Professional Science Master's: Graduate Science Degrees **Designed** to Prepare for Entrepreneurial Careers

NATIONAL RESEARCH COUNCIL

COMMITTEE ON WOMEN IN SCIENCE, ENGINEERING, AND MEDICINE

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Why has Sloan Foundation supported PSM?

- 1 of very few foundations devoted to science
- Strong supporter of academic PhDs and postdocs
- BUT: important place for serious graduate science degree configured for needs of entrepreneurial science careers outside Academe
- A new pathway designed for science/math majors who are not interested in pursuing PhD (~ 80%)

Filling Odd Gap in U.S. Science Graduate Education

- Strong: bachelors, PhDs
- But BA/BS insufficient for science career
- Master's: merely entry to (or exit from) PhD?
- Yet PhD too long for many, careers too uncertain
- PhD: less attractive to domestic students?
  - < 20% of majors enter graduate programs in major (NSF)

Meanwhile, science-intensive employers say..

- Need some PhDs, but not in large numbers
- Need graduate-level science knowledge, PLUS…
  - Interdisciplinary teamwork, flexibility
  - Project management
  - Computational skills
  - Communication ability
  - Basic business skills
  - Ethics
  - Legal and regulatory issues

Science undergrads have good questions

- If commit time and foregone income for advanced degree, will I be able to do science?
- Will science careers provide compensation roughly comparable to peers in other professions?
- Is a science career compatible with “having a life”?

What do workforce projections tell us?

- The future is hazy… accurate forecasts impossible
- Perhaps increasingly true:
  - R&D investment unstable: booms and busts
  - Rapid changes underway: globalization, off-shoring
- Some: ⇧ US demand for graduate science skills
- Others: rising low-cost competition (China, India)
- Needed: more <u>flexibility, nimbleness</u>

PSM programs are for:

Students who want to work in:

- Non-academic sectors
- Interdisciplinary careers
- Team oriented environments
- Managerial or other professional level positions
- Emerging areas

Students who are:

