

CENTERS OF EXCELLENCE EMERGE FROM EVALUATION OF EAST GERMAN SCIENCE

Nobody ever accused Germans of not knowing how to organize things, but even so, it is impossible to be unimpressed by the care and methodicalness with which the task of evaluating and reorganizing East German science has been handled in the last year and a half. While the process has been painful and costly for physicists in the newly incorporated East German states, and for physicists in the western states as well, at least it has been carried out with amazing speed and efficiency. That, anyway, is how things appear from the vantage point of Bonn and Cologne, where a visit by PHYSICS TODAY at the end of February afforded opportunities to discuss the situation with officials at the Science Council, the Ministry for Research and Technology (BMFT) and the German Research Foundation (DFG). A similar trip to Dresden and Berlin in October 1990, on the very eve of reunification, produced the general impression that physics would emerge much stronger from admittedly traumatic adjustments (PHYSICS TODAY, December 1990, page 59). This year's trip afforded a chance for that hypothesis to be checked against raw fact.

General employment picture

When the Science Council started nearly two years ago with its detailed evaluation of the institutes of the East German Akademie der Wissenschaften, or Academy of Sciences, it was generally predicted that about two-thirds of the scientists working in the institutes would be dismissed. The actual results have turned out to be somewhat less brutal than feared: The council's final report recommended retaining about 13 300 jobs of the original 30 000—most of them to be funded by the federal and state governments in combination.

Wilhelm Krull, the head of the research policy unit at the Science Council and the coordinator of the council's evaluation, says that the recommended staff reduction is somewhat smaller than it appears. Taking



Max Planck working groups and institutes, Fraunhofer institutes and "blue-list" institutes are being created at some of the locations highlighted on the map, which shows the five "new states."

into account the fact that many former academy employees were working on soft money, and other factors, the real staff reductions will be on the order of 20–30%, Krull says.

In physics the results seem to have been about as severe as expected. The Science Council subcommittee headed by Helmut Gabriel of the Free University, Berlin, identified about 6600 academy jobs in physics, about three-quarters of them in applied physics and 30% alone devoted to the development and construction of scientific instruments and apparatus. The committee recommended retaining 2400 positions, barely over a third.

For physicists who had been doing industrial R&D in the eastern states, the situation is even worse than for

those from the academy. According to information published last year in *Physikalische Blätter*, the German Physical Society's monthly magazine, about 5000 physicists were employed in East German industry at the time of reunification. Of the 900 who responded to a survey, only 205 had full-time jobs at the end of 1990. Moreover, among the organizations that responded to the survey, not one had hired a new physics graduate that year, implying, as *Physikalische Blätter* put it, that the entire 1990 graduating class was unemployed.

While more recent data are not available, the situation cannot have improved much and probably has deteriorated. Scores of firms have been teetering on the brink of bank-



Max Planck Institute for Micro-Structure Physics in Halle was officially opened on 9 January. Standing in front of the institute that day are three of the institute's four codirectors with the president of the Max Planck Society: from left to right, Hellmut Fischmeister (Stuttgart), Max Planck Society president Hans F. Zacher, Johannes Heydenreich (Halle) and Manfred Rühle (Stuttgart). Absent is the fourth director, Gerhard Ertl (Berlin).

ruptcy or have actually gone over the edge, and, under the circumstances, "the temptation is big to obtain financial relief from cuts in R&D," as the German magazine put it.

Jenaoptik Carl Zeiss Jena, perhaps East Germany's most famous company, provides a case in point. When it was split in two last year and the larger part was incorporated into Carl Zeiss Oberkochen, its West German descendant, staff at Jena reportedly was reduced from 25 000 to 3000. The smaller part was converted into a state-owned company, Jenoptik, which the state—Thuringen—cannot adequately support.

Meanwhile the Center for Micro-electronics, the Zeiss subsidiary in Dresden that developed East Germany's highly touted 1-megabit chip, has been incorporated into a new industrial group called MTG (Micro-electronics and Technology Company), which is being provided with Philips equipment left over from the discontinued MegaProject. A creation of *Treuhandanstalt*, the special government agency responsible for restructuring East German industry, MTG may itself be a somewhat dubious enterprise: It is described by critics in the German government, derisively, as just another *Kombinat*—the word for the big industrial combines favored by the former German Democratic Republic.

University reform

Research Minister Heinz Riesenhuber has urged West German firms to allocate 5% of their R&D funds to the new states, and his ministry has

provided some matching funds as an enticement, but this is generally seen as a modest program that has had an even more modest impact. More substantial have been the measures taken to bolster university faculties. The Science Council recommended transferring 2000 positions from the old academy institutes to the universities, and DM200 million per year for two years has been allocated for this purpose. (The mark currently is worth about two-thirds of a dollar.)

