QuikChange™ Site-Directed Mutagenesis Kit

**Near 100% Efficiency**
- Eliminates background
- Cuts screening time in half
- Highest efficiency method
- Mutation in virtually all transformants

**150 Times More Accurate than PCR-based Mutagenesis**
- Extends without PCR
- Uses high-fidelity Pfu DNA polymerase
- Replicates only parental DNA
- Reduces second-site mutations 150 fold

1-Day Method
- Gene in plasmid with target site for mutation

1. Mix
- Denature plasmid and anneal primers containing the desired mutation

2. Cycle
- Temperature cycle to extend and incorporate mutation primers resulting in nicked circular strands

3. Digest
- Digest parental DNA template

4. Transform
- Transform the resulting annealed double-stranded nicked DNA molecules
- After transformation the XL2-Blue E.coli cell repairs the nicks in the plasmid

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You can be sure of that.
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Dorsal view of a day 15.5 transgenic mouse embryo (1 centimeter long) in which the cardiovascular system was visualized by staining for expression of a transgene controlled by the promoter of the smooth muscle-specific gene SM22α. Staining specifically marks arterial smooth muscle cells throughout the developing vasculature. The molecules controlling heart development are among the topics highlighted in this special issue on cardiovascular medicine. See page 671 and the special section beginning on page 663. [Image: L. Li, B. Mercer, and E. Olson]

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Dendritic spines revealed

**Inhibitor p21WAF1/KIP1 Mediated by STAT1**


In Vitro Development of Primitive and Definitive Erythrocytes from Different Precursors

T. Nakano, H. Kodama, T. Honjo

Homologous Association of Oppositely Imprinted Chromosomal Domains

J. M. LaSalle and M. Lalande

Amelioration of Vascular Dysfunctions in Diabetic Rats by an Oral PKC β Inhibitor


A Mouse Model of Familial Hypertrophic Cardiomyopathy


The Cytolytic P7 Receptor for Extracellular ATP Identified as a P2X Receptor (P2X): A. Surprenant, F. Rassendren, E. Kawashima, R. A. North, G. Buell

Requirement for BMP Signaling in Interdigital Apoptosis and Scale Formation

H. Zou and L. Niswander

Role of Gene Interactions in Hybrid Speciation: Evidence from Ancient and Experimental Hybrids

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**TECHNICAL COMMENTS**

Origin of Replication of Mycoplasma genitalium

J. R. Lobry

Classification of the Arthropod Fuxianhuia

M. A. Wills; G. D. Edgecombe and L. Ramsköld

**Indicates accompanying feature**

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Don't Get Stuck with Magnets.

Figure 1.
No-passing zone
Traveling down a two-lane road can be slow, but it is even slower when you are not allowed to pass cars ahead of you. Molecules diffusing in channels so confining that they cannot pass each are also expected to be slowed down, but this effect has been difficult to measure. Kuyla et al. (p. 702) now provide direct nuclear magnetic resonance measurements of molecules diffusing “single file” in zeolite channels. This type of diffusion may also occur in ion channels in cell membranes.

Peaks in pollution
Regional data on long-term trends in tropospheric air pollution for the Southern Hemisphere have been extracted from data from the TOMS satellite. Jiang and Yung (p. 714) compared the TOMS total column ozone values for the high Andes, whose peaks extend through the troposphere, with those of nearby oceanic regions. The derived signals show that tropospheric ozone levels over the tropical Pacific Ocean have increased from 1979 to 1992. The likely source of the pollution is biomass burning.

Iron in Io
Io—the odd, sulfur-rich, volcanically active inner satellite of Jupiter—has a metallic core that accounts for as much as 20% of its mass. Anderson et al. (p. 709) detected this core using Doppler waves generated by the Galileo orbiter on its closest approach to Io. How this smaller scale version (about the size of the moon) of a differentiated Earth with an iron-rich core evolved and why it is part of the jovian system is still not known.