- Seeking career advancement
- Re-entering the workforce

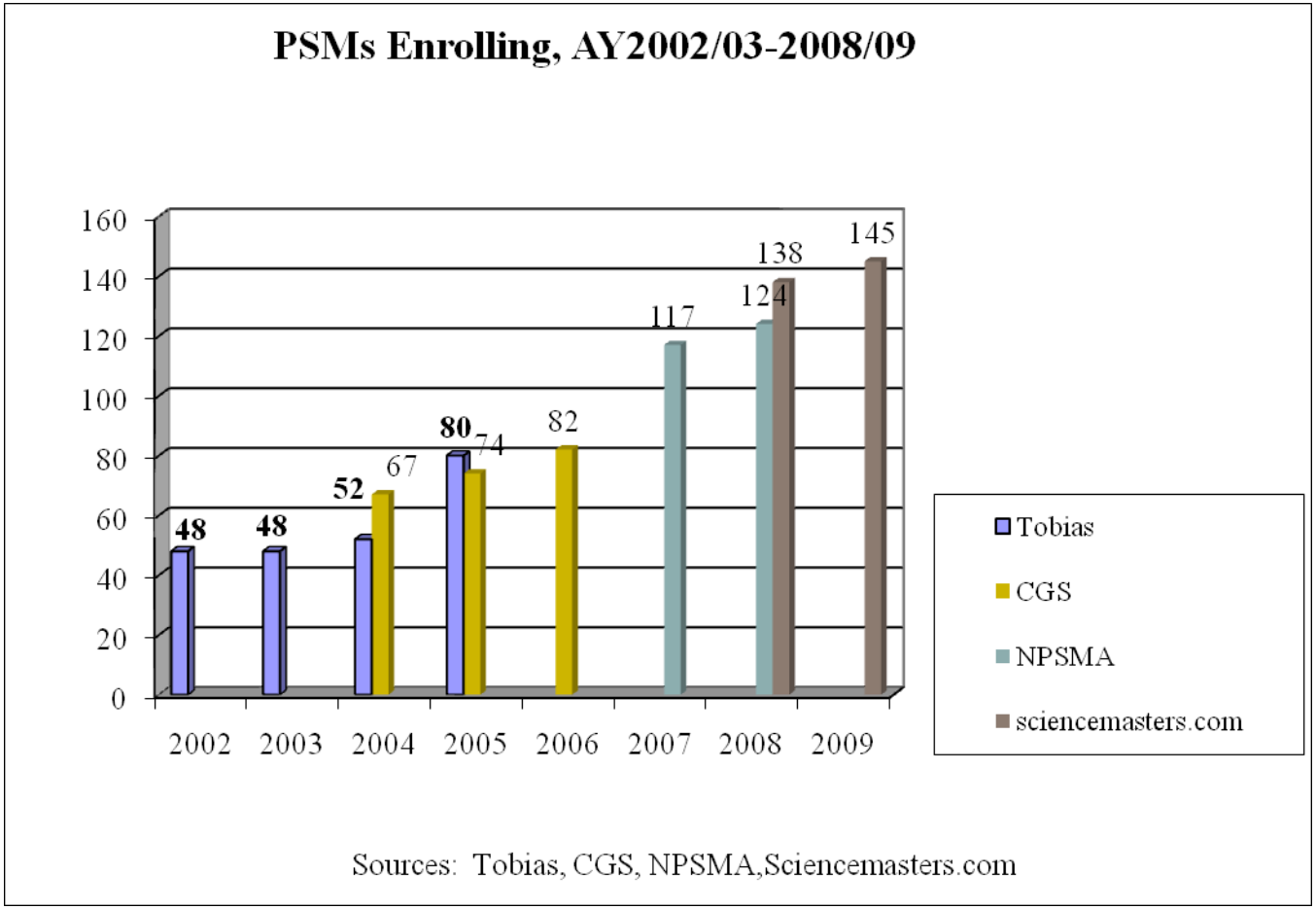
Key elements of PSM degrees

- Rigorous graduate-level science/math coursework
- PLUS needed professional skills, e.g.
  - Management, teamwork
  - Communications (written and verbal)
  - Computational skills
  - Ethics
  - Legal and regulatory issues, intellectual property
- “T-shaped” science professionals
- Some for working professionals (online, hybrid)

