

SCIENCE

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EDITORIAL

Careers in Science

Choice of a career is usually an unquantifiable mixture of love at first, second, or third sight, and a subliminal evaluation of ability. Many will say they cannot remember when they decided to be a scientist or an artist or a lawyer, but they "just knew" it was right for them. This scientist thinks he decided when, at the age of 13, he read *Arrowsmith* by Sinclair Lewis and *Microbe Hunters* by Paul de Kruif and decided then and there to become a scientist. Later in high school I had some doubts, but I was already embarked on many science courses and was looking into colleges with good science departments. In retrospect, I probably "loved" math and science courses because I was good at them, and the fact that I was a miserable artist, an incompetent singer, and possessed other deficiencies that eliminated other careers tends to get forgotten. That combination of some unexplainable intuition and some good assessment on the basis of ability probably lies behind many choices, certainly in science. In interviewing many graduate students at Berkeley, I find almost all of them decided they wanted to be scientists in high school and were very good at math in elementary school. Many scientists are in more descriptive or administrative work later in their lives, but the analytical thinking and problem solving of grade-school mathematics is probably a good prognosticator of success and happiness in a science career.

If that pattern holds, what about the "facts of life": the job market blues described so well in this issue developed by Deputy News Editor Joshua Fischman and Reporter Constance Holden? The problem is clearly very complex. There are obviously more people who want to be scientists than there is money to support them in the manner to which they would like to become accustomed. So what else is new? Are architects guaranteed they will start careers in a building boom or farmers in a year of a food shortage? No one can ask to be guaranteed a future. Yet there is something seriously awry when a career with long and arduous preparation leads to a dashing of expectations and places enormous difficulties in getting the funding to do a good job. Some steps to improve the situation seem possible if funders and administrators of science can agree on a long-term strategy that smooths out some of the fluctuations described in these pages.

Should scientists adopt "birth control" (for example, cutting down the admissions to graduate school) to be equal to the number of positions available? That sounds kind, but it would be erroneous. We have learned from experience that we have no absolute predictor of success in research except actually doing it. Grades in college, GRE scores, and IQ scores are indicators, but not definitive correlators. So we inevitably have to train more applicants than jobs available. Moreover, we cannot predict job availability that well. A biotechnology industry springs up, providing many more jobs than previously predicted. A defense industry dries up, providing fewer jobs than expected. There are too many unpredictables to allow anyone to be an entitlement czar.

It is important, however, that we foster a better correlation between training and success, and a minimization of disappointment after training. To do this mentors can play a key role. They must view themselves as protectors of the young aspirants as well as recruiters for the profession. The profession should also develop statistics to provide guidance. Mentors can say to the eager scientist getting straight A's in college science, "You are one of those who are likely to succeed, but there are many hurdles ahead." Mentors should say to the eager scientist who is getting straight C's, "We can't prevent you from trying, but we consider success highly unlikely and it would be wise to consider other options"—mentors could also mention that Pasteur got a C in chemistry. Moreover, to those the mentor considers likely to succeed, it is important to stress flexibility in mid-course corrections. Government could help by maintaining responsible funding levels and avoiding whimsical fluctuations, but the big discoveries—the transistor, recombinant DNA, new polymers—generate new opportunities that no one can predict. No one is promising scientists a rose garden, but a tough career choice should not be exaggerated to sound impossible. The able scientist will probably find a job with high satisfaction, but beginners should be told that it will not be easy.

This issue of *Science* gives a snapshot of the difficulties and rewards that continue to challenge those who decided to be scientists. They are also analogous to the challenges and stresses in any other profession, so they should not deter the beginners who yearn to become scientists, and may help those who are making career choices.

Daniel E. Koshland Jr.