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10. Successively reproducible within close specified limits
11. Abbrev for cell-selective protein that promotes adhesion of cells
12. Abbrev for gram negative endotoxin
13. Site on DNA lacking either purines or pyrimidines
14. Provided for a detection enzyme
15. Obtained from an affinity column
16. "The Ice Man Cometh" for cells
17. Abbrev for cluster of differentiation
18. Abbrev for superoxide dismutase
19. In exact conformity to fact
20. Cross-linked molecules
21. Discrete portion of a molecule
22. Region of an antigen that combines with an MHC class II molecule
23. Cell migration from the interior of small vessels into tissue spaces
24. A high level of discrimination; with 21 and 36 across, descriptive of Quantikine kits
25. Evidence ignored by Simpson jury
26. Capable of replication
27. An antigenic determinant
28. An end-to-end union or junction together of blood vessels
29. What R&D Systems is your source for
30. Substance acted upon by enzymes

DOWN
1. The weight of a single hydrogen atom or a member of an outlaw gang
2. Winner who shared 1984 Nobel prize with Miltstein
3. Major component of Dawkins' selfish entity
4. A molecule that serves as a homing device
5. Having a single binding site
6. A substance with which an antibody molecule or T cell receptor may bind
7. A defining example
8. Complementary binding site
9. "M" of EOM
10. A specimen of known content used together with an unknown in order that the two may be compared
11. Abbrev for an anticoagulant that binds divalent cations

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Imanishi-Kari Ruling Slams ORI

Scientists Ponder New Cluster Mission and Uncertain Future

Italian Space Agency Head Ends Term With a Bang

National Science Foundation: Awards

Mark Research-Learning Links

Japan: Five-Year Plan to Boost Spending

Phage Transfer: A New Player Turns Up in Cholera Infection

Watching the Earth Move

Divide and Confer: How Worm Embryo Cells Specialize

Artificial Life Gets Real as Scientists Meet in Japan

Corn: A Lot of Change from a Little DNA

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There Is Plenty of Room Between Two Atom Contacts

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Glacial Climate in the Tropics

W. Broecker

Tickling Memory T Cells

R. Ahmed

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M. K. Waldor and J. J. Mekalanos

Minimal Energy Requirements in Communication

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Atmospheric, Evolutionary, and Spectral Models of the Brown Dwarf Gliese 229 B

M. S. Marley, D. Saumon, T. Guillot, R. S. Freedman, W. B. Hubbard, A. Burrows, J. I. Lunine

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AIDS: A Global Response

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Human immunodeficiency virus (HIV) docking onto the CD4 receptor of a T lymphocyte with chemokine receptors (blue) at the ready. The face of acquired immunodeficiency syndrome has changed dramatically over the past few years, as a new generation of researchers comes to the fore, a new class of drugs shows promise, and scientists gain new insight into how HIV infects a CD4-bearing cell, its primary target. See the special section (pages 1876 to 1890), editorial (page 1855), and related reports (pages 1939 and 1955). Illustration: Terese Winslow

1943
Solution Structure of a Two-Base DNA Bulge Complexed with an Eneediyne Cleaving Analog A. Stassinopoulos, J. Ji, X. Gao, I. H. Goldberg

Induction of Bystander T Cell Proliferation by Viruses and Type I Interferon in Vivo D. F. Tough, P. Borrow, J. Sprent

Nonselective and $\text{G}_\text{B}^+$-Insensitive $\text{K}^+$ Channels B. Navarro, M. E. Kennedy, B. Velimirović, D. Bhat, A. S. Peterson, D. E. Clapham

A Chemoaerotrophically Based Cave Ecosystem S. M. Sarbu, T. C. Kane, B. K. Kinkle

CC CKR5: A RANTES, MIP-1α, MIP-1β Receptor as a Fusion Cofactor for Macrophage-Tropic HIV-1 G. Alkhattab, C. Combiadiere, C. C. Broder, Y. Feng, P. E. Kennedy, P. M. Murphy, E. A. Berger

1959

Modeling HIV Concentration During Acute AIDS Infection S. E. Wilson, J. A. Habeshaw, J. S. Oxford; A. N. Phillips

Rate of Killing of HIV-Infected T Cells and Disease Progression M. A. Huyten and A. U. Neumann

On the Web
The New Face of AIDS http://www.sciencemag.org/science/content/vol272/issue5270/1876a.htm
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**Not quite a star**

Now that astronomers have clearly identified a brown dwarf, Gliese 229 B, there is great interest in determining what makes this intermediate between a star and a planet tick. Marley et al. (p. 1919) used the methane spectrum of Gliese 229 B and a jovian atmospheric evolution model to estimate this body's mass and age. In addition, their model suggests that there is a flux enhancement in the 4- to 5-micrometer region that observers might use in their search for other cool objects.

