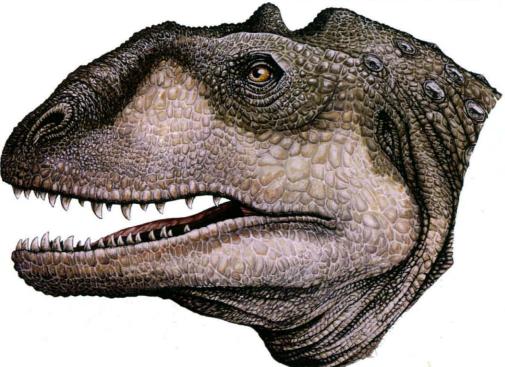


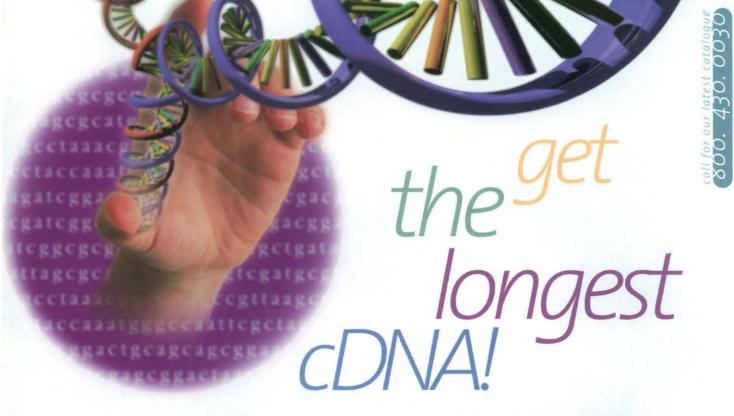
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No. 65 on Readers' Service

ISSN 0036-8075 15 MAY 1998 Volume 280 Number 5366

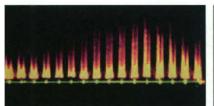


NEWS & COMMENT On the Trail of Supercharged Hydrogen

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1009



994 All the genome, all at once



1007 & 1039 A quicker catastrophe



1034 & 1052 Taking a spin in the ocean

Hubris and the Human Genome Picking Up the Pace of Sequencing	994 995
ricking op the race of bequencing	555
The Power of the Front Page of The New York Times	996
The Roadblocks to Angiogenesis Blockers	997
Mars 2001 Mission Hits the Wall	998
State Department Sees S&T Weaknesses	998
German Biotechs Form Gene Venture	999
Earthquake Prediction: Japan Urged to Drop Short-Term Goal	1000
Allen Roses: From 'Street Fighter' to Corporate Insider	1001
The Alzheimer's Gene Puzzle	1002
A Clash Over Testing for Alzheimer's Disease	1004
RESEARCH NEWS	1719
Probing the Biology of Emotion	1005
Unmasking the Emotional Unconscious	1006
Biggest Extinction Looks Catastrophic 🛛 🖊	1007
	1008

	Construction of the local division of the lo	On the frait of Supercharged Hydrogen	1005
	994 995	New Probes Open Windows on Gene Expression, and More	1010
	996	SCIENCE'S COMPASS	A22.0
		Policy	
S	997	Interpretation of International Test	1030
	998	Score Comparisons I. C. Rotberg	
	998	Books and New Media	
	999	Early Neuro Networks M. Constantine-Paton	1032
	1000	Vignette Browsings	1033 1033
	1001	Research	
		A New Spin on Hydrothermal Plumes	1034
	1002 1004	K. G. Speer	
	1004	The Expanding Role of Cell	1035
		T. Jacks and R. A. Weinberg	
		Landscaping the Cancer Terrain	1036
	1005	K. W. Kinzler and B. Vogelstein	
	1006	RESEARCH ARTICLE	
1	1007	U/Pb Zircon Geochronology and	1039
	1008	Tempo of the End-Permian Mass Extinction	
	1000	S. A. Bowring, D. H. Erwin, Y. G. Jin,	M. W
		Martin, K. Davidek, W. Wang	
F	DAD	MENTS	122
	975	and S. J. Green • Causal Systems in Ecolog	m. 1
		H. Reynolds • Corrections and Clarifications	
	977		
	983	SCIENCESCOPE	993
t			1013
		Neuron Growth and ApoE • Moscow Dine Scramble • Authentic Deep Impact	o Egg
3	983		
N	И. К. G. M.	ESSAYS ON SCIENCE AND SOCIETY Science as a Craft Industry	1014
yn	aud •	F. J. Dyson	
	Bird,		
	tnam: ibluda	TECH.SIGHT	1099
100	CONTRACTOR DATES	Read-	

