Interdisciplinary Opportunities for Women

Alice M. Agogino
Mechanical Engineering
University of California at Berkeley

Panel III: A look into the future and the increasing complexity

of interdisciplinary careers

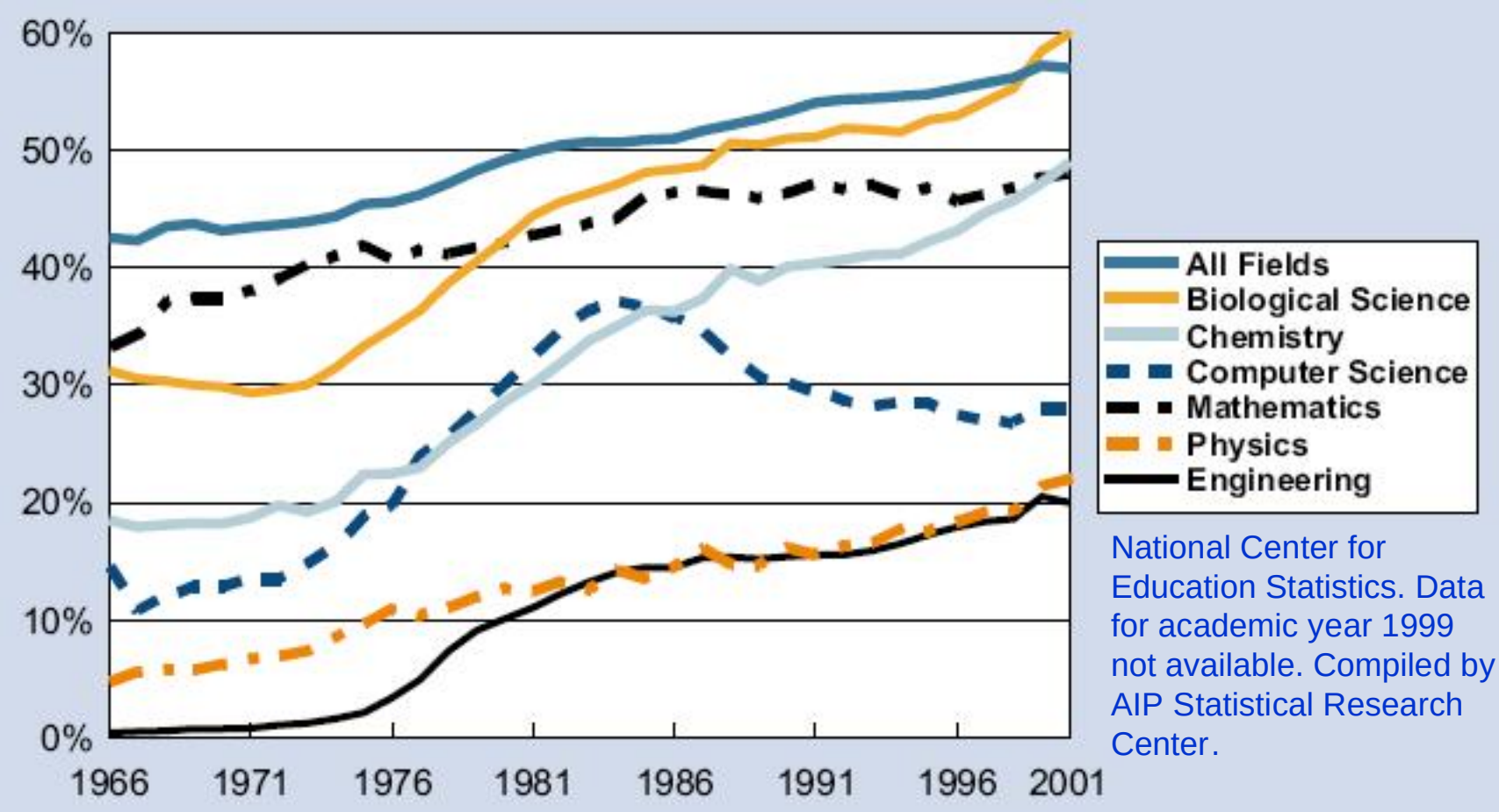
From Doctorate to Dean or Director: Sustaining Women through Critical Transition Points in Science, Engineering, and Medicine

