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EDITORIAL

Degrees of Uncertainty

According to the dictionary, a doctor of philosophy is a person skilled in, and therefore entitled to speak authoritatively on, any branch of knowledge; an eminently learned person. Also, it is the highest degree conferred on successful scholars in any of the fields of natural science by a university. And the Latin root of "doctor" implies the role of a teacher. But there is nothing in any of these statements to place the Ph.D. awardee in the real world of employers and career paths. A recent report (see *Science*, 21 April, page 358) from the National Academy of Science's Committee on Science, Engineering, and Public Policy (COSEPUP) entitled "Reshaping the Graduate Education of Scientists and Engineers" focuses on concerns about the ultimate employability of our Ph.D.'s, and what COSEPUP recommends may well provoke debate in the scientific community.

The report observes that the three main sites of employment for Ph.D. scientists and engineers (academia, industry, and government) are all experiencing constraints on growth and an increased need to respond rapidly to new competitive challenges. COSEPUP acknowledges that the principal role of graduate training in the United States is to produce the academic and research leaders of the future. However, in light of current political realities and perceived pending economic transitions, COSEPUP states that the graduate training enterprise should sustain the "creativity and intellectual vigor needed to address a growing range of social and economic concerns" such as the environment, health, energy, and the provision of products and services for industrial competitiveness. As regards the latter goal, COSEPUP concludes that present-day graduate programs are too narrowly focused and produce scholars with highly specialized (and perhaps unneeded) skills, and that inadequate attention has been devoted to the role of scientific expertise in serving these broader societal needs.

It will scarcely come as a surprise that there are exciting opportunities for scientists to contribute to the solution of current everyday problems. Congress apparently agrees and, despite budget balancing, has protected basic research for now. That advanced training should be a career requirement for preparation to make such contributions is also not a surprise. What is remarkable, at least to this observer, is COSEPUP's implicit acceptance of what seems to be a call for graduate programs that sound like graduate technical colleges and for recruitment of students who have formulated more realistic career expectations. The report admonishes graduate mentors that they have an obligation to inform their students "accurately and explicitly of their career options" and proposes that prospective graduate students be informed by an electronic database of their employment options in specific fields, including access to financial aid, time to degree granting, and job placement rates. Certainly, knowing these characteristics of training programs and job opportunities will be useful to students and faculties, but are these the most important bases for career decisions?

An electronic job exchange listing fluctuations in slots in graduate program Y or consumer demand for posts in field X is an unnerving departure from today's idealized approach to attracting new students to scientific careers. Is this practical reality likely to be well received by graduate trainers, their students, or prospective employers? Is a hard-nosed economic assessment of career paths the way to go? Will the student so recruited be entitled to claims of liability if mentors fail to predict the emergence of an exciting new field? When successful scientists give reasons for their career selections, they cite curiosity, fascination with natural phenomena, inspiring professors, the zeal for discovery, or chance life experiences, but rarely "earning a living." Will the provision of more facts about the economic realities of even large categories of science and technology make those fields more or less attractive? Do we want our next generation of colleagues to be defined on the basis of what they may be able to earn or on the basis of what they think they can contribute to the solution of the world's problems, regardless of what the economic predictors were when they opted for more education?

The highest objective of graduate training should be the continuous development of a cadre of well-trained creative scientists who will grow to compete successfully for the funds that allow them to survive and contribute. The idea that they can help solve societal problems in ways other than through independent, investigator-initiated research projects must certainly be a part of their education. However, should we now strive to train generic "flexible" scientists who can move productively across fields as employment demands rise and fall—and what will we lose if we do?

Floyd E. Bloom