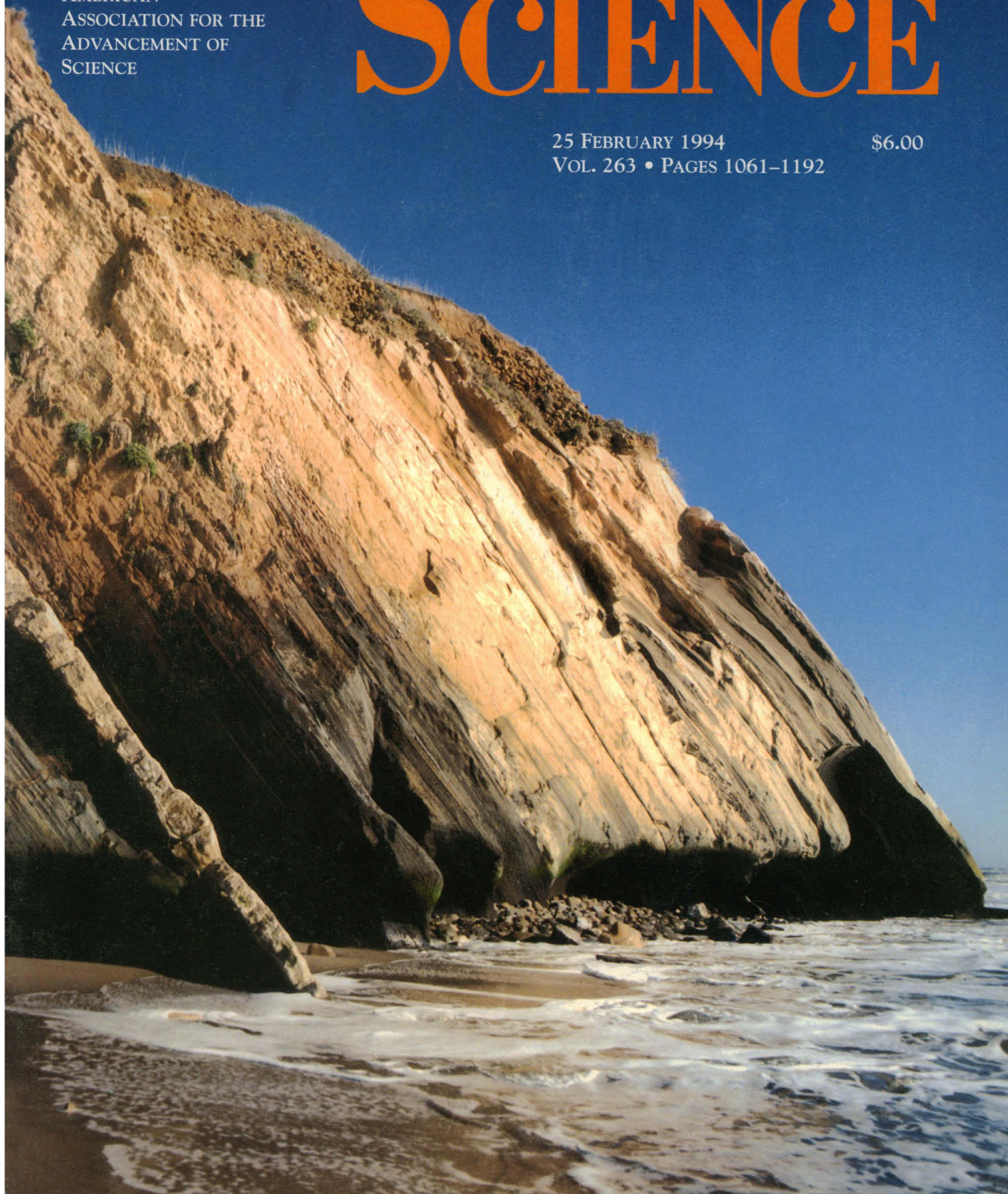


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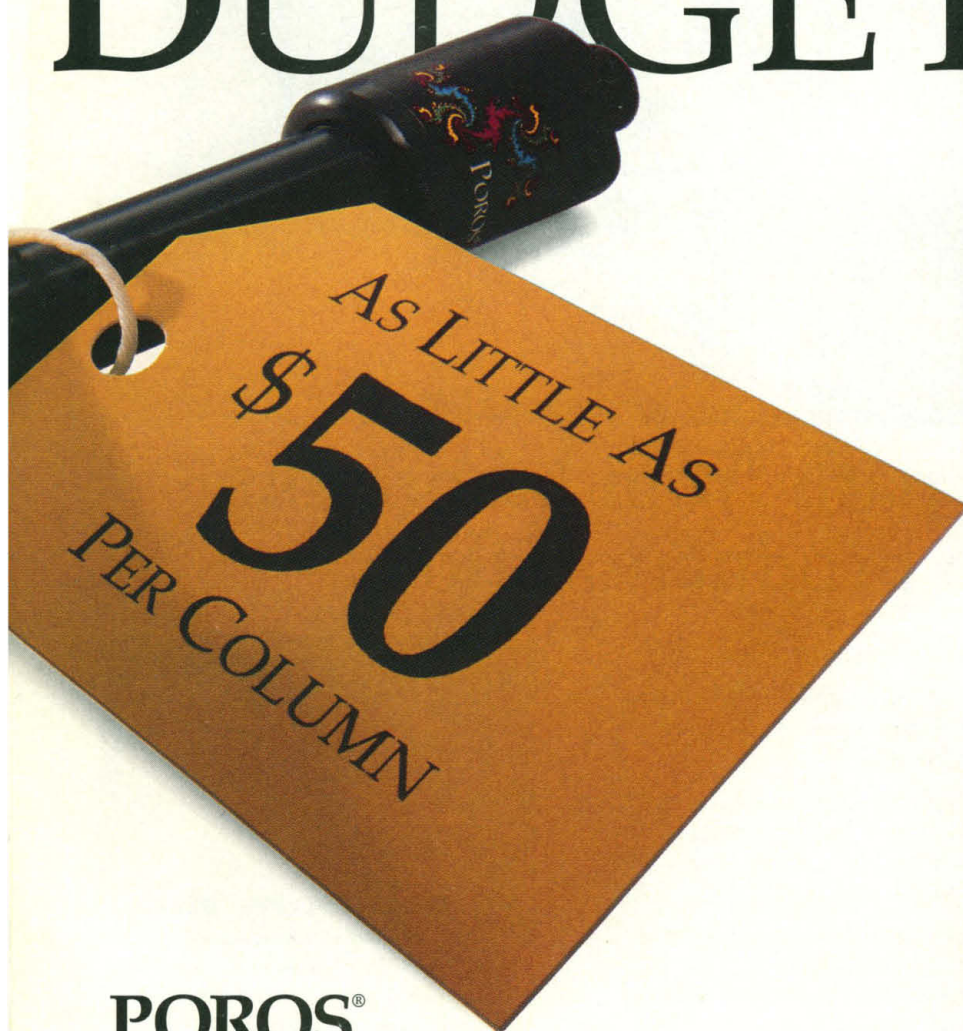
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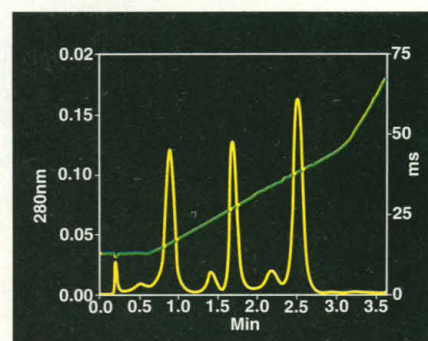