September 18-19, 2008, Washington, DC

Discussion Hypotheses

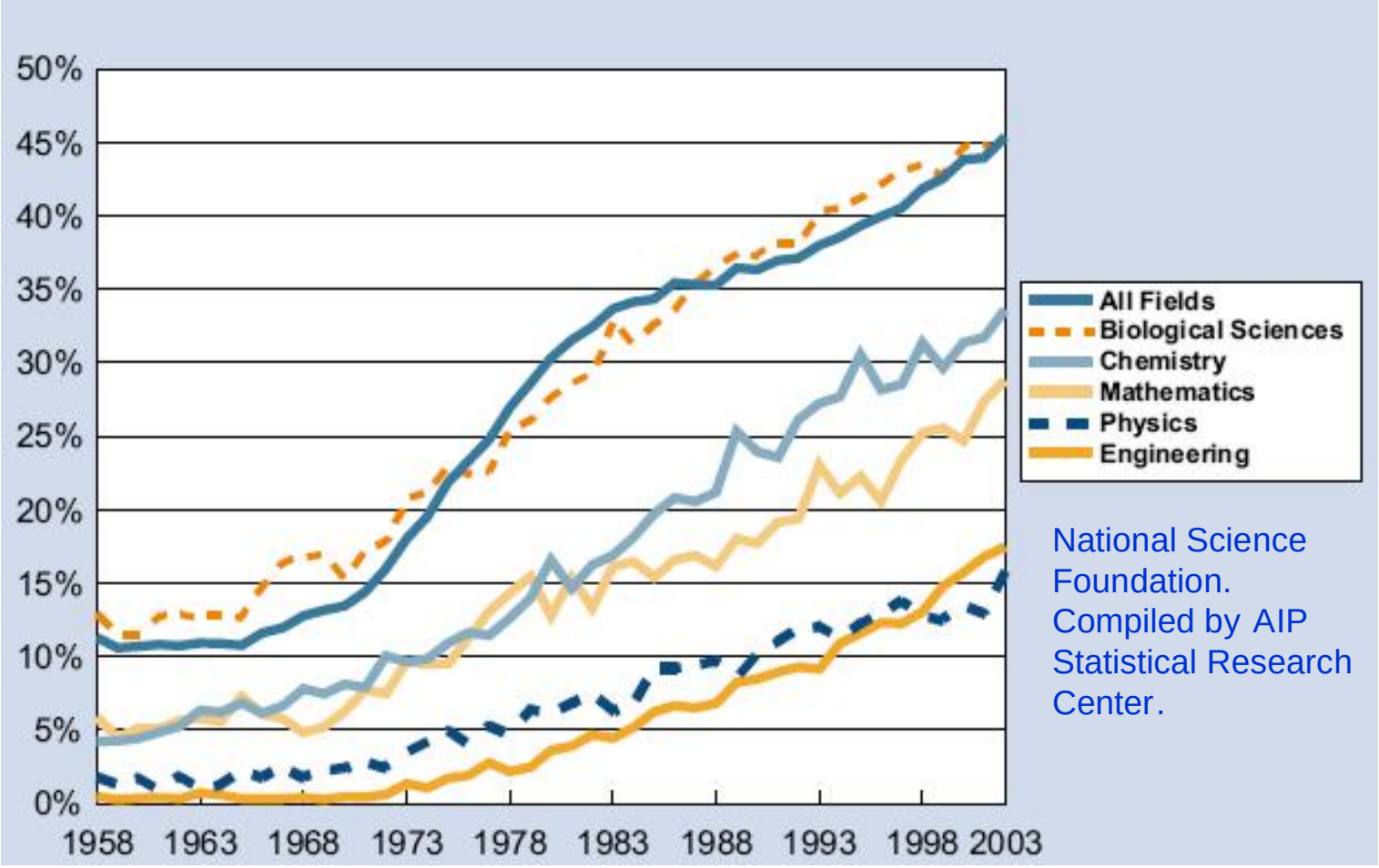
- In fields with a low percentage of women, the entrenched status quo can create (often unintended) barriers and toxic work climates for women.
- Successful women have have been able to carve out unique career pathways at the intersection of disciplines and in new emerging fields.
- Women more likely to go into interdisciplinary fields with a direct connection to improving the human condition.

