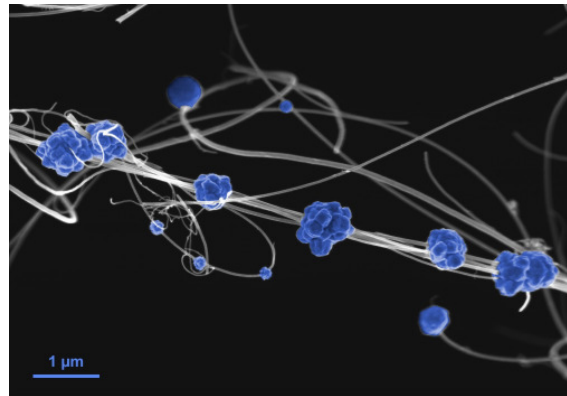


An Assessment of Opportunities - Visions - Developments For Women in Nanotechnology



Julie Nucci
Max-Planck-Institute for Metals Research, Stuttgart, Germany

18 November 2005
Heinz Nixdorf MuseumsForum
Paderborn

What is Nanotechnology?



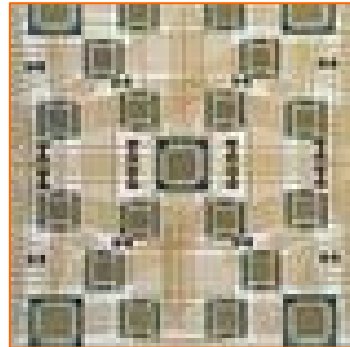
Nanotechnology encompasses the science, engineering, and technology related to the understanding and control of matter at the length scale of ~ 1 to 100 nanometers.

However, nanotechnology is not merely working with matter at the nanoscale, but also research and development of materials, devices, and systems that have novel properties and functions due to their nanoscale dimensions or components.

Source: The National Nanotechnology Initiative at Five Years: Assessment and Recommendations of the National Nanotechnology Advisory Panel, May 2005

Nanotechnology in Germany

Develop market & employment potential in the field of nanotechnology



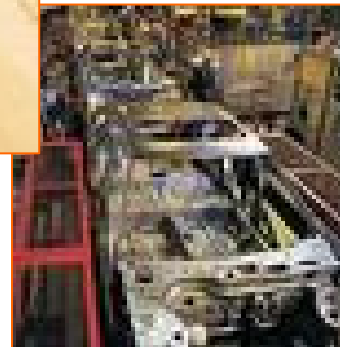
Nanofab



Nanobiotechnology



Nanolux



Nanomobil



Federal Ministry
of Education
and Research

Nanotechnology in Germany

Objectives

1. To create future-oriented jobs
2. To maintain or enhance technological leadership
3. To integrate services
4. To support German companies as “system leaders” on the global market

