

nuclear power from 11% in 1985 to 33% by the year 2000. Said Frolov: "We endured the tragic experience of Chernobyl and right now we are working on improving safety, reliability, and efficiency of nuclear power stations and in particular are developing a new generation of nuclear power reactors." Frolov also stressed that his country is committed to fusion research, and will continue to participate on a joint U.S., Soviet, and European project on a fusion test reactor, for which the first technical sessions are scheduled to begin this April.

In other areas, the Soviets discussed ongoing research in topics ranging from the transmission of ultrahigh voltage electricity to their fledgling biotechnology industry. Finally, Frolov said that one area where American and Soviet scientists should collaborate is the work of arms control and verification. "For the betterment of science and for prosperity on earth," said Frolov. That remark got a standing ovation. ■

W.B.

Monsanto Marker Shows Promise in Field Test

Field testing points to the success of a marker system for tracking and evaluating the effectiveness of microorganisms that have been genetically engineered for specific applications in agriculture. Researchers at Monsanto Company and Clemson University say the marker, which is based on two *Escherichia coli* genes known as *lacZ* and *lacY*, is proving to be an extremely sensitive mechanism for distinguishing between strains of the root colonizing bacterium *Pseudomonas fluorescens*.

An 18-month field test of the marker was initiated on 2 November in a small plot of wheat at Clemson's Blackville, South Carolina, research station. Funded by Monsanto, the experiment is being conducted to determine whether genetically modified organisms can be monitored adequately in the open. So far, the *lacZY* marker has been shown to be genetically stable, according to Clemson microbiologist Ellis Kline, who presented the results at a AAAS symposium on microbial ecology.

Pseudomonas fluorescens strains, which colonize the root systems of many plants, are viewed as potential vehicles for delivering growth promoters, pesticides, or fungicides to crops. But adequate evaluation of the effectiveness of genetically engineered bacteria requires better tracking tools. "What we've seen indicates that this is feasible," says David Drahos, group leader of Monsanto's plant microbiology department.

Monsanto researchers say that the modified strain of *P. fluorescens* does not appear to compete with native populations and shows little migration beyond the point of introduction. ■ M.C.

Baltimore Attacks "Professional Guardians of the Status Quo"

David Baltimore, director of the Whitehead Institute for Biomedical Research at MIT, opened the AAAS meeting on 11 February with a fiery blast against the "powerful retrograde forces" he sees at work in society, forces that could obscure the "glories of new knowledge" remaining to be discovered. The problem, he said, is created by two armies of ignorance made up of "those who fear and distrust science and those who wish to pervert science to their own ends."

Baltimore noted that "many of us have had to spend long hours fighting for the right to continue doing research," and he listed some of the types who stand in the way, including:

- "Professional guardians of the status quo" who aim to "stop all recombinant DNA research" and who have pitted researchers like himself against "those who see only hazards in the new technology"—presumably a gibe at Jeremy Rifkin, an activist who has been generally critical of applications of biotechnology.

- Animal rightists, who "threaten the whole enterprise of modern biology, putting animal rights ahead of the human right to optimum health."

- Politicians and citizens who are unable or unwilling to consider the good scientific

rationale that justifies the field testing of altered bacteria.

- "Ignorance, superstition, and fear at their most nefarious," embodied in the creation science movement, which "denies the basic fundament of all biological science, the concept of evolution."

- The crude "anti-elitism" in Congress that favors pork-barrel funding of projects and attacks the peer-review system, a trend that "runs counter to the understanding that forefront science is a difficult enterprise in which only a few excel."

Baltimore also took the federal science establishment to task for one case of neglect (failing to recognize the gravity of the AIDS epidemic early on) and one case of hyperactivity (putting too much emphasis on mapping the human genome). He called the genome project a "ploy to raise money, a project justified by its public relations value not its scientific value." It would be best to entrust this whole task to the National Institutes of Health (NIH), Baltimore said, because NIH is "well positioned to be certain that the effort is integrated with the rest of modern biology, not a moon shot run under separate auspices."

By contrast, he charged that the U.S. attack on AIDS has been "too timid." The Whitehead Institute has begun to solicit funds for a new program of AIDS-related research.

In closing, Baltimore denounced the Administration's heavy emphasis on military applications, particularly for "diverting billions of dollars to a defensive system [the Strategic Defense Initiative] that is ridiculed by most of the knowledgeable scientific community." He considers the program a "cruel hoax," and its endorsement by the President's science office, a "black mark for science." ■ E.M.



David Baltimore. A fiery opening blast.

China and the Bomb

China's nuclear stance is a simple one: The Chinese want to possess enough weapons to be taken seriously, but not enough to break the bank, said Di Hua, a director of the China International Trade and Investment Corporation in Beijing, who spoke at a AAAS symposium on China and arms control. "China needs to have a limited but strategic nuclear arsenal, a shield to keep the more aggressive of the two superpowers from attempting global hegemony," said Hua.

At this, the Chinese have succeeded, reported Richard Fieldhouse of the Stockholm International Peace Research Institute. According to public documents unearthed by Fieldhouse, China has between

300 and 400 nuclear warheads. About 120 missiles are ground-based, a number of which are hidden in caves. Another 250 warheads could be delivered by some 120 antiquated but still quite effective aircraft. China also has two submarines which could launch up to 12 missiles each. Said Fieldhouse: "Only a handful of these are capable of reaching either Moscow or North America, though China has a robust ability to retaliate in Asia." Fieldhouse believes that "survival of Chinese forces under any conceivable attack is assured."

