THE NATIONAL ACADEMIES

Blueprint for the Future: Framing the Issues of Women in Science in a Global Context Summary of a Workshop

Report Launch

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Advisers to the Nation on Science, Engineering, and Medicine

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Background

- Complex socio-cultural factors operate in different ways across national contexts to influence women's participation in the scientific workforce.

- Studies within and across nations consistently show inverse correlations between level in the career hierarchy and the number of women in science: often the higher the position, the fewer the women. To understand these complex patterns requires an interdisciplinary and international approach.

Project Scope

- Funded by the National Science Foundation (DRL1048010), the project examined status & participation of women in international STEM disciplines and careers, with a focus on:
  - Chemistry
  - Computer science
  - Mathematics and statistics

- This project incorporated social science methods to identify effective strategies, data, and important guidelines for implementing policies and procedures that will increase women's participation and advancement in the global scientific enterprise.

Blueprint Workshop

A workshop was held in 2011 to

- Review the existing international knowledge base and exemplary policies and programs;
- Identify critical gaps in data and research literatures on women in the focused disciplines; and
- Pinpoint issues and topics for further research women in STEM fields that transcend national boundaries.

Collaborators

This project was a product of long-term collaboration by colleagues including:

- The National Science Foundation
- Professional Societies
  - American Association for the Advancement of Science
  - American Chemical Society
  - American Mathematical Society
  - American Statistical Association
- Industry
  - Microsoft
- Academia
  - Georgia Institute of Technology
  - George Mason University
  - University of California, Berkeley
  - University of Virginia
- International Partners
  - Inter-American Network of Academies of Science (IANAS)
  - International Council for Science (ICSU) Rio +20
  - Mie University, Japan
  - Organization for Economic Cooperation and Development (OECD)
  - United Nations University Maastricht