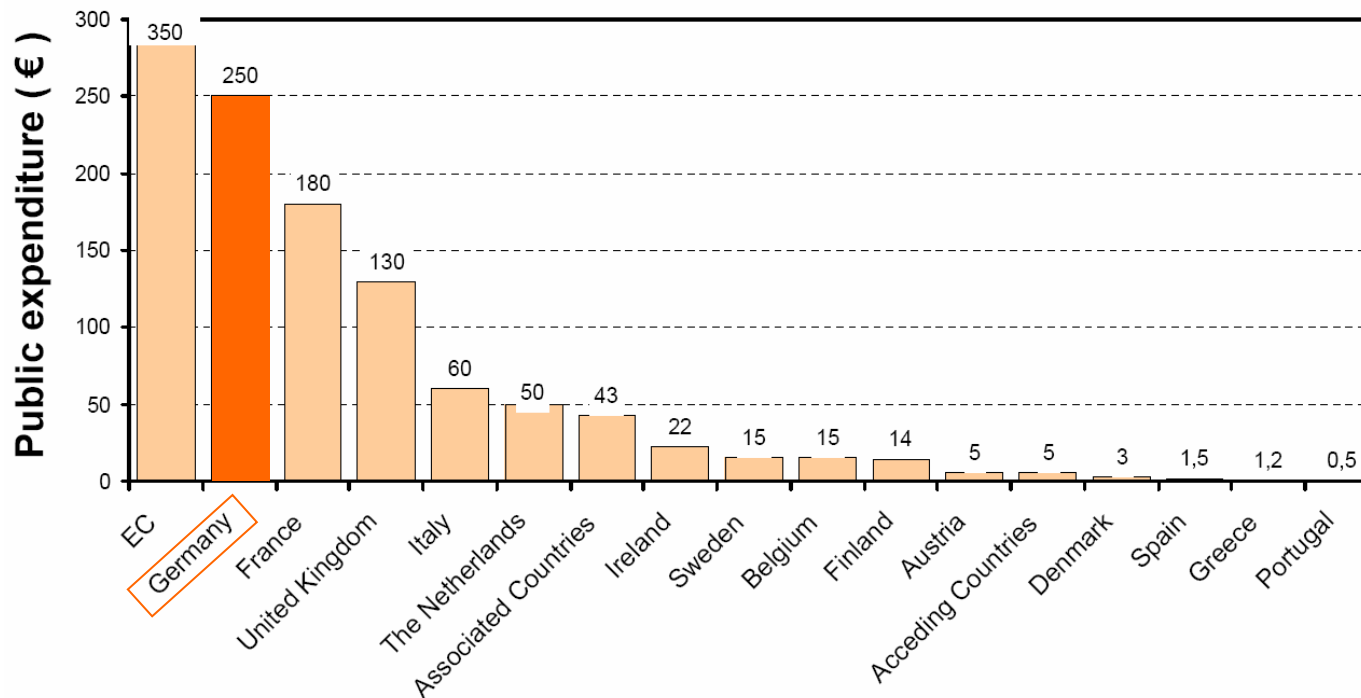
UPI News: 7 November 2005: World Ranking in Nanotechnology

1. United States
2. Japan
- 3. Germany**
4. South Korea

<http://www.bmbf.de/en/nanotechnologie.php>

Nanotechnology in Europe

- **Absolute public investment in Europe during 2003**



Source: European Commission, 2003



EU Nanotechnology Research

NMP

Nanotechnologies and **N**anoscience, knowledge-based multifunctional **M**aterials and new **P**roduction processes and devices

Budgets

6th Framework Programme (2002-2006) – 1.3 billion €

7th Framework Programme (2002-2013)- 4.8 billion € (proposed)

New Nanotechnology Platforms

Nanomedicine & Nanoelectronics



EU Nanotechnology Research

6th FP Focus Areas

Long-term interdisciplinary research into understanding phenomena, mastering processes and developing research tools

Nano-biotechnologies

Nano-metre-scale engineering techniques to create materials and components

Development and handling of control devices and instruments

Applications in areas such as health and medical systems, chemistry, optics, food and the environment



Nanotechnology in the USA

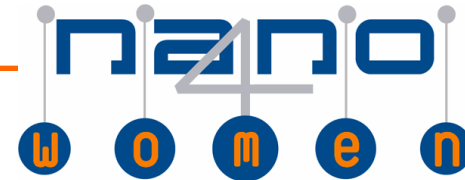
The National Nanotechnology Initiative – 2001

NNI Vision Statement

The vision of the NNI is a future in which the ability to understand and control matter on the nanoscale leads to a revolution in technology and industry.

Towards this vision, the NNI will expedite the discovery, development, and deployment of nanotechnology in order to:

1. achieve responsible and sustainable economic developments
2. to enhance the quality of life
3. to promote national security



Nanotechnology in the USA

NNI Centers and Networks of Excellence Multidisciplinary Research Centers

1. National Aeronautics and Space Administration (NASA) – 4
2. National Institutes of Health – 11
3. National Science Foundation – 33
4. Department of Defense – 4

2006 Budget Request for Nanotechnology R & D

1. Fundamental Nanoscale Phenomena and Processes	\$234 million
2. Nanomaterials	\$228 million
3. Nanoscale Devices and Systems	\$244 million
4. Instrumentation Research, Metrology, and Standards for Nanotechnology	\$ 71 million
5. Nanomanufacturing	\$ 47 million
6. Major Research Facilities and Instrumentation Acquisition	\$148 million
7. Societal Dimensions	\$ 82 million
	<u>\$1,050 million</u>

Near Term Goals (1 – 5 Years)