Heartsick mice
Familial hypertrophic cardiomyopathy (FHC) is a clinically diverse inherited disorder whose effects range from mild shortness of breath to heart failure and sudden death. A subset of HFC is caused by mutations in the β cardiac myosin heavy chain (MHC) gene. Geisterfer-Lowrance et al. (p. 731) created a mouse model of FHC by introducing a clinically defined β cardiac MHC mutation into the mouse α cardiac MHC gene. Mice homozygous for the mutation died 7 days after birth. Heterozygotes survived for 1 year and showed age-dependent hemodynamic and histopathologic abnormalities, with males somewhat more affected than females. Preliminary results suggested that exercise capacity was compromised in the heterozygotes. A special section on cardiovascular medicine (pp. 663–693) discusses progress in understanding and treating heart disease.

The layered look
Suspensions of colloidal particles can form ordered crystals, but this process is difficult to control or to confine to two-dimensional layers on a surface. Trau et al. (p. 706) have developed an electrohydrodynamic method for growing two- and three-dimensional colloidal crystals on electrode surfaces. The method can be used with particles from the micrometer- to the nanometer-size range and offers a route for assembling nanoparticles into structures.

Imprint by association
Imprinting is a process that distinguishes certain maternal and paternal chromosomal regions that will be differentially expressed during development. LaSalle and Lalande (p. 725) found that the maternal and paternal homologs of human chromosome 15 preferentially associate at a region that has been implicated in imprinting (15q11-q13), and that this association occurs only during the late S phase of the cell cycle. This homologous association was not seen in cells from patients with genetic disorders that result from the lack of a paternal or maternal contribution to the 15q11-q13 region (Prader-Willi syndrome and Angelman syndrome, respectively). These results suggest that trans-acting elements may be important in imprinting.

Dendritic spine coupling
In order to understand how the dendritic spines are electrically and chemically coupled to the dendritic shaft—a process important in understanding synaptic transmission—Svoboda et al. (p. 716) directly measured the diffusion of dextran with fluorescence imaging techniques. Their findings show that the spines and shafts are chemically but not electrically separate compartments during neuronal transmission.

Broken open
Extracellular adenosine triphosphate (ATP) can cause the lysis of macrophages due to the formation of large membrane pores in the cell’s membrane. The identity of the pore—known as the P2 receptor—has remained elusive. Surprenant et al. (p. 735) describe a bifunctional ATP receptor from rat brain that, in addition to acting as a traditional ligand-gated ion channel, has the characteristics expected of the P2 receptor— the ability to form lytic pores in cells that express the protein.

Both young and old
During evolution, new species can arise from the hybridization of two parental species. Rieseberg et al. (p. 741; see the Perspective by Coyne, p. 700) examined the genomic composition of an ancient hybrid sunflower species and three hybrid sunflower lines created in the lab. Although the three experimentally created lines were synthesized by different crossing schemes, they contain similar combinations of genes. Surprisingly, these experimentally created lines resemble very closely the ancient hybrid species.

Chick chick duck
During development of the digits in vertebrates, programmed cell death (apoptosis) causes the loss of interdigital tissue in order to define the digits. Zou and Niswander (p. 738) examined the role of the bone morphogenetic protein (BMP) in interdigital apoptosis. The blockage of BMP signal transduction in the developing chick limb by the expression of a dominant negative BMP receptor reduced apoptosis, which resulted in webbed feet as well as a transformation of scales to feathers.
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Glowing reviews

Applause is given to scientists who have helped unlock the secrets of cultivating a new research “model” of animal-microbe symbiosis: a Hawaiian squid that harbors glow-in-the-dark bacteria (right). Questions about radiation and cancer dose-risk theories are raised: Is there a threshold below which exposure to radiation can be deemed safe? Is acute or continual exposure more dangerous? According to public health specialists, many lives could be saved by acknowledging the safety of plasma-derived hepatitis B vaccine in developing countries. And theories of immune system functioning and evolution are discussed.

Squid Pro Quo?