**Atomic conductors**

Future device applications will require an understanding of electron transport through nanostructures or even atomic structures. Yazdani et al. (p. 1921; see the Perspective by Muller and Reed, p. 1901) measured the electrical resistance of a single xenon atom or a pair of xenon atoms held between a scanning tunneling microscope tip and a nickel surface. Theoretical calculations accurately predict the observed resistivity and show that off-resonant conduction occurs through the tail of the 6s electronic level.

**Cluster creation**

Two reports focus on new methods for synthesizing nanoclusters. Ahmadi et al. (p. 1924) show that the morphology of platinum particles can be controlled in colloidal synthesis by changing the concentration of a capping material, sodium polyacrylate. Xie et al. (p. 1926) have synthesized nanocrystalline gallium nitride, which has applications in blue-green laser diodes, by a method analogous to hydrothermal synthesis except that benzene is used instead of water. In addition to the hexagonal phase, they also make the rocksalt phase normally seen only at high pressure for bulk samples.

**Role of bacteriophage in cholera**

A filamentous phage has been shown to encode a virulence factor. Waldor and Mekalanos (p. 1910; see the news story by Williams, p. 1869) show that a phage encodes the structural genes for cholera toxin. Transmission of the phage occurs in the gastrointestinal tract. The receptor is an intestinal colonization factor called the toxin-coregulated pili. Because phage focuses in on those strains that can colonize the gut, it may prove useful as a gene therapy vector. Many clinically relevant pathogens express similar pili, raising the possibility that these may also serve as receptors for virulence-related phages.

**CD28 and HIV-1 infection of T cells**

Although CD4+ T cells are the main site of infection for human immunodeficiency virus-type 1 (HIV-1), not all of these cells are necessarily infected. Attempts to stimulate polyclonal proliferation of the uninfected cells for immune reconstitution or gene therapy are usually hampered by simultaneous stimulation of infected cells. Levine et al. (p. 1939) now show that costimulation of T cells from infected individuals with immobilized monoclonal antibodies to CD28 decreased HIV-1 viral load. Similar stimulation of T cells from uninfected donors rendered the cells resistant to HIV-1 infection.

**Macrophages and HIV-1**

Different HIV-1 isolates vary in their ability to infect different CD4+ cells because of differences in their envelope glycoprotein, which interact with specific fusion cofactors. Recently, the T cell cofactor was identified as fusin. Alkhattab et al. (p. 1955; see the news story in last week's issue by Balter, p. 1740) have now shown that the cofactor for macrophages is CC-CXCR5, a G protein-coupled receptor for the chemokines RANTES, MIP-1α, and MIP-

**Cave dwellers**

Ecosystems based on organisms that derive their energy from hydrogen sulfide rather than from the familiar photootrophic processes have been described in deep sea thermal vents, in deep freshwater lake thermal vents, and in surface hot springs. Sarbu et al. (p. 1953) have added a fourth chemoautotrophic system, a small terrestrial ecosystem discovered in a cave in Romania. In this karstic system, a diverse fauna, many of which are endemic to the system, subsists on grazing chemoautotrophic primary producers.

**Chloroplast import of sigma factor**

Chloroplast genomes encode all of the various proteins that make up the RNA transcription machinery except for the sigma factor, which affects promoter selectivity. Tanaka et al. (p. 1932) found that the missing gene is not in the chloroplast but is found in the nuclear genome. The nuclear gene product shows sequence similarity to cyanobacterial sigma factors and is imported into the chloroplast. This unusual distribution of genes may represent transfer of a gene from the primitive endosymbiont to the host nuclear genome during the evolution of eukaryotic cells.
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Hirudo medicinalis Unplugged

In August 1994, Ken Muller, chair of the neuroscience program at the University of Miami Medical School, asked if I would compose a musical tribute (1) to neuroscientist John G. Nicholls (2, 3) for his 65th birthday, as I am a scientist (4), a composer, and a former student of Nicholls'.

The "NichollsFest" was planned for November; I was at the Marine Biological Lab at Woods Hole and had little free time for music until the squid stopped running in September.

Knowing Nicholls' love of Beethoven (whom he often compared to his own mentor, Nobel Laureate Bernard Katz), I based the first movement on Beethoven's music, using thematic gestures and the sonata-allegro form. Nicholls' passion for Peru inspired the rhythms and melodies of the second movement, while the third movement was based on a 15th-century Nahuatl-Aztec poem he translated and sent as a greeting card to all his colleagues in 1993. This movement also uses gestures from a song cycle by Berlioz, "Les Nuits d'Été."

The thematic material for the final movement was borrowed from the electrical firing patterns of neurons in the central nervous system of the leech Hirudo medicinalis, a biological model system (3) developed by Nicholls before his current work on the opossum, in which he made significant discoveries about the role of glia and neurons in electrical signalling (2, 5) and about fundamental principles of axonal regeneration (6). As an undergraduate student in Nicholls' lab at Stanford in the late 1970s, I was surrounded by these neuronal rhythms, even in my dreams.

