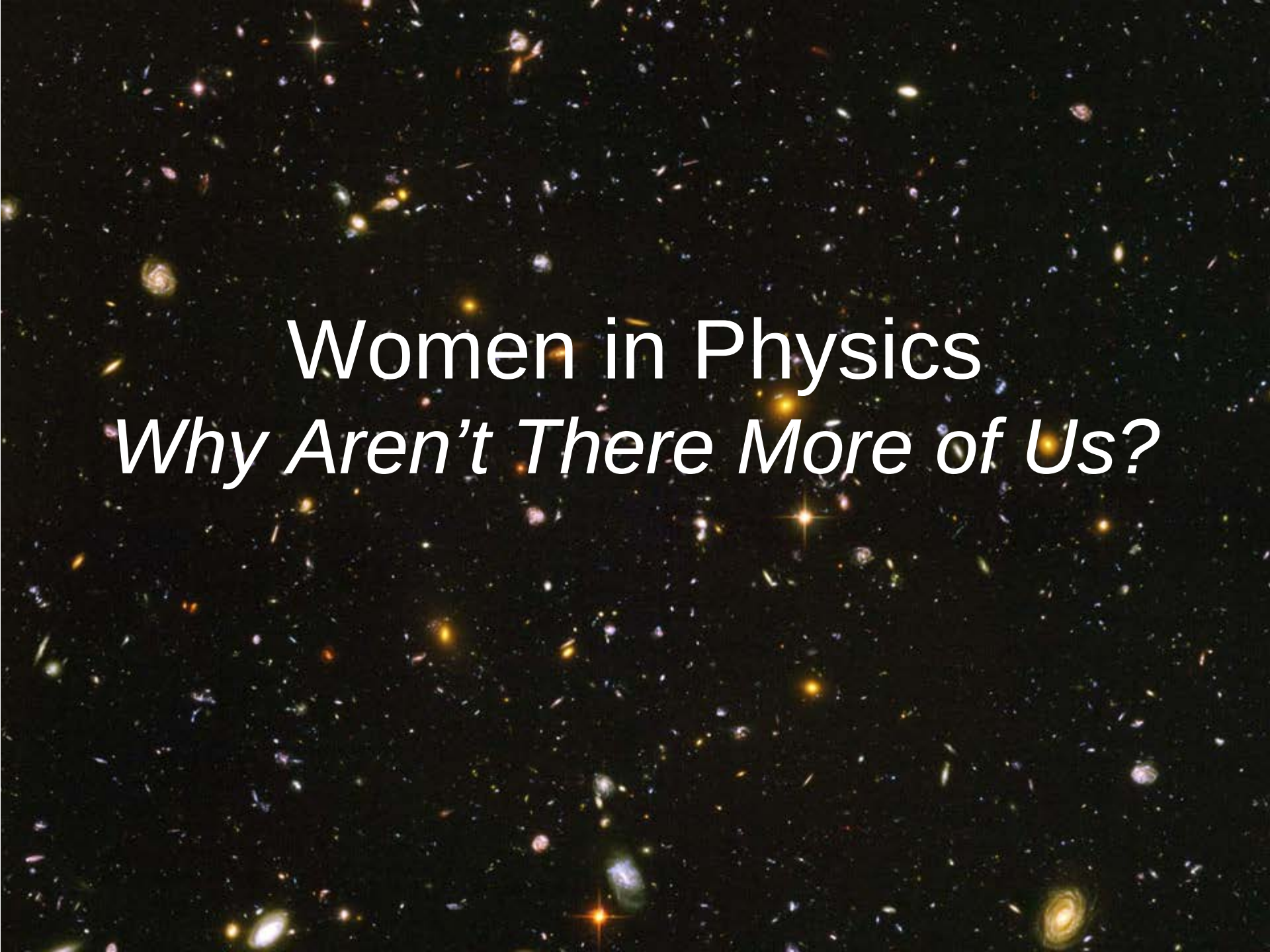
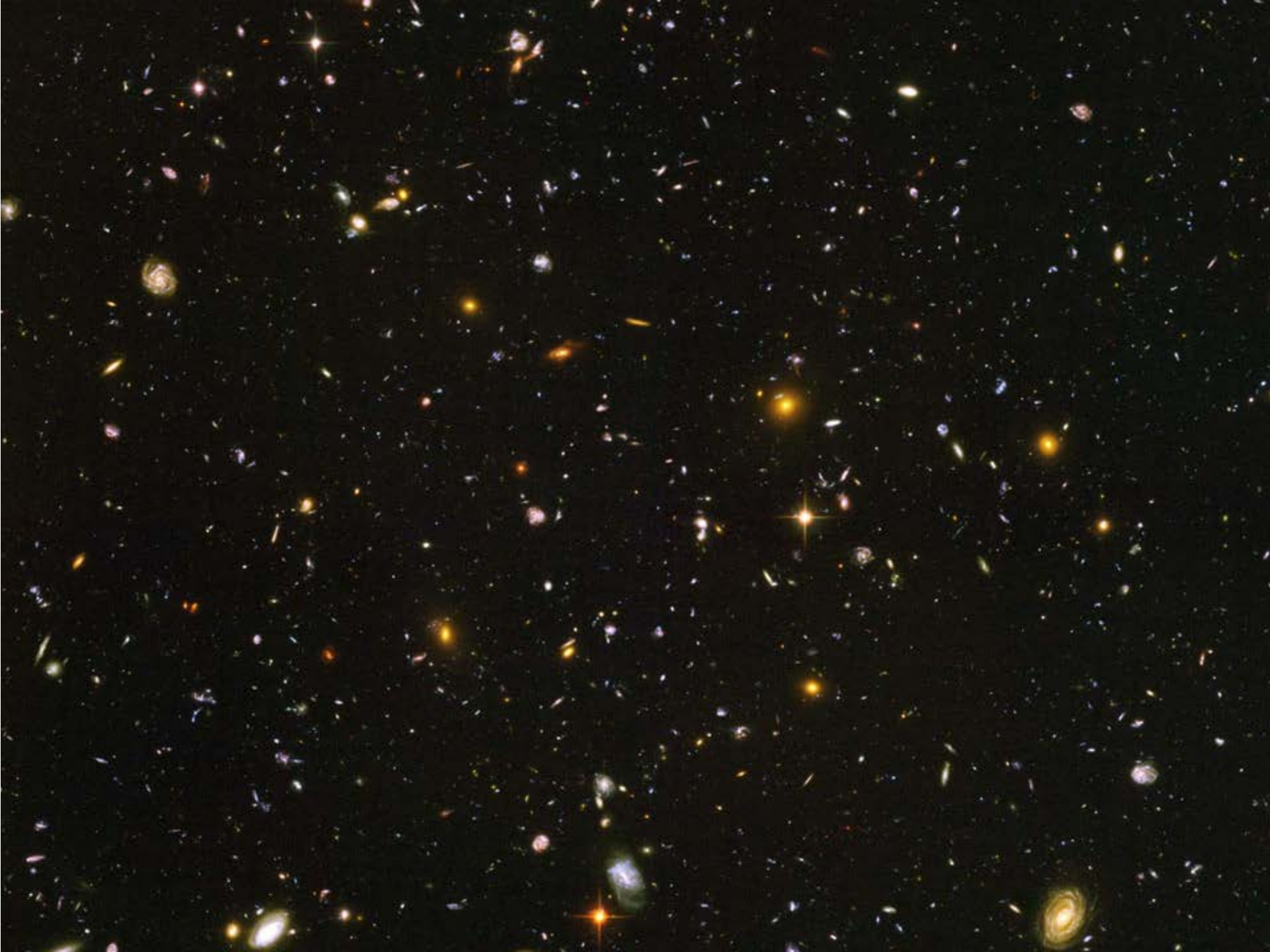
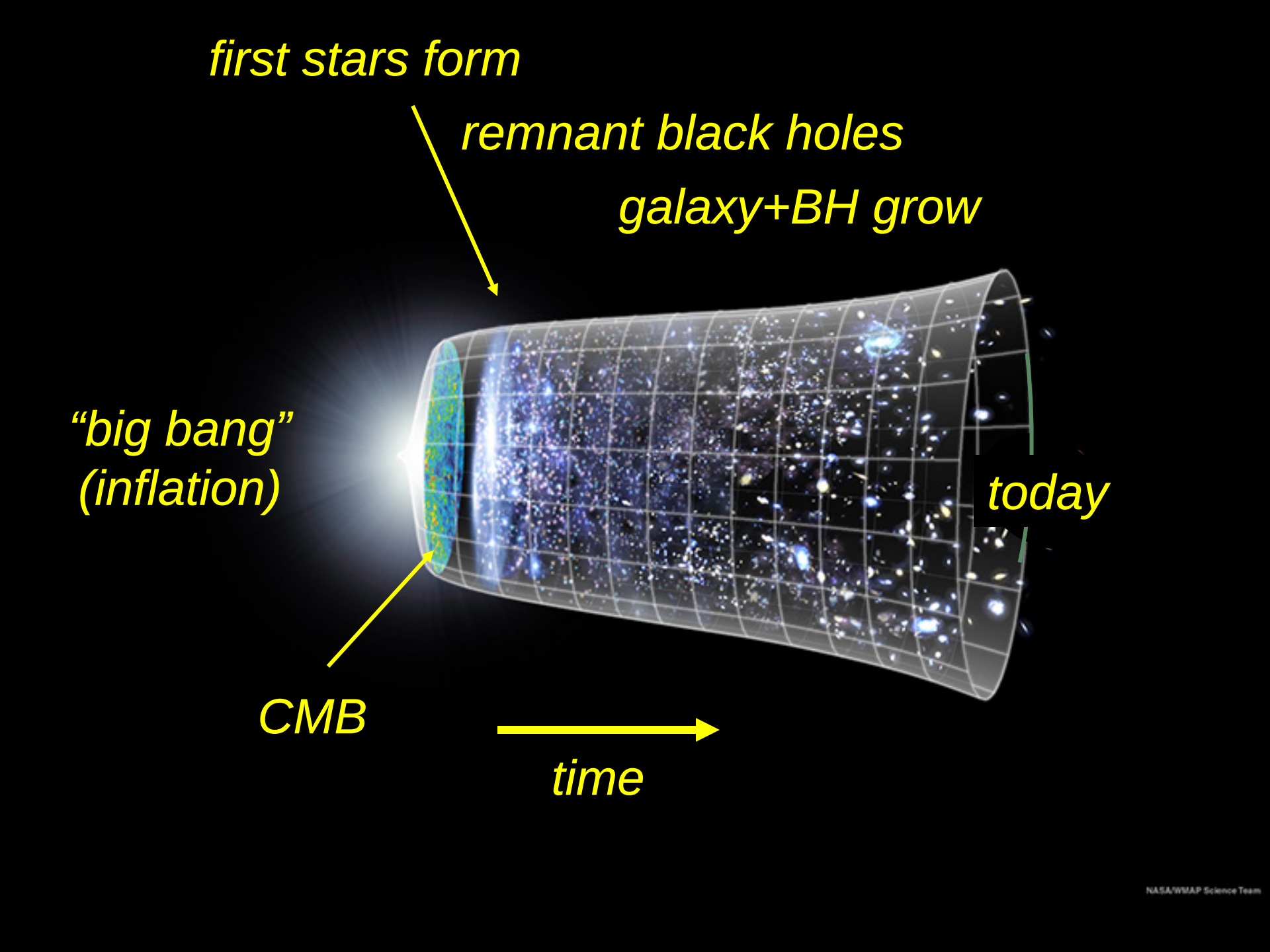