I was pleased to see the coverage in Random Samples (5 Apr., p. 37) of the new little squid (Euprymna scolopes) now under culture at the Marine Biological Laboratory (MBL). It is exciting to have a new squid in the village and to look forward to the future research use of the organism. It seems appropriate, however, to also credit the work of the scientists who are making this development possible. Roger Hanlon, the MBL’s Director of Marine Resources, working with Paul Dunlap, Susan Ashcraft, Michael Claes, and others, have conducted the first significant egg-to-egg cultivation of Euprymna since they were raised by John Arnold in Hawaii (the squid’s home waters) in the 1970s (1). Without the provision of a stable source of these fascinating cephalopods, Euprymna-based research could not progress to its next stage.

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References

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Risks from Low Doses of Radiation

We disagree with some of the statements in Marvin Goldberg’s Perspective (29 Mar., p. 181) challenging the traditional linear-nonthreshold paradigm for estimating cancer risks at low doses of ionizing radiation. It contains, in our opinion, a number of misleading interpretations of scientific data and ignores the considerable weight of evidence in support of linearity.

It is widely accepted that carcinogenesis is a multistage process in which a single cell gives rise to a tumor, with mutation of cellular DNA required in one or more of the steps leading to malignancy. Since cancer is a common disease, obviously the background rate for each of these steps is not zero, and any filtration mechanism for removing precancerous cells is imperfect. Therefore, any exposure that increases the rate of somatic mutations would be expected to increase the risk of cancer. Radiation is believed to be mutagenic down to the lowest doses, as ionization clusters generated by a single track can produce DNA damage that is not always faithfully repaired. Consequently, a threshold for radiation carcinogenesis seems unlikely.

Goldman states, “We now know that continual radiation exposure is less carcinogenic than acute exposure, all else being equal.” Although this has been demonstrated in laboratory experiments, the limited evidence in humans suggests that the reduction risk is generally very modest (about a factor of 2 or less) (1, 2). Goldman writes that comparative studies of cancer rates in areas of differing background levels are suggestive of a beneficial effect of radiation but does not point out that most epidemiologists consider such “ecologic” studies to be noninformative because of statistical limitations and potential confounding. He cites data on bone cancer induction by ingested radium as evidence that the latent period between irradiation and cancer expression increases with decreasing dose rate to suggest that there may be a “practical threshold” at low dose rates, below which the latency would exceed the lifespan. A refutation of this interpretation of the bone cancer data has been published by Mays (3), and there is no suggestion at all of a varia-
tion in latency with dose or dose rate for induction of other types of cancers.

Finally, Goldman’s projection of 1500 fatal cancers from a 1-inch increment in altitude for the world’s population is high by three orders of magnitude. The annual dose increases by about 50 micro Selvins for each 1000-foot increase in altitude; thus, an added inch would result in about a $4 \times 10^{-9}$-Selvin-per-year dose increase. Multiplying by the standard generation population lifetime risk coefficient of $5 \times 10^{-2}$ fatal cancers per Selvin (4) and a global population of 5.8 billion, one projects only about 1.2 fatal cancers.

It is our view that the linear nontreshold assumption remains a sound basis for radiation protection policy. Measures for further reducing very low doses of radiation must nevertheless be considered in light of their costs.

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References


Goldman laudably pleads for risk assessment to be based on “sound and solid science.” However, he does not discuss a large body of scientific evidence, including relevant discussions in his first reference, the BEIR V report by a select committee of the U.S. National Academy of Sciences (1), and more recent refereed surveys of the many inconsistencies and open questions in this highly politicized and controversial field of health science (2, 3). He states that “we now know that continual radiation exposure is less carcinogenic than acute exposure, all else being equal,” and references BEIR V (1), but does not cite other points of view on this subject (2). In support of his contention of reduced cancer risks at protracted exposures, Goldman cites two 25-year-old animal studies with questionable relevance to human cancer induction. He does not note, however, that the opposite conclusion was recently drawn by the U.S. Department of Energy (DOE), the funding agency for practically all radiation health studies, including those Goldman cites. The DOE states (4)

In general, the risks of adverse health effects are higher when exposure is spread over a long period than when the same dose is received at one time.