Moves by the United States and the Soviet Union to reduce intermediate-range nuclear forces (INF) in Europe and Asia have been given qualified support by China. "The INF treaty is a breakthrough in a long stalemate," said Zhen-Qiang Pan of the National Defense University in Beijing. Though Pan described the actual reduction in weapons as "insignificant," he did say that the INF treaty plays an "active role in reducing tension." Fieldhouse, however, stressed that the INF treaty is good for China, since it removes 171 Soviet SS-20 Saber missiles deployed east of the Urals. These missiles could reach China as well as Alaska and Japan.

As for the further cuts in nuclear weapons by the United States and the Soviet Union, Hua maintained that even a 50% cut would only provide "short-term psychological benefits." He said that China would not begin reducing its own forces until a 5-to-1 or even a 3-to-1 ratio between the superpower nuclear forces and its own was achieved. Pan added that any quantitative cuts must be accompanied by assurances from both superpowers that they would also stop enhancing the quality of their weapons. "Only by doing that can real arms control be achieved," said Pan.

Both Pan and Hua argued that the Strategic Defense Initiative (SDI) was destabilizing. "Star Wars must not become a reality," said Hua. "China as weakest among the second class nuclear countries should speak strongest against SDI . . . We cannot permit China to become strategically obsolete," he said.

There were also some pointed questions from the audience at the end of the session about China's alleged sale of Silkworm missiles to Iran. While maintaining that China did not directly sell the weapons to Iran, Pan said with some bitterness: "I do not like my country being described as a naughty boy in the process of maturity . . . like somebody who still needs to learn some lessons." Pan said the United States and Soviet Union have been selling weapons to Iran and Iraq for the past 8 years. "Why is China singled out?" ■ **W.B.**

Using Forests to Counter the "Greenhouse Effect"

Virtually nothing is being done at present to protect the earth against an esoteric and possibly catastrophic problem called the "greenhouse effect"—the buildup of heat in the atmosphere caused by an excess of carbon dioxide (CO₂). The chief man-made source of CO₂ is fossil fuel burning. Several speakers at a special session at the AAAS meeting suggested methods of attacking the problem, aside from the obvious one of reducing the use of fossil fuels. Admittedly, their proposals are a bit impractical because they would encounter opposition on economic and political grounds. But they have the virtue of being the only proposals on the table, and if the CO₂ problem becomes bad enough, they may get attention.

One intriguing idea, presented as a quick fix by Gregg Marland of the Oak Ridge National Laboratory, calls for a rapid reforestation of the globe. The aim would be to recapture in trees much of the carbon released into the atmosphere by burning coal and oil. Plants can fix atmospheric carbon by photosynthesis, and trees are able to fix more carbon per hectare (without fertilizer) than any other plant.

Marland first proposed this idea in 1976 along with physicist Freeman Dyson. Since then he has refined his calculations to show that by roughly doubling the volume of forest growth per year, the major fuel burning nations could delay the onset of the greenhouse effect for a decade or two, if they acted decisively. This would allow time for permanent changes in energy use. He judges this to be a difficult, unlikely, and expensive project, but not physically impossible. He also claims that this might be the most acceptable of a group of unpopular remedies to the CO₂ problem.

Marland's emergency scenario includes a number of assumptions that make it appear impractical. For example, as a starting condition, the destruction of existing forests—particularly in the tropics—must be stopped. But at present, the less developed world is tearing down forests at a rapid pace. According to the best estimates, the total inventory of trees has almost been halved since the beginning of agriculture. In the tropics, which comprise more than 30% of the earth's surface, forests are being cleared at the rate of 7 to 20 million hectares per year. If the populations of tropical countries continues to grow at a rate of 2.4% per year, the demand for fuel wood will increase tremendously. To carry out this program, the most populous nations would not only have to invest heavily in tree farms, but, in addition, they would have to refrain from

burning the wood.

Yet, the scenario is not entirely fantastic. In the industrialized Northern Hemisphere, commercial lumber plantations have restored once depleted tree stocks. For example, in 1970, the forest area in New England, although smaller than in the pre-colonial era, had increased by 40% over the amount in 1890. And in the 1950s, a steady decline in forested area in the southeastern United States was reversed and began a slow but steady growth that has persisted ever since.

"The dimensions of the fix are staggering," Marland writes. And he concedes that a huge tree-growing push does not seem economically justifiable. But he concludes that "reforestation could . . . play a significant role as one component among a variety of measures taken to address increasing CO₂." Unfortunately, the other measures suggested at the AAAS meeting—such as rapidly increasing the number of nuclear fission plants or installing costly CO₂ capture equipment at fossil plants—seem no more likely to win acceptance. ■ **E.M.**

A No-Fault Proposal for AIDS High Risks

LeRoy Walters is a soft-spoken and unassuming academic, but that did not stop the Georgetown University ethicist from suggesting that homosexual acts, drug use, and prostitution be decriminalized in an attempt to stem the AIDS epidemic.

To control the rapid spread of the human immunodeficiency virus (HIV) among intravenous (IV) drug abusers, Walters would like to see users provided with carefully limited access to injectable drugs accompanied by a simultaneous decriminalization of IV drug use. Walters believes that this would bring addiction and its social context above ground. "Every Administration declares a war on drugs, but thus far it doesn't seem as if drug addiction has been greatly ameliorated," said Walters, who spoke at a AAAS symposium entitled "AIDS: An Overview." Walters stressed that approaches towards controlling AIDS should be pragmatic and experimental, not dogmatic and moralistic. Earlier in the symposium, James Curran, head of the AIDS program at the federal Centers for Disease Control in Atlanta, remarked, "If we really want to do something about IV drug use we have to do something big." Walters' suggestion was certainly big.

On to prostitution. Walters advocated an approach similar to that taken by some European countries and several counties in Nevada, where prostitution is legalized and