- Nanocomposites with greatly improved strength-to-weight ratio, toughness, and other characteristics
- Nanomembranes and filters for water purification, desalination, and other applications
- Improved catalysts with one or more orders of magnitude less precious metal
- Sensitive, selective, reliable solid-state chemical and biological sensors
- Point-of-care medical diagnostic devices
- Long-lasting rechargeable batteries

Source: The National Nanotechnology Initiative at Five Years: Assessment and Recommendations of the National Nanotechnology Advisory Panel, May 2005

Mid-term Goals (5-10 years)

- Targeted drug therapies
- Enhanced medical imaging
- High efficiency, cost effective solar cells
- Improved fuel cells
- Efficient technology for water-to-hydrogen conversion
- Carbon sequestration

Source: The National Nanotechnology Initiative at Five Years: Assessment and Recommendations of the National Nanotechnology Advisory Panel, May 2005

Long-term Goals (20+ years)

- Drug delivery through cell walls
- Molecular electronics
- All-optical information processing
- Neural prosthetics for treating paralysis, blindness, and other conditions
- Conversion of energy from thermal and chemical sources in the environment

Source: The National Nanotechnology Initiative at Five Years: Assessment and Recommendations of the National Nanotechnology Advisory Panel, May 2005

Nano 4 Women: L'Oréal

Number of Nanotechnology Patents issued:
Top 3 Companies: IBM, Intel, **L'Oréal**

350 million € R&D budget (3% of total sales)

2700 researchers

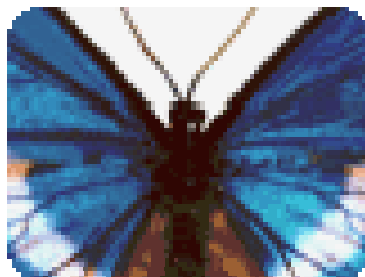
Last 10 years: research budget tripled

Last 50 years: number of researchers has increased 25-fold.

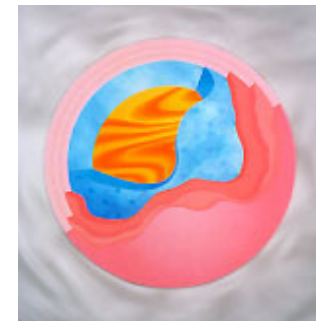
Nanosomes: Intercellular „vehicles“ for active ingredients

Reconstructed Skin

Natural Looking Make-up: biomimetic research



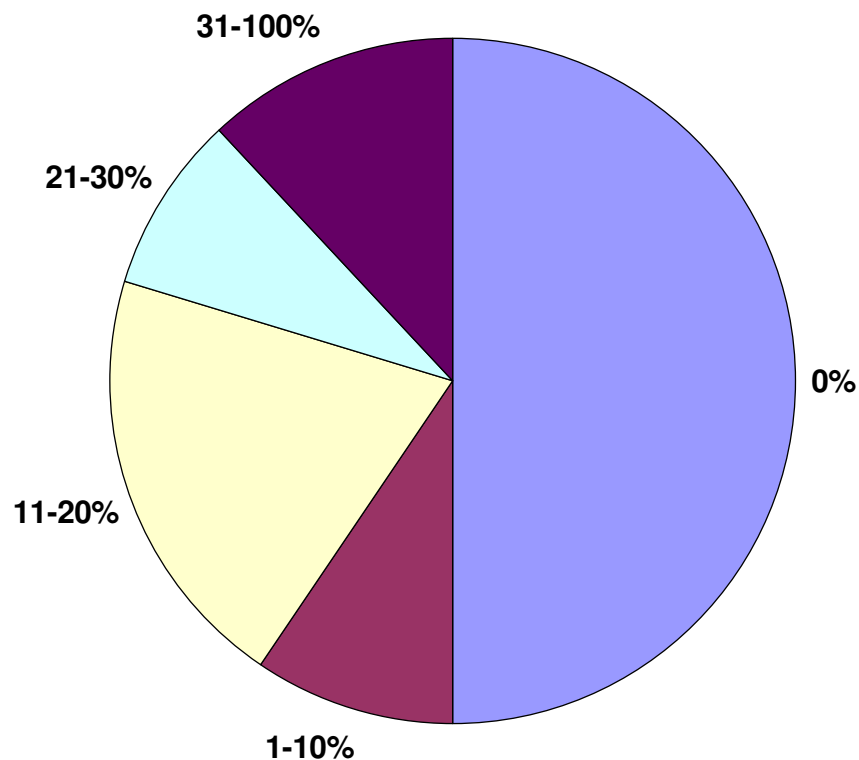
Source: L'Oréal website, Small Times article (2002)



