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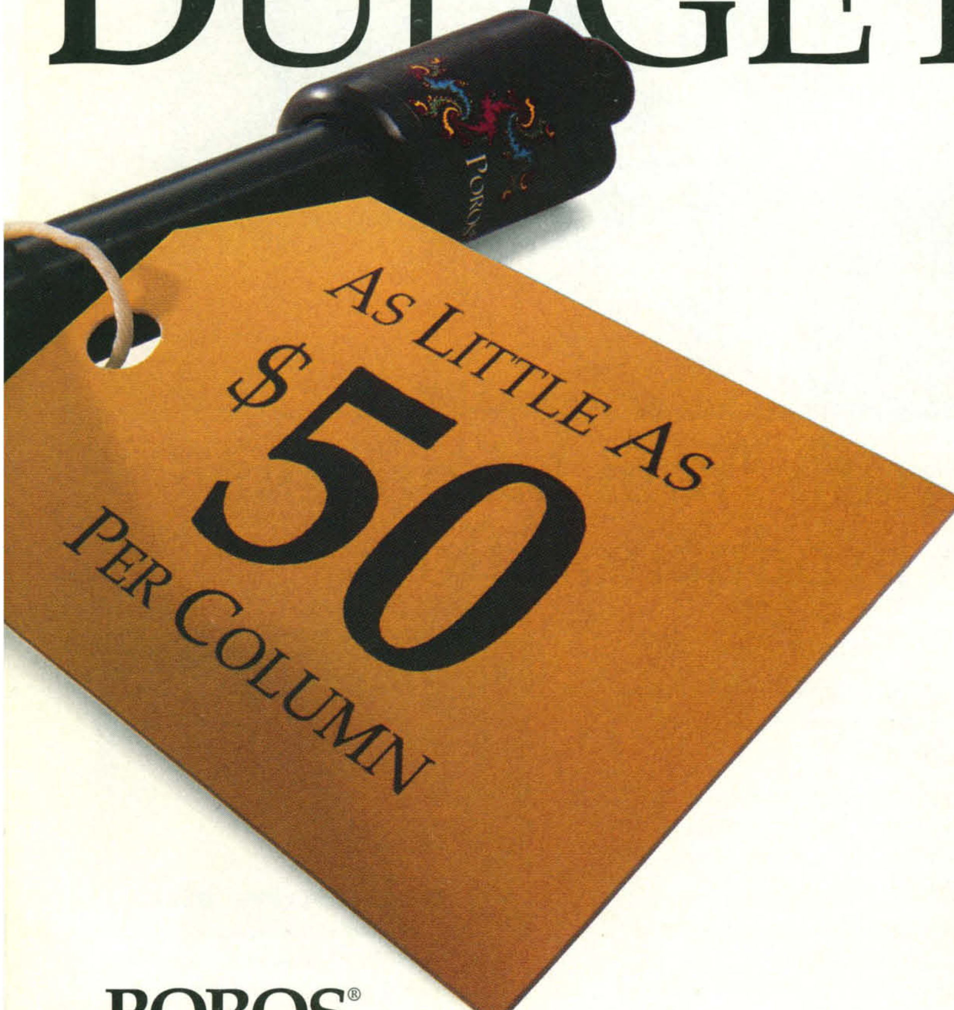

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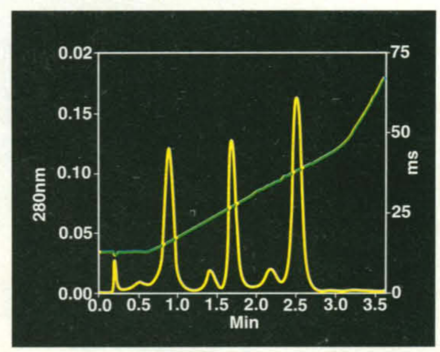

