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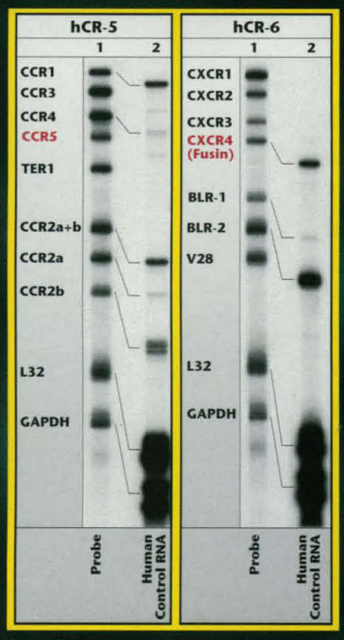

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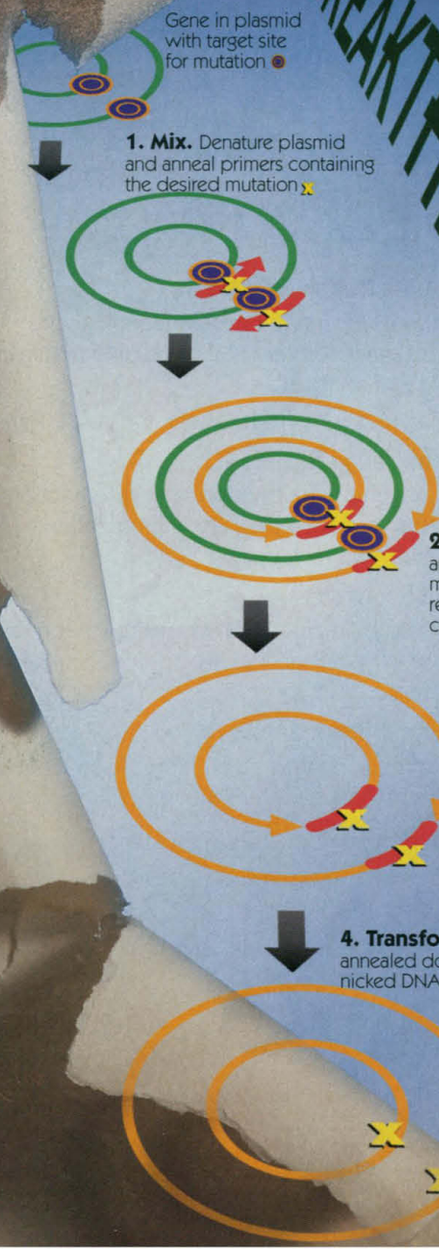

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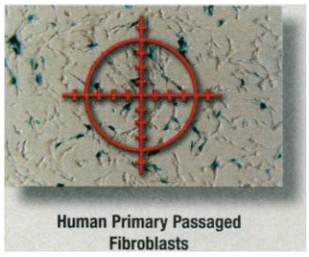
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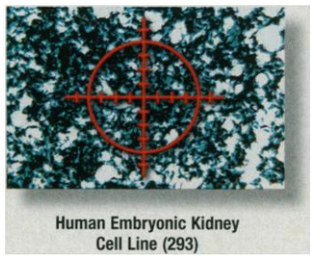
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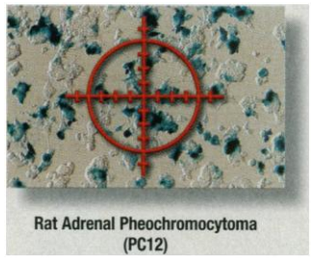
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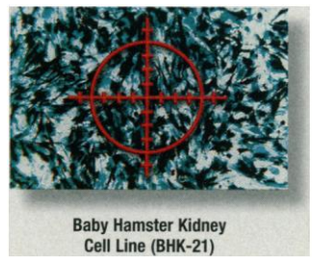
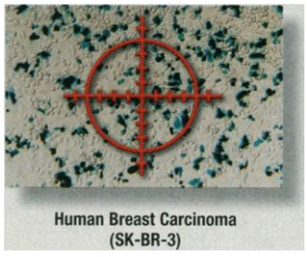

Baby Hamster Kidney Cell Line (BHK-21)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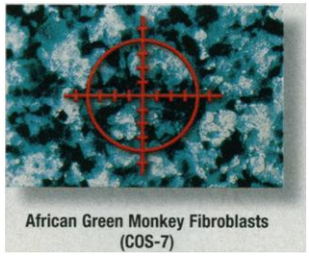
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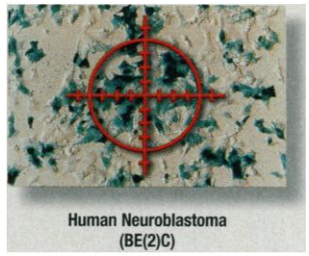
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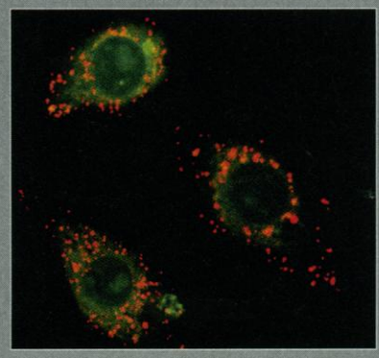

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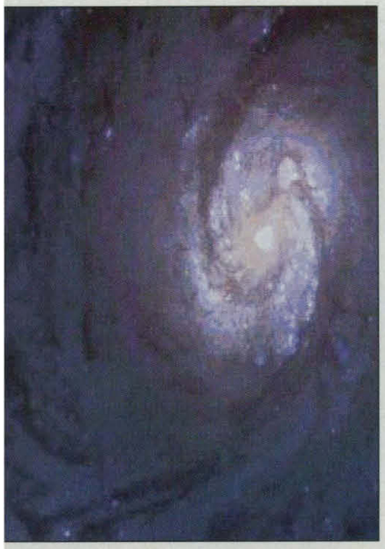
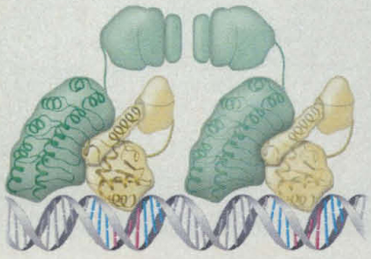