Nano 4 Women in the EU

EU Goal: 40% female participation

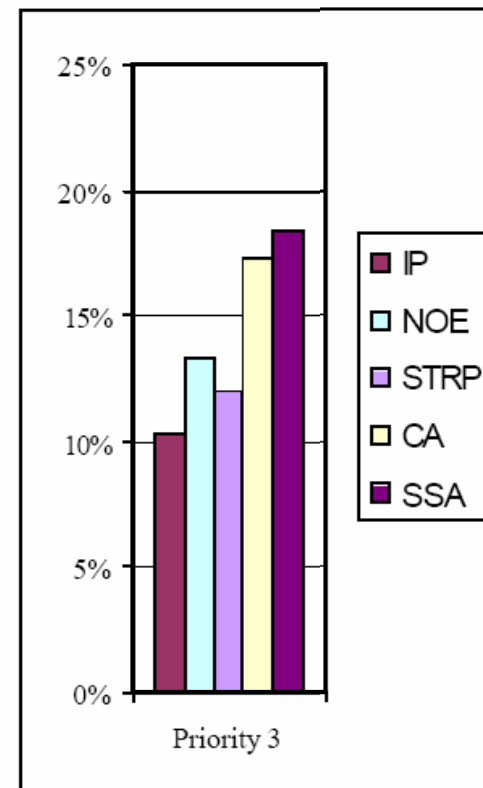
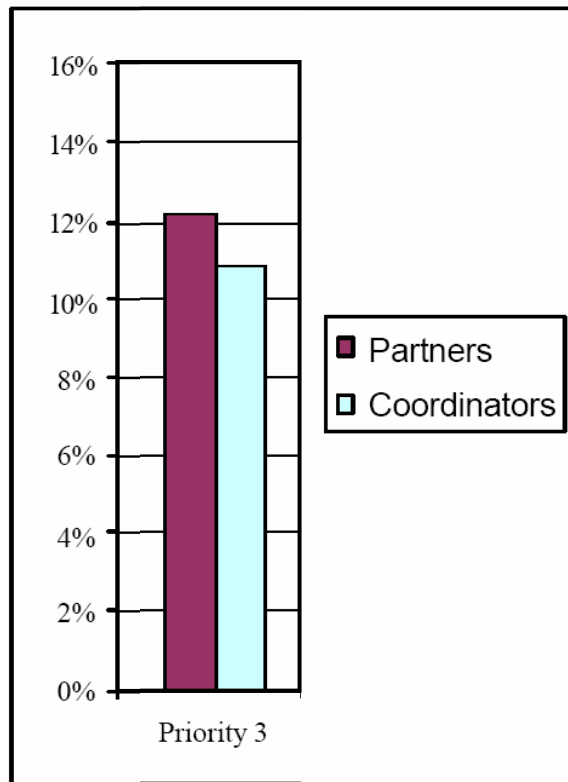
Percentage of Women Among Partners (Submitted Proposals)



