

warm to US participation in international projects, which may bear on US support of CERN's Large Hadron Collider and the proposed International Thermonuclear Experimental Reactor.

More important than the science committee in the future of government-funded R&D are the appropriations committees in both chambers. In the House, John Myers, an Indiana Republican who headed the Appropriation Committee's energy and water development subcommittee, and Tom Beville, an Alabama Democrat who was the subcommittee's longtime chairman and has been the ranking minority member for the past two years, are both retiring. Jim Chapman, a Democrat of Texas, was defeated in November and leaves another vacancy on the subcommittee for energy as well as on the subcommittee for Veterans Affairs, Housing and Urban Development and independent agencies, which approves the budgets for the National Science Foundation, NASA and the Environmental Protection Agency.

On the Senate Appropriations Committee, Ted Stevens, the Alaska Republican, will replace Mark Hatfield of Oregon, who is retiring after serving as the committee's senior Republican since 1981. Stevens, a 28-year Senate veteran, is often independent, especially when it comes to spending issues affecting his own state. As a leading board member of the now-defunct Office of Technology Assessment, Stevens was usually outspoken on issues involving science and technology. Also leaving is J. Bennett Johnston of Louisiana, the senior Democrat on the Energy and Natural Resources Committee and former chairman of the Appropriations Committee's energy and water development subcommittee.

Johnston was a staunch advocate of most Energy Department research programs, particularly high-energy and nuclear physics (see *PHYSICS TODAY*, January 1996, page 51). Replacing Johnston on the energy committee will be Dale Bumpers of Arkansas, whose populist position on many issues has put him at odds with officials of the energy and aerospace industries. His perennial attempts to scuttle NASA's space station have failed five times.

The defeat of Larry Pressler, a South Dakota Republican, will produce major changes at the Senate Commerce, Science and Transportation Committee. His successor is likely to be John McCain of Arizona, who has taken a notably more free-market approach than did Pressler and other committee members on regulatory issues such as spectrum allocations without charge to broadcasters. With Sam Nunn of Georgia leaving the Senate Armed Services Committee after two decades, Carl Levin of Michigan is almost certain to ascend as senior Democrat.

Moderates on the rise

Another senior Democrat who decided to retire is James J. Exon of Nebraska, who held his party's highest seat on the Senate Budget Committee. In line to take Exon's place is Frank R. Lautenberg of New Jersey, who is more peppery and partisan than Exon on many issues, though the balanced budget hasn't been one of his priorities.

Still, the Senate Budget Committee will continue to be led by Pete Domenici of New Mexico. Domenici also figures as a powerful force in the Senate. He is admired as a canny moderate and friend of R&D, as is the other senator from New Mexico, Democrat Jeff Bingaman. Both champion the nuclear weapons laboratories in

their state—Los Alamos and Sandia.

Moderates are most likely to dominate in both chambers of the 105th Congress. Sure, Newt Gingrich of Georgia will continue to be Speaker of the House, even though the pollsters named him the most unpopular politician in the country because he took the heat for shutting down the Federal government twice last winter and for his arrogantly partisan stance on many issues. Lott will still control the legislative calendar as Senate majority leader. Richard Gephardt of Missouri and Tom Daschle of South Dakota again will lead the opposition. But the election suggested that many of the new members in both parties are middle-of-the-roads.

President Clinton has pledged to adopt a bipartisan approach to balancing the budget, advancing education programs and reducing the welfare rolls. He has declared that if he "could do one thing" in his second term it would be to balance the budget, which he asserted was "easily achievable if we all work hard in good faith and if the Democrats remember too that we have to do it." Clinton has called on members of Congress to meet on "common ground." "It's a 180-degree change from where the President stood in January 1995, when he submitted a budget that called for \$200 billion deficits as far as the eye can see," said Robert D. Reischauer, who headed the Congressional Budget Office until the Republican takeover of Congress in 1995. "The bottom line is that the Republicans have triumphed in that they have set the agenda." How that agenda plays out in the 105th Congress, which opens on 7 January 1997, will have a lasting effect on funding science and technology into the next century.

IRWIN GOODWIN

At Last, Nuclear Powers Sign Comprehensive Test Ban But Doubts Remain on Nonsigners and Subcritical Tests

In 1954, Prime Minister Jawaharlal Nehru of India proposed a "standstill agreement" on all nuclear testing. It would be the first step by any government, he said, toward a ban on nuclear tests. Four years later, US President Dwight Eisenhower called for the end of all nuclear testing as the best way to slow the arms race with the Soviet Union. Now, with the Cold War over and the Soviet Union broken up into 15 separate countries, the comprehensive test ban (CTB) treaty was signed on 24 September, the opening day of the 51st session of the United Nations General Assembly in New York City. Within a week, more than 90 nations signed the CTB document. But India

did not sign, despite appeals from the existing nuclear powers and many other countries. In fact, India went to great lengths to prevent the treaty from reaching the UN. Its neighboring rival, Pakistan, had indicated earlier that it would support the treaty, but later reversed course and refused to sign as long as India didn't.

President Clinton was the first world leader to sign the treaty—notably with the same pen used by President John F. Kennedy in 1963 on the world's first treaty limiting nuclear tests in space, the atmosphere and the seas, but not underground. At the UN ceremony, President Clinton called the CTB "the longest-sought, hardest-

fought prize in arms control history." He hailed the accord for preventing the world's acknowledged nuclear nations "from developing more advanced and more dangerous weapons [and for limiting] the ability of other states to acquire such devices themselves."

After Clinton came the representatives of the four other acknowledged nuclear weapons states—Britain, China, France and Russia. All have now declared moratoriums on nuclear testing. All told, they have conducted 2045 known nuclear tests in the 51 years since the first one, called Trinity, exploded over the desert at Alamogordo in New Mexico. In the

meantime, their combined total of warheads burgeoned to nearly 70 000—though many are now being dismantled.

