

Dr. Rita R. Colwell  
Distinguished University Professor, University of Maryland College Park and  
Johns Hopkins University Bloomberg School of Public Health

**Plenary I: Enhancement and Expansion of the PSM: National Perspectives**  
Professional Science Master's (PSM) Sixth Biennial Meeting  
*PSM: Advancing the Nation's Competitiveness and Innovation Agenda*  
Council of Graduate Schools (CGS)

Washington Court Hotel, Washington, DC  
November 5, 2009

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## Science Professionals: Master's Education for a Competitive World

Rita Colwell, Chair  
Committee on Enhancing the Master's  
Degree in the natural Sciences

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## Study Scope

- A 12-month study to describe the landscape of master's-level education in the natural sciences
- Examine innovations in science master's programs
- Provide recommendations on enhancing master's education in the natural sciences to better respond to the needs of employers in industry, government, and the non-profit sector

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## Study Questions:

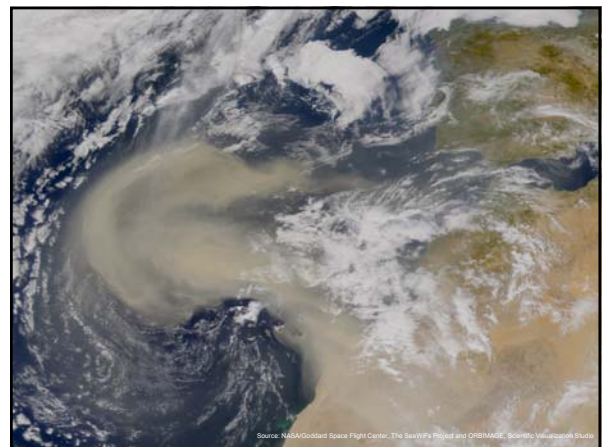
- What is the demand for master's degree holders in the natural sciences? What characteristics do employers seek in staff with advanced training?
- What is known about students who pursue and obtain master's degrees in the natural sciences? What are their educational and career goals?
- How do master's programs support these goals?
- What can institutions and programs learn from efforts already underway to re-shape master's education in the natural sciences?

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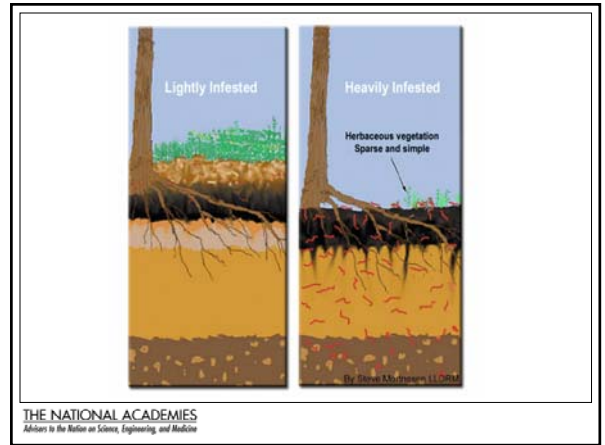
## America COMPETES Act

- Section 7034: Authorizes an NSF program providing grants to four-year institutions to establish or expand Professional Science Master's (PSM) programs
- Adds a study question: based on the answers to the original study questions is this new program appropriate, correctly configured, and adequately supported?

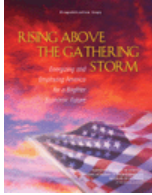
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Source: NASA/Goddard Space Flight Center, The SeaWiFS Polaroid and ORISIMAG, SeaWiFS, Visualization Studio



## *Gathering Storm*



- The vitality and competitiveness of the U.S. economy is due to the investment our nation has made over five decades in research and higher education, yielding a steady stream of scientific and technical innovations.
- Growing consensus we are again at one of those moments when we need bold action to continue to ensure this vitality and competitiveness.