Proposal success rate: 19% for women, 23% for men

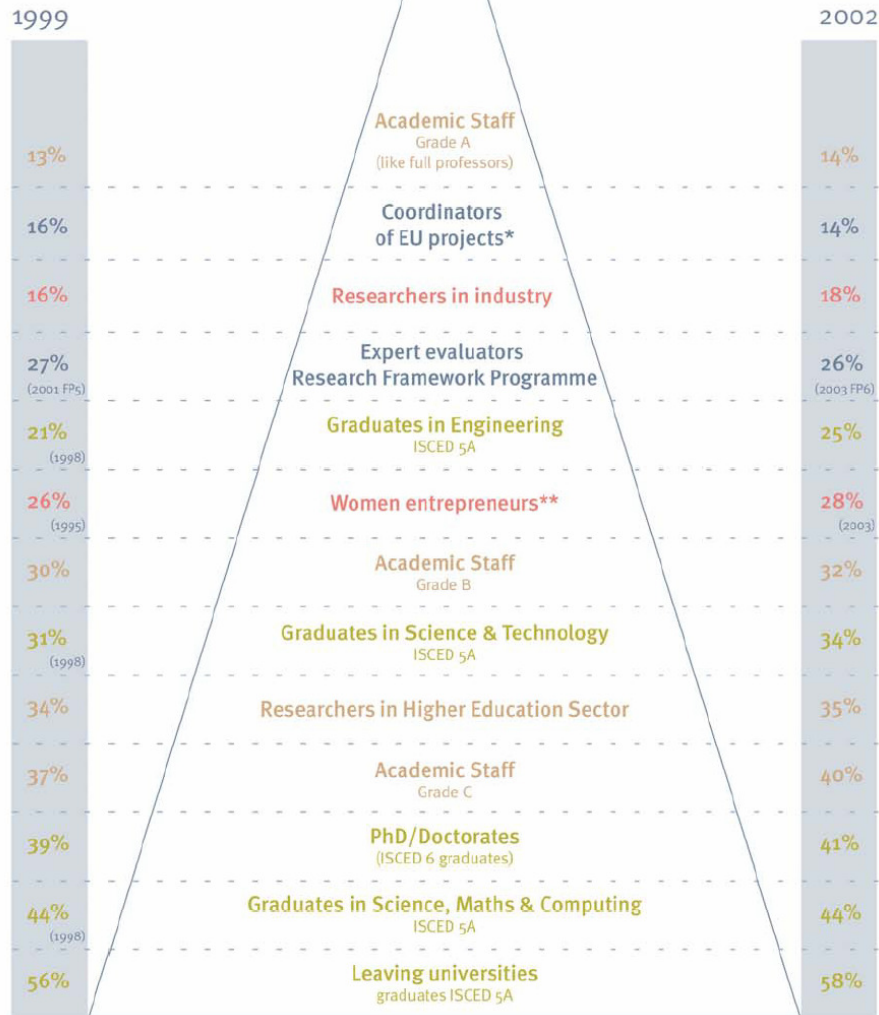
Nano 4 Women in the EU

Female participation in NMP Research Projects



Source: EC: compilation on the basis of data provided by the Commission

Women in Science

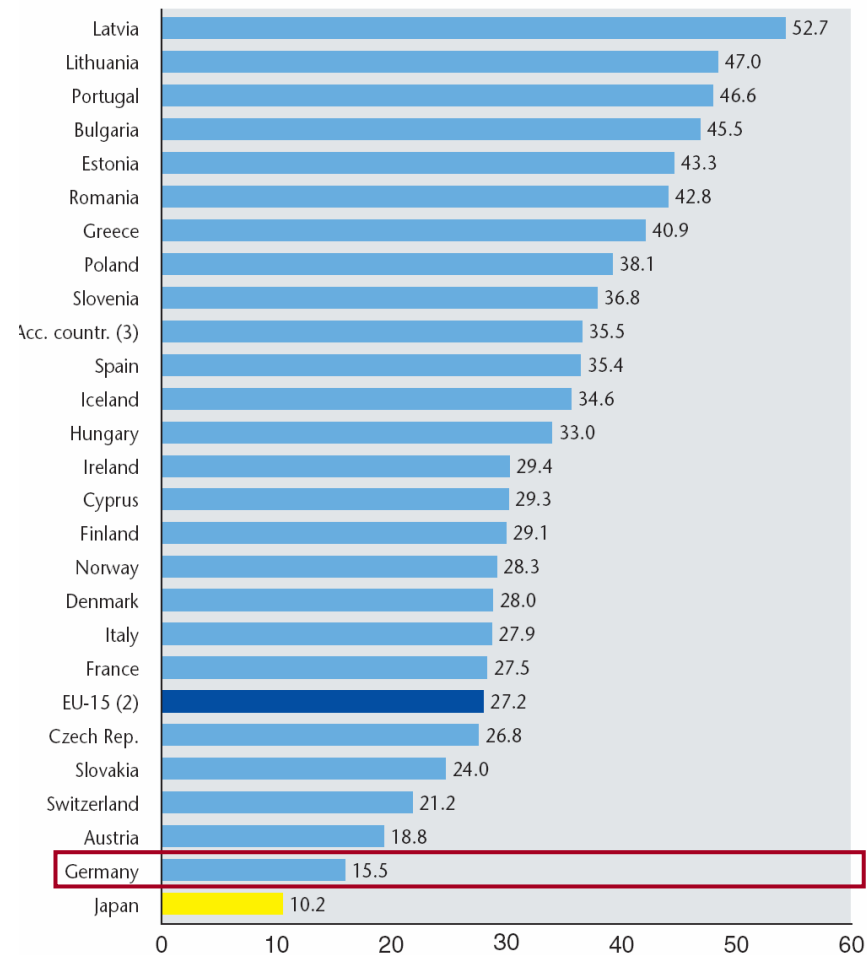


The **very** leaky pipeline

Source: EU Commission Working Document, Women and Science: Excellence and Innovation – Gender Equality in Science, Brussels, 11.3.2005

Women in Research: Europe

Female Researchers as % of all Researchers (2001)



Source: DG Research Key Figures 2003-2004

National Policies for Gender Equality

Table 1: National policies to promote gender equality in science (2004)

	EU-Member States (25)																									
Equality Measures in Science	BE	CY	CZ	DK	DE	EE	EL	ES	FR	IE	IT	LV	LT	LU	HU	MT	NL	AT	PL	PT	SI	SK	FI	SE	UK	
Equal treatment legislation (general)	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Commitment to gender mainstreaming	X	X	X	X	X		X	X	X	X	X		X	X			X	X	X	X	X		X	X	X	X
National Committee on Women & Science	X	X	X	xx	X	X	xx	X	X	X	X		X		X	X		X	X	X	X	X	X	X		
Women & Science Unit in Research Ministry					X		X5	X	X		X							X							X	