To alleviate possible boredom to the noninitiate, I added a Swiss yodel, intended to symbolize Nicholls' position as chair of pharmacology at the BioCenter in Basel, Switzerland.

Elaine L. Bearer
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References and Notes
7. I thank K. Muller and many other colleagues of J. G. Nicholls for support in producing the CD.

Striving for Creativity

My joy in seeing the title of Eliot Marshall's article "NIH panel urges overhaul of the rating system for grants" (News & Comment, 31 May, p. 1257) turned to dismay when I read that members of the National Institutes of Health (NIH) panel evaluating the peer-review system "left innovation out," according to Hugh Stampler (extramural research director at the National Institute of Mental Health), "because it seemed a bad idea to suggest that every grant should strive for creativity."

The current very low proportion of funded grants coupled with a rating system subject to a ceiling effect effectively results in a blackball system: Even one disgruntled
evaluator can knock a proposal out of the competition. Many scientists have developed an evaluative system that they have seen as implicitly rewarding grant proposals that are not objectionable to anyone passing judgment, rather than proposals that are highly creative and therefore likely to offend at least some vested interest (1). The recommendation of the panel makes explicit what before had been implicit—the institutionalized view that scientific creativity is not a necessary condition for a grant's being reviewed favorably. Yet, the research that has mattered in science has always been that which is creative and thus often defies existing conventions. There is a problem with the rating system at NIH, but fixing the rating system won't fix the larger problem of priorities that fly in the face of the history and philosophy of science.

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References

The Economics of Contraceptives R&D

A recent report by an Institute of Medicine (IOM) committee on contraceptive research and development (R&D) (Robert F. Service, News & Comment, 31 May, p. 1258) clearly defines the global unmet need for contraception. It decries the withdrawal of the pharmaceutical industry from the contraceptive field and considers it important "to show drug companies the massive need and potential market for new contraceptives." That massive need may well exist, but not the potential market. Of the eight largest pharmaceutical companies in the world, not one is active in contraceptive R&D; not one seems to sell contraceptive drugs or devices. The pharmaceutical market, which has changed dramatically during the past decade, has spoken. It now focuses on blockbuster drugs dealing with diseases of aging or deterioration in the increasingly geriatric populations of affluent Japan, North America, and Europe, not the needs of the poor pediatric societies of Latin America, Asia, and Africa.

An item in the same issue (Random Samples, 31 May, p. 1269) features the ominous trends for infectious diseases, listing the four biggest global killers: acute respiratory infections, diarrheal diseases, tuberculosis, and malaria. If we again consider the minute fraction of the huge R&D budgets of the top eight pharmaceutical companies dedicated to these fields, we see that unmet burning societal needs do not necessarily equal financial returns.

The most important point missed by the IOM committee is that the features of a truly novel contraceptive (say, a contraceptive vaccine or a once-a-month anti-implantation or menses-inducer pill) associated with major societal advantages (for example, low cost and long duration for a vaccine; short action and minimal pill consumption involving 13 pills per year for a menses-inducer versus 250 or more pills per year for current oral contraceptives) are precisely the economic disincentives keeping companies, which search for billion-dollar drugs used daily, from reentering the contraceptive field. The proposal "that commitments [by international aid agencies] to buy large volumes of contraceptives would induce companies to develop low-cost products" is a pipe dream. The only reason why some of the current oral contraceptive manufacturers will sell monthly pill regimens at 20 cents a pack-

Even Carl von Linné would have difficulty classifying us
age in lots of multimillion units to the Agency for International Development is the fact that an affluent American woman buying the same product in a drugstore pays more than 100 times that price. Absent that latter market, a pharmaceutical company would go broke if it focused on the low-cost public-sector market for a new contraceptive. More realistic, though politically unpopular, incentives for industrial involvement have been suggested earlier (1).

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References

Monbusho and CREST Grants

The News & Comment article by Dennis Normile describing the awarding of CREST (Core Research for Evolutional Science and Technology) grants in Japan (3 May, p. 645) was instructive and timely. However, I was not quoted accurately. What I said to Normile was, “As a matter of policy, Monbusho [the Ministry of Education, Science, Sports, and Culture] Research Grants usually do not provide funds for hiring research personnel. In addition, because the Department of Neurology is a clinical department, it is difficult to hire permanent staff who hold only the Ph.D. degree. My goal for the Department of Neurology is to foster a high level of basic research while maintaining excellence in clinical areas. The CREST grant is therefore particularly welcome, since it will help meet this goal by allowing us to hire researcher who hold Ph.D’s.” Indeed, my research has received much-appreciated support from Monbusho in the past. The CREST grant is also welcome, however, as it is of surprisingly large size.

This, of course, does not mean I agree with the content or tone of the statement, “Monbusho typically doles out tiny grants to academic researchers.”

Ichiro Kanazawa
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Response: I apologize for misinterpreting Kanazawa’s remarks. I did not intend any criticism of Monbusho, but was trying to explain that previously available funding programs would not have allowed Kanazawa to undertake his planned research.

