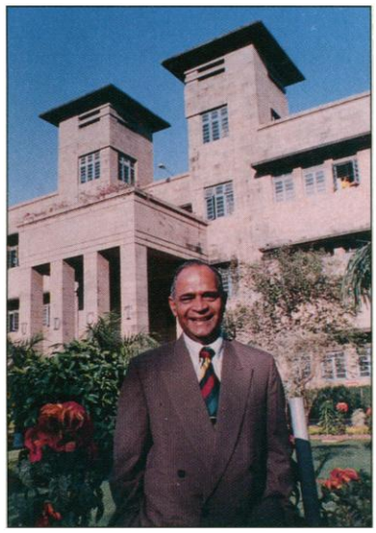
JOINT RESEARCH

# India Cracks Whip to End Addiction to State Funds

NEW DELHI—Basic researchers in the United States who have been grumbling in recent years about efforts to encourage scientists to become more involved in "strategic" research might take a look at what is happening to their colleagues in India. The Indian government is using strong medicine to try to cure academic and government scientists of their near-total dependence on government funding and encourage them to work with industry.

PHOTOS BY PALLAVA BAGLA



**Industrial strength.** Bombay University's department of chemical technology, led by Man Mohan Sharma, benefits from corporate ties.

Part of the prescription is a set of powerful inducements: bonuses and a share of royalties from products created in their labs, changes in a 25-year-old patent law allowing product patents of new technologies, and greater protection for intellectual property that should come with membership in the World Trade Organization. But the government is also prescribing an unpalatable remedy: flat or declining research budgets, which should push institutions to find private sources for a growing share of their activities.

The idea of greater cooperation is not new: "We have been advising universities to reach out to industry through their research since 1990," says G. Ram Reddy, who has just retired as chair of the University Grants Commission (UGC), the government agency that oversees higher education. And science policy-makers now believe it is needed to promote high-tech development in India. For example, the theme of last month's 82nd annual meeting of the Indian Science Congress Association in Calcutta was "Science, Technology, and Industrial Development in India," and several speakers reminded the 6000 scientists and government officials that greater cooperation between industry and academia is long overdue.

But strong words are not enough to bring about change. Industry increased its share of national R&D expenditures from 24.3% in 1990–91 to 26.4% in 1992–93, but the change amounted to less than $35 million in a $1.6 billion R&D budget. Clearly, more is needed to keep academic research alive and well. "The initiative has to come from the particular university," says Reddy, who points out that the great majority of R&D institutions rely on government funds to keep their research programs going. The prestigious Jawaharlal Nehru University in New Delhi, for example, "gets 95% of its funds from the government," he says. Indeed, most academic administrators tend to lump together a range of possible collaborations—from courses that deal with practical questions to research collaborations—and view them all with contempt. "We should not be expected to do product development," says Y. K. Alagh, the university's vice chancellor.

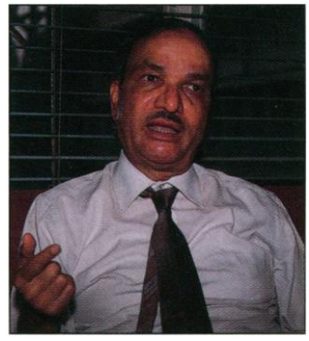
Dependence on the government runs deep. Last summer at the University of Delhi, for instance, a projected shortfall of $5 million from the UGC triggered a financial crisis that led to the resignation of its vice chancellor, Upendra Baxi. Baxi said the university "would lose its soul" if the government did not increase its support of faculty salaries and the research supplies and equipment they needed.

Not every university scientist and administrator regards the situation in such dire terms, however. J. B. Joshi is a chemical engineer and faculty member at the University Department of Chemical Technology at Bombay University who designed a novel gas-liquid reactor for catalytic hydrogenation, a process used to produce industrial chemicals. The reactor is selling briskly, in large part because the savings from the catalyst it uses cover the cost of the entire system in only 3 months. And Joshi collects $15,000 a year in consulting fees, thanks in part to a 200% increase in 1993 in the rates that faculty members can charge for their time working with industry.