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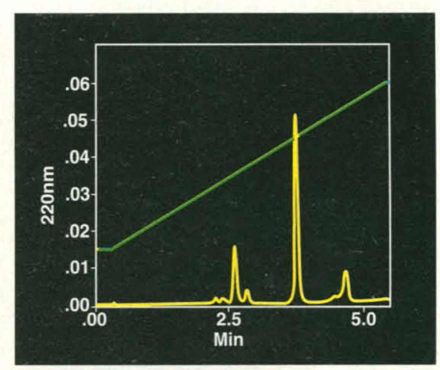

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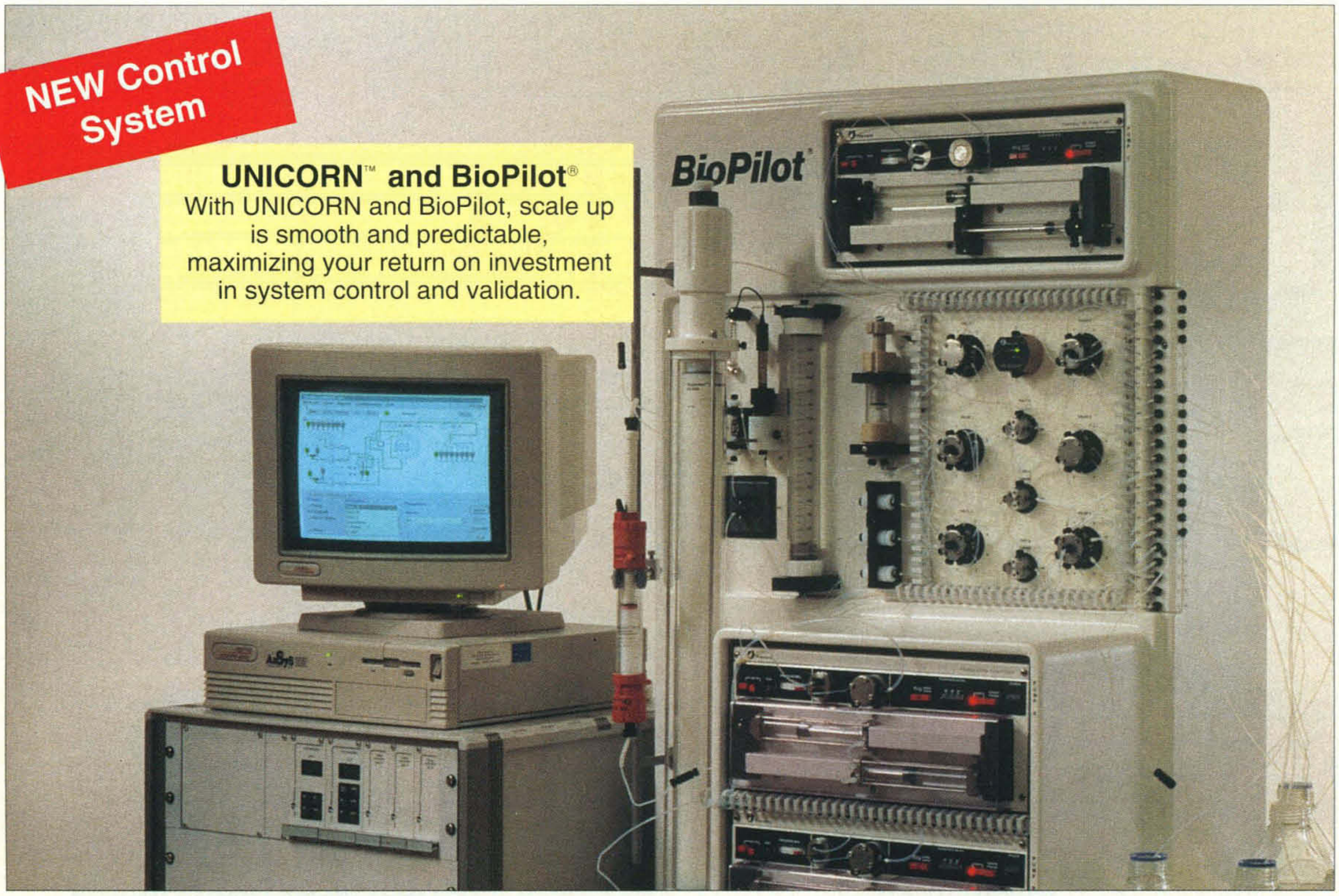