—Dennis Normile

What Is Holography?

The Research News article “Two versions of holography vie to show atoms in 3D” by Steve Nadis (3 May, p. 650) discusses exciting new developments in x-ray analysis at atomic resolution (1). Is it accurate, however, to describe these methods as holography? Coherent illumination is not required, and the methods described allow one to reconstruct a representative unit cell when many unit cells are rotationally (although not necessarily translationally) aligned, rather than a point-to-point image of an object in the usual sense. Can it be applied to a single unit cell (that is, a noncrystalline specimen)? Issues which must be dealt with include fundamental considerations of radiation damage (2), even for materials science specimens, and of the desired condition |a| << 1r in holography between a reference wave r and an object wave a (diffraction analysis considers |a| **2).

The Research News article states, “x-ray
holography, like crystallography, cannot illuminate highly disoriented samples such as living biological tissue.” This statement is not in agreement with findings (3) about the use of x-ray holography to image subcellular structures and microfabricated test objects at sub-100–nanometer resolution; holography with x-ray lasers has been demonstrated (4) as a step toward flash imaging of initially living specimens. Other publications report biological imaging at a resolution of less than 60 nanometers by x-ray holography and plans for extension of the method to frozen hydrated specimens and 3D reconstruction by means of holographic tomography (5). These experiments involve holography in the usual sense of the word: A nonrepetitive object is illuminated by a coherent beam, and a classical image is reconstructed by propagation of a reconstruction wave through the processed hologram.

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References

"Natural" Cancer Prevention

I would like to comment on the News & Comment article "‘Natural’ cancer prevention trial halted“ by Kim Peterson (26 Jan., p. 441), in which it is implied that there is "less anomalous” toxicity for beta carotene because of the findings of the Beta Carotene and Retinol Efficacy Trial (CARET) study (1) and the earlier Alpha-Tocopherol, Beta Carotene (ATBC) study (2) of smokers.

Albanes (the principal investigator in the ATBC study) made presentations at antioxidant meetings in Berlin (fall 1994) to that effect that the increased incidence of lung cancer in the beta carotene cohort occurred only in smokers who were also heavy alcohol abusers. In other words, the smokers on beta carotene who were not heavy drinkers did not have increased lung cancer. No harm occurred, but no benefit could be expected, because beta carotene is not a suitable therapy for thwarting the consequences of heavy smoking. A similar co-morbidty occurred in the CARET study, where vitamin A (conservatively estimated at 50,000 international units per day for 4 years, because the conversion of beta carotene to vitamin A is likely enhanced in the presence of vitamin A) was found to be toxic and to induce liver pathology not unlike that of alcohol damage.

The scientific literature (3) and the 1980 and 1989 U.S. Recommended Dietary Allowances make it clear that 50,000 international units of retinol per day for months is unwise and leads to vitamin A toxicity. Beta carotene has a record of safety in humans who have ingested large doses (150 to 300 milligrams per day) over 15 years to control the symptoms of the genetic disease erythropoietic protoporphyria. Ironically, in developing nations, vitamin A deficiency is a major problem in spite of carotenes in food (4).

There is a likelihood that autopsy materials are available for some of the subjects in the ATBC and CARET trials, and the funding agency would be remiss if at least the liver tissues were not examined. Fur-
other, no clinical trials of these costly dimensions should be designed without peer review by experts in the biochemistry and toxicity of the agents under test.

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References

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**Super Success for Kids’ Radio**

The AAAS weekly children’s radio drama “Kinetic City Super Crew” won a gold medal for Best Educational Series in the annual International Radio Festival of New York. It competed against shows from Australian Radio, BBC, Canadian Broadcasting, and other production companies and networks around the world. In all, the entries totaled 1400 from 31 countries. The winners were honored 13 June in New York City.

The show, written and produced in AAAS studios, also was a finalist or medalist in two other categories: Best Drama Special Series and Best Writing.

The program follows the adventures of a young crew aboard an imaginary high-powered train that travels around the world solving science-based mysteries with the help of a talking computer. Launched in October 1994, the show is now heard on 50 stations nationwide. Listeners can follow the show’s progress on the Web at http://www.aaas.org/ehr/kcsuper.html. It offers a synopsis of the current week’s episode, a related experiment to conduct at home, and other information. Producer Bob Hirshon of AAAS’s Education and Human Resources Director-ate said the program is seeking funding for a greatly expanded Web site, to be called The Kinetic City Cyber Club. It would feature monthly mysteries with daily clues, science discussion groups, and voting to determine the direction of the Super Crew’s investigations.

Two additional outreach initiatives, Kinetic City Classrooms and Kinetic City Super Crew Clubs, began this spring at 150 initial school and community sites. Teachers and other adults implement team-oriented, hands-on experiments based on the show’s activities, while students complete and submit a “casebook.”

