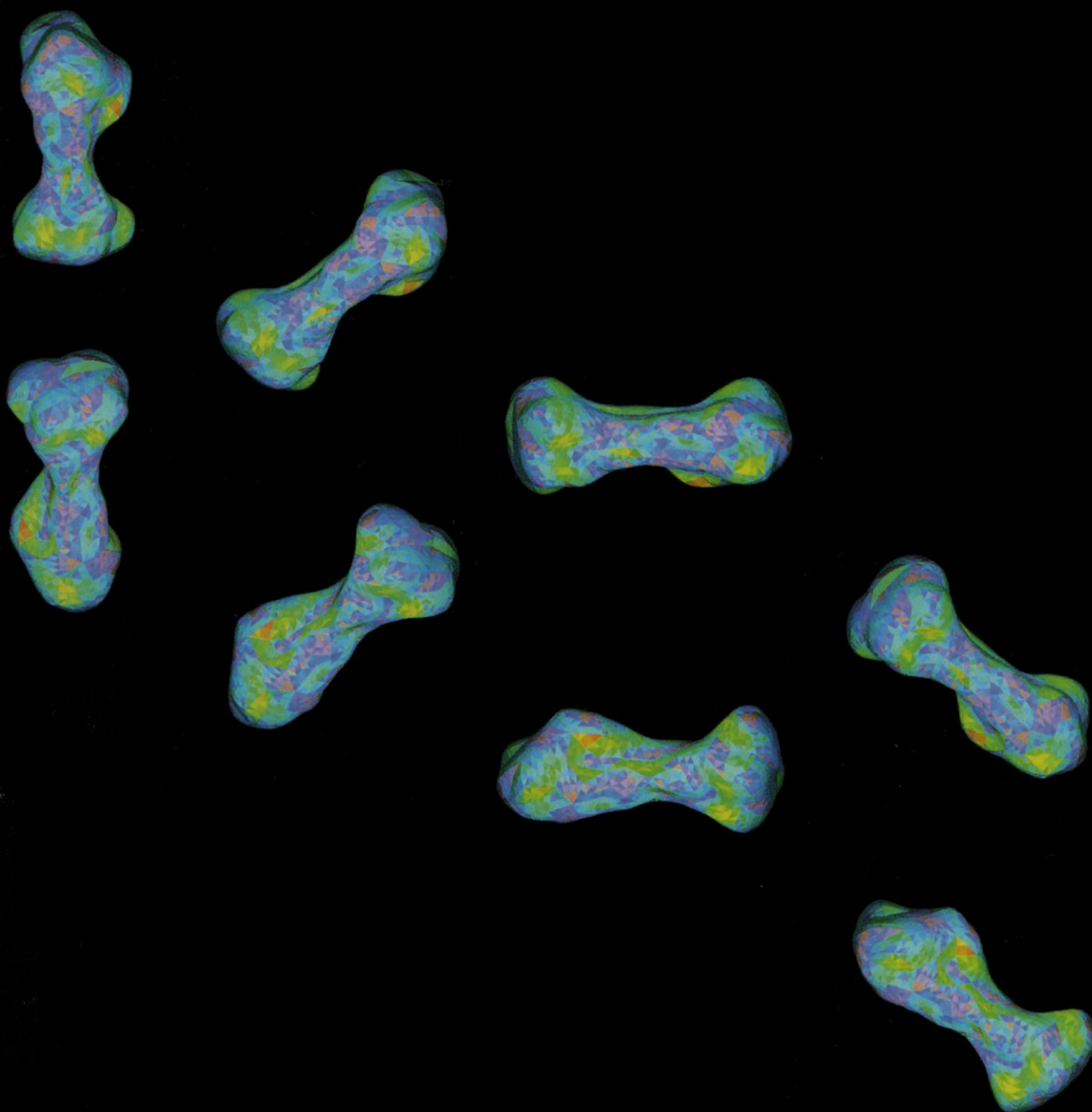


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Pages 761-916 \$8

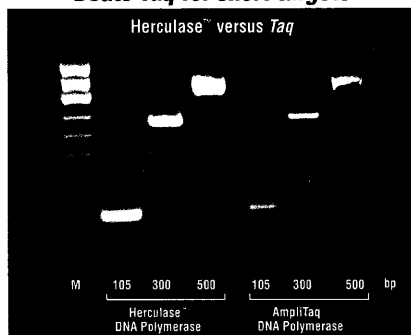


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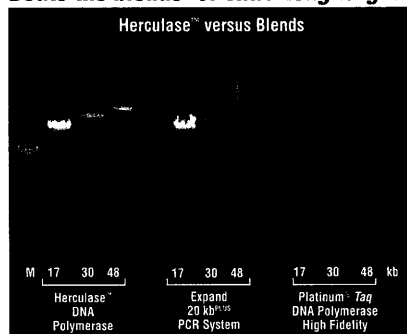
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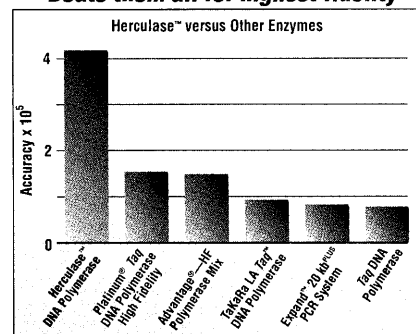


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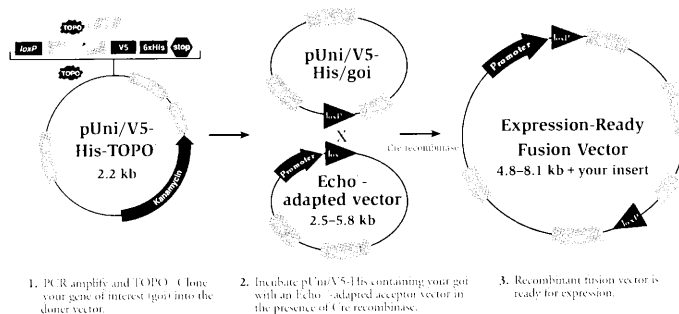
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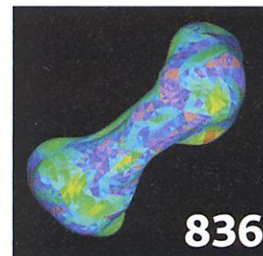
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COVER This radar-derived model of asteroid 216 Kleopatra is color-coded for gravitational slopes (yellow and red, steepest), whose shallowness (orange through purple, blue, green) suggests a surface covered by unconsolidated porous debris. A metallic object the size of New Jersey, Kleopatra may be the remains of a collision of two former pieces of an ancient asteroid's disrupted core. [Graphics: Shigeru Suzuki and Eric DeJong, JPL Digital Image Animation Laboratory]



