Lima, M. G. Klein, W. A. Hendrickson

Angiogenic and HIV-Inhibitory Functions of KSHV-Encoded Chemokines

C. Boshoff, Y. Endo, P. D. Collins, Y. Takeuchi, J. D. Reeves, V. L. Schweickart, M. A. Siani, T. Sasaki, T. J. Williams, P. W. Gray, P. S. Moore, Y. Chang, R. A. Weiss

Caspase-3-Generated Fragment of Gelsolin: Effector of Morphological Change in Apoptosis

S. Kothakota, T. Azuma, C. Reinhard, A. Klippel, J. Tang, K. Chu, T. J. McGarry, M. W. Kirschner, K. Koths, D. J. Kwiatkowski, L. T. Williams

V(D)J Recombination in Mature B Cells: A Mechanism for Altering Antibody Responses

F. Papavasiliou, R. Casellas, H. Suh, X.-F. Qin, E. Besmer, R. Pelanda, D. Nemazee, K. Rajewsky, M. C. Nussenzweig

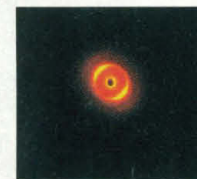
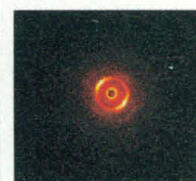
V(D)J Recombinase Activity in a Subset of Germinal Center B Lymphocytes

S. Han, S. R. Dillon, B. Zheng, M. Shimoda, M. S. Schlissel, G. Kelsoe

TECHNICAL COMMENTS

BMP Expression in Duck Interdigital Webbing: A Reanalysis

E. Laufer, S. Pizette, H. Zou, O. E. Orozco, L. Niswander

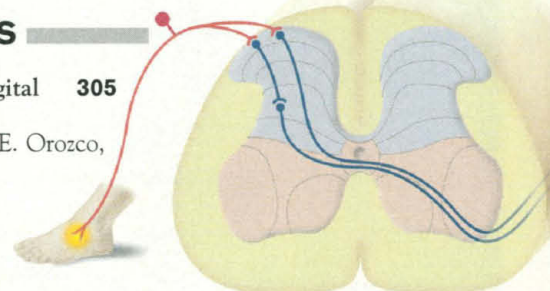


264

Magnetic alignment of mesoporous films

239, 275 & 279

Cutting the pain



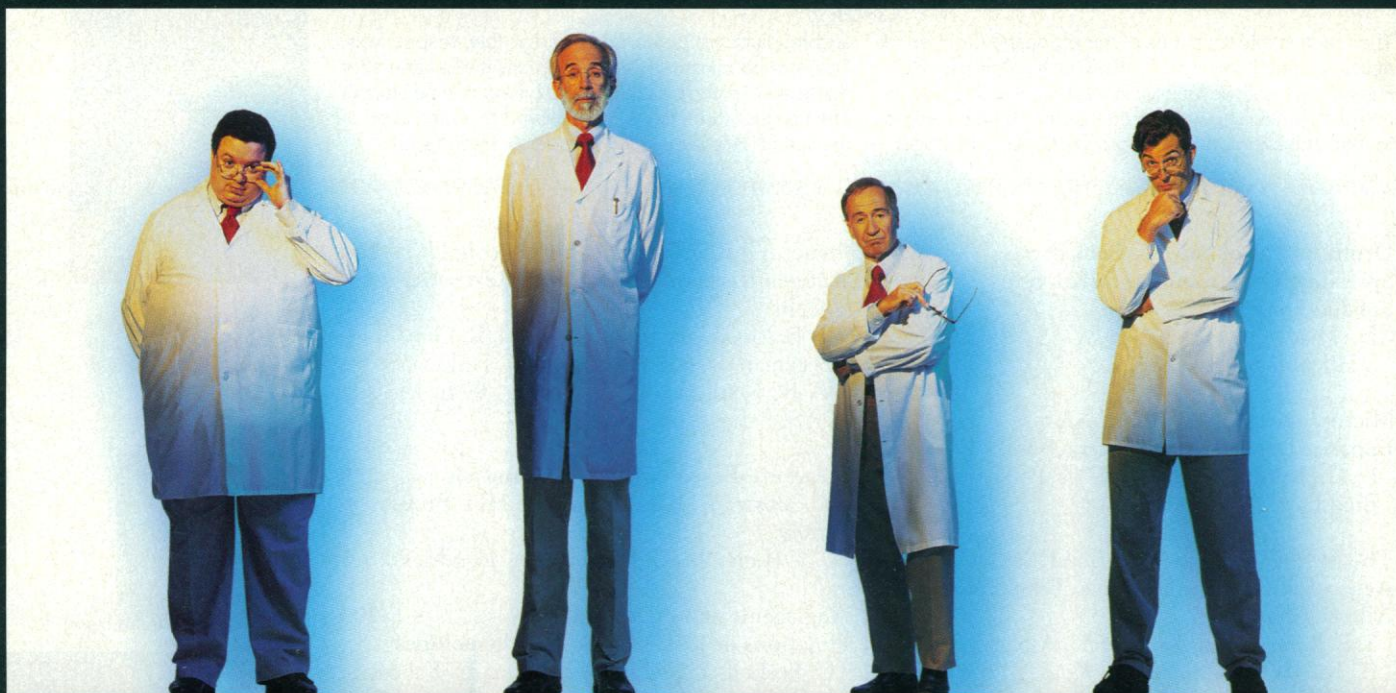
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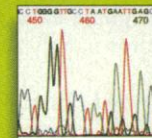