Israel, which is an undeclared but de facto nuclear power like India and Pakistan, signed the treaty on 24 September. Still, doubts remain on how soon, if ever, the CTB will become international law. Libya and Bhutan voted against the treaty, and Iraq and North Korea, which have ambitions to develop nuclear weapons, did not take part in discussions or negotiations at the UN.

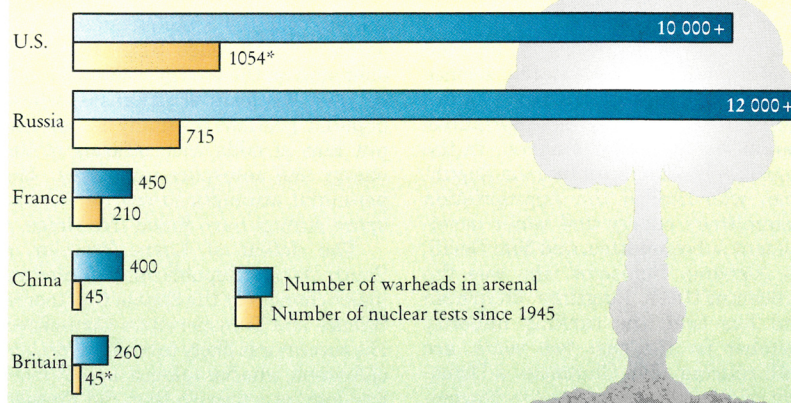
India fired only one nuclear device in 1974, according to arms control experts, and is reckoned to have a clandestine program that it doesn't want to give up until a timetable is set for totally eliminating the world's nuclear weapons, which was Nehru's original goal. Without this, India argues, the CTB is little more than a device that makes it easier for the nuclear nations to hold on to their weapons while guaranteeing that no other countries join the nuclear club. China, which continued testing throughout the negotiations and insisted that "peaceful" explosions be allowed for excavating harbors and highways or exploring for oil and minerals or even diverting asteroids on a collision course with Earth (see *PHYSICS TODAY*, June 1996, page 46), finally agreed to the treaty's provisions.

Government officials in India insist that the CTB is dangerous because it could encourage a new arms race based on scientific sophistication and nonnuclear technology out of the reach of most nations. The treaty simply rules out tests involving nuclear explosions. As such, it does not ban the kinds of inspection and modification of existing weapons or design and deployment of new weapons that are being done within the US science-based stockpile stewardship program, which will employ laser experiments at its proposed National Ignition Facility and super-computed designs and tests at its nuclear weapons laboratories to upgrade components and warheads and to gain additional fundamental understanding of nuclear explosions.

The CTB treaty will not go into effect for at least two years, and in any case not until it is signed and ratified by the 44 countries that conduct nuclear research or possess nuclear reactors. But while the treaty as it is now written would ban both full-scale and low-yield nuclear tests, including the so-called hydronuclear tests, it would not prohibit subcritical tests of nuclear weapons components, including the chemical explosives to trigger the weapons, so long as no nuclear energy is released.

In October 1995, the Energy Department announced that a series of

The Five Declared Nuclear Weapons Nations



*The US and Britain jointly conducted 24 underground nuclear tests at the Nevada test site.
(Source: Natural Resources Defense Council)

subcritical experiments would be conducted underground at the Nevada Test Site to study the effects of aging plutonium and components on the safety and reliability of nuclear warheads. Besieged with objections from many countries, DOE postponed the tests at the urging of the State Department and the White House. A review of lower-yield and hydronuclear tests by the Jason panel, a group of smart and experienced scientists who mainly advise the Defense and Energy departments, concluded that such tests would not be very useful for maintaining stockpile safety and reliability. Still, DOE's nuclear weapons labs argued that subcritical tests would be necessary even after the CTB is adopted.

The issue is unresolved. In an article in the November–December issue of *The Bulletin of the Atomic Scientists*, Frank von Hippel, a nuclear weapons expert at Princeton University who recently completed two years on the staff of the White House Office of Science and Technology Policy, and Suzanna Jones, a research associate at Princeton's Center for Energy and Environmental Studies, raise objections to such tests. They call for an independent peer review "so that the technical arguments for performing the

tests can be sorted out from the political and economic arguments on which conducting the tests has been promoted." If the review panel were to find that some subcritical experiments are indispensable, write von Hippel and Jones, "the only way to assure the international community that these tests are subcritical will be through on-site monitoring. This could be accomplished by allowing an international organization to measure the intensity of neutron and gamma-ray radiation from the experiments." They calculate that the radiation released in subcritical tests should be "minuscule."

"The issues surrounding subcritical tests highlight broader questions about whether international controversy would be created by conducting exercises that resemble nuclear test preparations or involve underground detonations," von Hippel and Jones maintain. "The US is the only country to have announced plans to conduct underground subcritical tests—or underground nuclear-weapons-related tests of any type—under the nuclear test ban. Whatever example it sets in terms of underground testing and transparency, it must be prepared to expect similar behavior from other countries."

IRWIN GOODWIN

Engineering Academy Picks Wulf to Replace Deposed President

It has been a disturbing and divisive time for the National Academy of Engineering. Last February, seven months after he was elected president of the NAE in a combative campaign against the academy's anointed candidate, Harold Liebowitz was ordered by his governing council to resign. Lie-

bowitz ignored the directive. In May, after polling the NAE's 1840 members, the council amended the bylaws with a new recall provision, enabling it to ask the members to vote on what to do about Liebowitz. By an overwhelming vote of 1179 to 179 in early June, the members chose to remove Lie-