of Tokyo, to flee his 5-year postdoc position after just 2 years to become a research associate at Kyoto University. The permanent position won't give him as much freedom to pick his own research targets, he acknowledges, but Iwamae didn't want to be caught without a job at the end of his postdoc. "There are very many candidates for each open position," he says. While acknowledging the tough job market, Ikegami and others say that the increased competition should raise the quality of research at national institutions. "We can choose those who are really the most talented," says Ikegami.

A more lasting solution, proposed by Ikegami's committee, would sidestep the limits on permanent positions for scientists by creating "super" postdoctoral positions for younger researchers who have completed one postdoc and are ready for more independence (*Science*, 9 April, p. 233). More experienced researchers capable of leading a team would be eligible for independent researcher positions. Both types of positions would be for fixed terms and would be filled through an open, competitive selection process. The trade-off for impermanence, says Ikegami, would be more money and more freedom for a researcher to pursue his or her own interests. The proposal is being reviewed as part of a larger package of prospective science initiatives.

–DENNIS NORMILE

NEWS

Europeans Who Do Postdocs Abroad Face Reentry Problems

A stint abroad is crucial for many European Ph.D.s, who must overcome government resistance to temporary positions in order to become academic researchers

HEIDELBERG, GERMANY, AND PARIS, FRANCE—Florence Horn is fast becoming a scientist of the world—but not necessarily by choice. Born and raised in Normandy, France, Horn received her Ph.D. in bioinformatics from the University of the Mediterranean in Marseilles, and this fall she'll complete a 3-year postdoctoral fellowship at the European Molecular Biology Laboratory (EMBL) in Heidelberg. Then she's headed off to the University of California, San Francisco, for a second postdoc —if she can find salary support.

Horn would like to return to France. But at 32 she's 1 year over the age limit to compete for an entry-level position at the French research organization where her expertise might be most welcomed—the basic science agency CNRS. And the French government funds no domestic postdocs for people in her field, in keeping with a 3-decade-old policy that says it would be unfair to offer people temporary posts with no promise of permanent employment. Officials acknowledge that postdocs represent a rich vein of scientific talent that could bolster French science. But except for a few specially targeted programs, France's research policy-makers are reluctant to put public money into the pockets of French postdocs.

Many young European scientists share Horn's dilemma. *Science* met recently with nearly a dozen EMBL postdocs who, although they come from a wide variety of countries and backgrounds, have all been encouraged to do their postdocs outside their home countries. Now they are struggling to reintegrate themselves into their native scientific communities. Some have been luckier than Horn: When Guillermo Montoya, a structural biologist from Spain, leaves EMBL at the end of next year, he will become a group leader at the Biophysics Institute now under construction in Bilbao. But Austrian structural biologist Susanna Lüdemann's experience may be more typical. With few opportunities in her native country, she has resigned herself to being a permanent expatriate. "If I wanted to pursue a scientific career, I had to leave Austria," she laments. German postdocs who seek an academic career at home must also overcome the formidable Habilitation, a lengthy process of qualification for university posts. Although the Habilitation's days may be numbered (see sidebar), the road to a permanent position remains long and rocky.

Bon voyage. Florence Horn's quest for postdoc training is taking her around the world.

CREDIT: DON YOUNG/EMBL

The problems faced by many European postdocs reflect differences in scientific culture between continental Europe on the one hand, and the United States and the United Kingdom on the other. Whereas U.S. and U.K. graduate students are seldom pushed to do postdocs outside their countries, continental Europeans see a foreign stint as a feather in a postdoc's professional cap. "A postdoc abroad is generally considered necessary for your CV," says neuroscientist Markus Missler of the University of Göttingen in Germany. A U.S. posting in particular is so highly valued that some German researchers jokingly add "iAg"—*in Amerika gewesen* (been in America)—to their abbreviated titles.

