

Physics PhDs: too few or too many?

The physics community needs to determine as soon as it can whether or not there is a third crisis in education, at the PhD level. The other two are more general problems, recently publicized, at the primary and secondary-school and college enrollment levels. H. William Koch, director of AIP, has presented data at the recent Physics Department Chair Conference on the Education of Physicists that could be interpreted as the basis for concern about the future supply of physics PhDs.

At first glance, there would appear to be no problem—the annual rate of PhD production has leveled off at about 1000 per year for the first half of the 1980s. But Koch points out that PhD production in the other natural sciences and engineering is undergoing significant increases during this period. This finding raises the question of whether 1000 physics PhDs per year is enough if this number represents a steadily dwindling fraction of the total PhD production in the natural sciences and engineering.

A related concern is that the number of women receiving PhDs in the other fields shows a definite upswing (to as high as 26%), while the number for physics remains unchanged at around 7%.

Still another concern is that the percentage of US nationals making up first-year graduate classes in physics is now less than 60%. The actual number of new physics PhDs available to the US could, then, be far less than the 1000 per year currently projected if foreign national PhDs were not to stay and work in the US after they receive their degrees. But we already reported in October (page 57) on a new trend among foreign nationals to accept positions outside the US (many are returning home because their studies have been funded by their native country to an increasing degree).

On the other hand, there are indicators that lead one to argue that there will be a *decreasing* demand in the future for physics PhDs and that our PhD output should be tailored accordingly. The October news story (page 57) also reported that more new PhDs (5%) last year received *no* job offers than the previous year (3%). In the face of dwindling outlays for research on the part of industry, can we expect future job opportunities to be even tighter?

Many physics departments have fragmented, producing new “hyphenated departments.” Accordingly, it is legitimate to ask to what extent is the decreasing share of physics PhDs in the total PhD output for natural sciences and engineering cross disciplines an artifact, in that the PhDs produced by the new departments are not counted as physics PhDs even

though they are intimately involved with physics?

The physics community needs to mount a concentrated effort to sort out, understand and weigh these conflicting data and trends about the future needs for PhDs. The study by the Brinkman committee just now getting underway could not be more timely for this purpose and could well serve as a focus for efforts to reach a consensus. We are also quite fortunate to have available for this purpose the extensive data base developed by AIP's Division of Manpower Statistics that defines in detail the demographics of physics education and employment over the last 20 years.

Other data reviewed by Koch indicate that, regardless of whether we conclude that more or fewer PhDs will be needed, there is a need to make the study of physics more attractive. We have seen that in spite of a vigorous program by The American Physical Society to encourage the interest of women in physics, the number of women entering physics has failed to increase significantly. It would appear this goal will require a much more massive effort on the part of the physics community as well as allied disciplines.

Since 1968 the percentage of physics faculty members who had doctorates for less than seven years has fallen sharply to around 10%. The faculty aging problem is much less serious for the other and newer disciplines. The challenge for the graduate physics departments, therefore, is how to compete for students (in both number and quality) against the much younger and often larger departments in other disciplines. A possible resolution might be to decide *not* to compete overtly but instead emphasize the production of physics undergraduates. This would be done with the expectation that many will go on to graduate work in allied disciplines or even outside the natural sciences and find themselves well served by their physics background; many will indeed become interested in graduate work in physics. Another direction to consider, suggested by Koch, is that the departments might collectively conduct a “market analysis” of how they could best attract graduate students in the numbers and quality they need.

In the interests of both the national welfare and physics as a science, the physics community must prepare itself to make definitive recommendations about goals for future PhD production. But, whatever level is recommended, our graduate physics departments will first need to examine how they can most effectively contribute to these interests.

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