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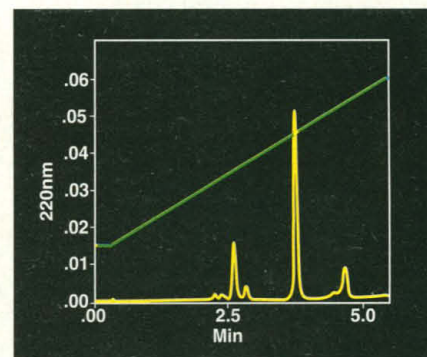


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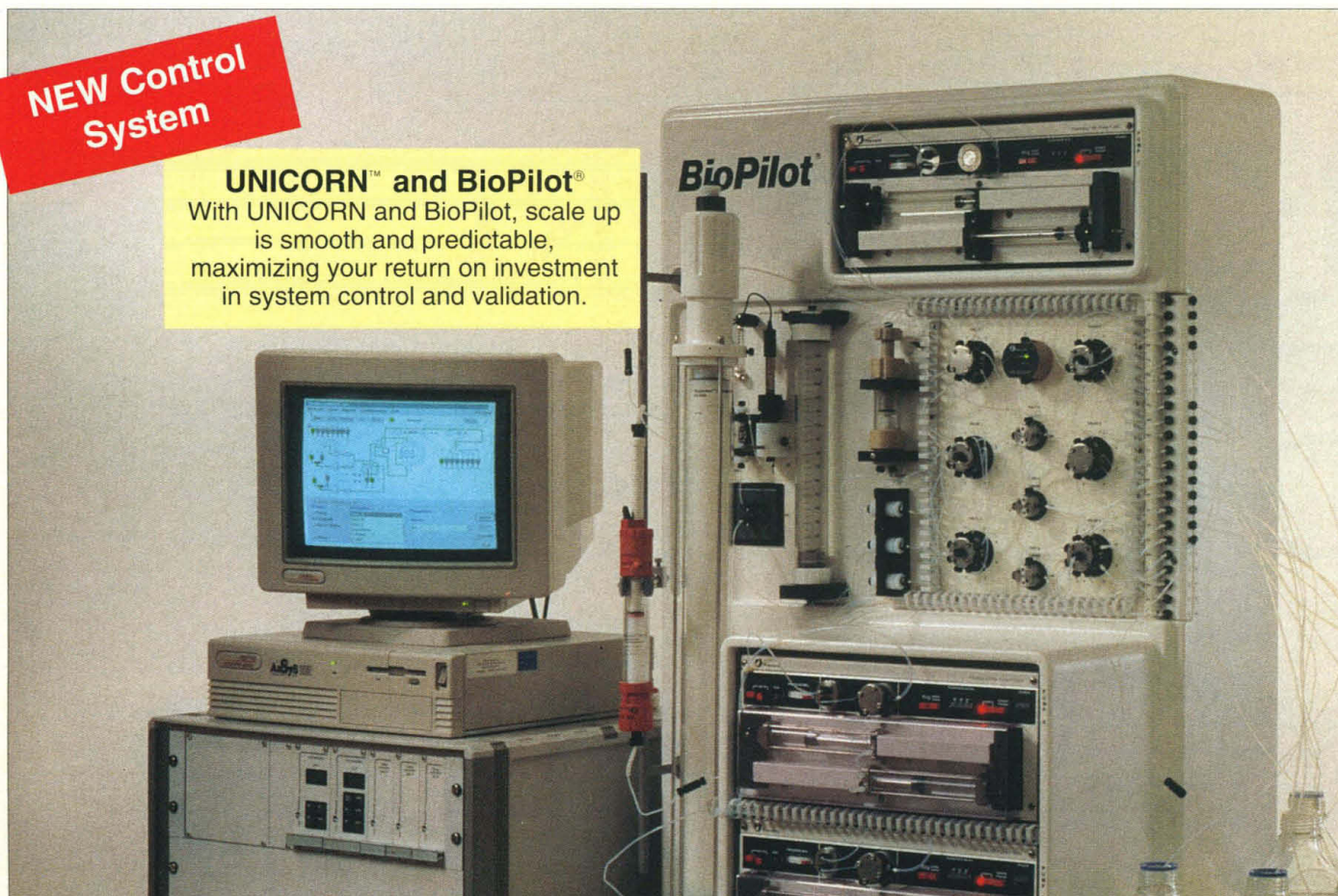
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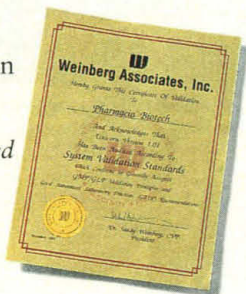