792

Animals and antibiotics

NEWS

NEWS OF THE WEEK

- 782 NATIONAL IGNITION FACILITY: DOE Set to Double Price of Troubled Laser Project
- 783 MILITARY ASSETS: Scientists Gain Access to Sharper GPS Signal
- 783 ARCHAEOLOGY: Hints of Frequent Pre-Columbian Contacts
- ▼ 785 ⁸⁵² ECOLOGY: Does Biodiversity Help Fend Off Invaders?
- 786 CANCER RESEARCH: Caution Raised About Possible New Drug
- 787 ADVANCED TECHNOLOGY PROGRAM: Grants Evoke Squeals of Delight and Anger
- 788 ANTIMATTER: Coaxing Shy Particles Into an Atomic Jar
- ▼ 789 ⁸⁴¹ EVOLUTION: Stretching the Reign of Early Animals

789 THERMODYNAMICS: Backward Heat Flow Bends the Law a Bit

791 BIOMEDICAL POLICY: New Minister Hopes to Create an Italian NIH

NEWS FOCUS

792 ANTIBIOTIC RESISTANCE: Superbugs on the Hoof?

794 PHILANTHROPY: Indian Schools Cash In on Silicon Valley Wealth

795 GENOMICS: Money and Machines Fuel China's Push in Sequencing

798 AMERICAN ASSOCIATION OF PHYSICAL ANTHROPOLOGISTS: From Field to Lab, New Insights on Being Human

800 GENOMES 2000: Intimate Portraits of Bacterial Nemeses

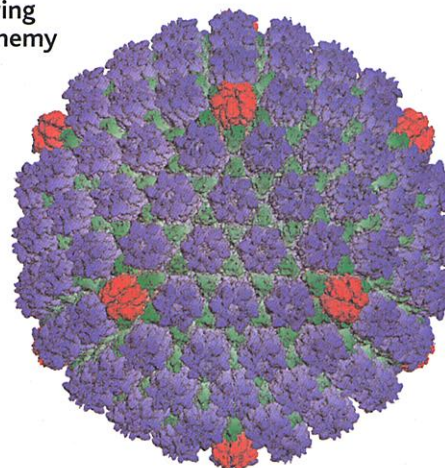
RESEARCH

REPORTS

- 831 Micropatterning of Organic Electronic Devices by Cold-Welding C. Kim, P. E. Burrows, S. R. Forrest
- 834 Stable Versions of Transient Push-Pull Carbenes: Extending Lifetimes from Nanoseconds to Weeks C. Buron, H. Gornitzka, V. Romanenko, G. Bertrand
- ▼ 836 ⁸²⁰ Radar Observations of Asteroid 216 Kleopatra S. J. Ostro, R. S. Hudson, M. C. Nolan, J.-L. Margot, D. J. Scheeres, D. B. Campbell, C. Magri, J. D. Giorgini, D. K. Yeomans
- 839 Large-Scale Thermal Events in the Solar Nebula: Evidence from Fe,Ni Metal Grains in Primitive Meteorites A. Meibom, S. J. Desch, A. N. Krot, J. N. Cuzzi, M. I. Petaev, L. Wilson, K. Keil
- ▼ 841 ⁷⁸⁹ Age of Neoproterozoic Bilateral Body and Trace Fossils, White Sea, Russia: Implications for Metazoan Evolution M. W. Martin, D. V. Grazhdankin, S. A. Bowring, D. A. D. Evans, M. A. Fedonkin, J. L. Kirschvink

877

Knowing the enemy



845 ⁴⁰K-⁴⁰Ar Constraints on Recycling Continental Crust into the Mantle N. Coltice, F. Albarède, P. Gillet

DEPARTMENTS

NETWATCH
767

THIS WEEK IN
SCIENCE
769

EDITORS' CHOICE
773

CONTACT SCIENCE
778

SCIENCESCOPE
785

RANDOM SAMPLES
803

NEW PRODUCTS
883



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EDITORIAL

- 807 **Education for a Biocomplex Future**
L. J. Gross

LETTERS

- 809 **Surveying the SBIR Program** J. W. Glover; J. Davis. *Response* J. Lerner. **Carbon Cost of Applying Nitrogen Fertilizer** R. C. Izaurralde, W. B. McGill, N. J. Rosenberg. *Response* W. H. Schlesinger. **Corrections and Clarifications**

ESSAY

- 813 **Not (Just) in Kansas Anymore** E. C. Scott

BOOKS ET AL.

- 816 **PSYCHOLOGY: *The Cultural Origins of Human Cognition*** M. Tomasello, reviewed by M. D. Hauser
- 817 **HISTORY OF SCIENCE: *A Culture of Fact England, 1550–1720*** B. J. Shapiro, reviewed by M. Poovey

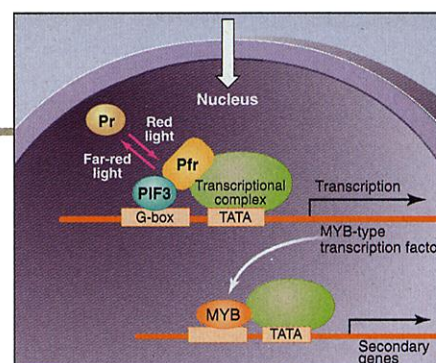
PERSPECTIVES

- ▼819
850 **SOCIAL SCIENCE: *Shrewd Investments*** M. A. Nowak and K. Sigmund



821

Genes with a light switch



- ▼820
836 **PLANETARY SCIENCE: *The Shape of Kleopatra*** W. K. Hartmann

- ▼821
859 **PLANT BIOLOGY: *Lighting Up the Nucleus*** A. Nagatani

- 822 **ASTRONOMY: *Primordial Rain or Galactic Pollution*** M. Zwaan

REVIEW

- 824 **CHEMISTRY: *Whither the Future of Controlling Quantum Phenomena?*** H. Rabitz, R. de Vivie-Riedle, M. Motzkus, K. Kompa