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References


Goldman states that the Radiation Effects Research Foundation (RERF) follow-up is a “high-dose study” and that most of the excess cancer deaths (hence most of the information in the study) pertain to survivors with very high doses, that is, doses greater than 1 Selvin (Sv). Goldman also states that RERF analyses consist of comparisons of survivors in dose categories of less than 0.1, 0.1 to 0.2, and more than 0.2.
Sv, with the implication that this may obscure evidence for a threshold dose below which there is no excess cancer risk. These allegations are not correct.

Of the 86,572 subjects with individual dose estimates, 38,316 received doses in the range from 0.005 to 0.20 Sv, and a comparable sample of 36,549 received essentially zero doses of less than 0.005 Sv. Thus, about 85% of the cohort received doses in the range of direct interest for radiation protection, whereas only 2.6% of the cohort received doses of more than 1 Sv.

We stress that the RERF study is not just a high-dose study. There is a lack of focus on low-dose risks for solid cancers because the dose response is very linear, and important issues involving age at exposure and time since exposure should be addressed using all the data.

Modern analyses of these data, including those carried out by committees of the United Nations (1) and of the National Research Council (2), are not based on comparisons of broad dose categories. The data for solid cancers, including tumor registry incidence data as well as cancer mortality data, are inconsistent with the notion of a threshold for radiation effects. However, epidemiological studies have inherent limitations in assessing such issues, and it is important to also consider basic radiobiology results.

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References

Safety of Hepatitis B Vaccine

The editorial by Gerald R. Fink describing the development of yeast recombinant technology at the National Science Foundation (1 Mar., p. 1213) was enlightening. However, readers may be left with the misconception that persons who receive plasma-derived hepatitis B vaccines risk “infection with other blood-borne viruses carried by the vaccine.” There is no evidence that plasma-derived hepatitis B vaccines have ever posed an increased risk of infection with blood-borne pathogens. The decision to use any vaccine should be based on three criteria: safety, efficacy, and cost. All available data indicate that plasma-derived hepatitis B vaccine is as safe and efficacious as recombinant vaccines, while costing considerably less.

Currently, all plasma-derived hepatitis B vaccines undergo inactivation procedures (formalin treatment alone or in combination with heat treatment) that eliminate the risk of infection with blood-borne pathogens (1). Furthermore, epidemiologic studies and national surveillance of vaccine-related adverse events in the United States and other countries have demonstrated no association with infections transmitted by blood in children and adults who received plasma-derived hepatitis B vaccine (2-4). Studies of hepatitis B vaccine have shown that the antibodies produced after administration of plasma-derived vaccine or recombinant vaccine are alike in terms of their ability to elicit protective determinants and that the efficacies of plasma-derived and recombinant vaccines are comparable (2, 5, 6). Although the cost of recombinant vaccine continues to decline, it still is more expensive than plasma-derived vaccine. Factors that contribute to the higher cost include start-up expenses associated with recombinant technology and patents that protect the products.

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cirrhosis resulting from chronic hepatitis B virus (HBV) infection kill more than 1 million persons annually (7). In 1992, the World Health Assembly recommended that infants be routinely vaccinated against hepatitis B in all countries with high endemic rates of chronic HBV infection. Unfortunately, the populations of many developing countries with high rates of chronic HBV infection do not benefit from hepatitis B vaccination because of the misperception that plasma-derived vaccine may be infectious and donors are not able to finance the higher cost of recombinant vaccine. Acknowledgment of the safety of plasma-derived hepatitis B vaccine would greatly facilitate the prevention of the high rate of death from HBV-related chronic liver disease in these countries.

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Immunology Taught by Darwin

We read with interest the recent article by Rolf M. Zinkernagel (12 Jan., p. 173) reexamining the idea that the function of the immune system is the recognition of the distinction between self and nonself. We applaud Zinkernagel for recognizing that any theory of immune system functioning must be based on the predicted outcome of the coevolution between parasites and their hosts. As evolutionary biologists, we find it refreshing to see immunologists attempt to shape their conceptual understanding of immunity using an evolutionary framework. One must, however, avoid erroneous group selection arguments.

