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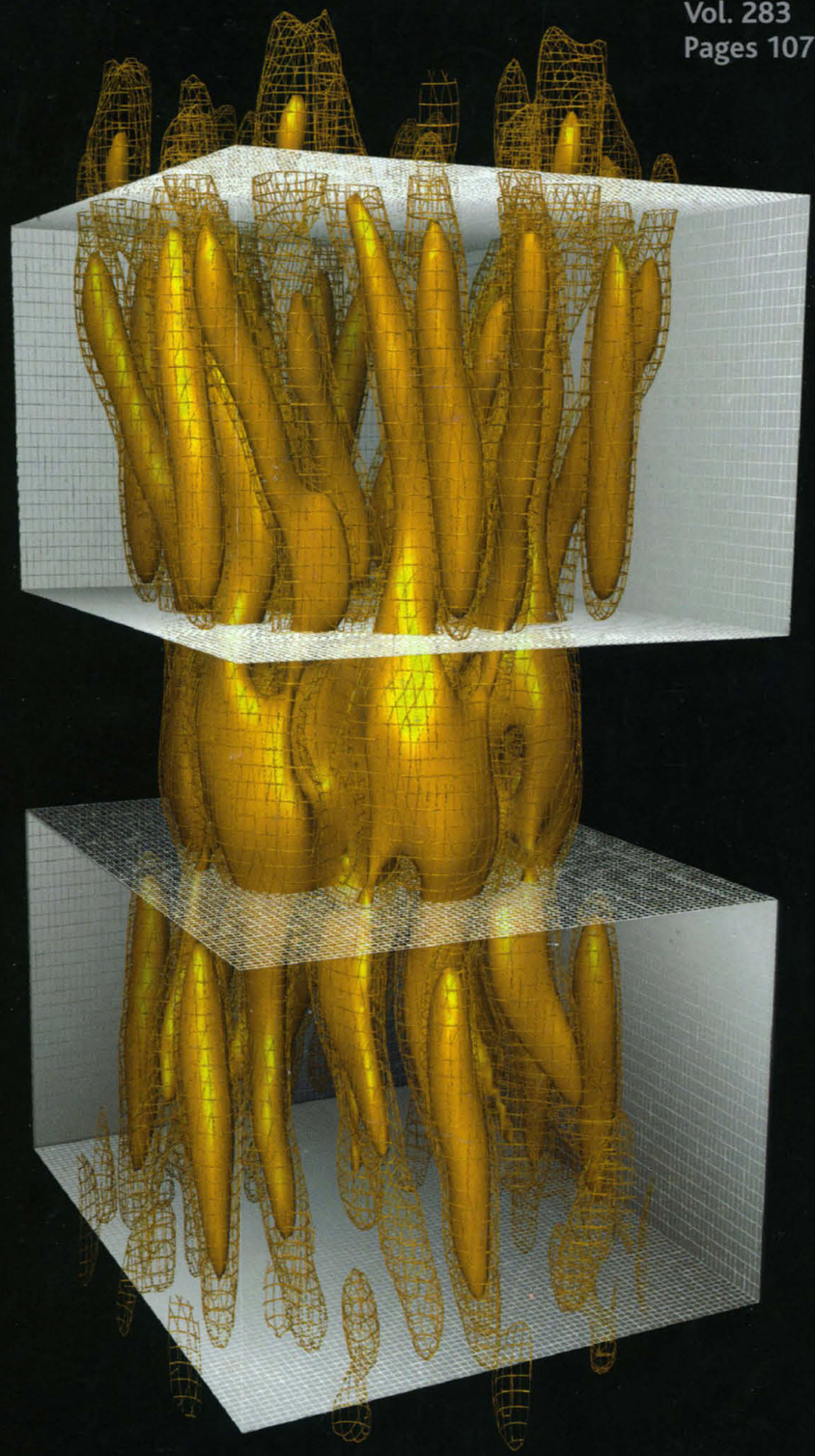

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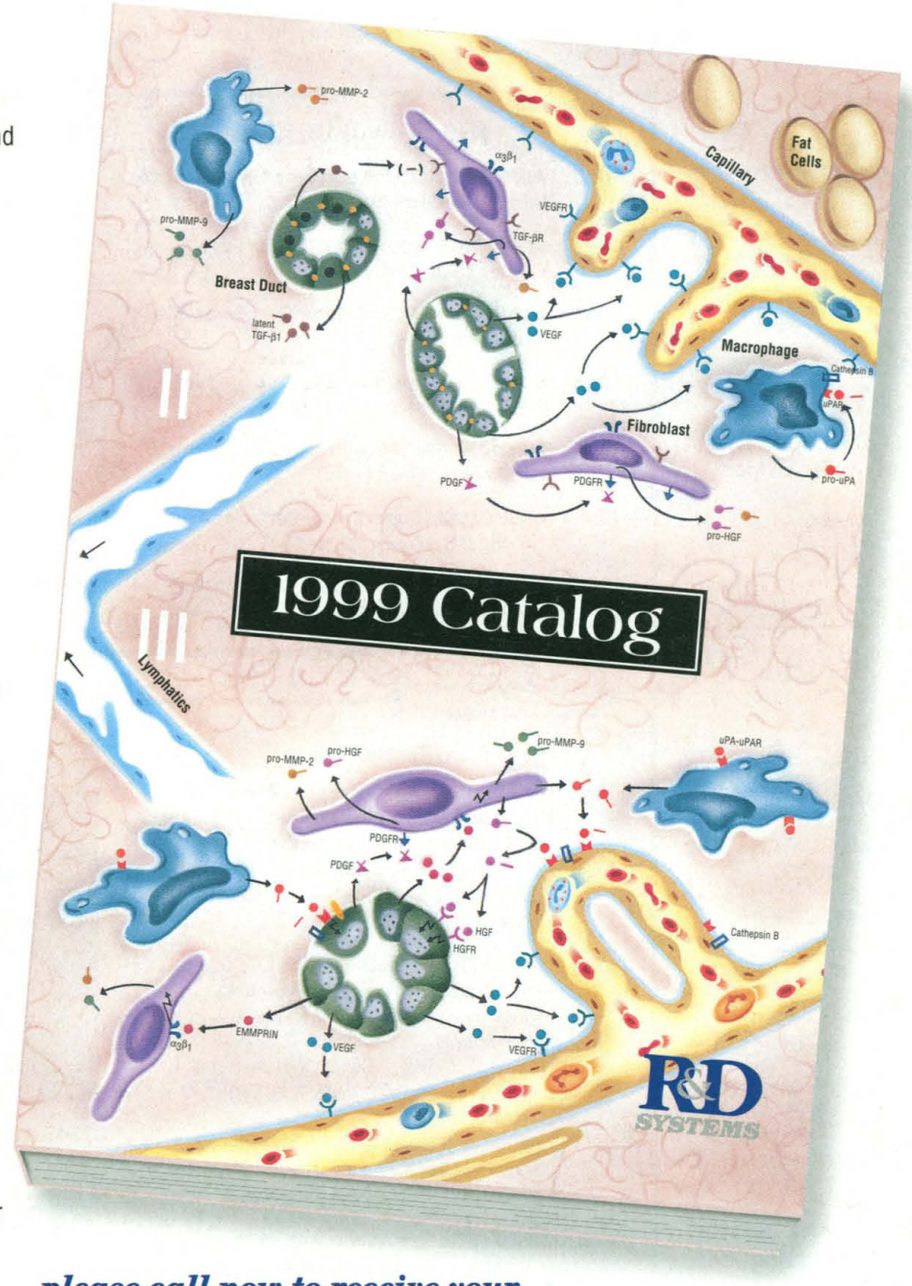