Women in Physics
Why Aren't There More of Us?



~All galaxies host supermassive black holes


first stars form
remnant black holes
galaxy+BH grow
"big bang"
(inflation)
today
CMB
time
NASA/WMAP Science Team


Chandra


HST


XMM


Spitzer

Space Telescope Science Institute

founded 1981

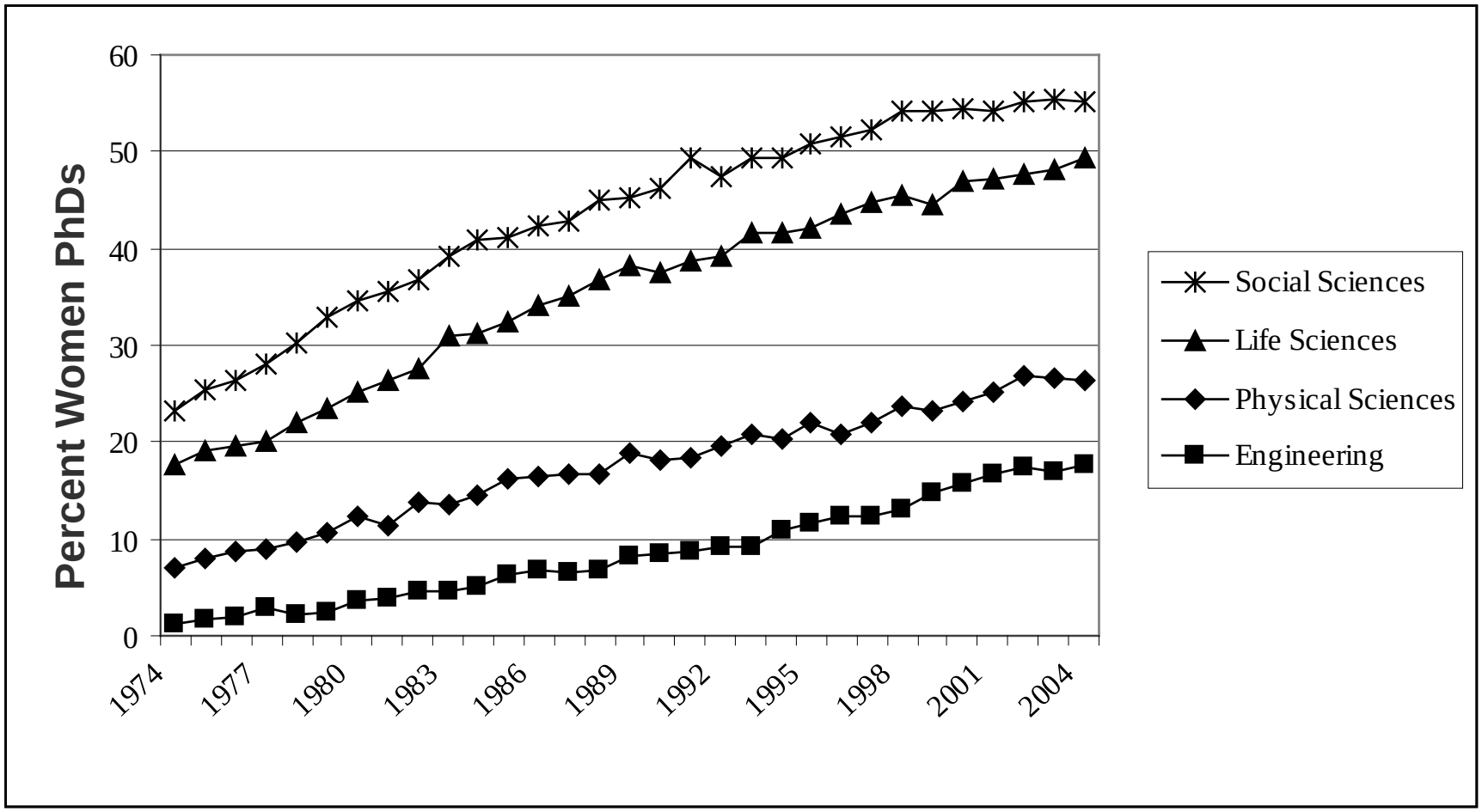
Women in Astronomy I - *Baltimore, MD* 1992