U.S. Percentage of BS Degrees for Women



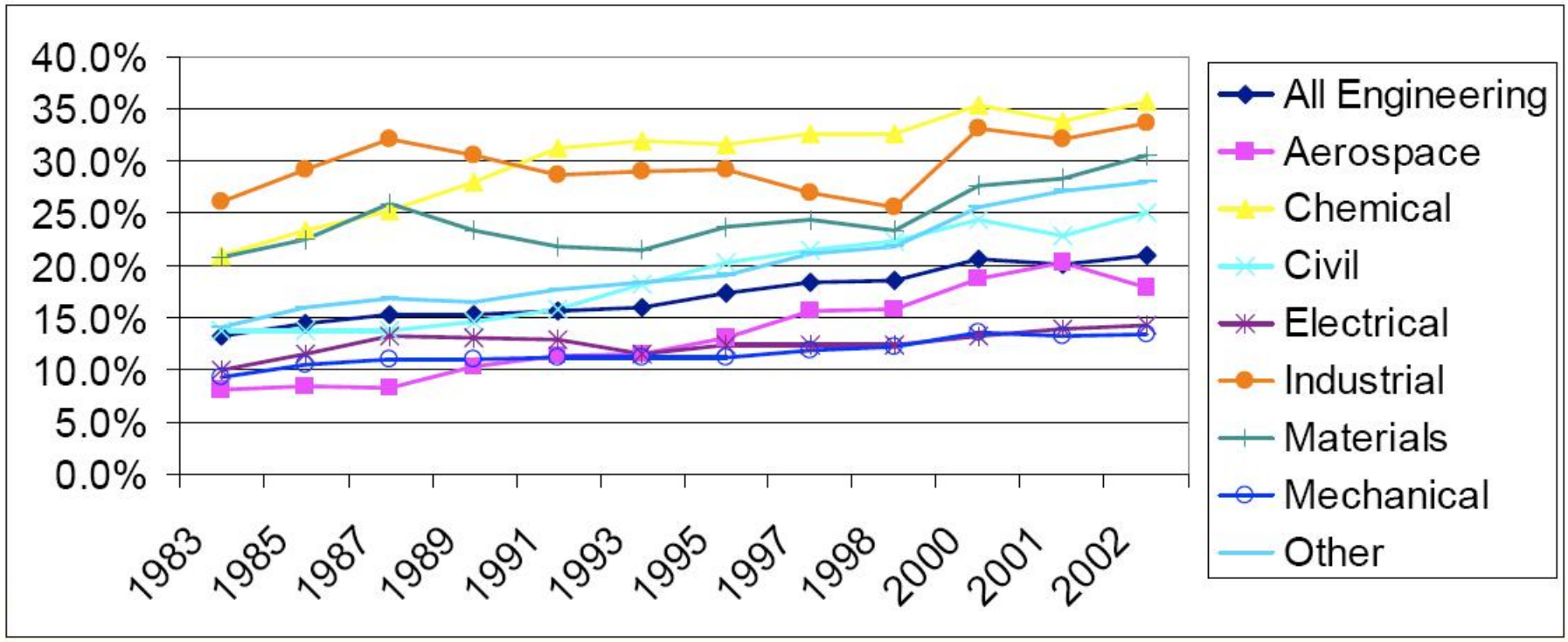
National Center for Education Statistics. Data for academic year 1999 not available. Compiled by AIP Statistical Research Center.

Percentage of PhDs Earned in U.S. by Women



National Science Foundation. Compiled by AIP Statistical Research Center.

Percentage of Engineering Degrees Awarded to Women by Discipline 2002



Parity in Environmental Engineering

- **UC Berkeley:** 46% of undergraduate environmental engineering science and 51% of graduate students in environmental engineering are women.
- **D-Lab (MIT):** Women are 70% of applicants (Led by Amy Smith in Mechanical Engineering).
- **ESW Students:** Women are over 70% of Students in Engineers for a Sustainable World.