819

Keeping score

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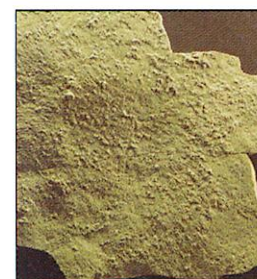
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841

Animal origins—
dates and questions

- 847 **Satellite Measurements of Sea Surface Temperature Through Clouds** F. J. Wentz, C. Gentemann, D. Smith, D. Chelton

- ▼850
819 **Cooperation Through Image Scoring in Humans** C. Wedekind and M. Milinski

- ▼852
785 **Species Diversity and Biological Invasions: Relating Local Process to Community Pattern** J. M. Levine

- 854 **Homogenization of Fish Faunas Across the United States** F. J. Rahel

- 857 **Evidence for Brainstem Structures Participating in Oculomotor Integration** K. Nakamagoe, Y. Iwamoto, K. Yoshida

- ▼859
821 **Direct Targeting of Light Signals to a Promoter Element–Bound Transcription Factor** J. F. Martínez-García, E. Huq, P. H. Quail

- 863 **Template Boundary in a Yeast Telomerase Specified by RNA Structure** Y. Tzfati, T. B. Fulton, J. Roy, E. H. Blackburn

- 867 **Promoter-Selective Properties of the TBP-Related Factor TRF1** M. C. Holmes and R. Tjian

- 870 **Requirement of JNK for Stress-Induced Activation of the Cytochrome c–Mediated Death Pathway** C. Tournier, P. Hess, D. D. Yang, J. Xu, T. K. Turner, A. Nimnual, D. Barsagi, S. N. Jones, R. A. Flavell, R. J. Davis

- 874 **Ubiquitin Protein Ligase Activity of IAPs and Their Degradation in Proteasomes in Response to Apoptotic Stimuli** Y. Yang, S. Fang, J. P. Jensen, A. M. Weissman, J. D. Ashwell

- 877 **Seeing the Herpesvirus Capsid at 8.5 Å** Z. H. Zhou, M. Dougherty, J. Jakana, J. He, F. J. Rixon, W. Chiu

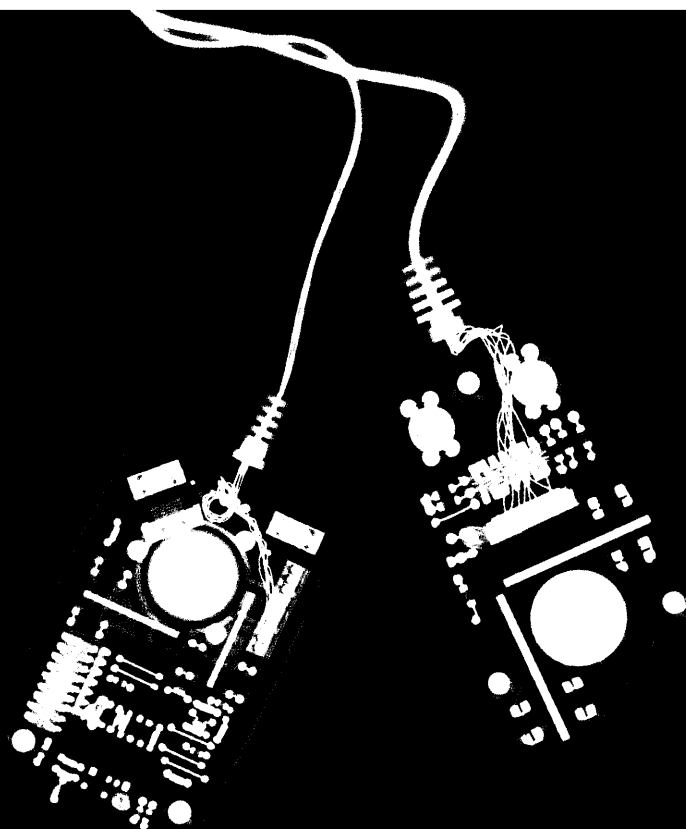
TECHNICAL COMMENTS

- New Neurons: Extraordinary Evidence or Extraordinary Conclusion?**
R. S. Nowakowski and N. L. Hayes. *Response* E. Gould and C. G. Gross

