An Industry Perspective of the Professional Science Master's Degree in California

**NRC Committee on Enhancing the Master's Degree
in the Natural Sciences**

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California Council on Science and Technology

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About CCST

- **Nonpartisan, not-for-profit 501(c)(3) corporation established in 1988 by state legislation (ACR 162 – Farr)**

- **Designed to offer expert advice to the state government and to recommend solutions to science and technology related policy issues**

- **Sustaining institutions:** **University of California, California State University, California Community Colleges, Stanford University, University of Southern California, California Institute of Technology**

- **Affiliate members:** **Lawrence Berkeley National Laboratory, Lawrence Livermore National Laboratory, Sandia National Laboratory/California, Stanford Linear Accelerator Center, NASA Ames, Jet Propulsion Laboratory**

- **Work funded by state agencies, foundations, industry**

- **14 Board members, 30 Council members, 122 Fellows, 11 Cal TAC**

    - **6 Nobel Laureates, 80 National Academies members, 12 National Medals of Science or Technology**

Selected CCST Activities

- *Critical Path Analysis of California's Science and Mathematics Teacher Preparation System* (2007)

- California Response to "Rising Above the Gathering Storm" (2007)

- California Teacher Advisory Council (Cal TAC) joint meeting with NRC Center for Education and Teacher Advisory Council (2007)

- Energy strategies for California

- *California's Federal Laboratories: A State Resource* (2006)

- *Policy Framework for Intellectual Property Derived from State-funded Research* (2006)

- *Policy Framework for Intellectual Property Derived from Stem Cell Research* (2005)

- Health Information Technology

- *Nanoscience and Nanotechnology: Opportunities in California* (2004)

- *Benefits and Risks of Food Biotechnology* (2002)

- *Critical Path Analysis of California's Science and Technology Education System* (2002)

Critical Path Analysis of California's S&T Education System (2002)

- Follow up to *California Report on Environment for Science and Technology*

- Comprehensive analysis of entire STEM education pipeline

- Among findings:

  - Master's degrees in significant demand in CA

  - Growth in S&E master's degrees largely driven by increased participation of women in health & life sciences