Why Diversity?

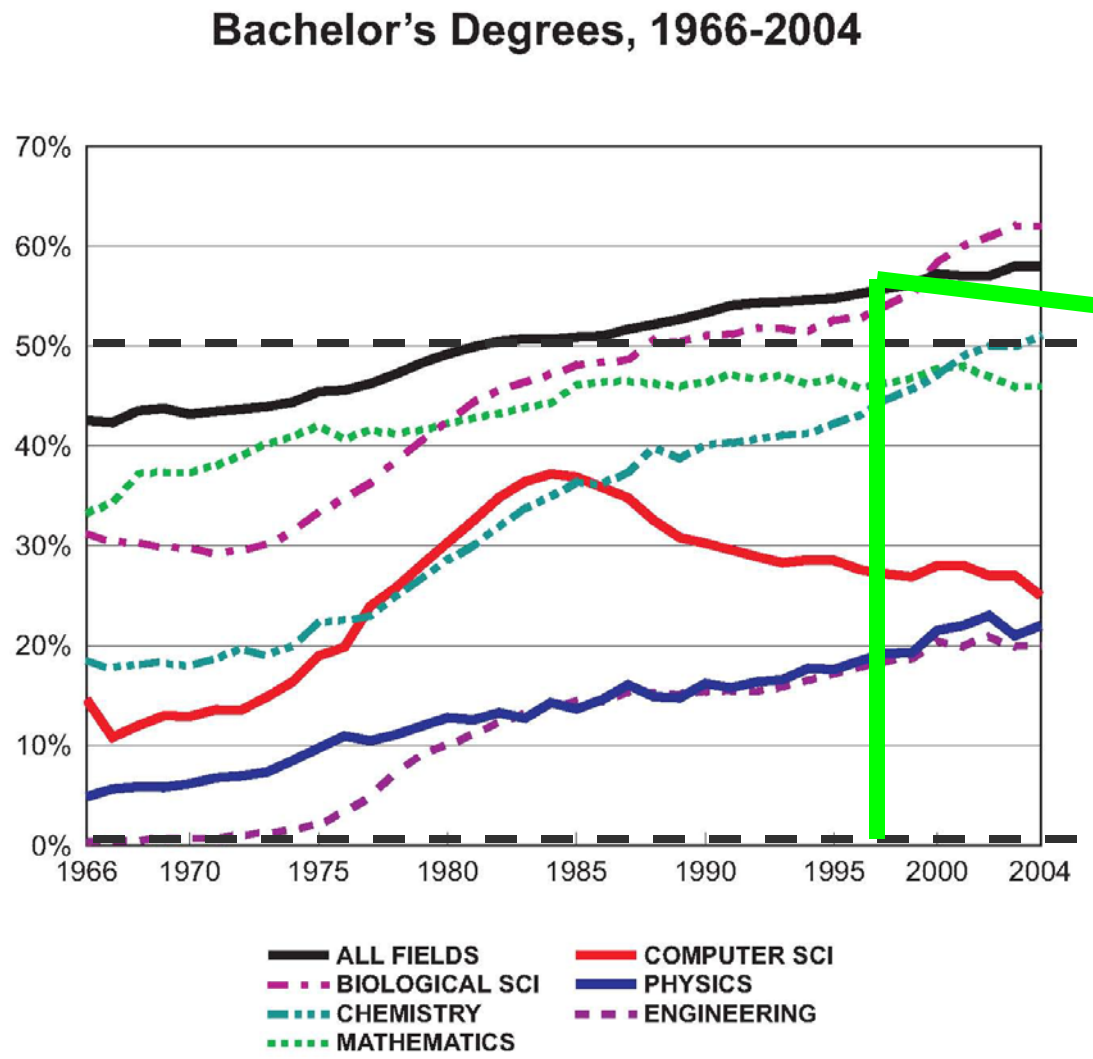
- Excellence of science
- Fairness/justice
- It's a great life!
  - Taxpayers support science, so should benefit equally
- Health of science profession
  - More scientifically literate public

    $\Rightarrow$ more public support of science
- Workforce issues …

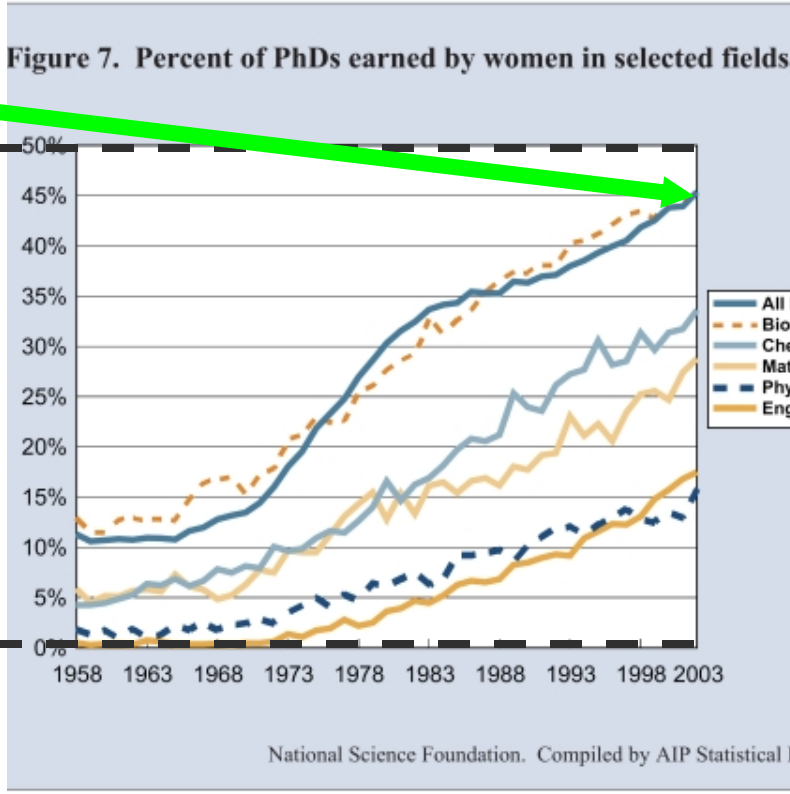
More women are earning science and engineering PhDs