981
New star dates



1000 & 1037
How *ets* proteins bind to DNA

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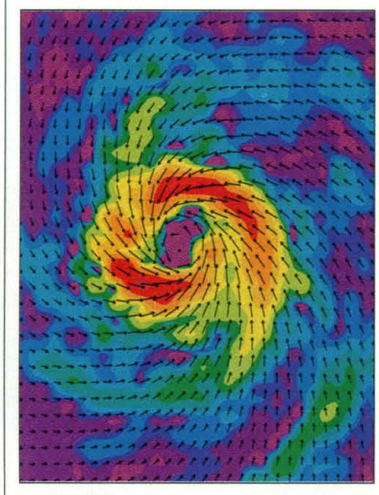
COVER

Gypsy moth outbreaks and Lyme disease are major problems in eastern U.S. forests. The abundance of gypsy moths and the tick vectors of Lyme disease are determined by an ecological chain reaction. Acorn production determines the abundance of white-footed mice and deer. Abundant mice suppress gypsy moth outbreaks, and mice and deer support tick populations, potentially increasing the risk of Lyme disease. See p. 1023 and the News story on p. 984. [Photos: deer, R. J. Winchcombe; acorns, M. Adhean. Collage: P. Morrighan]

REPORTS



1018
Hurricanes and climate change

1003 & 1014
Reading coral for climate

◩ **Indicates accompanying feature**

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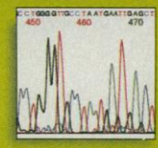

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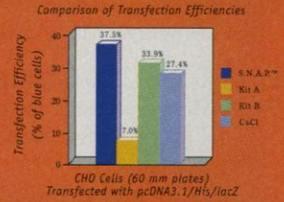

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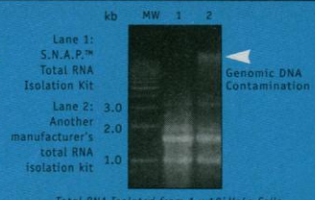

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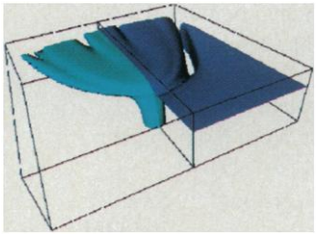
edited by PHIL SZUROMI

Raising Hawaii

Hawaii is the site of the most active and voluminous volcanism on Earth; magmatism is generally thought to be associated with a hot spot in the mantle, perhaps associated with a mantle plume, that is currently beneath the big



island of Hawaii. Steady movement of the Pacific plate over the hot spot has produced a long chain of islands and seamounts. As a result of this magmatic activity, the ocean floor around the Hawaiian island chain forms a broad topographic swell that extends over hundreds of kilometers and, along with heat flow and other geophysical measurements, can be used to infer the thermal state and convection in the underlying mantle. Moore *et al.* (p. 1008) present a numerical model of this swell that accounts for the interaction of a mantle plume with the oceanic lithosphere. The results imply that small-scale convection in the mantle beneath Hawaii has thinned the lithosphere and that the plume may be 100 to 150 Celsius degrees hotter than surrounding mantle and dynamically isolated.

■

Comparing records

The amount that the tropical sea surface cooled during the last glacial maximum has been controversial but is critical for evaluating glacial climates and climate models. Strontium/calcium ratios in corals imply that temperatures were cooler than oxygen isotope values in foraminifera. Gagan *et al.* (p. 1014; see the commentary by Beck, p. 1003) compare these two records in corals from near the Holocene maximum about 5000 years ago. The data imply that the seawater was 1 Celsius degree warmer then and that the ocean had a higher oxygen-18/oxygen-16 ratio because of increased evaporation. This increase in the oxygen isotope ratio of seawater could account for the small shift seen in the foraminifera record from glacial times to the Holocene and would be consistent with increased cooling of the tropics.

■

Storms in a warmer climate

The Intergovernmental Panel on Climate Change (IPCC) concluded in their 1995 assessment that it is not possible to conclude whether tropical storm intensity, distribution, and frequency will change in a warmer climate caused by increased greenhouse gas emissions. Knutson *et al.* (p. 1018) show that in a high-resolution hurricane prediction model for the northwest tropical Pacific, more intense hurricanes are observed in the warmer climate compared to current conditions, indicating that global warming may be accompanied by an increase in storm intensity.

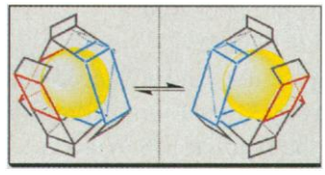
■

Anomalous burst

Gamma ray bursts (GRB) are brief, high-energy flashes of photons from unknown sources and previously undefined locations in the universe. Recently, the Burst and Transient Source Experiment (BATSE) on the Compton Gamma Ray Observatory satellite (launched in 1991) indicated that these events were randomly located in space, while the x-ray satellite BeppoSAX (launched in 1996) determined more precise locations of these bursts within a few arc minutes (see the Perspective by Kouveliotou in the 29 August 1997, p. 1257). These improved observations allowed astronomers to detect transient emissions in other wavelengths related to the initial burst of gamma rays. Castro-Tirado *et al.* (p. 1011) observed the optical transient related to GRB 970508 from about 4 hours to 4 days after the burst on the 2.2-meter telescope at the Calar Alto Observatory and the 4.2-meter William Herschel Telescope at La Palma, Spain. They observed a sudden peak in the brightness of the optical transient that occurred 2 days after the burst. This peak in brightness is difficult to reconcile with the standard fireball model of a GRB in which an object explodes and the shock wave moves into the gas surrounding the galaxy to produce first gamma ray radiation, then x-ray, optical, and radio radiation. The authors suggest that the fireball model is more complicated and requires a mechanism in the source, the shock waves, the surrounding medium, or a combination of all three to alter the theoretically defined timing of the optical transient duration and strength.

