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EDITORIAL

Educating the Best and Employing Them

The education of scientists at the college and university level in the United States is the focus of this issue of *Science*. From a period of rapid growth in funding and a good supply of jobs, science has moved into a period of little growth and more students than job opportunities. This change has precipitated much discussion of the teaching and advising programs and whether they are preparing students for the current realities or for an imagined past of unlimited funding and countless job prospects.

The higher education system in the United States has, to a large extent, been the most flourishing in the world. A higher percentage of high school students go on to college here than in any other developed country, and the system of research and teaching occurs in a marvelous symbiotic, albeit not perfect, harmony. Both self-selection and mentor selection occur at every new level, so that, in general, the most interested and the most able emerge at each new stage.

As the current funding for higher education and the job opportunities for graduate students decrease relatively, the system must now reappraise itself. There is serious question whether or not cuts at these levels are wise for a nation that wishes to maintain a competitive edge in a global economy, but that is not the focus in this issue of *Science*; instead, our coverage rests on the assumption that the funding and job levels will stay more or less constant at a time when the system can produce many more scientists. Thus, to function well, the system must have a mid-course correction to adjust to new conditions. That suggests evolution, not revolution.

Any impetus for soul-searching and reexamination has positive aspects, but haphazard suggestions and shoot-from-the-hip "reforms" can cause more harm than good. For example, the inadequate training of high school students is a real problem, but should not lead to colleges becoming high schools. Remedial courses may be needed temporarily, but they should be called "remedial" and not given for college credit. That keeps the pressure on high schools to reform and maintains colleges at the right intellectual level.

"Teaching students to be prepared for the real world" is not achieved by turning a university into an industrial pilot plant. A graduate training program should be used to instill in students the disciplines of rigorous thinking, originality, and versatility that the Ph.D. has always been supposed to require. With expanding funding and plentiful job prospects in the past, both college-level and graduate-level standards tended to decline to allow admission of more students. That trend created false expectations, both on the part of the students and on the part of the universities that train them and the industries, universities, and other institutions that hire them. Calls to expect students to think more creatively and learn how to be flexible and resourceful are well taken. Calls to Ph.D. programs to become job training courses for specialized professions sound less appropriate. The Policy Forum of Mary Lowe Good and Neal Lane discusses some of these issues.

Educational training is like DNA: it tends to protect itself in order to transmit information with fidelity and integrity. Like DNA, education can be improved by mutation, but also degraded. Like DNA, changes should be subject to selection so that the good changes survive and the bad changes are discarded. The educational system of the United States has some built-in inertia that first rejects mutations and then becomes unwilling to discard bad ideas even when they are not working. In the current era of change it will be good if sociology recapitulates biology by welcoming change but applying selective pressures to maintain the survival of the fittest.

Most important, the major goals—a system that produces the best and most able scientists and a number of scientists that is enough to put a dent in the gargantuan problems of the present—should never be abandoned. Governments that talk about "creating" jobs and supporting research, and then put their money elsewhere, are the most in need of reform.

In the future, *Science* will discuss the changes in education outside the United States, as Ellis Rubinstein mentions in his introduction to our Special Section. In the meantime, we relate some of the first ideas on how to improve a system in the United States that is functioning well, but must adjust to a new environment.

Daniel E. Koshland Jr.