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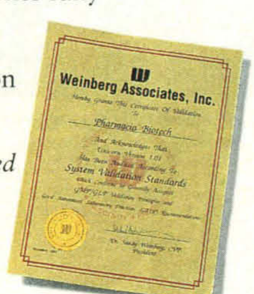

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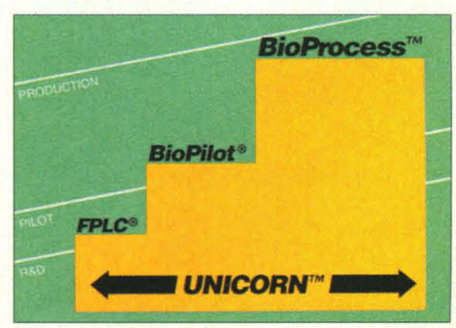

UNICORN control system is scaleable. It supervises BioPilot and BioProcess systems keeping documentation and user interface constant. 1140

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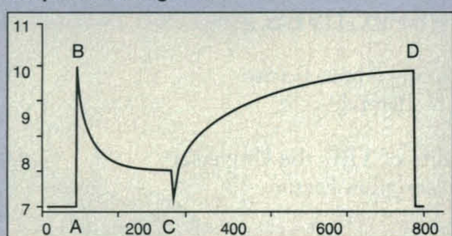

x-axis: Time (seconds)
y-axis: Relative Intensity

0 to A:	Background Fluorescence
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Benzodiazepine1,2	Antagonist
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Cannabinoid	Agonist
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Dopamine1	Antagonist
Dopamine2	Antagonist
Glycine Receptor (strychnine-insensitive)	
Glycine	Antagonist
Muscarinic Receptor	
Muscarinic-M1	Agonist
Muscarinic-M2	Antagonist
N-Methyl-D-Aspartate Receptor	
NMDA	Antagonist
Opioid Receptor	
Kappa1	Agonist
Peripheral Benzodiazepine Receptor	
Peripheral benzodiazepine	Antagonist
Potassium Channel	
Potassium channel	Antagonist
Sodium Channel Modulator	
Sodium channel	Antagonist
Adenosine	
Adenosine-A2a	Antagonist
Angiotensin I	
Angiotensin I	Antibody
Dopamine	
Dopamine	Reuptake blocker
Histamine	
Histamine-H1,	Antagonist
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NUMBER 5150

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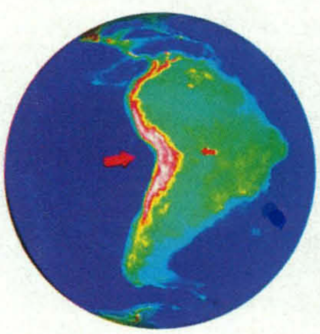
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

1087 & 1118
Java fossil redates human history



1105
Mapping mantle flow

NEWS & COMMENT

RESEARCH NEWS

PERSPECTIVES

ARTICLE

DEPARTMENTS

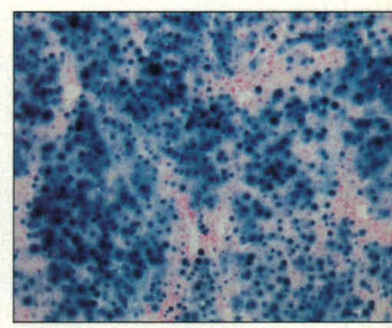
Board of Reviewing Editors

COVER

Cliffs of the Miocene Monterey Formation, Naples Beach, California. These finely laminated sedimentary rocks rich in organic matter were deposited during a period of worldwide cooling about 14 million years ago. A record of this climate change is revealed by the carbon isotopic signatures of certain molecules synthesized by organisms, such as marine algae and bacteria, and subsequently fossilized after the sediments were deposited. See page 1122. [Photo: Kevin Irwin, Chevron Petroleum Technology Company]