Publication of Sex-disaggregated Statistics	X	X	X	X	X	X	X	X	X	X		X	X	xx	X	X	X	X		X	X	X	X	X	X	X3
Development of Gender equality indicators	X4			X	X		X		X	X	X	X			X	X		X		X	X		X	X	X	X
Gender balance targets: public committees	X2			X	X		X		X	X													X	X	X	
Gender balance targets on university ctees		X		X	X				X								X4	X					X	X	X4	
Gender Equality Plans in Univ.& Research I.	X4			X	X				X	X	X			xx			X4	X					X	X		
Gender ² Studies & Research at Universities	X	X	X	X	X	X	X	X	X	X	X	X	X	xx	X	X	X	X		X	X	X	X	X	X	X
Programmes on W&S, special funding available					X		X		X	xx	X	xx	xx			X	X	X			X				X	
Nationwide Centres on Women & Science			X		X																				X	

***Source:** Information provided by the members of the Helsinki group & EOWIN, Summer 2004, DG RTD, UNIT C4 xx = in preparation

²)or women studies/research X1= only BE French-speaking X2= only BE Dutch-speaking X3= not for industrial R&D

x = yes blanc cell = no X4= set by certain universities X5= person only responsible for W&S

Source: EU Commission Working Document, Women and Science: Excellence and Innovation – Gender Equality in Science, Brussels, 11.3.2005

Women in Germany

Google: Rabenmutter: 58,900 hits
Powerfrau: 127,000 hits
Hausfrau: 3,410,000 hits

