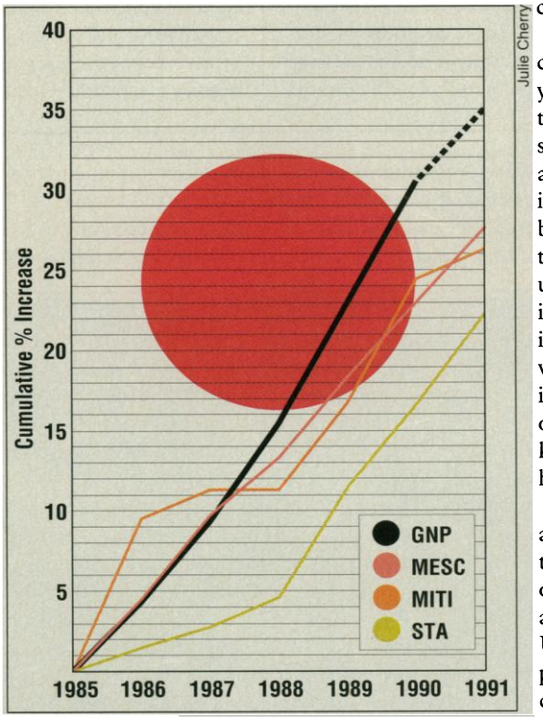
A Culture Clash Over Big Science

Efforts to persuade Japan to join major international scientific projects are doomed to failure without a better understanding of how Japan works

Tokyo—HAD YOU BEEN VISITING LABORATORIES here last month, and had your hosts translated some of the local newspapers for you, you might have thought that Japan-U.S. cooperation in big science was about to turn into another of those "trade wars" that inflame passions on both sides of the Pacific. In mid-May, the U.S. Congress looked as if it was about to shoot down years of quiet cooperation between Japan and the United States in support of the American space station. Never mind that Japan had already spent $300 million on the project and allotted another $250 million worth of contracts, a subcommittee of the House of Representatives voted to cancel the space station altogether—and without so much as a word of consultation with America's international partners. Over the next days, before a House floor vote eventually restored funding, Japan's Foreign Minister Taro Nakayama and the head of the nation's Science and Technology Agency (STA), Akiko Santo, fired off letters to their U.S. counterparts threatening an end to future participation in big science projects.

Can you blame them? U.S. embassy officials in Tokyo don't. "We're trying to get people in Washington, D.C., to understand the situation in Japan, but they just don't listen," fumed one frustrated diplomat, who notes that Japan had counted on a steady commitment to the project from the United States. And U.S. embassy officials agree with Japanese science administrators on an even more important principle: With big science growing ever bigger, an end of cooperation is not what anyone needs—what is needed is a new beginning.

The first problem that needs to be overcome is the continuing reality that neither side understands the other's system very well. If the Japanese overreacted to what has already proved to be a minor diversion in the erratic journey of the space station, what about the famous remarks of Nobelist James Watson in regard to what he saw as Japanese "free-loading" on the international genome project? (See *Science*, 3 November 1989, p. 576.) It is a fact that while Japan has welcomed this global research project, it has been extraordinarily slow to ante up. Despite a doubling of its allocation to the project last year, Japan still spends less on human genome research then any of the other advanced nations—just $14 million [¥2.003 billion] compared to the United States' $135 million. It was an earlier generation of puny contributions that caused U.S. Genome Project head Watson to unleash, in the eyes of many members of the U.S. scientific and diplomatic communities, an embarrassing tirade against the Japanese. "Just because the Japanese bureaucracy runs slowly, there is no reason for the United States to carry the burden. The Japanese must face up to the fact that they are a wealthy nation and act accordingly," Watson complained at that time. But what Watson didn't understand, some Americans with long-term dealings with the Japanese would say, is that even if the Japanese bureaucracy runs slowly it runs true: It would never back off once a commitment is made.



Big squeeze. *Growth in funds for science agencies has lagged behind GNP; new projects, including international ones, must be shoehorned into "zero growth" budgets.*

These failures of each nation to understand the other could have serious consequences, because of the delicate financial state of many megaprojects dear to some scientists' hearts. In addition to the endangered space station and the Human Genome Project, there's the Superconducting Super Collider (SSC) project, in which a U.S. delegation unexpectedly asked Japan for $2 billion, but has so far received nothing (see box, p. 129). And then there is the four-way collaboration (including the European Community and the Soviet Union) on an experimental fusion reactor.