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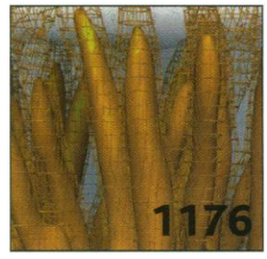
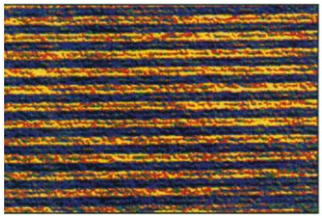


Cover Gap junction membrane channels between adjacent cells allow passage of ions and small molecules that coordinate electrical and metabolic activities in tissues. In the heart such channels mediate current flow from cell to cell, thereby synchronizing the heartbeat. This density map of a cardiac gap junction channel (solid and mesh density; ~150 Å long) reveals 24 protein α helices (gold rods) spanning each cell membrane (white boxes). [Computer graphics: M. Pique and M. Yeager]



1106
Superconductivity shows its stripes

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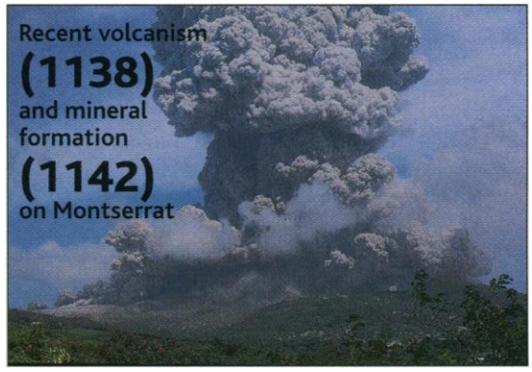
REPORTS



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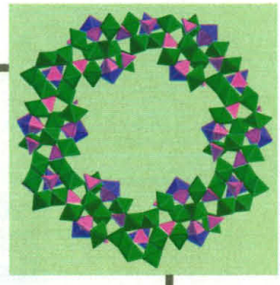

1125
Giant pores for new applications

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1158
Of mice and men: Deciphering a source of congenital heart defects

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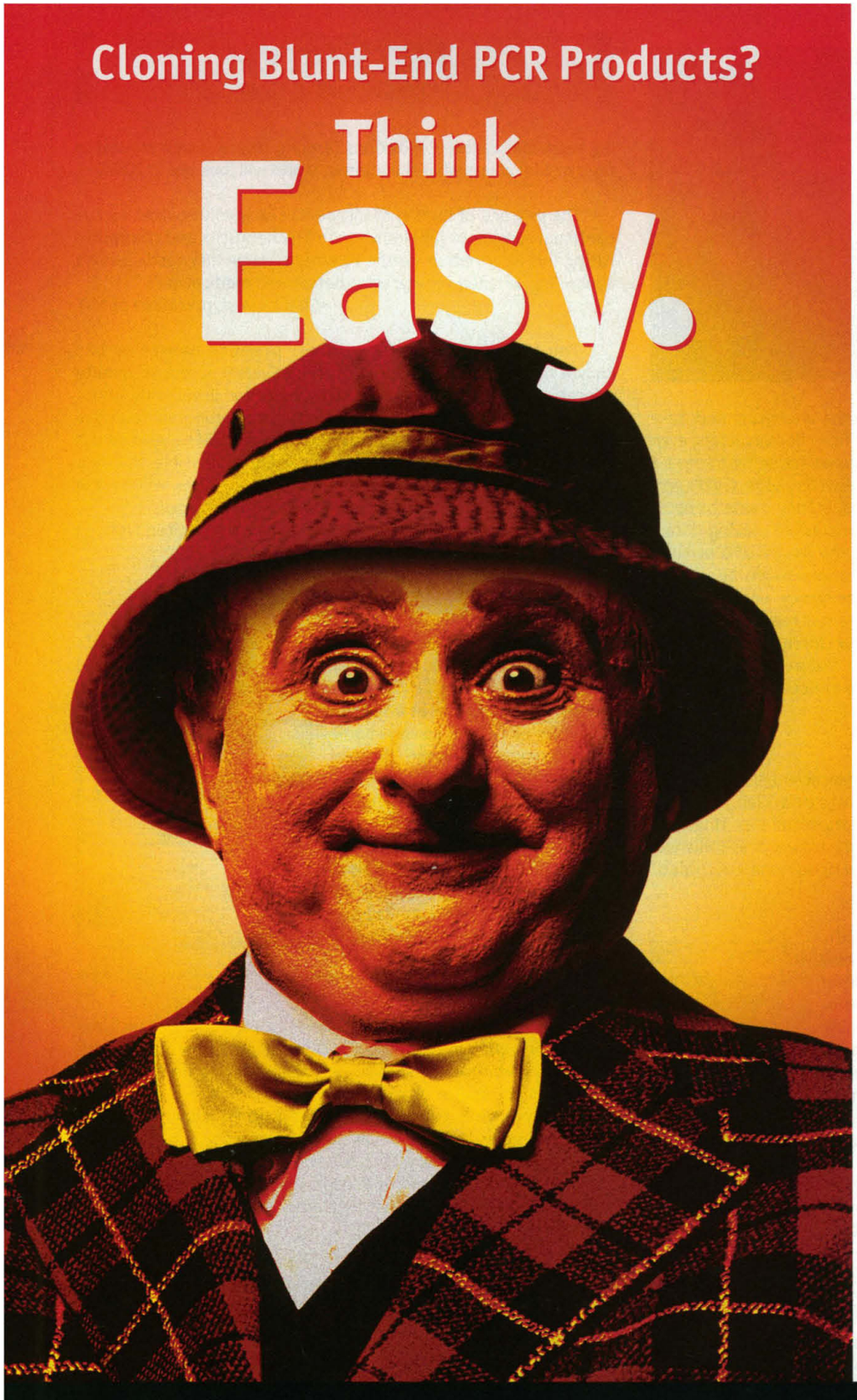

