

What you don't learn at the bench...

Conclusions from the EMBO/ELSF-organised meeting on career prospects in the life sciences

Europe's academic research in the life sciences is facing a crisis. Numbers of students entering the universities to study the natural sciences are falling, and an increasing number of researchers are leaving the academic realm to accept better paid positions in the growing biotechnology business, in government, journalism and other sectors. No wonder that politicians fear a dearth of talented researchers to fill positions at universities and research institutions. This looming crisis has prompted many senior scientists and politicians to look to the reasons underlying the increasing labour shortage and discuss how to make a career in the natural sciences—and Europe as the geographical location for that career—more attractive for young people.

As Gottfried Schatz, President of the Swiss Science and Technology Council, noted in his opening talk at the meeting, it is not that Europe produces inferior scientists to the USA—Europe's record in scientific publications is witness to the opposite—merely that they are not properly nurtured. A microbiologist, let's call him Fritz, he added anecdotally, who had done his Ph.D. in Switzerland and postdoc at Northwestern University in the USA, then returned to Europe to find he was 'trapped in the morass of a fuzzy unclear career structure'. After some years trying to find a position as an independent researcher, 'he was thinking of crossing the Atlantic once again, this time with a one-way ticket', noted Schatz sombrely. 'We in Europe are doing a worse job in furthering the people we have', he asserted; identifying the main problem in Europe, and setting the agenda for the meeting. Indeed, it is not only unclear career structures and prospects that ultimately drive many young scientists away from Europe. Equally, the uncertain career prospects deter many bright high school students from choosing to study the life sciences in the first place. Whether it is the choice between Europe or the USA, or the choice to study science at all, a great deal of work must be done in Europe to improve the scientific career in order to attract the best talent and keep it.

This has finally come to the attention of leading scientists and funding agencies, and the increasing concern about the future supply of researchers has become an important debate in academic circles. The European Life Science Forum and the European Molecular Biology Organization thus organised a meeting in September 2002, bringing together politicians,

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academic and industry scientists, representatives from funding agencies and other organisations close to science to discuss more practical aspects of how to improve the scientific career structure. If one could distil two salient points from this meeting they would be that young scientists need more information on careers, and they need to develop a range of skills beyond those acquired at the bench. However, these will not fall from the sky; rather scientists aspiring to make a career in science need more support than they currently receive.

If asked how she or he 'succeeded' in science, most scientists will divulge a chronicle of happenstance and opportunism, a haphazardly constructed journey containing more than one element of coincidence and 'luck'. Clearly, if there were a failsafe recipe for success in science, everyone would know it by now. A more realistic aim is to analyse the scientific 'career' critically with respect to how one can navigate through the virtual career space or 'career web', as it became dubbed in the meeting. This may seem a trivial renaming, but it is important because career 'path' implies a one-dimensional trajectory with no branching, and that is certainly not what science and science-related jobs are about.

In science there are fewer stars in the academic firmament to guide the traveller through the shallows than there are in many other disciplines. A good part of the meeting was therefore devoted to discussing

alternative infrastructures and funding schemes that apply to science in general. In detail, the meeting examined in six sessions such questions as: what is required of young scientists to progress through the academic hierarchy; what parallel skills are needed today; how alternatives to the archetypal academic track can be accentuated and whether pay and benefits in academia are sufficient to reward the efforts of scientists and make science an attractive career.

Starting with academia, all agreed with Schatz that the standard European model of academic careers leaves much to be desired. A student enters a university to start a degree in science, and subsequently, by a combination of luck, chance and often on the whim of a senior scientist, ultimately reaches a more independent position. Such careers are a symptom of the non-transparent career structure in Europe, to which Sissel Rogne, Director for Biodiversity at the Norwegian Research Advisory Council, commented 'How on earth, can we, as scientists, adopt this military system that is not scientific at all?'. In contrast, the US institutions employ a tenure track system that is brutally transparent, and sometimes brutally harsh, as Nadia Rosenthal pointed out with the example of Harvard Medical School, which she likened to a 'shark tank'. Given its efficiency in attracting the best scientists to US universities, Schatz proposed adopting the tenure track system to European universities. 'It is far superior to the many other systems floating around', he said. 'None of them are part of a comprehensive career structure that promotes performance.' But that may indeed be a hard task to perform. As Raffaele Liberali from the European Commission pointed out, it is the established university system and professors who are resisting any change. Rather than convincing deans and presidents at European structures, he thus proposed 'to create an alternative system where young people can escape the established system' and hope that its success will convince other institutions to adopt tenure track.

