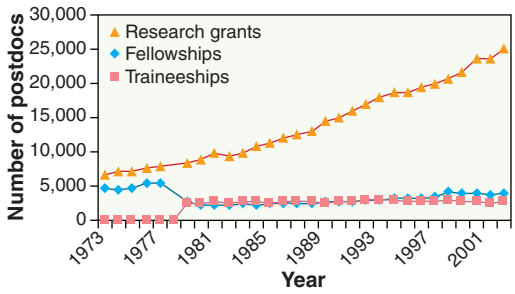
EDUCATION

The Evolution of Postdocs

Maxine Singer

Four years ago, the National Academies' Committee on Science, Engineering, and Public Policy (COSEPUP) published its guide on enhancing the postdoctoral experience (*1*). Since then, the smoldering "postdoc problem" has transformed into lively constructive activities (*2*). In the United States, research institutions are creating and staffing postdoctoral offices, supporting postdoctoral associations, and improving compensation packages (*3*). Funding organizations are raising stipends and sponsoring transitional grants. The Postdoc Network was founded by *Science*'s Next Wave (*4*). Sigma Xi has launched a large-scale survey of postdocs (*5*). The National Postdoctoral Association (NPA) was formed (*6*).



Mechanisms of postdoctoral support (*1*). Traineeship support did not exist before 1981, and there is no NSF data on the support mechanism for 1978.

Although stipends and benefits have improved, they remain a concern. There is continuing frustration at the lack of data on postdocs supported on research grants, data that can only be collected by federal agencies. However, the greatest continuing concern is the quality of mentoring from advisers, especially support and guidance in the transition to independent careers. Here, the first principle identified in COSEPUP's guide [(*1*), p. ii] remains primary: "the postdoctoral experience is first and foremost an apprenticeship whose purpose is to gain scientific, technical, and professional skills that advance the professional career of the postdoc." Mentors must be honest with each postdoc about her/his talents, accomplishments, and potential. They must impart the realities, and variety, of scientific careers, and should encourage experiences outside the laboratory to broaden postdocs' aspirations.

However, such roles are often inconsistent with mentors' expectations, especially because principal investigators (PIs) are already overburdened with responsibilities. Particularly in the biomedical sciences, many PI's view postdocs not as apprentices but as skilled, bargain-rate assistants, who become increasingly valuable with time. Given the career challenges they face, postdocs agree to lengthy extensions in the hope of eventually publishing a highly visible paper that can help them land a good job. This relationship too often confers benefit to the mentor at the cost of the postdoc's career goals.

As years go by, postdocs tend to see their positions as semipermanent "jobs" rather than defined periods in which to advance their careers. Their primary responsibilities become carrying out research defined by their supervisor and training students and new postdocs. In this way, they rightfully acquire a certain status, but it is without a foundation in independence. The title "postdoc" no longer conveys their skills, knowledge, and contributions. In time, they establish families and roots in the community that, together with the lack of academic opportunities elsewhere, make moving away unattractive.

In a positive step, some institutions have adopted a 5-year limit on the postdoctoral period. After that, a postdoc must either leave or be internally promoted to staff scientist or research professor positions with appropriate compensation, retirement benefits, and performance expectations (*7*, *8*).

In earlier times, postdocs were expected to have independent research projects, with guidance from mentors. Many postdocs were supported by portable, competitive fellowships awarded to them directly and limited to 2 or 3 years. This arrangement balanced power between the postdoc and mentor: The mentor still largely controlled the postdoc's future opportunities, but the postdoc controlled the research topic and could shop a proposal to the most suitable mentor.

Today, 80% of postdocs are paid from a PI's research grant (see figure). This shift has advantages and disadvantages, but the important question is how well it serves science and the education of new generations of scientists. At least in biomedical sciences, the shift in funding parallels the increased age at time of first independent grant (*9*).

I worry about the costs to the advancement of science when junior researchers postpone independence and are thwarted in energetically developing original ideas. We all know many scientists who broke new ground when considerably younger than the current median age for postdocs (*10*).

During the COSEPUP-sponsored postdoc convocation last April, MIT Professor Mildred Dresselhaus (*11*) described the postdoc situation as a systems problem. No one designed the current system; it evolved over time. If we clarify the goals of scientific training, we could design strategies and incentives that will promote constructive continued change. Meanwhile, several measures can go a long way toward providing students training for a variety of careers, reducing time to degree (*12*), and promoting earlier independence for postdocs. These include written appointment letters for postdocs with clearly outlined expectations and compensation; at least annual conversations between postdoc and PI to evaluate progress and provide career guidance; tracking of career outcomes by institutions and, tracking of grantees including postdocs supported on investigator awards, by funding agencies. Such changes will also help graduate students and undergraduates see a career in science or engineering as an exciting and rewarding prospect.

The author is chair of the Committee on Science, Engineering, and Public Policy, National Academies, and president emerita, Carnegie Institution of Washington, Washington, DC 20005–1910, USA. E-mail: msinger@pst.ciw.edu

References and Notes

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