“Ours is to revise the project based on feedback from the spring program and offer it to 600 sites in the fall,” Hirshon said. “Eventually we hope to secure the resources to start Kinetic City Classrooms and Kinetic City Super Crew Clubs in towns and cities across the country.”

A prototype of the Crew Club concept was started last fall at the St. Louis Science Center. Children who joined the free club attended monthly Super Crew rallies, did hands-on science experiments, and solved mysteries that involved hunting for clues in the museum.

The first cassette of the radio show is now available. In this episode, “Concrete Jungle, or the Case of the City Safari,” the crew help Kinetic City’s Mayor Schwindle track down wild animals so their town will be named an official “Safari City.” (The cost is $8.95 plus $4 postage and handling. Order by calling 1-888-GET-CREW.)

**Reports View S&T Future in Two States**

California’s world-class universities and overall economy and Georgia’s growing high-tech industry could suffer major blows if the federal government were to out plans to slash research funding in the next several years, according to two new AAAS reports.

The reports, published by the AAAS Center for Science, Technology, and Congress, are the first in a series analyzing state and regional impacts of research and development (R&D) funding in federal budget proposals. They follow earlier AAAS analyses showing that total government support for nondefense R&D is projected to decline by one-quarter in real terms by 2002.

Because of California’s heavy dependence on federal R&D, major cutbacks would have “a disproportionate impact” on the state, concludes The Future of Science and Technology in California: Trends and Indicators. It notes that more than one-fifth of all U.S. R&D is done in California, which gets about 25% of federal R&D expenditures.

Several of the state’s universities—notably Caltech, Stanford, the University of California-San Diego, and the University of California-Santa Barbara—receive more than 80 percent of their R&D funds from the federal government. Steep declines in R&D support would be painful for academic budgets already squeezed by steady reductions in California’s spending for its colleges and universities.

AAAS issued the report late last month at a summit of R&D leaders who gathered in Sacramento to discuss ways of collaborating to promote R&D development throughout the state in the face of increased competition, economic job shifts, and curtailed funding.

A comparable AAAS report on Georgia concluded that the federal R&D budget proposals could undermine the state’s progress in establishing a strong high-tech research community.

In 1990, a partnership of research universities, businesses, and state officials founded the Georgia Research Alliance (GRA) to foster economic development by establishing Silicon Valley-type concentrations of high-tech businesses in the vicinity of Georgia universities.

The Defense Department’s award of a major F-22 contract to Lockheed Martin in 1991 had “a stunning impact on the R&D picture in Georgia,” the AAAS report found. The contract helped boost Georgia from 25th to 5th among states receiving federal research money, said Al Teich, head of the AAAS Science and Policy Directorate. At a 20 May forum in Atlanta hosted by AAAS and GRA, Teich cautioned against over-reliance on the F-22 program and suggested the need for a more diversified R&D portfolio.

Copies are $8.95 each, plus $2.50 for postage and handling. Order by phone: 202-326-6600; fax: 202-289-4950; e-mail: science_policy@aaas.org; or from Shirley Young, AAAS Directorate for Science and Policy Programs, 1200 New York Avenue, NW, Washington, DC, 20005.
Brave New World of Biopatents

As biotechnology dangles the promise of a new Golden Age of medicine, companies and research institutions are rushing to patent genetically altered animals and human genetic material, including DNA fragments, that could give them an edge in the marketplace.

Morally troubled by the practice, a broad coalition of religious leaders mounted a national campaign last year against "the granting of government patents on God's Creation."

In response to the controversy, AAAS's Program of Dialogue Between Science and Religion last month convened a panel of scientists, philosophers, religious leaders, and representatives of business and government to discuss the issue. Their talk was complicated by differing interpretations of patent law and lack of agreement about what is being patented. Yet many agreed with Alan Goldhammer of the Biotechnology Industry Organization, who said: "We have more in common than we realize."

The participants didn't object to the use of genetic technologies per se for human benefit, and they agreed some kind of intellectual property rights can advance that cause. They also agreed on the need to prevent "commodification and commercialization" of human genetic material. They had arrived, however, with a range of theological, moral, and social objections, which fueled the debate.

What Is Patented?

Lawrence Goffney Jr., acting deputy assistant secretary of the Commerce Department and deputy commissioner of patents and trademarks, attributed the controversy to a "misunderstanding about what is being patented." The U.S. Patent and Trademark Office, he declared, does "not allow people to patent life forms." A gene patent, he explained, applies "not to the DNA itself but to the process of altering it in some way using human knowledge to create something else." He also challenged another sticking point: the notion that a patent confers "ownership" of a gene. The patent, he said, merely grants an exclusive right to prevent others from making, using, or selling a particular sequence in a specific application without express permission for a period of 20 years.

"If you think of it in terms of ownership, it's a problem," agreed Francis Collins, head of the National Center for Human Genome Research. "To my mind you step away from the idea that patenting a gene is owning a gene."

Collins said he views the new genetics in the light of one of the strongest mandates of humankind: to relieve suffering—"as Christ spent a lot of his time on Earth healing the sick." He suggested one major question to address: Is patenting in genetics beneficial to the public or not?