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Toward a Transparent Federal S&T Budge J. Bingaman and J. Lieberman

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SCIENCE • VOL. 280 • 15 MAY 1998 • www.sciencemag.org

972

#### COVER

1059

Skull and head reconstruction of *Majungatholus atopus*, a large (7- to 9-meter) predatory dinosaur from the Late Cretaceous of Madagascar. The well-preserved skull (~57 centimeters long) is very similar to those of contemporaneous forms from Argentina and India, suggesting that land connections among the host landmasses (via Antartica) were retained much longer than previously thought. See page 1048. [Photograph: J. Weinstein, ©The Field Museum, GEO86106.2.9c. Artwork: B. Parsons]

#### REPORTS

#### Chemical Amplification: Continuous-Flow 1046 PCR on a Chip M. U. Kopp, A. J. de Mello, A. Manz

#### Predatory Dinosaur Remains from 1048 Madagascar: Implications for the Cretaceous Biogeography of Gondwana

S. D. Sampson, L. M. Witmer, C. A. Forster, D. W. Krause, P. M. O'Connor, P. Dodson, F. Ravoavy

#### Tracking the Evolution of a **1052** Hydrothermal Event Plume with a RAFOS Neutrally Buoyant Drifter

J. E. Lupton, E. T. Baker, N. Garfield, G. J. Massoth, R. A. Feely, J. P. Cowen, R. R. Greene, T. A. Rago

 Earthquakes on Dipping Faults:
 1055

 The Effects of Broken Symmetry
 D. D. Oglesby, R. J. Archuleta, S. B. Nielsen

Percolation of Core Melts at Lower Mantle Conditions M. C. Shannon and C. B. Agee

#### Localized Reconnection in the 1061 Near Jovian Magnetotail C. T. Russell, K. K. Khurana, D. E. Huddleston, M. G. Kivelson

Ferromagnetism in LaFeO<sub>3</sub>-LaCrO<sub>3</sub> 1064 Superlattices

K. Ueda, H. Tabata, T. Kawai

Inducible Repair of Thymine Glycol **1066** Detected by an Ultrasensitive Assay for DNA Damage X. C. Le, J. Z. Xing, J. Lee, S. A. Leadon, M.

Weinfeld

Inhibitory Function of p21<sup>Cip1/WAF1</sup> **1069** in Differentiation of Primary Mouse Keratinocytes Independent of Cell Cycle Control F. Di Cunto, G. Topley, E. Calautti, J. Hsiao, L.

Ong, P. K. Seth, G. Paolo Dotto

#### Genetic Evaluation of Suspected 1073 Cases of Transient HIV-1 Infection of Infants

L. M. Frenkel, J. I. Mullins, G. H. Learn, L. Manns-Arcuino, B. L. Herring, M. L. Kalish, R. W. Steketee, D. M. Thea, J. E. Nichols, S.-L. Liu, A. Harmache, X. He, D. Muthui, A. Madan, L. Hood, A. T. Haase, M. Zupancic, K. Staskus, S. Wolinsky, P. Krogstad, J. Zhao, I. Chen, R. Koup, D. Ho, B. Korber, R. J. Apple, R. W. Coombs, S. Pahwa, N. J. Roberts Jr.

#### Large-Scale Identification, Mapping, and 1077 Genotyping of Single-Nucleotide Polymorphisms in the Human Genome

D. G. Wang, J.-B. Fan, C.-J. Siao, A. Berno, P. Young, R. Sapolsky, G. Ghandour, N. Perkins, E. Winchester, J. Spencer, L. Kruglyak, L. Stein, L. Hsie, T. Topaloglou, E. Hubbell, E. Robinson, M. Mittmann, M. S. Morris, N. Shen, D. Kilburn, J. Rioux, C. Nusbaum, S. Rozen, T. J. Hudson, R. Lipshutz, M. Chee, E. S. Lander

#### RasGRP, a Ras Guanyl Nucleotide– Releasing Protein with Calcium- and

Diacylglycerol-Binding Motifs J. O. Ebinu, D. A. Bottorff, E. Y. W. Chan, S. L. Stang, R. J. Dunn, J. C. Stone

