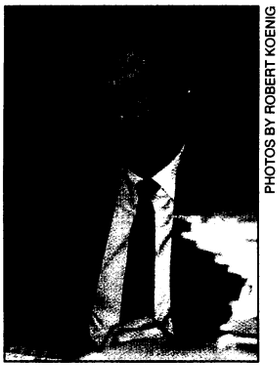
diluted the academy's power and opened the granting process to more university researchers, some educators—especially those who have to hold down a second job to make ends meet—still find it difficult to keep pace with fast-moving scientific fields and to update their curricula. Meanwhile, most departments still set nearly all the details of their students' courses of study.

These problems were spelled out in a recent report by the Paris-based Organization for Economic Cooperation and Development (OECD), which criticized the system of science education for "inbreeding," and for producing Ph.D.s who "have limited experience and have been exposed to only one way of doing things." The report, written by a panel of experts, recommended that Poland move closer to the graduate-school model of North American universities.

The OECD's call for more flexibility struck a chord among education reformers and nearly all the Polish students interviewed by *Science*. "We should make the university structures more flexible and recruit students to aggregate departments, rather than to individual faculties," says Ireneusz Bialecki, research director of Warsaw University's Center for Science Policy and Higher Education. "There is a need for fundamental changes," says Tomasz Swigut, age 23, a molecular biology undergraduate at Warsaw University. "Although it is possible to overcome the many disadvantages of that [rigid] curriculum, it takes lots of time." Says Gdansk's Podhajska: "Wherever possible, I believe Polish universities should switch to individual-style studies."

But for most of Poland's university teachers, curriculum development inevitably ranks below the struggle to make ends meet. A background report for the recent OECD study concluded that lack of money is "unquestionably the greatest problem of the Polish educational system." At leading universities, science professors routinely have to dip into research grants to cover costs of expensive laboratory classes for their students. Aleksander Koj, a biochemist who is rector of the prestigious Jagiellonian University, says science education "has been deteriorating over the past few years" because of insufficient government funding—especially for lab courses in biology, chemistry, and physics. Wlodzimierz Siwinski, rector of Warsaw University—Poland's largest—also says budget limitations pose "a major limit to the number of laboratory courses we can offer. It's a big problem."



PHOTOS BY ROBERT KOENIG

Help wanted. Andrzej Kajetan Wroblewski (*top*), former rector of Warsaw University (*above*), says that without more funds, education could move backward.

That problem is being exacerbated by swelling student rolls. At Warsaw University the number of students has nearly doubled—to about 50,000—over the past 6 years. Meanwhile, Siwinski estimates, government support declined by about 25% in real terms. This affects many staff members personally—some professors are paid less than transit workers. "Even talented young professors or scholars who stay in fields such as science often have to take second jobs outside the university," says Siwinski.

At the Warsaw University of Technology—where the number of students has also doubled, to 20,000—Rector Marek Dietrich says his faculty steers many science students toward practical applications so they can find work. "Fewer students want to teach or do basic research: They want jobs outside of the university," he says. Ewa Bartnik, a genetics professor at Warsaw University, warns that "the generation gap will soon become unbridgeable" in science unless more is done to help young scientists and students.

While some Polish educators are pessimistic, others hold out hope for curriculum reform and for increased government support. Poland's new president, reformed communist Aleksander Kwasniewski, has said he wants more emphasis on education, and the nation's Parliament voted to increase this year's education budget. The European Union's Tempus program has provided aid, and rectors at Poland's best universities—including Warsaw and Jagiellonian—are trying to strengthen Ph.D. programs, make curricula more flexible, and convince government officials to invest more in the future.

"This is the time for Poland to move forward and improve science education," says physicist Andrzej Kajetan Wroblewski, a former rector of Warsaw University. "But, without more government support, there is a danger of moving backward."

–Robert Koenig

Robert Koenig is a writer based in Berlin.

Hungary: Industry and Foundations Help Out

BUDAPEST—Sándor Zeidlas explains his decision to quit studying chemistry after 3 years this way: "I used to see a professor whom I thought was brilliant; I had tremendous respect for him. At lunch, he was drinking only milk because he couldn't afford anything else. And I thought, if I studied 10 more years, I would be at that level." Zeidlas is now studying for a master's degree in business from Budapest's ELTE University. "I don't think anyone here goes into science because they want to make good money," says Miklós S. Gáspár, who is working for a chemistry master's at ELTE University while writing for a business newspaper in the city. Gáspár himself thinks it is unlikely he will actually use his chemistry degree. The new "elite" in Hungary is not scientists and engineers, as in the communist era, but business people and lawyers.

This shift is reflected in the number of students who want to study science. Once, science programs drew 10 times as many applicants as there were available spots. Now the ratio is just 2.6 to 1, says Géza Gordos, vice rector of Budapest Technical University. "The best talents are going to business," laments Katalin R. Forray, director general of the Department of Scientific Affairs in Hungary's Ministry of Culture and Education. And this trend is causing concern in a country with a solid scientific heritage. Hungary has produced 10 Nobel Prize winners in science, as well as famous names such as Edward Teller, Eugene Wigner, and Leo Szilard, all key players in the development

of the U.S. atomic bomb

The university community is trying to reverse this trend by revamping and broadening courses. But, like their colleagues in other former Soviet-bloc countries, they are short of money. The government here is trying to convert the country rapidly into a Western-style market economy, and inevitably, part of that process involves cutting back on the once-generous university funding. So, in many cases, the reaction of Hungary's universities has been to follow the example of their students: Go to industry.

