billion, a 7.9% increase over 1987. The budget includes $100 million in 1987 space orbiter funds that were transferred to the R&D account. Legislators also instructed NASA to continue to dedicate at least 20% of agency resources to unmanned space activities.

To control project costs, Congress is continuing to impose annual spending caps on programs, including the Hubble Space Telescope, the Advanced Communications Technology Satellite, and the Upper Atmospheric Research Satellite. These caps may not be exceeded without approval.

■ **Department of Energy** (DOE) spending in the Office of Energy Research will rise 10% to $2.05 billion. The funding increase is diluted to a great degree, however, by an estimated $121 million in "earmarks"—unrequested research projects imposed by Congress. In addition, the Congress has specified that Florida State University shall receive $11.7 million to continue operations of its supercomputer center.

Support for high-energy physics programs is just $10 million below the $566 million requested by the Administration. The Congress funded $10 million in construction-related work for the SSC, but stated that research and site selection work should proceed. To avoid further delays in high-energy research experiments, legislators told DOE to provide as much budgetary support as possible. DOE officials say complying with this will be difficult because of "earmark" projects that have been attached to the budget.

Congress also authorized $8 million to begin construction of the Compact Ignition Tokamak at Princeton University. But it cut overall funding for the financially strapped magnetic confinement fusion program by $10 million to $335 million.

■ **Department of Defense** (DOD) spending for research, development, testing, and engineering was held to $37 billion, a 1% increase above 1987. Basic research is slated to receive $902 million, but DOD officials note that this contains $25 million for funding university instrumentation grants. The budget, which is less than the $918 million requested, could rise if the department classifies as basic research special projects that were added by Congress.

DOD got $85 million for the University Research Initiative instead of the $92.8 million requested. DOD officials say some ongoing research will be affected by the reduced funding.

R&D for the Strategic Defense Initiative (SDI) was cut 3.7% below 1987's level of $3.74 billion. The Administration had requested $5.2 billion for the SDI program. The National Aerospace Plane's budget is declining by $53 million to $183 million. ■

MARK CRAWFORD

# Down to the Wire on U.S.–Japan Agreement

*Negotiators want a new science agreement before Japan's prime minister visits the United States this month, but the Japanese find some U.S. proposals unacceptable*

THE United States and Japan are still at loggerheads over proposed changes to an existing presidential-level agreement to cooperate in science and technology. The impending visit of Japan's new prime minister, Noboru Takeshita, to the United States on 12 to 15 January has given impetus to the negotiations, but several provisions proposed by the United States remain controversial, according to Administration sources.

The United States is pressing for these changes to help remedy what it regards as an imbalance in scientific exchanges and technology transfer between the United States and Japan. In response, Japan proposed several new programs this fall to support more foreign researchers to work in its government laboratories. If funded, the new programs would provide more than 100 additional fellowships for foreign scientists, which would be a substantial increase.

***"It's a poker game right now. It's anybody's guess whether anything will be hammered out before Takeshita comes."***

The Reagan Administration, National Academy of Sciences president Frank Press, and others complain that the Japanese have fallen short in providing reciprocal access to its research. This summer, as friction over the trade gap with Japan increased, the Administration sought to rectify the lopsided relationship in part by proposing changes to a 1980 agreement on cooperation in science and technology between the United States and Japan (*Science*, 31 July, p. 476). The agreement was due to be renewed in November, but is still in force.

Negotiations over the changes to the agreement intensified in December as delegations from each country shuttled back and forth between Tokyo and Washington for talks. Kaname Ikeda, science counselor at the Japanese Embassy in Washington, also said that the two sides "are making progress," but then added that he is "not sure whether we are close to or far from agreement." Another Administration source remarked, "It's a poker game right now. It's anybody's guess whether anything will be hammered out before Takeshita comes."

The present agreement covers a range of modest projects involving several agencies from both governments. The United States wants to add several new provisions, according to Administration sources and Japanese press reports. It has pressed to establish a new committee of high-level officials from each government to review future cooperative agreements in science and technology research; to insert language that would protect information related to national security interests; to assign patent rights to the host government even if a foreign researcher worked on an invention; and to increase foreign access to collaborative projects between government and industry.

Japan has in general resisted changing the agreement, according to Administration sources. It is willing to go along with the establishment of a joint committee, but, one Administration official says, Japan "would gut any substance of the activities we proposed," including its review authority. "So we're left with a shell." Many joint agreements are now handled by individual agencies in each country and are then basically rubber stamped by a higher level authority.

According to the same official, the language regarding the protection of information related to national security was included at the Defense Department's insistence after the disclosure this summer that the Toshiba company diverted American submarine technology to the Soviet Union. Although the proposal would not go beyond existing restrictions, Japan has resisted the provision because it "may inhibit the freedom of research," according to a 2 December news article in *Asahi Shimbun*, one of Japan's leading newspapers.

Hiroshi Inose, a leader in science policy in Japan and director general of the National Center for Science Information Systems, said

in a telephone interview from Tokyo that if this provision "is coming from the military, it has to be watched very carefully. I understand the importance of national security, but you have to consider the international community of scientists too, and its need for the free flow of information."

Science counselor Ikeda notes that "there is no precedent for this provision. [U.S. science] agreements with other countries don't include this." He adds, however, "Maybe we need to accommodate the U.S., but it's a matter of how we articulate it in the agreement."