#### Mutations in the SMAD4/DPC4 Gene **1086** in Juvenile Polyposis

J. R. Howe, S. Roth, J. C. Ringold, R. W. Summers, H. J. Järvinen, P. Sistonen, I. P. M. Tomlinson, R. S. Houlston, S. Bevan, F. A. Mitros, E. M. Stone, L. A. Aaltonen

#### Requirement for Atm in Ionizing 1089 Radiation–Induced Cell Death in the Developing Central Nervous System K.-H. Herzog, M. J. Chong, M. Kapsetaki, J. I. Morgan, P. J. McKinnon

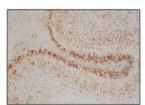
COII: An Arabidopsis Gene Required 1091 for Jasmonate-Regulated Defense and Fertility D.-X. Xie, B. F. Feys, S. James, M. Nieto-Rostro, J. G. Turner







1082



#### 1089 Atm and control of cell death in the central nervous system

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#### References

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### THIS WEEK IN SCIENCE

edited by PHIL SZUROMI

#### **Ocean twister**

The steady venting of fluids from mid-ocean ridge hydrothermal systems at black smokers is dwarfed by event plumes or megaplumes that mark the rapid release of hot water associated with intrusion of new magma. These plumes can extend for tens of kilometers above a ridge and persist for months; they were first recognized from their anomalous helium isotopic composition and have been used to trace ocean circulation. Although there have been several theoretical studies of how they persist, in situ observations have been lacking. Lupton et al. (p. 1052; see the commentary by Speer, p. 1034) were able to insert a neutrally buoyant tracking float into an event plume that formed over the Gorda Ridge in spring 1996. During a 60-day period, the float traced an anticyclonic path marking the circulation of water in the plume. Chemical and physical data collected at the beginning and end of this period imply that the plume remained coherent and maintained concentrations of iron particles and dissolved manganese. The data imply that such plumes could persist for periods greater than 1 year.

#### Performing PCR on a chip

The three steps of the polymerase chain reaction (PCR), melting the double-stranded DNA, binding specific primers, and enzymatically extending the primers, have been automated on a chip. Kopp *et al.* (p. 1046) developed a continuous flow system that temperaturecycles the sample and the necessary reactants through 20 rounds of amplification. At the highest flow rates, the process is

#### End of an era

The end-Permian extinction is the largest in Earth's history. Its age, 251 million years ago, corresponds to the eruption of the Siberian Traps, the largest flood basalt province on Earth. However, the cause of the extinction remains unclear, in part because the duration of the extinction and of the terminal part of the Permian has not been well resolved. Bowring *et al.* (p. 1039; see the news story by Kerr, p. 1006) provide uranium-lead dates on several volcanic tuff horizons straddling the Permian-Triassic boundary in China. The data imply that the final extinction pulse there, corresponding to loss of most of the marine species, lasted less than 1 million years and perhaps occurred within only a few hundred thousand years.

complete in 90 s, and successive samples appear to be amplified without cross-contamination.



#### Fossil record of land bridges

Several fossil remains of vertebrates from the Upper Cretaceous (about 80 million years ago) from Madagascar, including a nearly complete skull of a predatory dinosaur, are described by Sampson et al. (p. 1048; see the cover). Similar fossils have been so far found only in South America and in India, which was still connected to Madagascar in the Late Cretaceous, but not yet in Africa. This distribution suggests that land bridges remained between South America and India through Antarctica into the Latest Cretaceous.

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#### Fault asymmetries

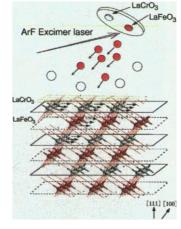
The ground motion caused by a thrust (reverse) fault is greater than the ground motion caused by a normal fault for earthquakes of the same magnitude. Oglesby *et al.* (p. 1055) performed dynamic simulations of earthquakes on different fault geometries and found that the difference in the intensity of the ground motions is caused by time-dependent stress produced by the interaction of the earthquake stress field with Earth's free surface. These simulations will be helpful for characterizing previous earthquakes and modeling ground motion for future events.

#### Ironing out the lower mantle

The formation of Earth's core required separation of iron melt from Earth's silicate mantle. Whether this separation involved percolation of melt through a solid silicate matrix or the settling of iron melt through a molten matrix may have depended on the nature of the pore network through MgSiO<sub>3</sub> perovskite, the dominant silicate phase in the lower mantle. Shannon and Agee (p. 1059) measured experimentally the wetting angle between iron melts and perovskite. The data imply that percolation of iron through the Earth's lower mantle might have been possible, unlike the case for Earth's upper mantle, where the mineralogy is different.

