Germany Puts Money on Peer Review

As German research suffers another year of stagnant funding, the research ministry adds an element of competition to keep its researchers on their toes

BERLIN—A subtle but profound change is taking place in German science. For as long as most working scientists here can remember, Germany's bustling economy produced enough tax revenues that few scientists in federally funded research centers or in academia had to worry about their next funding check, which came in the form of a block grant to their institution. "People have been fed well; there's never been a need to justify what they are doing," says neurobiologist Helmut Kettenmann of the Max Delbrück Center for Molecular Medicine (MDC) in east Berlin, one of 16 national research centers. The economic squeeze brought on by reunification—followed by strict spending guidelines required to qualify for Europe's common currency in 1999—have reduced the comfort level in recent years, however. Now, Jürgen Rüttgers, Germany's research and education minister, is about to reduce it further by injecting some competition into the system.

MANFRED SCHULZE-ALEX

Collision course? New competition could squeeze DESY's Next Linear Collider test-bed.

Starting in 1998, $90 million—about 5% of the national research centers' $1.8 billion budget—will be pooled in a new "Strategy Fund" for peer-reviewed research. Rather than doling out funds to each center to spend on research of its own choosing, the federal government is forcing center scientists to team up with colleagues in academia and elsewhere to compete for the sequestered 5%. The national labs are not the only ones to feel the chill wind of competition. The Blue List institutes—a hodgepodge of 83 specialist research labs that receive equal shares of federal and state funding—will see 2.5% of their 1998 budgets diverted to Germany's main granting agency, the DFG, which will award the funds to peer-reviewed projects. And a handful of universities are for the first time having their basic budgets subjected to peer review.

The reason for the changes is a need to

Public Acceptance Fuels Biotech Boom

Biotech backer. Minister Jürgen Rüttgers.

MUNICH—The view through the bulletproof glass shielding the director's office at the Genzentrum, a major molecular biology lab run by the University of Munich in Germany, looks much rosier now than it did a decade ago. In the late 1980s, many Germans were so vehemently opposed to genetics and biotechnology that university officials feared someone might take a potshot at Genzentrum director Ernst-Ludwig Winnacker. Adverse public opinion also led many German drug firms and agricultural biotech companies to carry out their research abroad. Today, however, the Genzentrum's thick glass is a vestige of a bygone era. "The mood has changed dramatically," Winnacker says. And that is translating into a biotech boom. "We wouldn't be here without that change of mindset," says Timm-H. Jessen, head of biotechnology in Germany for Hoechst Marion Roussel (HMR), the drug division of the chemical giant Hoechst.

The German public's acceptance of medical biotechnology is now so widespread that unveiling a new biotech center merits a visit from the science minister, not the glazer. Last week, Minister Jürgen Rüttgers joined Winnacker and local officials here to open HMR's Center for Applied Genomic Research. In an era of belt tightening across German science (see main text), biotech is one area that is blossoming. The science ministry estimates that the number of new biotech firms in Germany has doubled over the past 2 years, from 75 to 150. "Every day you see a company setting up a new production or research facility," says Max Planck Society President Hubert Markl.

Part of the credit for the boom belongs with Rüttgers: One of his pet projects was a "BioRegio" competition last year to fund collaborations between industry, academia, and government labs. The three winning regions—in the Munich area, Rhineland, and Rhine-Neckar—each will receive $30 million over 5 years. But even the 14 regions that missed out have benefited from the competition, says Joachim Treusch, director of the Jülich Research Center: "The idea of a competition has made people cooperate." In addition, the ministry has requested $140 million in 1998 to fund peer-reviewed projects in biotech and molecular medicine.

But perhaps the biggest factor fueling biotech's rapid ascent is an ample supply of private cash. "There was nothing" just 5 years ago, says Winnacker. Now "it's a gold-rush atmosphere." Analysts estimate that there is roughly $500 million available to finance German biotech ventures—a staggering figure considering Germany's tradition of fiscal conservatism. "The whole concept of high-risk money is not part of the culture," says HMR Vice President Norbert Riedel, adding, "there's probably more money in venture funds than can be spent wisely." The money glut is particularly visible in the Munich area, home to about 25 biotech start-ups born in the past few years. Germany's "highest density of expertise, we think, is in Munich," says Jessen.