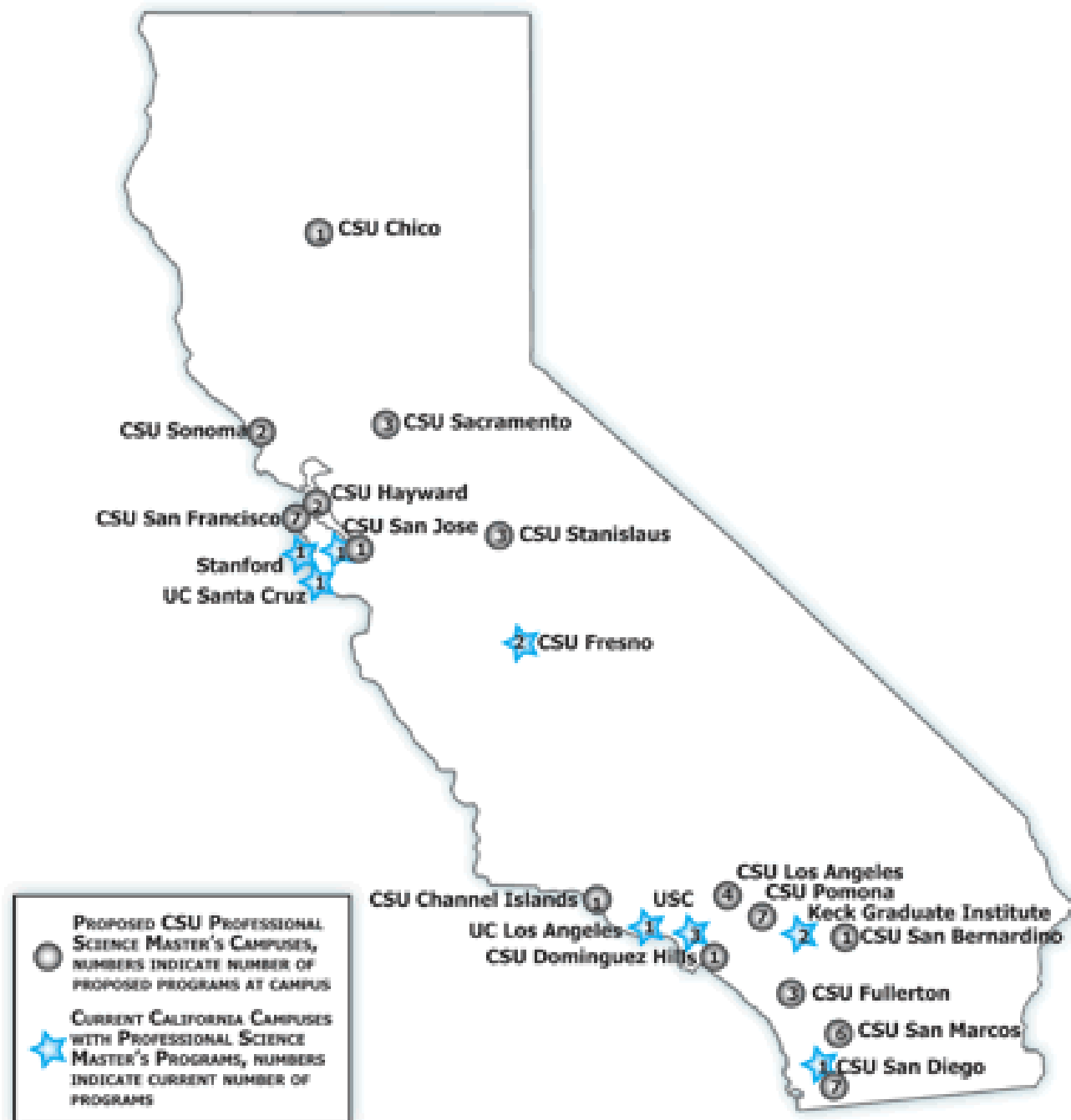 - Significant percentage (>35%) awarded to non-resident aliens
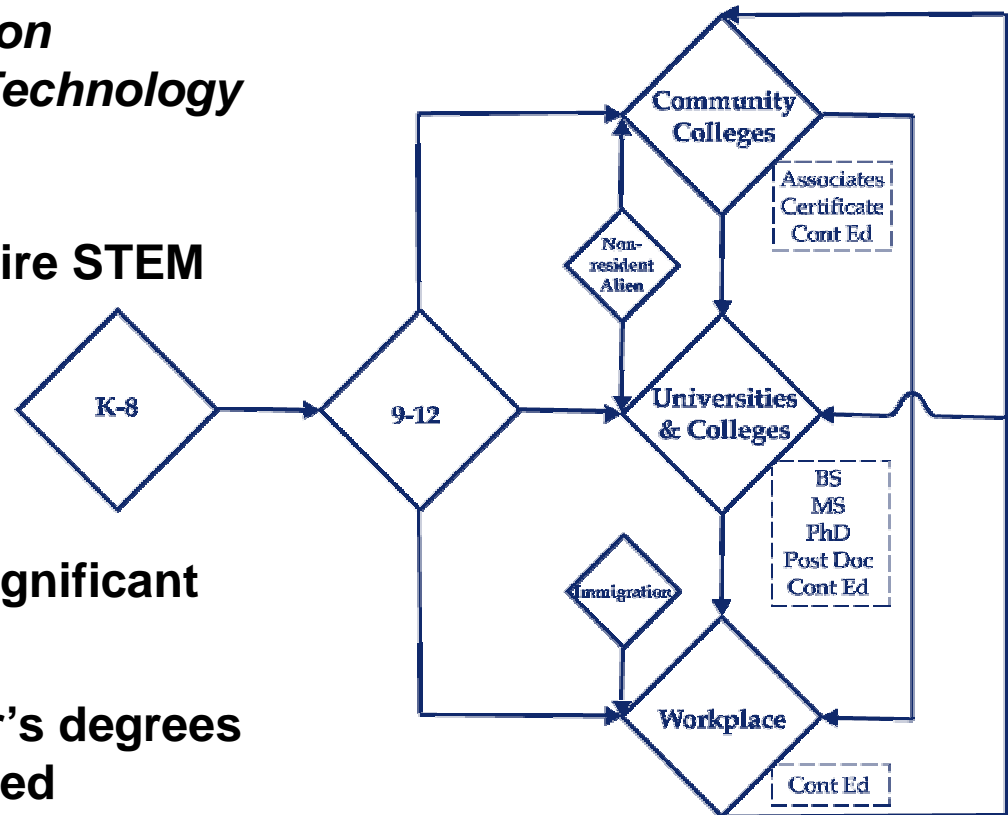
Recommendations included expanding terminal/professional master's degree options