Uneven molecular spaces

Certain types of "claw" shaped molecules have been shown to dimerize around appropriate "guest" molecules, thus encapsulating them but not so tightly that they cannot escape. Rivera *et al.* (p. 1021) have now synthesized achiral molecules that can assemble around chiral guests (terpenes) to form two different complexes. (In the schematic example shown, one side of the guest favors the small-arm side of



the caspule shown in red, while the other favors the long-arm side shown in blue.) The different contacts between the molecule and the cavity might ultimately be exploited in performing asymmetric reactions around the guest.

■

Bosonic stimulation

In Bose-Einstein condensation, an atomic vapor is cooled to very low temperatures, which causes the atoms to enter a single quantum state. One application of the condensate is to make an atom laser—a device that emits coherent beams of atoms rather than photons. Miesner *et al.* (p. 1005; see the news story by Hellemans, p. 986) now report the observation of an important part of that process, matter wave amplification. By watching how the condensate evolved with time near the phase transition, the authors were able to observe stimulated growth of the boson population.

■

Detecting unpaired chromosomes

To assure proper distribution of chromosomes during mitosis, cells have a checkpoint mechanism that delays anaphase and chromosome separation until all of the chromosomes are properly attached to the spindle. The Mad2 protein participates in this checkpoint mechanism and binds to unattached kinetochores (the structure through which the chromosomes contact the spindle). Kim *et al.* (p. 1045) studied the fission yeast *Saccharomyces cerevisiae* and show how, under conditions where the spindle is not properly assembled, a signal from Mad2 can influence the cell cycle machinery to arrest the cell division cycle. Mad2 interacts with a protein known as Slp1, which is implicated in regulation of the anaphase-promoting complex (which controls progression of cells into anaphase.) Hwang *et al.* (p. 1041) describe similar findings from the budding yeast

(Continued on page 959)

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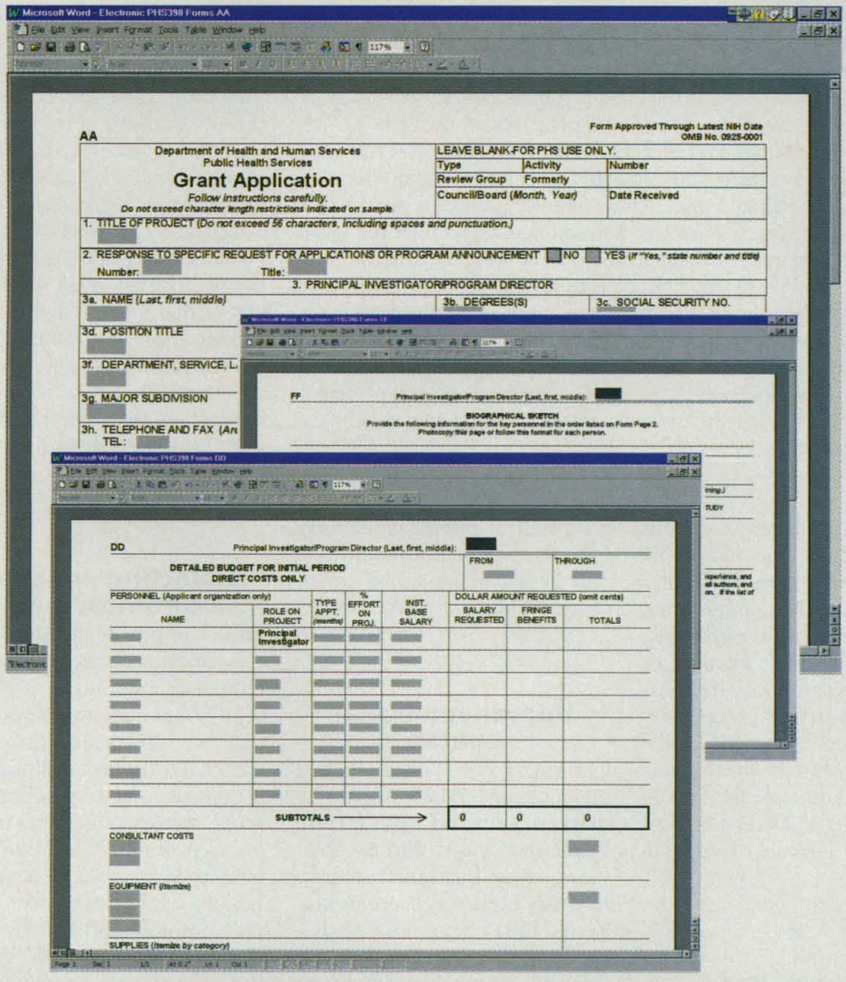

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(Continued from page 957)

Schizosaccharomyces pombe in which the Slp1 homolog Cdc20 interacts with three components of the spindle checkpoint, Mad1, Mad2, and Mad3. The findings in both reports reveal a molecular mechanism by which cells can sense unpaired chromosomes and delay cell cycle progression (see the commentary by Elledge, p. 999). In this way, cells avoid aberrant chromosome segregation, which is recognized as a potential source of genomic instability in cancer cells

■

From little acorns...

What connects outbreaks of a defoliating pest moth with human risk for tick-borne diseases? Jones *et al.* (p. 1023; see the cover and the news story by Kaiser, p. 984) have conducted a series of large-scale experiments in oak forest of the northeastern United States to uncover the ecological relations. The experiments connect acorn production, the white-footed mice whose numbers are heavily influenced by the acorn crop, and the gypsy moth outbreaks that are controlled by the mice. They also link acorn production to the presence of deer in the woods, which controls the density of black-legged ticks, ticks that in subsequent stages of development on mice may become infected with the Lyme disease pathogen, thus increasing the risk to humans of contracting the disease. The work confirms the importance of indirect interactions among species in driving population dynamics and will also inform forest management practice.