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## Talent

- Talent is one of the important keys to innovation and competitive success. Key steps:
  - Reform K-12 science, technology, engineering, and mathematics, especially by ensuring teacher quality
  - Encourage undergraduates to pursue scientific and technical education and careers
  - Supporting doctoral students who will undertake future research is fundamental.
  - Yet, the master's-trained segment of the science workforce is also pivotal

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## Tradition of Educational Investment

- In the course of our nation's history, our leadership has made bold moves to equip our people with the skills and knowledge needed for the future:
  - Morrill Land Grant Act of 1862
  - Serviceman's Readjustment Act of 1944 (commonly known as the GI Bill)
  - National Defense Education Act (NDEA) of 1958
- Each of these actions reflected the needs of its times and spurred social, economic, and technological change through undergraduate and graduate education.

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## RECOMMENDATION

- The time is now right to accelerate and spread nationally the development of professional science master's education that:
  - has deep knowledge of science
  - is interdisciplinary in character
  - strongly emphasizes effective communication and problem solving, and
  - provides an understanding of entrepreneurial skills and technical innovation.

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## Professionalization of the Master's

- Science jobs require "T-shaped" people who are **both broad and deep**: they speak the language of many disciplines, and are deep in at least one area
- Need for new professional science master's programs to train them

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"Need I-shaped, T-shaped, π-shaped people..." – Stuart Feldman (Oct. 6, 2006)

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## Appeal to students

- Professional master's programs attract students who want to work in nonacademic sectors, managerial or other professional level positions, or emerging areas of science and scientific discovery.
- They appeal to students who seek career advancement, look to gain a competitive edge, or want to refine professional and technical skills in order to reenter the workforce.

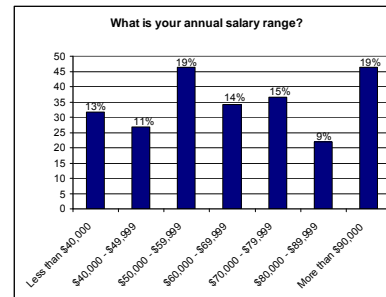
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## Appeal to Employers

- PSM graduates work for
  - Finance, insurance and other large firms who need mathematics and data analytics
  - a maturing biotechnology industry with a growing need for middle managers
  - services corporations like IBM that require employees with depth in science and breadth in business and customer skills;
  - government agencies that need scientific and technical talent

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## 2009 Alumni Employment Survey



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## Federal Government

- We recommend that Congress appropriate funds for the PSM program authorized in the COMPETES Act beginning in FY 2009:
  - If this program flourishes and demand for PSM graduates increases as much as we expect it will, then program funding will need to be considerably larger than the levels that Congress has so far authorized.
  - If the program is to meet needs across the government, it should be the responsibility of the NSF and also all other major federal science agencies as well.

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## Major Federal Science Agencies

- National Science Foundation
- National Aeronautics and Space Administration
- Department of Defense
- Department of Energy
- Department of Health and Human Services (National Institutes of Health)
- Department of Commerce (National Institute of Standards and Technology and National Oceanic and Atmospheric Administration)
- Department of Agriculture
- Department of Interior
- Department of Homeland Security

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## Other Actors

- State Governments
- Philanthropic institutions
- Professional societies
- Business associations

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## Higher Education Institutions

- **Higher education institutions** should continue to develop master's degree programs in the natural sciences to meet the needs of students seeking science-based careers and of the employers who hire them.
  - Provide incentives to and support for faculty to participate in these efforts
  - Reach out to and work as partners with employers to create and sustain programs.
  - Informing undergraduate students, alumni, and other potential graduate students of the professional science master's degree opportunity.

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## Higher Education and Employers

- The use of external employer advisory councils will provide substantive, real-time input for framing of new science master's programs and practical assistance with
  - Curriculum development
  - Mentoring
  - Marketing
  - employer-sponsored projects
  - Internships
  - hiring for graduates
  - financial support.