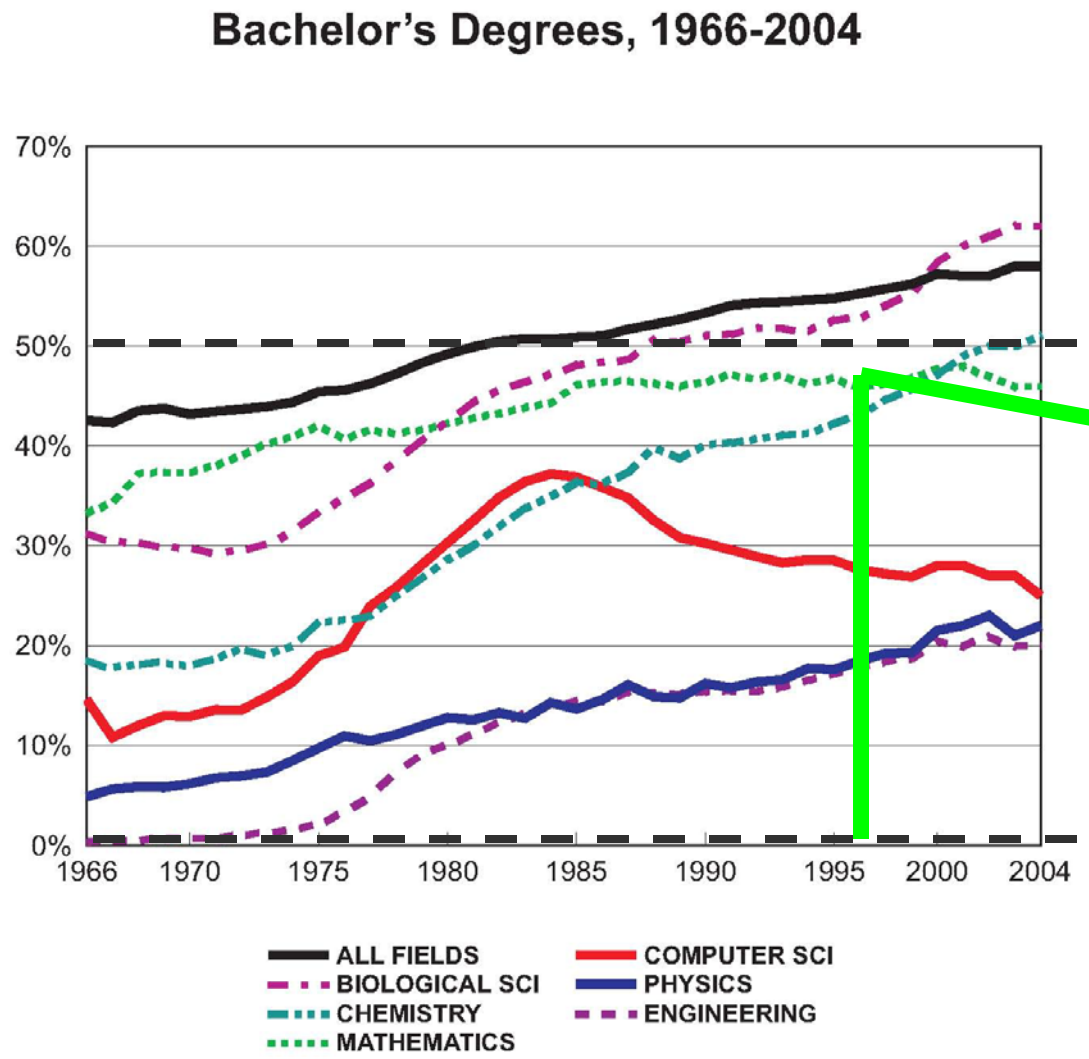
Attrition between B.S. and Ph.D. degrees