#### Forcing ferromagnetism

Interactions between magnetic ions in oxides can be estimated theoretically to predict whether



materials will exhibit ferromagnetism. Although theory predicts that  $Fe^{3+}$  and  $Cr^{3+}$  should be able to form ferromagnets in a perovskite structure, phase separation normally occurs in the bulk oxides and antiferromagnetic materials are formed. Ueda *et al.* (p. 1064) grew superlattices of alternating layers of LaCrO<sub>3</sub> and LaFeO<sub>3</sub> on the (111) face of SrTiO<sub>3</sub>. They show that this material, which forces the proximity of Fe<sup>3+</sup> and Cr<sup>3+</sup> ions, is ferromagnetic.

### Reconnected magnetotails

The magnetosphere of Jupiter is controlled by currents in the jovian interior, but the volcanically active moon, Io, is expected to upset the magnetosphere by spewing out tons of ions in a magnetized plasma. Theories suggest that one way to release this plasma sheet is to reconnect the jovian magnetotails and allow the plasma to flow out of the system. Russell et al. (p. 1061) have been sampling the magnetospheric field from the Galileo spacecraft since its insertion into orbit around Jupiter in December 1995. They have found evidence for transient reconnections of the magnetotail

(Continued on page 979)

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#### THIS WEEK IN SCIENCE

#### (Continued from page 977)

that supports this theory and helps explain how Jupiter can maintain a balanced magnetic flux in the presence of Io.

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#### Alternative function for cell cycle inhibitor

The protein p21 inhibits cell division by inhibiting the activity of cyclin-dependent kinases and binding to proliferating cell nuclear antigen (PCNA). Such effects of p21 may contribute to terminal differentiation of cells by promoting withdrawal from the cell division cycle. However, Di Cunto et al. (p. 1069; see the commentary by Jacks and Weinberg, p. 1035) report that the opposite is true in the later stages of differentiation of mouse keratinocytes. In this situation, p21 has an inhibitory effect on expression of markers of terminal differentiation. These results are consistent with observations that the amounts of p21 first increase as the cells begin to differentiate and then diminish. Furthermore, the inhibitory effects of p21 on differentiation appear to be produced independently of its effects on cell division.

8

### Lab error and transient HIV infection

Numerous cases have been reported in which infants of HIV-infected mothers appear to have been transiently infected. If validated, these findings would have significant implications for thinking about the ability of the host immune response to successfully fight HIV. However, when Frenkel *et al.* (p. 1073) reanalyzed 42 cases in which a transient infection was suspected, the results were more likely due to mislabeling or laboratory contamination. The authors suggest that criteria for the conclusive demonstration of a transient infection should include phylogenetic analyses on previously unmanipulated portions of the specimens in a manner that can minimize crosscontamination.

#### 33

### SNPing away at the human genome

New tools are becoming available for the identification of disease genes, characterization of human traits, forensic identification, and studies of human evolution and diversity. Wang et al. (p. 1077) present a proofof-principle study to show that large-scale analysis of singlenucleotide polymorphisms (SNPs) in human DNA is feasible. They identified more than 3200 candidate SNPs across the entire human genome (with about 40 percent confirmed so far), constructed a map more than 2000 of the loci, and used 500 of these to create a genotyping chip.

#### 鐊

#### Linking to Ras

The small guanine nucleotidebinding protein Ras participates in control of cell signaling pathways that regulate diverse cellular functions from cell division to neuronal activity in the brain. Ebinu et al. (p. 1082) describe a new guanine nucleotide releasing factor, RasGRP. Ras is active when GTP (guanosine triphosphate) is bound to it, and exchange factors like RasGRP activate Ras by facilitating release of bound guanosine diphosphate and binding of GTP. RasGRP is found primarily in the brain and contains protein domains that bind the intracellular signaling molecules calcium and diacylglycerol. RasGRP appears to link signals that alter intracellular concentrations of calcium and diacylglycerol to changes in Ras activity.