Yet despite the luster that foreign travel can add to a résumé, the tight job market for researchers can make reentry difficult for even the most promising young scientists. And although continental postdocs might envy their British colleagues for being able to stay home, a domestic postdoc in Britain has its own downside: a huge corps of Ph.D.s who find it hard to get off the postdoc treadmill.

A major reason many countries shove their newly minted Ph.D.s out the door is the hierarchical European university systems. A change of scenery is deemed essential for the nurturing of scientific talent. "We strongly encourage them to leave the place where they have been trained as graduate students," says Ernst-Ludwig Winnacker, president of the Deutsche Forschungsgemeinschaft (DFG), Germany's basic research granting agency. "The idea is for people to have mobility."

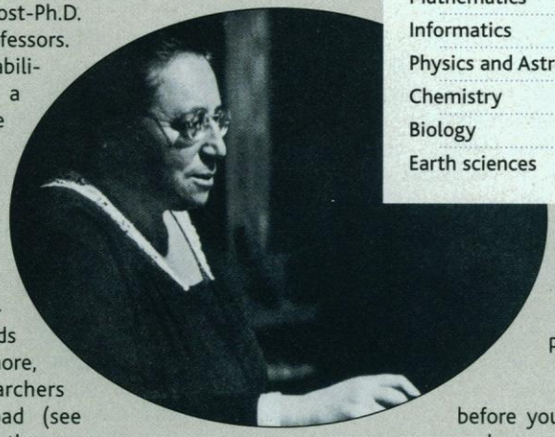
Indeed, "mobility" has become a mantra for European research policy-makers. "We have decided not to fund French postdocs in French research organizations," says geophysicist Vincent Courtillot, director of research in France's science ministry. "It prevents mobility, and we don't think that is healthy." As a result, nearly 70% of French postdocs do their post-Ph.D. training outside France. Another reason for the flight of young talent is that most European countries are not strong in all scientific fields. Thus, postdocs wanting to apprentice in the best labs often must dig out their passports and hop on a plane.

Government funding policies reinforce these political and scientific realities. For ex-

Germany Tries to Break Its Habilitation Habit

HEIDELBERG, GERMANY—For young researchers seeking an academic career, the trek from graduate school to a permanent position is long and arduous under the best of circumstances. But in Germany, tradition has laced this tortuous road with an additional minefield: the infamous Habilitation, a post-Ph.D. degree for aspiring professors. In the sciences, the Habilitation consists of a long—10 years or more is not unusual—postdoc spent in the laboratory of a senior professor. It ends at the discretion of the candidate's academic advisers, and with recipients in some fields pushing 40. What's more, young German researchers doing postdocs abroad (see main text) cannot begin the process until they have returned.

But the Habilitation's days may be numbered, at least in the natural sciences. The Deutsche Forschungsgemeinschaft (DFG), Germany's basic research granting agency, has begun a fellowship program that may provide an alternative—and quicker—route to a tenured position for postdocs returning from abroad. And last year, the German parliament gave universities greater leeway to design the path to tenured positions. The universities have been receptive: In July, Germany's Conference of Rectors and University Presidents (HRK) agreed that the time from entry into a Ph.D. program to qualification for a tenure-track position should not exceed 10 years. "The doctorate should be reached by age 27 or 28, and then another 6 years at most for young people to get the tenure qualification," says HRK president Klaus Landfried. In particular, the HRK is urging those in the natural sciences to switch to a program of "qualification professorships" that would cut the umbilical cord between postdoc and adviser much earlier than under the present system.



Pioneer. A grant named after mathematician Emmy Noether may help German postdocs sidestep the lengthy Habilitation process before entering academia.

HABILITATION DEGREES AWARDED IN 1997

Subject area	Total number awarded	Average age
Mathematics	49	37.0
Informatics	33	37.0
Physics and Astronomy	110	38.2
Chemistry	72	38.2
Biology	109	39.8
Earth sciences	44	39.8

The recommendations come in the wake of a report by a blue-ribbon panel commissioned by the government and issued in June. A key recommendation of the panel, led by materials scientist Richard Brook, chief executive of the U.K.'s Engineering and Physical Sciences Research Council, was to replace the Habilitation with something akin to the assistant professor system in the United States (*Science*, 4 June, p. 1595). "Young researchers should be encouraged to do independent work more quickly than they do now in the German system," Brook told *Science*. "The Habilitation means you can be 40 years old before you find out whether you have an academic career ahead of you."