Funds for the transfer of positions come out of the Higher Education Renewal Program, which has a total federal-state budget of DM1.75 billion for 1992 and 1993. But the Science Council has called the two-year duration of the program too short and recommended its extension to five years. One serious problem, Krull notes, is that adequate housing for senior faculty often is not available in the new states.

The basic structural problem, Krull explained during a conversation at the offices of the Science Council in Cologne, is that East Germany had only a small number of true universities—just six—and an enormous number of overly specialized technical colleges. And so the council has recommended a far-reaching consolidation of the system, involving creation of 12–15 new universities. Independently DPG has emphasized the importance of creating physics faculties at each university that are capable of providing instruction in the whole field, even if some research fields cannot be fully represented.

But Wolfgang Heinicke, the execu-

tive officer of the German Physical Society, points out that funds for such grandiose reforms simply are not available in many states at the present time. At the university level, where morale has taken a beating, the political will may be lacking as well. All university faculty, along with researchers at the institutes, have been subjected to a grueling process of individual assessment by two committees, one responsible for intellectual attainments and one for ethical behavior. Anybody found sorely lacking on either score has been or will be sacked.

So far, then, the universities are not providing much of a haven for East German physicists who have lost their jobs elsewhere, and noted physicists from the west also are not volunteering in significant numbers to take faculty positions in the new states. Still, large numbers of university positions and jobs at institutes have been advertised in recent issues of *Physikalische Blätter*, and some non-German physicists are known to be applying for them.

Student demographics

Ironically, students from the new states also are not flocking West, even though in the German system any student is entitled to matriculate at any university upon completion of the *Abitur*. Theo Mayer-Kuckuk, the head of the nuclear physics institute at Bonn and the current president of German Physical Society, says for example that he has yet to see a single student from the new states.

In 1990, according to a German survey, there were 38 400 students enrolled in universities in the new states, while 4000 students from the new states had enrolled in universities in the western states. Only 250 individuals from the west had gone east to study.

Education officials had expected a flood of eastern students at the already overcrowded universities in the western states, but a number of factors militate against migration, and they appear to be even stronger than one might have supposed. Mayer-Kuckuk mentioned that the course of study is shorter and more efficient in the East, so many students would sacrifice time if they moved west. (Mayer-Kuckuk, incidentally, considers the current course of study in the old states too long.) Another important factor, no doubt, is the sharp difference between the courses of study typically pursued in the east and the west: Traditionally, 50% of East German men studied engineering, while law was the preferred

course in West Germany.

Other obvious factors are the higher cost of living in the West and mutual prejudice associated with the cultural cleavage between the two former Germanies.

Reorganization of institutes

The Science Council report on the East German academy institutes was released in the middle of last year, several months ahead of schedule. The subcommittee's report on physics research covers 11 institutes and represents an analysis of daunting complexity. In almost every instance, working groups within each institute are to be reestablished as autonomous institutions of several possible types or reaffiliated with national institutions such as the Max Planck Society or the Fraunhofer Society, both of which are based in Munich, or with *Grossforschungseinrichtungen*, or large research establishments—Germany's national labs—which are funded primarily by BMFT.

The Science Council's task was especially challenging because talented researchers in the East sometimes were not permitted to publish in the best international journals or attend international conferences, because their political attitude or conduct was deemed incorrect. (Mayer-Kuckuk mentioned Gerd Röpke, a theorist at Rostock, as an example of a person who was not as well-known to Western physicists as he deserved to be, because he refused to go along and get along.) The other side of the coin, of course, was that the more prominent East German physicists sometimes obtained their positions as a reward for correct behavior.

Given those distortions, the Science Council felt it had no choice but to take a very careful look at the former East German institutes at the work-bench level.

Given that research in the old Democratic Republic was so overwhelmingly applied, the Research Council most frequently ended up recommending reestablishment of whole institutes or units of institutes as "blue-list" institutions. Blue-list institutes are devoted to topics of supraregional significance and are jointly funded by the federal and state governments, usually on a 50-50 basis. In the formula most often recommended by the Science Council, the federal government will fund a larger-than-usual share of the new eastern German institutes initially, with the state shares growing over a period of years.

