

Supply-side academics

The number of biology PhDs has increased without a corresponding change in tenure-track positions. This oversupply has led to an intense competition for jobs and funding that may be damaging the culture of science.

The Federation of American Societies for Experimental Biology recently compiled statistics showing that the United States is producing PhD biologists at a greater rate than academic research can absorb them. According to the National Science Foundation, the number of biology PhDs awarded annually has doubled over the last 20 years, while the number of tenure-track jobs has remained steady. The percentage of PhD biologists holding tenure-track positions has decreased accordingly, from 46% in 1981 to less than 30%.

What has happened to the other PhDs? Some remain in a holding pattern, increasing the length and number of their postdoctoral positions while waiting for an academic job. The age at which scientists receive their first RO1 grant from the National Institutes of Health has risen steadily from 34 years in 1970 to 42 years in 2006. Others have turned to nonacademic careers, particularly in industry, which now hires 30% of new PhDs, compared with 10% in 1970. The trend toward alternative careers appears to represent a compromise for many scientists. In 2004, 57% of postdocs aspired to a tenure-track position, according to a survey by the American Association for the Advancement of Science (AAAS), twice the number that could realistically expect to achieve that goal.

This situation is self-evidently difficult for young scientists, who are asked to commit themselves to a decade or more of training after college without any strong reason to expect that this effort will pay off with a job in their chosen field. It is no surprise that postdocs suffer from stress, overwork and morale problems. Biologists who rated their promotion opportunities as “very poor” in the 2006 AAAS survey were seven times more likely than average to rate their job satisfaction as low.

Less obviously, the situation is also bad for science. The past two decades have brought increasing concern that researchers are reluctant to disclose unpublished results to their colleagues at meetings or to share reagents and data with other scientists. Such competitive behavior is a natural—and perhaps rational—reaction to the recent demographic shifts. Even tenured faculty frequently feel the need to behave in such ways to protect the competitive position of young researchers from their laboratories. Increased competition interferes with the availability of resources and collaboration opportunities, at a time when such efforts are being promoted by many funding agencies in an effort to improve the efficiency of their support for research.

We see this culture of increased competition most clearly in the peer review process, which is often shadowed by fears of being scooped, concerns about conflicts of interest and anxiety about career advancement if a paper is rejected. All these stresses flow from the perception that scientists cannot get an academic job or tenure

without at least one high-profile publication. Though this perception may be correct in many cases, the correlation is not inevitable. In more relaxed times, it was common for hiring committees to judge the papers of candidates individually. Now, the large numbers of applicants for most academic positions makes it difficult for anyone to read all the candidates’ output, so faculty and administrators often use high-profile publication as a shorthand for career achievement, relying on the judgment of editors and referees instead of evaluating the work directly. Similar problems arise in grant review panels, which often evaluate productivity by looking at the number of an applicant’s papers, thus encouraging the spread of the ‘least publishable unit’ in journals.

The laws of economics ultimately will solve the problem of PhD oversupply, one way or another, but many of the potential solutions are unpleasant. Absorbing the additional PhDs by increasing the length of scientific training would appear to have reached a natural limit. Few people are likely to be willing to wait beyond their early 40s to achieve their first permanent professional position. Alternative careers can take up only some of the excess. Moreover, traditional academic training costs a great deal of time and money and does not provide optimal preparation for many nonacademic career paths.

The approach with the lowest cost would be to train fewer PhD scientists or to increase the number of tenure-track jobs, with the former seeming more plausible in the current economic climate. To achieve this goal, the scientific community would need to find new ways to meet the requirements of stakeholders, including graduate schools that derive funding and prestige from the number of students that they educate.

The current system is largely driven by the community’s need for the substantial amount of research and teaching that is done by graduate students and postdocs. One possibility would be to make it easier for researchers to hire, promote and appropriately compensate career-track technicians capable of taking on substantial responsibility for experiments, as is done at the RIKEN Institute in Japan. Such an approach would also reduce turnover and the need for frequent training of new personnel. It would also be helpful to reduce administrative and grant-writing responsibilities to allow senior investigators to do more hands-on work in their own laboratories.

Such efforts would benefit the scientific community by reducing the resources currently devoted to training graduate students and postdocs who will not end up doing academic research or other work that requires intensive research skills. More effort could instead be invested in training the most promising young scientists, who could then be rewarded with a fair chance of achieving their career goal of a tenure-track position. ■