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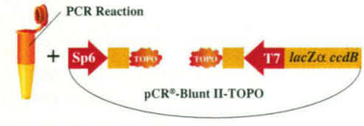

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INTERSTELLAR STARTING MATERIALS

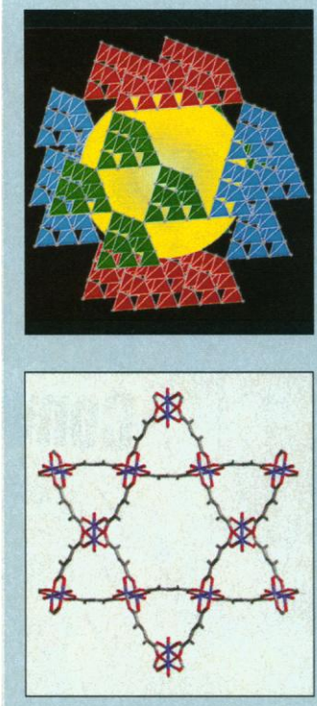
Polycyclic aromatic hydrocarbons (PAHs) are ubiquitous in the interstellar medium (ISM), where they are trapped in ices of cold, dense molecular clouds. Bernstein *et al.* (p. 1135; see the Perspective by Ehrenfreund) conducted laboratory experiments to determine if ultraviolet irradiation of PAHs trapped in water ice could produce more complex organic compounds. Infrared spectra indicated that the PAHs could undergo oxidization to form ketones, ethers, and alcohols or be reduced to form compounds with partially hydrogenated rings. Interstellar PAHs may be a source for more complex organic (and possibly biogenic) compounds found on planets and in extraterrestrial samples.

MAKING MINERALS IN A CYCLIC VOLCANO

The eruption of Soufriere Hills in Montserrat, which began in July 1995 and continues still, devastated the island and forced the evacuation of most of the inhabitants. Voight *et al.* (p. 1138) describe the cyclic behavior of the volcanic eruptions, earthquakes, and dome building and how this pattern allowed some short-term forecasting and an understanding of the dynamics of the magma system. One unexpected additional hazard associated with the volcano was the surprisingly high abundance, up to 24%, of cristobalite, a form of crystalline silica and known health hazard, in some of the eruption plumes. Baxter *et al.* (p. 1142) document that the cristobalite occurs in eruptions associated with collapse of a lava dome but not in the main explosive eruptions originating from greater depth. Thus, the formation of cristobalite is occurring in situ in the lava dome.

TAKING A STRANGE BOUNCE

When the momentum associated with a particle acts in the same direction as its velocity, the momentum is said to be parallel to the velocity. Hence, a tennis ball hits a racket and the racket recoils backward. However, superfluid helium-4 is predicted to contain particles, negative momentum rotons, that have their momentum in the opposite direction to the velocity. In the tennis analogy, if the ball had antiparallel momentum, the racket would still recoil on impact with the ball but in the forward direction, counter to our intuition. Tucker and Wyatt (p. 1150) verify the existence of these particles from angle-resolved quantum evaporation experiments.



EXTENDING THE RANGE OF MICROPOROUS MATERIALS

Crystalline microporous materials, which can be useful in catalysis and in separations, are usually formed from oxides (such as silica or alumina) or from metal phosphates. Previous attempts to create alternatives in metal sulfides or metal organics have been unsuccessful, however, because the desired lattice tends to fill in or else collapse after the templates used to create the pores are removed (see the Perspective by Férey and Cheetham). Attempts at creating open-framework sulfides usually form densely packed crystals, in part because of the different tetrahedral angle at the sulfur atom compared with oxygen. Li *et al.* (p. 1145) show that strategies based on assembly of larger tetrahedral units can lead to stable indium sulfide materials with interconnecting channels 2.6 nanometers in diameter. The semiconducting properties of such sulfides could eventually lead to materials with unusual electronic properties. Chui *et al.* (p. 1148) report that the hydrothermal reaction of copper nitrate and trimesic acid in the presence of ethanol creates an open-framework material with 1 nanometer pores and an accessible porosity of 40%. The material is stable up to 240°C, and water bound to the copper centers can be replaced by pyridine.

A GENETIC HAND-LE ON CATCH-22

Patients with CATCH-22 syndrome have abnormalities in tissues derived from neural crest cells, most notably cardiac and craniofacial defects, and the vast majority show deletions of chromosome 22q11. Yamagishi *et al.* (p. 1158; see the news story by Hagmann) provide evidence that the critical gene in the deleted region is *UFD1L*, the yeast homolog, which encodes a factor involved in degradation of ubiquitinated proteins. In mice, expression of *UFD1L* was dependent on dHAND, a transcription factor implicated in neural crest development, and all of the 182 CATCH-22 patients examined had deletions of *UFD1L*. These results suggest that ubiquitin-dependent proteolysis may play a role in neural crest development.

METHYLATION MYSTERIES

Genomic DNA contains many repetitive elements, including 5′-CpG sequences (adjacent CG bases). Methylation of these CpG sequences has been reported to silence transcription. Previous work concluded that a primary role of methylation is to modify transposable elements, thus preventing unwanted active transposition. This idea has been termed the genome defense model. Simmen *et al.* (p. 1164) examined methylation in a urochordate *Ciona intestinalis*, an organism that contains comparable amounts of methylated and nonmethylated DNA. Restriction enzyme analysis showed that the majority of *C. intestinalis* genes are methylated, and transposable elements are unmethylated. Thus, the genome defense model does not hold with the urochordate *C. intestinalis*.

HEARTS DIVIDED

During embryogenesis, the vertebrate heart initially develops as a single tube that later divides into the atrial and ventricular chambers. Bao *et al.* (p. 1161) identify a gene that appears to play a critical role in heart chamber formation in the chick. This gene, *Irx4*, is expressed only in the ventricles and it encodes a protein containing an *Iroquois* homeodomain, a motif previously associated with pattern formation in other tissues. *Irx4* was found to regulate the expression of myosin isoforms that are specific for the atria or ventricles.

WALKING OR HOPPING?

The mechanism by which molecular motors move their cargo along microtubules has been the subject of much scrutiny. The basic idea is that motors are elongated molecules with two "heads" that "walk" along microtubules. This hypothesis would imply that a

CONTINUED ON PAGE 1083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single-headed motor should not be able to promote movement. Okada and Hirokawa (p. 1152) looked at a single-headed kinesin-like molecular motor. They found that it could in fact promote movement.