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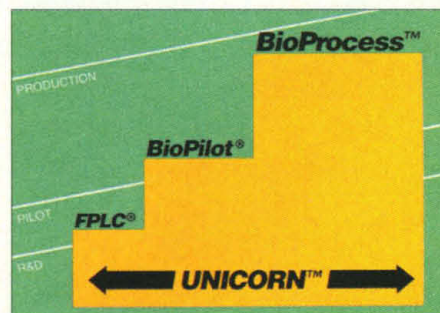
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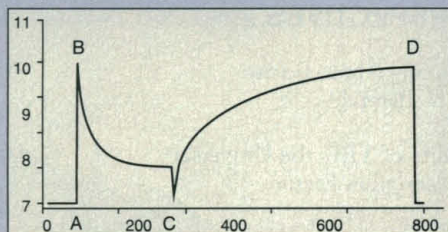
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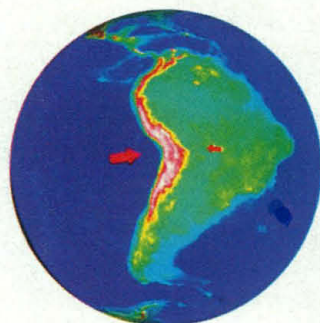
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Cliffs of the Miocene Monterey Formation, Naples Beach, California. These finely laminated sedimentary rocks rich in organic matter were deposited during a period of worldwide cooling about 14 million years ago. A record of this climate change is revealed by the

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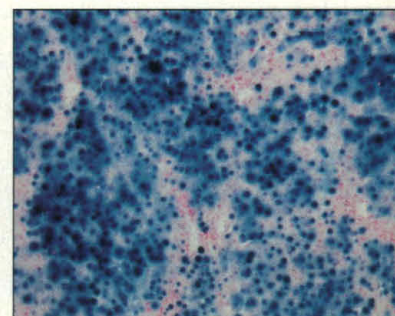
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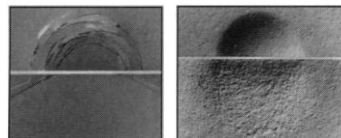


## A state of flux

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  $\text{YBa}_2\text{CuO}_{7-x}$  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 outbreaks, 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 pro-