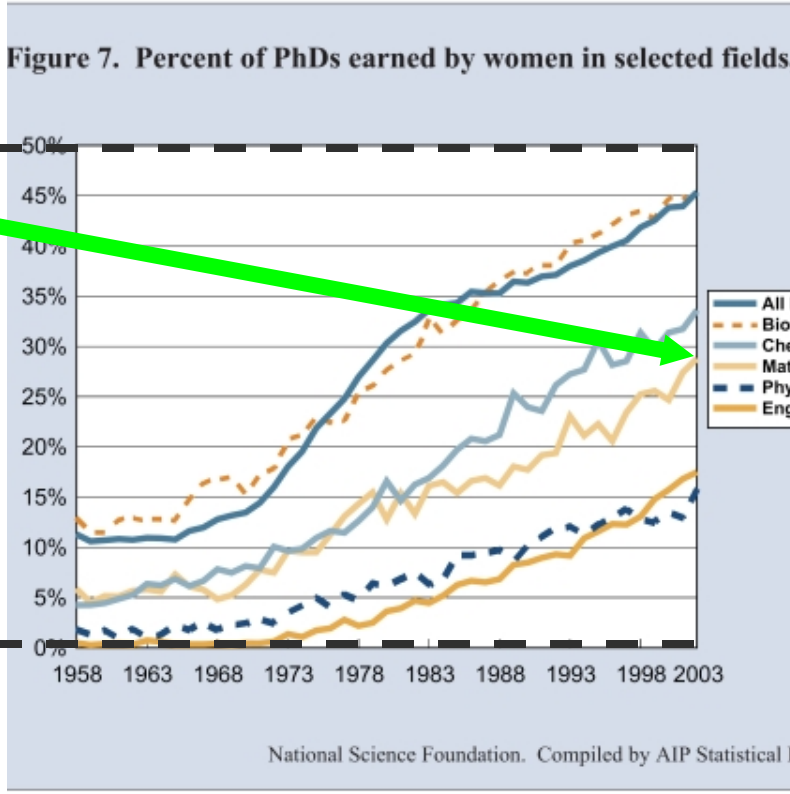
56% → 45% All fields



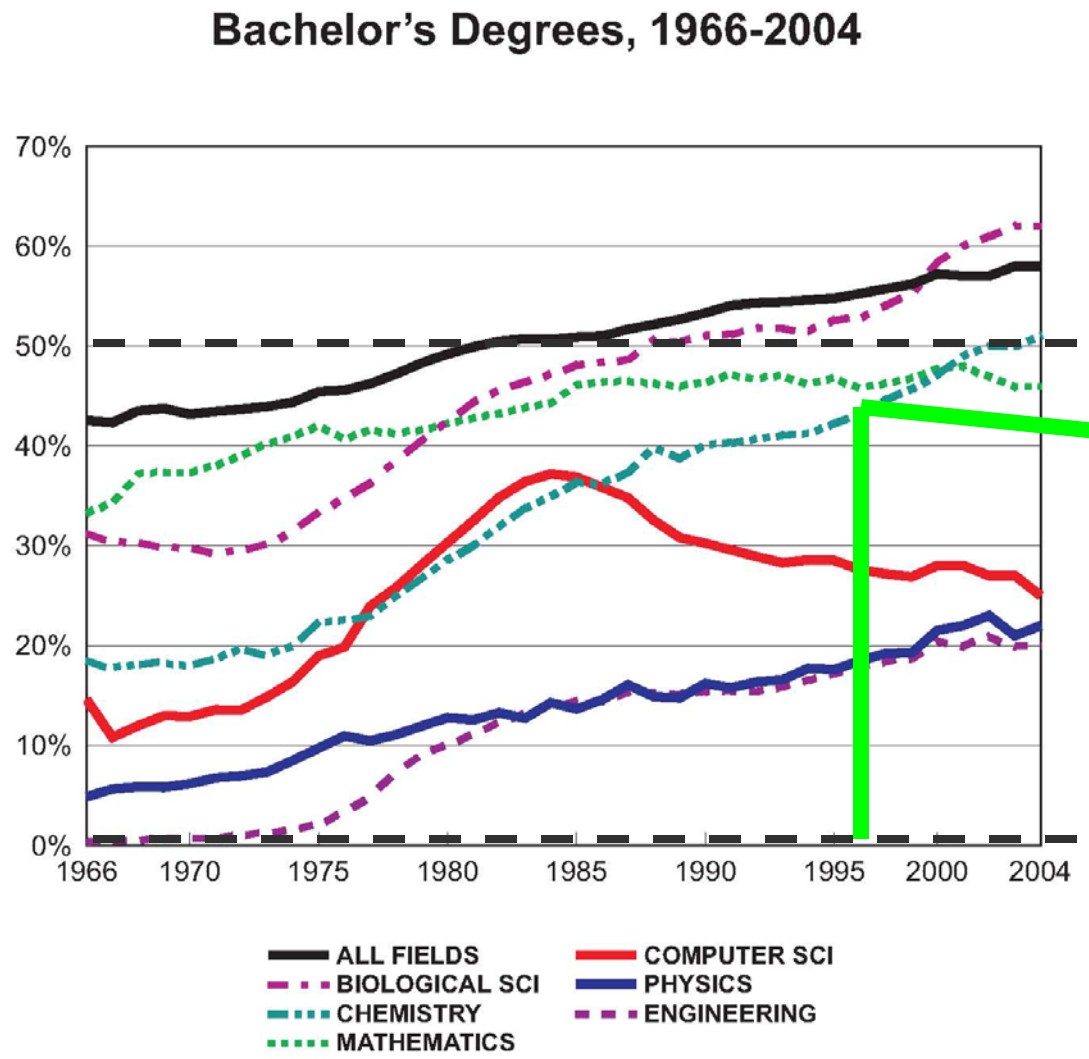
Attrition between B.S. and Ph.D. degrees



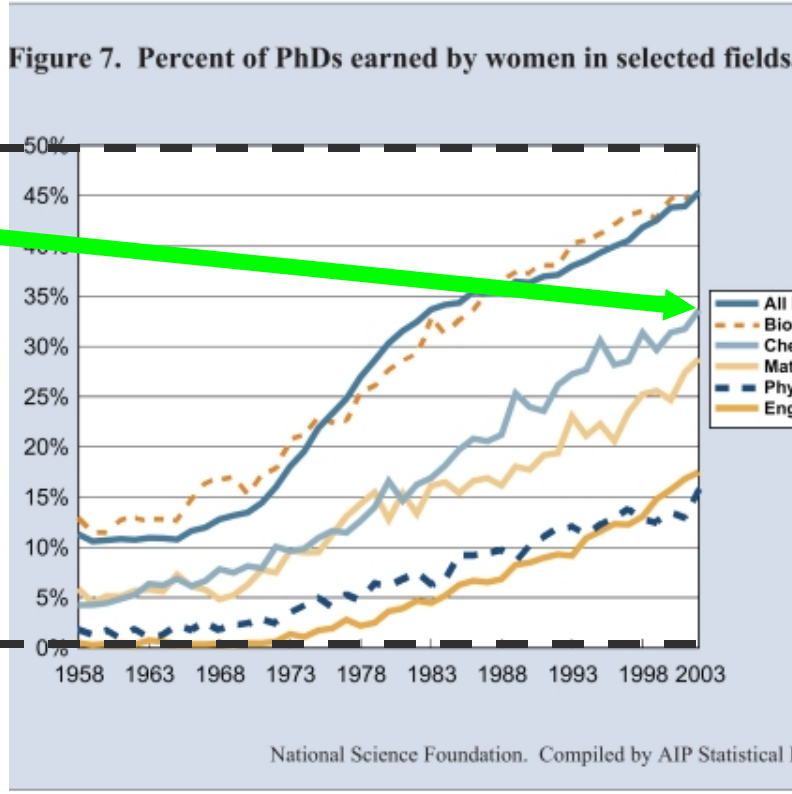
47% → 28% Math



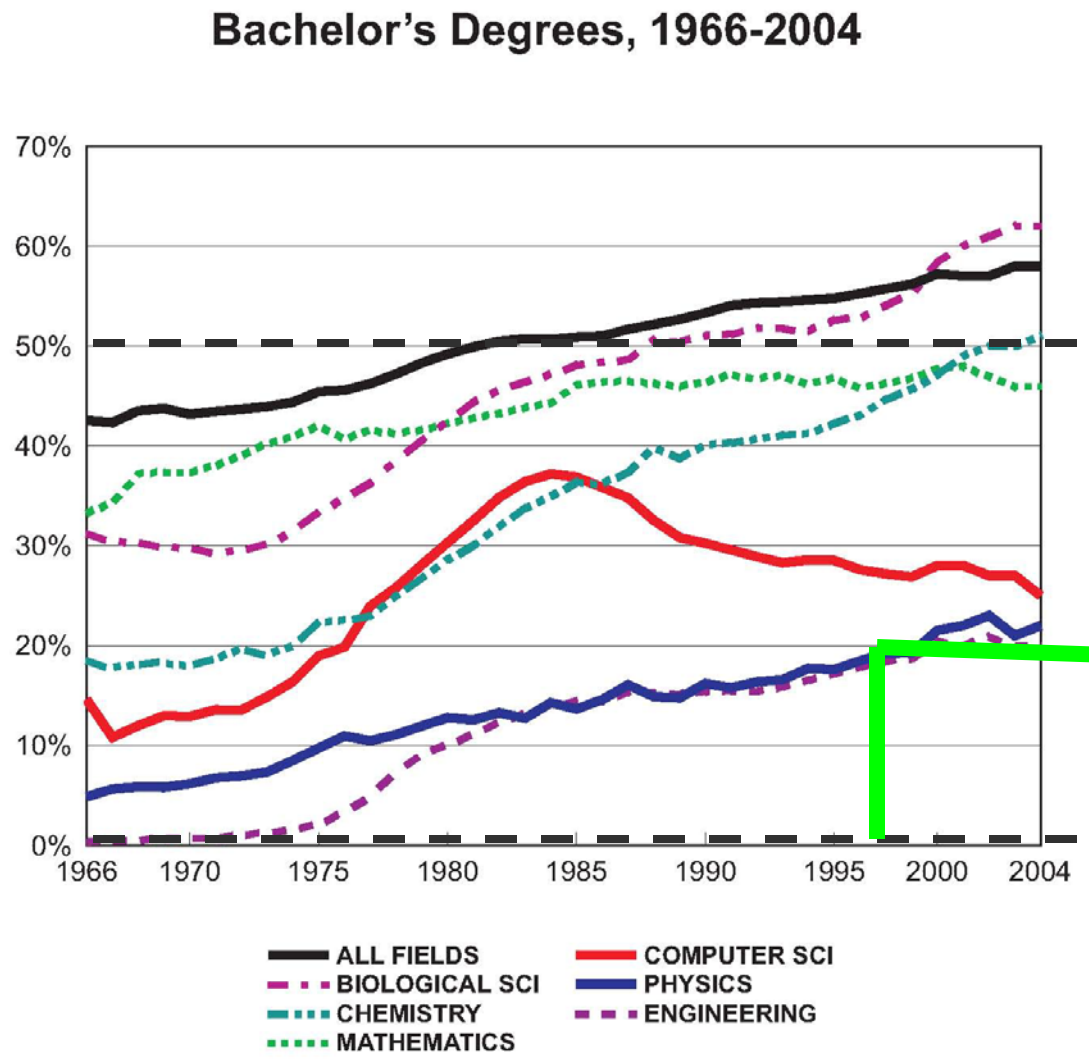
Attrition between B.S. and Ph.D. degrees