REPORTS

TECHNICAL COMMENTS



1149
Replacing diseased liver

◪ Indicates accompanying feature

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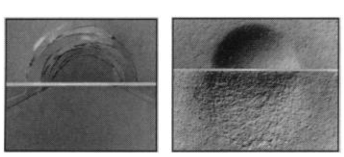
edited by PHIL SZUROMI

A state of flux

Although the weak links between grains in the current generation of high-temperature superconductors limits their current carrying capacity, these same weak links can be used to fabricate Josephson junctions for microelectronics applications. Fischer *et al.* (p. 1112) report scanning electron microscopy studies of nearest-neighbor superconducting grains of $YBa_2CuO_{7-\delta}$ that were grown epitaxially to form Josephson junctions. They directly imaged the magnetic flux arising from the quantum interference between two neighboring superconducting elements. Such studies allow the physics of these junctions to be more completely understood.

Tougher ceramics

Ceramics often lack toughness; rather than adsorb mechanical energy, these brittle materials crack and fail catastrophically. Toughness can be improved by weakening the interfaces between grains and by coarsening and elongating the grains. Lawn *et al.* (p. 1114) show that microstructural heterogeneity can be processed into brittle ceramics (silicon carbide and a glass-cer-



amic) in such a way as to make these materials "ductile." When subjected to a classical indentation test, large cracks did not propagate from the damage area. Instead, energy was adsorbed in the form of damage that was distributed throughout in a small zone. This ductile response can improve the resistance of these ceramic materials to wear and impact damage.

Connecting plate motions and mantle flows

Plate tectonics on the surface of the Earth is thought to be driven by convection in Earth's mantle. Although the surface manifestation of the convection is evident, resolution of the actual mantle flow and its correspondence to the observed movements of plates is problematic. Russo and Silver (p. 1105) use the splitting of certain seismic waves induced by a preferred orientation of minerals to infer the flow direction in the mantle beneath the Nazca Plate, which is being subducted beneath South America. The data imply that the mantle beneath many parts of the Nazca plate is flowing orthogonal to the subduction direction.

Older Java fossils

Homo erectus fossils from Java and China were generally thought to be much younger than *H. erectus* fossils found in Kenya and Tanzania. Swisher *et al.* (p. 1118; see news story by Gibbons, p. 1087), however, present argon-argon dates on minerals separated from volcanic rocks associated with two of the Java fossils that indicate that their ages, 1.81 million and 1.66 million years ago, are comparable to that of the oldest African *H. erectus* fossils. Characteristic stone cleavers associated with younger African *H. erectus* after 1.4 million years ago but lacking in the Java localities may reflect an early migration of *H. erectus* out of Africa.

Population explosions

In mathematical modeling of ecological systems, the aim is typically to determine the long-term behavior of species populations, which may be stable, periodic, or chaotic. Hastings and Higgins (p. 1133) provide a simple but realistic model in which the asymptotic behavior takes so long to be reached that for practical purposes the system never gets there, and is instead dominated by irregular transients. Their model is of a single species with a once-a-year breeding cycle, whose larvae are dispersed geographically (along a coastline, for example). From random initial conditions, the species can take as long as 10,000 years to settle into the appropriate long-term pattern. The result offers a new way of looking at unexpected population outbursts, such as occur in plankton or insect species.