■

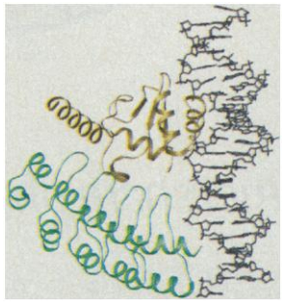
Calcium entry through sodium channels

Contraction of muscle cells in the heart is initiated by an action potential, which causes voltage-dependent influx of calcium ions (Ca^{2+}) from outside the cell. However, even when voltage-gated Ca^{2+} channels and the sodium-calcium ion (Na^+/Ca^{2+}) exchanger were blocked, such Ca^{2+} entry persisted. Santana *et al.* (p. 1027; see the commentary by Hanks, p. 1004) provide evidence that, under certain conditions, external Ca^{2+} can actually enter cardiac myocytes through Na^+ channels in amounts that can substantially influence contractility of the cells. These Na^+ channels undergo a transient loss of selectivity that allows Ca^{2+} ions to enter the cell. The results identify an unexpected source of Ca^{2+} influx that may influence Ca^{2+} signals in heart muscle and other cells types. Furthermore, this unusual conductance property of Na^+ channels appears to contribute the mechanism by which widely used therapeutic agents related to digitalis produce their effects on the heart.

■

Creating a binding partnership

Proteins that mediate transcription in eukaryotes appear to increase their specificity by binding as dimers, and structural studies have been performed for dimers where both proteins are members of the same gene family. Batchelor *et al.* (p. 1037; see the commentary by Graves, p. 1000) present the crystal structure of a heterodimer, the GA-binding



protein (GABP), in complex with 21–base pair DNA strand. The partners are from different families: The GABP α subunit contains a DNA-binding domain of the ETS family, which can bind DNA as monomers, whereas the GABP β subunit exhibits a series of ankyrin repeats. Although GABPβ does not contact DNA in this complex, the ternary complex is 100 times more stable than the complex with GABPα alone. The contacts that GABPβ makes to GABPα through its ankyrin repeats to parts of the ETS domain and the carboxyl-terminal region appear to reorient some of the α helices of GABPα and stabilize its contacts to DNA.

■

Cell interactions with Ebola virus

Ebola virus is known to cause lethal outbreaks of hemorrhagic fever. To help define the molecular basis for the virus-cell interactions, Yang *et al.* (p. 1034; see the news story by Wickelgren, p. 983) studied the secreted and transmembrane forms of the viral glycoprotein. The secreted form can bind to neutrophils and inhibit their activation. The transmembrane form interacted specifically with endothelial cells and may be involved in the hemorrhaging that is a hallmark of the disease.

■

Turning on inflammation

One of the effects of severe autoimmune diseases is kidney damage. Autoantibodies form large complexes with their antigens, which get trapped in the glomeruli of the kidney. It was thought that complement proteins were essential for the subsequent inflammatory damage. Clynes *et al.* (p. 1052) crossed mice that have a propensity to develop autoantibodies with those deficient in Fc receptor γ chain (an essential part of Fcγ receptors, which bind the "Fc" portion of antibodies). The mice still produced immune complexes but did not succumb to renal failure. Thus, although complement seems to be important for the clearance of immune complexes, Fcγ receptors are critical for turning on the inflammatory response to the complexes, which causes kidney damage. This finding explains the paradoxical propensity for lupus in people deficient in complement and may offer avenues to prevent the damage.