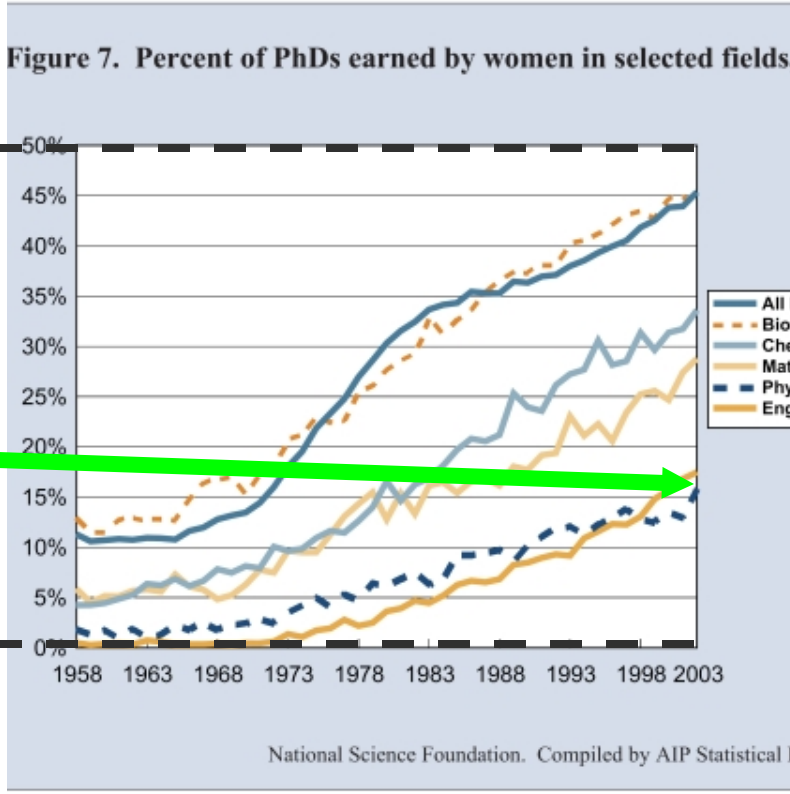
43% → 33% Chemistry



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

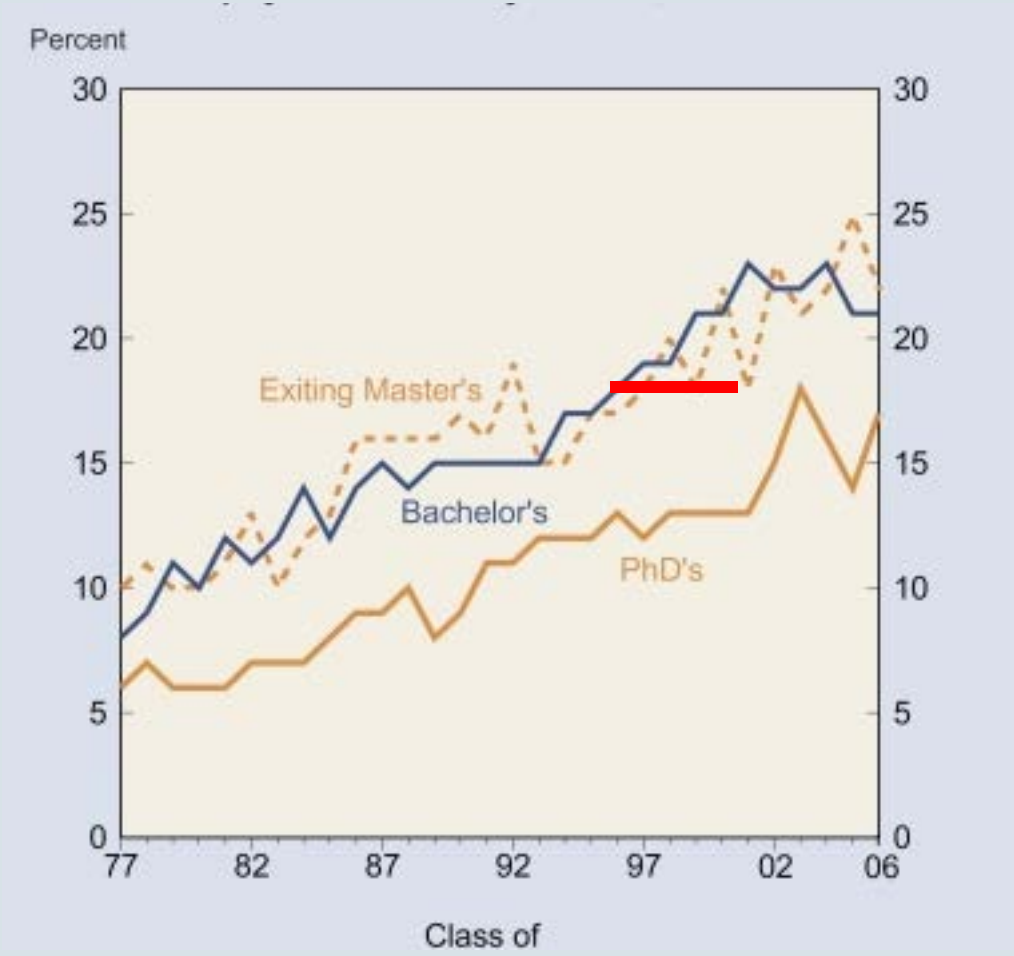


19% → 15% Physics



Differential Attrition

% Physicists who are women (U.S.)



AIP Statistical Research Center

Career Disparities

- *Long 2001*
- *Sonnert & Holton 1996*

  Synthetic cohorts, e.g., NSF fellows – career advancement of women slower

Salary Disparities

- *Egan & Bendick 1994* – factors that affect salary
- *Tesch et al. 1995* – resource allocation in academic medicine appointments
- *MIT Report, 1999* – resource allocation much greater for men than women

Reasons for Disparities?