#### SMADs and cancer predisposition

Familial juvenile polyposis (JP) is an autosomal dominant disease characterized by a predisposition to hamartomatous polyps and gastrointestinal cancer. Howe et al. (p. 1086; see the commentary by Kinzler and Vogelstein, p. 1036) show that a subset of JP families carry germline mutations in the SMAD4/DPC4 gene on chromosome 18q21.1. SMAD4 is a key player in the transforming growth factor- $\beta$  (TGF- $\beta$ )-signaling pathway, which mediates cell growth inhibitory signals from the cell surface to the nucleus.

#### **1**

#### Jasmonic acid and auxin signaling Jasmonic acid and its deriva-

tives affect developmental and defensive responses in a great



variety of plants. Xie *et al.* (p. 1091) have cloned and mapped a gene from *Arabidopsis* that is required for responses to jasmonates. The *coil* gene encodes a protein that has intriguing similarities the *tirl* gene, required for auxin signaling,

suggesting that jasmonates and auxin may share some aspects of their signaling pathways. Both proteins include Fbox motifs, which are found in proteins that form part of the ubiquitin-dependent protein degradation process.

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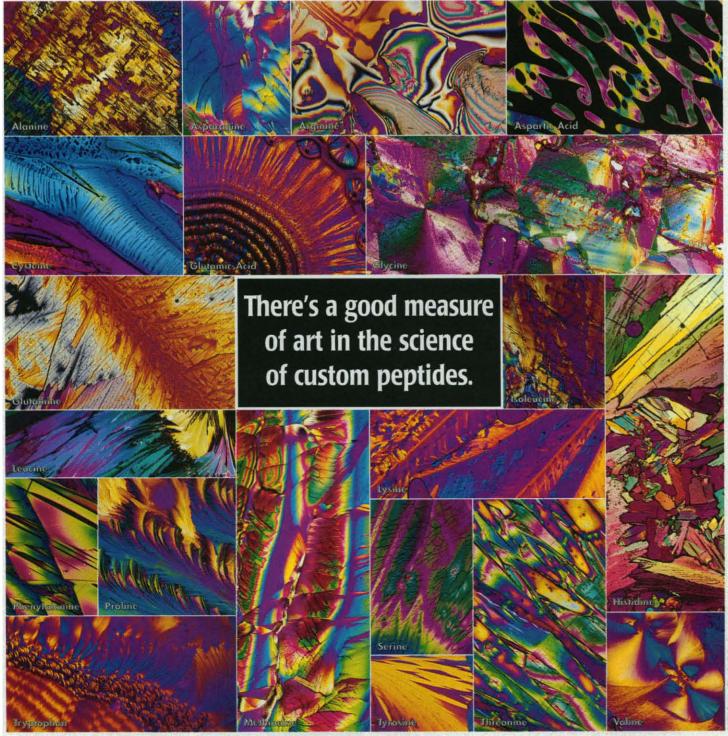
#### Surveying the damage

DNA damage and its repair are key determinants in the early stages of carcinogenesis, cancer therapy, and aging. Le et al. (p. 1066) have developed an ultrasensitive assay for DNA damage that couples immunochemistry with capillary electrophoresis and laser-induced fluorescence detection. This assay, which is specific for radiation-induced thymine glycols, requires only nanogram amounts of DNA and can detect a single base modification among 10<sup>9</sup> normal bases. With appropriate affinity probes for other types of DNA damage and with further automation, the assay could be adapted for use in risk assessment.

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#### Clues to ATM function

A key component in understanding how an abnormal gene can act to cause disease can come from insights into its normal function. The neurodegenerative disease ataxia telangiectasia is associated with mutations in the gene ATM. When Herzog et al. (p. 1089) have knocked out the Atm gene in mice, cells of the developing central nervous system were no longer as sensitive to ionizing radiation and showed a dramatic lack of programmed cell death. The authors speculate that Atm may be involved in a developmental checkpoint, and that mutations in this gene may allow damaged cells to survive during development, leading to problems later in life.



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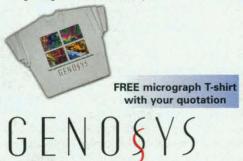
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Micrographs courtesy of Michael W. Davidson, director of the Optical Microscopy Division of the National High Magnetic Field Laboratory.