Once on the 'track' to becoming a professor, or other tenured staff, mentoring young researchers is vital and should apply to all stages of the academic career. However, many participants were aware of what a delicate balance has to be

between Europe and North America, all is not what it seems, as Tom Wilson from NATFHE, the British Union for lecturers in higher education explained. Canada and the USA appear at the top of the table because one third of their remuneration

to gain the same appreciation as their colleagues who remain on the academic track. 'I think we have a problem of attitude within the research community', Martin Reddington from the Human Frontier Science Programme (HFSP), commented. 'If you leak out, you have failed.' Europe could do more to recognise alternative abilities and suitabilities in its scientists and provide better training for alternative professions. Science policy makers carry the obligation to highlight the professions that rely on scientifically trained people, and accord them due respect, rather than allowing them to assume the image of lesser destinations for 'drop-outs' from the academic career path. 'We have to start at the beginning of science training', Reddington said, 'we have to tell people "You haven't failed if you leaked out".' An admirable thesis on this principle is the Oak Tree paradigm that was recently proposed as a model for scientific career structures by HFSP and the European Science Foundation (ESF) [Wiesel, T. and Banda, E. (2002) *EMBO rep.*, 3, 906–910].

Participants at the meeting felt that such alternatives should already be introduced at the undergraduate level via programmes and seminars given in research institutes. Although industry is an increasingly important alternative, as emphasised in the ESF position paper 'Agents of Change', professions in, for example, science journalism, forensics, environmental protection, intellectual property rights & patenting, politics, science management, teaching and healthcare, need to be advertised early in a scientist's training.

For some who have already proven themselves in academia, however, the temptation is too much, and they make the link between their basic research, and its applications in the form of a start-up company. Giulio Superti-Furga, Vice President for Biology at Cellzome AG (Heidelberg, Germany), exemplifies this type, as he enthusiastically recounted his

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struck. In some parts of Europe 'mentoring' disguises a rigid system of dependence on superiors—the habilitation principle. The most important aspect of academia, however, is intellectual independence, and this must be fostered from the earliest possible age. Vital components of that concept are the financial independence of researchers and the awarding of funds to individuals rather than higher structures. Furthermore, laboratory space should be granted to emerging talents, and special programmes to support young investigators need to be established. This Arcadia relies on more positions becoming free at the top, but the greatest resistance will be 'us and our colleagues' as Schatz noted. But it also relies on more money for academic research, and whereas the USA's science budget has doubled in the last 5 years, Europe's has declined, as Moshe Yaniv from the Institut Pasteur in Paris lamented. Frank Gannon, Executive Director of EMBO, noted with a touch of irony that, 'if Europe only spends between 1/2 and 2/3 as much as the USA, we need to be at least twice as clever'. However, the seriousness of the point was clear to all.

With regard to concrete proposals to improve the European academic system, there was a consensus on the introduction of a series of defined career steps with transparent criteria and procedures in between. Constructive feedback should be provided to those who do not make it to the next step. Mentoring, as well as building scientific contacts, should include a component of careers advice to prepare those not destined to continue on the academic professorial track for other worthy careers. The recompense may, at the very least, be a fatter salary, and, indeed, it is the sheer lack of financial reward that drives some postdoctoral scientists out of academia.

