

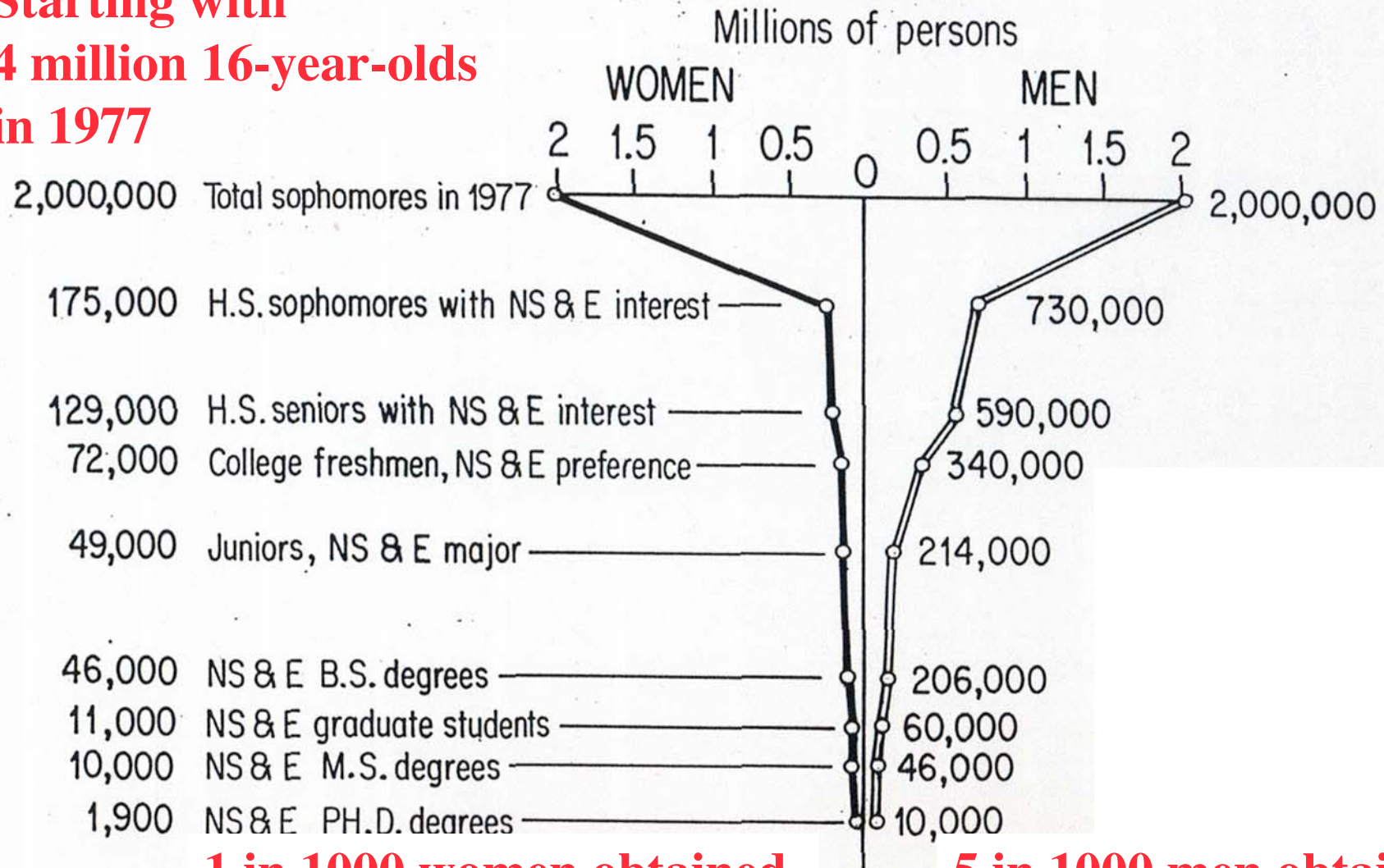


Women in Science:
Speeding up the Long, Slow
Path to Change

Meg Urry
Yale University

“The Leaky Pipeline”