FINDING RNAS—THROUGH LINGUISTICS

A major challenge of the Human Genome Project is attaching meaning to the massive amounts of sequence information being generated. The task of predicting certain RNA sequences is even more complicated because structural comparisons are also needed. Lowe and Eddy (p. 1168) have adapted probabilistic modeling algorithms used in speech recognition and linguistics to identify a specific family of small nucleolar RNAs from the complete genomic sequence of the yeast *Saccharomyces cerevisiae*. The predictions were confirmed experimentally to function as methylation guides for ribosomal RNA.

ELEPHANT'S GRAVEYARD

Recently a threat to elephant conservation, in the form of a fatal hemorrhagic disease affecting elephants in zoos in North America, was identified. Richman *et al.* (p. 1171; see the news story by Ferber) found cytological and molecular evidence that the disease is associated with herpesviruses that grow in endothelial cells. The deaths in Asian elephants may have been the result of exposure to a herpesvirus that infects but is not lethal for African elephants.

GAP JUNCTIONS REVEALED

Gap junctions are composed of multiple subunits on the surface of two adjacent cells that need to be electrically or metabolically coupled, as in heart tissue. Unger *et al.* (p. 1176; see the cover) present a three-dimensional view of the gap junction channel itself, which reveals how the subunits are arranged. This structure shows how gap junctions allow unrestricted exchange between cells without leaking cell contents to the extracellular milieu.

A SIGNAL TO COME ON OVER

Neurotrophins, which are expressed in the vicinity of developing neurons, support the growth of axons that extend in search of their enervation targets. Patapoutian *et al.* (p. 1180) show that it is not the neurons that induce expression of these supportive factors—rather, it is the nearby ectoderm. Thus, signals from the ectoderm, possibly those of Wnt signaling proteins, promote the expression of neurotrophins in the mesenchyme, making these areas in turn attractive to growing axons.

MODERATING T CELL RESPONSES

Two critical controls on the human immune response, antigen presentation by dendritic cells and T cell help, can now be linked. Rissoan *et al.* (p. 1183; see the Perspective by Bottomly) show that the two known subsets of dendritic cells (DCs) are functionally distinct and induce the development of different subsets of helper T cells, thus controlling what type of response the organism makes. They also report that interleukin-4, produced by the T_H2 subset of helper T cells, kills the dendritic cells that foster T_H2 development, and that interferon-γ protects the same dendritic cell subset from destruction. This feedback mechanism may be important in limiting development of additional helper T cells late in a response.

TECHNICAL COMMENT SUMMARIES

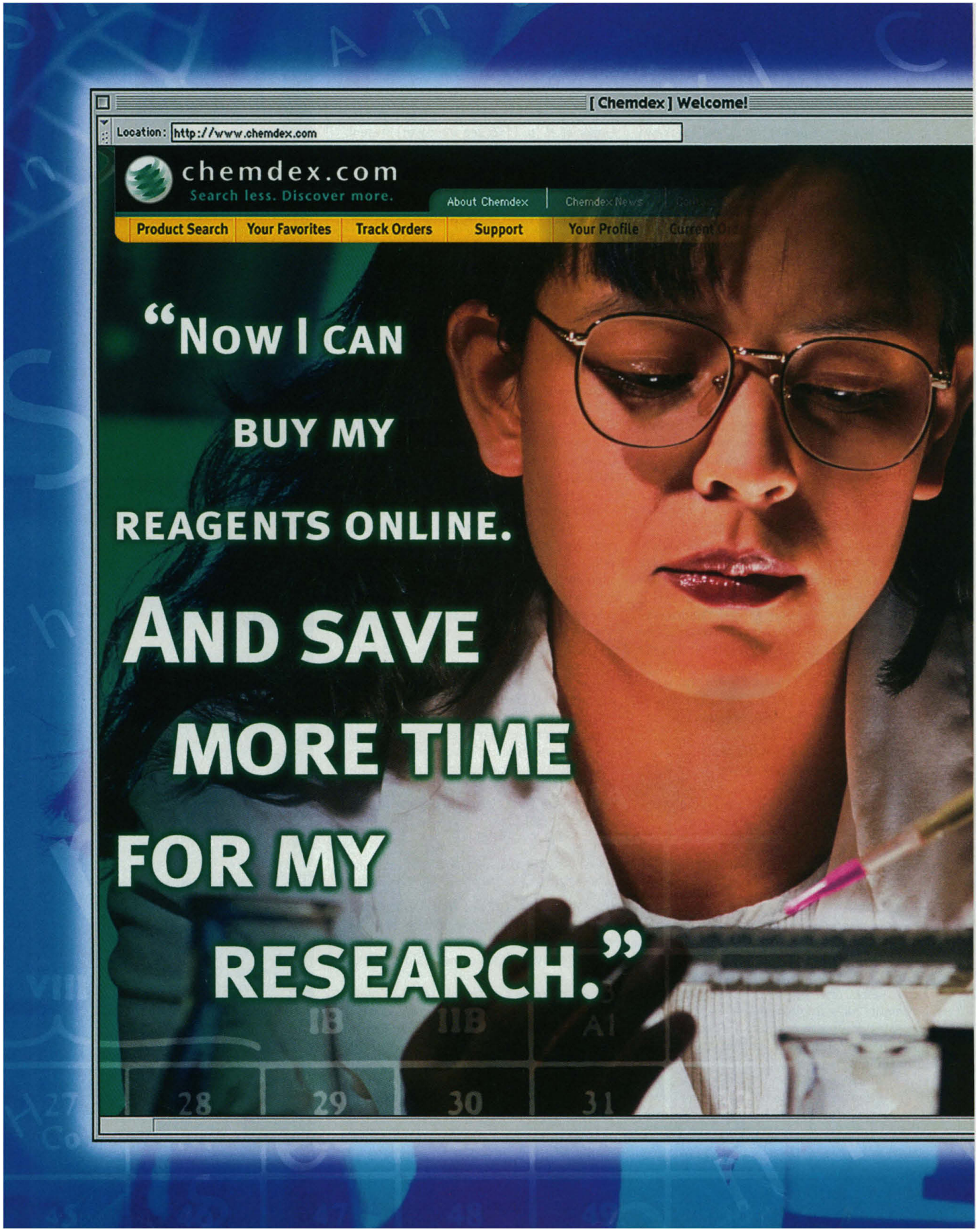
Sexual Selection and Sensory Exploitation

The full text of these comments can be seen at www.sciencemag.org/cgi/content/full/283/5405/1083a

M. J. Ryan (Reviews, Evolution of Sex, 25 Sept., p. 1999) stated "that traits and preferences often do not coevolve via genetic correlations, that female mating preferences for a given male trait are influenced by adaptations and constraints outside of the context of female responses to that particular trait, and that receiver biases can explain much of the diversity in male signaling phenotypes."