The bells tolling the possible death of the Habilitation are music to the ears of German postdocs. "The current system is a closed shop; nothing is openly discussed or public, and there is no security or official status for the applicant," says Thomas Dandekar, a German structural biologist at the European Molecular Biology Laboratory (EMBL) in Heidelberg, who received his Habilitation degree in 1994. "There should be Germany-wide rules" for how successful candidates are chosen, he adds. And Germans who do postdocs abroad should be doubly happy, given their late start at obtaining the Habilitation. "Everyone tells you it is prestigious to go abroad," says EMBL postdoc Thomas Preiss, who is currently working on his Habilitation degree. "But when you come home, no one is waiting for you."

The DFG's new fellowship program is an attempt to redress this situation—at least for the most talented young scientists. The 5-year fellowships, begun earlier this year, allow researchers to go abroad for a postdoc and return to a more independent position that leads to the chance for tenure. The new scheme is named after mathematician Emmy Noether, the first German woman to receive a Habilitation degree. Flooded with applications, the DFG has so far awarded more than 50 grants, with another 20 or 30 expected by the end of the year. "Our hope is that the funds will allow people who have gone anywhere in the world to come back as independent researchers," says DFG president Ernst-Ludwig Winnacker.

That hope is shared by the first grant recipients. "No other fellowship would put so much trust in researchers at such an early age," says Emmy Noether winner Florian Hollfelder, a bioorganic chemist from Berlin currently doing a postdoc at Harvard Medical School in Boston. "The program really puts Germany back on the map for young scientists." **–M.B.**

With additional reporting by Robert Koenig in Bern.

CREDIT: (LEFT) STOCK MONTAGE; SOURCE: (RIGHT) HOCHSCHUL REKTOREN KONFERENZ (HRK)

ample, of 475 grants to young scientists awarded by the DFG in 1998, 84% went to researchers working in institutions outside Germany. An even stronger incentive to leave home is built into the European Union's (EU's) postdoc programs. The largest of these, called the Marie Curie Fellowships, provides postdoc positions to nearly 3000 young researchers—but only in labs outside their native countries.

In some countries, the dearth of domestic postdocs until recently left doctorates with no choice but to leave home. "When I was a Ph.D. student in the 1980s, my only possibility was to go abroad," says chemist Dario Narducci of the University of Milan in Italy, who did his postdoc at an IBM research center in New York. But during the last few years, the Italian government has begun funding 3-year postdoc positions in the universities and public research centers, which have been snapped up by young researchers. Despite these new opportunities, however, many already-established Italian scientists believe that a tour abroad is still the best path to scientific excellence. "If they don't go out of the country, they will not grow intellectually," says immunologist Mario Clerici, also of the University of Milan, who spent a lengthy postdoc at the U.S. National Institutes of Health.

The concept of a postdoc abroad as a rite of passage for young researchers has never caught on in the United Kingdom, which relatively speaking might seem like a postdoc paradise. The Engineering and Physical

Denmark Proposes Postdoc Tonic for Universities

Countries pondering how to blend postdocs into an established system might want to watch an experiment about to begin in Denmark, which plans to create up to 400 postdoctoral positions at the nation's universities and research centers over the next 4 years.

Denmark roughly doubled its university system in the 1960s and 1970s, says Ove Poulsen, deputy permanent secretary for research at the Ministry of Research and Information Technology. But the 4000 tenured faculty members have "grown old with the system," he says, and creating "a postdoc culture" is seen as a necessary tonic. The medicine will cost the national government $15 million—1% of its overall investment in research—which, matched by universities, will create up to 100 postdoc positions a year in each of the next 4 years. To get the money, university administrators must explain how the new positions will help their institutions create world-class centers of excellence in new or existing areas of research.