The Administration, particularly the Commerce Department, also wants to award patent rights to the host federal agency "unless otherwise specified." The provision is intended to set a general policy for assigning patents resulting from international ventures; they are currently designated on an ad hoc basis by individual agencies. Patent rights are now not part of cooperative agreements with other countries either.

Japan maintains that the issue of patent rights should not be part of this agreement and should be addressed separately, according to Administration sources. Ikeda would not comment on Japan's position on this issue, but expressed general frustration with Commerce's Office of the U.S. Trade Representative (USTR). "USTR doesn't know anything about science and technology. They look at it with the same eye as trade. They are insensitive to the healthy atmosphere we should provide scientists."

The Administration also wants to include a measure that would allow foreigners to participate in research conducted jointly by government and the private sector, a common form of collaboration in Japan. Under the proposal, an individual research entity itself, rather than the parent agency, would be given the authority to permit foreign researchers to participate.

Japan has made a bid of its own to modify the agreement. According to the *Asahi* article, whose general substance was confirmed by U.S. authorities, Japan has pressed for 5-year joint research programs in several new areas, including superconductivity, biomedical engineering, information-related technology, manufacturing, materials, and biological functions. White House science adviser William Graham wanted to press the Japanese to cooperate in superconductivity but was advised by officials at other agencies not to do so to protect the American lead.

As the United States has put more verbal heat on Japan to open up its lab doors, three Japanese federal agencies have proposed setting up more fellowships for foreign researchers and picking up the tab. But all these proposals must first win budget approval by the Ministry of Finance. The Japanese federal budget for the next fiscal year will be announced in early January.

The Ministry of Education, Science, and Culture would support the biggest increase in foreign researchers. According to its plan, 50 Americans and 50 Europeans would be eligible. Of the American candidates, 25 would be nominated by the National Science Foundation (NSF), 5 by the National Institutes of Health, and 20 by individual Japanese laboratories. The ministry would pick up the tab for travel, research, and living expenses, which will cost about $40,000 per researcher.

The Science and Technology Agency has applied for similar funding to support 24 more researchers, who will be selected by the Japanese, according to Charles T. Owens, a Japan specialist at NSF. In addition, the Ministry of International Trade and Industry has proposed to support five new fellowships for Americans to work in its laboratories, but the United States would select the researchers.

The new proposals by the Japanese government to open its agencies' doors a little more to foreigners represent some progress, but they do not resolve two problems related to the imbalance in scientific cooperation. Most research in Japan is supported by private companies and conducted in their laboratories. Entree to this research would not be covered by the agreement being negotiated.

Second, although the opportunities for Americans to do research in Japan are increasing, few Americans seem to be interested. The applications to NSF's exchange program with Japan have remained steady in recent years.

Aware of this lack of interest, NSF recently proposed a new $1.6-million program called the Japan Initiative to lure more Americans to Japan. The program, which is awaiting congressional budget approval, would subsidize primarily graduate and postgraduate scientists and engineers to conduct research and to study the Japanese language. NSF plans to encourage Japanese laboratories, including those in the private sector, to host American researchers, and it will serve as a matchmaker for these laboratories and American researchers. NSF also intends to help researchers with orientation in Japan and with arranging housing there, which is a big headache.

So, given the basic structural differences in how research is conducted in the United States and Japan, even if President Reagan and Prime Minister Takeshita eventually sign the modified agreement about science and technology cooperation, deeper and more difficult problems about achieving a balance in access will persist. ■

MARJORIE SUN

# IBM, Chen in Supercomputer Partnership

On 22 December, in a move clearly aimed at strengthening its position in the burgeoning supercomputer market, the IBM corporation announced its intention to form a partnership with a brand-new start-up company founded by Steve S. Chen, former chief engineer and star designer at Cray Research, Inc., of Minneapolis.

An announced goal of the partnership is to produce a new machine in the 1990s having 100 times the processing power of current-generation supercomputers. According to the initial agreement, IBM will provide Chen with an undisclosed amount of development capital, as well as access to its own advanced technology in such areas as high-speed memory devices and bipolar logic chips. Chen, however, will have complete design authority. The new computer will be marketed by both firms jointly.

Chen started his new company, Supercomputer Systems, Inc., of Eau Claire, Wisconsin, shortly after he left Cray Research on 2 September in a dispute over future directions for supercomputer development. IBM and Supercomputer Systems stressed in their announcement that they will take great care not to utilize technology that Chen had developed at Cray. Nonetheless, the machine they are proposing does sound similar to the "MP," or multiprocessor, machine that Chen was developing there. The MP would have achieved a hundredfold speedup by harnessing 64 individual processors in parallel. Cray, which had originally supported the development effort, terminated it because of its high projected cost—$100 million—and because of its technological risk.

Cray currently dominates the $1-billion supercomputer market with about 61% of world sales. However, a number of serious competitors have begun to emerge in recent years. Among them are Fujitsu in Japan and the Control Data Corporation in this country. With IBM also taking a more aggressive stance in supercomputers, the pressure on Cray can only increase.

The details of the partnership are not yet final, say company spokesmen, but they should be concluded over the next several months. ■ M. MITCHELL WALDROP