Starting with
4 million 16-year-olds
in 1977



**1 in 1000 women obtained
Ph.D.s in NS&E**

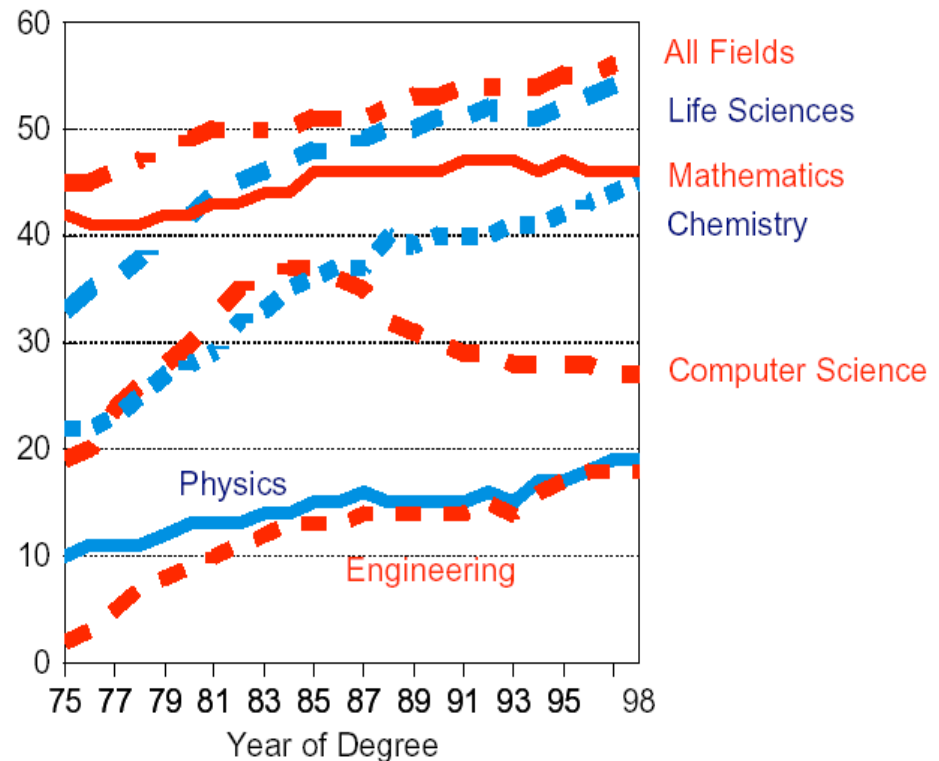
**5 in 1000 men obtained
Ph.D.s in NS&E**

Bachelor's degrees in science

In most fields, degrees are increasingly awarded to women.

Only biology & medicine ~ 50%.