Committee on Women in Science, Engineering, and Medicine
POLICY AND GLOBAL AFFAIRS

THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

Bio-/Biomedical Engineering

Women choose biomedical engineering 2001

ARLINGTON, Va., - Biomedical engineering leads all engineering disciplines in the percentage of degrees awarded to women at all levels: bachelor's, master's and doctoral, according to the American Society for Engineering Education.

Thirty-nine percent of all biomedical engineering bachelor's degrees awarded in spring 2000 went to women. Chemical engineering was second with 36 percent of bachelor's degrees to women.

At the master's level, 34 percent of biomedical engineering degrees went to women, followed by agricultural engineering at 32 percent.

Biomedical engineering's largest lead was at the doctoral level where women received 32 percent of all biomedical or bioengineering doctorates, compared to the next highest, chemical engineering at 21 percent.

- **2007-2008**
- 38% of undergraduate and 40% of graduate students at UC Berkeley are women.

Percentage of Faculty Positions Held by Women in U.S.

Physics

	1994 %	1998 %	2002 %
Academic Rank			
Full professor	3	3	5
Associate professor	8	10	11
Assistant professor	12	17	16
Instructor / Adjunct	N/A	N/A	16
Other ranks	8	13	15
Type of Department			
PhD	5	6	7
Master's	7	9	13
Bachelor's	7	11	14
Overall	6	8	10

