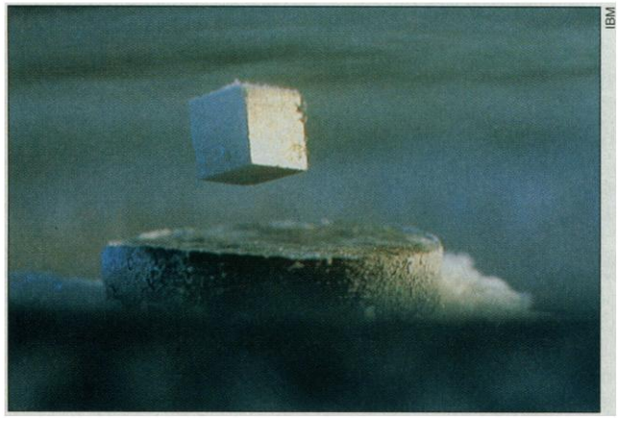
A Clouded Future for IBM Research

Top scientists say a premier research program is beset by turmoil and fear as staff cuts loom and basic scientists are 'redirected' into applied research

For 30 years, IBM has maintained one of the world's leading programs of basic research in the physical sciences. The program made IBM a leader in semiconductor technology, and it led to countless scientific breakthroughs in everything from surface chemistry to astrophysics. In 1986 and 1987, the company's record in basic research was crowned with back-to-back Nobel Prizes in physics, the first for the scanning tunneling microscope and the second for high-temperature superconductivity. But now this extraordinary basic research enterprise may be on the verge of dissolution.



IBM

That old magic. A magnet floats above a slab of high-temperature superconductor, a class of materials for which IBM physicists won the 1987 Nobel Prize in physics.

Struggling to stem a hemorrhage of red ink, IBM management is quite open about its determination to cut its total research bill. Indeed, it has already trimmed some $65 million from last year's $650 million research budget. Within this shrinking pie, the company is now shifting resources from basic to applied research. And within both basic and applied research, the physical sciences (as opposed to mathematics and computer science) have been targeted for the deepest cuts in the future, as dwindling profit margins on computer hardware in general and mainframes in particular drive IBM toward increased emphasis on applications software, consulting, and other services. "We have explicitly embarked on a campaign to rapidly grow the percentage of technical resources aimed at that stuff," says James McGroddy, IBM's vice president of science and technology.

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>
> **–William Gallagher**

To physicists doing basic research at IBM's facilities in San Jose, Zurich, Tokyo, and—most prominent of all—the Thomas J. Watson Research Center in Yorktown Heights, New York, these cuts and shifts in emphasis are calling into question the future of their programs. IBM management insists it will maintain a somewhat more selective but still vital program, staffed by many of its top current researchers. But a number of IBM scientists, speaking under condition of anonymity, provided a different outlook. These researchers, who include managers and some of the company's most highly regarded scientists, described a basic research program beset by turmoil and fear, and they warned of an imminent mass exodus of the company's major talent. "Six months ago this was a great lab," said one. "Now it's a wreck. They've pulled apart a lot of great projects, and they'll never get them back."

Adding to the anxiety is the fact that nobody knows what the overall structure of IBM might look like in a few years' time—let alone how research will fit into the picture. Last month, the company replaced its longtime CEO, John Akers, with Lou Gerstner, who had held the top slot at RJR Nabisco. Few people expect Gerstner to restore basic research at IBM to its glory days. In addition to having little experience with science or technology, Gerstner is renowned as a tough cost-cutter who resuscitated RJR Nabisco largely by breaking up the company's operations and selling off many of them—exactly what many analysts expect him to do at IBM. And there might be little room for basic research in a restructured IBM.

But even if IBM remains intact, basic researchers are seeing some grim omens. Estimates of the size of the cuts being planned for basic research in physical sciences vary, and may be based on slightly different views of how "basic" versus "applied" research is defined. McGroddy, while saying he plans to shift resources away from basic research, also says basic research will get the same percentage of the shrinking research budget as in recent years—a figure he puts at 3%. When asked to reconcile these seemingly contradictory assertions, McGroddy contends that a carefully chosen definition of "basic" research would exclude many of those projects that he intends to cut, allowing him to keep the share of the budget at a fairly constant level. An IBM spokesperson later told *Science*, however, that the budget share devoted to basic research in physics had stood at 4% and is actually being cut to 3%.