Joshi and his fellow consultants aren't the only ones who benefit from stronger links to industry. The department receives one third of their consulting fees, which last year totaled $133,000. Industry has also given the department $600,000 over the past 5 years for research, most of it from Reliance Industries, a manufacturing conglomerate, which has provided the funding with no strings attached. This outside income has helped the state-owned Bombay University thrive in the face of a stagnant public subsidy for general operating expenses.

A few government institutions are also learning how to flourish in the new environment. The National Environmental Engineering Research Institute (NEERI) in Nagpur is part of the Council of Scientific and Industrial Research (CSIR), which receives $99 million a year from the Indian government to operate a network of 40 laboratories. NEERI is earning 65% of its $1.7-million-a-year budget from selling its wares, says its director, environmental engineer Purushottam Khanna, who oversees 146 externally funded projects ranging from making biosurfactants from industrial wastes to making lead-resistant catalytic converters.

One way CSIR hopes to get closer to industry is through participation in its governing boards. The powerful Research Advisory Councils (RACs), which oversee each laboratory, are now required to draw two thirds of their members from industry, says CSIR's director-general, Shri Krishna Joshi. This added representation—the old councils were comprised mostly of eminent scientists with the occasional industrialist—is causing labs to incorporate research objectives that are relevant to the problems facing local industry, he says.



**Patent pending.** None of CSIR's 470 patents has generated revenue, laments Director-General S. K. Joshi.

But CSIR has a long way to go. It has promised the government that each CSIR lab will earn half its budget from external sources by 2000; at present, only 11% of CSIR's earnings now come from private industry. With recent budget increases lagging behind inflation, the money would certainly come in handy. But Joshi confesses that "CSIR has yet to earn anything at all from its 470 patents."

That pitiable performance doesn't surprise C. N. R. Rao, former adviser to the prime minister on science and technology and now president of the Jawaharlal Nehru Center for Advanced Scientific Research in Bangalore. "The patent scene in India is rotten," he says, referring to his country's traditional disregard for intellectual-property rights. "China has managed

to train 500 [legal] specialists in patents in the past few years, while India has just half a dozen," he notes.

One reason for the scarcity of patent examiners is the lack of interest among academics in the needs of industry, says Nagaraj Vittal, chief of administration for the government's Department of Electronics. Vittal, who dismisses most Indian research as "metooism," feels that little will change until Indian scientists begin carrying out "innovative rather than imitative research."

That philosophy has already taken hold among the faculty of India's premier research and teaching institution, the Indian Institute of Science (IISc) in Bangalore. Govindaranjan Padmanabhan, IISc's soft-spoken chief, points to several cases where industrial partnerships have led to significant economic gains. "Research at the institute helped the nation become self-sufficient in silicon manufacture through cooperation with Metur Chemicals in southern India," he says. And Padmanabhan notes that the institute has also made important—but harder to measure—contributions to the country's space and defense programs.

The new emphasis on industrial ties, he says, has also been a catalyst for such changes as a new course on patenting and a promotion system that relies more heavily on the impact of publications than sheer numbers. But he says there is still room for improvement. Private sponsors provide half of the institute's funding, he notes, but only 10% of that total comes from industry. Padmanabhan would like to triple the size of that industrial slice. "While the institute can never give up on its primary mandate of basic research," he says, "we have no intention of resisting change."

Even with the backing of such important institutions, however, it's not yet certain that the government's effort to make Indian science more financially independent will permanently alter the country's research enterprises. Rao says the answer lies in increasing export of technology-related products, adding, "but that can happen only with an increasing outlay for targeted and product-identified R&D." Before that can occur, though, university scientists and their industrial counterparts need to learn how to work together.

**–Pallava Bagla**

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NATIONAL LABORATORIES

# Galvin, DOE Spar Over Reform Plan

The chairs of most blue-ribbon panels dutifully release their reports and then return quietly to their regular jobs. But not Robert Galvin, the chairman of Motorola and head of a Department of Energy (DOE) task force that in February suggested radical changes in how DOE's national laboratories are managed. At a Senate hearing last week, Galvin went a step further, describing in detail how Congress could create a private company that would receive federal funding to operate the labs but function largely free of government oversight.