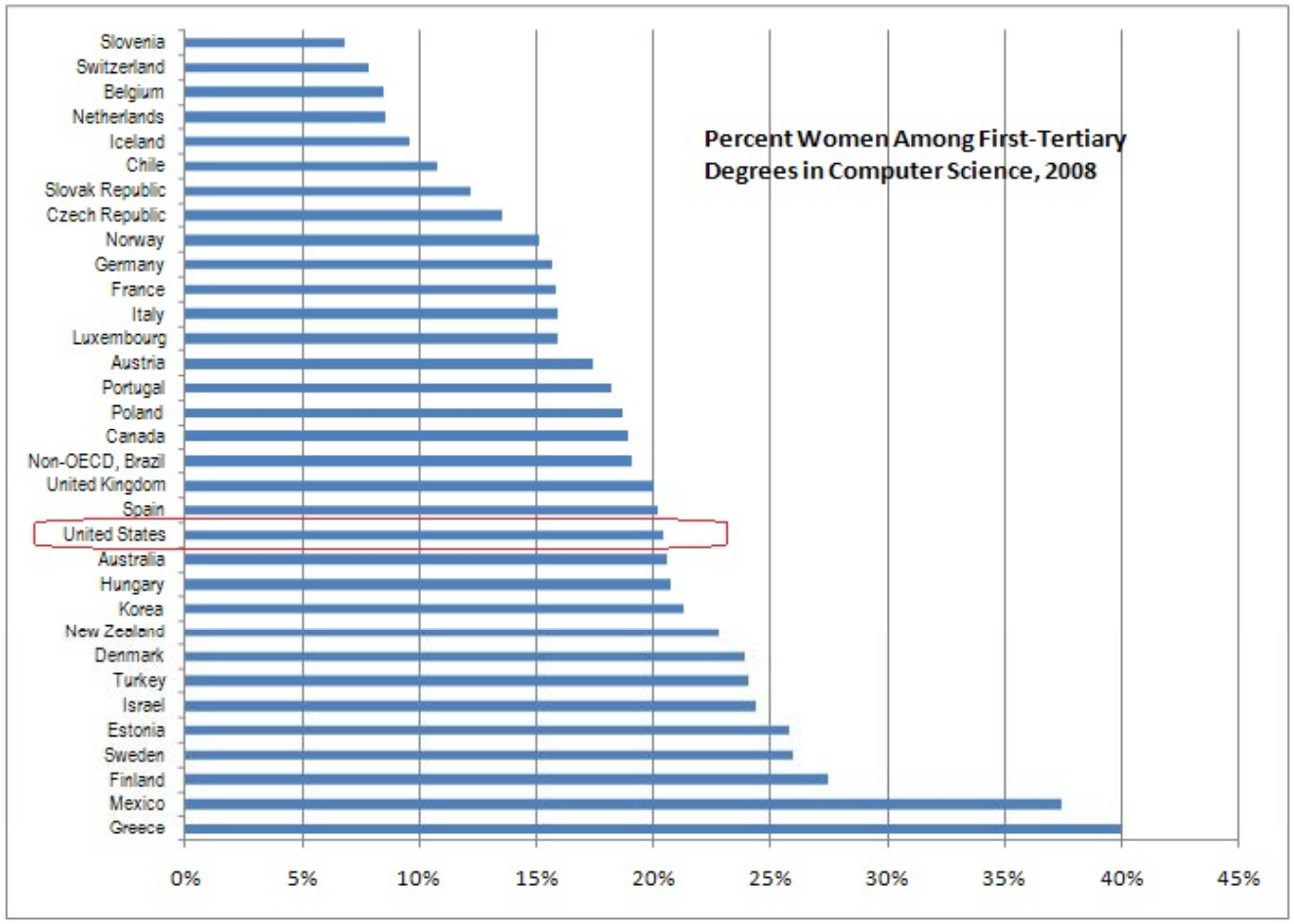
Global Perspectives

- A review on OECD data which provided statistical comparison for both OECD and non-OECD economies in an attempt to identify gaps, patterns, and links among education, employment, and entrepreneurship (3Es),

- A historical perspective on the development of the research university and its impact on women's participation in scientific fields, and

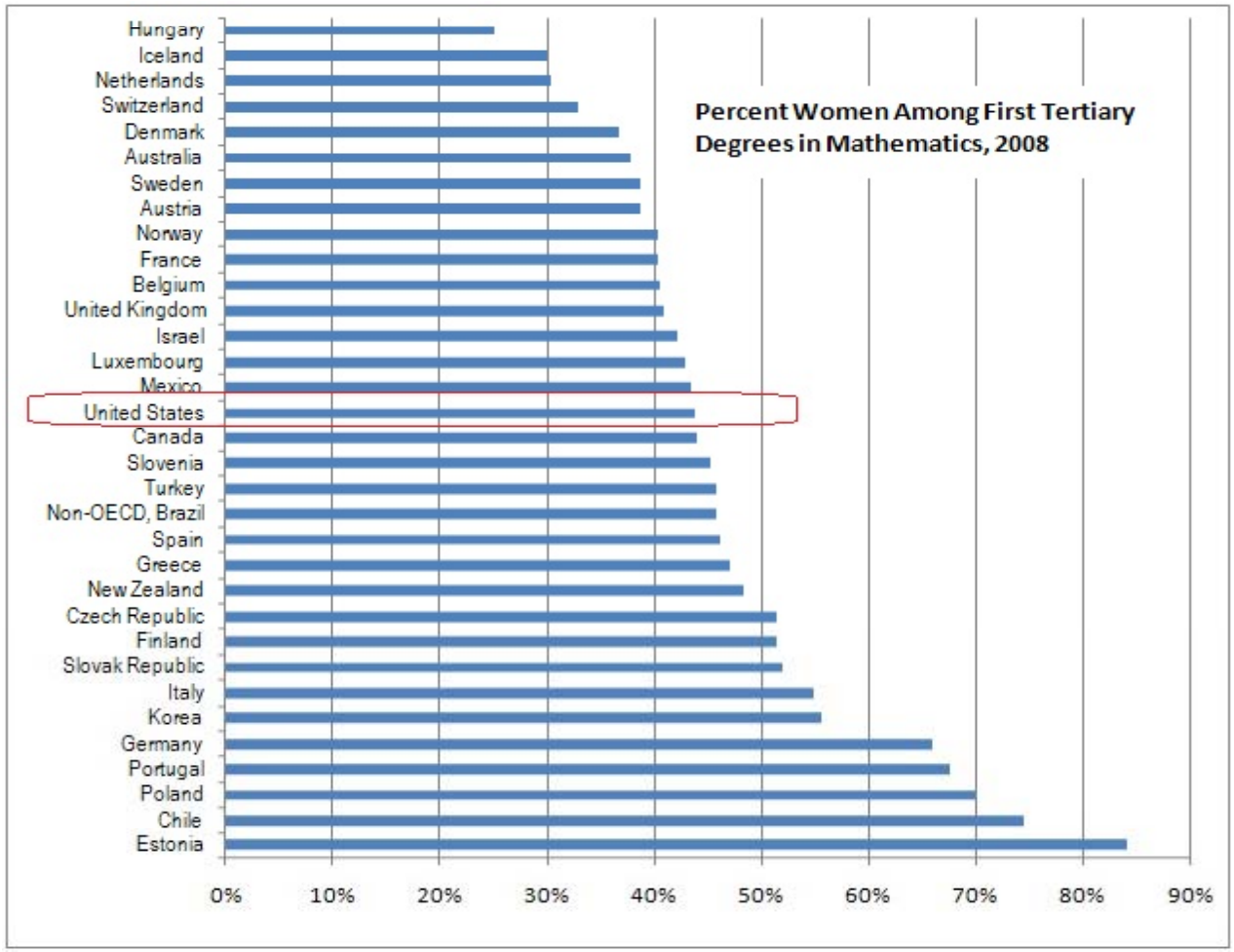
- An overview and analysis of occupational sex segregation in computer science, chemistry, and mathematics and statistics.

