

**CPST CONFERENCE**  
**Master's Education in the Sciences and Mathematics:**  
**Its Value, Importance, and Growth**

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**Opening Remarks**

Good morning! As a member of the CPST Board of Directors, I am pleased to join Eleanor in welcoming you to this historic conference. My role today is to facilitate our discussions. For the next few minutes, I would like to try to frame them.

A decade ago, master's education in the US was called a "silent success." Yet around the same time, a respected educator observed that the master's degree in physical science is perceived as a "stepping stone, a consolation prize, or an incomplete."

What, if anything, has changed in 10 years? As this oversubscribed gathering – by 50 percent, I might add – suggests (in the immortal words of Buffalo Springfield), "something's happening here, what it is ain't exactly clear."

In the next two days, we hope to find out "what's happening." We have assembled to examine together a vital, if underdeveloped, component in the suite of degrees offered by institutions of higher education – the master's in science and mathematics.

First and foremost, thank you all for your interest and the hard work many of you devote to master's education in your home institutions.

The new world of global hi-tech careers – more interdisciplinary, less secure – has created market opportunities that institutions with graduate programs in science or mathematics fields, as well as employers, policymakers, and analysts, need to revisit.

Various sessions today and tomorrow will sketch programs, outcomes, best practices – and complement them with perspectives from those not involved on a workaday basis, but curious about the skills and knowledge embodied by science-based professionals. What, for example, can a bioinformaticist do that a biotechnologist cannot – and vice versa?

We are here to take stock, share, challenge, synthesize, and learn, we are also mostly true believers in the post-baccalaureate enterprise. We regularly engage skeptics and naysayers about trying to expand, and therefore reshape, the culture of graduate and professional education in the sciences and mathematics to recognize the value of the master's degree.

As we shall hear, this is being done one program and a few students at a time. What, then, are the prospects of building capacity and producing more? Tradition is not on our side. It remains to be seen whether the economy is.

For now we can say, without benefit of the data that will be presented to us later, that with the growth, for example, of the Professional Science Master's degree, or PSM, there is an alternative for science-educated students who are enthralled neither by business nor law per se and who aspire neither to the PhD nor to a research-focused career.

The PSM is that degree, one market-sensitive to areas of corporate interest. It is, in my words, "demand-driven" rather than the PhD, which has always been "supply-driven."

We are not here, however, to point fingers or lament how slowly, and oft-times painfully, academic culture changes. For that matter, we are not here to celebrate prematurely either.

That said, I laud the architects of about 70 PSM programs instituted on 45 campuses. They, and many of you, have created an innovative niche degree, just as the AA, BS, and PhD occupy niches in the credentialing process. As long as we remember that each degree opens certain doors and creates opportunities, we will not confuse degrees with careers.

Rather, we seek to assess how far master's education in the sciences and mathematics has come – and the context for that growth. Let's be realistic about the waxing and waning of job opportunities in a dynamic economy.

We are in a trough. As a *Science* magazine article you probably saw less than two months ago suggested by its very title, "Poor Job Market Blunts Impact of New Master's Programs" (8 August 2003, 752-53).

The same thing can be said, of course, for postdocs waiting for the upturn and new PhDs facing the limitations on launching their careers. Indeed, in the very same issue of *Science*, a letter-writer bemoans, "More and more biomedical PhDs are being shunted into managerial jobs in the pharmaceutical and biotechnology industries. . . . As a result, many young biomedical PhDs are locked into long 'holding patterns' at the postdoctoral level before they attain a 'real' job."<sup>1</sup>

The PSM is an ongoing experiment. The outcomes are still too few and scattered to be reliable. Some are encouraging, others surprising. With that in mind, I'd like to preview – without graphics – some preliminary findings (with thanks to Sheila Tobias and Eleanor Babco) that will be elaborated today and tomorrow.

On enrollments . . .

- In 2002-03, over 600 PSM students were enrolled. Programs with the highest enrollments were bioinformatics, bio and biotech, and mathematics. One in 6 students attended part-time, 1 in 3 was a foreign national, and less than 1 in 10 a US minority.
- In all but bio and biotech programs, men outnumbered women by large margins. In the 2003-04 academic year, the sex ratio has narrowed to 3 to 2.

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<sup>1</sup> R.L. Juliano, *Science* **301**, 763 (2003).

- Incomplete data for 2003-04 indicate that more US minorities are enrolling (though disaggregated race and ethnicity figures are unknown) and more students are attending part-time.

As for graduates . . .

- Three-quarters of PSM graduates came to their program with a BS – no surprise. However, 12 percent had already earned an MS and 3 percent had a PhD – mild surprise.
- Over the course of their studies, a combination of support was used by PSM graduates: more than half were supported by a fellowship or scholarship, almost half had university employment such as a TA, and over a third took loans. Another third self-financed their master's degree at least part of the time they were enrolled.
- PSM graduates themselves consider their degree more “competitive” than candidates with a baccalaureate plus 2 years of work experience, and at least as competitive with candidates earning a traditional master's.
- Three out of five PSM grads work in industry. Many envision a “PSM career ladder.” Indeed, to demonstrate comparative advantage, we would expect to see rising employer demand and actual job performance that distinguishes PSMs from others.
- As for the future, 1 in 3 PSM graduates aspires long-term to a career in research, 1 in 4 in senior management. Almost all rank internships, independent research projects, and their academic course work as key activities. Internships are rated as particularly useful in the job search.

As we contemplate such tendencies, we wonder how far the lessons yielded to date by master's programs might take us. Among the questions to address:

- Are sponsors, both federal and private, convinced of the programs' and graduates' quality and marketability?
- Who seeks to hire PSM graduates?
- How might PSM programs be scaled?
- Should institutions designate a “point person” on campus who is accountable for master's education?
- More generally, should institutions of higher education better organize to support and monitor master's education?

- How can public policy, notably, reauthorization of the Higher Education Act, spur more serious consideration of the master's degree in science and mathematics as a national priority?

And perhaps most important, as investors in the future, what are your expectations for master's education – in your sundry roles as academic program administrators, faculty, sponsors, and employers?

Finally, *if* every graduate of a PSM becomes an advocate for it, . . . *if* the model is seen as sound to propagate, . . . and *if* partnerships across sectors and organizations reflect commitments to the conviction underlying master's education in the sciences and mathematics, . . . *then* the future is bright.

For this is really about expanding choices for students, about equipping graduates with skills that build on their science and math foundations, and about illuminating career paths that they may not have known even existed – and some probably did not exist – five years ago.

In my view, this is what PSM represents. It should be welcomed both by higher education and the science and mathematics enterprise as a novel contribution to 21<sup>st</sup> century workforce development.

As a result of this conference, I hope we can plant a flag around which the science and mathematics communities can rally – as an expansion of their graduate offerings to the nation's, indeed the world's, S&T enterprise. For that to be realized, I turn to you as stakeholders . . . and thank you again.