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## How To Plug Europe's Brain Drain

Europe's best and brightest scientific minds are leaving in droves for the U.S. — and billions of euros and thousands of jobs are at stake. Here's how Europe is trying to lure them back

BY JEFF CHU

When Valerio Dorrello looks around his lab, he sees a miniature European Union. As the afternoon sun streams in, the Italian postdoctoral fellow stands at his sink, changing solutions for one of his experiments. A Spanish colleague, Virginia Amador, pours a gel between glass plates, while a German researcher named Tarig Bashir works on a computer nearby. Their primary investigator, Michele Pagano, is Italian. Two other postdocs are Italian, too, while two more are French. There's such a jumble of languages in the group, which is doing cancer research, that its members have talked about putting up a keyword chart by the telephone with basic phrases in all their languages, "so anyone can say, 'He's not here' in Italian if my mom calls," says Dorrello, punctuating his Neapolitan-accented staccato with laughs. "We're going to make it with flags and everything."

What's not so funny for European policymakers is that this lab isn't in Brussels or Paris or any other E.U. capital. It's at the New York University (N.Y.U.) School of Medicine. All over the U.S., such research facilities are teeming with bright, young Europeans, lured by America's generous funding, better facilities and meritocratic culture. "In Italy," says Dorrello, "I'd be earning maybe €900 a month." At N.Y.U., he gets nearly three times that. "The U.S. is a place where you can do very good science, and if you're a scientist, you try to go to the best place," says Pagano, who likens researcher migration to football transfers. "In soccer, if you're great, another team can buy you." Science is the same, and the big buyer is the U.S.: in 2000, the U.S. spent €287 billion on research and development, €121 billion more than the E.U. No wonder the U.S. has 78% more high-tech patents per capita than Europe, which is especially weak in the IT and biotech sectors.

Three years ago, E.U. leaders vowed to make the union "the most competitive and dynamic knowledge-based economy in the world" by 2010. But one of the most worrying signs of their failure is the continued drain of Europe's best and brightest scientific brains, who finish their degrees and pursue careers in the U.S. Some 400,000 European science and technology graduates now live in the U.S. and thousands more leave each year. A survey released in November by the European Commission found that only 13% of European science professionals working abroad currently intend to return home.

**I love my country.  
my dream is to have  
the lab from New  
York—with the  
American  
organization and  
technology—in  
Naples**

— VALERIO DORRELLO,  
postdoctoral fellow, New  
York University

The flight of European scientists to the U.S. is nothing new, of course. Political and religious persecution drove luminaries like Albert Einstein and Enrico Fermi across the Atlantic. The exodus continued in the 1950s and 1960s, as the U.S. poured billions into defense-related research and created magnetic clusters of scientific excellence, staffing them with the world's best minds and prompting Britain's Royal Society to coin the term brain drain. America's investments laid the foundation for the tech booms

of the 1980s and 1990s, which drew yet more entrepreneurial Europeans westward. Europe's bureaucracies, rigid hierarchies and frustrating scientific fragmentation also pushed people away — as they still do to this day. "Europe is a mess," thunders Christopher Evans, a biotechnology professor at four British universities and chairman of the venture-capital firm Merlin Biosciences, "a haze of overregulated and overcomplicated bureaucracies smothering the rare flames of true entrepreneurial brilliance."

Is it really so bad? Europe does have world-class research centers, such as the European Organization for Nuclear Research (CERN) in Geneva, where the World Wide Web was invented, and the Heidelberg-based European Molecular Biology Laboratory (EMBL), where 1995 Nobel laureates Eric Wieschaus and Christiane Nüsslein-Volhard did their fruit-fly genome research. But complaints like those of Claude Allègre, the former French Education Minister who heads the Paris VII geochemical lab, are all too common. He decries France's anachronistic "Soviet" system, in which control is centralized and researchers must run a bureaucratic obstacle course, whether to buy expensive equipment or order basic office supplies. "I'm planning on moving to the U.S. indefinitely because I want to continue my research," says Allègre. "I can't do so in the current conditions."

Brain drain isn't a purely academic problem. Billions of euros and tens of thousands of jobs are at stake, because science drives economic growth in the IT, biotech and pharmaceutical sectors. Europe can't afford to fall further behind. "Growth in the future will come from industries that are science-based," says analyst Andrew Wyckoff, of the Organization for Economic Cooperation and Development. Europe "needs scientists to irrigate them."