Living longer

The accumulation of molecular lesions as a result of oxidative damage has been proposed as a cause of aging. Orr and Sohal (p. 1128; see Random Samples, p. 1094) added an additional copy of the genes for Cu-Zn superoxide dismutase and catalase, which are the primary enzymatic antioxidant defenses of cells, to fruit flies. The transgenic flies exhibit a one-third extension of lifespan, thus providing support for the free-radical theory of aging.

Risks of overstimulation

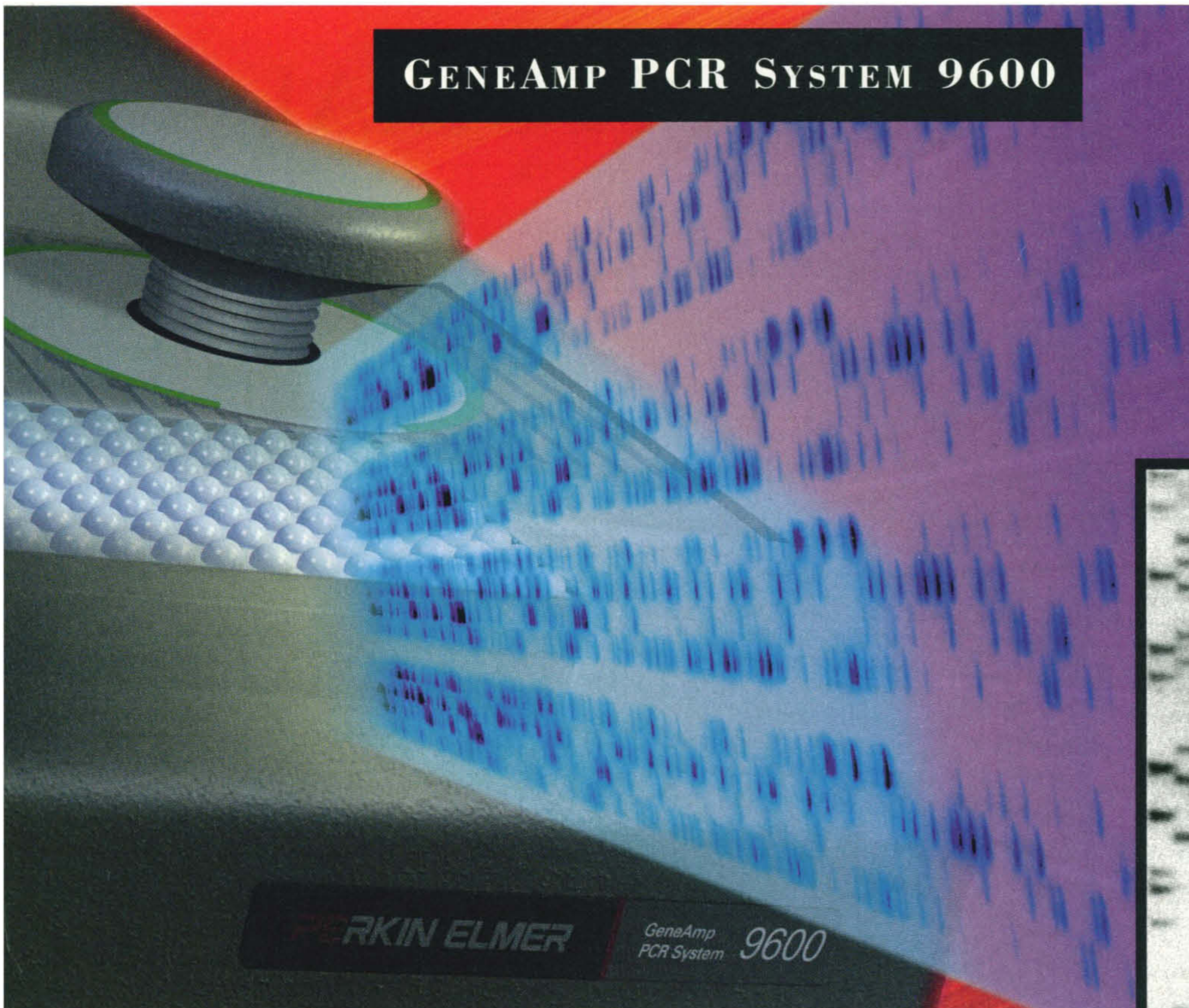
Resting T cells that encounter high doses of antigen do not proliferate, a phenomenon known as high-dose suppression. Critchfield *et al.* (p. 1139) studied this effect and in in vitro models showed that high concentrations of interleukin-2 and antigen caused T cell death. This process could be part of a regulatory feedback mechanism that normally attenuates an immune response. They then used high doses of antigen to selectively eliminate T cells that attack the body. Mice with experimental allergic encephalomyelitis that were treated with high doses of myelin basic protein, the antigen used to induce this autoimmune disorder, had no self-reactive T cells and showed no further symptoms of disease.