Hausfrau



Rabenmutter



Powerfrau



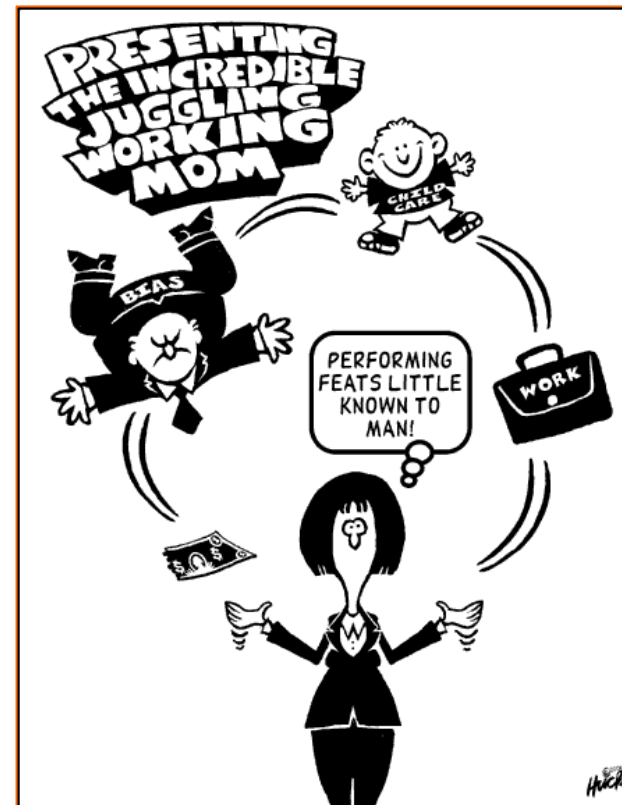
Women in the United States

Google: Working Mom/Mother 1,718,000 hits
Stay-at-home Mom 1,950,000 hits

Stay-at-home Mom



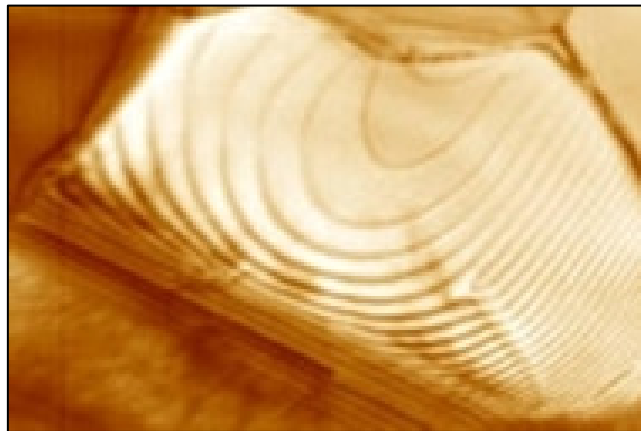
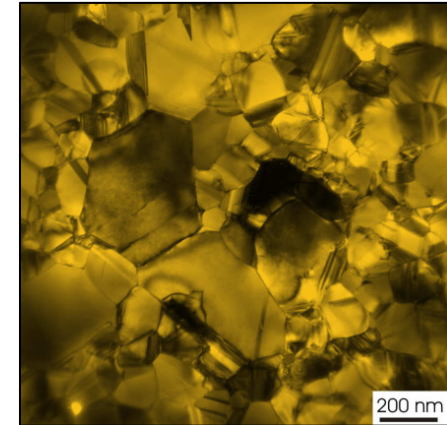
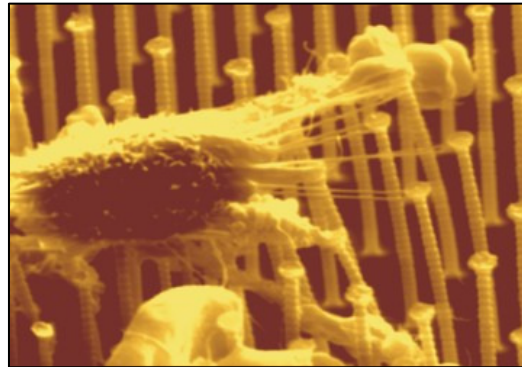
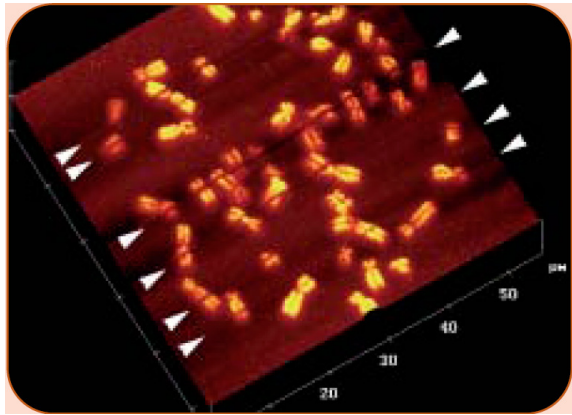
Working Mom



Work and Family: A delicate balancing act



The Wonder of Nanotechnology



body mass →

A B C D

beetle fly spider gecko