P. W. Sherman and H. K. Reeve comment that a female's putative "receiver bias" might "have originated, and be maintained, by the advantages of choosing conspecific males of superior quality...." They cite studies, give examples of such evolution in fish and frogs, and conclude that there is "mounting evidence that females' mate choices yield direct ... and indirect benefits (that is, good genes...)" to their species.

In response, Ryan discusses data (some from the same studies) that support his interpretation and defends his use of "the term 'exploitation' to describe the male's use of a given signal" to win female attention. He maintains "that many of the response biases associated with female mate preferences do not result from selection for adaptive mate choice [and] that they can be important in directing the evolution of sexually selected signals...."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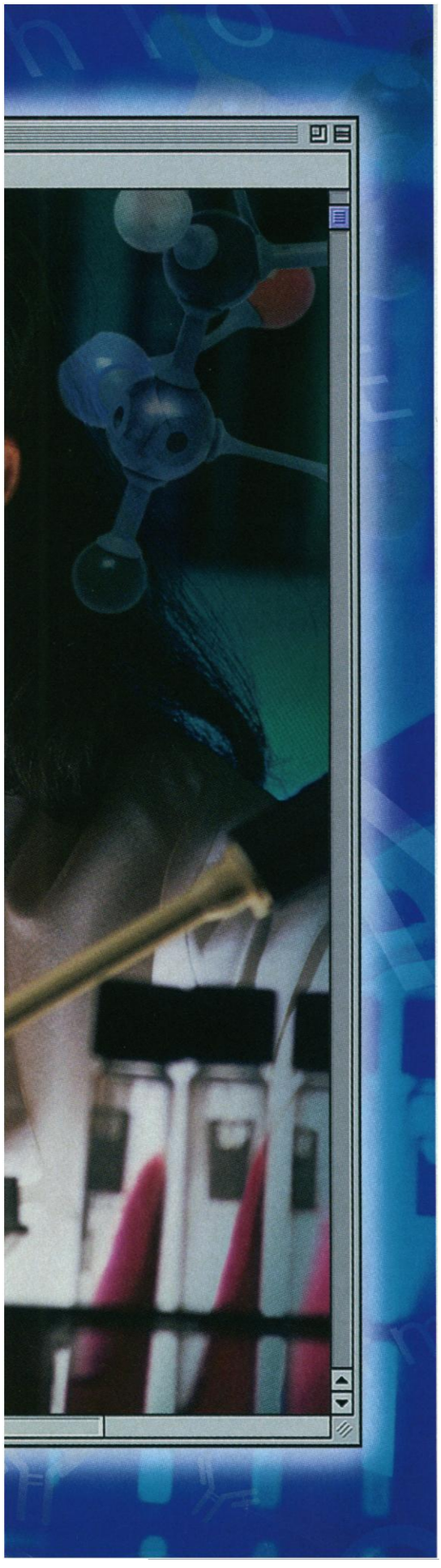

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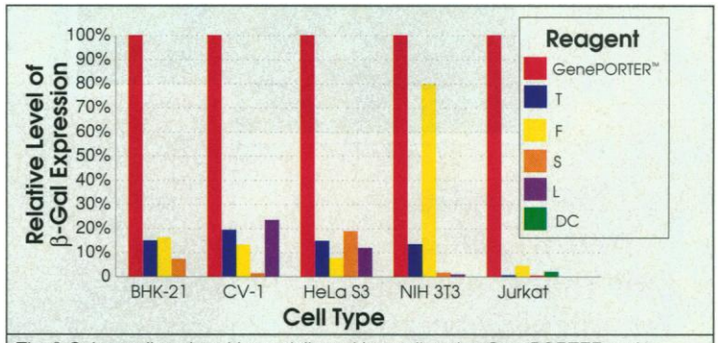

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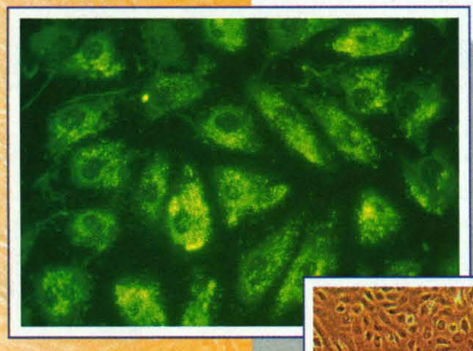

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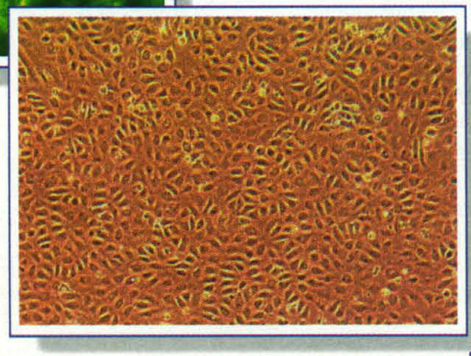

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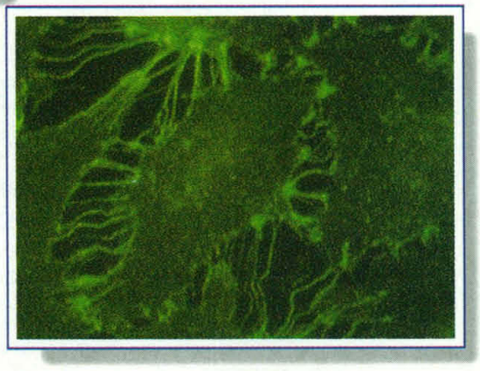

