The Max factor

Summer 2000. Max Perutz had just cut the ribbon to open a new building. Self-congratulatory complacency abounded. The festive mood suddenly changed when Max turned around, ceremonial scissors still in hand, and said: 'And not one of you reacted to my article'. He was referring to a commentary he had written for *Nature* entitled 'Will biomedicine outgrow support?' (*Nature*, 1999, **399**, 299–301). The thesis advanced by Max, having examined the increase in the number of scientists engaged in the biosciences and the cost per research scientist, was that there could not be enough money available to satisfy all their needs. Thus, the percentage of public funding that can be accommodated in a research career, could be called the 'Max factor.'

Although one could quibble with some of his extrapolations, there is no doubt that the underlying message is true. But this reality applies predominantly to those that are publicly funded. There has been a phase of expansion in the biotech industry and, although it is currently suffering from a hiatus, it promises to provide career options for many more scientists in the future. A possible problem, however, is that this may be regarded as a second-class option, only to be taken if the linear path to the 'top', i.e. an academic professorship, is blocked. Even if this is not said openly, it is often thought, at least in Europe. An old-fashioned view, indeed, but a damaging one also.

This attitude uses the pipeline metaphor to describe career paths in the natural sciences, which is increasingly becoming obsolete. An invigorating meeting organised by the Human Frontier Science Program (HFSP) and the European Science Foundation (ESF) formulated an alternative that promotes the metaphor of an oak tree as a more appropriate image for careers in science (*EMBO reports*, October 2002). This model envisions many strong roots feeding from diverse sources into a tree trunk with an abundance of healthy branches spread majestically above. Each of these branches represents a different

career possibility for a trained scientist—and there are plenty of them. The model also stresses the equivalence of the different end points: all are needed by society, all are satisfying and challenging, and all make use of the various skills a scientist acquires during education. There are no superior or inferior branches of the tree; they are just different.

Unfortunately, this is not yet the reality. Many career choices are difficult to reverse and hence imply a lack of equivalence between them. The criteria for selecting applicants for a teaching position might include a positive view of some research output, but a move from a secondary, pre-college level school to a university lectureship is very unlikely to succeed merely on the basis of teaching experience, despite the fact that the work of many university lecturers depends much more on teaching skills than on research capabilities. The movement from academia to industry—or, more infrequently, in the opposite direction—is even more fraught because it is seen as a complete change of work context and philosophy. A CV entry of some years in industry, coupled with a gap in publications, often still leads selection panels to hesitation and questioning. Another meeting, organised this time by the ESF, the Swedish Karolinska Institute and Science's Next Wave, made some practical proposals on how to improve such movements to and from industry (<http://nextwave.sciencemag.org/cgi/content/full/2002/08/26/1>). The reality is that one should not refer simply to industry, as there are different types of industry. For instance, working for a big pharmaceutical company is quite different to being a researcher in a start-up biotech company, and the next employer may perhaps find greater merit in one experience above the other.

In a fair world, every student and Ph.D. coming through the education system would eventually find his or her 'branch' on the career tree. But some live in countries where opportunities do not match the number of scientists, and the existence of

more vibrant economies that need their skills is of little help if the scientist does not wish to change location. Others simply stick with their initial career decision even if their search for a job does not go well. They accept a series of short-term contracts, stacked like aeroplanes waiting to land. Such a period of circling is acceptable, but if it becomes the norm then 'air traffic control' should send a message for them to land at a different airport. As group leaders, we are bad at doing this, especially since our research is often boosted by the work of these post-docs—the longer they linger, the more valuable they become, even if this is not reflected in their pay. Their supervisors thus have a responsibility, but one that is too often not discharged. A recent change in European law, as yet not implemented in all countries, might force a change in this attitude. The new laws will make it impossible, or at least difficult, to offer repeated short-term contracts for more than 4 years. There are advantages and disadvantages of course, but they herald a change, at least in Europe, that could have a major impact on our current practices.

Now, however, it is our task to promote the concept of the equivalent value of all possible jobs to society and to the scientist if the oak tree paradigm is to succeed the pipeline model. Even the words 'career path' need to be replaced, perhaps with 'career web' or 'net', both of which suggest multiple endpoints of equal value. Otherwise, Max's concerns will not be addressed other than by a negative effect on the number of entrants into science. Current data suggest that this is the trend. Solutions to promote changes in the perception of different scientific careers are essential if we want to attract very bright and well-motivated students to science in order to supply all the needs of society.

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