cess 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

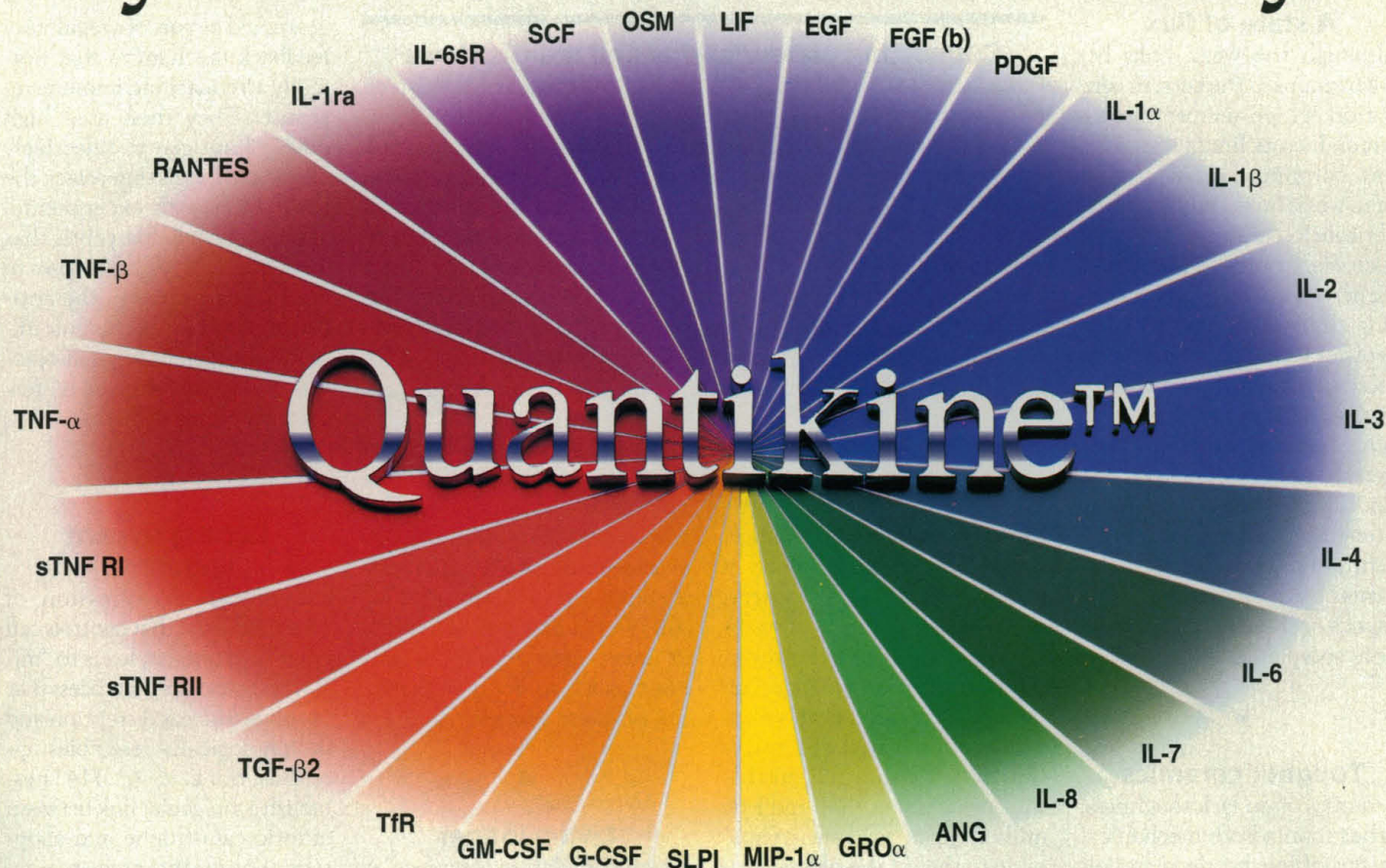
Inappropriate expression of  $\text{p34}^{\text{cdc}2}$ , a kinase that controls cell entry into mitosis, leads to "mitotic catastrophe," a process that involves nuclear disruption and morphologically resembles apoptosis. Shi *et al.* (p. 1143) establish a molecular link between mitotic catastrophe and apoptosis, showing that premature activation of  $\text{p34}^{\text{cdc}2}$  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.