That message is getting through to Europe's politicians, including policymakers at both the national and E.U. levels. Amid the chronic complaints about bureaucracy and lack of resources, there are signs of progress. In some institutions, public and private, Europeans are stealing a page from the American playbook, offering researchers better funding, better facilities, better support for entrepreneurship and competition, and an overall better environment for world-class science. No single European country has the brain power or the financial clout to challenge America's scientific preeminence, so the E.U. is trying to develop a European Research Area — a "common market" for science — building networks, pooling strengths and raising standards regionwide. As German Chancellor Gerhard Schröder noted last week when he presented his government's priorities for 2004, "Only if we manage to keep our innovation at the top will we be able to reach a level of prosperity that will allow us to keep our welfare system in today's changing conditions." To make that vision a reality across the region, Europe will have to add 700,000 new researchers by 2010 and lure back the Continent's scientific expats. Here are the problems — and potential solutions.

#### **FOLLOW THE MONEY**

In the spring of 2002, after three productive years of research at the pharmaceutical giant Eli Lilly in the U.S. state of Indiana, Matthias Tschöp went home. Leaving the country he calls "a paradise" for scientists was hard, says Tschöp, who studies hunger-related hormones. "I thought about staying, but I'm German. That's where I belong and where I should contribute."

He landed at the German Institute of Human Nutrition (DIfE) in Potsdam, and the shock set in. As at many German institutions, his colleagues were top-notch, but there was little money, and bureaucracy had a stranglehold on what resources were available. Though he quickly helped to win an €11.7 million E.U. grant for obesity research in collaboration with more than two dozen other institutions, it wasn't enough to overcome his disillusionment. "You had to file a four-page application to get a used computer, only to be rejected because of a mistake in paragraph 342," he says. "I could not deal with all that." He kept a visiting professorship at the DIfE and a role in the obesity project, but headed back to America, where he's now an associate professor in the University of Cincinnati's psychiatry department. He still laughs when he thinks of the \$750,000 he got for his new lab, staff and travel at Cincinnati. In Germany, he says, "I couldn't even get a start-up grant."

European research Commissioner Philippe Busquin points to an E.U. funding program called the Sixth Framework, which is backing Tschöp's obesity work, as proof that the money is there for good research. But he

concedes that the priorities of politicians are another matter. "It's easier during an election year to build an extra kilometer of highway than it is to build a new lab," he says. "Americans have made better long-term strategic choices."

"Money is the real point," agrees CERN director Luciano Maiani. "Europe has been weaker because we have not invested enough." Only Finland and Sweden have reached the E.U. goal of spending 3% of GDP on research. For the whole union to hit the target by 2010, R-and-D investment must grow by 8% a year — nearly twice the 4.5% annual increase recorded since 1997. It's not happening. In Italy, public-research spending has fallen over the past decade. Poor opportunities — and pay as paltry as €6 an hour — provoked scientists to rally in Rome in November, waving their passports to symbolize their readiness to take their talent abroad. France's 2004 budget hikes funding for research by about 0.9%, less than half of what's needed to cover inflation and not enough to change the fact that "I pay more for my cleaning lady than a researcher gets," says Pascal Degiovanni, a theoretical-physics researcher at the Centre Nationale de la Recherche Scientifique in France.

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— MICHELE PAGANO,  
associate professor of  
pathology, New York  
University

And what if a scientist tries to cover the shortfall by procuring funds on his own? In some places, that apparently deserves punishment. Michael Krausz, a professor at Hamburg University's Clinic for Psychiatry and Psychotherapy, accepted research funds from an unnamed drugmaker; German prosecutors are investigating whether he did so in exchange for promotion of its products. Clinic director Dieter Naber, who notes that a 2001 university inquiry cleared Krausz of wrongdoing, wonders how institutes like his are supposed to pay their bills. Industry is an essential source of funding — though in 2000, E.U. firms spent €79 billion less on R and D than U.S. companies — but Germany lacks a clear legal framework for the donor-recipient relationship. "Nearly every contact to industry is being criminalized," Naber says. "Because local governments are bankrupt, we are being asked to procure third-party funding, including funds from industry. But often, when we do so, prosecutors are called in."

Even countries without such legal hurdles struggle to match the deep-pocketed U.S. For example, wealthy charities such as the Wellcome Trust and a relatively flexible funding system boost research in Britain, which has many world-class scientific centers, such as Edinburgh's Roslin Institute, the University of Nottingham and King's College London. But "there's simply no comparison to the U.S.," says Colin Blakemore, who heads Britain's Medical Research Council (MRC). The \$27 billion annual budget of its U.S. counterpart, the National Institutes of Health (NIH), is about 40 times that of the MRC. "Even corrected for population, it's 12 times higher," Blakemore says. "The total annual MRC budget last year was equal to a fifth of the increase in the NIH budget."