Group selection arguments often suggest that various adaptations in organisms have evolved for the “good of the species.” While many adaptations may indeed benefit the species, the selective forces favoring such traits directly are usually extremely weak and easily swamped by individual-level effects. Hence such group-level benefits are best interpreted as by-products of the benefits that a particular adaptation accrues to individuals within a population (1). Only under conditions of extreme group isolation (the classical models of group selection) or high group relatedness (the models of kin selection) can group selection be effective in the production of adaptation (2).

Zinkernagel proposes that his conception of immunobiology “reflects the coevolutionary balance reached between the immune system and viruses to guarantee survival of both virus and host.” However, the outcome of the parasite-host relationship represents a trade-off between transmission and virulence, and intermediate and even high levels of virulence can evolve, provided that transmission between hosts is not compromised (3).

Zinkernagel suggests that “By coevolutionary necessity, cytopathic viruses induce protective immunity efficiently, to avoid elimination of the essential host species [emphasis ours].” One need only consider the fate of a gene in a virus that causes its bearer to avoid elimination by the immune system to see that these viruses will be much more successful in future generations than their altruistic counterparts. Differences in the kinetics of responses to cytopathic viruses and noncytopathic viruses may have an evolutionary function, but the purpose proposed by Zinkernagel seems implausible.

By viewing natural selection acting primarily at the individual level, Zinkernagel does not offer a viable alternative to the idea that the immune system distinguishes self from nonself. Rather, he identifies means by which evolution may have economized effector functioning by localizing immune responses. We believe the recognition of nonself is essential to immune system functioning, as “nonself” is likely to have different genetic interests from those of the host; this conflict of interest is at the heart of host-parasite coevolution (4). The argument that the immune system distinguishes harmful from harmless (rather than self from nonself) erroneously assumes that virulence (or avirulence) is a fixed trait in parasite populations. Counting on the continued benevolence of another living organism, when increased rates of transmission may offer opportunities for increased virulence, is a precarious proposition, particularly as the density of the human population increases. The most reliable way for the immune system to defend against parasites and pathogens that may potentially shift their level of virulence is to have an effective means of distinguishing self from nonself (4).

The history of infectious disease demon-
strates that as population densities increased following the agricultural revolution, new diseases emerged (5). Today we are still facing emerging epidemics such as AIDS and the rise of drug-resistant pathogens. Group selection arguments cannot explain these phenomena.

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References

Response: McKean et al.’s point about epidemiology is well taken: in fact, an increase of population density most of the time increases the frequency, severity, and extent of disease, in balance with herd immunity. I agree that mutual overall balances between infectious agents and host populations are important and that immunity is only one part of this equilibrium. McKean et al. point out that I have used a group selection argument. However, I feel this is a misrepresentation of the general thrust of my paper, which is basically about the overall balance between infectious agents and the host, including the immune system. This balance is different for each virus or group of viruses. Therefore, McKean et al.’s arguments about “successful viruses” may be incomplete. Noncytopathic viruses such as LCMV and hepatitis B virus are successful, and so are some cytopathic viruses, but at “different costs” and by “different mechanisms.”

I wanted to stress the importance of antigen localization of different effector functions because, particularly in skin and solid organs, there is no “local” immunity. The examples discussed in my paper, where T cells ignore self and foreign antigens or where T cells get exhausted by foreign antigens, show that the immune system does not fundamentally distinguish between self and nonself, although functionally the system is set up to not usually react against self.

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Corrections and Clarifications
In the article “New York courts seek ‘neutral’ experts,” by Eliot Marshall (News & Comment 12 Apr., p. 189), a member of the scientific advisory panel was incorrectly identified as Fred Alan Wolf. He should have been identified as physicist Alan Wolf of the Cooper Union for the Advancement of Science and Art in New York.

Fritz Kleinhans’ name was misspelled in the Author Index (p. 1891) for volume 271, January–March 1996 (29 Mar., p. 1887).

Letters to the Editor
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Quieting down? New law could mute attempts to block telescope slated for red squirrel's home.