Cycling toward apoptosis

Inappropriate expression of $p34^{cdc2}$, a kinase that controls cell entry into mitosis, leads to "mitotic catastrophe," a process that involves nuclear disruption and morphologically resembles apoptosis. Shi *et al.* (p. 1143) establish a molecular link between mitotic catastrophe and apoptosis, showing that premature activation of $p34^{cdc2}$ is required for apoptosis induced by a lymphocyte granule protease. Because most forms of apoptosis are accompanied by nuclear disruption, activation of this kinase may be a general mechanism shared by other apoptotic pathways.

Complex control

Cyclin-cdk (cyclin-dependent protein kinase) complexes regulate the cell cycle in eukaryotes, but many cdk and cyclin-like molecules of unknown function have also been found. Kaffman *et al.* (p. 1153; see news story by Marx, p. 1093) report a new function for a cyclin-cdk complex in phosphate regulation in yeast. The PHO80 and PHO85 proteins form a cyclin-cdk complex that negatively regulates a transcription factor, PHO4, by phosphorylation.



DNA SEQUENCING OF RETROVIRAL LTR USING PCR PRODUCTS AMPLIFIED FROM NIH 3T3 FIBROBLAST CELL LINE ON THE GENEAMP PCR SYSTEM 9600. COURTESY OF PIA MARIA CHALLITA, CHILDREN'S HOSPITAL, LOS ANGELES, CALIFORNIA.

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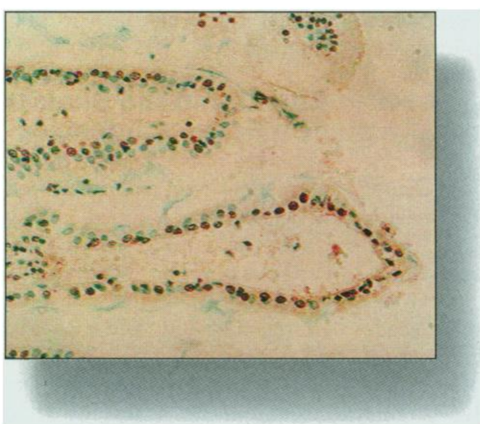
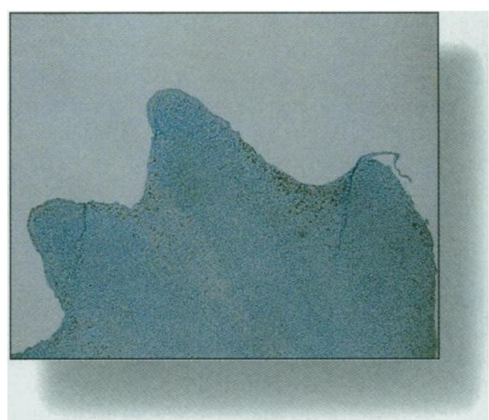
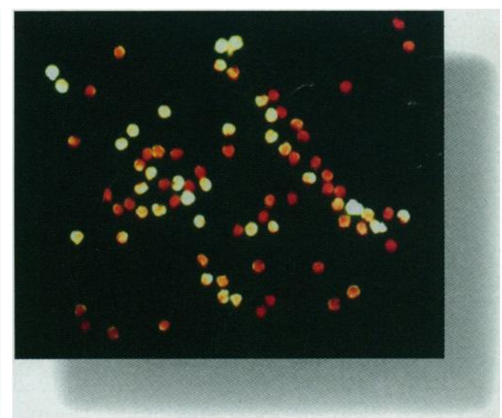