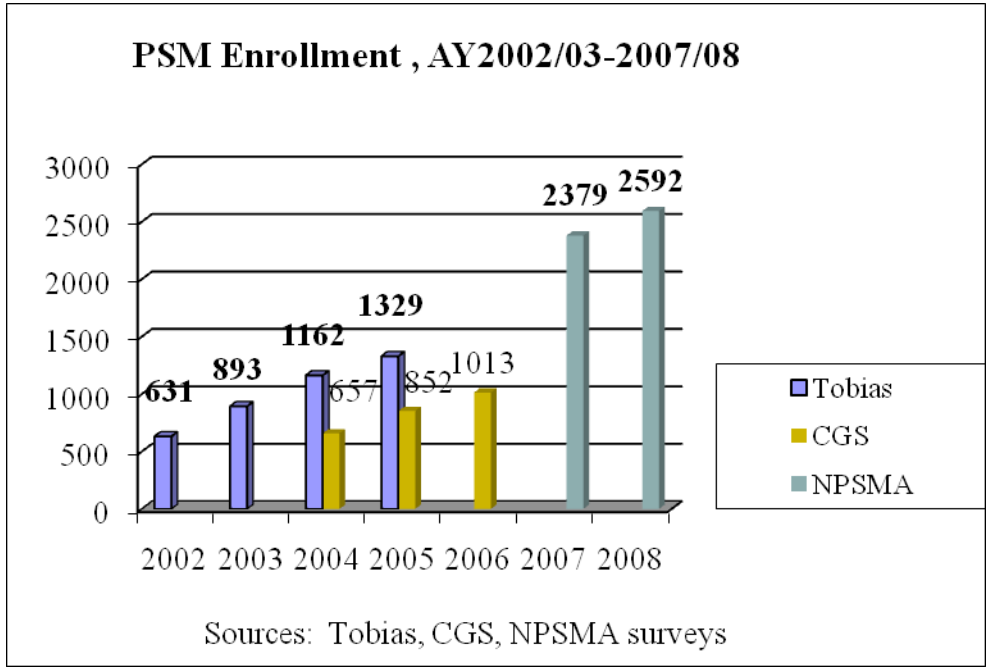
An interim status report

- Proof of concept:
  - Now up to ~145 PSM programs
  - Offered by 77 universities, in 25 states + DC
  - ~2,600 current students
  - >2,600 alumni (majority quite recent)
- Graduates' initial job/career experiences: very good!
- Strong signs of acceleration now in number of PSMs
- BUT still small relative to higher ed in science