Green Light for Mount Graham Telescope?
Astronomers may soon be able to build an $80 million telescope on a controversial site on Mount Graham in southern Arizona, thanks to a few words buried in last week's budget deal (see p. 640).

Senators Skeptical of International Projects
While Department of Energy (DOE) managers are busy laying plans for U.S. participation in a host of large international science projects, enthusiasm is lagging in the Senate.

At a hearing last week held by the Energy and Natural Resource Committee's energy R&D subcommittee, Senator Bennett Johnston (D-FL) said he was "highly skeptical of spending $450 million on a foreign machine," referring to U.S. plans to take part in the Large Hadron Collider (LHC) at CERN in Geneva (Science, 5 April, p. 25).

Senator Pete Domenici (R-NM), who chairs the subcommittee, also expressed doubts, asking DOE to provide detailed data comparing the LHC's capabilities with those of the late Superconducting Super Collider.

U.S. involvement in the International Thermonuclear Experimental Reactor (ITER) also came under scrutiny. Johnston said DOE can hardly afford a large share of the multibillion-dollar fusion project. "We ought to make our minds up on ITER," he said. "It may well be worthwhile doing, but I haven't been able to get the president interested."

Martha Krebs, DOE's energy research chief, said the Administration supports participation in ITER: "The U.S. ought to be there," she declared. But she assured the senators that the United States would likely be "a very minor partner" in the project, spending about $50 million a year.

U.K. Revisits Plan for Genetics Oversight Panel
After rejecting a parliamentary committee's advice to establish a national panel with broad oversight of human genetics, the British government now seems to be reconsidering the idea, which is expected to be debated by Parliament later this year.

The House of Commons Science and Technology Select Committee was "profoundly disappointed" by the government's response in January to its report of last summer (Science, 21 July 1995, p. 291) calling for an independent, lay body to regulate gene therapies and screening and offer advice on ethical and legal aspects of genetics. Prime Minister John Major's cabinet rejected that suggestion, agreeing instead to establish an "Advisory Committee on Genetic Testing."

The Select Committee, however, felt such an advisory group would not have sufficient independence or a wide enough purview, and that it wouldn't provide a focal point for public concerns. So in February and March, the committee took the unusual step of questioning government science and health ministers and advisers about their reasoning. During these sessions, Stephen Dorrell, Secretary of State for Health, indicated he hasn't abandoned the idea of a body with a broader charge and a "cross-departmental view" of the broad implications of genetics.

Last week, the Select Committee called for a House debate "on the way in which such a commission would operate." "The government realises there's a lot of interest in this," says Anne Campbell of the committee, though she suspects it would still oppose giving such a panel regulatory powers.

Is the End Near for Smallpox Stocks?
Public health authorities have been poised for 3 years to obliterate variola—the smallpox virus—from the face of the planet. Twice leaders of the World Health Organization (WHO) have set an execution date for the virus, which now lives only in airtight research labs, and twice they've backed off. Later this month, WHO is expected to discuss another "final" deadline of June 1999, but in the meantime some of its scientific advisers are arguing for a speedier death.

The objection comes from six WHO infectious-disease experts led by Frank Fenner of Australia. In March they circulated a public letter to WHO urging destruction of smallpox stocks by June 1996. Fenner had chaired a WHO advisory panel in the early 1990s that concluded there was no need to keep stocks for research and that the stocks should be destroyed by December 1993. But a few scientists argued for a delay, and the death sentence was put off to June 1995. WHO's executive board then let the deadline slip again because it found "no consensus" for going forward (Science, 27 January 1995, p. 450).

Public health officials have been vague about the reasons for previous delays. But Donald A. Henderson, former adviser to the U.S. Public Health Service and a leader in smallpox eradication, says British military officials have been "the key" proponents of retaining stocks. Military scientists, Henderson says, suspect that Russians or terrorist groups may be hiding secret stocks, so they are reluctant to let go of their own. But Henderson sees no advantage in using smallpox as a weapon and no need to conduct further defensive research; he was one of those who signed Fenner's letter supporting immediate destruction of stocks. Henderson says the Australian delegation to WHO will offer Fenner's proposal as an alternative to the 1999 deadline at the WHO meeting this month.
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program that would link newly trained U.S. scientists with Japanese "mentors" in related fields. A stunt in a Japanese lab, he noted, would be a good way to enable them to generate the preliminary data required to get their first government grant back home.