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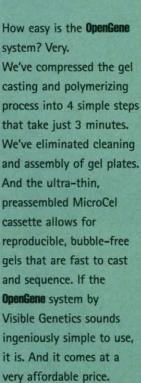
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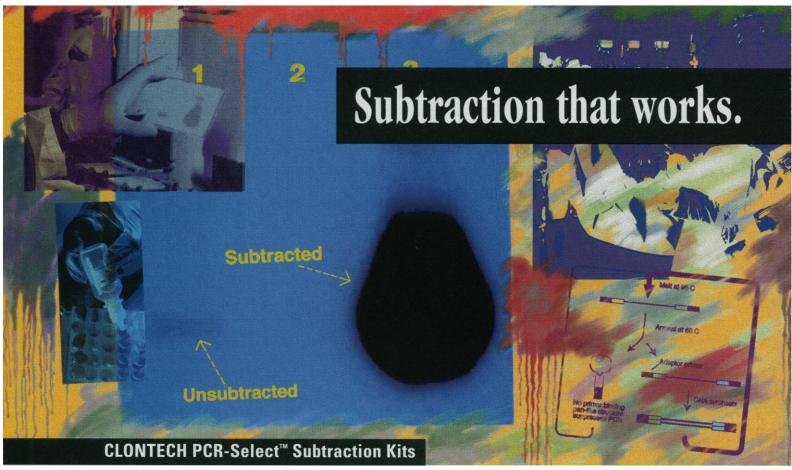
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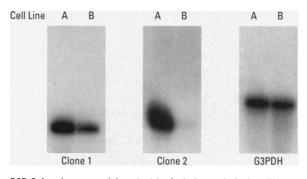
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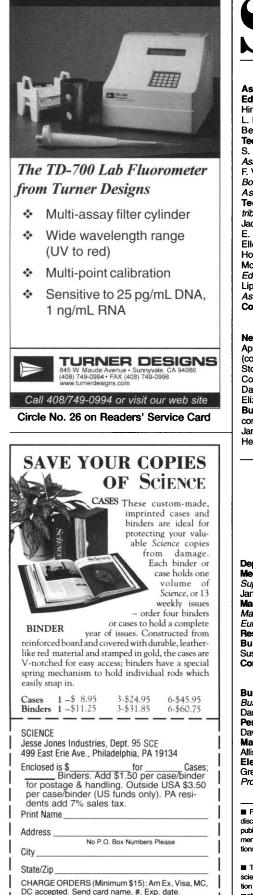
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The closing date is May 31, 1998. All prizes will be presented in Sweden in December 1998. Full details, and the required entry form can be collected from:

