IBM's Zurich Lab Is "Flower" in Europe

Two major discoveries—the scanning tunneling microscope and superconducting ceramics—highlight IBM Zurich lab's success in tapping Europe's scientific talent

Zurich

WHEN two of the scientists working in a relatively small research laboratory win the Nobel Prize for physics, it is inevitably cause for celebration. When two of their colleagues emerge a few months later with a major, unrelated discovery that promises to revolutionize the contemporary technological landscape—and could also eventually lead to Stockholm—speculation begins to run free about the reasons for the laboratory's exceptionally high level of scientific productivity.

"We have recently begun to ask ourselves this very question," says Dieter Pohl, a senior physicist in IBM's Zurich Research Laboratory. Pohl works on developing applications of the scanning tunneling microscope, an invention for which his colleagues Heinrich Rohrer and Gerd Binnig last year shared the Nobel Prize for physics.

A few doors down the corridor from Pohl's office are the rooms of Alex Müller and Georg Bednorz. It was these two who first described, in a paper published around the same time that Rohrer and Binnig's Nobel award was announced, how a copper oxide ceramic originally developed by French research workers exhibited superconducting properties at temperatures far higher than ever previously recorded. Their discovery led directly to the boom in superconductivity research that has taken place over the past 6 months.

Both discoveries were, according to laboratory staff, the product of a fertile environment able to support "high risk" scientific ventures that might never have got off the ground in a more restrictive atmosphere. But both were also the products of a strategy aimed at tapping into the best available European talent in areas of basic research with potential relevance to IBM's long-term technical and commercial interests.

The Zurich research laboratory was set up in 1956 as the European arm of the IBM's research division by the company's then president Thomas J. Watson, Jr. According to current director Martin Reiser, Zurich was chosen for two main reasons: its geographical centrality, which places the laboratory within relatively easy reach of the major university research centers in continental Europe, and its political neutrality. "The idea was that from Switzerland, one could work with all the surrounding countries," says Reiser.

Early research activities covered a wide spectrum from magnetic core logic to the development of devices such as the sampling oscilloscope. Since then, the laboratory has focused on three areas: physics (in particular that related to surface structure), solid-state technology, and the relationship between telecommunications and information technology.

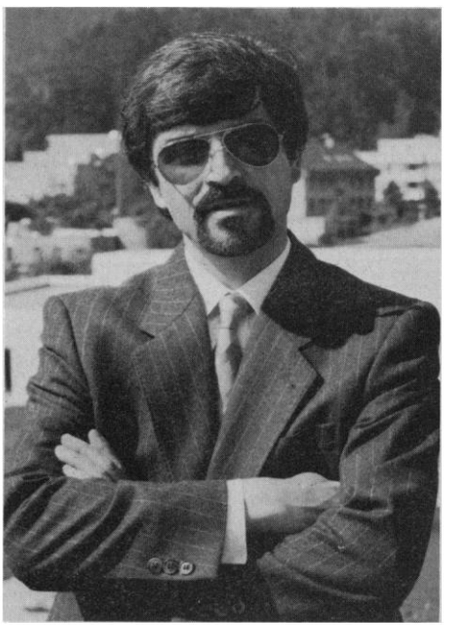
IBM research division head John Armstrong claims that the philosophy behind the Zurich laboratory, whose activity spans both pure and applied research, is no different than in any other IBM research laboratory, in particular its main research center in Yorktown Heights, New York.

"Our general approach is that we want to do world-classs fundamental work in areas of science known to be of real or potential interest to IBM," says Armstrong. He points to the duality contained in the formal statement of his division's goals, namely to become "a research division famous for its science and technology and vital to IBM."

As elsewhere in the company, the main stimulus for new research projects comes from the scientists themselves, but Armstrong admits that the intellectual climate is different from a university. "It is shaped by the fact that one is in an institution that wants to make things; that means that you have to go wherever nature leads in order to make things work."

Reiser points out that the Zurich laboratory's profile differs slightly from the IBM norm. For example, one-third of its research activity is devoted to fundamental, nongoal-oriented, research, a somewhat higher proportion than the company average. Furthermore, the presence of four IBM Fellows out of the laboratory's research staff of 200 is also a higher ratio than elsewhere in the company.

One factor explaining the laboratory's recent successes, Reiser says, is that key decisions about which research proposals to support are made by managers who have themselves been selected for their scientific competence. "We have a management which is trained to recognize ideas," he says.



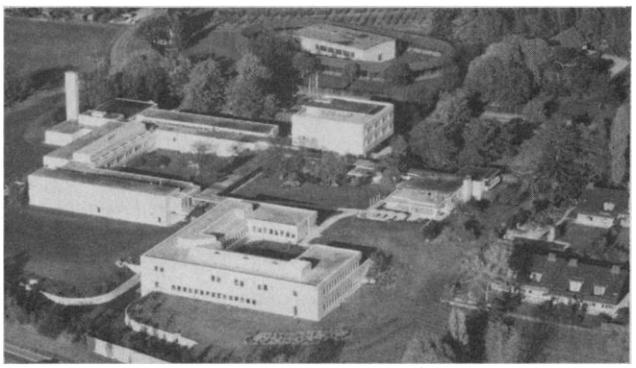
Martin Reiser *heads IBM's productive lab in Zurich.*

A second important factor has been a willingness to take scientific risks—even in the face of a certain amount of skepticism. The initial proposals for the research programs leading to both the tunneling microscope and the discovery of superconductivity in ceramic oxides were, he says, accepted for funding largely on the reputations of the scientists that put them forward.