At Budapest Technical University, the country's best known and most highly regarded higher education institution, the administration recently convened an "external senate," made up of 17 chief executive officers from companies in the city and surrounding area. This panel advises the university on curriculum and the direction of science programs but does not, Gordos says, interfere with academic freedom—they just advise. "Even if CEOs don't understand science, they know the application of science, and they [want] courses that allow students to apply scientific knowledge," Gordos says. "We are moving from curiosity-driven science to market-driven science."

The aim is twofold: to make science education more relevant to Hungary's developing economy, and to prepare students for scientific research work in industry. Those jobs are more plentiful and higher paying than academic posts—an incentive to would-be scientists whose professors have had to drive cabs at night to supplement an average salary of about $200 a month. According to Gáspár, it is "definitely to the university's advantage that the private sector gets involved," because it helps financially. But he does not think the business people should gain control over the curriculum.

Corporations and foundations are, however, beginning to contribute more than just advice. Some are donating cash to the university, mainly for equipment, Gordos says, something that is "entirely new for Hungary." Other local businesses are getting actively involved in training students: sending visiting lecturers to science classes and inviting students to spend some time working in industrial research labs. A student who spends some time working in an industry lab will have a better background for postgraduate work in research, says physicist Ernö Szmola, managing director of the GE-Tungsram lighting company here. It also helps them dismiss an old communist-era mentality, he adds, where research data were not shared and therefore not used to the full. "They were used to hiding the information. Information was power," Szmola says.

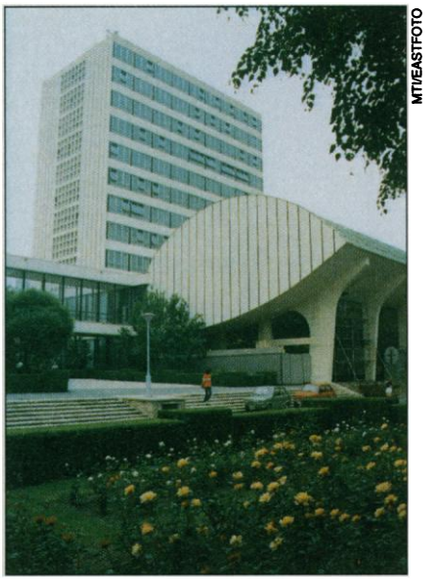
Meanwhile, across town another kind of financial support has led to the creation of an entirely independent graduate school—a first in the former communist bloc. The Central European University was founded in 1990 by George Soros, the Hungarian-born financier now living in the United States who has been a major supporter of scientists in the former Soviet Union. "Central European University has as its goal to teach things that were neglected under communism," says program assistant Sander Bremer. For the most part this means the humanities, but last year for the first time 60 students from 30 countries (chosen from 500 applicants) have begun a master's program in environmental science and policy.

Many of the students already have a master's degree, and some even have Ph.D.s, Bremer says. But after a year studying the science, law, policy, and economics of the environment, they will return to their home countries to apply a science that was ignored under Soviet rule. This new discipline is perhaps especially needed now to repair the damage done by the antiquated plants of the communist era and also keep an eye on newcomers keen to take advantage of lax environmental laws. "I saw what happened to Hungary after it was opened [to the West]. Western companies came here, and they didn't care too much about the environment," says Igor Pastirk, a Yugoslav physical chemist on the environmental science program. He plans to meld the two disciplines in his work when he returns to Belgrade, perhaps in the area of atmospheric chemistry.

With the heavy hand of communism removed from Hungary's education system and the new government maintaining a hands-off approach, educators are quietly confident that with a little help from industry and international foundations, they will keep science alive. "We are a little bit hopeful. We think there is light beginning to come up at the end of the tunnel," Gordos says. "But the tunnel seems so long."

–Susan Milligan

Susan Milligan is a writer based in Budapest.



MTI/EASTFOTO

Outside help. Budapest Technical University calls on the expertise of local business.

Czech Republic: Grad School Bridges Old Divisions

PRAGUE—This beautiful medieval city, a crossing point between western and eastern Europe, is in the midst of a renaissance. After 45 years of Soviet domination, the city of Kafka and coffeehouses is now a magnet for writers, artists, and entrepreneurs. And Prague's Charles University—one of Europe's best from the 14th to the early 16th centuries—is also undergoing a profound transformation as it struggles to regain its place in international science.

It is a colossal task that involves building up research after decades of neglect and overhauling the system of training scientists, particularly at the doctoral level. Beyond the material problems of equipment and money, this means pulling together deeply divided faculties mistrustful of coordination imposed from above. "Our current fight is to bring people together," says Jan Herget, vice dean of one of the five medical faculties at Charles and co-founder of one of its major reforms—a U.S.-style graduate program that is unique in the Czech Republic.

The former Czechoslovakia's communist leaders adopted a policy of divide and rule for science. Most research was carried out at institutes run by the Academy of Sciences, while universities were mostly pure teaching establishments. "We were expected to teach and also to prepare students ideologically," Herget says. "Divisions between faculties were very big. Many