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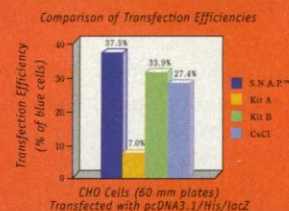
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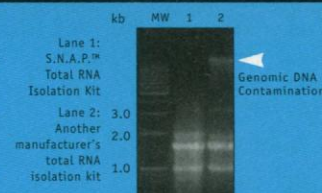
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THIS WEEK IN SCIENCE

edited by PHIL SZUROMI

Faster together

Diffusion of atoms and molecules on surfaces is important for catalytic processes. Although strongly bound systems, such as metals on metal surfaces, have been investigated for some time, the study of weakly bound systems, such as carbon monoxide on metals, has been more difficult, as measurement can more easily affect the molecular motion. Briner *et al.* (p. 257) performed scanning tunneling microscopy of carbon monoxide on copper surfaces and found that dimers and longer chains move faster, through single molecule jumps, than monomers; this difference is attributed to a reduction of vibrational entropy in the chains rather than to a difference in activation energy.

Pore alignment

Mesoporous materials, with typical pore sizes of a few nanometers, are complementary to zeolites, which have smaller pores and thus can only take up molecules up to a certain size. However, large-scale applications of mesoporous materials often require alignment of the pores over macroscopic length scales, which has been difficult to achieve. Tolbert *et al.* (p. 264) have devised a strategy whereby the precursor material, a liquid crystal, is aligned in a magnetic field; the alignment is preserved during the processing stages, resulting in a material with macroscopically aligned mesopores.

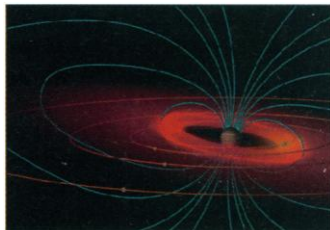
Io-Jupiter feedback

Io, the most volcanically active body known in the solar system and Jupiter's nearest large satellite, is intimately coupled to Jupiter's magnetosphere. Brown and Bouchez (p. 268; see the Perspective by McGrath, p. 237) observed sulfur ions (S^+) in the Io plasma torus and sodium atoms in the neutral plasma cloud

Recognized by their caps

T cells recognize proteins and peptides through major histocompatibility complex (MHC) proteins, which bind peptides and "present" them to antigen receptors on T cells. However, T cells see more than just peptides—they can be activated by binding to certain lipids and glycolipids, which are presented by proteins that are distant cousins of those encoded in the MHC region. Moody *et al.* (p. 283) identified a glycolipid antigen from mycobacteria and did a detailed analysis of which parts of the glycolipid were critical for recognition. Recognition depended mainly on hydrophilic cap of the glycolipids; naturally occurring substitutions of the hydrophobic tail were well tolerated. This result is consistent with the recently solved structure of CD1—both sets of work support the concept that the deep CD1 binding groove is designed to accept a hydrophobic tail, which allows the carbohydrate cap to stick out and become a target for T cells.

associated with the jovian magnetosphere for 6 months. During this time, a volcanic eruption on Io created a large plume that increased the Na content of the neutral cloud, followed by a delayed increase in the S^+ content



of the Io torus. These excess S^+ ions dissipated nonlinearly, which suggests that the jovian magnetosphere stabilizes itself with a nonlinear feedback mechanism against the sporadic volcanic outbursts of Io.

Trapped organics on Ganymede and Callisto

Jupiter's largest satellites, Ganymede and Callisto, show evidence for water ice on their surfaces that may have been trapped early in the evolution of our solar system. McCord *et al.* (p. 271), using near-infrared spectra from the Galileo orbiter, found evidence for CO_2 , SO_2 , and some organics trapped within the water ice and hydrated minerals on the surfaces. Such components could be derived from a variety of sources, including interstellar

ices, the jovian magnetosphere, and meteorites. Fitting the spectra with these sources will help define how and where carbon, hydrogen, and oxygen were distributed in the early solar system.