Apoptosis in physiological cell turnover of epithelium in human duodenum[1], ApopTag™ Peroxidase Kit and methyl green (X400)



Developmental cell deletion in remodeling of mouse forelimb bud (14-day embryo), ApopTag™ Peroxidase Kit and methyl green (X200)[2]



Apoptosis of human peripheral blood lymphocytes *in vitro*, ApopTag™ Fluorescein Kit (yellow) and propidium iodide (red) (X400)[3]

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[1] JFR Kerr, AH Wyllie & AR Currie, (1972) *British Journal of Cancer*; 26:239-257. CS Potten, (1977) *Nature*; 269:518-521.

[2] JFR Kerr, J Searle, BV Harmon & CJ Bishop, in: CS Potten (ed), (1987) *Perspectives in mammalian cell death*. Oxford U. Press, pp. 93-128. Z Zakeri, D Quaglino, T Latham & R Lockshin, (1993) *FASEB Journal*; 7:470-478; and manuscripts submitted.

[3] X Li, W James, F Traganos & Z Darzynkiewicz, (1993) manuscript submitted.

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Science, Technology and the Post-Cold War World

19th Annual AAAS Colloquium on Science & Technology Policy

April 6-8, 1994 ▪ The Washington, DC Renaissance Hotel

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

Wednesday, April 6

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

Keynote: John H. Gibbons*, Assistant to the President for Science and Technology, and Director, OSTP.

The Federal FY 1995 Budget for R&D
(Plenary Symposium)
- Overview of Federal Budget Proposals for R&D in FY 1995
- Trends in U.S. Industry's Spending for R&D
- International Comparisons of R&D Spending
- A View of the FY 1995 Budget from the Financial Community

The William D. Carey Lecture (public invited): Speaker to be announced

Thursday, April 7

Managing the National R&D Enterprise
(Plenary Symposium)
- Pasteur's Quadrant and its Relevance for Federal S&T Policy
- Priority-Setting for Federal R&D: Recent Proposals and Their Aftermaths
- Coordinating Federal R&D from the Top: Recent Initiatives
- Strategic Planning at Major Federal R&D Agencies
- Congressional Management of National Research Priorities

Luncheon with Address: Speaker to be announced

Concurrent Symposia:
- How Are We Doing? Measuring International Comparative Performance of U.S. Industries and Technologies (Christopher T. Hill, organizer)
- The Former Soviet Union and Eastern Europe: Science and Technology Issues (Jon M. Veigel, organizer)
- The Structure of Industrial R&D: Responding to Opportunities (Deborah Wince-Smith, organizer)

Major R&D Agency Budgets for FY 1995
(Concurrent small group sessions)
▪ DOD ▪ DOE ▪ NASA ▪ NIH ▪ NSF ▪ DOC (NIST, NOAA)

Friday, April 8

Breakfast with Address: Speaker to be announced

Concurrent Symposia:
- Accountability in R&D and Other Government Programs (Irwin Feller, organizer)
- Issues in the Public Understanding of Science (Marcel LaFollette, organizer)
- Clinton's Technology Policy One Year Later (Nancy Carson, organizer)

Luncheon Address: John D. Rockefeller IV*, Chairman, Subcommittee on Science, Technology, and Space, United States Senate

*Invited speaker

Budget discussions will be supplemented by *AAAS Report XIX: Research and Development, FY 1995*, a comprehensive analysis of the proposals for FY 1995 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 *1994 AAAS Science and Technology Policy Yearbook* (containing most of the colloquium addresses, plus other significant items) in late summer; and *Congressional Action on R&D in the FY 1995 Budget* in the fall.

