

An analysis of public policy issues and how they affect MRS members and the materials community...

Flexible, Broad, Short Doctoral Education Recommended

At a recent national meeting, Michael Zigmund (professor of neuroscience and psychiatry, University of Pittsburgh) was asked to lead two one-hour workshops on career preparation. He was told to expect about 50 faculty members at the first workshop and about 50 students at the second. He had, in fact, five faculty members wander in over the course of the hour for the first workshop. Thinking that there was little interest in the topic, he decided his trip had not been worthwhile, that he would get a few students for the second workshop before he could go home. However, his student workshop had over 250 attendees!

The fact that a majority of science and engineering doctoral students are very concerned about their job prospects was obvious at the NAS/NAE/IOM Convocation on Science and Engineering Doctoral Education which was held in Washington, DC on June 15, 1996. This convocation was organized by the Committee on Science, Engineering, and Public Policy following its report, *Reshaping the Graduate Education of Scientists and Engineers*.¹ The U.S. job mar-

ket is changing to reflect developments in the world economy, politics, and society. Doctoral graduates are being hired by a widening variety of professions and organizations as the country responds to expanded economic competition, urgent public health needs, environmental degradation, national security challenges, and other pressing issues.² The materials research community appears to follow this trend with 48% of Materials Research Society members pursuing industrial, national laboratory, and other government or nonacademic careers.³ Clearly the doctoral education must also change to meet the needs of future generations of scientists and engineers. The question is, "How?" Three recurring ideas were discussed at the convocation.

One of the most dramatic suggestions at the convocation was to shift student funding away from research assistantships and toward individual fellowships. Students would benefit directly as they would have control of their own education, and would not be solely reliant on a faculty advisor for financial support. This freedom would enable students to focus

on career-related issues in addition to their thesis research. Faculty members would benefit indirectly as they would be less tied to research for which they can obtain large grants (elevated costs due to graduate stipends), and they could afford to investigate a larger variety of topics. However, as Neal Lane (Director, National Science Foundation) noted, shifting support is straightforward, but not easy. In addition, faculty tenure requirements would need reconsideration before research pressures on students could be altered significantly.

The second suggestion was to broaden the education that doctoral students receive. Similar suggestions were made at the NSF Workshop on Graduate Education on June 5-6, 1995 (see *MRS Bulletin*, August 1995, p. 13). Original thesis research is still of primary importance to doctoral employers of all sectors.² However, additional skills, such as teamwork and oral and written communication, that are critical in today's job market should also be nurtured during the doctoral education. Multidisciplinary teams and industrial internships are the types of

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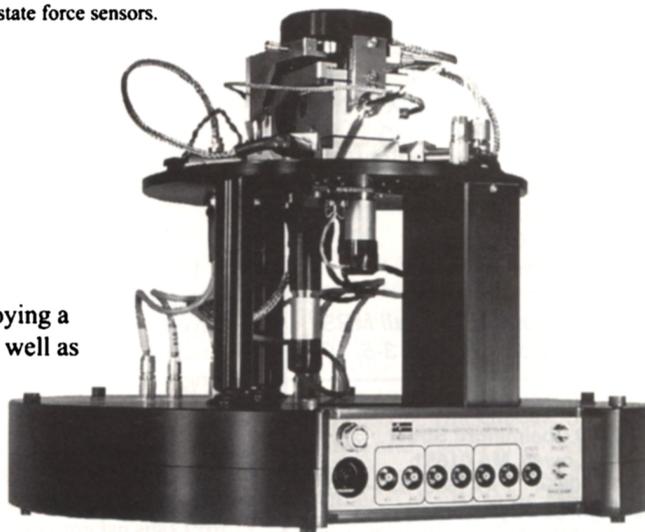
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experiences required to prepare doctoral students to make their way in all sectors of society. As Debra Stewart (Vice Provost and Dean, Graduate School, North Carolina State University) suggested, industrial partners are becoming more of a bank for universities, and they rarely have single-discipline projects in which to invest. In addition to industrial internships, students should be allowed to pursue government policy, teaching experience, business education, K-12 certification, and other means of broadening their training in their areas of interest. It is important for academia to acknowledge that PhD graduates are not wasted on alternative careers like law, government, and business. Rather, they are needed to represent the science community.

When discussing nonacademic careers, the suggestion for tighter limitations on the time to obtain a degree was adamantly defended. Even in academia, however, a quicker degree allows for a more productive postdoctoral experience which is invaluable to an academic career. A popular public perception of graduate education is that it takes an unreasonably long time to earn a PhD degree, especially

when graduates cannot be sure of finding a job when they are done.⁴ Student panel members at the convocation advocated that students need clear guidelines of minimum degree requirements. Some faculty and industrial members even suggested having maximum degree requirements ("When you finish these, you're out"). These requirements and time limitations should be departmentally regulated so that students receive equal treatment. Additional training and shorter tenure appear to be contradictory. However, modularization of courses could be an answer. Several schools offer career-training courses that are half-semester in duration, yet they meet the students' needs for broad knowledge in secondary areas.

Additional ideas were also discussed, such as whether the number of doctoral students should be limited since academic positions are becoming limited. This met with serious resistance for two reasons. Job forecasting for those with a PhD degree is seldom trustworthy, and PhD candidates are valuable in nonacademic sectors for proper public perception and treatment of science. University materials departments and professional societies would greatly help the situation if they would collect field-specific data on the employment records of current PhD recipients. Such databases would be valuable for students in choosing careers, as well as for educators and employers who need to understand the job market. As noted at the convocation, it is easy to blame faculty members, but they need accurate data in order to be accurate career mentors. MRS has been, and will surely continue to be, very active in addressing this issue through the Job

Placement Center, Career Workshops, Employment Services Task Force, and member surveys.³

Finally, the postdoctoral position must be re-evaluated. The chance to learn from a second mentor in a second laboratory is valuable for alternative as well as academic careers. However, the current system, which allows and sometimes encourages multiple or very long postdocs, is demoralizing for graduate students, postdoctoral fellows, faculty members, and industry alike.

Some may feel that offering degrees via more flexible, broader, and shorter educational programs will depreciate the value of the PhD degree. However, the real issue that we face as a scientific community is to not allow these changes to weaken, but rather to enhance the PhD criteria. This will first require a change in attitude. During a breakout session, one dean said, "I'm all for these alternative careers, but we should still make sure the best students get the best jobs (that is, academic jobs)." In reality, we need the best scientists in all sectors of our modern society, not just to promote science funding, but to promote science.

BETHANIE J. STADLER

Bethanie J. Stadler is chair of the MRS Academic Affairs Committee.

1. For a copy of this report, write to the National Academy Press, 2101 Constitution Avenue, NW, Box 285, Washington, DC 20055, or call 800-624-6242.
2. Report brief, available from the NAS homepage on the World Wide Web at <http://www.nas.edu>.
3. See MRS 1995 Membership Survey, available on the MRS homepage on the World Wide Web at <http://www.mrs.org>.
4. Richard J. Tarrant, "From the Dean: Beyond the PhD," *Harvard Graduate School Alumni Association Newsletter*, Summer 1996.

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