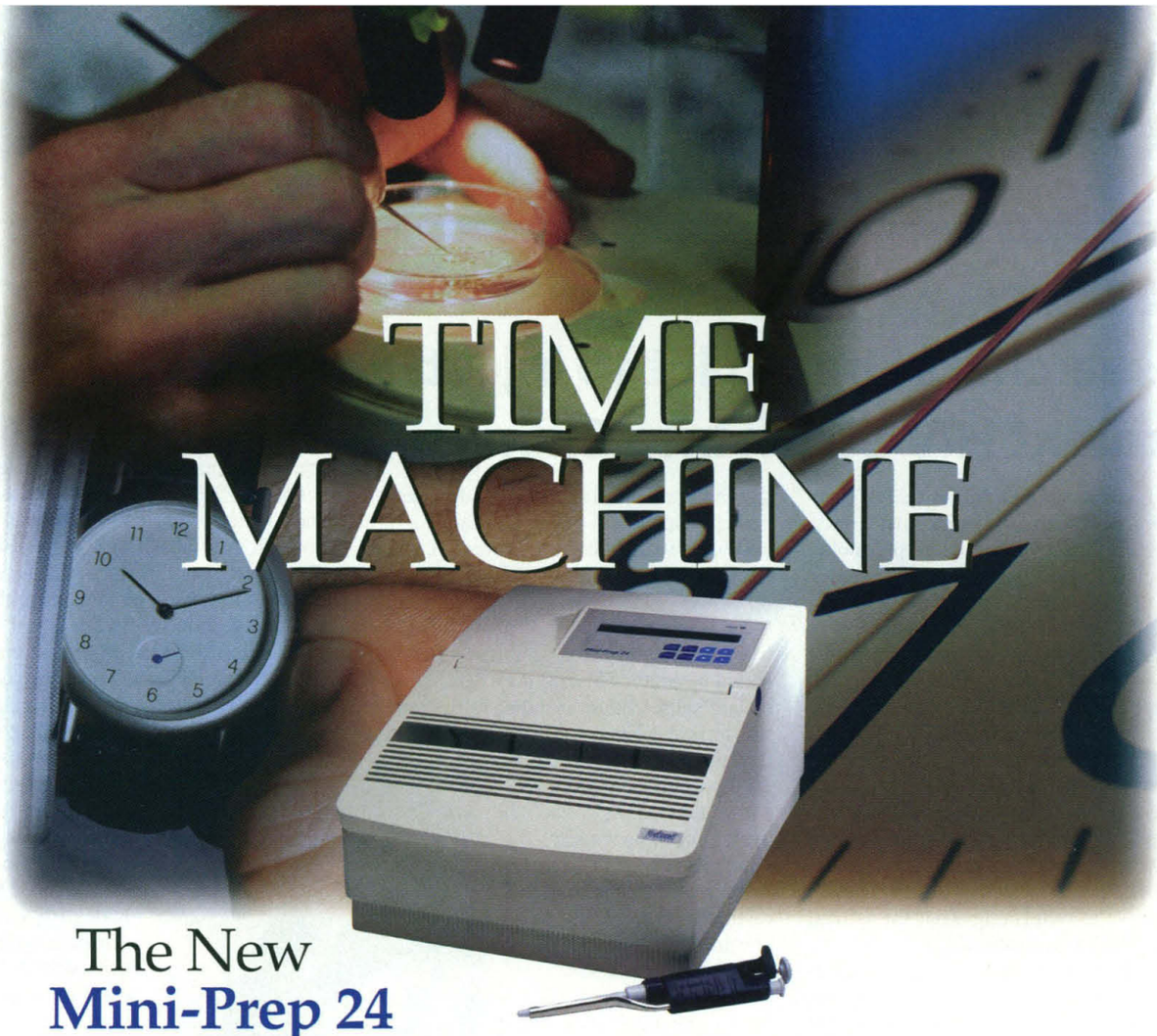

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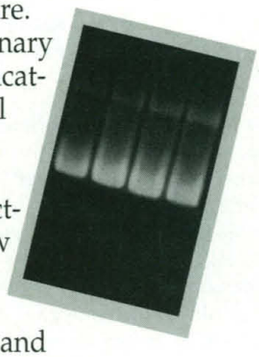

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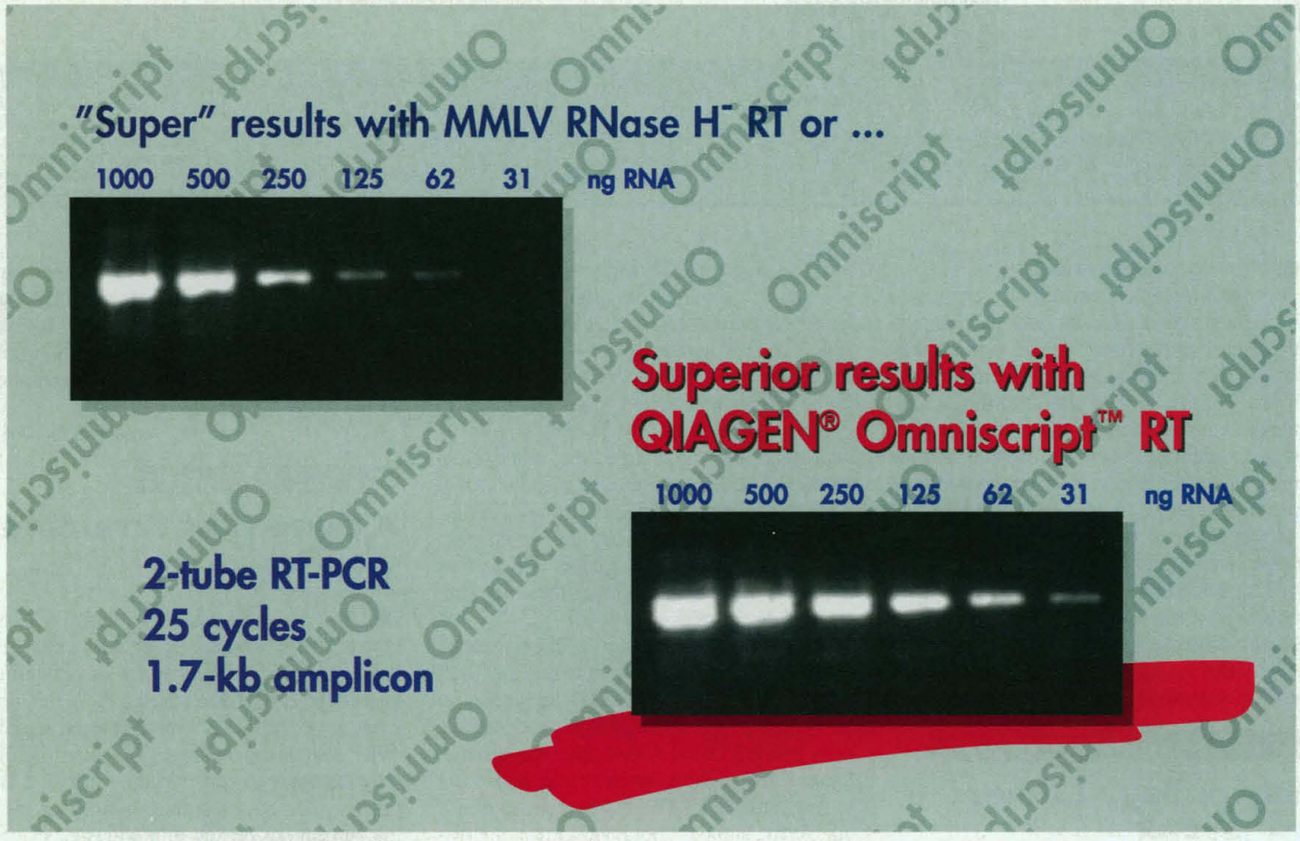

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The Foundation began its awards program in 1986 to recognize scientists who have made significant contributions to the understanding and treatment of Alzheimer's disease. Since then, this program has awarded millions of dollars.