The grandest idea came from molecular biologist Paul Berg of the Stanford University School of Medicine. He suggested that Japan set up a new international institute of biomedical sciences modeled after the Institute for Advanced Study in Princeton, New Jersey. It should come complete with living accommodations and use English for all discussions, he said: "If you're looking for a breakthrough, you need to do something big."

Urban Nightmare
The World Resources Institute (WRI), a Washington, D.C.-based think tank, issued its biennial report, World Resources, on 18 April, and it's a grim one. The focus is on cities, sites of most future population growth, the vast bulk of which will occur in developing countries. A few items from the report:
- The number of urban poor in Latin America increased from 44 million to 115 million between 1970 and 1990.
- At least 220 million urban dwellers lack access to clean drinking water.
- Respiratory-tract infections from air pollution account for 12.6% of deaths in Jakarta.
- In Abidjan, Côte d'Ivoire, 10% of adults carry the AIDS virus.
- Mexico City's aquifer is being overdrawn and is sinking by about 1 meter a year.
- The traffic congestion in Bangkok is so bad that the average commute now takes 3 hours.

Waterman, Bush Awards
Stanford chemistry Professor Robert Waymouth has won the National Science Foundation's fastest prize, the Alan T. Waterman Award for researchers of "exceptional promise" under the age of 36. Waymouth, who garners $500,000 for creating a new class of plastic, "thermoplastic elastomers," gets in just under the Waterman wire—he turns 36 on 20 May.

And in the lifetime achievement department, Philip Abelson was selected by the National Science Board to receive the Vannevar Bush Award. Abelson actually worked for Bush at the Carnegie Institute of Washington after getting his Ph.D. in nuclear physics in 1939. He went on to become co-discover of the element neptunium, an expert on science and public policy, and editor of Science for 22 years until 1984.

Uganda May Host AIDS Vaccine Trial
Plans for the first internationally organized African trial of an AIDS vaccine, to be held in Uganda later this year, are moving ahead—finally—at a brisk pace, Science has learned.

The World Health Organization in 1991 selected Uganda, where more than one-third of the adults in some urban areas are infected with HIV, as one of four developing country sites to test AIDS vaccines. Despite keen government interest, however, no trial has started yet, primarily because it has taken so long to build the necessary scientific infrastructure. Some researchers have also had strong doubts about the lead vaccines available to date, which contain a genetically engineered version of HIV's surface protein, gp120.

By the end of this year, clinicians Roger Mugera at Uganda's Makerere University Medical School and Jerold Ellner at Case Western Reserve University hope to begin a small trial using a vaccine made by Pasteur Mérieux-Connaught which contains several HIV genes that have been stitched into a canarypox virus. Early tests of the vaccine in France and the United States suggest that it is safe and can trigger a broader range of immune responses than the gp120 vaccines do (Science, 1 March, p. 1227).

The 1-year test, funded by the U.S. National Institute of Allergy and Infectious Diseases, has a routine design for early trials: 20 people who are at low risk of becoming infected with HIV will be vaccinated to see if the vaccine is safe and evokes the same immune responses as have been observed previously; 10 control subjects will receive a rabies vaccine also made with the canarypox. "It's essential that we begin testing vaccines in developing countries, not only to promote vaccine development but to learn more about human responses to HIV," says Peggy Johnston, scientific director of the Rockefeller Foundation's International AIDS Vaccine Initiative. "We may be surprised."
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Panel B: Large fragment DD-PCR samples run on genomyxLR DNA Sequencer (18 hr, 100 W, 703 V, 40°C, 6% HR-1000 denaturing gel). Lanes represent total RNA prepared from untreated and treated human cell line cultures. DD-PCR carried out with GenHunter RNAimage™ Kit.

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