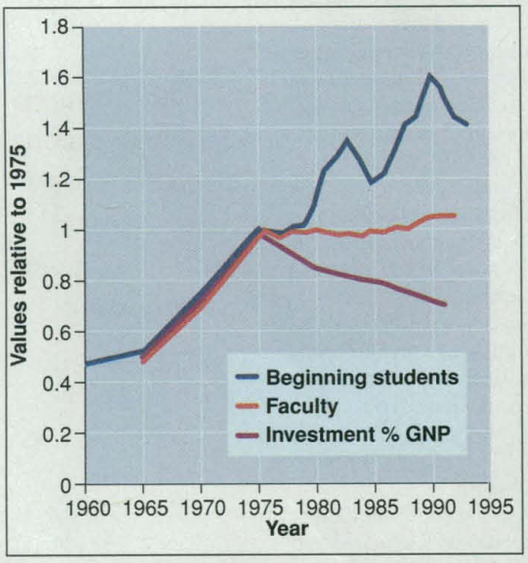
GERMANY

An Egalitarian System Straining At the Seams

For most of his career, Humboldt University biologist Günter Tembrock struggled against the East German regime that persecuted him relentlessly for disputing the state-supported Lysenkoist dogma. Now basking in his new-found freedom, 77-year-old Tembrock—an ex-student of Konrad Lorenz and a pioneer in animal communication—is an indefatigable activist. His cause: helping the university rebuild its rundown sciences and cope with the chaotic, crowded, and overspecialized education system imported from western Germany.

Tembrock and like-minded reformers of the country's ailing universities have their work cut out for them. "It's incredibly hard to change anything," Tembrock says. Federal and state laws still tightly regulate education, leaving universities little freedom to tackle problems their own way or build on their strengths. What's more, the laws are based on "the ideal ... that all universities are equal," says Hans-Joachim Meyer, science minister of the state of Saxony and one of the country's most vocal advocates for change. "Of course this is nonsense," he adds—but it has led to a system that shuns the notion of "elite" institutions and strives to standardize what universities offer and how they are treated.

Stultifying rules and regulations are not the only barriers to reform. Funding for universities has stagnated over the past 20 years, while the number of students has increased dramatically, resulting in severe overcrowding in many fields of study and placing huge burdens on resources (see below). What's more, as in the United States, teaching ability takes a back seat to research prowess in hiring and promoting faculty—so professors often give their teaching duties low priority. And few faculty have rallied to the cause of reform: As budgets are slashed, many people simply battle to protect their turf, says Ulrich Steinmüller, vice president at the Technical University of Berlin. "Everyone is fighting for their own chair ... and choking on administration," says Tembrock.



More with less. Compared to 1975 figures, Germany's student population has ballooned, but funding and the number of faculty members have not kept pace.

Baptism of fire. The situation creates great confusion for students, especially beginners trying to figure out what courses to take, resolve chaotic scheduling, and manage the often-tricky business of getting a place in seminars or lab courses. "It took me years to get the hang of things," says a fourth-year chemistry student. "If I had one wish, it would be for a clear, simple structure."

Most majors start with several years of required courses that are often crowded, anonymous, and fail to give a general picture. "Every prof teaches his own thing," says one engineering student. "There's no integrated view at all." Some professors agree: With science moving so fast, says Reto Weiler, a neurobiologist at the University of Oldenburg, "we pack up all the new things on top of the old. It is becoming more and more unteachable."

Support systems are also meager, and many students who spoke with *Science* described the early years as lonely and difficult. Faculty members often take the view that, while overcrowding is unpleasant, in the end "cream rises to the top," says one. "Professors ... could be there in a moment of weakness and frustration, but they are not," says a physics student.

It is even getting harder for students to rely on each other. For Jürgen Ritterhoff, a graduate student in ecology at the University of Oldenburg, study groups were an important part of his early university years, providing a forum to raise questions and problems. Now their popularity is waning, as the overcrowding and more competitive atmosphere foster a "lone fighter" mentality, he says. "Students are less and less able to work together"—a deficit that not only robs them of support but will make later professional life difficult, he says.

Slowly, universities are realizing that "we have to support students much more intensively," says Raban von der Malsburg, head of academic advising at the University of Heidelberg. The university's data show that closer guidance and a highly structured major reduce dropout rates and degree times, he says—successes he hopes will coax financially desperate universities and ministries to support more tutoring, mentoring, and academic advisory programs.

One department that has taken these lessons to heart is Heidelberg's physics department—one of Germany's biggest, with 1700 undergraduates, 300 graduate students, and 40 professors. For a start, there is a crash course in math to help those who are less prepared, and tutorials led by professors rather than teaching assistants. There is also lots of group work and even an "exchange" that helps students find study partners. And it seems to work: Although it is "a very demanding major," says physicist Jörg Hüfner, one of Heidelberg's pro rectors, there are fewer dropouts than in most other fields, and students graduate on average 1 year ahead of the national rate.