California State University System

- **23 campuses, 414,000 students**

- **Largest system of postsecondary education in the US that does not include community colleges**

- **Prepares 55% of California's teachers, 40% of engineering graduates; more graduates in business, agriculture, communication, health, and public administration than all other CA colleges and universities combined**

- **Overall, approximately half the baccalaureates and a third of master's degrees awarded by CSU**

- **Sustaining CCST member**

California State University System Coalition (2004)

- **15 CSU campuses seeking to establish and/or enhance Professional Science Master's programs with assistance of Alfred P. Sloan Foundation (team leader: Faramarz Valafar, professor of Computer Science, San Diego State University)**

- **To date, PSM programs had been created in conjunction with local industries/industry clusters; wider assessments of need lacking**

- **CSU Chancellor Charles Reed requested that CCST help assess "whether and to what extent there is a high-tech industry demand for the PSM"**

- **Support: $20K from Sloan Foundation, $10K from CSU**

CSU Chico ①

CSU Sonoma ②　　　③ CSU Sacramento

CSU Hayward

CSU San Francisco ⑦　CSU San Jose

Stanford ☆ 1

UC Santa Cruz ☆ 1

☆ 2 CSU Fresno

CSU Los Angeles

CSU Channel Islands ①　USC　④　CSU Pomona

UC Los Angeles ☆ 1　☆ 1　⑦　Keck Graduate Institute

CSU Dominguez Hills ①　　☆ 2　① CSU San Bernardino

③ CSU Fullerton

⑥ CSU San Marcos

☆ 1 CSU San Diego

⑦

PROPOSED CSU PROFESSIONAL SCIENCE MASTER'S CAMPUSES, NUMBERS INDICATE NUMBER OF PROPOSED PROGRAMS AT CAMPUS

CURRENT CALIFORNIA CAMPUSES WITH PROFESSIONAL SCIENCE MASTER'S PROGRAMS, NUMBERS INDICATE CURRENT NUMBER OF PROGRAMS

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Prepared for the California State University System

JANUARY 2005

PSM

CALIFORNIA COUNCIL ON SCIENCE AND TECHNOLOGY

- **Qualitative study of industry need**

- **Industry cluster data used to identify promising sectors to focus on near existing and planned PSM programs**

- **Goal: target high-level executives, scientists, and managers with the ability to constructively evaluate a set of qualifications that may not fit current employment niches**

Focus group/interview areas

- **Greater Sacramento:**
    - **Agricultural Biotechnology and Environment**
    - **Government**

- **San Francisco Bay Area:**
    - **Bio/Nano/Information Sciences**
    - **Computer Sciences and Software**
    - **Environmental Technologies**

- **Southern CA/Los Angeles:**
    - **Nanotechnology-Materials Sciences**
    - **Specialty Manufacturing (Pharmaceuticals, MIMS, aerospace, military, etc.)**

- **San Diego:**
    - **Biotechnology**
    - **Telecommunications and Computing**

Contacts made w/assistance from Regional technology alliances, economic development agencies & partnerships, CCST members

Participation

- CCST contacted 144 companies and agencies by letter, email and telephone over a 2-month period