One potential obstacle to German biotech's meteoric rise is academia's antiquated view of intellectual property. "The filing of patents is not lodged in the heads of scientists," says Peter Heinrich, chief executive officer of MediGene, a Munich–based firm developing cancer vaccines and drugs for heart disease. And German universities generally do not have technology-transfer offices to cover the cost of patent filings, which run to about $6000 each in Germany.

In spite of this newfound interest, analysts estimate that Germany's biotech industry lags about 5 years behind that in the United Kingdom and 10 years behind that in the United States. But German researchers insist there are advantages in joining the game late. Says Riedel, "We can learn a lot about the mistakes that have been made." –R.S.

make German science leaner and more efficient. There is a growing sense that a lack of competition has left many institutes ill-equipped to cope with tightening budgets. "There's always criticism that institutions get old and unresponsive," says Ernst-Ludwig Winnacker, who will head the DFG for 3 years starting in January.

The next few years will certainly test their ability to adapt. The Ministry of Education and Science's proposed $8.8 billion 1998 budget, expected to be approved by parliament late next month, is only 1% larger than the 1997 budget—a boost that is unlikely to keep pace with inflation. The budget will hold level Germany's contributions to five international labs—including the CERN particle physics center—that suffered deep cuts in 1997 (*Science*, 6 December 1996, p. 1606). And the DFG and the Max Planck Society (MPG), which have regularly won healthy budget increases in recent years, have found their promised 5% boost in 1998 trimmed to 3.9%. The reduction, MPG President Hubert Markl told *Science*, will force the society to delay the creation of an ethnology institute in east Germany. (MPG is still pushing ahead with plans for a new center on evolutionary anthropology in the east German city of Leipzig—see story at right.)

The small shift in funds to peer-reviewed grants has already had a big effect on scientists' attitudes. "By using these competition mechanisms," Markl says, Rüttgers "has produced a psychological change which is larger than what you can read from the budget." Markl and others warn, however, that the new emphasis on peer review won't ameliorate growing concerns over R&D spending by the government and industry, which in recent years has grown slower than inflation; these concerns were laid out in an open letter signed by Markl and four other top science administrators last January (*Science*, 24 January, p. 475). The decline, contends MDC director Detlev Ganten, "is a catastrophe for the country." Rüttgers told *Science* that the downward trend "has been stopped."

Perhaps the boldest initiative Rüttgers is backing in the 1998 budget is the introduction of competition to the national research centers, collectively known as the Helmholtz Association. The Strategy Fund, which will be spent entirely on collaborations with non-center scientists, has provoked a flurry of networking between institutes and disciplines: "activities never seen before in that direction," says Joachim Treusch, director of the Jülich Research Center and outgoing head of the Helmholtz Association. "It's really changing the culture."

The Helmholtz Association's senate, which will administer the competition, has already received proposals requesting about twice the money available. It will announce the winners

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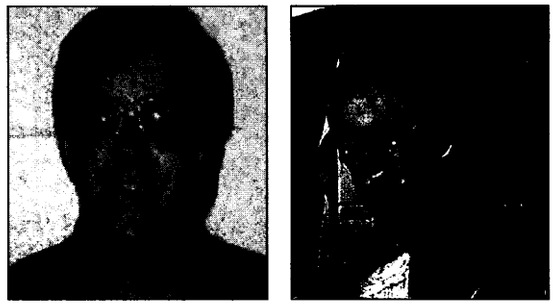
ANTHROPOLOGY

All-Star Cast for New Max Planck Institute

With Germany mired in a post-reunification economic slump, and researchers across the country feeling the budget squeeze, the last thing you might expect is a big, bold new science undertaking. But last month, the Max Planck Society (MPG) signed up four star scientists from the United States and Europe to found a center in the eastern city of Leipzig—an institute that looks poised to become a powerhouse of interdisciplinary research on evolution in humans and our closest primate relatives.

The hallmark of the center, called the Max Planck Institute for Evolutionary Anthropology, is a mixture of fields that seems unusual at first glance, but which all four department heads hired so far told *Science* was a strong enticement to move there. "It will be a unique environment for getting at human diversity through the different perspectives of language, social development, genetics, and primatology," says one, linguist Bernard Comrie of the University of Southern California in Los Angeles. And bringing together research on humans and the four great ape species provides "a rare opportunity" to compare them directly, says another recruit, psychologist Michael Tomasello of Emory University and the Yerkes Regional Primate Research Center in Atlanta. The other two signed up so far are molecular geneticist Svante Pääbo of the University of Munich in Germany, and primatologist Christophe Boesch from the University of Basel in Switzerland.



