sues related to biotechnology. Scientists from outside government would have been included on the board.

Now, according to Robert Rabin of OSTP, the new committee will only comprise government officials from agencies including EPA, NIH, the U.S. Department of Agriculture, and the Food and Drug Administration, and will limit its attention to generic scientific questions. It will be formed under the auspices of an obscure federal committee called the Federal Coordinating Council for Science, Engineering and Technology. The sense is that the committee won't be doing much, according to several government officials and observers. Senator Albert Gore (D–Tenn.) said at a hearing recently, "I'm concerned that the council is toothless and just a kind of discussion group."

The one problem that companies have been concerned about is where to get approval for their products. But after 2 years, the regulatory waters are still muddy. Neither the biotechnology council nor its parent committee resolves the confusion about jurisdictional control, remarked Harvey Price, director of the Industrial Biotechnology Association.

The council does take away some of the pressure from NIH's recombinant DNA advisory committee, which has been the main forum for discussing general biotechnology matters. On the other hand, it is not clear yet what role USDA is going to play in reviewing biotechnology products. The tobacco plant experiment planned by Agracetus was approved by NIH, but officials there hope that in the future, such applications will go to USDA, so it can turn its full attention to reviewing biomedical proposals. The General Accounting Office is currently conducting a study to evaluate what USDA's regulatory role should be in biotechnology.

—MARJORIE SUN

Gandhi Shakes Up Indian Science

Government R&D programs are being critically evaluated and links with Western science are being encouraged

New Delhi. India's scientific enterprise is in the midst of a shake-up, thanks to policies adopted by Prime Minister Rajiv Gandhi and a small group of close associates. Government departments are being told to conduct a thorough assessment of their scientific programs, with the aim of speeding up high-priority projects and weeding out those deemed unproductive. Greater internationalism in science is also being encouraged. Not surprisingly, these changes are being viewed with mixed feelings in India's scientific community.

Like his mother, Indira Gandhi, and his grandfather, Jawaharlal Nehru, the country's first postindependence prime minister, Rajiv Gandhi has staked out a strong personal role in shaping India's science policy. He is also emphasizing his commitment to science and is promising to use high technology to propel India into the 21st century.

In his first Independence Day speech, for example, which was delivered in August from the ramparts of Delhi's famous Red Fort, he explicitly identified India's postcolonial support for science and technology as the key to its economic and social progress over the past 38 years, "while many other developing countries have fallen by the wayside." Perhaps even more significant, in a major cabinet reshuffle in September, science and technology was one of five portfolios that Gandhi decided to retain for himself. He had previously held responsibility for 13.

This top-level interest does not mean that bigger budgets are on the way. In recent years, science and technology have done well by the government. During the past 5 years, for example, government funding for research and development has almost doubled. "We have been in a privileged position," admits one senior administrator with the Council of Scientific and Industrial Research (CSIR). Few pretend that such a growth rate can be maintained, and funding for R&D will not increase significantly in the Seventh Five Year Plan, which officially started this year but was not approved until early November.

But money alone does not reveal the whole picture. Other government policies could have an equal, if not greater, impact on the conduct of government-funded research. One of the most important is the new accent that Gandhi and his finance minister, Vishwanath Pratap Singh, are placing on the need for greater accountability in all levels of government, including its research community.

For the first time, for example, the Department of Science and Technology has been asked to carry out a top-to-bottom peer review of all the research it supports in both government laboratories and universities. Ringing in the ears of administrators as they organize this effort are Gandhi's instructions, given while opening a new defense laboratory in July, that research projects found to be yielding important results should be completed speedily and their benefits fully utilized; in contrast, projects not shown to be producing results should be "identified quickly and discarded."

Also being recalled is a statement the new prime minister made to the CSIR directors that, whereas "chasing other countries" might have been adequate when the agency was born in the period immediately following independence, "now we should choose some areas and aim at being the foremost in the world." Consequently, "we are using a zero-based budget approach, looking at total resources and the totality of our requirements," says CSIR Director-General S. Varadarajan.

The second aspect of the new government's science policy that seems to mark a significant shift from the past is a far greater willingness to accept the need to import both technology and science from abroad in some situations. The concept of "self-reliance" frequently applied by Indira Gandhi and Nehru to science and technology was usually interpreted as the ability to generate indigenous activities broadly comparable to similar programs in the advanced nations. Today, it is being interpreted more as the ability to adapt the most advanced technology from elsewhere.