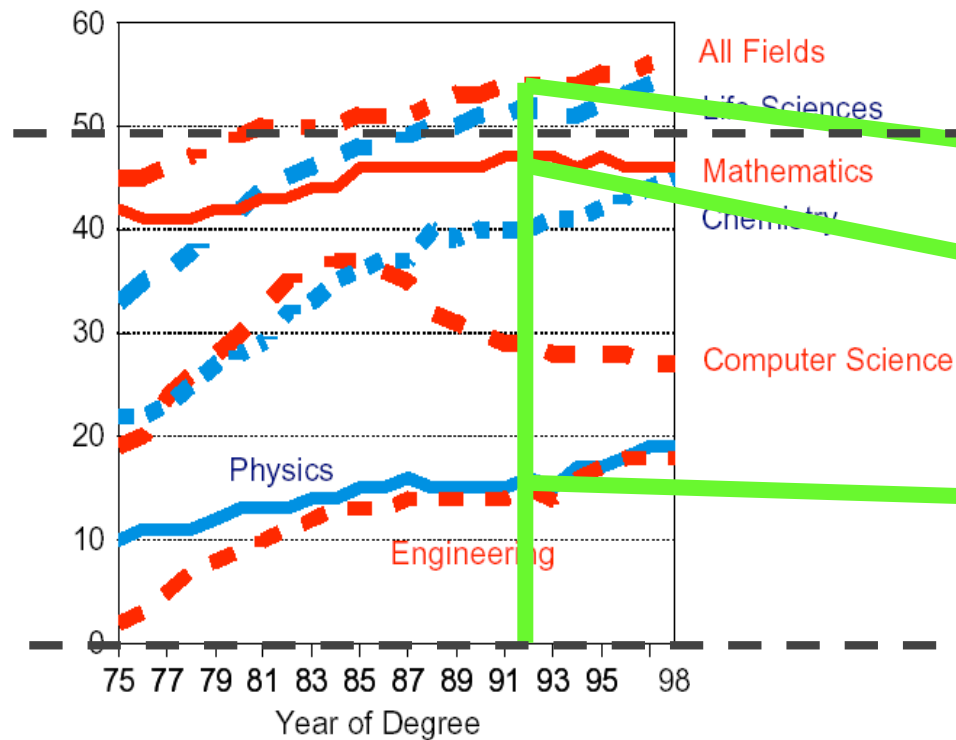
Figure 4. Percent of Bachelor's Degrees in Selected Fields Earned by Women, 1975-1997.



Source: AIP Statistical Research Center, Data from Mulvey & Nicholson, Enrollments and Degrees Report, and the National Center for Education Statistics.

Attrition between B.S. and Ph.D. degrees

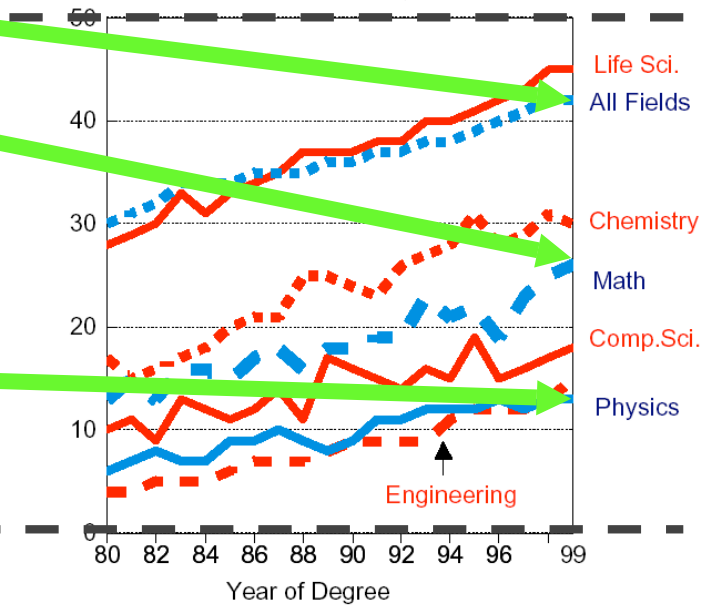
Figure 4. Percent of Bachelor's Degrees in Selected Fields Earned by Women, 1975-1997.



Source: AIP Statistical Research Center, Data from Mulvey & Nicholson, Enrollments and Degrees Report, and the National Center for Education Statistics.

16% → 12% Physics

Figure 6. Percent of PhDs Earned by Women in Selected Fields, 1980-1998.



Source: AIP Statistical Research Center. Data from Mulvey & Nicholson, Enrollments and Degree Report, and National Opinion Research Center.

Women in Physics in the US

- ☞ 47% high school students
 - ☞ 18% of undergraduate majors
 - ☞ 13% of Ph.D.s
 - ☞ 5% full professors
 - few depts have more than 1 woman
 - <20 depts graduate ≥ 5 women majors
- ⇒ women rare in US physics depts
(minorities even more rare)

Why worry?

☞ Excellence of science

☞ Fairness/justice

☞ It's a great life!