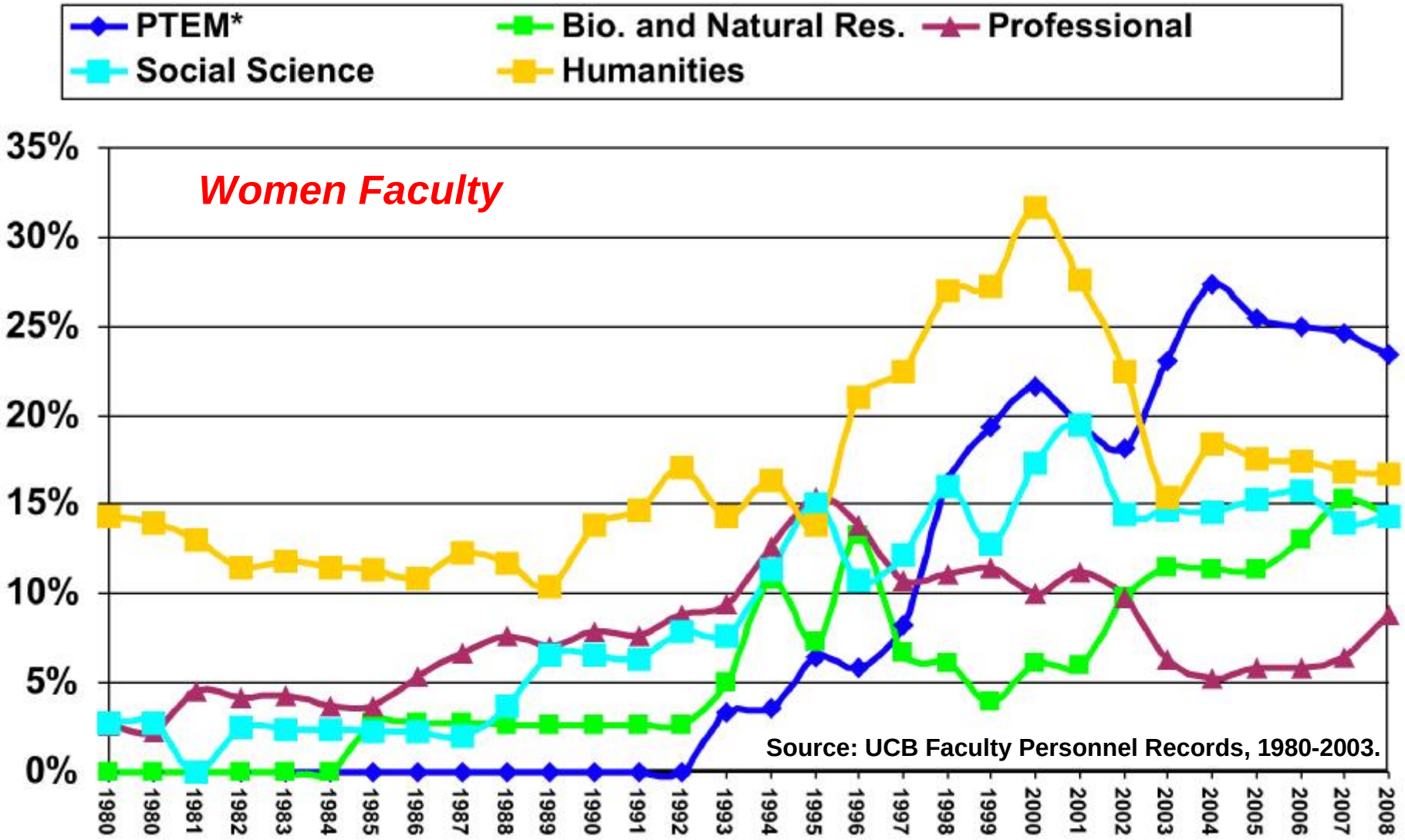
Astronomy

Academic Rank	Percent
Full professor	10
Associate professor	23
Assistant professor	23
Instructor / Adjunct	15
Other ranks	15
Overall	14

AIP Statistical Research Center

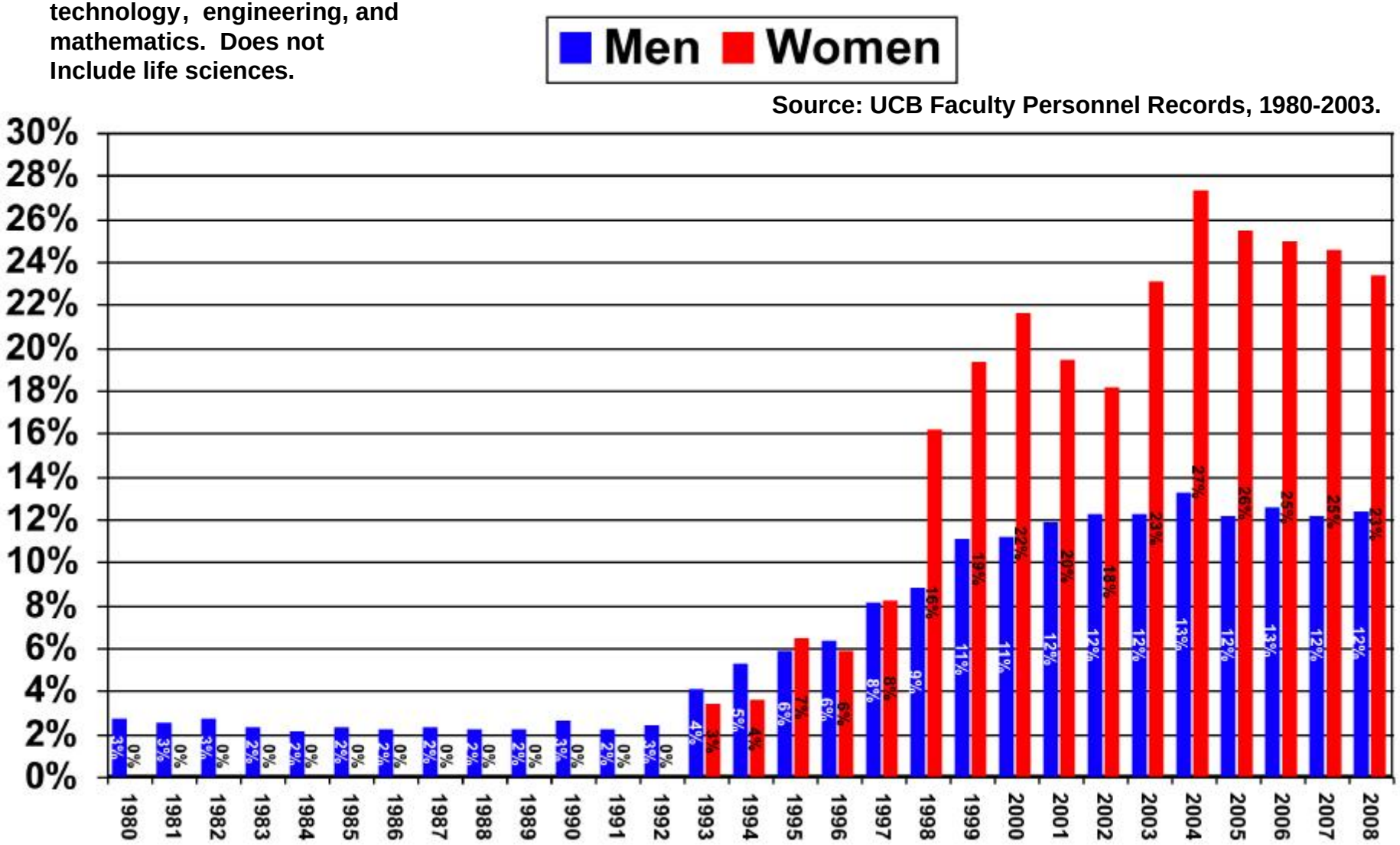
Percent of UCB Faculty Women in Joint Departmental Appointments by Field, 1980-2008