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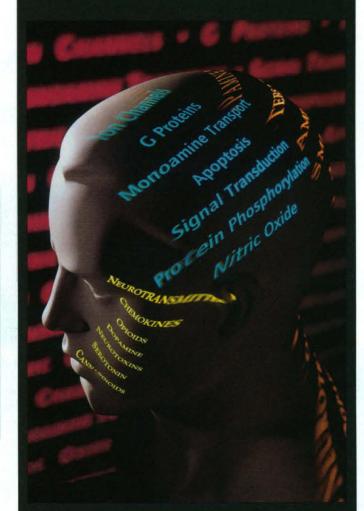
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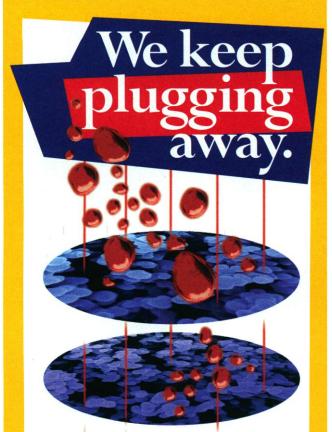
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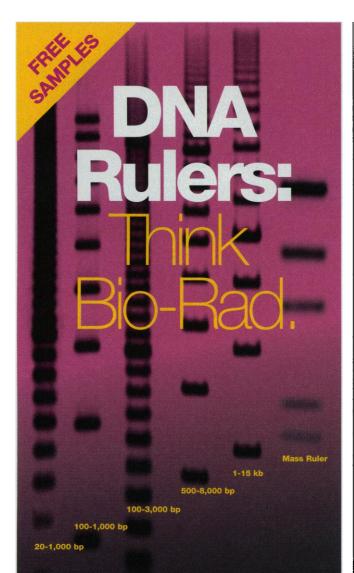
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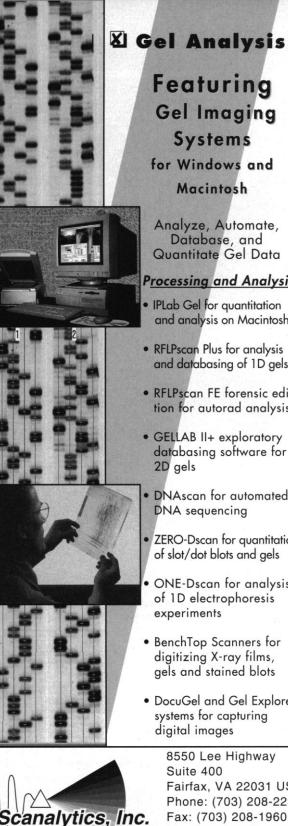
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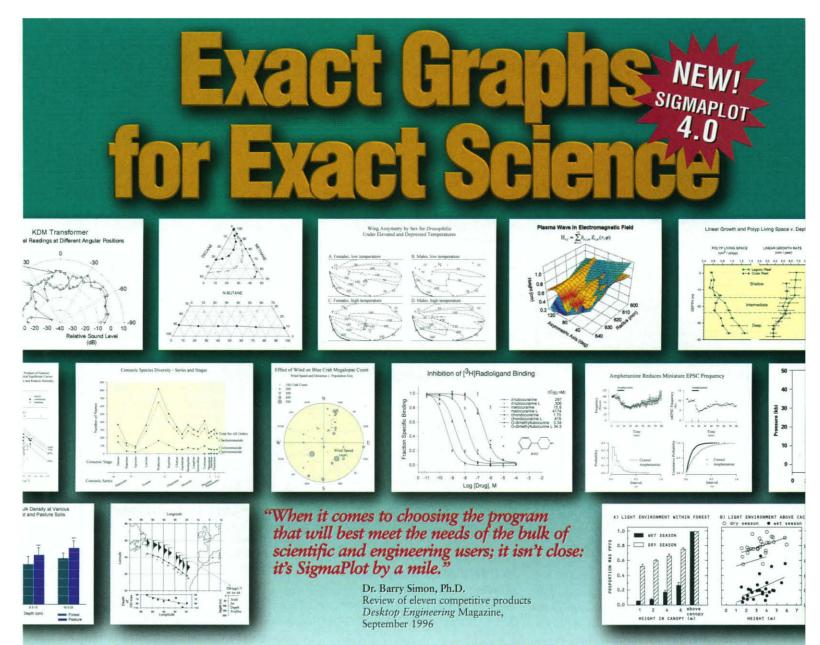


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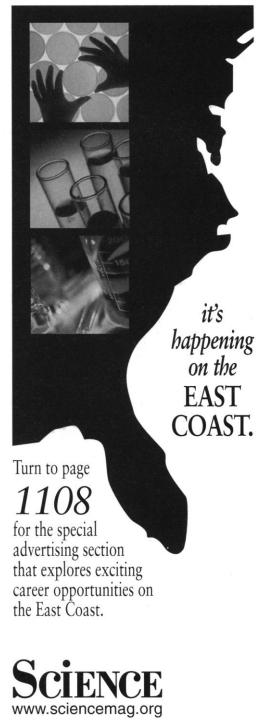
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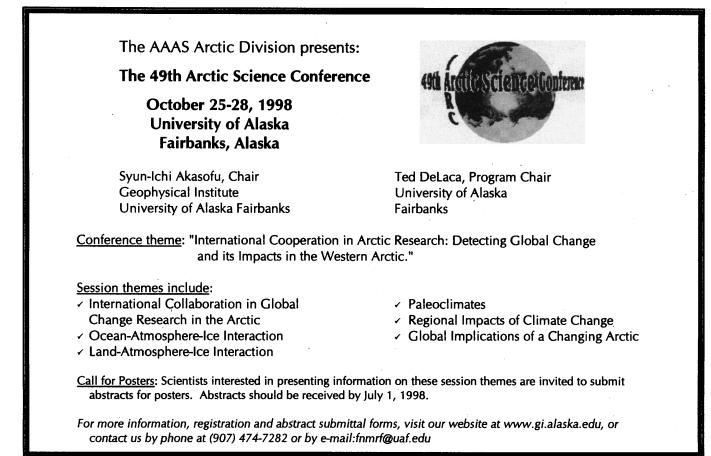
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Complete nominations, as described above, must be received by Monday, June 15, 1998.