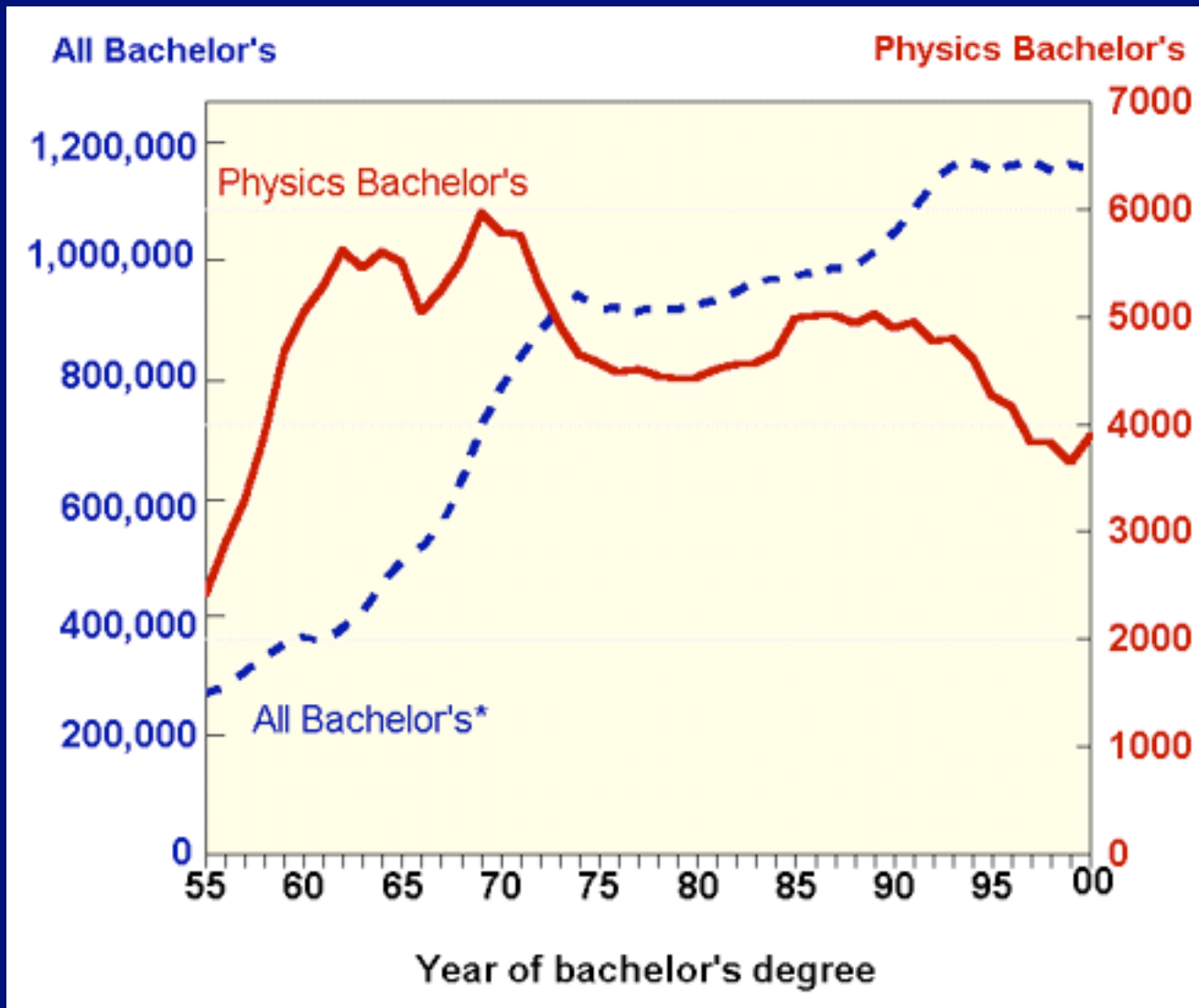
- taxpayers support science, so should benefit equally