The European Commission has boosted funding levels. Its Directorate General for Research is in the midst of the five-year Sixth Framework, which runs until 2006 and is worth €17.5 billion — a 17% jump from 1997-2001. But critics contend that E.U. funds are often doled out by bureaucrats who prioritize social and geographic factors over science. The E.U. claims to have reformed its procedures, but the running joke among funding applicants is still that a Portuguese on the team will lock in money — bonus points if there's a female scientist on board. Such tales typify the Brussels bureaucracy, laments computational scientist Peter Slood of the University of Amsterdam: "There is a strong administrative and management culture, rather than a scientific culture, in the higher regions of the E.U."

The good news is that such gripes are finally getting through in some European capitals. After a year in which researchers slammed it for putting key funding on hold, the Irish government has put a new emphasis on science, especially the kind that can benefit the rest of the economy. The 2004 government budget includes new tax relief for companies that invest

in R and D. It also boosts funding for the state-backed Science Foundation Ireland (SFI) by 62%, in a move meant to speed construction of a solid scientific-knowledge base and make Ireland more attractive to firms in high-value sectors like biotechnology. SFI will plow €400 million into research over the next three years, including millions for fields such as mathematics and earth science, which are often neglected in favor of more obviously commercial sectors. "We want to make Ireland a place that's not only friendly to scientists, but science-friendly," says William Harris, SFI's director general. The focus — and the funds — are paying off. Last month, SFI lured home respected Irish-born geneticist John Atkins. He'll use his €3.2 million package to launch a lab in Cork, forming a transatlantic partnership with his ongoing work at the University of Utah. "I'm delighted to see the increase in funds for science," Atkins says. "It's an enormous improvement from how things used to be in Ireland."

**If you're in the system, you do what you have to do to survive. the culture is the main problem**

— SANDRA SAVAGLIO,  
research scientist, Johns  
Hopkins University

### **CULTURE CLASH**

Whenever astronomer Sandra Savaglio thinks about returning to Italy, her memory of October 2002 reminds her why she's still in the U.S. Researchers often retain ties with their home institutions in Europe, so when Savaglio moved to Johns Hopkins University in 2001 she kept her collaboration with colleagues at the Rome Observatory. Her work focuses on gamma-ray bursts, massive energy explosions believed to occur when a giant star dies. In the fall of 2002, "I was working very hard, and things were looking very interesting," Savaglio says. So interesting, in fact, that the data caught the eye of her principal investigator in Rome. "He said, 'This is interesting, but let's be clear: if you get something, and we publish, I'll get the first name,'" Savaglio recalls. "We didn't even know what the final results would be, and he was already thinking of who would be first author."

Authorship can make a researcher's career, and Savaglio cites such hierarchical attitudes — in research credit as well as in everyday office politics — as a key factor in her decision to stay in the U.S. for now. Still, she harbors no ill will toward her colleague in Rome: "That's just the system. If you're in the system, you do what you have to do to survive. Someone probably did the same thing to him. The culture is the main problem. It has always been like this."

No amount of funding can buy a culture of competitiveness. And if researchers don't see opportunities for reward, they'll take their talent to the States, where innovation and hard work are rewarded with generous grants, full credit and a financial stake in your work. "The U.S. has an entrepreneurial culture," says Finnish molecular biologist Erkki Ruoslahti, who moved to the U.S. in the 1970s and helped build San Diego's Burnham Institute into a top medical-research facility. "People tend to be more enterprising — because they have to be. Otherwise, they're out of business."

Scientists say the competitive spirit found in Ruoslahti's largely European-staffed lab and across America is absent from much of the Continent. In the U.S., "young people who prove they're good get many more opportunities, including perhaps the freedom to run their own labs," says physicist Guido Langouche, vice rector of the Catholic University of Leuven (K.U.L.), who did his postdoc work at Stanford and returned to Belgium for family reasons. "In Europe, you usually have to work for an older professor for 10 years before you get that chance."

Even those lucky enough to get their own labs feel restricted. "In Germany, the principle of reward for performance doesn't exist," says physicist Michael Alexander Rübhausen, 32, who leads a biophysics research group at Hamburg University. He cites a law requiring a doctoral-degree recipient to leave the institution at which the qualification was earned. The idea behind the law is to prevent favoritism in the hiring of new professors, but the practical result is to close off a logical growth path to young scientists at a career crossroads. Rübhausen is lucky — he got a grant guaranteeing his salary and funding for his group through the spring of 2004. But after that? "I don't know whether I'll be able to stay in

Germany," he muses, because he won't be allowed to continue at Hamburg, and positions in his speciality are rare. So he's looking back to the U.S., where he did postdoc work.

