Britain's Particle Physics and Astronomy Research Council, says the salary for HCM fellows was pegged to that for researchers in Belgium and adjusted for the local cost of living. But because of the differing status of researchers in different countries, fellows were tremendously well-paid in Britain but rather poorly paid in the Netherlands in comparison with locally paid colleagues. Differences in national tax systems also exacerbated these disparities. A new program, Training and Mobility of Researchers, which replaced HCM last year, aims to solve these problems by defining a target salary for each country that will help reduce the national differences.

Many of the problems students and researchers encounter when they move to other European countries would be eliminated if the universities developed a standard Euro-Ph.D. This notion, promoted by prominent researchers, has not yet gotten off the ground, however. University autonomy in awarding degrees is too hallowed a right to be Europeanized. Indeed, it is so deeply entrenched that graduate students at two key European laboratories—the European Molecular Biology Laboratory in Heidelberg, Germany, and the CERN particle physics center in Geneva—which have long-running graduate programs, still receive their higher degrees through a local or home university.

In the past couple of years, however, the commission has found a niche from which it can influence education without treading on national toes—quality assessment. The trend toward broadening higher education in member states such as the United Kingdom has produced a growing need for standard methods to assess quality across a broad range of institutions, says the commission's Barbara Kern. "It's a potential way of Europeanization without imposing a model," says Diana Green, a pro vice chancellor of the University of Central England who has worked on an assessment pilot project with the Committee of European Rectors. The commission has also carried out a pilot project to test methods of self-assessment and peer review of teaching quality in two subjects at 46 universities and higher education institutes throughout all 15 member countries plus Iceland and Norway, which was completed in December. The working group found that a standard methodology of assessment could work in the different countries, and an advisory group is now exploring ways of extending the work, says Jim Donaldson, who helped manage the project for the commission.

The commission is also making progress on mutual recognition of professional qualifications. A report for the European Parliament published last November recommended ways of recognizing some of the informal networks and agreements that are developing between different countries. The report's recommendations, which were supported by Parliament, can now be developed into European directives that will steer policy changes in the member states. Although the timetable depends on academic goodwill, it is a tangible sign of harmonization, says MEP Robert Evans. The union is making its mark on education, says Whitehead: "The more the EU can fund exchanges of know-how, curriculum planning, and students themselves, the better its money will be spent." Sometime early in the next century, perhaps, Ph.D.s may be able to move around Europe as freely as manufactured goods.

–Nigel Williams

CENTRAL EUROPE

After Communism: Reinventing Higher Education

For the former satellite states of the Soviet Union, educational reform is a matter of necessity, not choice. Under the communists, education enjoyed high priority, receiving generous funding and elevated status. But to reduce their political influence on students, researchers were hidden away in research institutes.

In the economic turmoil of today's Eastern Europe, the generous funding is gone, and educationalists are fighting hard to update curricula and again bring researchers and students into contact.

Poland: Teachers Struggle With Low Funds and Morale

WARSAW—After Anna J. Podhajska returned home to Gdansk University from postdoctoral studies at the University of Wisconsin a decade ago, she was struck by the contrast between Poland's rigid education system and the smorgasbord of choices available to science students in the United States. She decided to do something about it. During the years when Poland was reinventing itself after the fall of communism in 1989, Podhajska, a molecular biologist, helped establish a new biotechnology program in Gdansk that is now a magnet for students in Poland. "Because changing the old system step by step is so difficult, we decided to create something entirely new here," Podhajska says.

Instead of a restricted and inflexible science curriculum—the typical pattern in Poland—students in the Gdansk program can set individual courses of study under a flexible credit system and even study the potential business uses of biotechnology. Joanna Potrykus, an undergraduate student at Gdansk, says she would like to see other Polish universities try similar innovations to help students "broaden their scientific horizons."

Only a few universities in Poland appear to have followed Gdansk's example, however. With some exceptions—including interdisciplinary programs offered by Warsaw University and Krakow's Jagiellonian University—critics say that Poland's education system remains troubled by the sort of postcommunist inertia found in so many ex–Soviet bloc countries. Adding to the malaise is a pernicious combination of increasing student numbers and declining government support for higher education, which makes reforms doubly difficult. And some of the best and brightest students are turning away from science.

Science education in Poland is still haunted by the ghosts of the old system. Under the communists, Polish science was dominated by a powerful Academy of Sciences. The academy maintained its own institutes, which received the lion's share of research funding, leaving most universities as bit players in the research enterprise. While science reforms in Poland have now

For more on young scientists in Europe, see *Science*'s Next Wave at http://sci.aaas.org/nextwave/

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