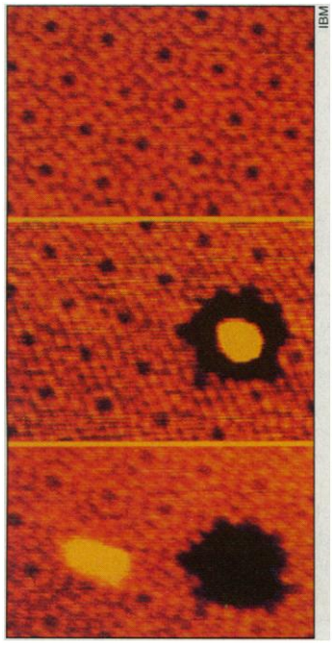
However the overall budget for basic research sorts out, most of the scientists *Science* contacted agreed that IBM is determined to push at least half of the approximately 300 basic physical science researchers worldwide (out of 3300 researchers of all types) into applied research—or out of the company altogether through retirement incentives or layoffs—over the next year or two. Several IBM scientists say that the first inkling of deep cutbacks came last fall in a meeting of the physical sciences group, at which McGroddy outlined the company's intention to bring research more into line with the company's needs. Then, say some scientists, about 2 months ago some one-third of the basic physical science researchers were told by managers that their jobs were going to be phased out eventually, and that they couldn't count on other physical science research jobs. One scientist said his manager told him that half of the remaining basic physical science researchers would be given a similar message at some point in the future. (An IBM spokesperson confirms that some basic research groups have been told by managers that they are likely to be disbanded or "at the very least redirected," although the spokesperson couldn't say what percentage of researchers were affected.)

When these cutbacks are complete, some scientists say they expect only 75 or so scientists will be left in basic physical science research—if everyone who is allowed to stay chooses to do so, which seems a dubious assumption. "The real risk is of the people who are doing the most interesting work picking up and leaving," said one scientist, who called the changes at the lab "unnerving." Between

staff cuts and departures, another scientist predicted that the theoretical physics group will vanish completely within 2 years, and that other basic physical science research groups will be either "shut down or made more applied" within the same time frame.

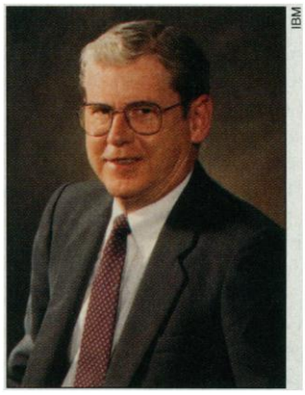
IBM management concedes that the cutbacks and stronger emphasis on applied research have created morale problems, but it denies that the basic research program in physical sciences is in danger of collapsing. As evidence, the company provided interviews (monitored by a public relations official) with several scientists, all of whom are engaged at least part-time in applied research. These researchers maintained that the changes in the research program are far from catastrophic, and might even be viewed as somewhat positive. "It's satisfying to have impact on the real world," said Tony Heinz, a surface chemist whose lab recently acquired a $100,000 titanium-sapphire laser. "I think it's become easier to find a receptive audience [for ideas about applying basic research] because of the changes in the environment." Physicist William Gallagher was less upbeat, but he declined to predict disaster: "Realistically, it won't go back to the way it was, but it will still be an exciting place to work," he said.

IBM appears prepared to make room for many of those basic researchers willing either to find ways to make their work contribute to the company's depressed bottom line, or else to make a jump into computer science or even business-oriented functions. On the other hand, McGroddy expresses little sympathy for those scientists who want to go on in basic research against the company's wishes. "We have a set of people here who don't want change, who want things to be like they were in the 1970s, who don't want to get involved with IBM, who say, 'Give me money and support me like you used to,' and who are unhappy because we won't," he said. But he added that he will make exceptions for those basic researchers who add "luster" to IBM's research efforts through high-visibility work. Though such scientists are typically the first to attract top-notch job offers from universities, McGroddy suggested he can keep most of them on board, partly by assuring them of continued funding, but also by denying them the attractive early retirement package IBM is offering to trim its numbers as part of company-wide cutbacks. "This isn't a program where anyone who leaves goes with money," he said. "We can remove the incentive."