*Includes physical sciences, technology, engineering, and mathematics.

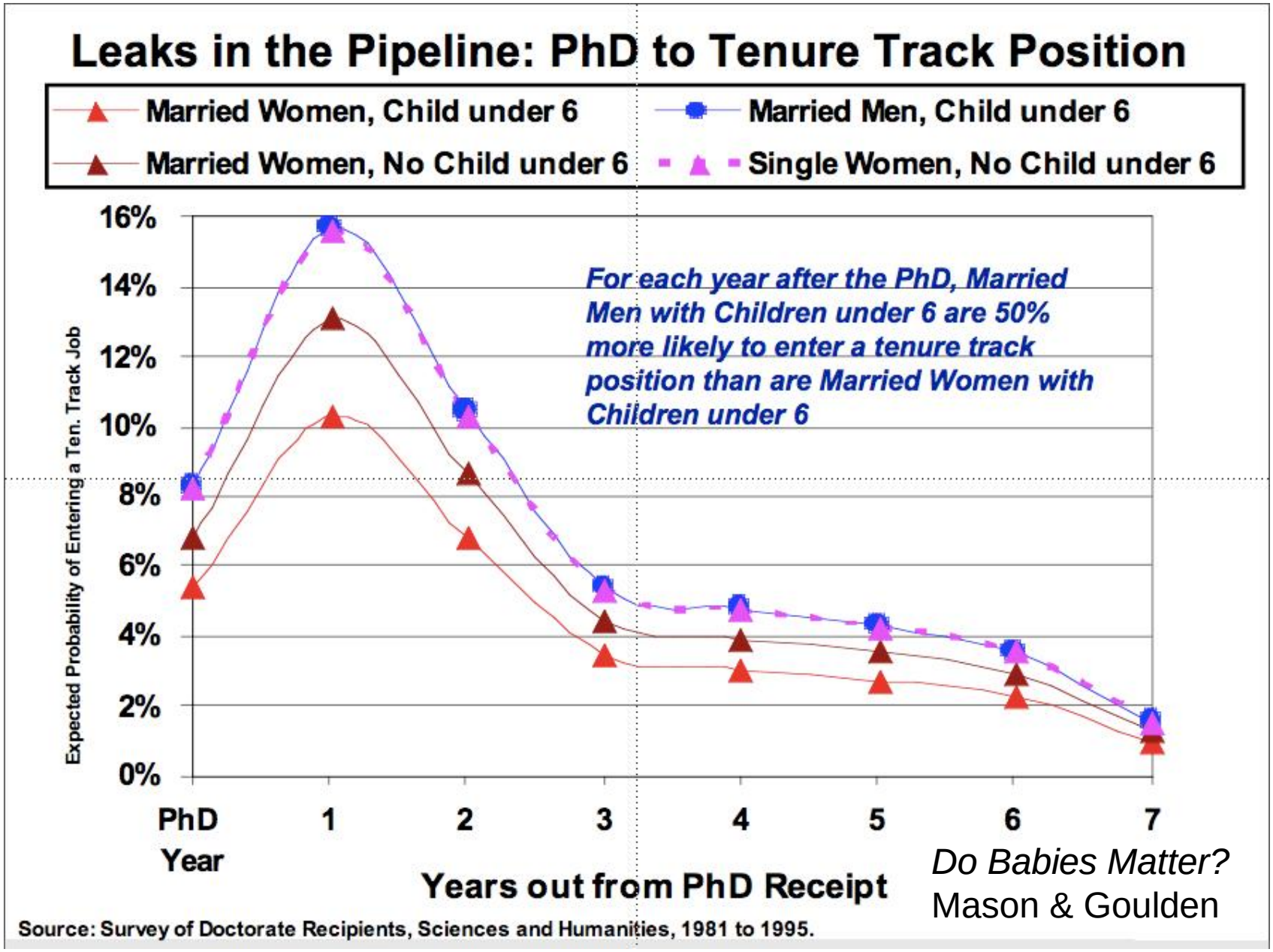


Percent of PTEM* UCB Faculty in Joint Departmental Appointments by Gender, 1980-2003