Reverend Ben Mitchell of the Southern Baptist Convention's Christian Life Commission found such an approach too reductionistic. "There's an interest in alleviating suffering, but we need to consider unintended consequences," he cautioned. "It's a slippery slope. I see it leading from a flat mechanistic approach to patenting of a full human being."

Although "sanctity of life" concerns were of primary consideration, Jaydee Hansen of the United Methodist Board of Church and Society said principles such as equity and nondiscrimination also are central to the debate. "There's a generational shift going on in the churches, and groups of younger people are more concerned today with medical and distributional justice issues," he noted.

Representing patients and their families, Martha Volner, director of health policy for the Alliance of Genetic Support Groups, suggested that society treat genetic discoveries more like public utilities, to ensure the availability and affordability of drugs that may result.

Industry Viewpoint

Industry representatives defended gene patenting. Goldhammer said intellectual property rights protection is paramount for the biotechnology industry because it takes 6 to 8 years, at nearly $400 million a year, to take a discovery from invention to commercialization. "For any company to embark on a project of this magnitude you need assurance you have the market to yourself," he said.

Patrick Korten of the Pharmaceutical Research and Manufacturers of America said that while his industry welcomed "thoughtful input" on issues related to genetic technology, "we don't see the issue of gene patenting as a debatable one." He added: "A patent makes possible a tremendous good. Without it, an important discovery will not lead to practical products."

Stuart Newman, a professor at New York Medical College and cofounder of the Council for Responsible Genetics, took issue with that assumption, arguing that gene patents work against the tradition of shared knowledge in scientific discovery. "Patients help people who hold the patents," he declared. "They don't help science, and they don't necessarily help people."

Some of the participants expressed a willingness to consider alternative mechanisms that could offer intellectual property protection while accommodating religious and moral principles.

The group concurred that the meeting helped to clarify areas of agreement and identify issues on which there was no consensus, and decided to meet again in the fall to continue the dialogue. They also expressed interest in a new dialogue on genetic discrimination issues.

For information, contact Audrey Chapman: 202-326-6795 or achapman@aaas.org.

AAAS Annual Election: Preliminary Announcement

The 1996 AAAS election of general and section officers will be held in September. All members will receive a general ballot for election of the president-elect, members of the Board of Directors, and members of the Committee on Nominations. Members registered in one to three sections will receive ballots for election of chair-elect, member-at-large of the Section Committee, and members of the Electorate Nominating Committee for each section.

Members enrolled in the following sections will also elect Council delegates: Agriculture, Food, and Renewable Resources; Engineering; History and Philosophy of Science; Industrial Science and Technology; Medical Sciences; Psychology; Social, Economic, and Political Sciences.

Candidates for all offices are listed on the following two pages. Additional names may be placed in nomination for any office by petition submitted to the Executive Officer no later than 12 August. Petitions nominating candidates for president-elect, members of the Board, or members of the Committee on Nominations must bear the signatures of at least 100 members of the Association. Petitions nominating candidates for any section office must bear the signatures of at least 50 members of the section. A petition to place an additional name in nomination for any office must be accompanied by the nominee's curriculum vitae and statement of acceptance of nomination.

Biographical information on the candidates that follow will be enclosed with the ballots mailed to members in September.
General Election
President-Elect: M. R. C. Greenwood, University of California, Santa Cruz; Chang-Lin Tien, University of California, Berkeley.

Board of Directors: George Campbell Jr., NACME, Inc., New York City; Robert D. Goldman, Northwestern University Medical School; Alice S. Huang, New York University; Cora Bagley Marrett, National Science Foundation.

Committee on Nominations: Lawrence Bogorad, Harvard University; Joseph Gordon II, IBM; Ronald L. Graham, AT&T Research, Murray Hill, NJ; Ann R. Markusen, Rutgers University; Karl S. Pister, University of California, Santa Cruz; Frank Press, Carnegie Institution of Washington; Anne O. Summers, University of Georgia, Athens; William R. Wiley, Battelle Memorial Institute, Richland, WA.

Section Elections
Agriculture, Food, and Renewable Resources
Chair-Elect: Donald C. Beitz, Iowa State University, Ames; R. James Cook, Washington State University, Pullman.
Member-at-Large of the Section Committee: Clifford J. Gabriel, Office of Science and Technology Policy, Washington, DC; Bennie I. Osburn, University of California, Davis.
Electoral Nominating Committee: Charles Guy, University of Florida, Gainesville; Jo-An C. Leong, Oregon State University, Corvallis; Barbara Valent, DuPont Central Research & Development, Wilmington, DE; Neal Van Alfen, Texas A&M University, College Station.