Certainly, academic pay scales are not comparable to other professional salaries in similar subject areas, but in comparisons

package is non-pay benefits, one half of which is in the form of healthcare. And this is where Europe really leaves researchers in the lurch. According to Wilson's analysis, academic pay can only be influenced by competition in the work market, and that implied 'identifying a smaller number of researchers at the start.' Ultimately Wilson boiled the problem down to one of supply and demand controlled by government: governments supply scientists by funding their education, and demand them by investing in their research and its applications. 'The countries where there is a lot of demand [with a high proportion of the Gross Domestic Product spent on research] by and large pay their scientists more', he pointed out. 'There are many ways to tackle the problem but they usually come back to convincing the government to change their labour market', he said, so 'if you want to improve the situation, it's the government you have to talk to.' But improving salaries would only be fixing half of the problem. Pay is of increasing importance with increasing age, but at certain critical points, especially family building, it is the lack of non-monetary benefits such as crèche facilities, child allowances, pensions and healthcare schemes that make academic science unattractive.

Not surprisingly, not everyone who starts a career in science will continue in academic science. The often-referred-to 'leaky funnel' concept—too few positions at the top leading to a large proportion of

'drop-outs'—was visited several times during the meeting. Since leakage implies waste it is probably more appropriate to refer to the effect as the 'porous funnel' effect. But whatever the name, those who leak from the pipeline still find it difficult

excitement and fascination with the workings of a biotechnology company and the skills needed to found and manage it. This is clearly not for the faint-hearted, nor for those who want to spend much time with their family. But it is an expanding sector

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analysis

and experience with a company brings one more in touch with the real world, and develops new skills in management, communication, intellectual property and technology transfer, patenting and finance, according to Superti-Furga.

Indeed, such skills are among a growing battery that scientists at all levels must increasingly master to some extent in order to 'succeed' in the broad sense of the word. Science these days is generally a team effort, which requires management of resources, projects and people, and it increasingly draws on skills in written and oral communication with scientists and non-scientists alike. Graduate schools in the USA provide such training at an early age, and a similar scheme for Ph.D. students in Europe would surely pay dividends. Management deserves particular attention because of its predilection to crush independence and creativity. Giulio Superti-Furga's comment, 'to manage is not to rule' was picked up by David McConnel from Trinity College in Dublin, Ireland, who remarked that to manage is to educate, and that the real meaning of 'e-ducate' is to 'draw out' [the best in someone]. Though these words of wisdom were acknowledged, there is a strong belief to overcome, that science is somehow very different from other professions, and that normal everyday management skills are not necessary.

Where recent experience has demonstrated that everyday skills are crucial is in the arenas of public communication and media relations. As Richard Braun from Biolink in Bern, Switzerland, commented, companies have discovered that PR is a

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crucial factor in the success and share value of an enterprise. Communication not only increases public knowledge and understanding, good things in themselves, but it can drastically enhance the credibility of scientists, justify their continued funding and even increase their competitiveness for such funds. Rewarding of public communication is equally important, and several granting agencies, notably the Wellcome Trust, have taken a lead in financially recognising this aspect of a scientist's work.

However, the greatest ground shift has to occur between scientists and politicians, according to Liberali, who deplored the fact that too many scientists still regard talking to politicians with disdain. Making friends with politicians is as important as making friends with journalists, but political skills are all too often viewed as vices

rather than attributes. Politicians do not disdain scientists, rather the opposite; they are open to and grateful for suggestions on how to improve research in Europe, Liberali said. But scientists must do a much better job when lobbying politicians for the funds and structural changes they need, and they need to create a 'profession scientist' and create structures that speak with one voice rather than a cacophony of individual complaints.

But when all personal aspects are removed from the equation, Europe is still left with a question of deadly seriousness: how can it capitalise on its human potential in the life sciences? It is a question of both the mass and the individual, because it is in the hearts and minds of the individuals that the desire and talent to become brilliant scientists reside. They are a special group of individuals, who need appropriate support and nurture in order to realise their potential. 'Scientific talent for us as for any other country is our most valuable resource', Schatz pointed out, but the tragedy is that most European countries do not necessarily support scientific talent as they should: 'We support other talents, such as singers in the Vienna State Opera, or the national ski team; why not scientific talent?'

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