Pain relief

Prolonged pain can be extremely debilitating, but sensitivity to painful stimuli is critical for the avoidance of serious injury. Two reports look at the mechanisms that generate acute pain but that allow the avoidance of long-term pain, or extreme sensitivity, to what should be nonpainful stimuli (see the Perspective by Iadarola, p. 239). When noxious stimuli are applied, a peptide, known as substance P (SP), is released and binds to neurons possessing the SP receptor. The role of these neurons in acute and chronic pain perception has been unclear; Mantyh *et al.* (p. 275) now show that these neurons can be specifically removed by applying SP coupled to a toxin. The removal of these neurons did not change the animals' responses to acute pain but made them far less sensitive to chronic pain. Peripheral nerve injury can cause an increased sensitivity to pain (neuropathic pain). Malmberg *et al.* (p. 279) found that this pain state requires the expression of a brain-specific form of protein kinase C (PKC γ).

Mice genetically engineered to lack the PKC γ protein had a normal sensitivity to acute pain but were almost totally lacking in neuropathic pain after injury.

Viral infection and angiogenesis

Continued analysis of proteins encoded by the Kaposi's sarcoma virus HHV-8 are providing insights into pathogenesis and potential as therapeutic agents against HIV. Boshoff *et al.* (p. 290) found that two viral chemokine-like proteins, vMIP-I and -II, promoted the formation of blood vessels, which may be important in the development of Kaposi's sarcoma. The vMIP-II can activate and attract certain white blood cells (eosinophils), primarily through the CCR3 receptor. HIV infection through this receptor is also the most sensitive to inhibition by vMIP-II.

Unraveling actin during cell death

When a cell gets a signal to initiate the programmed cell death cascade, a series of proteases called caspases are activated by cleavage of one another. Other proteins can also serve as substrates for caspase cleavage, and Kothakota *et al.* (p. 294) show that gelsolin, a protein that severs actin chains in a calcium-dependent fashion, is cut during apoptosis. This cleavage liberates an activated gelsolin fragment that depolymerizes actin into monomers in an unregulated fashion and which is responsible for the morphologic changes associated with apoptosis. Cells that had no gelsolin had delayed apoptosis and only limited morphologic changes. Thus, gelsolin seems to potentiate the cell death process, a role consistent with its recently noted down-regulation in many human tumors.

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DNA Engine & Tetrad Set New Standards for Thermal Cyclers

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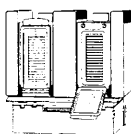
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WATERTOWN, Mass. — In late 1994, MJ RESEARCH introduced a revolutionary new line of thermal cyclers for PCR* and cycle sequencing. Called the “DNA Engine™” line, this new design builds upon experience the company had

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

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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



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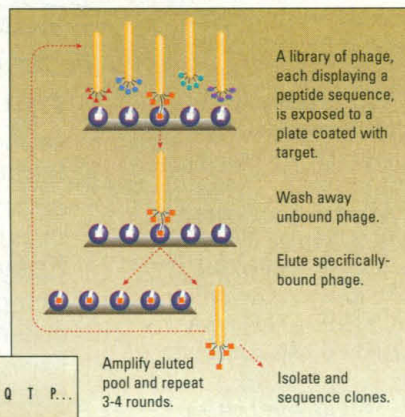
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β -endorphin:
Y G G F M T S E K Q T P...

3rd round sequences:

Y	G	G	F	M	T	T	P	S	H	V	P
Y	G	G	F	M	T	T	P	S	H	V	P
Y	G	G	F	I	S	Q	T	Q	H	Y	S
Y	G	G	F	I	S	Q	T	Q	H	Y	S
Y	G	G	F	G	N	S	L	V	M	P	V
Y	G	G	F	S	M	P	F	L	P	A	L
Y	G	A	F	D	V	T	T	G	V	T	S
Y	G	V	F	N	P	H	Y	L	P	S	L
A	P	S	T	D	K	Q	A	T	M	P	L
A	S	V	A	V	S	S	R	Q	D	A	A



Epitope mapping of the anti- β -endorphin monoclonal antibody 3E-7 with the Ph.D.-12 Library. Sequences selected after three rounds of biopanning clearly show that the epitope for this antibody spans the first seven residues of β -endorphin (boxed), with the bulk of the binding energy contributed by the first 4 residues (YGGF).

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for short run times

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TaKaRa Combines to Provide Premium PCR Performance for DNA Templates Extracted from Histologic Sections.

DEXPAT™ & ExTaq™

TaKaRa DEXPAT™
(9091; 100 extractions)

Reagent designed for One-Step Extraction of DNA from histologic sections.