Women Among First Tertiary Degrees in Computing, 2008



Source: OECD StatExtracts 2011.

Women Among First Tertiary Degrees in Mathematics, 2008



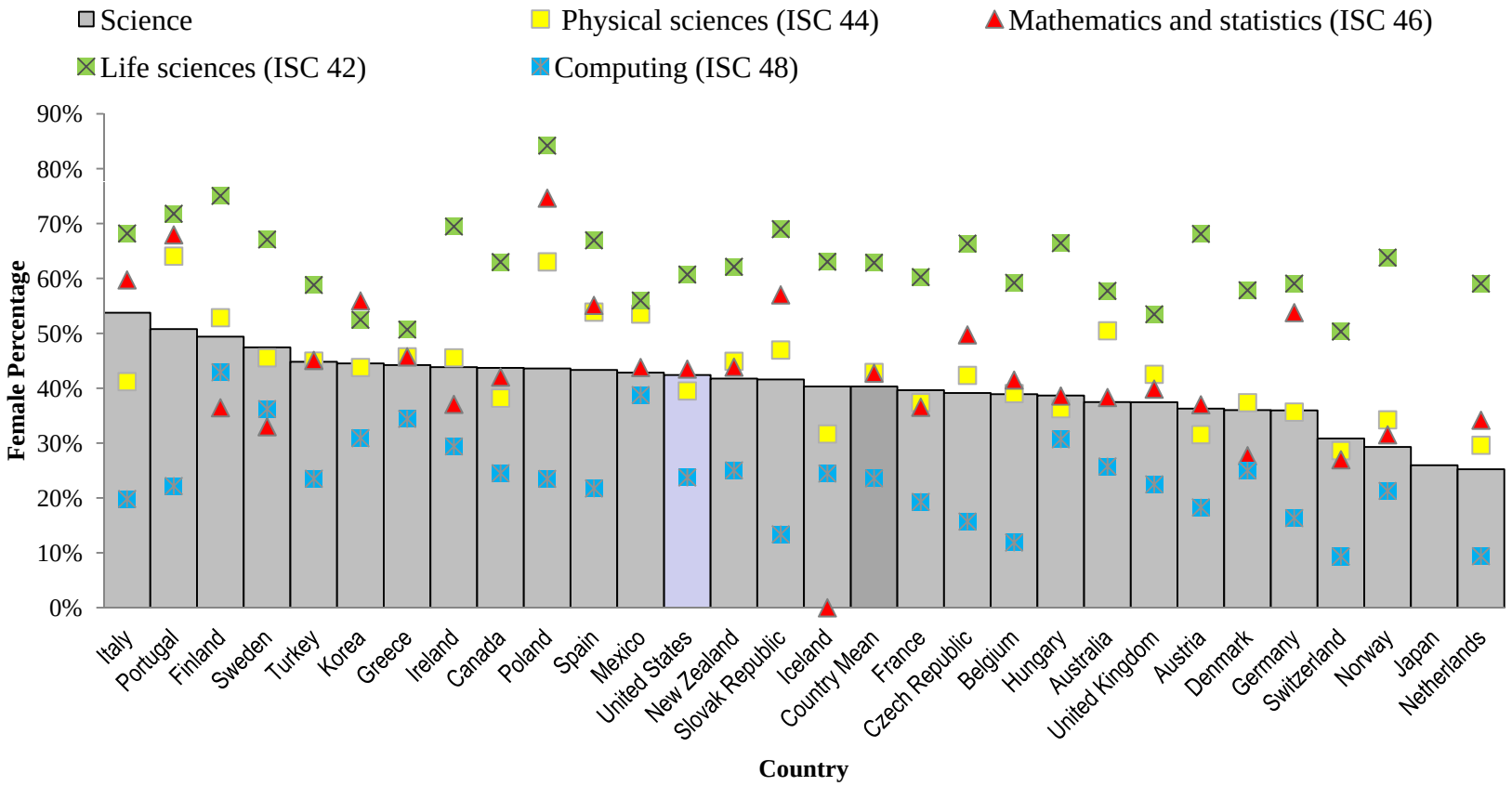
Source: OECD StatExtracts 2011.