Anthropology
Chair-Elect: C. Loring Brace, University of Michigan, Ann Arbor; Emilio F. Moran, Indiana University, Bloomington.
Member-at-Large of the Section Committee: Robert D. Drennan, University of Pittsburgh; Christopher B. Ruff, Johns Hopkins University School of Medicine.
Electoral Nominating Committee: George L. Cowgill, Arizona State University, Tempe; Dean Falk, State University of New York, Albany; James O'Connell, University of Utah, Salt Lake City; Richard Potts, Smithsonian Institution.

Astronomy
Chair-Elect: Stephen P. Maran, Goddard Space Flight Center, Greenbelt, MD; Virginia Trimble, University of California, Irvine.
Member-at-Large of the Section Committee: Laurence A. Marschall, Gettysburg College; David Morrison, NASA Ames Research Center.
Electoral Nominating Committee: Edmund Bertschinger, Massachusetts Institute of Technology; Peter B. Boyce, American Astronomical Society, Washington, DC; Christine Jones, Harvard-Smithsonian Center for Astrophysics; Alan P. Marscher, Boston University.

Atmospheric and Hydrospheric Sciences
Chair-Elect: Dennis L. Hartmann, University of Washington, Seattle; Michael B. McElroy, Harvard University.
Member-at-Large of the Section Committee: David Randall, Colorado State University, Fort Collins; Thomas C. Royer, University of Alaska, Fairbanks.
Electoral Nominating Committee: Kenneth H. Brink, Woods Hole Oceanographic Institution; Leo J. Donner, Princeton University; James F. Kasting, Pennsylvania State University; Willard S. Moore, University of South Carolina, Columbia.

Biological Sciences
Chair-Elect: Frank Talamantes, University of California, Santa Cruz; Marvaree H. Wake, University of California, Berkeley.
Member-at-Large of the Section Committee: Margaret G. Kidwell, University of Arizona, Tucson; Leonard Krishtalka, University of Kansas, Lawrence.
Electoral Nominating Committee: Michael J. Donoghue, Harvard University; David W. Inouye, University of Maryland, College Park; Deborah K. Letourneau, University of California, Santa Cruz; A. Javier López, Carnegie Mellon University.

Chemistry
Chair-Elect: Peter Beak, University of Illinois, Urbana; Peter C. Jurs, Pennsylvania State University.
Member-at-Large of the Section Committee: Peter J. Stang, University of Utah, Salt Lake City; Karen E. Wetterhahn, Dartmouth College.
Electoral Nominating Committee: Kathryn A. Parker, Brown University; C. Dale Poulter, University of Utah, Salt Lake City; Kenneth J. Shea, University of California, Irvine; Fred Wudl, University of California, Santa Barbara.

Dentistry
Chair-Elect: Brian H. Clarkson, University of Michigan, Ann Arbor; Lois K. Cohen, National Institute of Dental Research.
Member-at-Large of the Section Committee: Deborah Greenspan, University of California, San Francisco; Richard R. Ranney, University of Maryland, Baltimore.
Electoral Nominating Committee: J. Terrell Hoffeld, National Institutes of Health; Frank Nichols, University of Connecticut, Farmington; Ichiro Nishimura, Harvard School of Dental Medicine, Boston; Malcolm L. Sneed, University of Southern California.

Education
Chair-Elect: Ronald D. Anderson, University of Colorado, Boulder; Susan Phillips Speece, Fresno City College.
Member-at-Large of the Section Committee: Mary M. Atwater, University of Georgia, Athens; Valerie C. Chase, National Aquarium, Baltimore.
Electoral Nominating Committee: Andrea Bowden, Baltimore Public Schools; Loretta L. Jones, University of Northern Colorado, Greeley; Eleanor D. Siebert, Mount St. Mary's College, Los Angeles; Gordon E. Uno, University of Oklahoma, Norman.

Engineering
Chair-Elect: Joseph Bordogna, National Science Foundation; Robert M. Nerem, Georgia Institute of Technology, Atlanta.
Member-at-Large of the Section Committee: Frank S. Barnes, University of Colorado, Boulder; Nancy A. Da Silva, University of California, Irvine.
Electoral Nominating Committee: Cynthia J. Atman, University of Pittsburgh; Erieh Bloch, Council on Competitiveness, Washington, DC; L. S. (Skip) Fletcher, Texas A&M University, College Station; Edwin Byron Stear, Boeing Company, Seattle.

General Interest in Science and Engineering
Chair-Elect: Norine E. Noonan, Florida Institute of Technology, Melbourne; John L. Salko, University of South Carolina, Columbia.
Member-at-Large of the Section Committee: Noel W. Hinnery, Lockheed Martin Astronautics, Denver; Lawrence Kupchella, Indiana University, Pennsylvania.
Electoral Nominating Committee: S. K. Magumder, Lafayette College, Easton, PA; J. Shipley Nowlin Jr., Science Museum of Minnesota, St. Paul; Gloria J. Takahashi, La Habra High School, CA; Jo Ann Myer Valenti, Brigham Young University.