The council's next-most-common recommendation, also a result of the

Max Planck Groups

X-ray bending in layered systems

Humboldt University, Berlin

Leader: Rolf Köhler (formerly of the East German Akademie der Wissenschaften)

Partner: Max Planck Institute for Solid-State Research, Stuttgart—Hans-Joachim Queisser

Nonclassical radiation

Humboldt University

Leader: Harry Paul (AdW)

Partner: MPI for Quantum Optics, Garching—Herbert Walther

Quantum chemistry

Humboldt University

Leader: Joachim Sauer (AdW)

Partner: MPI for Solid-State Research—Hans Georg von Schnering

Theory of reduced-dimension semiconductors

Humboldt University

Leader: Roland Zimmermann (AdW)

Partner: MPI for Solid-State Research—Peter Fulde

Nonlinear dynamics in astrophysics

University of Potsdam

Leader: Jürgen Kurths (AdW)

Partner: MPI for Extraterrestrial Physics, Garching—Eugen Morfill

Theoretical many-body systems

University of Rostock

Leader: Gerd Röpke (University of Rostock)

Partner: MPI for Nuclear Physics, Heidelberg—Hans A. Weidenmüller

Theory of complex and correlated electron systems

University of Dresden

Leader: Helmut Eschrig (AdW)

Partner: Fritz Haber Institute of the Max Planck Society, Berlin—Matthias Scheffler

Mechanics of heterogeneous solid bodies

Technical University, Dresden

Leader: Wolfgang Pompe (AdW)

Partner: MPI for Metal Research, Stuttgart—Hellmut Fischmeister

X-ray optics

Friedrich Schiller University, Jena

Leader: Eckhart Förster (Schiller University)

Partner: MPI for Quantum Optics, Garching—Siegbert Witkowski

Physics and chemistry of interstellar dust in areas of stellar formation

Schiller University

Leader: Thoms Henning (Schiller University)

Partner: MPI for Radioastronomy, Bonn—Peter G. Mezger

Gravitation theory

Schiller University

Leader: Gernot Neugebauer (University of Jena)

Partner: MPI for Astrophysics, Garching—Jürgen Ehlers

East German focus on applied research, has been to reestablish institutes or groups as Fraunhofer institutes or outposts (see the list on page 54). But affiliations with the Max Planck Society or with the national labs also are suggested, and in some instances units would be incorporated into working groups that Max Planck Institutes have sponsored at universities in the new states (see the list on this page).

Take the Institute for Electron Physics in Berlin, which was one of the biggest and most diverse of the academy's institutes: Because of the institute's sprawling character, the council's subcommittee recommended abolishing it as an institute and reestablishing nine of its units either as independent institutes or as affiliates of other institutions. Its group devoted to fusion-oriented plasma physics, for example, will be attached to the Max Planck Institute for Plasma Physics in Garching in the short run, but in the longer run, it is hoped, the group will be incorporated into Humboldt University in Berlin. The unit devoted to low-temperature plas-

ma physics in Greifswald and the units working on III-V semiconductors and on high-frequency communications will be established as blue-list institutes. The semiconductor theory group will be affiliated with Max Planck and its photovoltaics group with a national lab, while the liquid crystals group will be supported via the university renewal program.

Naturally, Krull affirms, the Science Council did not prepare such recommendations without careful prior consultation with the institutions that would be expected to support and fund the various units. The expectation therefore is that most of the council's suggestions will be implemented. The council has been in the business of evaluating science institutions for a long time, in fact, and several other people in Bonn confirmed that its work is generally respected.

It is important to recall in this context that Germany has no national academy of sciences. This anomaly has partly to do with the fact that the East German Academy of Sciences was the lineal descendant of the old

Prussian Academy, which functioned almost as a national academy before World War II and the division of Germany; and it is partly a product of the federal structure adopted by West Germany, which placed principal responsibility for education in the hands of the state governments. As a result, the Science Council has been given the job of doing the kinds of national studies and evaluations that typically are carried out by the National Academy of Science's National Research Council in the United States.

Science Council review

An evaluation of the kind the Science Council just carried out inevitably gives rise to resentment and complaints of injustice, which often are difficult or impossible for an outsider to assess. In this instance the Science Council's work has been accompanied by charges that its recommendations were biased, that westerners sometimes gave work a low rating because they felt threatened by it. On the whole, however, it seems to be the case—as Krull has claimed—that the council's evaluation has been received as fair and more sympathetic than expected.

"Against previous expectation," Krull has written, "the Science Council's expert group did not encounter a 'desert' in the research establishment of the former GDR. What they found was more than mere oases—despite the political damage sustained by science. Indeed it could be said that... the picture of science was impressive [and that] what was achieved is sometimes amazing."

In only one instance among the physics establishments—the Einstein Laboratory for Theoretical Physics in Potsdam—did the council recommend that an institute be closed down pretty much wholesale. While the council called for rather drastic reductions at some other establishments, such as the Central Institute for Nuclear Research in Rossendorf, in other instances it called for institutes to be not only maintained but further developed.