Dr. Paul Greengard is the latest in our distinguished list of award winners.

Dr. Greengard is Vincent Astor Professor, Head of the Laboratory of Molecular and Cellular Neuroscience and Director of the Fisher Center for Alzheimer's Disease Research at The Rockefeller University in New York.

Intrigued by the mystery of how the brain's chemical messengers produce their effects on nerve cells, Dr. Greengard created a whole new branch of neurobiological research, and forged a path toward new treatments for Alzheimer's disease and other brain disorders.

Our congratulations and thanks to Dr. Greengard.

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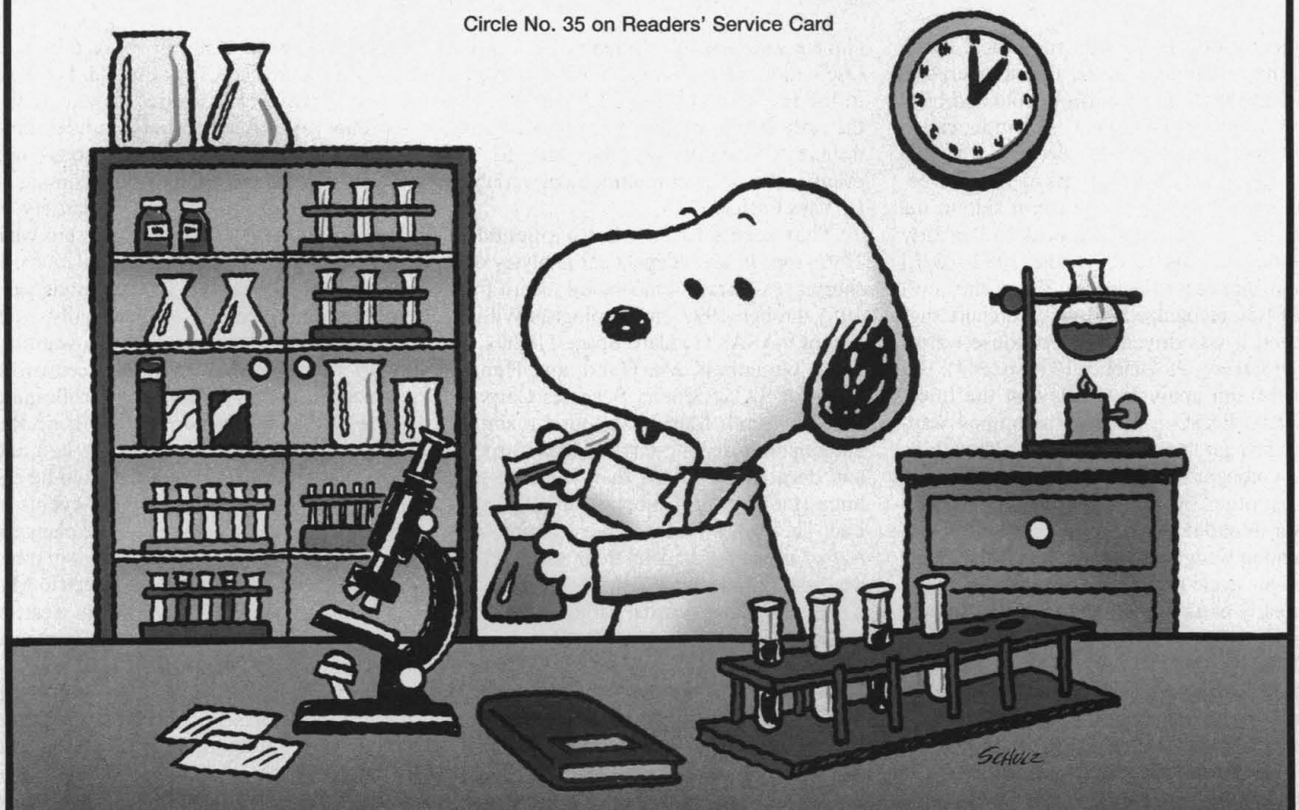

Science, Technology and the Knowledge Economy

24th Annual AAAS Colloquium on Science and Technology Policy

April 14 - 16, 1999, Renaissance Hotel, Washington, DC

The AAAS Science & Technology Policy Colloquium provides a forum in which federal and industrial policymakers and members of the scientific, engineering, and academic communities can participate in an open discussion of issues relating to science and technology policy.

The Colloquium occurs after the release of the President's budget but before final congressional action, thus allowing for the timely exchange of information about the budget and the consequences of various policy issues involving science and technology.

WHO SHOULD ATTEND: Scientists, administrators, industrial R&D managers, policymakers, academicians, association officials, federal grant recipients, students, and others with an interest in science and technology policy.

PROGRAM OVERVIEW

WEDNESDAY, APRIL 14

(Registration opens 12 noon; program starts at 2 p.m.)

KEYNOTE

Neal Lane, Assistant to the President for Science and Technology, and Director, OSTP

BUDGETARY AND POLICY CONTEXT FOR R&D IN FY 2000 (Plenary Symposium)

- Congressional Perspectives on S&T Issues for FY 2000
- AAAS Overview of Federal Budget Proposals for R&D in FY 2000
- Outlook for the National Economy
- Comparative National Efforts in R&D Support

THE WILLIAM D. CAREY LECTURE

(public invited)

Reception

THURSDAY, APRIL 15

GLOBALIZATION AND THE KNOWLEDGE ECONOMY (Plenary Symposium)

Perspectives of multinational firms, lesser-developed nations, research collaborators in different nations, and government officials

LUNCHEON AND ADDRESS

Frank Loy, Undersecretary for Global Affairs, U.S. Department of State

CONCURRENT SYMPOSIA

- Knowledge Management as a Strategic Asset in Industry
- How State Governments Are Dealing With the Knowledge Economy
- Do Current Systems of R&D Resource Allocation Foster or Stifle Creativity?