*Includes physical sciences, technology, engineering, and mathematics. Does not Include life sciences.



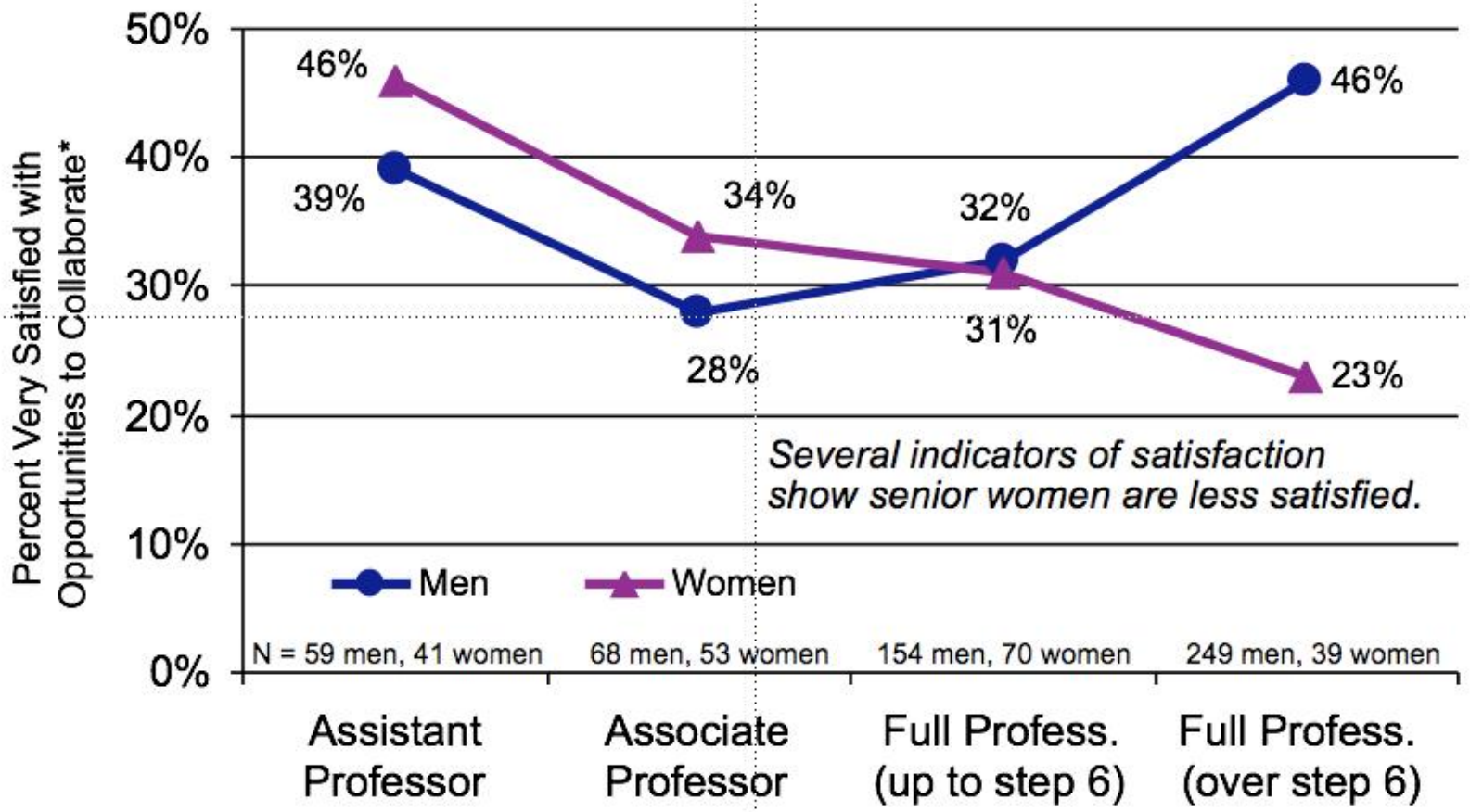
Source: UCB Faculty Personnel Records, 1980-2003.