Rossendorf presented the most serious conversion problems, say officials at BMFT, largely because of the question of what to do with its research reactor—an issue the council was unable to resolve definitively. BMFT was lucky, however, that Wolfgang Häfele, the former director of the Jülich Research Center, came in to take over leadership of Rossendorf for the next few years. These BMFT officials say the general policy has been to bring in senior-level directors

Fraunhofer Establishments

Institute for Integrated Circuits

Erlangen

Leader: Dieter Seitzer

Establishment for Applied Optics and Micromechanics

Jena

Leader: Wolfgang Karthe

Establishment for Electron Beam and Plasma Technology

Dresden

Leader: Siegfried Schiller

Establishment for Ceramics Technologies and Sinter Materials

Dresden

Leader: Waldemar Hermel

Establishment for Materials Physics and Layer Technology

Dresden

Leader: Wolfgang Pompe

from the outside for limited periods—individuals who are free of the baggage connected with evaluating individual staff members and reducing of staff but who will not stand in the way of young researchers advancing into the leadership as institutes get back on their feet.

The case of Rossendorf, in terms of conversion, was the exact opposite from that of the Institute for High-Energy Physics at Zeuthen, where research teams will largely go on doing what they already were doing. As expected, Zeuthen was the first of the eastern institutes to be recognized by the council as first-class and to be maintained largely intact. Led from 1962 to 1988 by Karl Lanius, who was known and respected in the West, the institute developed extensive collaborative programs with both Dubna and Serpukhov in the East and with CERN and DESY in the West. Zeuthen has been reconstituted as an affiliate of DESY, and Paul Söding, the former research director at DESY, has been brought in to run the institute during the transitional period.

Centers of excellence

The Science Council gave high ratings to parts of the Institute for Solid-State Physics and Electron Microscopy in Halle, which was built up over several decades by Heinz Bethge—a name not quite as familiar to Westerners as Lanius, perhaps, but now recognized to be of comparable stature. The council found Halle's position among the East German institutes to be "outstanding." Because the quality of its research was deemed to meet the standards of Max Planck Institutes, the council recommended its

reestablishment as an MPI, which has occurred.

The other MPI that has been established in the east is not strictly speaking in physics but has missions that certainly overlap somewhat with physics: The Institute for Colloid and Boundary Surfaces Research at Berlin-Adlershof.

Another of the physics establishments to receive a very high rating from the council was the Institute for Semiconductor Research in Frankfurt an der Oder. Officials at BMFT say that even though this institute worked for a local semiconductor manufacturer, industrial demands apparently were not too exacting, so a group there was able to do serious materials research—"real forefront work."

According to the BMFT people, Gabriel paid a lot of attention to this institute. The physics subcommittee finally decided the institute's work on fabrication processes was not important enough to continue, but its research on fundamental properties of materials was well deserving of ongoing support. And so the materials group was reconstituted as a blue-list institute, and Hermann Georg Grimmeis of the University of Lund was persuaded to take over the leadership for a few years. The head of solid-state physics at Lund since 1965, Grimmeis previously was a group leader at the Philips Research Laboratory in Eindhoven.

Another major establishment to receive a high rating was the Central Institute for Solid-State Physics and Materials Processing in Dresden. The largest materials research center in the GDR, the institute "won an international reputation with the larger part of its work."

There also is serious discussion of setting up a major chip fabrication facility in Dresden, and at least two US companies are considering whether to establish chip factories in the new states.

Squeeze on the West

Collectively the costs of subsidizing research in the new states have put a severe strain on science funding in the old states. The 1992 research budget was increased by barely over 10%, taking special appropriations for the East into account. This represented a much smaller increase, proportionally, than the budget as a whole, and it was not nearly big enough to cover the extra costs of reunification without cutting into funds for existing programs.

Within the DM9.5 billion research budget, about DM1.6 billion is ear-

marked for science in the new states: DM300 million to move former academy researchers into university positions, DM169 million for the new Max Planck and Fraunhofer institutes, DM416 million for the blue-list institutes and DM650 million for responsive funding of grant applications.

The *Deutsche Forschungsgemeinschaft*, Germany's close counterpart to the US National Science Foundation, already boasted in its 1990 annual report that 19% of its research applications were from scientists in the new states and that the approval rate was rapidly approaching that for the old states. Erich Kirste, who has been responsible for physics at DFG for several decades (though he says his responsibilities have narrowed some with the expansion of the field and of DFG), says that 20–25% of the applications now come from the East, and 45% are approved.