From the scientists' point of view, a relatively informal organization provides research workers the flexibility to shift from one topic to another as scientific possibilities or technical demands shift. "Compared to a university, what is missing here is the authority of the professor," says Pohl. Since most of the staff carrying out research have already completed their doctorates, the research environment tends to be both more mature and less hierarchical, he adds.

The availability of resources considerably beyond the level that could be expected in an average European university, the absence of teaching commitments, and a management dedicated to nurturing top scientific talent, each exert a strong appeal to many scientists. "The environment certainly contributes a lot, particularly the degree of freedom you are given to choose a project of your own interest," says Bednorz.

Like many other corporate research departments, the laboratory has close links with the outside scientific community, especially in universities. Its activities include



The IBM Lab

An international center for research in the physical sciences.

graduate summer schools, a postgraduate fellowship scheme, and support for a number of collaborative research projects.

These projects currently include research on the tunneling microscope with the Universities of Marseilles in France and Madrid in Spain; on potential applications of the microscope to the structural analysis of DNA molecules, which is being carried out with research workers at the Swiss Federal Institute of Technology in Zurich; and on computer science with the universities of Stuttgart and Aachen in West Germany.

What seems to set IBM apart is the single-mindedness with which its strategy is pursued. This can be seen in the efforts that are put into recruitment. The company never advertises research staff vacancies; young scientists are either handpicked from among those who attend its postgraduate courses, or have been spotted through the network of links that have been formed with European universities.

"It is important to get the best and brightest people," says Reiser. "You do not get these by advertising, but by being close to universities, and knowing the best institutions." The close relations established with major European universities, he says, has been "a key ingredient in our ability to hire those people who make our high level of achievement possible."

Ironically, Binnig came to the attention of IBM not through a visit by Rohrer to his university in Frankfurt—which Binnig has said he was unaware of at the time—but through the fact that his research had been picked out by Müller, then head of the laboratory's physics department, during an assessment of some of the university's research projects.

The same single-mindedness operates in ensuring that IBM scientists remain productive. Research division head Armstrong points out that, although scientific freedom is highly prized, scientists "have to earn their freedom through the quality of their research contributions."

Another factor distinguishing the center from a university research laboratory is the omnipresence, even in a research setting, of a powerful corporate culture which stretches from the four explicit principles of the research division—"excel technically," "know IBM," "know the technical world," and "provide technical leadership"—to a highly developed system of company awards recognizing scientific achievement.

To a certain extent, the corporate culture helps to compensate for a marked ambiguity over the national status of the Zurich laboratory. Armstrong and Reiser both argue strongly that the laboratory should be seen as a European research institution, emphasizing that it employs almost exclusively European scientists (from 12 different nations). As such, they claim a right to full partnership in joint European research programs, such as the information technology program ESPRIT run by the European Economic Community—a claim which is still contested in some quarters.

There is also ambiguity over who, apart from IBM and the individual scientists involved, can claim credit for the research results. The superconductivity breakthrough, for example, is frequently acclaimed—to the frustration of some of the laboratory scientists—as an American discovery.

This ambiguous identity is reflected within the laboratory itself, which operates through a mixture of an American-style working atmosphere grafted on to a strong European cultural background giving rise, for example, to debates about the rival values of German and English as operating languages.

But if the status of the laboratory is ambiguous, its value to IBM is not. The success of the Zurich laboratory, says Armstrong, is clear evidence of the strength of the company's research strategy. "It should not be seen as implying that we have some special policy that was applied in Zurich. But we are just as pleased as punch that in the recent past the flower has shot up here." ■ DAVID DICKSON

U.K. Lifts Veto on Plans for EEC

The British government claims to have lifted its veto on plans for future joint research spending by the 12 member nations of the European Economic Community. It has agreed to support a 5-year research program for 1987–1991—known as the Framework Program—providing that initial spending is kept at the current rate of $1.2 billion a year.

Britain has been at odds with the 11 other members of the EEC for the past 6 months over the future of a research program that ranges from biotechnology through microelectronics—the ESPRIT program—to the operation of the Joint European Torus for fusion research. While the majority of countries have supported a program costing $5.9 billion over the 5 years, Britain had previously insisted that the budget should be limited to $4.7 billion, citing the need for improved management and better evaluation of research projects. However, during a meeting of Common Market leaders in Brussels last week, Prime Minister Margaret Thatcher said Britain is now prepared to endorse a program costing $5.9 billion over this period, equivalent (after various adjustments) to extending the spending at its current level. She added that the question of additional funding for the Framework Program should be discussed at the next EEC summit, to be held in Copenhagen in 6 months time.

Commission officials in Brussels have yet to respond to the revised British offer. The $400-million gap with the budget they had previously been hoping for will require further cuts in the plans for several research programs, already considerably reduced from initial proposals for a 5-year program costing $8.7 billion. A spokesman for ESPRIT, which brings together university and industrial scientists on a range of projects jointly funded with the private sector and designed to help Europe meet the challenge from U.S. and Japanese microelectronics industries, says that 600 out of 2900 research workers will have left the program by the end of the year due to uncertainty over future funding. British officials, however, say that their new offer should now allow the whole joint research program to go forward, even if support for a growth in the budget will have to await the resolution of other topics—in particular, subsidies to European farmers—on which Britain remains isolated from the other EEC member states. ■

DAVID DICKSON