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Abstracts are being accepted for the conference on Enhancing Patient Safety and Reducing Errors in Health Care. This multidisciplinary conference is being convened by the American Association for the Advancement of Science (AAAS), the Annenberg Center for Health Sciences, the Joint Commission on Accreditation of Healthcare Organizations, the National Patient Safety Foundation at the AMA, and the US Department of Veterans Affairs. The conference will be held at the Annenberg Center in Rancho Mirage, CA, on November 8-10, 1998.

Abstracts may address safety issues wherever health care is provided. including acute and chronic health care institutions, HMOs, and outpatient surgical providers. Abstracts are welcome from investigators representing a broad spectrum of professional disciplines, including risk assessment, social science, medical informatics, pharmacy, nursing, home health care, and medicine. Abstracts must include: (1) a summary of the presentation, with bibliography, of fewer than 1,000 words, and (2) a resume or biographical sketch of fewer than 100 words. Complete information is available on the Web at http://www.mederrors.org.

The deadline for receipt of abstracts is July 1, 1998. E-mail submissions are strongly encouraged. Please submit 6 copies of mailed abstracts. Direct abstracts or inquiries to: Deborah Runkle, AAAS, 1200 New York Ave NW, Washington, DC 20005. E-mail: safety@aaas.org; telephone: (202) 326-6794; fax: (202) 289-4950.

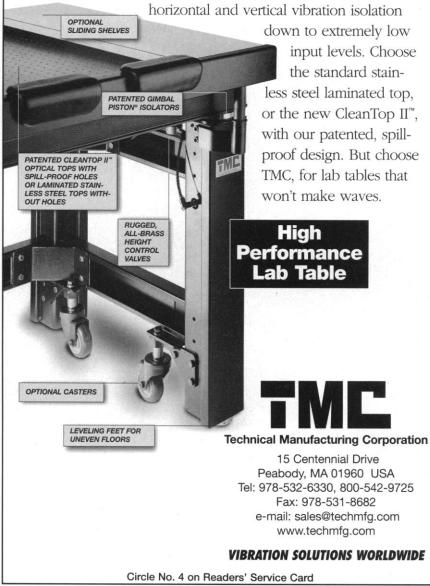
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And our patented Gimbal Piston® isolation system brings both



#### TRANSFECTION

# Transfection Reagents...

# Tfx<sup>™</sup>-10 Tfx<sup>™</sup>-20

 $Tfx^{-50}$ 

#### ...helping you finish first

#### Promega's new TransFast™ **Transfection Reagent is:**

- Fast: Transfect in one hour. Requires less optimization.
- Easy: Resuspend in water, mix with DNA and add to cells.
- Efficient: High efficiency transfection even in the presence of serum in a wide variety of cells. Can be used for transient and stable transfection.

#### **TransFast**<sup>™</sup>

TM **Transfection Reagent** joins Promega's team of cationic lipids in providing you with fast, easy and efficient transfection in a wide variety of cell lines. Use the table below to select the best reagent for your cell line.

CellLine TransFast™ Tfx™-10 Tfx™-20 Tfx™-50

CONLING	fidilai dat	114 -10	114 -20	114 -00
COS-7	•			
NIH/3T3	•			
293	•			1.17
CHO	•			
HeLa	- 202			2 NO
Hep G2	TRANK A		•	
K-562	•			The second
CV-1	1.2.2	•	•	•
BHK		•		
PC12		Retail	•	1
Jurkat	•			
St9				and the second
	COS-7 NIH/3T3 293 CHO HeLa Hep G2 K-562 CV-1 BHK PC12 Jurkat	COS-7         •           NIH/3T3         •           293         •           CHO         •           HeLa         •           Hep G2         •           K-562         •           CV-1         •           BHK         •           PC12         •           Jurkat         •	COS-7         •           NIH/3T3         •           293         •           CHO         •           HeLa         •           Hep G2         •           K-562         •           CV-1         •           BHK         •           PC12         •           Jurkat         •	COS-7         Image: Cost of the state

.promega.com/expression/

Visit Promega at www.promega.com/expression/ for the most current cell line specific information.

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Call your nearest Promega Branch Office or Distributor to request a trial size of TransFast™ or Tfx™ Transfection Reagents or to request our new Transfection Guide. While supplies last.

Tfx and TransFast are trademarks of Promega Corporation. The cationic lipid component of the Tfx<sup>™</sup> Reagents is covered by U.S. Pat. No. 5,527,928 assigned to The Regents of the University of California and pending foreign patents.

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