☞ Health of science profession

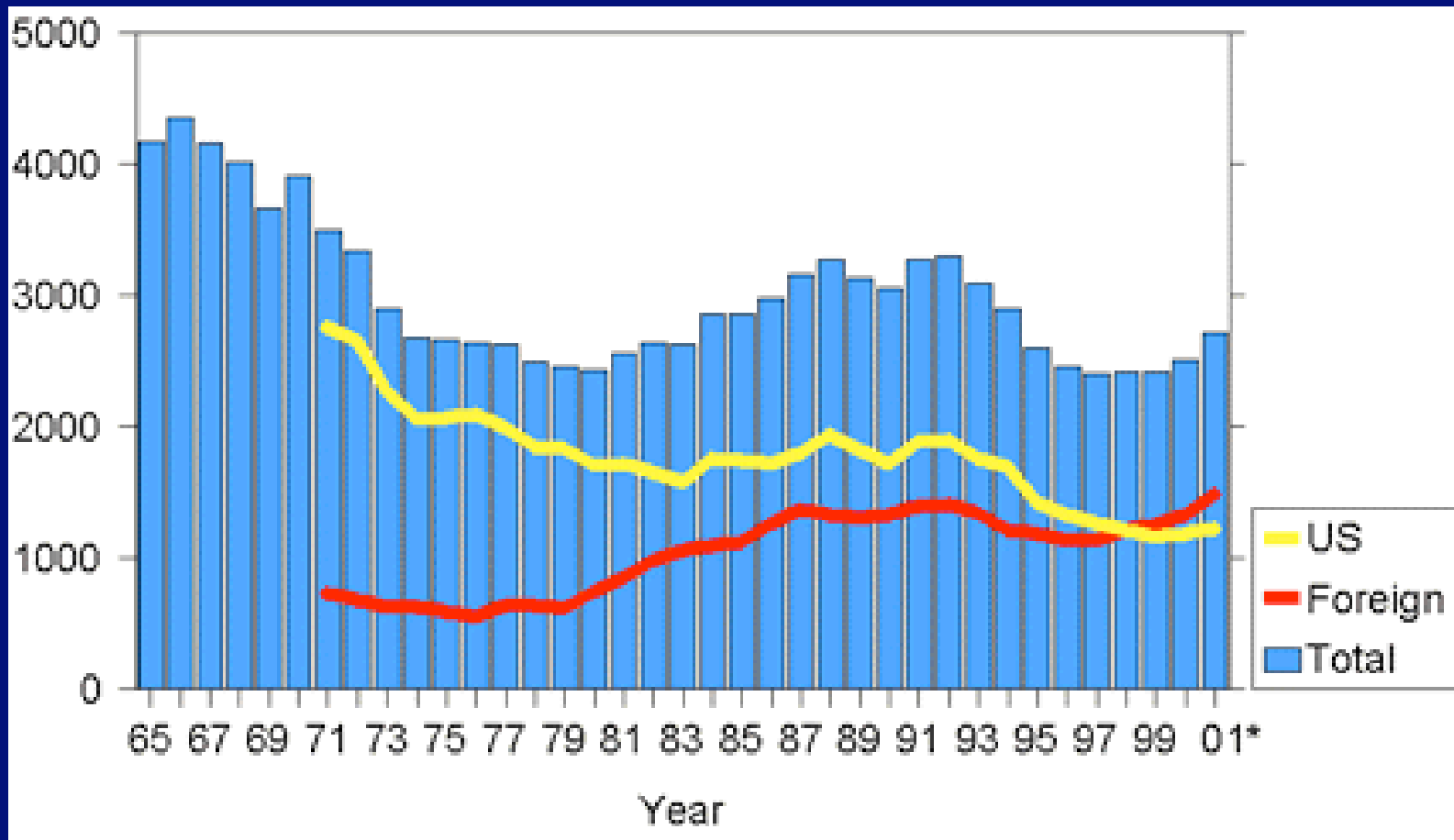
- more scientifically literate public
⇒ more public support of science

■ Workforce issues ...

Fewer majors



1st year graduate students in Physics and Astronomy — now mostly foreign



Active efforts to retain women would increase the skilled workforce.