PSM program no's (rough): positive trend



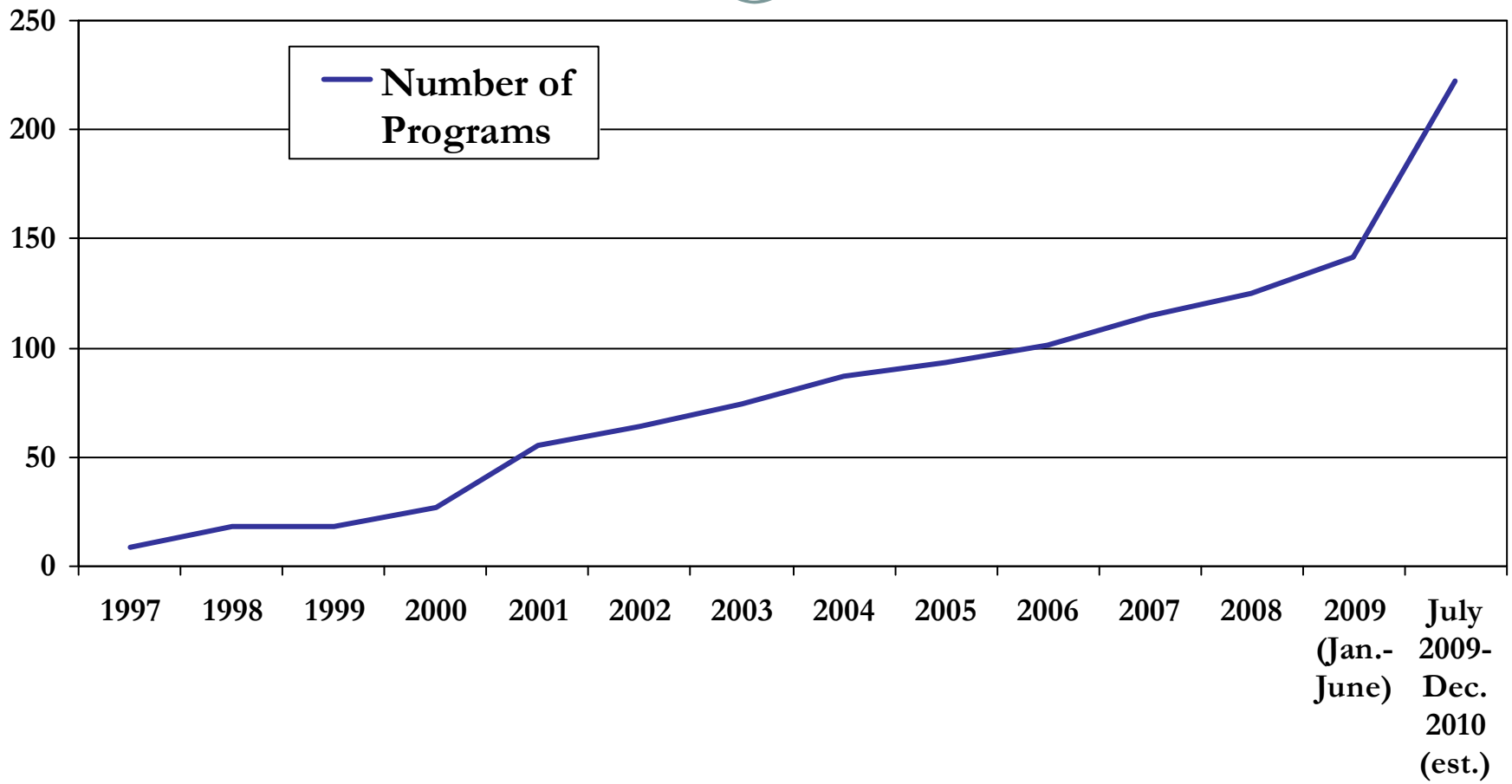
Enrollment trends (rough) are positive



Recent acceleration

- Major statewide/systemwide initiatives:
  - CA, NY, FL, OR, AZ, NJ, IL
- Numerous PSMs currently in development stage

Trendline (CGS data)



PSM data showing higher % women

38%

PhD Degrees in Natural Sciences

40%

Master's Degrees in Natural Sciences

47%

PSM Degrees 2008**

Source: Eleanor Babco, based on National Science Foundation, and Engineering Degrees: 1966–2006. Detailed Statistical Tables NSF 08-321.
**NPSMA, 2008.

PSM Degree Breakdown by Gender (2008 graduates)

Discipline	Male	Female
Bioinformatics/Biotechnology	54%	46%
Microbiology/Cell and Molecular Bio	45%	55%
Financial Math/Industrial Math	63%	37%
Applied Statistics/Computational Science	58%	42%
Analytical Chemistry/Biochemistry/Forensics	50%	50%
Food Safety/Pharmacology and Toxicology	50%	50%
Environmental and Geosciences	50%	50%
Applied/Industrial Physics	100%	0%
Health/Medical Physics	42%	58%
Total PSM Average	**55%**	**45%**

Explanations from women?

- Interviews (Tobias) -- consistent over time/program
  - 1) PSM offers defined and compact time-to-degree (2 years, compared with open-ended and much longer PhD+postdoc)
  - 2) hence "able to have a career up and running by age 30”
  - 3) PSM career path more compatible with a “having a life”
  - 4) portability of PSM: two-body problem
  - 5) versatility of PSM skills: facilitate career transitions
  - 6) internship: provides “work experience” employers want
- PSM format also facilitates career re-entry

Industry support: Enthusiastic

- Wide array of support
  - Providing advice to faculty leaders
  - Internships for PSM students
  - Hiring of PSM graduates
  - Support for employees to pursue PSM degree
  - Lectures by industry scientists
  - Alternate delivery to workplace (e.g. QUALCOM)
  - Straight cash contributions (e.g. Abbott to SJSU)
- Biotech: Especially strong support (e.g. BIOCOM)

Support from graduate deans & governments

- Strong support from graduate deans
  - Council of Graduate Schools (CGS) playing central role
  - PSM initiatives often led by Graduate Deans
    - E.g. UIUC, FL, SUNY, NC
- Governors: National Governors Association
- National Conference of State Legislatures
- Federal government:
  - COMPETES Act authorized support for PSMs (astonishing)
  - NSF just announced its new funding program (~$15 million)

Where would we like to be in 2011?

- 175-200 PSM degrees, at ~100 univ's, & rising
- 4-5,000 enrolled PSM students, & rising
- Appeal to women science majors not pursuing PhD
- Federal $ support (NSF; + Educ, Energy, DoD, DHS)
- Industry support ($, internships, hiring)
- Strong support coalition (CGS, NPSMA, NGA, NCSL)
- States such as CA, NY, IL, FL, NC, NJ

- OVERALL: PSM "normal" part of US graduate educ

THANK YOU!

Comments/questions are welcome:

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