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## Science Professionals: Study and Dissemination Process

Peter Henderson, Study Director  
Committee on Enhancing the Master's  
Degree in the natural Sciences

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## NRC Study Committee

- Industry (3)
- Government (4)
- University/College Presidents (5)
- Deans (2)
- Master's Program Directors (2)

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- **Rita R. Colwell**, *Committee Chair*, Chairman, Canon US Life Sciences, Inc., University of Maryland, and Johns Hopkins University
- **David S. Chapman**, University of Utah
- **Jung Choi**, Georgia Institute of Technology
- **Daryl E. Chubin**, American Association for the Advancement of Science
- **Mary E. Clutter**, National Science Foundation (retired)
- **Paul G. Gaffney II**, President, Monmouth University
- **Lee L. Huntsman**, University of Washington, and Life Sciences Discovery Fund Authority
- **Jonathan Kayes**, Central Intelligence Agency
- **Donald N. Langenberg**, University of Maryland-College Park and University System of Maryland
- **George M. Langford**, University of Massachusetts, Amherst
- **Henry Riggs**, Keck Graduate Institute of Applied Life Sciences
- **James C. Spohrer**, IBM Almaden Research Center
- **Richard A. Tapia**, Rice University
- **Thomas Tritton**, Harvard Graduate School of Education and Chemical Heritage Foundation
- **Philip Tuchinsky**, Ford Research & Advanced Engineering (retired)

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## Information Gathering

- Experts in competitiveness, graduate education, and industry workforce needs testified to the committee at its meetings in March and July 2007;
- Representatives of innovative master's degree programs in the natural sciences presented descriptions of those programs to the committee
- Officials of the Alfred P. Sloan Foundation, the National Science Foundation (NSF), and the Council of Graduate Schools (CGS) provided the committee with their perspectives on master's education, particularly in the larger context of graduate education and U.S. economic competitiveness;
- The committee reviewed and assessed Section 7034 of the America COMPETES Act—signed into law during the course of this study—that authorizes the NSF to develop a program of grants for the creation or expansion of professional science master's degree programs; and
- Staff conducted a review of the relevant literature and data.

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## Publication

- 300 pre-publication copies at release
- 2,000 published copies of final report
- 643+ published copies sold by NAP
- Free PDF of report on NAP web site
  - 1,200+ downloads of Summary or Full Report
- 2-page report brief
  - 1,179 mailed to Presidents and Provosts

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## Dissemination of Report

• Sloan	100
• NSF	4
• NPSMA/PSM Directors	250
• CGS/Graduate Deans	501
• CGS/Association use	90
• Sheila Tobias	50

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## Dissemination of Report

• National Governors Assoc	61
• Natl Conf of State Legislators	200
• National Assoc of System Heads	54
• AASCU	25
• Council on Competitiveness	100
• Business-Higher Ed Forum	50
• NC Biotechnology Center	50
• California State Univ. System	200

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## Briefings

- Pre-Release Briefings:
  - Michael Teitelbaum, Sloan Foundation
  - Arden Bement and Cora Marrett, NSF
  - House Science Committee
- Public Release Meeting, 7/11/08
- Council of Graduate Schools, Summer Meeting, 7/13/08

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## Presentations

- 10 Presentations: Meetings and Conferences
  - Included Session at 2009 AAAS Meeting
  - 1<sup>st</sup> Annual Air Force STEM Conference
- Capitol Hill Briefing (4/29/09)
  - Congressmen Vernon Ehlers and Brian Baird
  - Primary Speaker: Rita Colwell
  - Discussants: Carol Lynch, Michael Teitelbaum, Lewis Schwartz, Donald Langenberg
- PSM Biennial Conference (11/5/09)

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## Other Media

- Podcasts
- Article in *Science* (3/27/09)
- Web Site

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## CONTACT

Project web site:

<http://www7.nationalacademies.org/bhewmasters/>

Peter Henderson, Study Director:

[phenders@nas.edu](mailto:phenders@nas.edu)

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