"Yes," Kirste says, "you really can hold the East German applications to the same standards used for the West." He says that research in the new states is especially strong, for example, in astrophysics and in II–VI semiconductors. While this research was not broadly known in the West, he said, if one had talked, say, to specialists in II–VI semiconductors at Erlangen or Regensburg, they would have known about the work done in the East.

Kirste said DFG was quick to establish a special budget for the new states: It was about DM100 million this year and might be twice as large next. Even so, the burden of supporting the East has put additional pressure on the budget for small grants, which has grown progressively tighter over several decades. Kirste said DFG's real resources are half what they were during the late 1950s and early 1960s, when the approval rate for applications was about 90%, even though the university system doubled in size since then. From 1978 to 1989, given an index scale in which 1988 is 100, applications went to over 150, while grants went to barely 105.

Ramifications

One consequence of the financial situation is that big projects of every kind are coming under closer scrutiny. Space science, which consumes over 20% of the research budget, is especially controversial. Mayer-Kuckuk noted that the German Physical Society recently adopted a policy statement saying that large manned space projects could not be justified on the basis of science alone.

Probably it would be a mistake to assume that Germany will back off

from any truly challenging commitment merely because of money problems. In addition to their organizational genius, the leaders of the Federal Republic have shown themselves to be masters during the postwar period at successfully pursuing overriding objectives within strict fiscal limits. One manifestation of that talent is the way the matter of Bonn—that is to say the capital's move to Berlin—is being handled.

Parliament still is scheduled at this writing to take up residence in Berlin by the end of 1995. Yet major

buildings, including a new national history museum, continue under construction in Bonn, and the residential housing market appears to be wholly unaffected by the prospect of a mass departure. Apparently, there will be no mass departure. Along with much of the rest of the government, most of the science policy establishment is supposed to stay in Bonn, well beyond 1995, and there is talk of making the city a center for international scientific and cooperative European programs.

—WILLIAM SWEET

BEIJING MEETING REMAINS ON TRACK—AMID CONTINUED CONCERN

A conference on semiconductor physics scheduled for this August in Beijing, sponsored by the International Union of Pure and Applied Physics, has been the subject of concern and controversy among human rights groups, including The American Physical Society's committee on the international freedom of scientists. The decision to hold the conference in the People's Republic was finalized by IUPAP only months after the Tiananmen Square crackdown and prompted sharp expressions of dissent from some solid-state physicists and semiconductor scientists who traditionally have attended the conference. A letter in November 1990 to conference organizers from the PRC's director general of overseas students, in which he said that Chinese studying or working abroad would be welcome *provided* they broke from organizations opposing the PRC government, heightened concern and raised the question of whether IUPAP rules requiring completely open access to IUPAP-sponsored conferences were being violated (PHYSICS TODAY, December 1991).

As a result, IUPAP, its semiconductor commission and CIFS resolved last year to monitor the conference closely.

In the meantime assurances have been received by APS, CIFS and IUPAP that seem to have persuaded many concerned critics of the conference that participation in the conference by overseas Chinese probably is safe. For example, PHYSICS TODAY recently published a letter from Xie Xide, an eminent solid-state physicist in the PRC who is serving as chair of the semiconductor conference, in which she said that IUPAP policies would be fully honored (March, page 100).

The letter from Xie Xide left some

CIFS members somewhat dissatisfied because it failed, contrary to hopes and expectations, to specify what the assurance was based on, and because explicit assurances still were not included in the conference circular, contrary to promises. But in a meeting Xie had with CIFS and APS officers during the March APS meeting in Indianapolis, she provided a more specific assurance, which was conveyed to PHYSICS TODAY in the following words: "As a follow-up to my letter, I want to state that I have received assurances from the chairman of the State Education Commission, Li Tiejing, that all overseas Chinese scientists, including students, attending the semiconductor conference may enter and exit freely in accordance with ICSU and IUPAP principles." In addition to being the boss of the person who wrote the letter that aroused wide concern initially, Li is also a member of the State Council, a cabinet-level body of the executive branch of the Chinese government.

The communications from Xie have not altogether eliminated doubts about whether participation in conferences in the PRC is warranted at all under present circumstances. Indeed, a petition circulating with CIFS sponsorship at the March and April APS meetings drew attention to the fact that there still are scientists in PRC prisons, even though all they are accused of is nonviolent expression of political belief.

In February Britain's *Physics World* published a news report and an opinion piece in which sharp opposition to participation in the Beijing conference was expressed. An author of the opinion piece told PHYSICS TODAY that it was his hope that participation in the conference, nor-