Do Babies Matter?
Mason & Goulden

Gender and Rank

Crossing lines of opportunities to collaborate



*vs. somewhat satisfied, somewhat dissatisfied, and very dissatisfied.

Source: UCB Faculty Climate Survey, Spring 2003.

Woman's Focus Groups – Engineer 2020 Project

- A change in the culture of engineering (practice) is desired
  - Less unrewardingly competition, more collaboration
  - Changes in the types of problems we solve
  - Diversity and quality are seen as complementary
  - Greater value placed on family issues in work environment
- Strategies to get there
  - Radical change in the power structure (as it relates to who decides what problems are important)
  - Decision-makers represent a more diverse group
  - Allow alternative paths into the profession

Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering, National Academies Press, 2007.

Conclusions

Unintentional Bias Is Major Barrier

University trustees, university, presidents, and provosts

Deans, department chairs, Tenured faculty

LEADERSHIP

CLIMATE

RECRUITING

HIRING, TENURE, PROMOTION POLICIES

MONITOR AND EVALUATE

Professional societies

Journals

Federal funding agencies

Federal enforcement agencies

Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering, National Academies Press, 2007.

Call to Action

TRACKING AND EVALUATION

BOX 6-8. Scorecard for Evaluating How Well Research Universities Serve Women and Minorities in Science and Engineering

This scorecard should be used as a tool for continuous assessment of institutional efforts to remove the barriers to participation in science and engineering by women. It can be used to identify and publicize institutions that recruit and nurture talented individuals from diverse backgrounds, to create a culture that welcomes and supports all scientists and engineers and helps them realize their potential, and to work to overcome barriers to talented scientists and engineers at all levels

A. Demographics	**Number This year**		**Number 5 yrs ago**		**Number 10 yrs ago**	
Students/Scholars *(report by department)*	Men	Women	Men	Women	Men	Women
(A1) S&E undergraduate degrees						
(A2) S&E doctoral degrees (see A1)						
(A3) S&E postdoctoral scholars (see A1)						
Professors *(report by department/unit)*	**Number this year**		**Number last year**		**Number 2 yrs ago**	
(A4) Assistant tenure track professors						
(A5) Associate professors • Tenure-track • Tenured						
(A6) Full professors						
(A7) Endowed chairs						
(A8) Department chairs						
(A9) Center Directors						
(A10) Academic Deans[a]						
(A11) Provost						
(A12) President						

B. Faculty turnover *(report by department /center/hiring unit)*	**Number this year**		**Number last year**		**Number 2 yrs ago**		**Number 3 yrs ago**	
	Men	Women	Men	Women	Men	Women	Men	Women
(B1) Number of faculty searches								
(B2) Number of applications								
(B3) Number of interviews								
(B4) Number of faculty hired								
(B5) Number of faculty who left before tenure review								

- Monitor and evaluate
- Use peer pressure to highlight differences
- Track pathways
- Identify factors for success
- Develop data-driven strategies for action