J. OBERHEID/ARGUM

Leipzig bound. Hires for the new Max Planck Institute include molecular geneticist Svante Pääbo *(right)* and, probably, molecular anthropologist Mark Stoneking.

As word of the new center spreads, outside reactions are enthusiastic. "I'm excited," says evolutionary biologist Daniel Povinelli of the New Iberia Research Center, part of the University of Southwestern Louisiana, who participated in an early planning meeting. "The concept is excellent ... and [the comparative approach] long overdue. It's a wonderful opportunity to help move the whole field forward."

A major lure for the new hires is the sumptuous conditions offered by the MPG, which funds 78 research centers (*Science*, 27 October 1995, p. 568) and was spared harsh post-reunification funding cuts so it could build new institutes in the east—although this meant trimming centers in the west and even closing a few. The Leipzig institute will have a staff of 250 to 300, including those on outside money, and an annual budget of $14.1 million. And, following MPG tradition, this generous support is virtually guaranteed for life, freeing researchers from grant writing and enabling them to tackle long, difficult projects, which otherwise can be hard to fund. "I look at it as a 17-year grant," says Tomasello, counting the years until retirement, and one which is a "significant increase" over his present funding.

He is also jubilant about the "gorgeous" outdoor and experimental facilities to be set up for chimps, bonobos, orangutans, and gorillas at the Leipzig Zoo, which he says are "simply not duplicable in the U.S., period." Not only will the facilities boost his work on the development of cognition in apes and humans, he says, but they will enable him and Boesch to collaborate in comparing the behavior of wild primates with those in captivity—a crucial issue in the field.

The apes and the mixture of disciplines were also big attractions for Pääbo, who is best known for his work on ancient DNA, and especially for the recent stunning analysis of DNA from a Neandertal bone (*Science*, 11 July, p. 176). Pääbo is eager to compare the different ape genomes with the human one and to pinpoint the roughly 2% that differs between them—a small difference with obviously profound effects, he says. He will also continue work on the coevolution of genes and language in living human populations, together with Comrie and molecular anthropologist Mark Stoneking of Pennsylvania State University in University Park, who is also likely to move to Leipzig. And there is increasingly common ground with primatologist Boesch, a pioneer in using genetics to answer questions about the reproductive strategies and behavior of apes in the wild.

With these top positions filled and only an anthropology department head still being negotiated, the institute will now gradually start taking shape. Boesch will arrive first, moving into temporary space in early 1998, with the others following him over the next year while a permanent home is built. "People often speak about interdisciplinary research, but it's very hard to do," says Boesch. "Hopefully ... the new [Max Planck Institute will] be an example."

–Patricia Kahn

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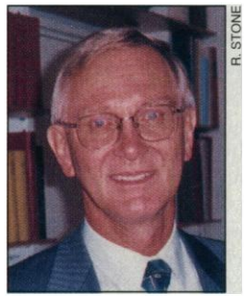
in mid-January. The worry for some labs is that they will not come up with enough sexy proposals to recoup their 5% contribution to the fund. One center—DESY, Germany's particle physics lab in Hamburg—has even asked to be exempted from the Strategy Fund until 2002. DESY's problem is that nearly all its budget is committed years into the future to operate its large international projects, such as the HERA electron-proton collider. If DESY fails to win an exemption, says director Bjørn Wiik, it would have to shut down HERA and other projects for 3 or 4 months per year.



R. STONE

Big psychological change. MPG President Hubert Markl.

Also new to peer review is a group of 10 universities, including Cologne, Leipzig, and Ulm, which are participating in a pilot program to have panels of outside scientists vet science spending in the portion of their budgets funded by state government. In the past, these universities would negotiate their budgets directly with local officials. "It was clear they would get it every year," says MDC's Kettenmann, who serves on a panel reviewing the University of Leipzig. Now, he says, "we have the possibility for the very first time to peer review part of the basic budget of a university."

Another, longer term policy shift—coming from the institutes themselves—is to give lab directors more control over how to spend their funds. Currently, the government spells out for each institute how much of its budget it can devote to different types of expenditures, from construction of new facilities to personnel—down to every last position. Markl and other science leaders are now negotiating with officials in the research and finance ministries over changes in the 1999 budget that should give more decision-making to the labs. "We will be freer to move around our resources ... to say, 'Let's not buy this machine, but employ new people,' " says Markl.