■

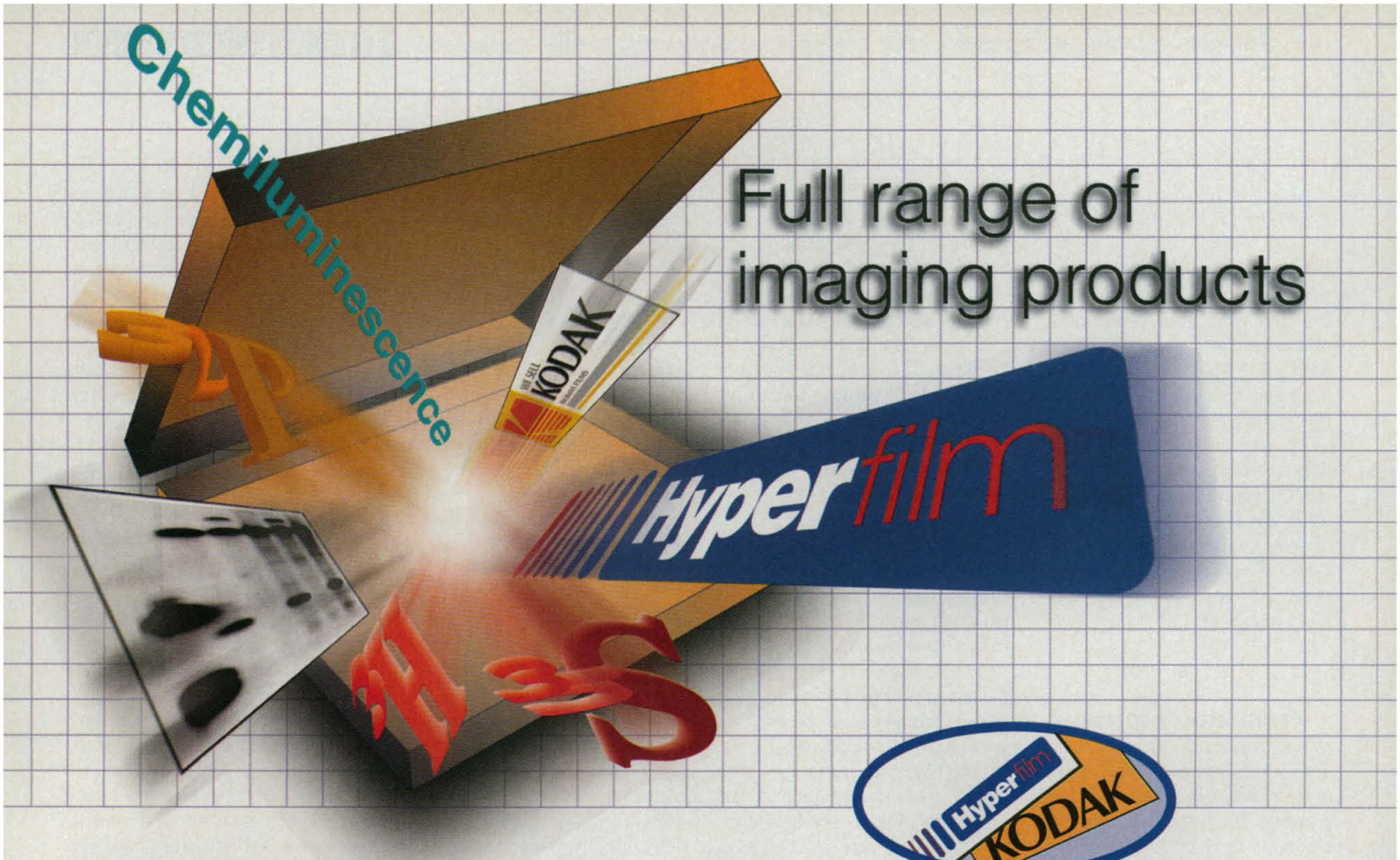
STAT structure

The STATs (signal transducers and activators of transcription) are transcription factors that bring about altered gene expression in response to cytokines and growth factors. In stimulated cells, active STAT dimers move from the cytoplasm to the nucleus where they activate transcription of target genes. STAT dimers bound to adjacent DNA binding sites interact through their amino-terminal domains. Vinkemeier *et al.* (p. 1048) present the crystal structure of the first 123 residues of STAT-4, which reveals the nature of the protein interface through which this interaction occurs.

■

Improving transplant matching

Successful human organ transplantation is a goal that cannot be regularly attained. Even when the organ donor is "perfectly" matched at the major histocompatibility locus, the grafted organ my fail to "take." Many of these failures seem to be mismatched at a minor histocompatibility locus called HA-1. den Haan *et al.* (p. 1054) have determined the sequence of the HA-1 peptide, and found that it comes from a gene that appears in two forms in the population, different in only one amino acid. Those family members that were typed as "HA-1 positive" all had one form of the gene. Determining before transplantation which HA-1 allele is present in a donor and recipient of otherwise "matched" pairs may improve transplantation statistics.



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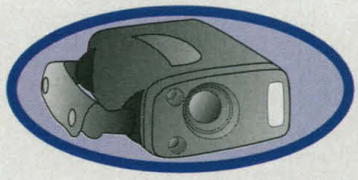

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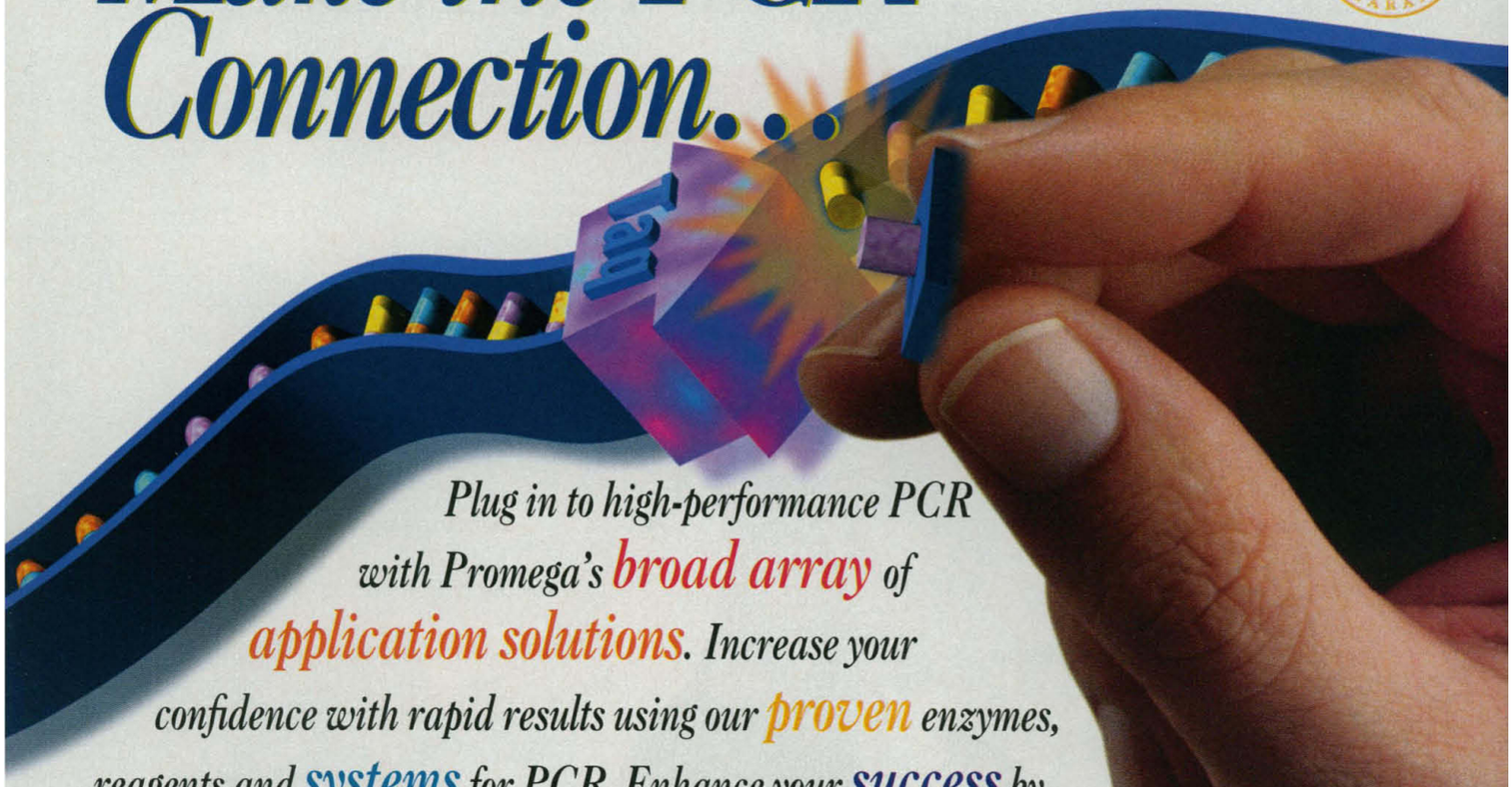