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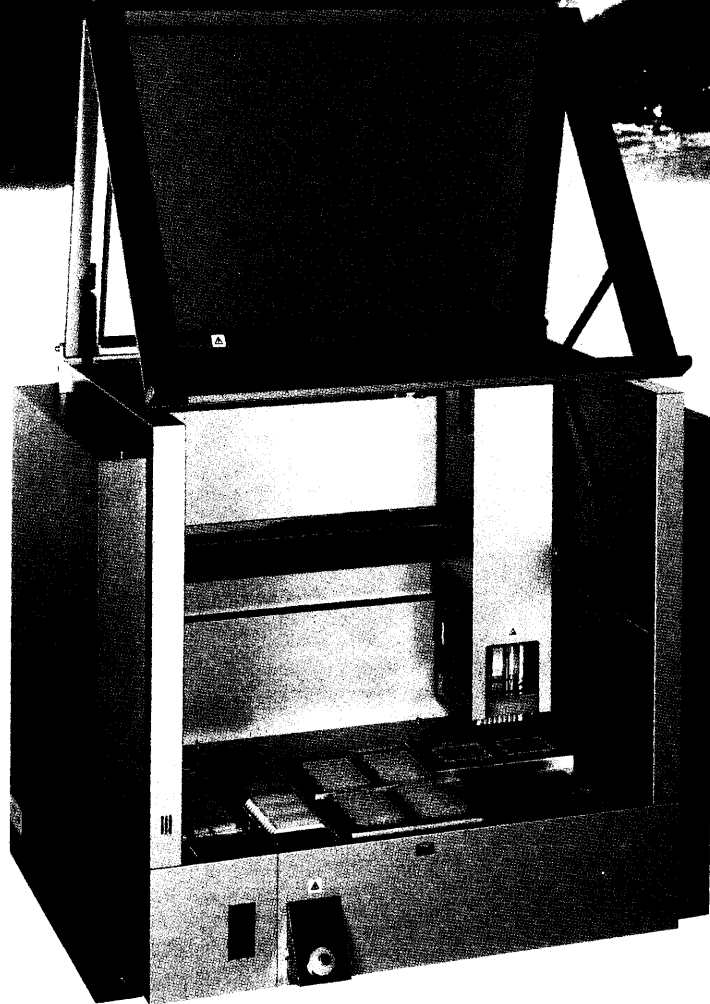
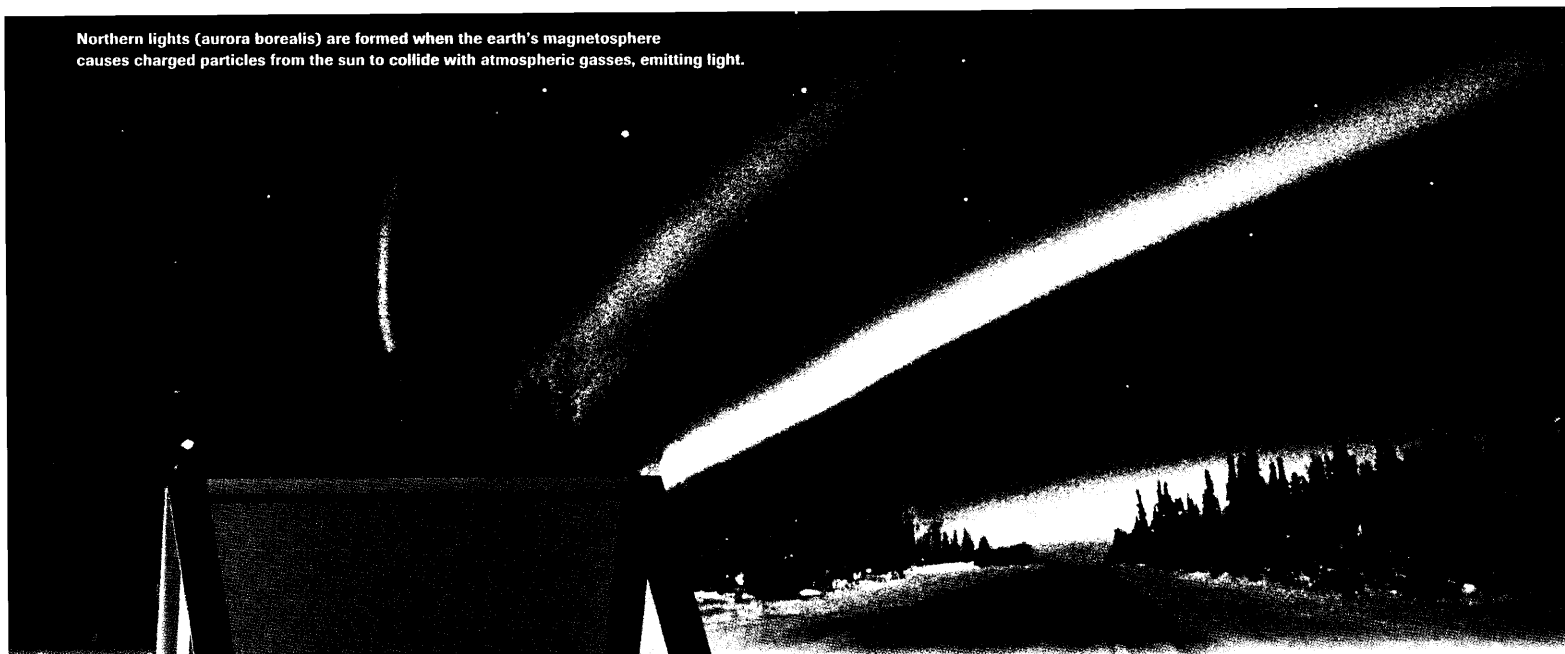
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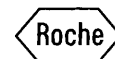
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STABLE TRANSIENTS

Carbenes are reactive species containing a neutral, formally divalent carbon atom. They are transient intermediates in many organic reactions of synthetic importance, but they have been difficult to isolate and characterize in detail. Buron *et al.* (p. 834) have succeeded in preparing stable carbenes by modifying the substituents so that the electroneutrality of the carbene center is preserved. The compounds are stable for weeks in solution at -30°C .

STAMPING YOUR (MICRO) MARK

The patterning of electrodes with micrometer resolution is achieved by a photolithographic process followed by an etching step. The time associated with this technique, however, introduces an additional cost to the overall fabrication process. Kim *et al.* (p. 831) introduce a cold-welding technique, whereby a metal in contact with another metal will weld together. With a patterned metal stamp, the contacted metal can then be removed by lift-off. The authors apply their technique to patterning an array of organic (soft polymer) light-emitting diodes.

A DUMBBELL ASTEROID

Asteroids of the M-class are thought to be rich in FeNi metal and may represent the partially exposed metallic cores of differentiated asteroids. Asteroid 216 Kleopatra has been studied intensely because of its large size and unusual light curves and occultation timings, which suggest a bifurcated structure or a binary system. Ostro *et al.* (p. 836; see Perspective by Hartmann) observed Kleopatra with the upgraded Arecibo radar system and propose a dumbbell shape for the asteroid. This model suggests that Kleopatra was once two separate pieces that came together during a low-velocity encounter and that much of its surface is covered by unconsolidated rock fragments.

METAL GRAIN FORMATION

Primitive meteorites (chondrites) are thought to contain the first particles formed in the solar nebula, the protoplanetary disk of swirling gas and dust around our nascent sun. Meiborn *et al.* (p. 839) explain the origin of chemically zoned Fe,Ni metal grains in chondrites with a model for gas-solid condensation relying on large-scale evaporation of dust near the plane and center of the disk. The gas rises convectively above the disk plane to cooler regions, where the metal grains condense. These grains then remain on

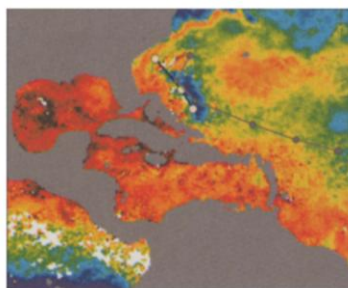
the cooler outer fringes of the disk, preserving their chemical zonation, until they are accreted into larger objects.

AGE OF A BILATERIAN FOSSIL

Ediacaran faunas mark the rise of soft-bodied animals prior to the Cambrian. Their age and correlation have been uncertain. They occur at a time of major swing in the carbon isotope composition of the oceans, which also may be related to their diversity and the subsequent explosion of animal life in the Cambrian. Martin *et al.* (p. 841; see news story by Kerr) now show that one of the most diverse and best preserved Ediacaran faunas in Zimnie Gory, White Sea, Russia, is older than 555 million years ago. The new age for these fossils breaks any simple relation between the Ediacaran diversity and the carbon isotope composition of seawater.