Percent of First and Doctorate University Degrees in Chemistry Awarded to Women, and Percent of Women on Academic Chemistry Faculties in Doctoral Institutions, 2008

Country	First Degree	Doctorate	Faculty
US	50%	39%	16%
UK	50%	40%	12%
Germany	40%	38%	11%

Source: Schmitz, K. 2009. Hochschullehrnachwuchs und Professorinnen. 2008. N*achrichten Chemie*. 57:463-465 (April), and "Who is Teaching Whom?" *Complete Report on the Fall 2009 Committee on Professional Training Survey of Faculty Status. American Chemical Society*. Fall 2010. Available at http://portal.acs.org/portal/PublicWebSite/about/governance/committees/training/reports/cptreports/CNBP_025912.

Percentage of Women Graduates* by Field of Study, 2005



Source: OECD Education Database, 2011.
Note: Graduates include students from tertiary type A and advanced research programs.

Women Researchers by Sector of Employment, As a Percentage of Total Researchers, 2008 (OECD)

Country	Business Enterprises	Government	Higher Education	Private non-Profit
Argentina	2.55	13.62	33.38	0.90
Portugal	4.33	8.39	26.54	5.11
Romania	10.85	9.70	22.54	0.18
Russian Federation	22.87	16.19	3.04	0.06
Slovak Republic	4.03	6.71	30.99	0.01
South Africa	5.60	2.67	31.17	0.28
Iceland	12.14	11.67	14.21	1.25
New Zealand	1.89	1.97	27.54	7.87
Poland	3.09	5.81	30.30	0.05
Spain	6.47	7.26	22.86	0.11
Greece	5.33	3.56	27.27	0.21
Turkey	3.67	1.78	30.82	0.00
Sweden	12.97	2.15	20.46	0.16
Slovenia	8.28	10.45	16.56	0.07
Hungary	5.12	7.22	21.13	0.00
Italy	5.09	5.97	19.37	1.92
Norway	7.89	4.59	19.25	0.00
Mexico	5.99	4.83	19.02	1.72
Finland	9.10	4.59	17.32	0.54
Ireland	8.38	1.10	20.76	0.06
Denmark	13.92	2.60	12.86	0.32
Belgium	8.75	1.62	19.36	-0.16
Czech Republic	5.20	8.20	14.99	0.08
France	9.03	3.60	14.51	0.70
Singapore	14.02	2.22	10.85	0.00
Switzerland	6.80	0.65	19.37	-0.08
Austria	5.87	1.90	15.50	0.35
Germany	5.27	3.11	12.99	0.00
Chinese Taipei	8.02	2.79	9.47	0.18
Luxembourg	10.60	5.40	2.21	0.00
Netherlands	5.90	4.61	7.20	0.31
Korea	7.01	0.77	5.08	0.27
Japan	4.11	0.55	7.61	0.14

SOURCE: Organization for Economic Cooperation and Development, Main Science and Technology Indicators Database, April 2008.

Women scientists and engineers by Sector of Employment, As a Percentage of Total Scientists and Engineers, 2008 (United States)

Employment Sector	Women scientists and engineers in S&E occupations, as a % of total scientists and engineers hired in the sector
Business or industry	6.3%
Federal government	10.0%
State / local government	6.7%
Universities and 4-year colleges	16.6%
Nonprofit	4.6%

Source: National Science Foundation. Women, Minorities, and Persons with Disabilities in Science and Engineering, 2011

Concluding Themes

- **Critical role & impact of disciplinary societies:** important organizational structures through which scientists and engineers build communities of practices, reward achievements, and share information,
- **Importance of selection criteria for building exemplary programs:** need specified interventions and target populations, sustainability, demonstrated outcomes, adaptability, and applicability, and
- **Characteristics of promising policies:** data driven, clearly defined problems, coupled with promising programs, specified goals, sustainability and institutionalization plans, and ability to be scaled up and applied across geographic boundaries.