And some new hiring is sorely needed, because the federal government has enforced a 2% reduction in federally funded staff in all its institutes over the past several years that has crippled efforts to employ new researchers. "In my 5 years here, I've been given one permanent position" for a new staff scientist, says Hans Specht, director of the Institute for Heavy Ion Research (GSI) in Darmstadt. Adds Treusch, "There's a danger of petrification because there's little chance to engage young people." The national labs' Strategy Fund should help here too, as grant winners will be able to offer scientists temporary jobs.

Thus far, researchers have not protested too vigorously against the government's reforms. "Many people are not yet sufficiently feeling the crisis," MDC's Ganten says. But a more painful triage may be in store in future years if the economic situation does not improve. "We have to have the courage to close things that aren't competitive," says Wiik. "Bad science is worse than no science," he says.

–Richard Stone

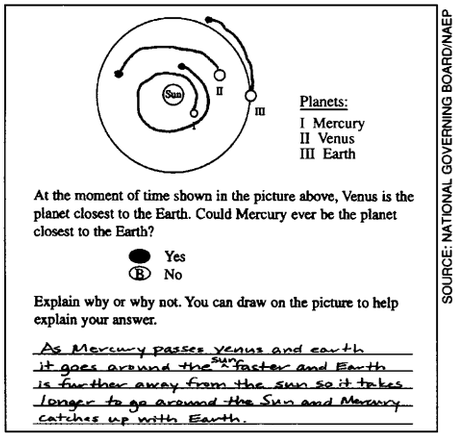
SCIENCE EDUCATION

Students Don't Measure Up to Standards

A new test designed to assess U.S. schoolchildren's understanding of science, rather than just their knowledge, has produced disappointing news: Fewer than 30% of those who took the test demonstrated the basic competence expected of students in their grade. But science education leaders say the exam is a step in the right direction, and it may help guide classroom teachers toward more effective science teaching.

The test was part of the National Assessment of Educational Progress (NAEP), which gauges student progress in several subject areas, including reading, mathematics, and geography. This year's science test is a far cry from the multiple-choice exams most U.S. schoolchildren are used to. Students spent 80% of the 90-minute science test answering open-ended questions and performing and analyzing experiments. Fourth graders, for example, were asked to describe differences and similarities in the life cycles of grasshoppers and butterflies. Eighth graders had to estimate the salt concentration in a water sample by comparing the height of a pencil floating in distilled water, a 25% salt solution, and the unknown sample. And 12th graders were challenged to describe a test—other than tasting or smelling—that could distinguish between samples of ocean water and fresh water. Students were rated against a fixed set of standards instead of the "national norm"—the overall average performance.

The results, analyzed in a report* by the independent National Assessment Governing Board, which sets policy for NAEP, paint a bleak picture. More than 70% of the 130,000 students tested—a representative sample from each state—failed to reach the "proficient" level in science, defined as "competency in challenging subject matter," and nearly a quarter failed to achieve the "partial mastery" of the basic level. Only 3% reached the advanced level, which indicates "superior performance" beyond the expected grade level.



SOURCE: NATIONAL GOVERNING BOARD/NAEP

Right answer. Only 20% of eighth graders got full credit for a complete explanation.

"The test will send an extremely strong message to schools" that in-depth understanding of science is important, says Audrey Champagne, a professor of chemistry and education at the State University of New York, Albany, and one of the authors of the report. She says the test measures whether students are meeting standards proposed by national organizations, including the American Association for the Advancement of Science (AAAS), which publishes *Science*, and the National Research Council—standards that by most accounts have reached few classrooms. George Nelson, associate director of AAAS's Project 2061, a science education reform effort, agrees. "The NAEP test was really built to probe the kind of learning we're talking about on the standards," he says, and the results suggest "that change is necessary."

The lackluster performance seems to conflict with the much-touted results of the Third International Mathematics and Science Study (TIMSS)—an international exam on which U.S. fourth graders were bettered only by Korea, and eighth graders were above the international average (*Science*, 22 November 1996, p. 1296; and 13 June, p. 1642). But Martin Orland of the Department of Education's National Center for Education Statistics says, "TIMSS shows that the U.S. is slightly above the international average, while the NAEP data say that there is a large proportion of students who don't achieve the levels we'd like to see."

But those levels are not out of reach, Champagne insists. The test "provides a very realistic goal for science education in the U.S.," she says. "We could do a lot worse than teaching to this test."

–Gretchen Vogel

* The full text of the report is at www.nagb.org/scirpt97.pdf.