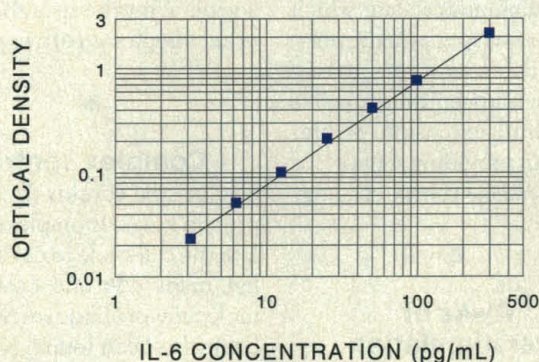


# Cytokine Immunoassays



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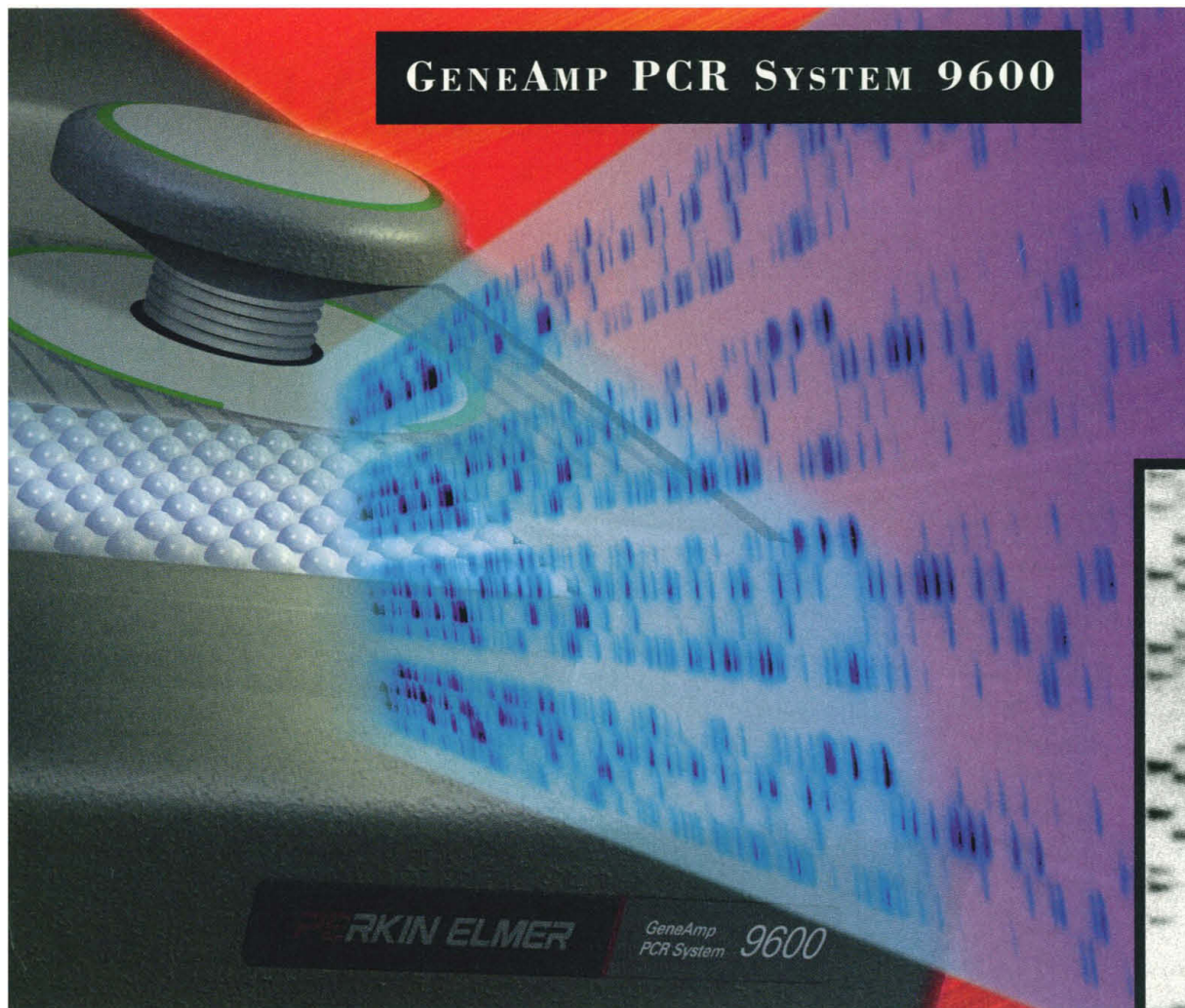
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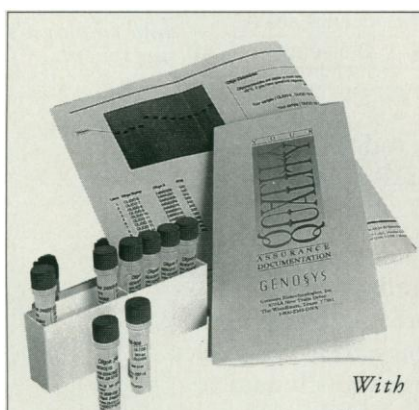


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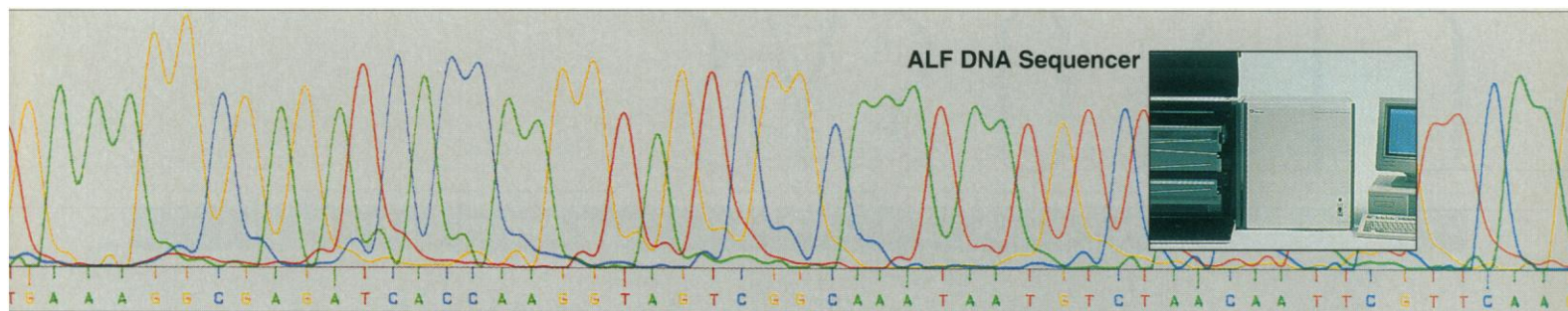
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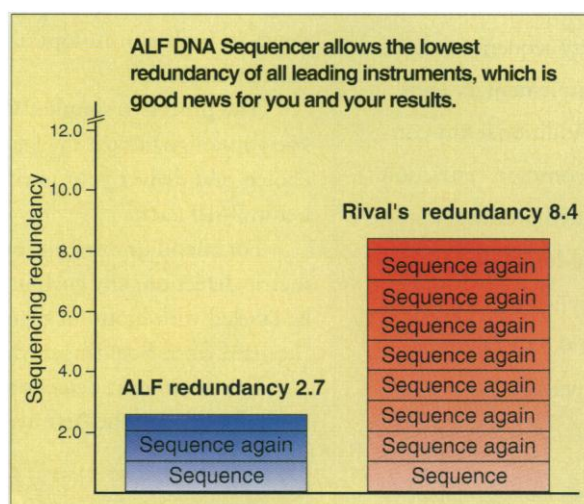
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### References