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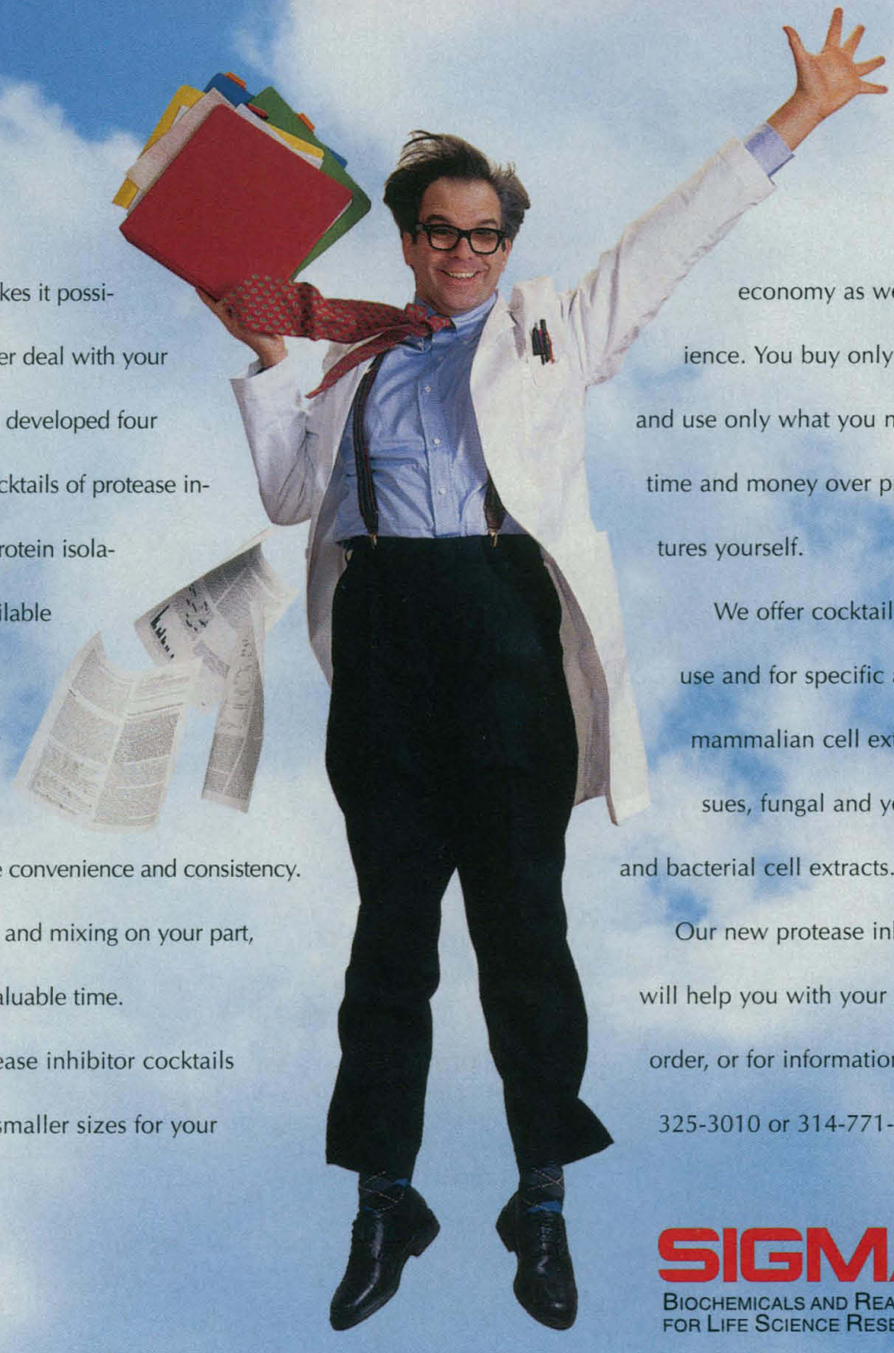