Intimate with atoms. In successive images, IBM researchers create and move a mound of silicon atoms *(white spot)* with a scanning tunneling microscope.

Apparently, neither the assurances nor the threats are having much effect. Since managers announced the cutbacks 2 months ago, said one scientist, a flood of IBM resumes has been circulating through university physics departments around the country—an assertion supported by physicists at a number of institutions. "Everyone here who wants to continue research without being 'redirected' and who can get a job elsewhere is trying to get one," said the IBM scientist. Indeed, all of the scientists who spoke candidly to *Science* expressed doubts about remaining, and some said they have already decided to leave. "I see some of the best people looking around," said Gallagher. "Maybe special treatment isn't enough if they see the whole infrastructure declining."



Willing to make exceptions. IBM's James McGroddy.

Trey Smith, director of the physical sciences research group at Watson, concedes that some good researchers are likely to leave—though he contends that's not necessarily a problem, since scientists who move from IBM to academia sometimes serve as informal recruiters for the company. "We don't want everyone to stay at IBM through their whole career," says Smith. "There's value in having someone in the academic arena who understands IBM's needs, and who ultimately helps provide new blood to the system."

In his vision for the Watson Research Center, Smith foresees an environment in which researchers get to perform a mixture of basic and applied research, both in and out of the physical sciences. What's more, he hopes to finance his vision with a mixture of funding from IBM, the federal government, and even customers. "I'm trying to create a broad spectrum of activity that has a variety of different applications and long-term investments," he said.

But if Gerstner's plans at IBM are anything like those he carried out at RJR Nabisco, even that may be in jeopardy. A dismantled IBM might disband its central research facilities in favor of separate facilities, each reporting to a different business unit. Or, in a less drastic alternative, it might maintain central facilities under combined funding from the various units. That arrangement would be similar to the one at Bellcore, the central research facility of the Regional Bell Operating Companies (RBOCs) established after the AT&T divestiture. Unfortunately, Bellcore is not a reassuring precedent: The lab was unable to convince the individual RBOCs of the potential payoff from physics research, and a once-thriving basic research program was essentially dissolved.

If IBM does avoid drastic restructuring, say some researchers, they hope the research program will evolve along the lines of AT&T Bell Laboratories. Bell Labs has maintained a vigorous physical sciences research program, including basic research, even though the lab made its own transition in the late 1980s from an environment in which basic researchers had autonomy to one in which applied research holds sway. But by all accounts, Bell Labs managed to accomplish the change with far less trauma than IBM appears to be experiencing. The reason, according to one scientist close to Bell Labs, is that, under Arno Penzias, Bell Labs moved more slowly and tactfully. "Things were less draconian at Bell Labs, and were handled over a long period of time with wisdom," said this scientist. "The pain is proportional to the derivatives." Even Bell Labs, though, isn't every IBM scientist's idea of the perfect place to work. "Bell Labs is more sink or swim than IBM ever was," said one IBM researcher. "We're used to a kinder, gentler culture."

The kinder, gentler days are probably gone forever at IBM. But some of the scientists who profess gloom about the future of basic research are unwilling to rule out the possibility that the situation will stabilize before the damage is irreversible. "There are still good scientists here who don't want to leave," said one. "Who knows what the future will bring, but right now we're not in a mode where we're necessarily going to crumble."

If basic research does crumble at IBM, however, scientists around the world will note its passing with dismay. Said David Awschalom, a physicist who left IBM when basic research first started to feel the squeeze last year and is now at the University of California, Santa Barbara: "The real shame is that it took 30 years to build this lab up, and it's only taking a year or two to experience this moral devastation."

–David H. Freedman

David H. Freedman is a science writer in Brookline, Massachusetts.