Happily, the meritocratic ethos Rübhausen craves isn't totally absent from Europe. You'll find it at institutions such as Belgium's K.U.L., No. 5 on Scientist magazine's rankings of best non-U.S. institutions for postdoctoral research. Its history of fostering competitiveness and openness to new ideas has had lucrative upsides. To progress, "we have to take ideas from the Americans," says Langouche. So, in 1973, long before most European universities linked academe to commerce, K.U.L. set up Leuven Research & Development, a department designed to turn top projects into moneymaking spin-offs — which it does at a rate of as many as 10 companies a year. Its star: tPA, a heart drug developed by biology professor Désiré Collen. Millions of euros in drug royalties fund a 160-person lab headed by Collen, who says he has benefited from K.U.L.'s "awareness of entrepreneurship and inventiveness." Another beneficiary: the region around K.U.L., where high-tech firms have clustered, generating jobs and tax revenue.

**Europe is a mess, a haze of overregulated and overcomplicated bureaucracies smothering the rare flames of true entrepreneurial brilliance**

— CHRISTOPHER EVANS,  
chairman, Merlin  
Biosciences

#### **HOMEWARD BOUND?**

"the u.s. is a sponge that's happy to soak up talent from across the globe. It values scientists," says Paul Tangney, an Irish physicist at the University of California, Berkeley. "Who wouldn't want to work in that environment?" Now several organizations are working to create that environment in Europe. The people at Sweden's Knut and Alice Wallenberg Foundation acknowledge that you cannot — and should not — keep young researchers from going abroad, because the experience is invaluable. But you can give them better reasons to return. The foundation funds stints for Swedish scientists at prestigious U.S. institutions such as the Massachusetts Institute of Technology (M.I.T.). It also pays for lab construction and donates millions of krona in equipment to Swedish institutions so researchers have the world-class infrastructure they need. "We're living in a global world," says Erna Möller, the foundation's director. "We can't keep the scientists at home if we can't give them the same environment to work in."

Many Wallenberg alumni now work at Stockholm's Karolinska Institute, which implemented radical reforms in the 1990s as its direct state subsidy shrank from two-thirds to one-third of its budget. Vice Chancellor Hans Wigzell describes the changes as "U.S.-like": councils were set up so extra resources could be funneled to promising research; tenured professors are now guaranteed three months' salary, with the rest covered by outside grants; private-sector funding is aggressively sought, with foundations contributing 22% of the budget and industry chipping in 11%; and two investment funds and a holding company were created to exploit discoveries commercially. "People thought our ideas were weird," Wigzell says. "But we made a classical European university into a competitive institution."

A group of like-minded institutions including the Karolinska, K.U.L., Cambridge and the University of Leiden have also formed the League of European Research Universities (leru), in the hopes that such reforms will prove contagious. They are pooling their resources and lobbying to improve the outlook for research. They want increased funding, more promotion of science in society and better incentives for businesses to invest in research. Leiden rector magnificus Douwe Breimer, who thought up leru, says that governments have to act if they want Europe to become more prominent as a scientific force: "We're still behind [the U.S.] in facilities and career opportunities."

Another step in the right direction would be the formation of a European Research Council (ERC). An expert group convened by the Commission concluded last month that "new European approaches to strengthening research are urgently needed," including a publicly funded, science-driven body to support research. "There's a need for a competitive funding

scheme independent of national interests," says Danish scientist Mogens Flensted-Jensen, who served as vice chair of the panel. "To define excellence, you need competition on a European level that is supporting basic research."

The panel called on member states to commit by the end of 2004 to the establishment of the ERC, which has heavy support from across the scientific spectrum. "The E.U. needs a COMMON research policy if it is going to play an important role in the future global development," says Bengt Samuelsson, chairman of the Nobel Foundation board, who offered his backing at last month's Nobel Prize presentations. By creating the ERC and endowing it with the €2 billion-plus per year that it would need to make a difference, member states would better equip the E.U. to match the U.S., which enjoys the strength of well-funded bodies such as the National Science Foundation.

At Lisbon in 2000, the E.U. set its own challenge: to compete. What this means, says Breimer of Ierl, who backs the ERC, is that "brain drain should work in both directions — we should make ourselves attractive to the U.S., too." If Europe follows the lead of its most innovative institutions, it can do just that, and it will have a ready audience: Europeans who have moved abroad would love to come home. "I would prefer to live in Europe," says Tangney. "I think about moving back every other day," says astronomer Savaglio. "I love my country," says N.Y.U.'s Dorrello. "My dream is to have the lab from New York — with the American organization and technology — in Naples." If Europe is serious about its science, perhaps that dream could come true. Home really is where the heart is for these researchers, but they need Europe to be a place where the scientific mind can flourish, too.

**You had to file a four-page application to get a used computer, only to be rejected because of a mistake in paragraph 342. I could not deal with all that**

— MATTHIAS TSCHOP,  
associate professor of  
psychiatry, University of  
Cincinnati

With reporting by Emily Brady and Grant Rosenberg/Paris, John Miller/Brussels, Joanna B. Notary/New York City, Regine Wosnitza/Berlin and Steve Zwick/Cologne