Geology and Geography
Chair-Elect: Grace S. Brush, Johns Hopkins University; Lisa A. Rossbacher, Dickinson College, Carlisle, PA.
Member-at-Large of the Section Committee: William R. Hammer, Augustana College, Rock Island, IL; Susan Hanson, Clark University, Worcester, MA.

History and Philosophy of Science
Chair-Elect: Michele L. Aldrich, Cornell University; Michael M. Sokal, Worcester Polytechnic Institute.
Member-at-Large of the Section Committee: Lindsey Darden, University of Maryland, College Park; Elizabeth Knoll, W.H. Freeman & Company, Needham, MA.
Electoral Nominating Committee: Joan H. Fujimura, Stanford University; Bruce V. Lewenstein, Cornell University; Vassiliki Betty Smocovits, University of Florida, Gainesville; M.
Norton Wise, Princeton University.

Chair: William R. Dill, Foreside, ME; Albert H. Rubenstein, Northwestern University.

Member-At-Large of the Section Committee: Aaron J. Gellman, Northwestern University; Barry G. Silverman, George Washington University.


Council Delegate: Don E. Kash, George Mason University, Fairfax, VA; Robert L. Stern, Washington, DC.

Information, Computing, and Communication

Chair: Caroline M. Eastman, University of South Carolina, Columbia; Alexia T. McCray, National Library of Medicine.


Electrocardiology Nominating Committee: Ray R. Larson, University of California, Berkeley; Davis B. McCall, Rockville, MD; Peter G. Neumann, SRI International, Menlo Park, CA; Ralph Z. Roskies, University of Pittsburgh.

Linguistics and Language Science

Chair: Lila R. Gleitman, University of Pennsylvania; Geoffrey K. Pullum, University of California, Santa Cruz.

Member-At-Large of the Section Committee: Ellen F. Prince, University of Pennsylvania; Susan Steele, University of Arizona, Tucson.

Electrocardiology Nominating Committee: Barbara Abbott, Michigan State University, East Lansing; Ralph W. Fasold, Georgetown University; Keren D. Rice, University of Toronto, Ontario; Catherine O. Ringen, University of Iowa, Iowa City.

Mathematics

Chair: Lencore Blum, Mathematical Sciences Research Institute, Berkeley, CA; Ronald G. Douglas, Texas A&M University, College Station.

Member-At-Large of the Section Committee: Amy Cohen, Rutgers University; Ian Stewart, University of Warwick, Coventry, United Kingdom.

Electrocardiology Nominating Committee: Edward F. Aboufadel, Grand Valley State University, Allendale, MI; Bonnie Jean Shulman, Bates College, Lewiston, ME; James G. Timourian, University of Alberta, Edmonton; Benjamin S. White, Exxon Research and Engineering Company, Annandale, NJ.

Medical Sciences

Chair: Neil R. Blacklow, University of Massachusetts Medical School, Worcester; Samuel C. Silverstein, Columbia University College of Physicians and Surgeons.

Member-At-Large of the Section Committee: Josephine P. Briggs, University of Michigan, Ann Arbor; Daniel Steinberg, University of California, San Diego.

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Neuroscience

Chair: Nicholas C. Spitzer, University of California, San Diego; Sandra F. Witelson, McMaster University, Hamilton, Ontario.

Member-At-Large of the Section Committee: John H. Byrne, University of Texas, Houston; Karina F. Meiri, State University of New York, Syracuse.

Electrocardiology Nominating Committee: Stephen S. Easter Jr., University of Michigan, Ann Arbor; Marcus E. Raichle, Washington University, St. Louis; Joshua R. Sanes, Washington University, St. Louis; Richard W. Tsien, Stanford University.

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Electrocardiology Nominating Committee: Ellen Cheung, Amgen, Inc., Thousand Oaks, CA; Jeffrey L. Ciepl, Genentech, Inc., San Francisco; Robert P. Hanzlik, University of Kansas, Lawrence; Robert A. Wiley, University of Iowa, Iowa City.

Physics

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Member-At-Large of the Section Committee: Jerry P. Goldblum, Haverford College, Haverford, PA; Noemie Koller, Rutgers University.

Electrocardiology Nominating Committee: Venky Narayanamurti, University of California, Santa Barbara; Robert L. Park, University of Maryland, College Park; Roy F. Schwitter, University of Texas, Austin; Mary L. Shoaf, West Chester, PA.

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Council Delegate: I. Gormezano, University of Iowa, Iowa City; Neal F. Johnson, Ohio State University, Columbus.

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Societal Impacts of Science and Engineering


Member-At-Large of the Section Committee: Harold M. Schmeck Jr., N. Chatham, MA; Arthur H. Westing, Westing Associates in Environment, Security, and Education, Putney, VT.

Electrocardiology Nominating Committee: Kevin Finneran, Issues in Science and Technology, Washington, DC; Thomas H. Moss, National Academy of Sciences; Paul Slovic, Decision Research, Eugene, OR; Robert Hunt Sprinkle, University of Maryland, College Park.

Statistics


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