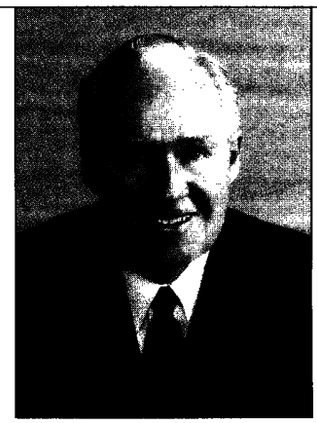
The idea to "corporatize" the labs is not popular with DOE or lab officials, as Energy Secretary Hazel O'Leary made clear to the committee during the same hearing. But Galvin hopes to strike a chord with those in Congress who are eager to reduce the size of government. He offered the senators a seven-page paper, prepared after his panel was disbanded, outlining how a quasi-government corporation could be established and the precedents for doing so. Under Galvin's plan, DOE would either lease or transfer its property to the organization. The bottom line, Galvin forecast, would be a 20% to 30% reduction in operating costs.

Galvin's presentation won some plaudits from Senator Pete Domenici (R–NM), who chairs the appropriations panel that controls DOE's budget and whose state includes two weapons laboratories. Domenici said he favored "a bold initiative," and warned O'Leary that "we don't intend to let the Galvin report gather dust. ... We want results." However, he and other Republicans stopped short of endorsing Galvin's proposal.

**"We don't intend to let the Galvin report gather dust. We want results."**

**—Sen. Pete Domenici (R–NM)**

Galvin's plan held little appeal for the panel's senior Democrat and former chair. "I'm really highly skeptical," Senator Bennett Johnston (D–LA) told Galvin. "This is a formula for abolishing the labs." O'Leary, who sat next to Galvin at the witness table, believes the proposal goes too far. The labs "are an investment on behalf of U.S. taxpayers of over $100 billion," she said. "I am very loath to submit them to some experiment."



**Working overtime.** Robert Galvin's "visionary" plan would corporatize DOE's labs.

O'Leary has already embarked on a major shake-up of the department to streamline operations and save $10.6 billion over 5 years. (This effort helped her shoot down a White House trial balloon lofted shortly after the election, to abolish DOE, although a group of freshmen Republicans has since revived the idea.) Last week she announced plans to create a Laboratory Operating Board of Directors within 1 month. This, she says, is in keeping with a less radical proposal contained in Appendix B of the Galvin report that calls for DOE to streamline the current system. The board, a panel of DOE managers and outside experts chaired by Energy Undersecretary Charles Curtis, would help the labs set strategic goals and monitor DOE efforts to cut costs. One lab director said he and his colleagues endorsed the moves at a meeting last month.

But Galvin told the senators that such an approach amounts to "rearranging the deck chairs [on the *Titanic*]." The corporation approach, he said, "is a non-risk test" and "a sure bet" to save money and make the labs more efficient. He praised the labs and damned DOE and congressional micromanagement of the system.

The plan Galvin presented to the senators calls for Congress to set up a not-for-profit organization through the Government Corporations Control Act, which has created entities like the Resolution Trust Corp., the Federal Land Banks, and the Federal Deposit Insurance Corp. A presidentially selected board of trustees would oversee the lab system and select its officers. "DOE, as the government sponsor and customer, should not serve as auditor or manager of the laboratories," Galvin's paper states. DOE would ask Congress for a budget, however, and the Comptroller General of the General Accounting Office could audit the new corporation.

Although O'Leary has not publicly rejected Galvin's plan, she does not believe it is politically realistic. "Bob Galvin is a visionary; I am focused on what I can do—and what I can do is Appendix B," the secretary told *Science*. For his part, Galvin insists he is not sparring with the secretary and that his goal is to "clarify" the task force report. He doesn't deny, however, that his efforts have created tension between him and O'Leary. "I don't think she is thrilled," he says.

**–Andrew Lawler**