- Preferred targets:
  - President/CEO/Center Director
  - COO
  - VP of Business Development or Researc
  - VP of Human Resources

- 36 participants, including 11 CEOs and presidents
  - 15 participated in 90-minute focus group meetings
  - 21 participated in telephone interviews (20 minutes)

  - Prior to meetings and interviews, participants asked to read a 1-page background description of the PSM program

Questions asked in both settings:

1. Have you heard of the PSM prior to our contacting you? What has been your experience?
2. How can CSU align PSM programs with industry and structure course content?
3. Do you currently provide input to local university programs? How? Who initiated this contact?
4. How should CSU be connecting with industry? Is it doing this?
5. How do you recruit currently?
6. How can recruitment be improved?
7. What can we do to ensure the success of existing and new PSM programs?
8. Would you hire a PSM graduate today if available?
9. Do you currently use internships? Paid or unpaid?
10. Would you offer an internship to a PSM student?
11. Would you sit on an advisory board to a PSM program?

Participating companies

QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

Results: Interest in skills, but more info needed

- **Many participants learned of PSM for first time through this study; those who were previously familiar with PSM more easily able to provide constructive feedback**

- **Essential goal of PSM program concept - to increase quantity and quality of graduate degree recipients - strongly supported**

- **Total sample size neither random nor sufficient to count as comprehensive and statistically accurate assessment of potential need, but participants provided valuable insight into strengths and pitfalls of expanding PSM programs**

Perceived strengths

- **Any program increasing overall number of STEM graduate degrees seen as positive**

- **Addition of business-related coursework is valuable**

- **Inclusion of internships is attractive, though dependent on program**

- **Companies welcome increased university-industry interaction (via advisory boards)**

- **PSM is one of several logical and needed evolutionary steps in the development of interdisciplinary graduate degrees**

Principal concerns

- **Other ways to instill business skills in graduates may be preferable**

- **Degree may not be valuable to recipients**

- **Degree may not be portable**

- **Lack of research thesis a detriment for some companies**

- **PSM programs may not increase overall master's recipients, but siphon students from existing programs**

Key issues: communication
Companies want greater participation in decision making

- "I'm a UCLA advisory board member, and founded the first nanotech spinoff from UCLA, but I get better info on internships from USC." (GeneFluidics)

- "Universities should develop curriculum with industry from the beginning." (SAIC)

- "You need to be able to tell the story in an elevator… Universities are really bad at this skill. Partnerships with industry will be expensive to the university; it will be their job to build relationships." (Pixar)

- "I'd like to have a better relationship with CSU, but the way we connect is through networking, word of mouth." (PerMedics)

Key issues: qualification
Companies want strong skill sets

- "You do not want a jack-of-all-trades." (Diversa)

- "We'd rather take an MBA or a scientist and train them ourselves." (Genentech)

- "I liked the part about teamwork, communication and presentation skills… we highly value those skills." (California Energy Commission)

- "We'd hire them if they were good… Just be sure students have a strong background in the fundamentals." (Bayer)

- "I find that master's level people with an applied orientation are often better than Ph.D.s." (EPA)

- "General competency must not leave out specific mastery… The student must be good at something." (Pixar)

Recommendations:
1. The PSM program must establish credibility in order to be accepted on a widespread basis

- **"There will need to be a branding of the individual… The degree needs to be seen as a real addition to the STEM community." (Cubic)**

- **"Relevancy is important. Do these graduates have skills and relevant knowledge? If I don't know they exist, how will I find them?" (SAIC)**

- **"The CSU PSM program will have to graduate high-quality students… Employers will have to be convinced of the greater value of including more business training at the expense of some technical training. (Lawrence Livermore)**

- **"Be selective in your early candidate choices." (HRL Laboratories)**

Recommendations:
2. In order to succeed, the PSM must be targeted to industries where it is best suited

- **"This is a great opportunity… I'm enthusiastic about it." (Palo Alto Research Center)**

- **"In my experience, the PSM is not really an advantage to a graduate." (Diversa)**