PENETRATING CLOUD COVER

Sea surface temperature (SST) has a profound effect on weather and climate and provides important information about ocean circulation, storms, and biological productivity. Satellites have measured SST with infrared detectors, but these measure-



ments are blocked by clouds, which cover about half of Earth's surface. Wentz *et al.* (p. 847) present global and regional measurements of SST made by satellite microwave radiometry, which is able to penetrate clouds. Their observations reveal a wealth of detail about winds, tropical instability waves, and upwelling.

GROWTH OF CRUST

The isotopes of potassium and argon can be used to trace the evolution and growth of Earth's crust because ^{40}K is preferentially incorporated into melt, and ^{40}Ar into the gas phase, when magma is generated in the mantle. Coltice *et al.* (p. 845) ana-

lyzed the K and Ar concentrations in the atmosphere, crust, and mantle. From their mass-balance calculations, they infer that less than 30% by mass of the modern continents were subducted over Earth's history and that continental crustal growth was mainly by accretion of oceanic plateaus.

COMMUNITY DIVERSITY AND HOMOGENIZATION

It is now well known that invasions by alien plants and animals are a major factor in the current biodiversity crisis. Levine (p. 852; see news story by Kaiser) presents data that address the factors that render species invasive or communities invadable. In Californian riparian vegetation, diversity does indeed reduce invasion at the local level, but biotic and abiotic factors correlated with diversity result in the more diverse communities having a greater number of invaders. In a study of fish faunas across the United States, Rahel (p. 854) examines the relative roles of species introductions and extirpations. Almost all states are more similar than they used to be; some states that originally shared no species now share two dozen or more. Even extinctions make states more similar, because extinctions generally have affected the more geographically restricted species. The main reason for the homogenization has been the east-to-west transport of gamefish and their associated prey species.

THE BENEFITS OF GIVING

In a world motivated by self-interest, why do people cooperate, especially in situations where they are unlikely to benefit directly? Wedekind and Milinski (p. 850; see Perspective by Nowak and Sigmund) tested the idea that people help others because it enhances the way they are viewed by their community. A group of students played a "game" in which they donated and received money, although reciprocal transactions were not allowed. Individuals with a history of donating generously were more frequently the beneficiaries of largess from other members of the group.

A STEADYING INFLUENCE

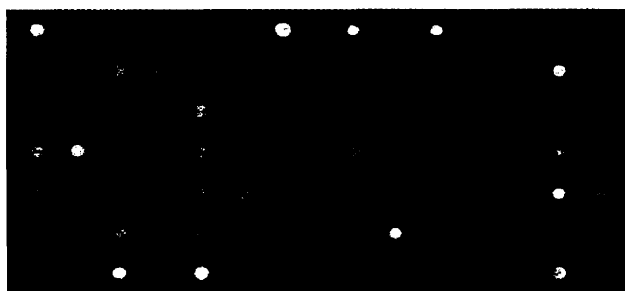
In order to control eye movements properly, the brain must integrate information about muscle activity from all over the body, the position of the head in space, and movement intentions. This is achieved by a distributed neuronal circuit, the oculomotor neural integrator. Nakamagoe *et al.* (p. 857) identify in the pontine region

CONTINUED ON PAGE 771

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THIS WEEK IN SCIENCE

CONTINUED FROM PAGE 769

of the brainstem a group of cells that project to the flocculus of the cerebellum and describe their role in the conversion of velocity to position.

LIGHT REGULATION OF TRANSCRIPTION

Plants respond to changes in light with physiological or developmental changes, processes mediated by light-responsive genes. Martinez-Garcia *et al.* (p. 859; see the Perspective by Nagatani) now clarify the molecular interactions that connect light to changes in gene transcription by showing that the activated form of phytochrome binds to a transcription factor that, in turn, binds to an element found in some light-responsive gene promoters.

SETTING BOUNDARIES

Telomerase is a ribonucleoprotein (RNP) enzyme that replenishes the ends of eukaryotic chromosomes by using a small portion of its RNA component as a template for DNA synthesis. Working with the yeast enzyme, Tzfati *et al.* (p. 863) show that the template boundaries (the sites at which DNA synthesis begins and ends) are determined not by the telomerase protein component but by a phylogenetically conserved secondary structure in the non-template region of the RNA.

GENE EXPRESSION AT ITS CORE

The discovery that the TATA-binding protein (TBP)-related factor 1 (TRF1) is expressed in a tissue-restricted fashion during *Drosophila* embryogenesis raised the possibility that the core RNA polymerase II machinery might display tissue-specific properties. Now, Holmes and Tjian (p.

867) have found a TRF1-responsive promoter in the *Drosophila* gene *tudor*. The *tudor* gene contains two tandem start sites; transcription from start site 1 is stimulated by TBP, while transcription from start site 2 is stimulated by TRF1. This arrangement of tandem promoters could allow TRF1 to substitute for TBP in regulating specific subsets of genes.

SELF-DESTRUCTING INHIBITORS

Mammalian cells contain proteins that function as endogenous inhibitors of apoptosis (IAPs) and that act, at least in part, by inhibiting caspases (proteases that mediate signals leading to cell death). In thymocytes, apoptosis can be blocked by inhibitors of the proteasome (a protein complex that mediates proteolysis of ubiquitin-tagged proteins). Yang *et al.* (p. 874) find that the IAPs have ubiquitin ligase activity and that they appear to catalyze auto-ubiquitination. This activity increases in response to apoptotic stimuli, indicating that regulated proteolysis of IAPs contributes to control of cell death in thymocytes.

PACKING THE HERPESVIRUS CAPSID

Human herpesviruses cause a variety of ailments ranging from cold sores to cancers. Now Zhou *et al.* (p. 877) have determined the three-dimensional structure of the herpesvirus capsid—a 0.2-billion-dalton capsid shell of four unrelated proteins—at 8.5 angstrom resolution by electron cryomicroscopy. The structure reveals how the four proteins are arranged in the hexon, penton, and triplex subunits; α helices can be identified at domains involved in capsid assembly and DNA packaging.