And that's just the wishlist from the West. Proposed by Japan are the Intelligent Manufacturing Systems Project and the new Sixth-Generation Computer Project, both of which have sunk into the mire after Japan was scolded for approaching U.S. researchers instead of working through diplomatic channels. Limping along behind is Japan's international Human Frontier Science Program, launched in 1989 and still begging for a small contribution from the United States.

So if you're the kind of scientist who cares anything for any of these projects, your conclusion would have to be that the bickering is endangering the grand scientific enterprise. Says Gregory Rose, an American with 8 years experience seeing foreign products through the Tokyo bureaucratic jungle, "We spend too much time fighting the system in Japan; it is usually better to build a strategy that uses it." Says Gerald Hane, a visiting researcher in public policy from Harvard University who is studying how Japan commercializes technology at the National Institute of Science and Technology Policy in Tokyo, "The key to success is understanding how decisions are made in Japan."

These may not seem like new words of advice to the many Americans struggling to overcome their own cultural biases in order to work with the Japanese, but they are nonetheless vital ones. For example, U.S. citizens look with envy at what appears to be Japan's ability to come to a consensus and work together harmoniously on long-term policies. But, over here, Japan's science administrators would put it a different way—and with a very different moral. They want the

$2 Billion for the SSC? Sayonara, but Thanks for Asking

Tokyo—Just at a time when cooperation is needed to push forward some of the grand schemes of big science, the last few years have seen tensions develop between the two wealthiest nations on the globe. No better example of the downside of this trend is the mutual embarrassment that was caused last year when the U.S. Department of Energy (DOE) dispatched a high-level delegation to Tokyo asking for a $2-billion contribution to the Superconducting Super Collider (SSC)—and came away with nothing more than a polite "Thank you for visiting us."

The Japanese had offered as much to the space station, so why not the SSC? But in the case of the space station, the United States could count on a formidable array of supporters in Japan (see accompanying story); not so with the SSC. In its quest for big bucks for the particle accelerator, the United States appears to have ignored the golden rule for getting major contributions from Japan: Links must be built at ground level before an official approach for funds. "The Americans are always asking for something new," one Japanese official involved in the negotiations complains. "They come here like salesmen and expect us to say yes immediately. We cannot."

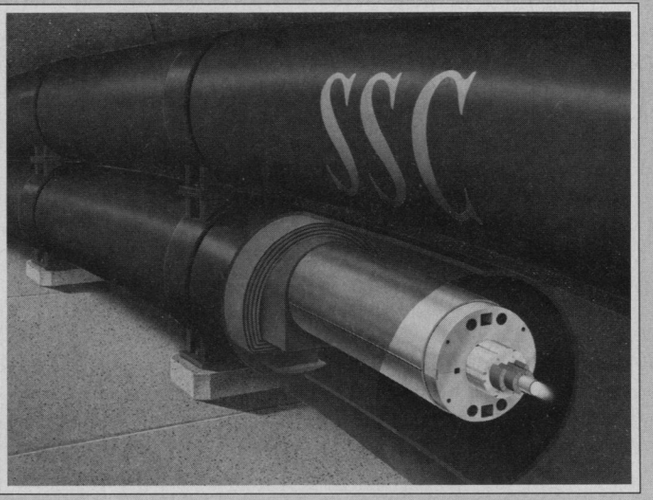
Japanese officials also cannot—and more important, do not want to—say no. One Science and Technology Agency (STA) official told *Science* (on the promise that he would not be named): "No one here knows what to do about the SSC request. We can't say no to the United States." This official pointed out that a commitment of $2 billion for the SSC would cause the Japanese to "have to pay $400 million per year, which is greater than the entire research budget of the Ministry of Education." Not surprisingly, he added: "We cannot pay for this project without special budget appropriations." But to get such a special appropriation, the Americans would have had to get more than the support of even the prime minister plus senior science administrators. That's what NASA learned. It found support in industry and academia for the space station and was able to lobby from the ground up. But in the case of the SSC, precisely the reverse is happening.

Because no one likes to offend, Japan's official position is that it is "considering" U.S. requests for a sizeable contribution to the SSC. But unofficially, senior STA administrators say that they see no hope of anything more than a token contribution. Although nominally in charge of policy coordination, the STA has ruled that the SSC is "a basic science project"—a death sentence for corporate involvement—and passed it on to languish in the Ministry of Education, the most conservative and slow moving of all the ministries.

