Professional Science Master’s Degree: Background and Overview

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Council of Graduate Schools
Professional Science Master’s (PSM) - What is it?

A new kind of degree that:

- Prepares graduates for work - outside academia - involved in active science.

- Combines technical competencies with workforce skills, e.g. management, policy, communications, law - “Science Plus!”

- Leads to a wider variety of career options than provided by traditional graduate programs – jobs in business, government, non-profit sectors.
Features of PSM Degrees

- Two-year graduate degrees: 36 credits
- Cross-disciplinary courses common
- Offer skills-based courses (e.g. marketing, management, statistics)
- Emphasize writing and communication skills
- Require final project or team experience
- Have employer/industry advisory board
- Require most students to participate in employer-based internship
How is the PSM Different?

- More science (or mathematics) than MBA
- More informatics/computation than science degree
- More professional skills (business, law, communication) than PhD
- Connections with potential employers
- Project or team experience vs. thesis: real world experience

As a result, these programs often require more credits than a traditional master’s degree and tend to be more rigorous.
Professional Science Master’s Degree - Why?

Odd Gap in U.S. Science Graduate Education

• Strong: Bachelors, PhDs in science.
• But BA/BS insufficient for science career.
• Master’s considered merely as entry to (or exit from) the PhD.
• But PhD too long, with uncertain prospects.
• Attractiveness of PhD declining among domestic students; ~ 20% of majors continue in science/math graduate programs.
Professional Science Master’s Degree - Why? (con’t)

PSM Degrees provide the skills that employers need:

• Interdisciplinary teamwork, flexibility
• Project management
• Computational skills
• Communication ability
• Basic business skills
• Ethics
• Legal and regulatory issues
How many? >120+ PSMs, >60+ institutions, >25 states

- **Math** – Financial, Industrial, Computational Sciences, Statistics for Entrepreneurship, or for Environmental Decision Making
- **Physics** – with Business Applications, Physics of Modeling, Industrial Physics, for Entrepreneurship
- **Biological Sciences** – Bioinformatics, Biotechnology, Applied BioSciences
- **Computational** Biology, Computational Chemistry
- **Forensics**
- **Bioanalytical** Chemistry, **Biomolecular** Chemistry
- **Geographical Information Systems**
Enrollments and Programs

PSM Enrollment and Number of Programs, 2004-2006

<table>
<thead>
<tr>
<th>Year</th>
<th>Enrollment</th>
<th>No of Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>657</td>
<td>67</td>
</tr>
<tr>
<td>2005</td>
<td>852</td>
<td>74</td>
</tr>
<tr>
<td>2006</td>
<td>1013</td>
<td>82</td>
</tr>
</tbody>
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Source: CGS, Pilot Survey of PSM Program Directors
# 2006 PSM Graduates by Program

<table>
<thead>
<tr>
<th>Program</th>
<th>Graduates</th>
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</thead>
<tbody>
<tr>
<td>Biosciences</td>
<td>122</td>
</tr>
<tr>
<td>Bioinformatics</td>
<td>50</td>
</tr>
<tr>
<td>Mathematics</td>
<td>36</td>
</tr>
<tr>
<td>Environment/Geology</td>
<td>22</td>
</tr>
<tr>
<td>Chemical Sciences</td>
<td>7</td>
</tr>
<tr>
<td>Physics</td>
<td>8</td>
</tr>
<tr>
<td>Computation Science</td>
<td>53</td>
</tr>
<tr>
<td>Other</td>
<td>46</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>344</strong></td>
</tr>
</tbody>
</table>
Demographics of PSM Enrollees

- About half are women
- More than two-thirds are U.S. citizens and/or permanent residents.
- About 10% are underrepresented minorities (African American, Hispanics, Native Americans)
Postgraduate Placement of 2006 PSM Graduates

Source: Council of Graduate Schools Pilot Survey, 2007
Starting Salaries for PSM Graduates

- **Private Industry** - $55,000 - $62,000
  - Boeing, Chevron, Novartis, Lockheed-Martin, G.E. Capital, Raytheon, Pfizer, Glaxo Smith-Kline

- **Government** - $45,000 - $55,000
  - NASA, EPA, USDA, National Center for Food Safety, Michigan Council of Governments

- **Nonprofits** - $45,000 - $55,000
  - Mayo Clinic, Institute Human Genome Therapy, IIT, Research Institute, Institute for Pollution Control

Comparable salaries for BS graduates: $29,000 - $36,000 (NSF data)
Why Should States Consider Establishing PSM Programs?

- The bulk of the new jobs being created are in the non-academic sector; these programs prepare students for employment in non-academe.

- Most universities have a commitment to outreach. PSM programs fit perfectly as they provide well-educated graduates who will apply their skills to endeavors within the state.
Why Should States Consider Establishing PSM Programs?

- Because master’s graduates typically are a less mobile group than PhD recipients. About two-thirds of S&E master’s degree graduates were employed in the state in which they earned a degree compared to about one-fourth of S&E doctorate recipients who plan employment in the state in which they earned their PhD.

- PSM programs are more popular with women and domestic students than traditional master’s programs in Natural Sciences.

- States have a long history of efforts in economic development and these programs are critical to producing a cadre of science professionals who can contribute greatly to managing and growing science & technology based industries in their state.
PSM in Federal Legislation

President Signed America COMPETES Act in August 2007. This Act included language for:

• A PSM clearinghouse at NSF to share program elements used in successful PSM degree programs.

• A grant program at NSF to make awards to institutions of higher education to facilitate the creation or improvement of PSM programs.

• Funding amounts authorized: FY 08 - $10 million; FY 09 - $12 million; FY 10 - $15 million
Recommendations by the NRC about the PSM

- Expand the PSM program authorized in the COMPETES Act beyond the NSF to other federal science agencies.
- Encourage states to endorse PSMs
- Philanthropic institutions should continue to create and sustain PSM programs
- Professional societies and industry associations should include PSMs in their high education strategies
Recommendations by the NRC about the PSM

- Higher education institutions should continue to support the development of PSMs
- Higher education institutions should seek out employers as partners to create and sustain PSM programs
- Employers should partner with higher education institutions to create and sustain PSM programs.
Summary

- Win, Win, Win
  - Win for the student – alternative way to remain in science without getting a PhD
  - Win for the university - provide students with another career option and help solve community workforce needs
  - Win for the employers – local, regional, state – have a technically trained cadre of workers
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