POLICY ROUNDTABLES WITH AGENCY OFFICIALS (Concurrent small group sessions)

DOD • NIH • NSF • DOE • NASA

FRIDAY, APRIL 16

BREAKFAST AND ADDRESS

(Speaker to be announced)

INFORMATION TECHNOLOGY: BACKBONE FOR THE KNOWLEDGE ECONOMY (Plenary Symposium)

National policies: system vulnerabilities and cyber-terrorism; electronic publishing for S&T; database protection, access, and manipulation

LUNCHEON AND ADDRESS

Charles Vest, President, MIT

Details and updated program information may be obtained by visiting the Colloquium Website, http://www.aaas.org/spp/r&d

Budget discussions will be supplemented by *AAAS Report XXIV: Research and Development, FY 2000*, a comprehensive analysis of the proposals for the FY 2000 budget, prepared by AAAS and a group of its affiliated scientific, engineering, and higher education associations. Registrants will receive this report at the Colloquium; the *2000 AAAS Science and Technology Policy Yearbook* (containing most of the Colloquium addresses, plus other significant items) in early fall; and *Congressional Action on R&D in the FY 2000 Budget* later in the fall.

REGISTER NOW by completing and returning the enclosed form. For further information, contact: Directorate for Science and Policy Programs, AAAS, 1200 New York Ave, NW, Washington, DC 20005. Fax: 202-289-4950. E-mail: snelson or syoung@aaas.org. Phone: 202-326-6600 (for information). To register by phone, call 202-326-7075 (automated service.) A more detailed version of the Colloquium program can be found on the AAAS homepage on the World Wide Web: http://www.aaas.org/spp/r&d.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

AAAS Colloquium on Science and Technology Policy

April 14 - 16, 1999, Renaissance Hotel, Washington, DC

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Cancellations must be faxed by April 1, 1999.

Deadline for advance registration is April 1, 1999.[1]

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Lunch (Fri. April 16)	$38

TOTAL AMOUNT DUE: $_____

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[1] After April 1, register in person at the Renaissance Hotel beginning at 12:00 p.m., April 14. On-site registration fees are $15 higher than advance registration fees.

[2] Nonprofit rates apply only to employees of government, academic, and nonprofit organizations. Student rates apply only to full-time undergraduate and graduate students and retirees.

[3] Refund requests for registration fees and meal tickets must be submitted in writing (to the address or fax number above) by April 1, 1999, and will be processed after the Colloquium. No refunds will be made for cancellations received after April 1.

Publications: All registrants receive *AAAS Report XXIV: Research & Development, FY 2000* at the meeting and the *2000 AAAS Science and Technology Policy Yearbook* in early fall and *Congressional Action on R&D in the FY 2000 Budget* later in the fall.

RENAISSANCE HOTEL RESERVATION FORM

AAAS S&T Policy Colloquium April 14 - 16, 1999

(After March 24, 1999, guest rooms and rate availability may be restricted)

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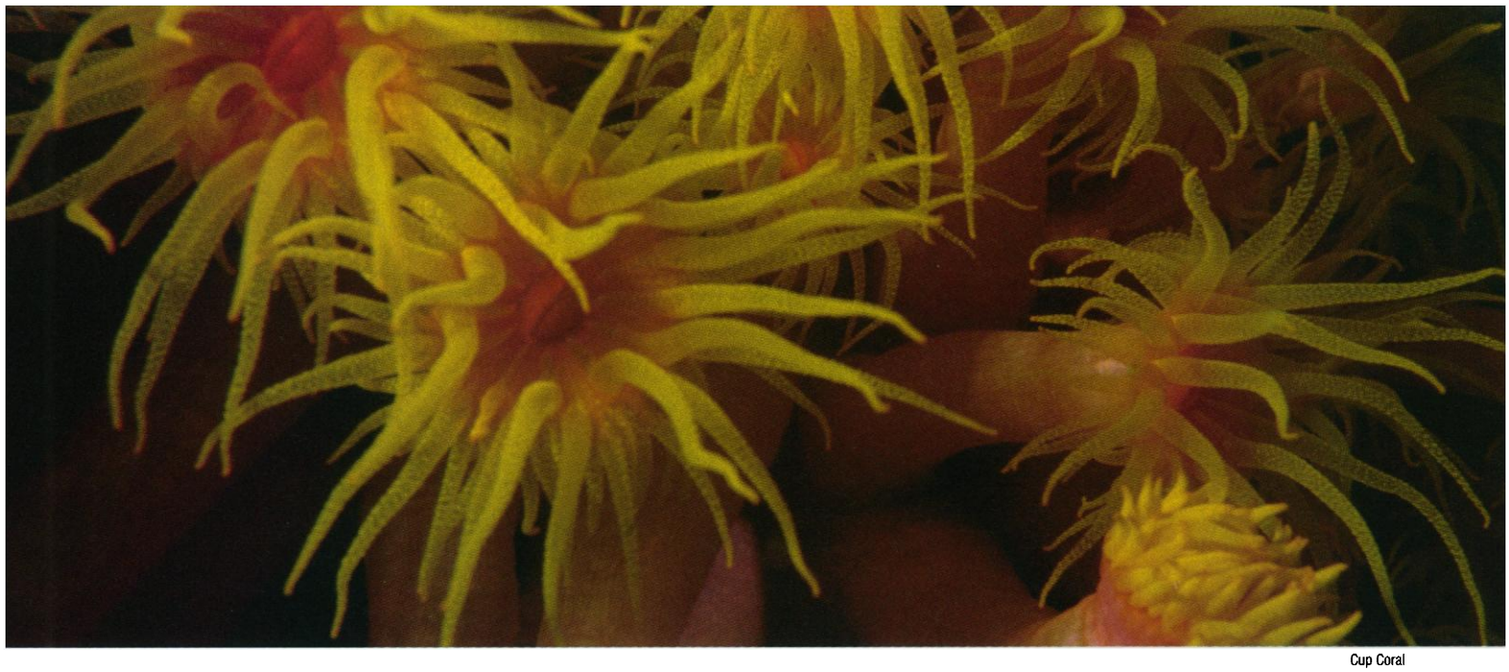

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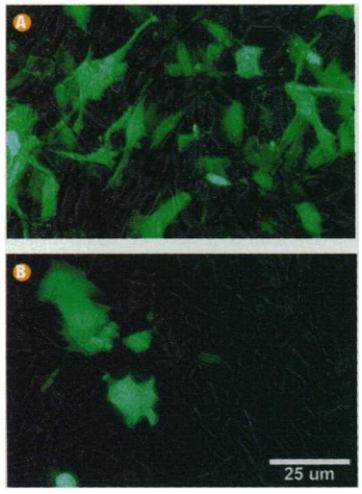

Expression of GFP in MC3T3-E1 cells, following transfection with vector phGFP-S65T using (A) FuGENE 6 Reagent or (B) leading supplier's liposomal transfection reagent (LF). *(Data courtesy of S. Ritter, Univ. of Texas, Houston, TX, USA)*

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