Postdockin' in the free world

Nowadays we are expected to make sure that doctoral education in molecular biology is more than just a three-year apprenticeship in slavery at the bench. PhD training is supposed to blend original research, advanced theoretical knowledge, technical expertise and 'transferable skills'. Yet for the majority of scientists, the PhD is only one step along the road. For anyone seeking a university position, a job as a staff scientist in industry or in a research institute, a career in academic publishing or even in the administration of science or its application to public policy, a further period of 'training' as a postdoc is indispensable.

The doctoral thesis is the first tangible proof of a scientist's ability to execute and interpret a coherent set of experiments. Nevertheless, everyone recognizes that doctoral projects in molecular biology are primarily devised and guided by the supervisor. The ability to fly solo as a researcher remains largely untested at the time of graduation: a smooth and successful PhD most often involves the student obediently following the supervisor's instructions and suggestions, starting from a tailor-made project plan.

Starting off as a postdoc is often the first moment in a scientific career that one appreciates the terrifying responsibility of devising one's own experiments and fitting them into a coherent programme. Even here, most postdoctoral projects are funded, at least in part, by the supervisor's grant, and the postdoc is therefore more or less obliged to follow the main lines of the supervisor's thinking and experimental design. Gaining independence is a slow process that requires patience and grit, with an unavoidable dose of frustration and failure along the way.

A successful outcome to a period of postdoctoral 'training' is universally judged to be one that secures the fellow's next move up the career ladder. Ideally, this is assumed to be to an independent principal

investigator (PI) position, euphemistically called an 'assistant professorship' in much of the Anglo-Saxon world. Even after achieving such a post, the young PI still has to focus on maximizing his or her research productivity, which is needed to secure tenure, even rolling tenure. Academic science is thus a cliff on which there are only two choices: keep climbing higher, despite the slim chance of ever reaching the top, or just fall off. The higher one climbs before falling off, the harder the fall.

Being a postdoc is not a career, even if idealistically one might wish it to be. It is more akin to a teenager's first experience of love. Even if many adults—senior editors included—allow themselves to lapse into teenage behaviour once in a while, it is not a viable strategy for building satisfying lifetime relationships. Science, like love, is something one can only learn by experience and by making mistakes. There are only a very few scientists who enjoy an unbroken run of luck leading from class prize to Nobel Prize. We need to train postdocs to take setbacks in their stride, give them more time to undertake risky but original projects, make mistakes along the way and learn from them; or merely to recover from a string of sheer bad luck. In addition, because of the inherent uncertainties of research, the relatively short lifetime of a postdoctoral fellowship and the very small number of real jobs in academic science, it is also vital that we reorganize postdoctoral training in a more realistic and useful manner. We need to nurture the development of a range of professional skills that will enable *all* postdocs to find worthy jobs that build on their experience.

Supervisors currently have very little interest in so doing, mainly because their own productivity is measured by the output of their postdocs. If a portion of postdoctoral time is to be spent on developing pedagogic skills, executing editorial tasks, assessing competitive bids for equipment purchases, or on developing a public outreach

programme, measurable productivity will decrease. All of these skills are professionally valuable, even in an academic career, but the current funding model precludes giving them all but the most cursory attention. Without a different financing system for postdoctoral science, we will continue to produce a fine but small crop of highly gifted research scientists, plus a large pool of disillusioned ex-researchers, imbued with an inappropriate but enduring sense of personal failure, and no better trained for the other careers that postdoctoral research should lead to than they were at the time of doctoral graduation.

A start could be made by requiring those supported by the most prestigious postdoctoral fellowships to spend 30–50% of their time in measurable professional tasks other than laboratory research. However, we would need a radical change of culture to make this work. For example, the evaluation criteria for the *next* steps on the road to becoming a career academic would need to be altered accordingly. Search committees would have to show that they take account of criteria other than simply the raw output of publications, otherwise the type of postdoctoral fellowship I am envisaging would be career suicide for an aspiring PI. Another necessary reform would be to make postdoctoral fellowships more similar to standard research grants, supporting real laboratory costs and perhaps the services of a junior assistant. The benefit to the host lab in terms of raw productivity would not be much different from now, and the postdoc might still have a realistic chance of building a portfolio of stellar publications within a few years. In addition, she/he would be far better prepared for other careers, and would feel much more comfortable about making such a choice later on.

Oh well, back to naive teenage dreams.

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