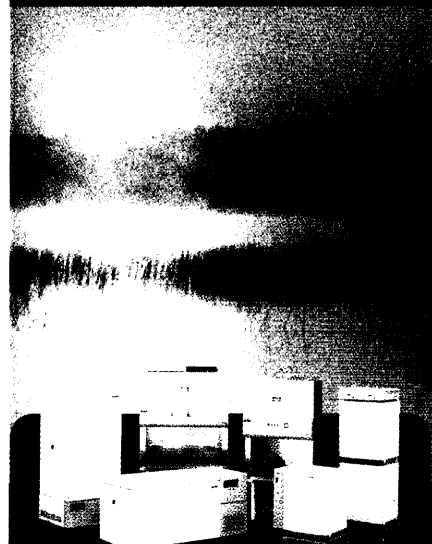
TECHNICAL COMMENT SUMMARIES

Extraordinary Evidence or Extraordinary Conclusion?

The full text of these comments can be seen at www.sciencemag.org/cgi/content/full/288/5467/771a

Gould *et al.* (Reports, 15 Oct., p. 548) found evidence that new neurons are added to neocortical association areas of adult monkeys and suggested that such neurons "may play a role in the functions of association neocortex." Nowakowski and Hayes take issue with several key points in the Gould *et al.* analysis. They note, for example, that the use of bromodeoxyuridine (BrdU) labeling and immunohistochemical detection could label cells undergoing DNA repair rather than mitosis, and that the interpretation of BrdU-labeled cells as neurons migrating from the subventricular zone to neocortex implies an unusually fast neuronal migration rate. They also argue that calculations of neuron growth based on the work of Gould *et al.* "imply three specific, experimentally verifiable predictions, none of which have yet been supported." In their response, Gould and Gross present additional data to support the notion that BrdU is indeed labeling cells that are preparing for division, argue that the supposedly excessive speed of neuronal migration cited by Nowakowski and Hayes lies "within the range of previously reported neuronal migrations," and suggest that some of the neuron-growth calculations of Nowakowski and Hayes may rest on a misreading of the data presented by Gould *et al.*

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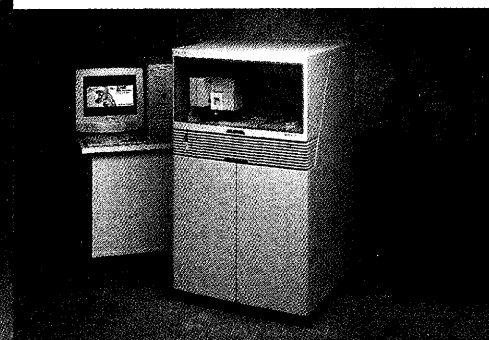
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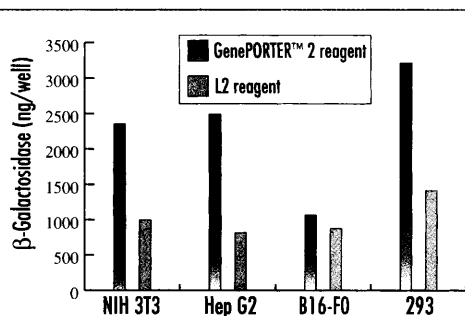
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BHK-21	Primary hepatocytes
CHO-K1	NSC34
DDT1 MF-2	D6P2T
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HeLa S3	CFT-1
SW 1353	Chicken cardiomyocyte
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FaDu	Y-79
LNCaP.FGC	T-84
PC-3	C ₂ C ₁₂
U-87 MG	BC 3H1
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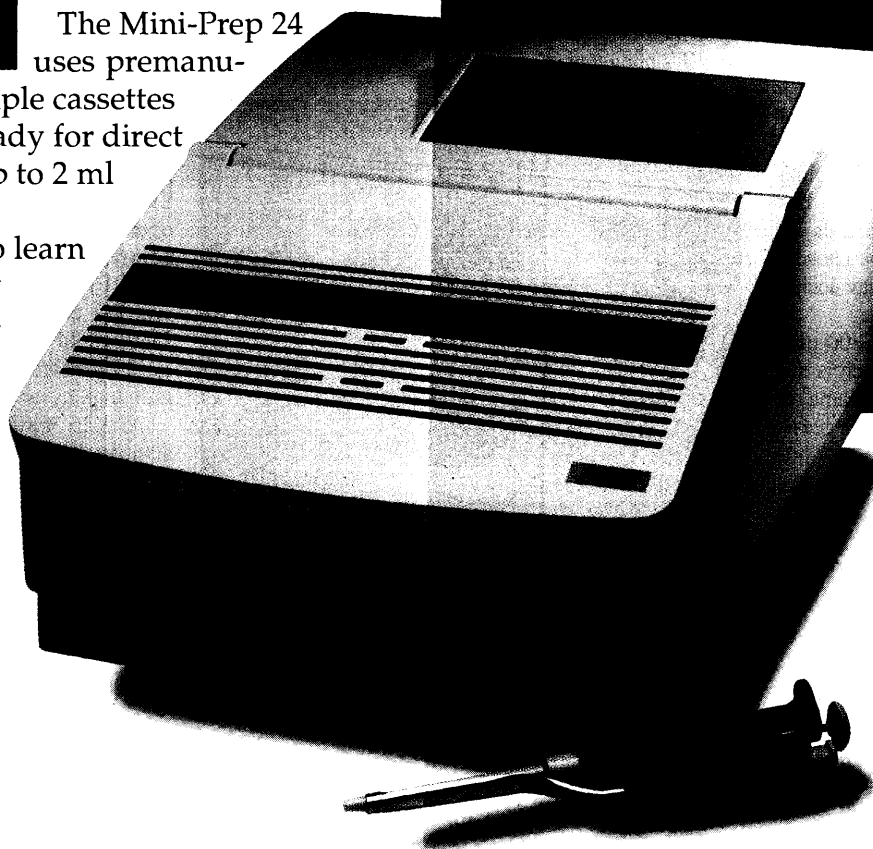
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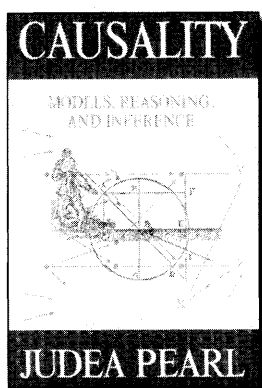
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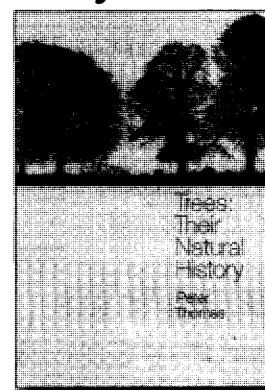
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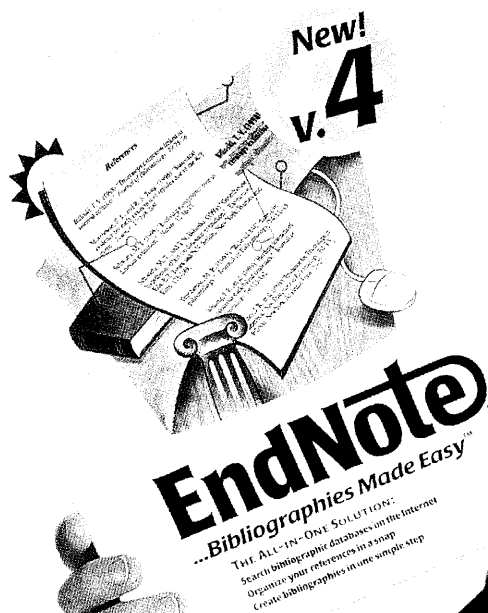
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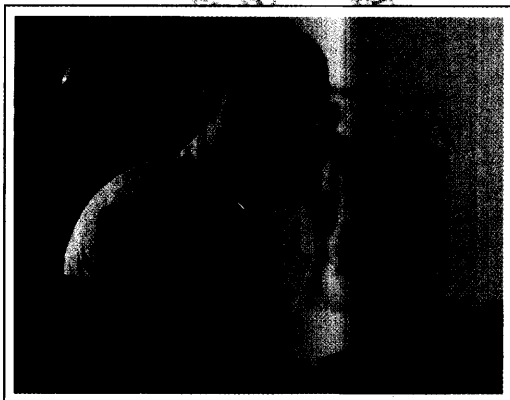