1. Comparison of three non-isotopic automated DNA sequence analysis systems. *Clinical Chemistry*, 38 (1992) 465, Van Ranst, M., Fiten, P., Voet, M., Volckaert, G., Opdenakker, G.
2. Automated low-redundancy large-scale DNA sequencing by primer walking. *BioTechniques* 15 (1993) 714-721, Voss, H., Wiemann, S., Grotheus, D., Sensen, C., Zimmermann, J., Schwager, C., Stegemann, J., Erfle, H., Rupp, T., Ansorge, W.
3. Sequence length and error analysis of Sequenase and automated Taq cycle sequencing methods. *BioTechniques* 14 (1993) 442-447, Koop, B.F., Rowan, L., Chen, W.-Q., Deshpande, P., Lee, H., Hood, L.

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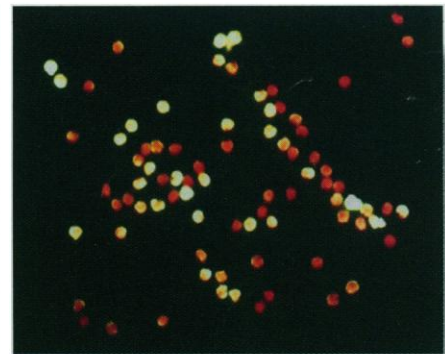
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<sup>1</sup>JFR Kerr, AH Wyllie & AR Currie, (1972) *British Journal of Cancer*; 26:239-257. CS Potten, (1977) *Nature*; 269:518-521.

<sup>2</sup>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 Zakari, D Quagliano, T Latham & R Lockshin, (1993) *FASEB Journal*; 7:470-478; and manuscripts submitted.

<sup>3</sup>X Li, W James, F Traganos & Z Darzynkiewicz, (1993) manuscript submitted.



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Instructors: Beverly Giammara, U of Louisville & Gary Login, Harvard Dental School

**DIGITAL IMAGE PROCESSING FOR MICROSCOPY**

Instructors: Lee Peachey, U of Pennsylvania; John Haselgrove, Children's Hosp of Philadelphia; & Klaus-Ruediger Peters, U of Connecticut

**THE DIVERSE ROLES OF ULTRAMICROTOMY IN PREPARING "HARD MATERIALS" FOR ANALYTICAL TEM**

Instructor: Thomas Malis, Energy, Mines & Resources, Ottawa, Canada

**CONFOCAL MICROSCOPY & VISUALIZATION**

Instructor: Barry Masters, Uniformed Services U of the Health Sciences

**SCANNING ELECTRON MICROSCOPY – HOW TO DO IT BETTER**

Instructor: Oliver Wells, IBM Yorktown Heights

**QUANTITATIVE ELECTRON MICROPROBE ANALYSIS**

Instructor: John Armstrong, Caltech

**CRYO-TEM FOR IMAGING BIOLOGICAL SPECIMENS IN SUSPENSION**

Instructor: Linda Melanson, Brandeis U

## MSA SYMPOSIA

### ✦ GENERAL ✦

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**MICROSCOPY TOWARD THE 21ST CENTURY**

Organizer: R. Cardell, U Cincinnati Med Sch

**X-RAY MICROSCOPY**

Organizers: C. Jacobsen, SUNY Stony Brook & W.B. Yun, Argonne Nat'l Lab

**MERGING ADVANCED COMPUTING WITH MICROSCOPY**

Organizers: B. Carragher, U Illinois & N. Zaluzec, Argonne Nat'l Lab

**DIRECT DIGITAL IMAGING**

Organizer: G. Fan, U California San Diego

**ADVANCES IN INSTRUMENTATION FOR LM**

Organizer: D. Taylor, Carnegie-Mellon U

**TECHNOLOGISTS' FORUM SYMPOSIUM:**

**ENERGY-DISPERSIVE X-RAY SPECTROSCOPY**

Organizer: S. Silvers, USDA

### ✦ BIOLOGICAL SCIENCES ✦

**ADVANCES IN MACROMOLECULAR MICROSCOPY**

Organizer: W. Chiu, Baylor College of Med

**ADVANCES IN FLUORESCENT PROBES FOR MICROSCOPY**

Organizer: M. Poenie, U Texas

**ADVANCES IN DIAGNOSTIC IMAGING**

Organizer: B. Herman, U North Carolina

**ORGANIZATION OF THE CELL NUCLEUS**

Organizer: D. Spector, Cold Spring Harbor Lab

**MICROANATOMICAL APPROACHES TO SYSTEMS**

**NEUROBIOLOGY**

Organizer: C. Greer, Yale U Med Sch

**CELLULAR NEUROBIOLOGY**

Organizers: M. Martone, U California San Diego & M. Ellisman, U California San Diego