- **"The PSM program is very exciting. (CALTRANS)**

- **"…Post docs and Ph.D.s are relatively inexpensive. Why would you choose to hire a lower degree?" (Invitrogen)**

- **"If I was looking for an administrative person in a technical company, I'd rather have someone with a PSM degree." (PerMedics)**

Recommendations:
3. Industry and universities need to develop better working relationships

- "Deans and so forth usually only want to talk to me when they want something." (IBM)

- "As past treasurer of the Small Manufacturing Institute, I experienced CSU as an institution that would say 'thanks', but then ignore all input." (Crucible Partners)

- "Put industry leaders on front end committees regarding both curriculum and assessment techniques." (Crucible Partners)

- "As you filter for partners, steer clear of those that aren't in favor of innovation." (Pixar)

Recommendations:
## 4. Statewide partnerships should be explored which best leverage the resources of the CSU

- **"This system is not well organized to find potential interns." (SAIC)**

- **"A very active internship outreach will help the success of recruitment and placing graduates… I get more information now from the University of Singapore placement network than I do from the CSU." (NanoGram)**

- **"There are problems for universities in placing students… The state of California needs to look at what it is providing overall, not just on a campus level." (GeneFluidics)**

Update

- **Coalition submitted system-wide implementation proposal to Sloan Foundation with support of Chancellor; CSU moving forward with expanding PSM programs**

- **Goal: 16 programs on 12 campuses in areas including bioinformatics, biostatistics, biotechnology, clinical project management, computational science, ecological economics, environmental science, and forensic science**

- **Six-year goal: 850 graduates over the first five years; 300 PSM graduates/year thereafter**

- **Sloan has awarded $890,000 towards statewide implementation; California State University match is more than $2 million**

2005
PSM programs (all institutions)
2 programs on CSU campuses
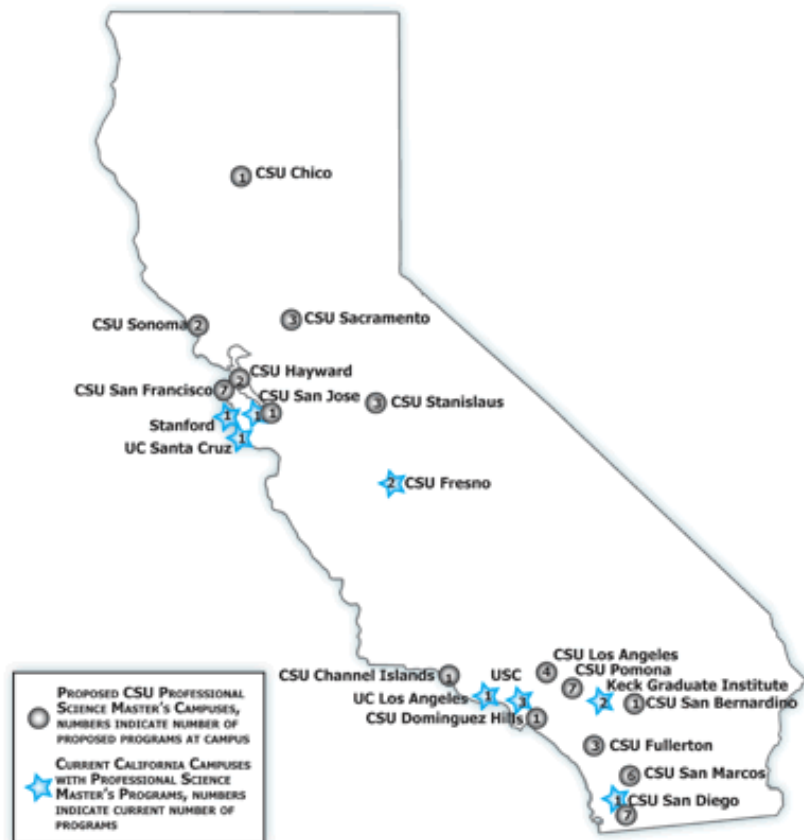
2007
7 PSM programs on
5 CSU campuses

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