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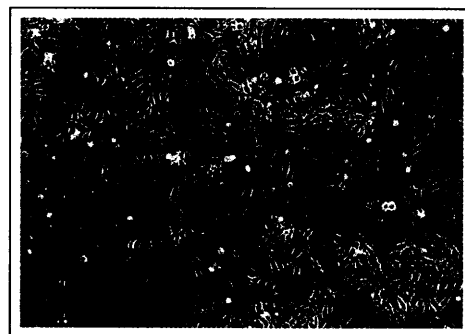
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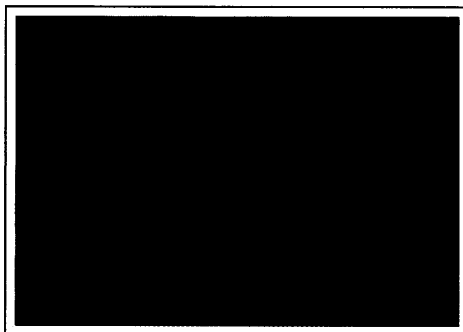
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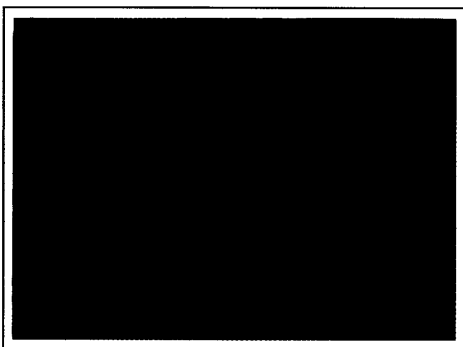
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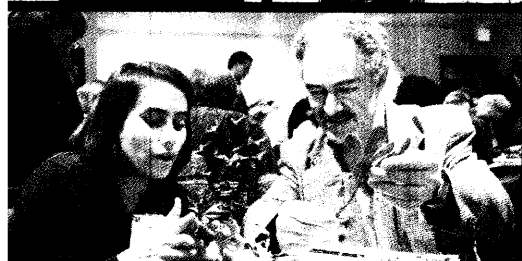
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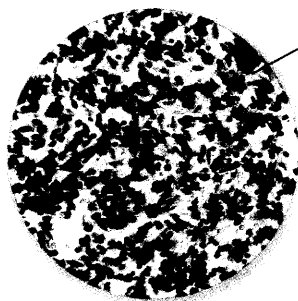
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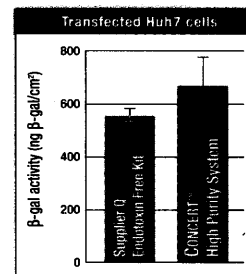
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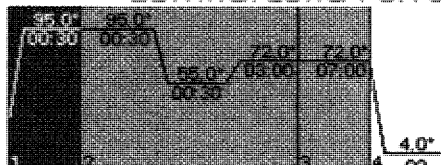
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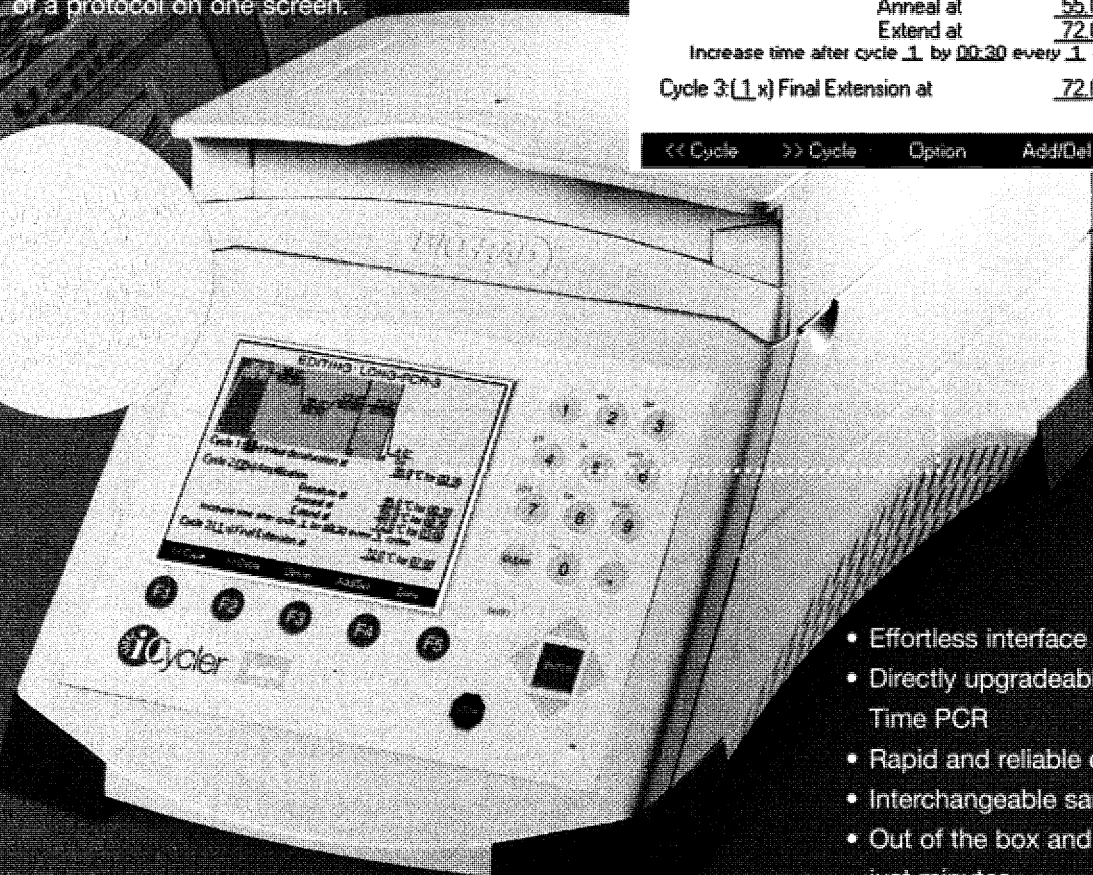
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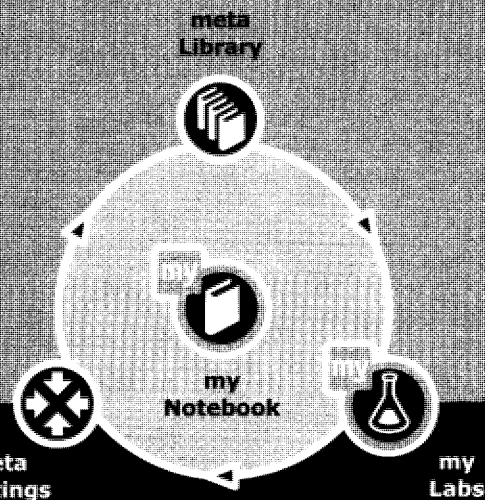
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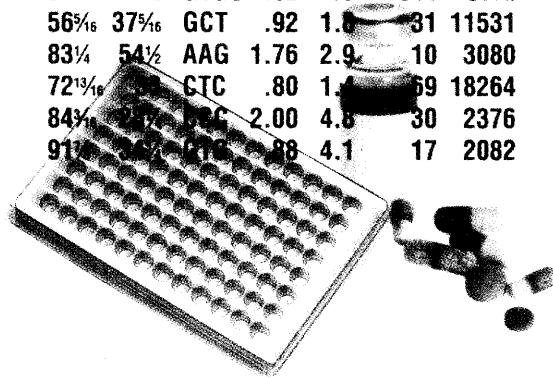
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FY00 Department of Defense Research on Combat Casualty Care Related Topics