### ✦ PHYSICAL SCIENCES ✦

**THE FUTURE OF ATOM-PROBE & FIELD-ION MICROSCOPY**

Organizers: T. Kelly, U Wisconsin & P. Camus, U Wisconsin

**ULTRA-HIGH-RESOLUTION SEM**

Organizers: L. Allard, Oak Ridge Nat'l Lab & D. Joy, U Tennessee

**SELF-ASSEMBLED MATERIALS**

Organizers: R. Spontak, North Carolina State U & J. Minter, Eastman Kodak Company

**MICROSCOPY OF OXIDE FERROELECTRICS**

**& RELATED MATERIALS**

Organizers: J. Speck, U California Santa Barbara & R. Ramesh, Bellcore

**CRYSTALLOGRAPHIC/TEXTURE ANALYSIS USING**

**ELECTRON DIFFRACTION IN THE SEM**

Organizer: J. Sudliff, General Electric

**QUANTITATIVE HIGH-RESOLUTION EM**

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## JOINT SYMPOSIA

**COMPUTATIONAL METHODS IN MICROSCOPY**

Organizers: W. Carrington, U Massachusetts & J. McCarthy, Noran Instruments

**SCANNED PROBE MICROSCOPIES**

Organizers: J. Hoh, U California Santa Barbara & I. Musselman, U Texas

**FIELD-EMISSION & LOW VOLTAGE SEM**

Organizers: M. Rosenfield, IBM & R. Apkarian, Emory U

**ANALYTICAL ELECTRON MICROSCOPY: CHALLENGES & OPPORTUNITIES**

Organizers: M. Libera, Stevens Tech; R. Carpenter, Arizona State U; & J. Michael, Sandia Nat'l Lab

## TUTORIALS

✦ **CRYOELECTRON MICROSCOPY OF WHOLE CELLS**

✦ **BASIC LITERACY IN X-RAY MICROANALYSIS, PART II**

✦ **RECENT ADVANCES IN LIGHT MICROSCOPY**

✦ **HANDS-ON COMPUTER DEMONSTRATION**

✦ **ACCESSING THE MSA SOFTWARE LIBRARY & A BASIC INTRODUCTION TO IMAGE PROCESSING USING NIH "IMAGE" AS A MODEL**

✦ **INTERPRETATION OF HREM IMAGES BY IMAGE SIMULATION**

✦ **INTRODUCTION TO ELECTRON HOLOGRAPHY**

✦ **INTRODUCTION TO AUTOMATED PARTICLE ANALYSIS**

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**QUANTITATIVE MICROANALYSIS**

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**OPTICAL MICROANALYSIS**

Organizer: J. Refner, Spectra-Tech

**ENVIRONMENTAL SEM**

Organizers: R. Bolon, General Electric; J. Mansfield, U Michigan; & S. McKernan, U Minnesota

**MICROBEAM MASS SPECTROMETRY**

Organizer: S. Novak, Evans East

**QUALITY ASSURANCE OF MICROANALYTICAL METHODS**

Organizers: D. Newbury, NIST & E. Steel, NIST

**CATHODE TECHNOLOGY, TODAY & TOMORROW**

Organizer: F. Schamber, RJ Lee Group

**MICRO XRF/XRD**

Organizer: B. York, IBM

**INSTRUMENTATION**

Organizer: F. Schamber, RJ Lee Group

**MATERIALS APPLICATIONS**

Organizer: C.B. Carter, U Minnesota

**GEOLOGICAL APPLICATIONS**

Organizers: S. Mehta, Arco & P. Hlava, Sandia Nat'l Lab

**BIOLOGICAL APPLICATIONS**

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**X-RAY & IMAGE ANALYSIS IN THE PETROLEUM INDUSTRY**

Organizer: E. Prestridge, Princeton Gamma-Tech

**MICROANALYSIS OF COATINGS & INTERFACES**

Organizer: J. Goldstein, U Massachusetts

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**LIGHT OPTICS & IMAGE FORMATION**