Could the triple combination that helped launch funds for the space station—support from scientists, industry, and politicians—be invoked in behalf of the SSC? Even if the DOE had done everything right, the answer is probably no. As in the United States, many scientists in Japan argue that the cost is simply too high—especially at a time when university facilities are in a state of serious decay. "If we could get $2 billion more," a senior scientist at the high-energy physics laboratory says, "why should we send it out of Japan? We've been trying to increase our own funding for years [without success]."

It will sound all too familiar in the United States but most fear that the SSC and other programs will crowd out their small science projects. Even many high-energy physicists in Japan think less expensive research alternatives are available at CERN and that they should be exploited first. Some, like Seiji Iwata, director of the physics department at the High-Energy Physics Research Institute, even think that Japan should launch its own big high-energy physics project. Iwata has plans to build a 1 TeV linear electron-positron collider, perhaps with help from SLAC.

STA officials are not keen on the SSC for a different reason—they have little confidence in DOE cost estimates and management skills. Complains one official: "The DOE has a long history of underestimating costs. The figure might double or triple in the future. And as the SSC is a new laboratory I am afraid it is not equipped with the proper staff."



Attractive. *Japanese companies would like to supply superconducting magnet technology, but not without formal government participation in the project.*

But their primary concern is whether SSC is truly an international project that could attract large-scale industrial support from Japan's sophisticated magnet makers. "I read reports from the U.S. Congress," says the same official, "that say the project is to enhance [U.S.] national competitiveness. I am afraid that if Japan decides to participate, they'll think Japan wants U.S. technology. We have to be careful."

And careful is what industry, that third leg in the triple combination, is being, although they also make plain that, given the right opportunity, they would move swiftly. "Many companies are interested, but they will participate only if the government of Japan joins the SSC under an international agreement. We want to avoid trade difficulties.... We will accept money from the government of Japan but do not intend to work with money from the United States," said a senior official at one key company. "We are very interested in developing the related technologies like superconducting magnets, ultra-low temperature refrigeration, and high vacuum, to name a few," the official explained. And for a simple reason: "They could lead to interesting products in the future. We're not interested in scientific results."

With industry nervous and only the first limb of the coalition—politicians—to work on, supporters of the SSC are looking forward to mid-July when George Bush is going to meet with Prime Minister Kaifu at the summit of advanced nations. Will he put pressure on Kaifu? From over here, it won't much matter with so little enthusiasm in the rank and file. ■ **R.C.**

United States to understand that their discipline is regimented by the extraordinary budget constraints under which they must work. "With the exception of defense and overseas development aid...the entire budget is fixed under a ceiling for 10 years," explains Kenji Goto, deputy director of Japan's Human Frontier Science Program. Like the United States, Japan has a vast fiscal deficit and its eqivalent of the Gramm-Rudman Deficit Reduction Act—the "zero-budget growth policy." Virtually all new programs must be financed within the zero-growth ceiling—directly at the expense of existing ones, says Goto.

Thwarted. *Even Yasuhiro Nakasone couldn't get a big budget for the international human frontier program.*

That means that each ministry receives predictable amounts, says Katsuhiko Umehara, a senior Ministry of International Trade and Industry (MITI) official responsible for overall research coordination. As a result, it is "budget battles within each ministry that determine the distribution of funds between projects." Outside pressure means little when no one can promise more money.

The result: a strange situation in which officials in each agency jealously guard their own programs—but no one controls the whole enterprise. For a new program launch, even top politicians and high officials must gain the support of lower bureaucrats. As Japanese officials put it, "Consensus must come from the bottom up."

Building a consensus is a time-consuming ritual in Japan. There is none of the winner-takes-all mentality that characterizes turf wars in U.S. agencies. With promotion linked to years of service, "no one goes exclusively for short-term gains," explains MITI's Goto. Instead, he says, "give and take" is the rule. The result of all this, Michio Oishi, professor of microbiology at Tokyo University, would like Americans to understand, is that scientific merit is rarely the principal criterion for project approval. Instead, he says, "bureaucrats usually wait for years for their turn to come to do their favorite project."