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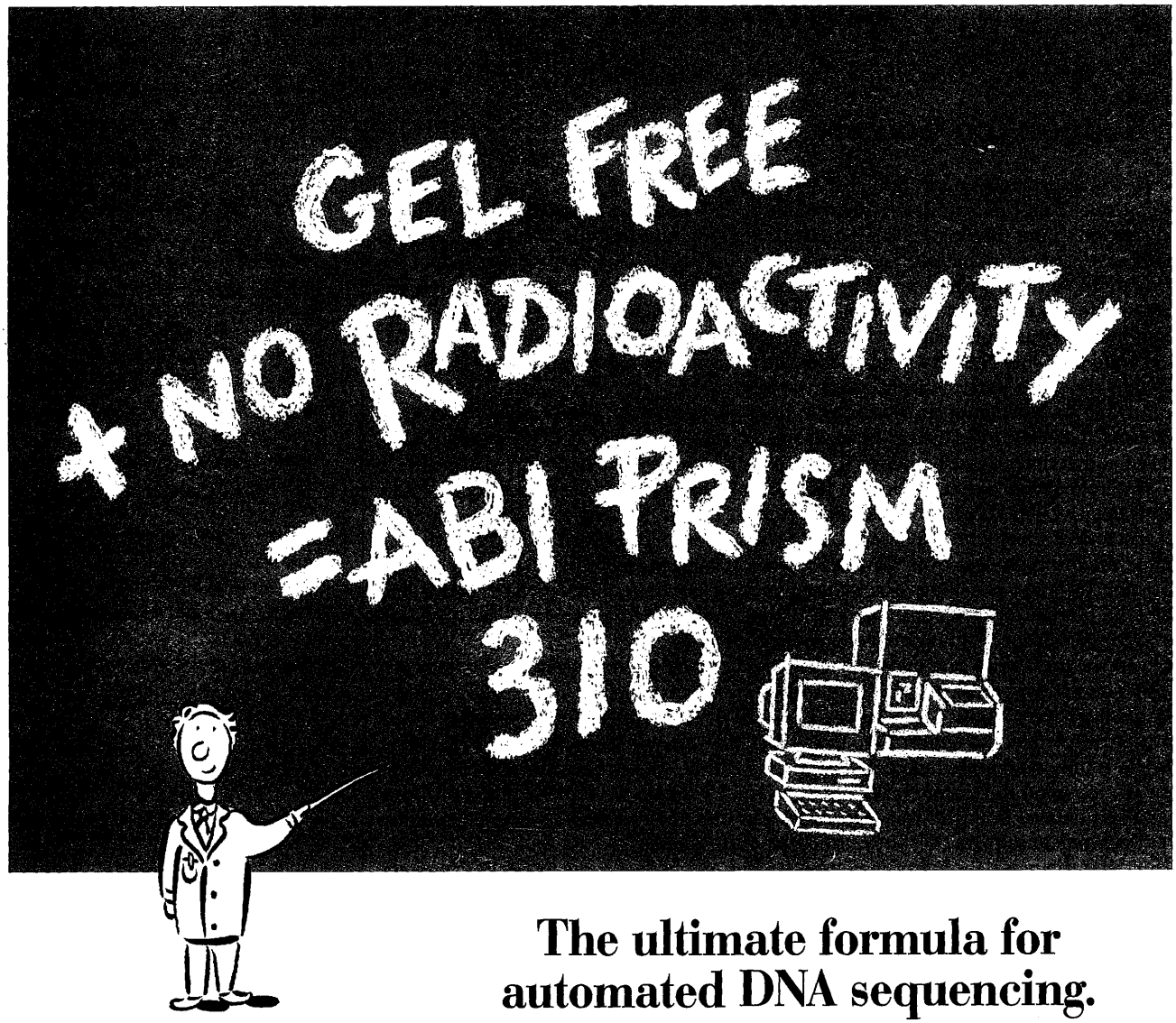

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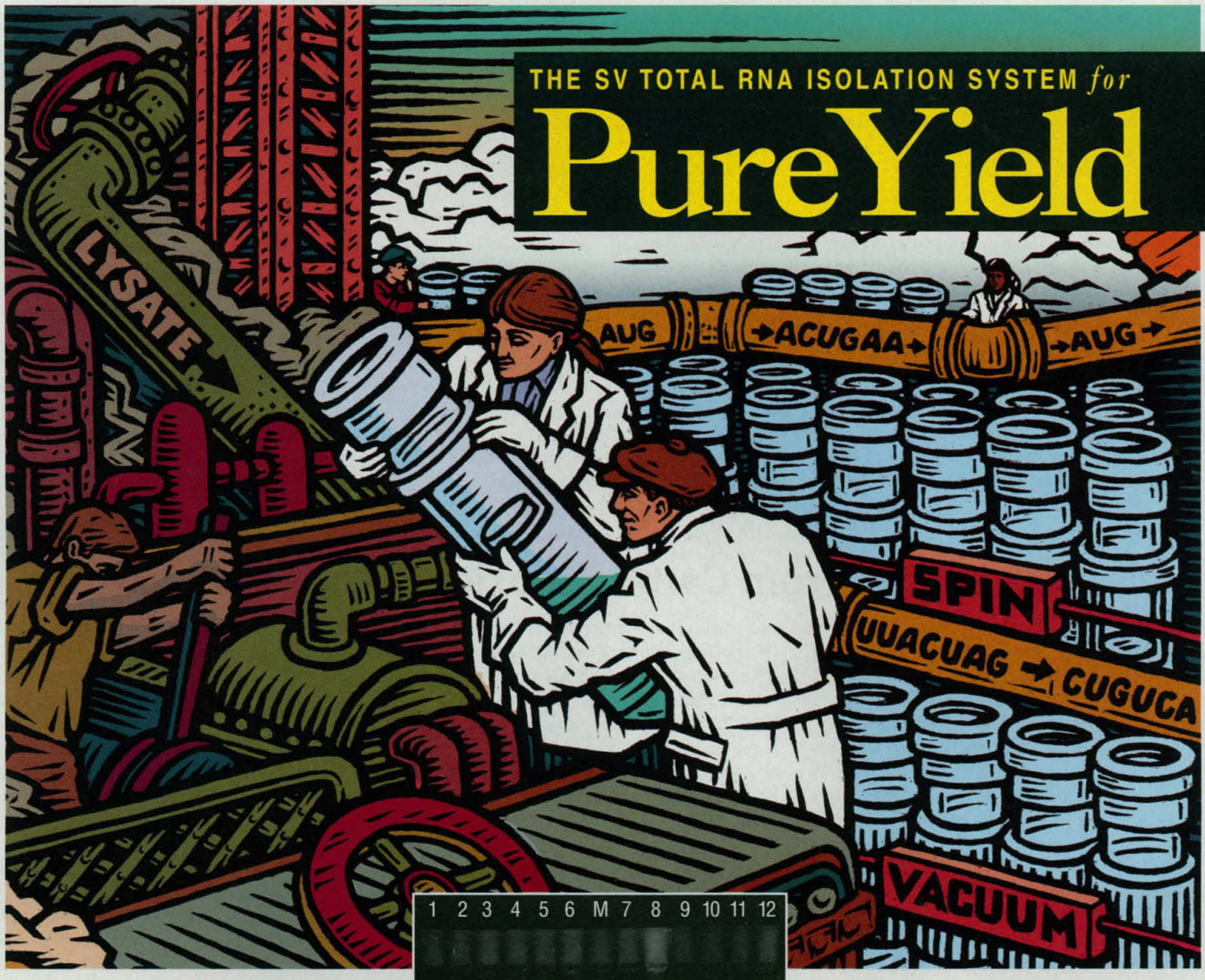