Diverse Preparations of either frozen tissues or paraffin-embedded tissues can be subjected to simplified DNA extraction.

Direct DNA Recovery in a single tube eliminates cumbersome steps of paraffin removal, organic solvent extraction and enzymatic digestion.

Dramatic Time Reduction for PCR-ready DNA preparation in 25 minutes from the 2-3 days required for conventional extractions.

DNA of the Highest Quality obtained through a simple 10 minute extraction technique which eliminates cross- and extraneous- contamination.

Differential Extraction of DNA from a tissue section on a histology slide is possible to increase the sensitivity and accuracy in detection of abnormalities.

TaKaRa ExTaq™*
(RR001A: 250 U, RR001B: 250 U x4, RR001C: 250 U x12)

Proven DNA Polymerase with Greater Processivity and Higher Fidelity.
Available in three sizes, each including 10x *ExTaq* Buffer and dNTP Mix.

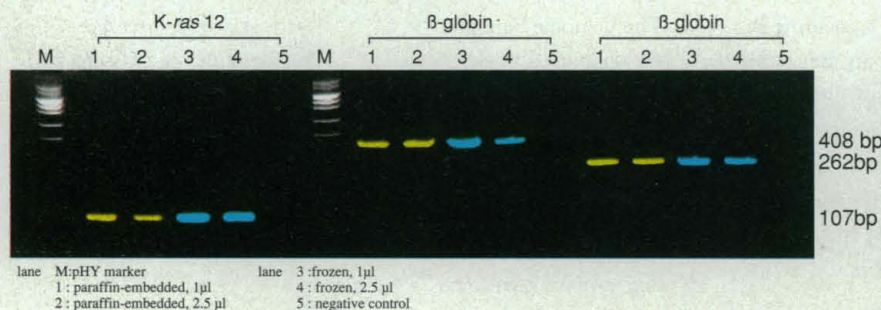
*U.S. Patent 5,436,149 for LA Technology Owned by TAKARA SHUZO CO., LTD

DNA Amplification from Histologic Sections

With DEXPAT™, DNAs were extracted as PCR ready templates which were then amplified with *ExTaq* to result in excellent PCR amplification with greater yield and longer extension than the conventional method.

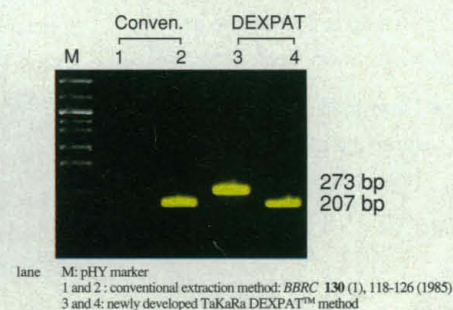
Comparison of Section Preparations

for K-ras 12 (107 bp) and β -globin (408 bp and 262 bp) Amplification from Human Tonsil: 1 μ l or 2.5 μ l extracts used for 25 μ l PCR



Comparison of Extraction Methods

for p53 exon 5 (273 bp) and exon 6 (207 bp) Amplification from Paraffin-embedded Tissues of Colon Cancer After a 10-year Preservation



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Purchase of the *TaKaRa ExTaq* is accompanied by a limited license to use them in the Polymerase Chain Reaction (PCR) process for research in conjunction with a thermal cycler whose use in the automated performance of the PCR process is covered by the up-front license fee, either by payment to Perkin-Elmer or as purchase, i.e., an authorized thermal cycler.

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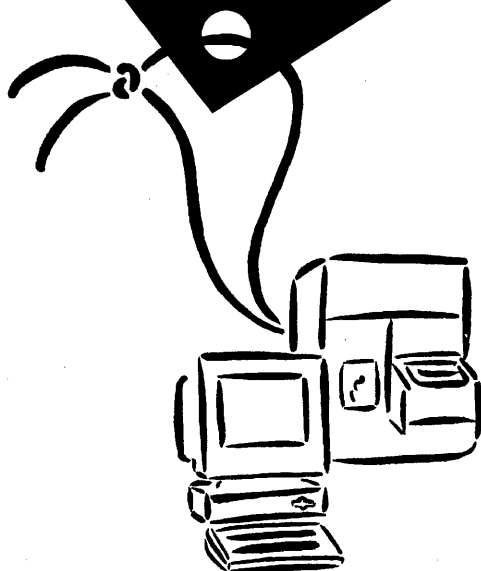
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Applicants should apply directly to the appropriate professional society. It is acceptable to apply to more than one society. Stipends, application procedures, timetables, and deadlines vary by society. Minorities and persons with disabilities are encouraged to apply. Further information about the program and a list of the participating societies, with mailing addresses and contact people, is available from:



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