For students who make it through to a Diplom (Germany's master's-level first degree) and wish to do postgraduate work, their problems are not over. Officially, there is no such thing as graduate school in Germany. Instead, students find a professor who will accept them—often the one who supervised their Diplom thesis research—and that's that: They "go into a lab, dig a deep hole, and do their thesis in solitude" with no courses or seminars, says Hans-Uwe Erichsen, president of Germany's association of university, technical, and vocational college rectors. And it shows, says Hüfner, in the "miserable, sometimes shockingly low level of knowledge" of many Ph.D. candidates outside their own field.

One solution, says Science Council Chair Karl-Heinz Hoffmann, is to expand the popular "Graduiertenkollegs," which are mini–graduate programs for selected

students in individual departments. Started in 1990, there are now about 200 Kollegs that enroll 10% of all graduate students. However, there is not enough money to keep up with the strong demand from universities.

Quality control. While there is little hope that the government will give university funding higher priority, there is growing pressure to act at the grassroots level, especially in efforts to improve teaching. One big reason is government demands for more "quality control" in universities and a shortening of undergraduate training—currently Europe's longest. "Four years ago, no one talked much about the quality of teaching," says Erichsen. "Now ... people realize that we must be accountable to the public. It's getting harder to speak out against [evaluation]. ... The avalanche can't be held back."

The very notion of evaluating teaching hits at the heart of western Germany's academic traditions. Universities generally do not have tight-knit departments with a strong sense of common responsibility for teaching—instead, professors build up their own small empires. And because good teaching barely counts for a university career, "many professors just give their lecture and leave everything else to [teaching assistants]," says Beate Meffert, professor of informatics at Humboldt University.

But the tradition of good teaching has survived in the less crowded universities of eastern Germany—a legacy of the communist era when most faculty, restricted in their research and forbidden to travel, poured their energies into teaching. "Professors here want to teach," says engineering graduate student Wolfram Drescher from the Technical University of Dresden (TUD). "It would shame me to give a bad

New University Breaks the Mold

COTTBUS—At first glance, this remote town—once nicknamed Siberia by the locals—seems an unlikely testing ground for ideas that could transform Germany's ailing universities. Located about 30 kilometers from the Polish border, the region is struggling to recover from the collapse of its industry following German reunification and the huge environmental problems left behind by decades of coal mining that supplied most of East Germany's energy. But since 1991 Cottbus has been home to a new university of science and technology that may well be the country's most ambitious experiment in higher education.

It began as the brainchild of Günter Spur, an engineering professor at the Technical University of Berlin and head of the neighboring Fraunhofer Institute for the design of automated manufacturing systems. When the new eastern state of Brandenburg asked him to help turn a small technical college into its first university, Spur agreed—provided he could "make a fresh start, not just continue all the old mistakes," he says. The new university should emphasize small group teaching, close student-faculty contacts, and an interdisciplinary education that produces problem-solvers for careers in the "real world" rather than pure academicians. The Brandenburg government went along, convinced by Spur's vision and his argument that higher staff costs would be compensated for by students finishing their degrees faster.

> **The Technical University of Cottbus is an attempt "to make a fresh start, not just continue all the old mistakes."**
>
> **Gunter Spur**

Next came the recruitment of faculty, a potentially difficult task given Cottbus's remote location and unfavorable environment. So far, 90 of 130 professor slots have been filled, along with some 400 junior faculty positions, largely by scientists drawn to the chance of making a fresh start. For example, Georg Bader, a self-described "practically oriented mathematician" from Heidelberg University, was eager to "leave the ivory tower ... [and] join math with technology."

Now, 5½ years after the new university officially opened, the key tasks are to attract excellent students and prove that the university's educational approach works. That is why faculty members from different departments spend a lot of time trying to coordinate curricula and fine-tune courses to the needs of each major, says physicist and Rector-elect Ernst Sigmund. "This is an absolute must here," but is exceptional at other universities, he says. New majors not offered elsewhere in Germany should also be a strong magnet; the first one—environmental engineering—is already very popular and draws more than half its students from western Germany, a proportion believed to be higher than at any other eastern university.

Cottbus's students get a few more extras. One is a heavy dose of training in communication skills through work in small groups. "It's crucial to understand the language of different fields, the way people think ... to be able to justify to others what you're doing," says computer scientist Bernhard Thalheim. Other courses help students develop international and intercultural awareness.

And instead of cookbook-style lab classes, students can get involved in practically oriented projects and problems of the local region—such as coping with the disastrous legacy of the world's largest area of contiguous open coal mines. The university's new environmental research center will play a key role, with projects to study the effects of mining on soil, water, and forests, and to develop concepts for recultivating the region, says Director Reinhard Hüttl.

This novel university has plenty of start-up problems, however. New labs and lecture halls are sorely needed, and, although there is money to build them, progress is painfully slow. Experiments get interrupted by unannounced shutdowns of electricity or water, or vibrations from construction machines. Curricula still need work, and there is not yet enough local industry to provide students with research opportunities—although this will change if plans come off for a major new engineering research center with joint university and industry backing.