- Not family (*Mason & Goulden 2002* "Do Babies Matter?")
- *Xie & Shauman 2003* – interest not correlated with ability in science
- *Seymour & Hewitt studies 1990s* – persistence in science not correlated with ability

What's going on? "Gender Schemas"

- Not conscious discrimination or overt prejudice
- Not differences in innate ability
- Lower expectations for women
- Uneven evaluation ("unconscious bias")
- Accumulation of disadvantage

Virginia Valian *Why So Slow? The Advancement of Women*

Uneven Evaluation

- Key issue: ***tilted playing field***
  - *Wenneras & Wold 1997 Nature* – bias in Swedish medical fellowships
  - *Paludi & Bauer 1983* – Blind refereeing
  - *Double-blind refereeing 2008 Nature*

Women aren't as good as men at science…

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

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

(1=excellent, 5=bad)

The Objectivity of Science …

Biernat, Manis & Nelson 1991 – height
Porter & Geis 1981 – leaders at table
Butler & Geis 1990 – speaker evaluation
Dovidio et al. 1988 – eye gaze

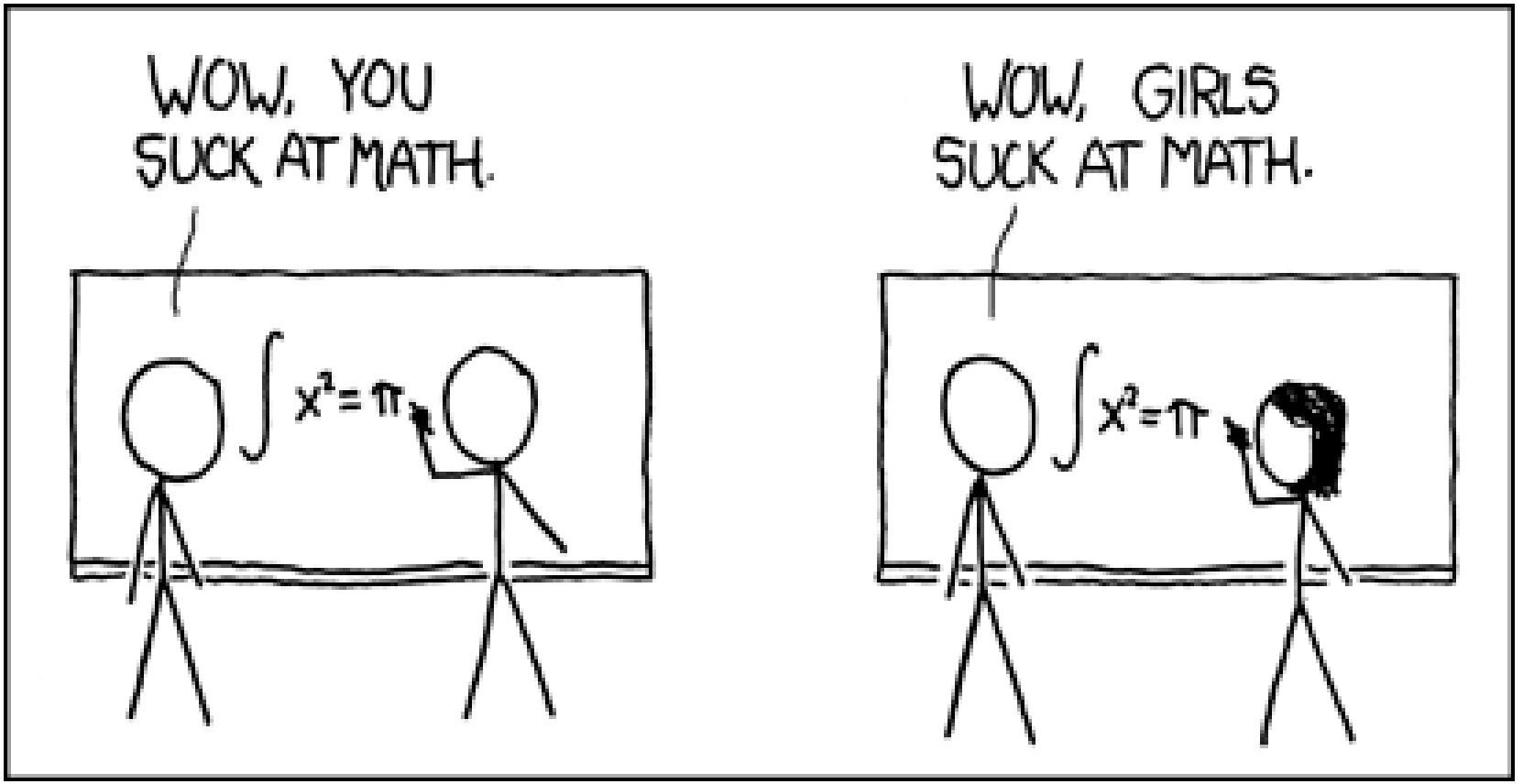
Uneven Evaluation

- *Heilman et al. 2004* – rating asst. VPs

  Women can be friendly or competent, not both
- *Norton, Vandello & Darley 2004* – rating resumes for construction job
- *Uhlman & Cohen 2005* – shifting criteria and (non)objectivity
- *Heilman 1980* – critical mass is ~30%

Valian annotated bibliography:
www.hunter.cuny.edu/genderequity/equityMaterials/Feb2008/annobib.pdf

Sanbonmatsu, Akimoto & Gibson 1994 (Evaluation of failing students)



Letters of Recommendation

- *Trix & Penska 2003* – letters for a prestigious medical fellowship
  - Length
  - Specificity
  - Superlatives v. "grindstone" adjectives
  - Doubt
  - Explicit mention of gender, personality, family
  - (Tenure letters: women on women)

Coaching (Mentoring)

Tony DeCicco, U.S. women's soccer coach
Boston Globe, June 18, 1999

When job searches are gender-blind …

blind audition…

…works for orchestras, writers, abstracts, resumes …

See story of Munich Philharmonic trombonist (Abby Conant)

What's going on? "Gender Schemas"

- Lower expectations for women
- Uneven evaluation ("unconscious bias")
- Accumulation of disadvantage
  - *Martell, Lane & Emrich 1996* – 1% bias, 8 levels → 65% male top management
- Most of us are biased

Mahzarin Banaji **implicit.harvard.edu**

Common Myths

Women lack math ability …

- 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

There aren't any good women to hire …

- Jane Doe
- John Doe
- Keisha Doe
- Jamal Doe

(Research shows name strongly affects success of resume, even among psychologists who are well aware of gender schemas.)

Women choose family over career…

- Women w/o children not more successful
- Many women in other demanding fields
- Countries w strong support systems (e.g., Scandinavia) have few women in physics
- Academic careers flexible: *become a professor, have a family!*

11 Things You Can Do To Succeed

1. Work hard
2. Do something interesting
3. Uneven playing field – don't be discouraged
4. Reject "lower standards"
5. Mentor up, down, and sideways
6. WiS: find allies, take turns following & leading
7. Use your full name
8. Prepare an "elevator speech"
9. Practice confidence after brushing
10. Give great talks
11. Be confident & enjoy yourself

Back-up slides

NAS Study: "Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering"