**ELECTRON OPTICS & IMAGE FORMATION**

**APPLICATIONS OF LIGHT MICROSCOPY**

**INSTRUMENTAL DEVELOPMENTS IN EM**

**INSTRUMENTAL DEVELOPMENTS IN OTHER MICROSCOPIES**

**IMAGE RECORDING TECHNOLOGIES**

**ELECTRON ENERGY-LOSS SPECTROSCOPY**

**BIOMATERIALS**

✦ **BIOLOGICAL SCIENCES APPLICATIONS ✦**

**TOMOGRAPHIC METHODS IN BIOLOGICAL MICROSCOPY**

**3-D VISUALIZATION**

**IN SITU HYBRIDIZATION**

**EXTRACELLULAR MATRIX**

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**MICROANALYTICAL METHODS IN BIOLOGICAL MICROSCOPY**

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**OPTICAL MICROSCOPY**

**3-D LIGHT MICROSCOPY**

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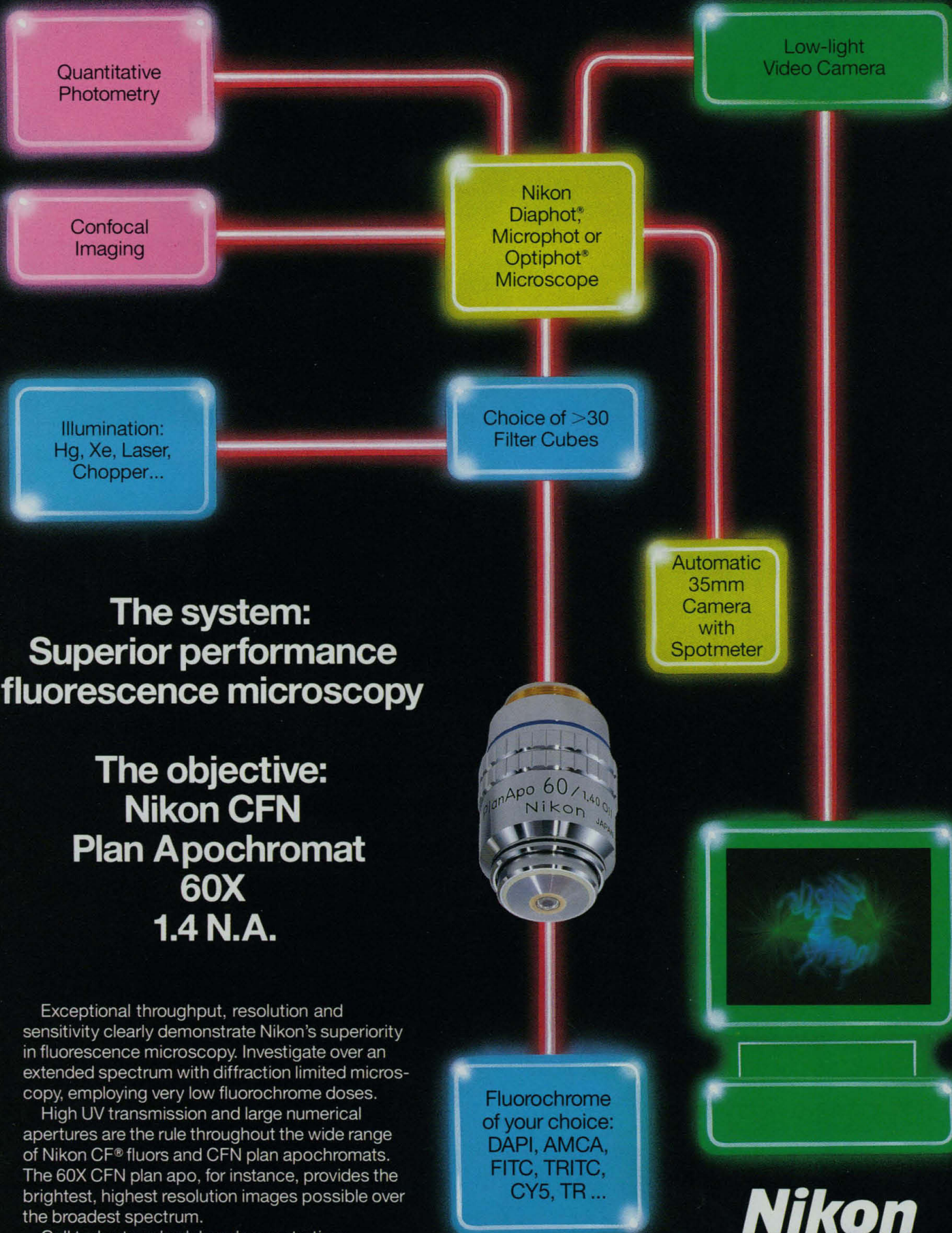
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## 19th Annual AAAS Colloquium on Science & Technology Policy

**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](mailto:snelson@aaas.org). Phone: (202) 326-6600.

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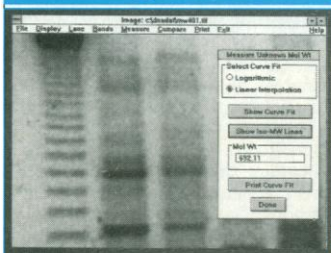
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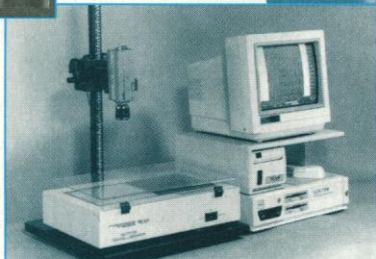
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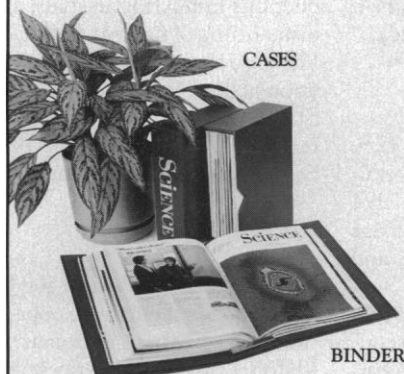
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