In the next few years, the Technical University of Cottbus will face growing pressure to show that its educational experiment works. The first test is whether Spur's promise of faster degrees for the same cost pans out; if it does, it could help other universities win better support. In the long term, success will mean finding a niche that attracts excellent students to help build up research—just the sort of profile-building that politicians and educators are starting to call for. If it can work in Siberia, it can work anywhere.

–P.K.

lecture," says TUD's Wolfgang Schwarz, who spends 8 hours each week in seminars and discussions with first-year students—after his 8 hours of lectures.

Back west, Heidelberg's Hüfner has high hopes that this attitude will grow. "Young [staff] see teaching as a more important part of their self-image," he says. And efforts like Heidelberg's 8-day seminar on pedagogy last year—a "great success" with participating young faculty—help in this process of consciousness-raising.

So the good news for students is that university departments around the country will soon be taking a hard look at their teaching. Some are already starting, eager to pre-empt state governments from taking matters in hand as they try to find out why students at some universities need 7½ years to graduate, but 4½ at others. But most universities are still unsure what the evaluation criteria should be and are starting out, while awaiting the results of working groups that are proposing guidelines for future assessments.

WALTRAUD HARRE

"I keep asking, isn't there something else I can try?"
—Günter Tembrock

Models for reform. Whether evaluations will actually make a difference depends a lot on whether the results are taken seriously or languish in a drawer. That is why many eyes are turned to four biology departments in northern Germany that served as the nation's guinea pigs last year when they carried out a self-evaluation, then an external review. At the University of Oldenburg, recommendations included streamlining and integrating curricula, changing exam rules, and drawing advanced students more into problems and projects—for example, in ecology and coastal research, which are departmental strengths.

Biology Dean Peter Janiesch now hopes to make changes quickly, but it remains to be seen if he will succeed. "We want to show that universities can take charge of their own evaluation," he says, and can act on the results, even without government pressure or official sanctions.

But many think change will come only when good work is linked to more resources and vice versa—a notion still "grossly against federal law," says Saxony's Minister Meyer. There is a bit of leeway, however, which a few states are exploiting to the limit, such as allowing discretionary funds to be given out based on a department's teaching record.

Beyond this, reforming universities and preparing them for autonomy means revamping how decisions are made and who makes them. It is a controversial topic that even ended up in court last year when professors in one state challenged a new law which reduced the role of university committees in decision-making and strengthened deans and rectors, who now have little power. Part of the problem also rests with overblown, slow-moving university administrations and the straitjacket of government approval even for small decisions like changing exam rules, which now takes years.

Perhaps most of all, the prospects for change depend on people who do not give up—people such as Humboldt's Tembrock. Described by colleagues as a brilliant teacher, Tembrock supervises 12 research students and focuses his teaching strongly on the big picture—for example, in his lectures on human biology to standing-room-only general audiences. Despite the daunting obstacles to change, "I will not become resigned," he says. "I keep asking, isn't there something else I can try? I call into the forest, and sometimes an echo really comes back."

–Patricia Kahn

FRANCE

An Elite System Struggles With Mass Education

When biologists Michel and Nicole Sicard moved from Paris to the University of Toulouse in 1966, this venerable institution (founded in 1229) did not offer a single course in genetics. "Genetics was only taught in Paris," Michel Sicard recalls. So the pair set up courses in genetics and microbiology—another subject not taught at Toulouse in those days—and they established a biology laboratory that is now part of a major research and training institute. Today, the university's sprawling science and medical campus—called by the separate name of Paul Sabatier University—is in the top ranks of France's 14 universities specializing in the sciences.

But Paul Sabatier's success has not shielded it from the acute problems afflicting campuses throughout France. The transformation in Toulouse has taken place during a period of explosive growth for French universities. The number of students at both undergraduate and graduate levels almost doubled between 1980 and 1995, reaching more than 1.5 million. And, as science is a popular subject and students are almost completely free to choose their fields of study, the number of science students has easily kept pace. At Paul Sabatier, for example, the number of basic science students increased from about 7900 to almost 18,000 over the same period. Increases in government funding, particularly for lab equipment and hiring of new professors, have not kept up with the student boom, however, and that is putting intense pressure on university resources.

"It is difficult to teach effectively with such an enormous quantity of students," says Michel Sicard. To make matters worse, cuts in government research funding have resulted in a rapidly shrinking number of new positions in the universities and France's public research agencies. So science graduates face considerable trouble finding a job. Just a decade ago, says Michel Morange, professor of biology at the University of Paris's Jussieu campus, "the good students had no problems finding a place in research. Now it's not the same."

The growing crisis is forcing educators to question one of the fundamental tenets of French higher education: that universities should be open to all secondary-school graduates. This open-door policy was introduced 25 years ago, into a system of academic training that was designed not for mass education but to pick out the country's best and brightest. The traditional elite structure of universities involves a rigorous, multitiered selection process in which nearly every successfully completed year is marked with the awarding of a special diploma. The inevitable result has been a good deal of frustration among both faculty and students.

Free for all. The stresses in the system are being felt at all levels, but the problems are most acute in the first two undergraduate years, which are referred to as the first cycle. Overall, about 40% of France's first-cycle students either flunk out or drop out without receiving the diplome d'études universitaires générales, a di-