Jens Oddershede, dean of science and engineering at the University of Southern Denmark, Odense, and a member of the government's advisory National Science Council, says the initiative will help university administrators start grooming replacements for the large numbers of faculty members approaching retirement. Oddershede says the Danish postdocs will be more like junior faculty members than their U.S. counterparts, with teaching duties and greater control over their own research activities. And thanks to an expansion of graduate programs earlier this decade, there are a lot of well-qualified younger scientists who could fill the positions.

Poulsen says Denmark will try to avoid one problem facing countries with entrenched postdoc systems—young researchers stuck in endless "postdoc cycles"—with guidelines requiring universities to specify the number of postdocs likely to be given tenured positions. Such a target will help postdocs assess their chances of success and force universities to plan ahead. But "we're still wrestling with the details," he admits. **–DENNIS NORMILE**

Sciences Research Council, for example, one of six government-funded research councils, alone supports about 4500 postdoctoral posts, almost all in the U.K., while the Medical Research Council foots the bill for just over 2000. Medical charities also play a large role: The mammoth Wellcome Trust funds about 2100 postdocs, for example, compared with 244 for the largest biomedical charity in France, the Association for Cancer Research.

But a large number of U.K. postdocs fall into a career limbo created by the combination of rising Ph.D. production and scant growth in the number of permanent positions. For example, a recent survey of physics postdocs by the London-based Institute of Physics found that nearly 30% had been postdocs for more than 6 years. There are an estimated 35,000 of these so-called "contract researchers" in Britain, a number that has "doubled and then doubled again since the 1980s," says David Bleiman, assistant general secretary of the Association of University Teachers. "It has become a monster that is out of control."

France stands at the other extreme. While the EU, Germany, and many other individual European countries provide some government funds to postdocs, at least to those willing to go abroad, France has held to a policy that dates from the 1970s, when the Socialist government decided that it was unfair to offer such temporary posts to young people.

Many French scientists believe this policy, breached only for small programs in targeted areas, is hurting the nation's research effort. "Going from the Ph.D. thesis to a position is difficult in France," says Simon Wain-Hobson, a virologist at the Pasteur Institute in Paris. "But what can you expect when there is no clear and coherent postdoc system? It is costing us dearly." For example, Wain-Hobson says, "good French students get good offers from abroad, or from industry, where they can make money and live comfortably."

Indeed, the postdoc problem in France is on the front burner in the ongoing debate over reforming French research (*Science*, 18 June, p. 1898). Courtillot, who is responsible for the research ministry's postdoc programs, agrees that French policy has created a "postdoctoral gap" that can make life difficult both for young scientists seeking postdocs and the labs who need them. In an attempt to address the problem, the research ministry has recently created 250 government-funded postdoc positions each year in industry and at high-tech public research agencies such as the Atomic Energy Commission and the national space agency CNES. Moreover, Courtillot told *Science* that the ministry began this year funding 100 foreign postdocs coming to France as the start of a program that it hopes will grow to 500 slots a year by 2001.

The government is hoping that this program will lead to a reciprocal arrangement with other countries. "If a postdoc comes to my lab, I am not going to ask Stanford University or the National Science Foundation to pay his or her salary. I have students in the U.S. and Australia, and I haven't paid for them," says Courtillot. But he adds that, outside of the 250 specially targeted postdocs, the government is still unwilling to provide state funding for a broad range of French postdocs to work either in France or in foreign labs.

Despite the persistence of such policies, the tide may be turning for expatriate scientists like Florence Horn. A recent report by the French Academy of Sciences targets bioinformatics as a high-priority area for government funding. "I don't want to come back just to come back," says Horn. "But when I do, I will have a lot of skills to offer."

–MICHAEL BALTER

Open arms. The European Molecular Biology Laboratory provides a temporary home for postdocs throughout the continent and from overseas.

CREDIT: DON YOUNG/EMBL