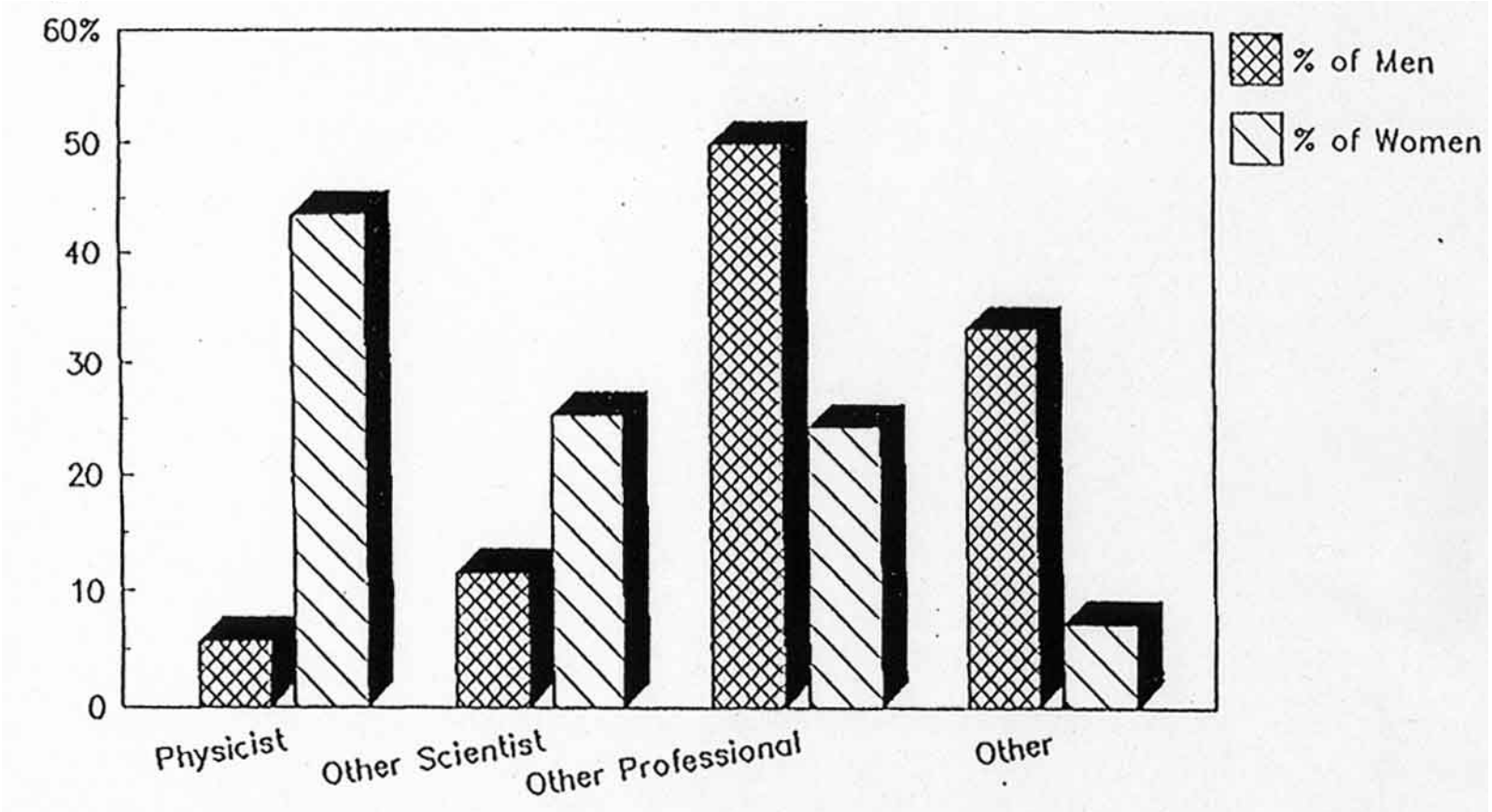
Statistics (U.S.)
Learning and performance *intrinsic difference?*
Persistence and Attrition
Evaluation of success *implicit bias*
Strategies that work
Undergraduate *Carnegie Mellon*
- Hiring faculty *U. Washington toolkit*
- Training women faculty *CoaCH*
- ADVANCE *CRLT players*

Institutional structures, career paths
Recommendations

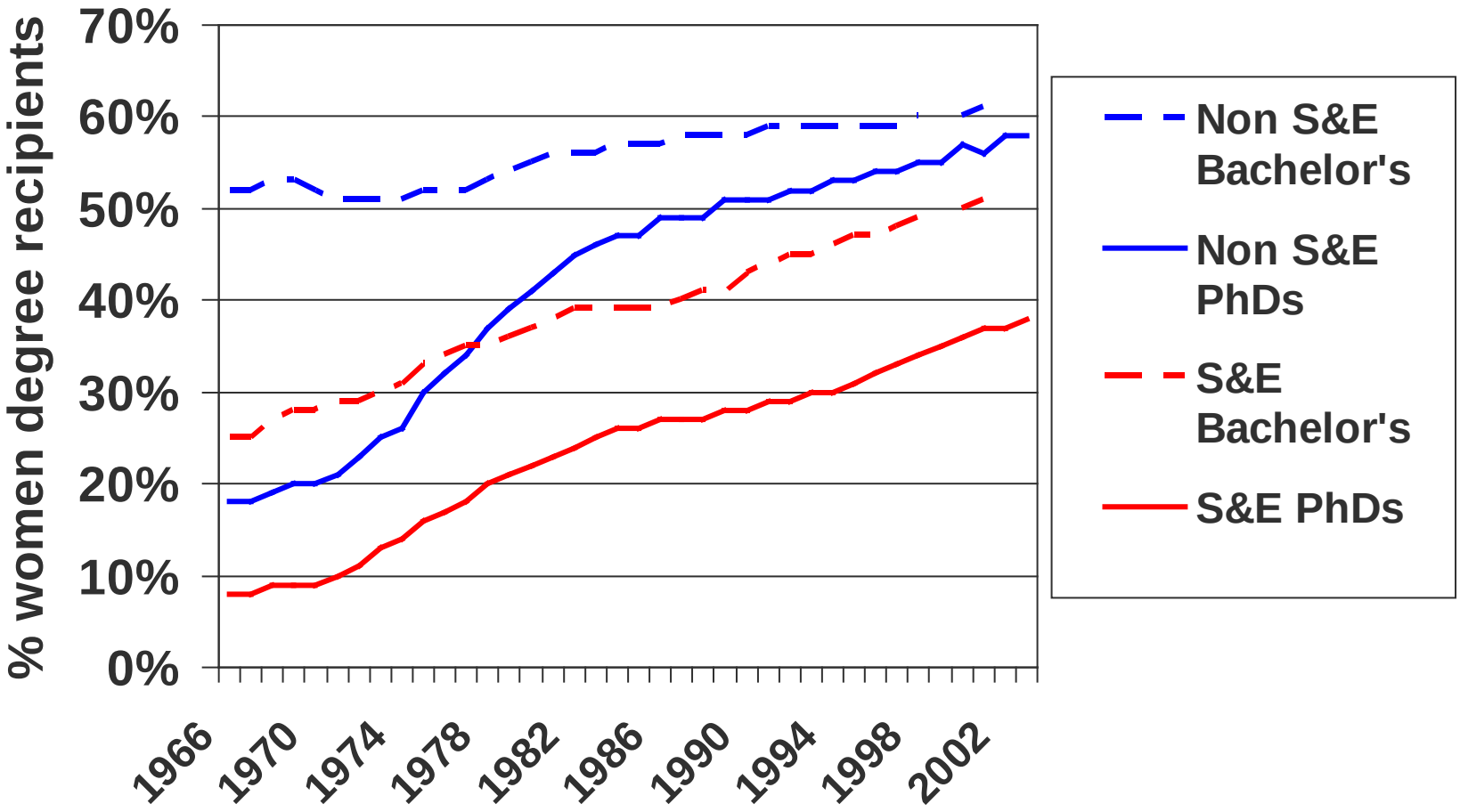
~50% women scientists unmarried

(in developed countries)

Women marry scientists/professionals



higher attrition for women between B.S. and Ph.D. degrees



SOURCE: *NSF, Women, Minorities and Persons With Disabilities in Science and Engineering-2004*

If you need mentoring, you're not good enough …

Women in Astronomy I - *Baltimore, MD* 1992

Women in Astronomy II – *Pasadena, CA* 2003