The U.S. Army is soliciting proposals for \$1.1 million in research on combat casualty care related topics. The Combat Casualty Care Research Program provides integrated capabilities for far-forward medical care to reduce mortality and morbidity associated with major battlefield wounds and injuries. The goals of the research and development effort are to extend the "Golden Hour" for treatment in order to improve survival and minimize morbidity after life-threatening injuries, and to provide military medical capabilities for far-forward medical or surgical care of battle and non-battle injuries. Preproposals are due by 5/26/00. Detailed information is available from the U.S. Army Medical Research and Materiel Command (USAMRMC) at <http://www.usamraa.army.mil>. POC: Craig D. Lebo, Contracting Officer (301) 619-2036.

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THE CANON NATIONAL PARKS SCIENCE SCHOLARS PROGRAM

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National Park Foundation

American Association for the Advancement of Science

The Canon National Parks Science Scholars Program will award scholarships to eight doctoral students in 2000. Each student selected will receive \$25,000 per year for up to three years to conduct research in the national parks. The Program is underwritten by Canon U.S.A., Inc.

The 2000 competition will focus on four research topics within the biological, physical, social and cultural sciences. The research topics are of critical importance to the management of the National Park System and selected by the National Park Service. Students applying for 2000 scholarships must submit dissertation proposals that address these topics.

Visit <http://www.nps.gov/socialscience/waso/acts.htm> for an application and guidelines, or contact Dr. Gary Machlis, Program Coordinator, Canon National Parks Science Scholars Program, Natural Resource Stewardship and Science, National Park Service, 1849 C Street, NW (MIB 3127), Washington, DC 20240, gmachlis@uidaho.edu.

Applications are due 1 June 2000. Winners will be announced in early August 2000.

MACS for RAT

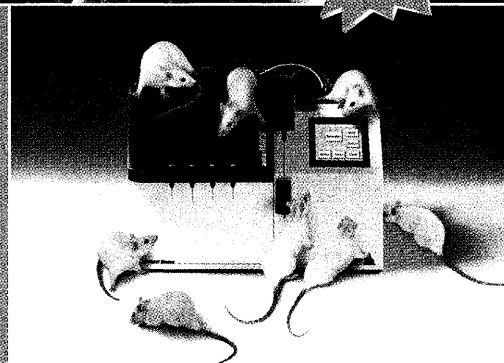
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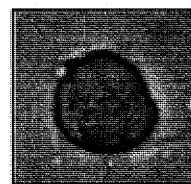
ESGRO® is a unique cell culture reagent that maintains *in vitro* the pluripotential of murine embryonic stem cells used in the production of knockout mice. Recombinant murine LIF, the active ingredient of ESGRO®, inhibits the spontaneous differentiation of ES cells in culture.

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LIF - U.S. Patent No. 5,427,925 & 5,187,077 & 5,443,825 & one pending.
ES Cell Patents - U.S. Patent No. 5,166,065 and two pending.

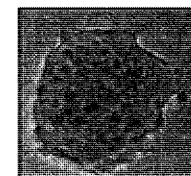
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