From the outside these practices create an impression of harmony. But they make it doubly hard for Japanese officials to negotiate international projects. They hinder the prioritization and reranking of research projects in the Japanese science agencies and reduce the flexibility of officials. Once an agreement has been hammered out, it may be impossible to alter, even years later.

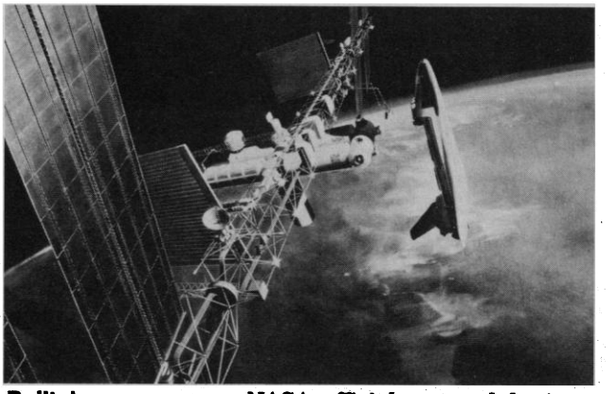
Cumbersome and time-consuming negotiations anger many U.S. officials who often see them as a ploy. "[Japanese] bureaucrats will say anything to get rid of meddlesome foreigners," fumed one U.S. embassy official to *Science*, proving that even the diplomats aren't ever-understanding of their hosts. Instead, foreigners have turned to applying pressure at the top as the quickest way to secure Japanese cooperation. But success is certainly not guaranteed. Rather, the Japanese are eager to have foreign negotiators know that even Japanese prime ministers often cannot push ahead with their own pet programs.

Take the case of the Human Frontier Science Program. It was conceived by Yasuhiro Nakasone, one of the most forceful postwar prime ministers. But after 6 years of struggling to convince—and in some cases to coerce—bureaucrats to cooperate, Nakasone emerged with just $25 million a year for the program, a small fraction of the $385 million he had envisaged. Two of the ministries with a stake in science—the Ministry of Education and the Ministry of Health—simply refused to join in at all.

The key lesson, explains Hane, is that in Japan pressure at the top from high-level deputations is not enough; efforts must first be made to build support lower down the hierarchy. "For virtually any program, supporters among key people can be found," he says. "Through judicious use of political pressure, the United States could aid many of them." And that has in fact happened in the past—the doubling of the budget for human genome research (albeit at the expense of other programs and although still far below the level one would expect from a mighty economic power) is a result of foreign pressure plus energetic support from scientists and key science administrators. Indeed, many Japanese scientists who want more money for basic research would like the United States to get tougher—one told *Science* (on the promise of anonymity), "You should hit them [bureaucrats and politicians] hard or nothing will change"—the key, though, is where and when to apply pressure.

Still, even knowing how to move the bureaucracy is not the end of the story. For really big-ticket items, industry needs to be added to the coalition. Take the space station. Ronald Reagan leaned on Prime Minister Nakasone in 1984, but by itself that wouldn't have been enough to get the big bucks. Next, NASA administrator James Beggs made the rounds in Tokyo where he triggered an unusual coalition: Corporate scientists and engineers formed study groups to explore technologies for manned space missions and university professors allied themselves to these groups, hoping to conduct a range of microgravity experiments. And government officials were in favor of the project because it was covered by an international Memorandum of Understanding that put one ministry in charge and avoided lengthy territory battles.

Masafumi Miyazawa, a National Space Development Agency official involved in the negotiations with NASA over the Japanese contribution, recalls: "The space station enjoyed strong support by scientists, businessmen, and government officials alike." The result of this magic triangle was a commitment from the Japanese government of $2 billion. That enormous sum made it not just the "largest R&D program in the history of cooperation in science and technology," as an STA official in charge of the program put it, but also a "milestone for all their future cooperation in science and technology."



Built by consensus. *NASA officials courted businessmen, scientists, and government officials to get a $2-billion contribution to the space station.*

A winning combination of support from politicians, industry, and scientists—in the right diplomatic package—could be found again for future big science projects. But if the United States wants to get the recipe for success right, each project will have to be studied carefully and measure taken of supporters within Japan before—not after—the project is launched. And, of course, to keep Japan's confidence in the meantime, constant reassurance will be needed that congressional action on the Space Station is not going to turn it from a milestone into a tombstone. ■ ROBERT CRAWFORD

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