Register now by completing and returning the enclosed form. For further information, contact: Directorate for Science and Policy Programs, AAAS, 1333 H Street, NW, Washington, DC 20005. Fax: (202) 289-4950. E-mail: snelson@aaas.org. Phone: (202) 326-6600.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

AAAS Colloquium on Science & Technology Policy

April 6–8, 1994 ▪ The Washington, DC Renaissance Hotel

ADVANCE REGISTRATION FORM

Please print or type:

Mailing Address:

Name ______________________

Institution/Company ______________________

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❑ Check here if you will be staying at the Renaissance Hotel.

❑ Check here if you need special services due to a disability.

Please describe. ______________________

To register by mail (16 March deadline[1]), send this top half (registration form) to: Registration, AAAS S&T Policy Colloquium, P.O. Box 630285, Baltimore, MD 21263.

To register by FAX (16 March deadline[1]; VISA or MasterCard only), send this top half (registration form) to 202-289-4021.

To register by phone (16 March deadline[1]; VISA or MasterCard only), call 202-326-6600 (9am–5pm Eastern Time).

Registration Fees

Regular	$215	$_______
Nonprofit[2]	$160	$_______
Student[2]	$50	$_______
Meal Tickets		
Lunch (Thur. 7 Apr.)	$35	$_______
Breakfast (Fri. 8 Apr.)	$18	$_______
Lunch (Fri. 8 Apr.)	$35	$_______
TOTAL AMOUNT		$_______

Payment[3]

❑ Check enclosed ❑ VISA ❑ MasterCard

❑ Original institutional purchase order attached
(Facsimile POs not accepted)

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Signature ______________________

SI

[1] Deadline for advance registrations is 16 March 1994. Thereafter, register in person at the Washington, DC Renaissance beginning at 12:00 pm, 6 April. On-site registration fees are $15 higher than advance registration fees. **[2] Special rates:** 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 30 March 1994 and will be processed after the Colloquium; no refunds will be made on cancellations received after 30 March. **Publications:** All registrants receive *AAAS Report XIX: Research & Development, FY 1995*; the *1994 AAAS Science and Technology Policy Yearbook*, after the meeting; and *Congressional Action on R&D in the FY 1995 Budget* in the fall. **Program materials** will be mailed to those who preregister by 16 March.

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The Washington, DC Renaissance Hotel Reservation Form

AAAS S&T Policy Colloquium ■ April 6 – 8, 1994

(Reservations received after 7 March cannot be guaranteed)

Send confirmation to:

Name ______________ Street ______________

City ______________ State ______________ Zip ______________ Phone ______________

Other occupants of room: Name ______________ Name ______________

Special housing needs: ❑ Wheelchair-accessible room ❑ Nonsmoking room ❑ Other______________

Room: ❑ Single (1 person, 1 bed) $149* ❑ Double (2 persons, 2 beds) $169* ❑ Triple (3 persons, 2 beds) $189*

For Renaissance Club Tower, add $20. *Add 11% DC sales tax and $1.50 occupancy tax.

Arrival: Date: ______ Time: ______ **Departure:** Date: ______ Time: ______

Please list definite arrival and departure dates and times. Check-in time is 3:00 pm; check-out time is 12 noon.

Enclose check, made out to ***Washington,DC Renaissance Hotel*** for first night's room deposit or provide major credit card information:

Credit card type ______________ Card # ______________ Exp. date ______________

Cardholder's signature ______________________

Mail bottom half (hotel reservation form) to: Reservations, Washington, DC Renaissance Hotel, 999 9th Street, NW, Washington, DC 20001-9000 (or **call** 202-898-9000, ext.3400; request AAAS rates; **fax** 202-962-4445)