The former approach to self-reliance is epitomized by India's success in space technology—a new, totally Indian telecommunications satellite, Insat-II, is to be launched from an Indian rocket in the 1990's—and in developing an indigenous nuclear capability. In contrast, the areas in which the new approach can be most clearly seen are those such as microelectronics, materials research, advanced

telecommunications, and the application of genetic engineering to medicine and agriculture, in which many Indian politicians and industrialists realize that India, whatever its achievements, still remains significantly behind the West.

"We are no longer looking at self-reliance to mean that everything we need we must be able to do ourselves," says S. Ramachandran, biotechnology adviser to the Department of Science and Technology. "We are looking more at self-reliance as the capacity to do something as a particular situation requires it."

The pressures for greater scientific accountabilty on the one hand and greater openness to international scientific competition on the other are already having a significant impact in those parts of India's scientific community which have previously been relatively protected from such demands.

There was a strong outcry recently, for example, when a prominent state-owned telecommunications company, Hindustan Cables Ltd., announced its intention to seek a foreign collaborator as a source of technology for the production of optical fiber cables, apparently ignoring domestic research in this field by groups such as the CSIR's Central Glass and Ceramics Research Institute in Calcutta. Hindustan Cables argued that foreign technology would be cheaper, quicker to set up, and more reliable. The Indian government eventually approved a license for the technology to be imported.

"People are getting shaken up," says K. N. Johry, the head of international relations for the CSIR. He points out that it is not only government officials close to the prime minister but also an increasing number of members of Parliament who are beginning to raise probing questions about the returns India should expect from the generous investments it has made in the scientific community.

One spin-off from the new policies is closer scientific collaboration between India and Western nations, in particular the United States. Over the past decade, such collaboration has been strained both by specific events—such as U.S. support for Pakistan in its war with India and the cutoff in supplies of uranium to the Tarapur nuclear plant—and a more general antagonism to excessive Western influence.

Today, however, there is a "new environment and a new psychology," says Philip Schambra, science counsellor at the U.S. embassy in New Delhi. Both are manifest in the landmark scientific cooperation agreement signed by Indira Gandhi and President Reagan in Washington in the summer of 1983, and even more so in an extension of the agreement signed by Rajiv Gandhi in the U.S. capital last June (*Science*, 28 June, p. 1514).

Moreover, while U.S. funds disbursed under more general aid programs were frequently used to bolster Indian research projects, there is now a move to rechannel them into providing Indian scientists with more direct access to research being carried out in the United States. "We want to use these funds to provide linkages with what we consider to be important areas of research, for example, by organizing workshops and sponsoring more scientific exchanges, rather than to support basic research here which is now being adequately funded by the government," says B. Venkataraman, a professor at the Tata Institute of Fundamental Research in Bombay.

Not all requests for access to the latest American technology have been granted. Strong reservations, for example, were expressed from the U.S. side when Indian scientists demanded that collaboration on materials science should include research results in the most advanced fields of semiconductor technology, such as the use of gallium arsenide. In several cases, requests were turned down, ostensibly for "proprietary" reasons, but with military arguments always lurking in the background.

In other areas, however, the United States has been eager to provide access to its most advanced science. This is illustrated by plans for the joint India-U.S. Vaccine Action Program, agreed in principle by top science officials from both sides during Gandhi's recent trip to the United States. Earlier collaborative programs in the health field ranged across a spectrum of medical disciplines and techniques, from epidemiology to nutrition. The vaccine program, in contrast, will concentrate almost exclusively on the development, testing, and distribution of vaccines against diseases such as rabies, typhoid, and hepatitis, manufactured with the use of advanced genetic engineering techniques.

India's new leadership is hoping that the new commitment to high technology, combined with a greater drive for industrial efficiency and more exposure to foreign competition, will revitalize Indian industry. But critics of an excessive commitment to this course warn that it could extend the gap between "technology rich" and "technology poor" sectors of the country, which in turn could provide fertile ground for fundamentalist political groups, as happened in Iran.

To avoid this, Indian science still requires "judicious choices" based on real social needs and the coordination of social goals, says historian of science Abdur Rahman, former director of the National Institute of Science, Technology and Development Studies.

To observers such as Rahman, as well as many prominent members of the scientific community, centralized planning for science therefore remains a necessity. Indeed, Gandhi himself has already talked of the need for 15- or 20-year plans sketching out India's technological future. How compatible these ideas are with his more free-market approach to the organization of both science and the economy seems destined to be a source of continued controversy in the months ahead.—**DAVID DICKSON**

The Reagans and the Gandhis

Seeking broader international links for Indian science.