What's going on?

- ☛ Not conscious discrimination
- ☛ Not overt prejudice
- ☛ Some causes: harassment, 2-career problem, discouragement, "derailing"
- ☛ More causes: *tilted playing field*

Paludi & Bauer 1983, mathematics paper sent to 180 referees (men & women)

Author → Referee ↓	John T. McKay	Joan T. McKay	J. T. McKay
Men			
Women			

(1=excellent, 5=bad)

Measurement error ...



Jeno Sokoloski, Harvard-Smithsonian
Center for Astrophysics

blind audition...

Works for
orchestras,
writers,
abstracts,
resumes ...
... but not for
job talks!

(Implicit) discrimination

- Lower expectations for women
- Uneven evaluation
- Narrow view of excellence
 - aggressiveness, assertiveness valued
- Accumulation of disadvantage
- Exclusion from informal networks
- Lack of transparency in hiring/promotions

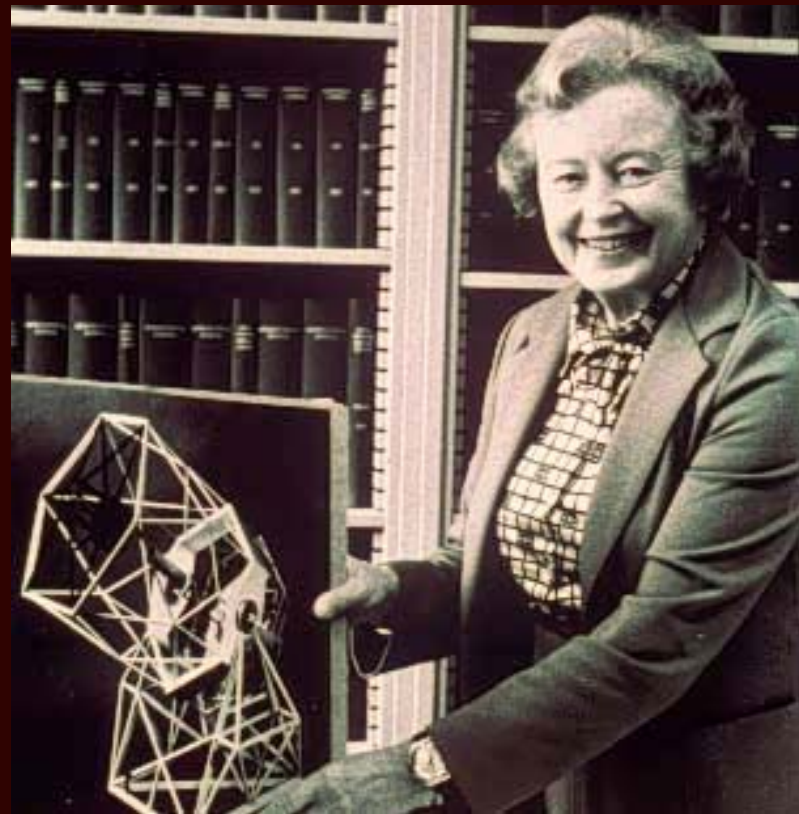
Determination and Confidence

- ☞ Stereotype threat: performing below ability because of expectations
- ☞ Example: "hard" math test
 - Men: 25/100
 - Women: 10/100
 - Gender gap in math ???
- ☞ "This test has been designed to be gender neutral"
 - Women: 20/100
 - Men: 20/100
- ☞ Also important for minorities



