Critical Thinking

IN THE PH.D. PROGRAM AT THE UNIVERSITY OF CALIFORNIA, Berkeley, we have a course in which students read published papers and analyze the quality of the science. It is one of the most valuable parts of their training. We intentionally pick really great papers and really bad papers. Sometimes the students can’t tell the difference, because the bad paper might be flashy and seemingly interesting. They learn that it takes a lot of probing before you can see the flaws. Developing deep analytical skills and a healthy skepticism—for careers in and out of the lab—is good training.

There’s an ongoing discussion in this country about whether we’re training too many Ph.D.s. The general assumption is that there aren’t enough scientific jobs for them. In academia, that’s been true for a while, and in industry, job growth seems to be plateauing as pharmaceutical and biotech companies consolidate and contract.

Last year the journal Nature published a series of articles on the subject, citing some surprising statistics about doctoral education in the United States. From 1973 to 2006, for example, the number of Ph.D. recipients in the biological sciences who held a tenure-track position six years after completing their degree dropped from 55 percent to 15 percent. That rate continues to fall.

Some critics compare the situation to a pyramid scheme: graduate schools take on too many students, and then principal investigators take on too many postdocs—an inexpensive and effective way to advance their research—knowing full well that there won’t be jobs for the trainees once they finish. I have a different view and would argue that the training behind a master’s or Ph.D. degree is a rigorous, critical-thinking process that is good for the world. It’s a worthy investment.

I’ve seen many of my most brilliant students, who were very talented in the lab, decide to do something other than science. They’ve taken what they learned and made contributions in law, venture capital, finance, and other fields. I don’t see that as a negative. I see a broader positive impact for society.

How to balance the resource commitment necessary for this kind of training with what comes out of it is another question. From the country’s economic standpoint, we must train more students in STEM fields—that is, science, technology, engineering, and math. Manufacturing, which used to power the U.S. economy, has been surpassed by the health care industry. According to projections released in February by the Bureau of Labor Statistics, health care jobs will add more than 5.6 million employees by 2020, by far the largest area of job gains. And it’s safe to say there will also be high-tech job growth in areas such as alternative energy and information technology.

To remain globally competitive, this country must be better educated in science and math. President Obama has voiced his concerns, calling for 100,000 new STEM teachers for our schools over the next decade. And as HHMI professor Jo Handelsman describes in a Perspective piece in this issue of the Bulletin, the President’s Council of Advisors on Science and Technology recently laid out recommendations to dramatically alter the way science and math are taught in our colleges and universities.

“Making these changes in a way that is economically feasible and sustainable won’t be easy. At HHMI, we give a lot of thought to how we can help advance the cause. Programs that start small can grow to have a much larger influence. Consider the efforts by some forward-thinking individuals to create research-based courses at large universities, described in this Bulletin. An early experience contributing to an actual research project can help cement a student’s interest in science. Finding the funds and resources to support such courses will no doubt be a challenge for universities, but we believe that initial experiments will lead to efficiencies over time.

Though HHMI’s efforts to improve the training of STEM teachers and students are modest in the big picture, we hope the work becomes an amplifying mechanism. And with new initiatives coming out of our science education group, we plan to have an even bigger influence on STEM education in this country.

The world needs more smart, well-educated, curious, critical thinkers. Some of the great inventions and advances we enjoy came from esoteric, unpredictable small beginnings. That’s what was going on at Bell Labs from the 1920s through the 1980s. They didn’t necessarily know what their research and investment would produce. But they brought together inquisitive folks who were willing to try some creative, unconventional things, and out of this mix and freedom to explore came amazing discoveries that we’re still benefitting from today. There aren’t too many organizations like that left and we hope that in our own way we are one of them.”