Where are they now?

A survey of the career possibilities for young scientists in the life sciences

The European Molecular Biology Organisation (EMBO) set out earlier this year to analyse the career paths of young scientists in molecular biology, and conducted an anonymous survey among past and present EMBO fellowship holders. As these grants are given mostly to European postdoctoral researchers, it gives a representative impression of the whereabouts of young European scientists after their PhDs. The questionnaire posed questions on their current income, current position, country of work and the stations on their career path.

Particularly senior scientists seem to find better payment and job opportunities in the USA

One hundred and ninety-three completed questionnaires were analysed. The overwhelming majority of the respondents are European citizens (Figure 1). The remaining 16% come from Israel, the USA and Asian countries. The answers indicate that the job opportunities in academia in Europe are better than most young scientists would expect. However, it also becomes clear that senior scientists in particular find better payment and job opportunities in the USA.

When collating information about their career paths and options, EMBO was particularly interested in the actual position and income of its fellows. Figure 2 illustrates that, as expected, four-fifths of those polled have a postdoctoral position up to 5 years after completion of their PhD thesis. Only 13% have a higher or permanent position in academia. Six to ten years after their PhD, only roughly a third still hold a postdoctoral position, while more than half of them have found a permanent academic position. This trend continues for those who received their PhD more than 10 years ago, although this statistic

Fig. 1. Fellows by nationality.

Fig. 2. Positions after PhD thesis (TECH, technician; RA, research assistant; PD, postdoc; GL, group leader; PERM, permanent position in research; LEC, lecturer, READ, reader; APROF, assistant Professor; PROF, Professor; DIR, Director of Institute or Head of Department; IND, scientist in Industry).

may not be significant due to the low total number in this group ($n = 10$).

For the postdoctoral fellows in the years immediately after their PhD, there is no

difference in income between Europe and the USA (Figure 3). Among those polled, European postdoctoral fellows earn Euro 2660 per month mean income (a maxi-

Fig. 3. Academic earnings: Europe versus USA.

Fig. 4. Mean earnings by position: Europe versus USA (RA, research assistant; PD, postdoc; GL, group leader; PERM, permanent position in research; APROF, assistant Professor; PROF, Professor; DIR, Director of Institute or Head of Department; IND, scientist in Industry).

Fig. 5. Percentage of Europeans who returned to their country of birth.

num of Euro 6400 for a position at the University of Darmstadt, Germany and a minimum of Euro 1100 at INSERM in France). Postdoctoral fellows in the USA receive a mean income of US\$ 2580 per month (maximum of US\$ 3333 at Monterey Bay Aquarium Research Institute and minimum of US\$ 1700 at the

University of San Diego). But 5 years after the completion of a PhD, things look quite different. Figure 3 shows that respondents who found a higher academic position in the USA clearly earn more than their European counterparts.

There are numerous complaints about an increasing number of scientists leaving

academic research. 'Presently I am still working in academia but will stop in 2 months,' said one respondent, explaining: 'the main reasons for leaving are the appalling prospects for gaining a permanent position and the overall low salary.' EMBO therefore polled how many biological scientists had indeed given up an academic career and moved into the private sector. Only 2.8% left academia for a position in industry within the first 5 years after their doctorate. The number increases slightly to a mere 4.5% among those who did their PhD thesis more than 5 years ago. This trend might reflect the better job situation that came with more investments in biological research in Europe in recent years but could also be explained by the fact that the position of research scientist in industry often requires postdoctoral experience. However, the survey does not yield the number of biologists who decided to leave academia directly after receiving their PhD as it polled only scientists who had at least one postdoctoral fellowship.

The survey found that the overwhelming majority of former fellows found a position in their country of birth within 10 years after their PhD

Another often-heard complaint is the brain drain of scientists from Europe to the USA. In contrast, the EMBO reports survey found that the overwhelming majority of former fellows found a position in their country of origin within 10 years after their PhD thesis (Figure 4). This confirms the results of a similar survey among those who received a fellowship in 1985 (Gannon *et al.*, 1997). While nearly two-third of the polled scientists who received their PhD less than 6 years ago still work abroad, a mere quarter of those who received their PhD more than 5 years ago are still working outside Europe. Obviously, the trend for a postdoctoral position abroad does not prevent most European scientists from seeking and eventually obtaining a position in their country of birth. Among the older EMBO fellows, more than 10 years after their PhD, 88% had returned to Europe. However, these data may not be significant as their total number is only 16. When looking at European scientists who returned to or stayed

in Europe, the numbers are even higher (Figure 4). Up to 5 years after their PhD thesis 78% ($n = 97$) are in Europe. From those that did their PhD more than 5 years ago, 90% have found a position in Europe. This supports the assumption that many young scientists decide to do one or more postdocs abroad to gain additional experience, but plan to return after these *Wanderjahre*.

The prospects for young European molecular biologists may be better than most of them think. For those who decide to pursue an academic career after their PhD thesis, there seem to be enough job opportunities in Europe, which enabled most of the polled scientists to return to their country of birth. Nevertheless, one of the most frequently heard complaints among respondents was the meagre pay and bad job opportunities for postdoctoral fellows. Indeed, while the pay for postdoctoral fellows in the USA is comparable, senior scientists there earn more than their European colleagues. This, and better opportunities for obtaining research

Fig. 6. Percentage of Europeans who returned to Europe.

grants, may still be a compelling reason for younger scientists to leave Europe.

The prospects of European scientists starting a career in Europe seem to be better than they think. But the continuing economic success, good funding and better job opportunities for senior scien-

tists in the USA are still very attractive. No doubt, the European system of doing research has to change and adapt if the EU wishes to compete with the USA. But most scientists feel that these necessary changes will probably come too late because of the inertia of the European research establishment. 'The system is very well entrenched,' commented one, 'and it is my belief that it will not be changed without changes in mentality—especially concerning respect for the human being behind that young scientist.'

References

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A doorman to keep foreign genes out

A new genetic barrier can protect corn from unwanted genetic modification

In October 2000, news reports in the USA described that millions of bushels of genetically engineered corn approved for animal use only, had found their way into taco shells. The producer, Kraft Foods, had to withdraw the taco shells from supermarkets not only in the USA, but as

buy back the corn, called StarLink, at a premium price of approximately \$100 million. Later, the US Department of Agriculture reported in mid-November that this brouhaha over genetically modified food had resulted in a steady drop in USA corn exports.

corn that grows naturally in Mexico alongside cultivated hybrid corn. When Kermicle bred the genes into modern hybrid corn, they actually prevented foreign genes from entering the corn via cross-pollination. Those genes are now being used to develop a corn hybrid that is resistant to horizontal gene transfer from genetically modified crops.

Corn is particularly prone to problems relating to food contamination with genetically modified relatives as it is notoriously susceptible to cross-pollination with other corn growing nearby. This susceptibility enables corn to pick up genes from nearby GM crops that may be undesirable. It is no wonder therefore that seed companies are interested in using the newly discovered set of genes. It would allow them to control the flow of genes between populations of corn and

The new technology will be used to breed corn with resistance to cross-pollination—which may be a paradox, using genes to confer resistance to further genetic modification

far away as Japan. Only a few days later the media reported that the same corn had been found in other corn products. Investigations to determine how the modified grain found its way into the human food supply are still ongoing, although Aventis has already agreed to

A set of genes from a wild relative of corn could solve the problem of unwanted food contamination by GM crops. Jerry Kermicle, a retired professor of genetics at the University of Wisconsin in Madison, discovered this molecular barrier in teosinte, a weed-like type of