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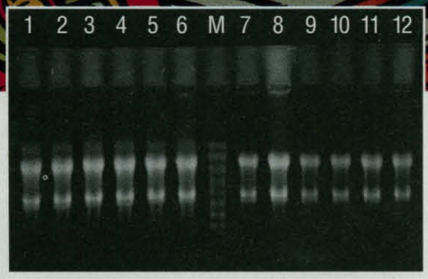

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- Works with blood, tissue and cells
- No chromosomal DNA contamination
- Fast protocol with no phenol

Product Information

Product	Cat.#
SV Total RNA Isolation System	Z3100
SV Total RNA Isolation System, Trial Size	Z3101

WWW.promega.com/rnafam/
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Promega

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R&D: Getting Our Money's Worth

23rd Annual AAAS Colloquium on Science and Technology Policy

April 29-May 1, 1998, 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 29

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

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

BUDGETARY AND POLICY CONTEXT FOR R&D IN FY 1999 (Plenary Symposium)

- Congressional Perspectives on S&T Issues for FY 1999 (Sen. Phil Gramm*)
- AAAS Overview of Federal Budget Proposals for R&D in FY 1999 (Stephen D. Nelson and Kei Koizumi, AAAS)
- Whatever Happened to the Entitlements Crisis? (Martha Phillips,* The Concord Coalition)
- A Scientist Looks at Science Policy (Eric Lander,* MIT)

THE WILLIAM D. CAREY LECTURE
(public invited) Rep. George E. Brown, Jr.

Reception

THURSDAY, APRIL 30

EVALUATING INVESTMENTS AND PERFORMANCE IN RESEARCH
(Plenary Symposium)
(Norine E. Noonan, moderator)
Franklin D. Raines,* OMB
Rep. Jim Sensenbrenner, Jr.*
Neal Lane,* NSF
Sir Robert M. May,* UK

LUNCHEON AND ADDRESS
Richard N. Zare,* Chair, National Science Board

CONCURRENT SYMPOSIA

- The Revolution in Military Affairs: The Role of R&D (Ann Markusen, organizer)
- Science and Technology Planning in the States (J. Scott Hauger, organizer)
- 150 Years of American Science Policy (Albert H. Teich, organizer)

MAJOR R&D AGENCY BUDGETS FOR FY 1999 (Concurrent small group sessions)
4:30 DOD • NIH • NSF
5:15 DOE • NASA • DOC (NIST, NOAA)

Reception and Open House at AAAS

FRIDAY, MAY 1

BREAKFAST AND ADDRESS

SCIENTIFICALLY ILLITERATE VS. POLITICALLY CLUELESS: THE INTERACTION OF SCIENCE AND ITS PUBLICS
(Plenary Symposium)
(J. Paul Gilman, moderator)

- Does Science Have a Credibility Problem? Pro and Con
- Questions the Public Has for Science
- "Literacy" Tests or a Dialogue?

LUNCHEON AND ADDRESS
House Speaker Newt Gingrich*

*Invited Speaker

Details and updated program information may be obtained by visiting the Colloquium Website, http://www.aaas.org/spp/dspp/rd/colloqu.htm

Budget discussions will be supplemented by *AAAS Report XXIII: Research and Development, FY 1999*, a comprehensive analysis of the proposals for the FY 1999 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 *1999 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 1999 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/dspp/rd/colloqu.htm.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

AAAS Colloquium on Science & Technology Policy

April 29–May 1, 1998, Renaissance Hotel, Washington, DC

ADVANCE REGISTRATION FORM

Please print or type:

Name _____

Organization _____

Street address _____

City/State/Zip _____

Phone _____

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

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

Please describe: _____

_____

TO REGISTER BY MAIL, send this registration form with payment to:
Registration, AAAS S&T Policy Colloquim
P.O. Box 630285, Baltimore, MD 21263.

TO REGISTER BY FAX, fax this registration to 202•289•4950.

TO REGISTER BY PHONE, call 202•326•7075 (automated service).

Cancellations must be faxed by April 16, 1998.

Deadline for advance registration is April 15, 1998[1]

REGISTRATION FEES	Non-member	AAAS Member
Regular	$270	$244
Nonprofit[2]	$210	$190
Student[2]	$75	$67

AAAS Membership Number: _____

MEAL TICKETS	
Lunch (Thurs. 30 April)	$36
Breakfast (Fri. 1 May)	$16
Lunch (Fri. 1 May)	$36

TOTAL AMOUNT DUE: $ _____

PAYMENT[3]

❑ Check enclosed ❑ VISA
❑ MasterCard ❑ American Express
❑ Original institutional purchase order attached (by mail only)

Card Number: _____

Expiration date: _____

Signature: _____

[1] After April 15, register in person at the Renaissance Hotel beginning at 12:00 p.m., April 29. 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 16, 1998, and will be processed after the Colloquium. No refunds will be made for cancellations received after April 16.

Publications: All registrants receive *AAAS Report XXIII: Research & Development, FY 1999* at the meeting and the *1999 AAAS Science and Technology Policy Yearbook* after the meeting and *Congressional Action on R&D in the FY 1999 Budget* in the fall.

RENAISSANCE HOTEL RESERVATION FORM

AAAS S&T Policy Colloquium April 29-May 1, 1998

(After April 7, 1998, guest rooms and rate availability may be restricted)

Name _____

Organization _____

Street address _____

City/State/Zip _____

Phone _____

Other occupants of room: Name(s) _____

Special housing needs:
❑ Wheelchair-accessible room
❑ Nonsmoking room
❑ Other _____

Room:
❑ Single (1 person, 1 bed) $142*
❑ Double (2 persons, 1 bed or 2 persons, 2 beds) $167*
❑ Double (2 persons, 2 beds) $167*
❑ Additional person, $25*

** Add 13% 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 p.m.; check-out time is 1:00 p.m. Cancellations/changes without loss to deposit must be made at least 72 hours before check-in time.

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

Credit card type _____ Card # _____

Signature _____ Exp. date _____

Mail bottom half (hotel reservation form) to:
Reservations, Renaissance Hotel
999 9th St. NW,
Washington, DC 20001

or call:
202•682•3400;
(reservations)
Fax 202•962•4445

Request AAAS rates.