Vera Rubin

Margaret Burbidge



Mentoring — Up, down, sideways



Women in Astronomy I - Baltimore, MD 1992

Women in Astronomy II – Pasadena, CA 2003

IUPAP Conference on Women in Physics



- Paris, 7-9 March 02
- 67 countries
- >300 delegates



US delegation



Laurie McNeil

*Univ North Carolina
condensed matter expt*

Meg Urry,
*US Del. Chair
Yale University
astrophysics*



Kim Budil

*LLNL
condensed matter,
shock physics*

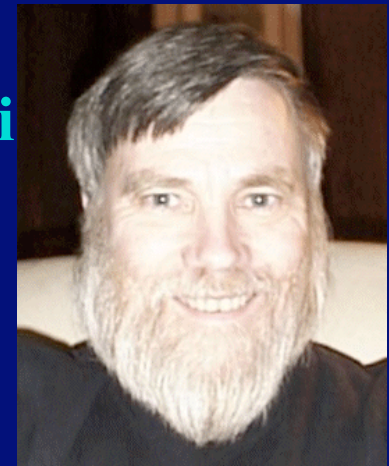
Sheila Tobias

*author, science
education expert*



Howard Georgi

*Harvard University
particle theory*



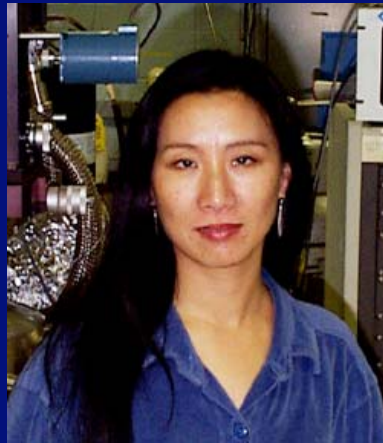
(+ Judy Franz, Bev Hartline, Katherine Gebbie)

US delegation, cont'd



Zhenya Zastavker
Wellesley College
biological physics expt.

Dongqi Li
Argonne National Lab
magnetic thin films



Jeno Sokoloski
Harvard/SAO CfA
astrophysics

Aparna Venkatesan
University of Colorado
astrophysics



Peter Saeta
Harvey Mudd College
nonlinear optics

Sharon Stephenson
Gettysburg College
heavy nuclei



Kristine Lang
UC Berkeley, U Colorado
condensed matter expt.

Important caveat:



Women who left physics not sampled
or heard — yet these are the women
we need to attract/retain.

Let's do the numbers:

- ☞ % women very different among countries
 - ⇒ no "physics" barriers to women
- ☞ Independent of developing/developed
- ☞ % women declines at higher levels
 - ⇒ systemic barriers common in all cultures
- ☞ Few women: Netherlands, Japan, Germany, UK
- ☞ More women: France, Portugal, Italy, Argentina, Brazil, India
- ☞ Backalidina: China, Russia

"Women have to choose between family and career"

☞ Child care & elder care burden

☞ Childbearing years = career launch

☞ but...

- Women w/o children not more successful
- Many women in other demanding fields (e.g., biology)
- Countries w strong support systems (e.g., Scandinavia) have few women in physics

☞ Academic careers flexible: *become a professor have a family!*

Social pressure (in U.S.)

- Tremendous pressure to stay home
- (post WWII)
- Especially with women



men to

risers

**“EXCELLENT MEN HAVE NOTHING
TO FEAR.”**



Speeding up Change

- ☞ Women and men: educate yourselves
 - Recognize uneven playing field
 - Nix "lower standards"
- ☞ Young women:
 - *find the right back burner*
 - *Be prepared*
- ☞ Administrators: use your power
 - Pressure
 - Training (e.g., how to hire, Denton/UWa)
 - Accountability

Baltimore Charter for Women in Astronomy

Women in Astronomy I: Baltimore 1992

☞ Greatest ideas come from confluence of diverse cultures

□ *excellence in science demands inclusion*

■ Recommendations

■ Current system will not change without pressure

⇒ *positive action needed*

Women in Astronomy II: Pasadena 2003

- ☛ Demographic data
- ☛ Research on women in STEM
- ☛ Minorities
- ☛ Institutional studies
- ☛ Title IX
- ☛ Recommendations now being formulated

Signs of hope

- ☛ Percentage of women/minorities increasing
- ☛ Senior men getting involved
- ☛ Junior women being hired
- ☛ Worldwide attention (IUPAP, CAWMSETT)

Image of a great scientist?

