The Nation Needs More Women Physicists

APS Gender Equity Workshop

May 6, 2007

Arthur Bienenstock

Scientific and Technological Workforce - View From OSTP – 1997-8 - 1

- Perception that science & technology very important to economy
  - Over 50% of productivity increase over past half century ascribed to science and technology
- Very low unemployment rate
- Statements that unavailability of science and technology workers is limiting economic growth
- Requests for increases in H-1B visas

Growth in Fraction of Total U.S. Workforce Employed in ST&E

- 1962 - 11%
- 1995 - 15%

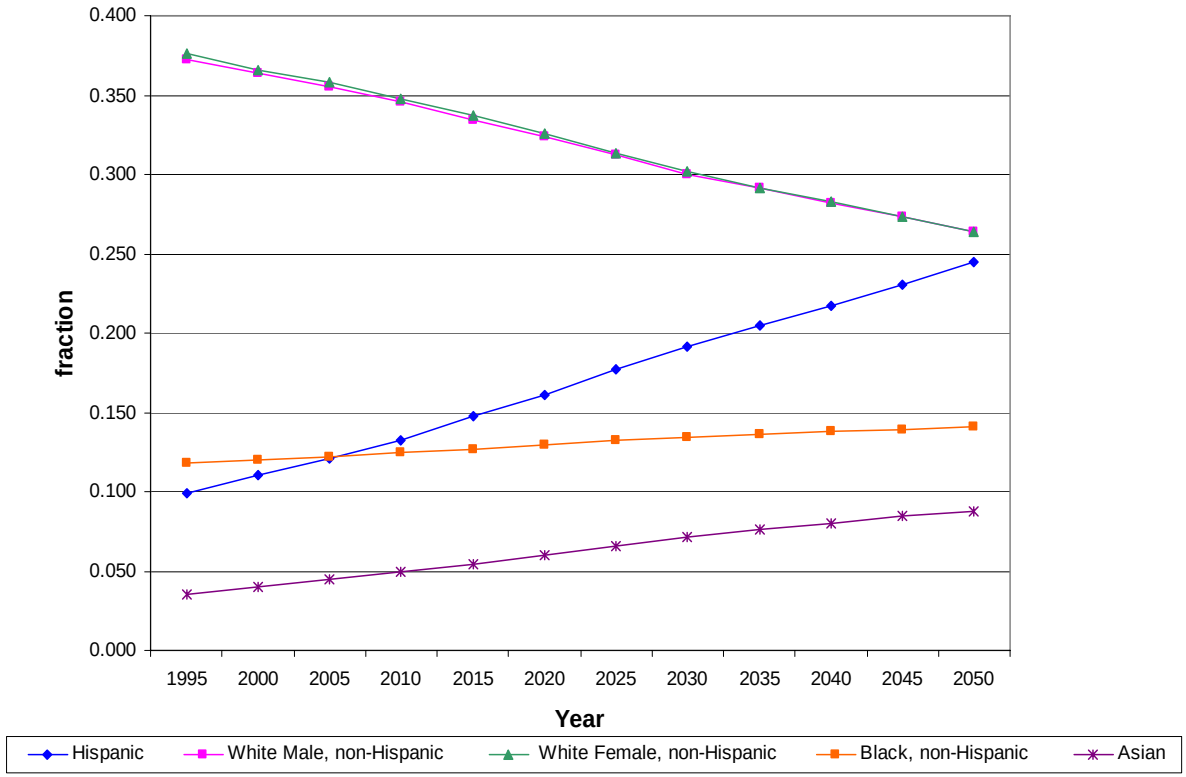
(OSTP analysis of Bureau of Labor Statistics statistics)

BLS Projections - Job Growth

- Professional specialty occupations
  - Includes scientists, engineers, medical personnel
- 1986-1996 - Grew by 34%
- 1996-2006 - Projected growth - 27%
- Ten specific occupations with highest projected growth
  - 6 - health-related
  - 4 - computer-related

Bureau of the Census Demographic Projections - 18-64 year olds

Figure 1-3.



Percent of 22 Year Olds Earning Science & Engineering Degrees - 1995

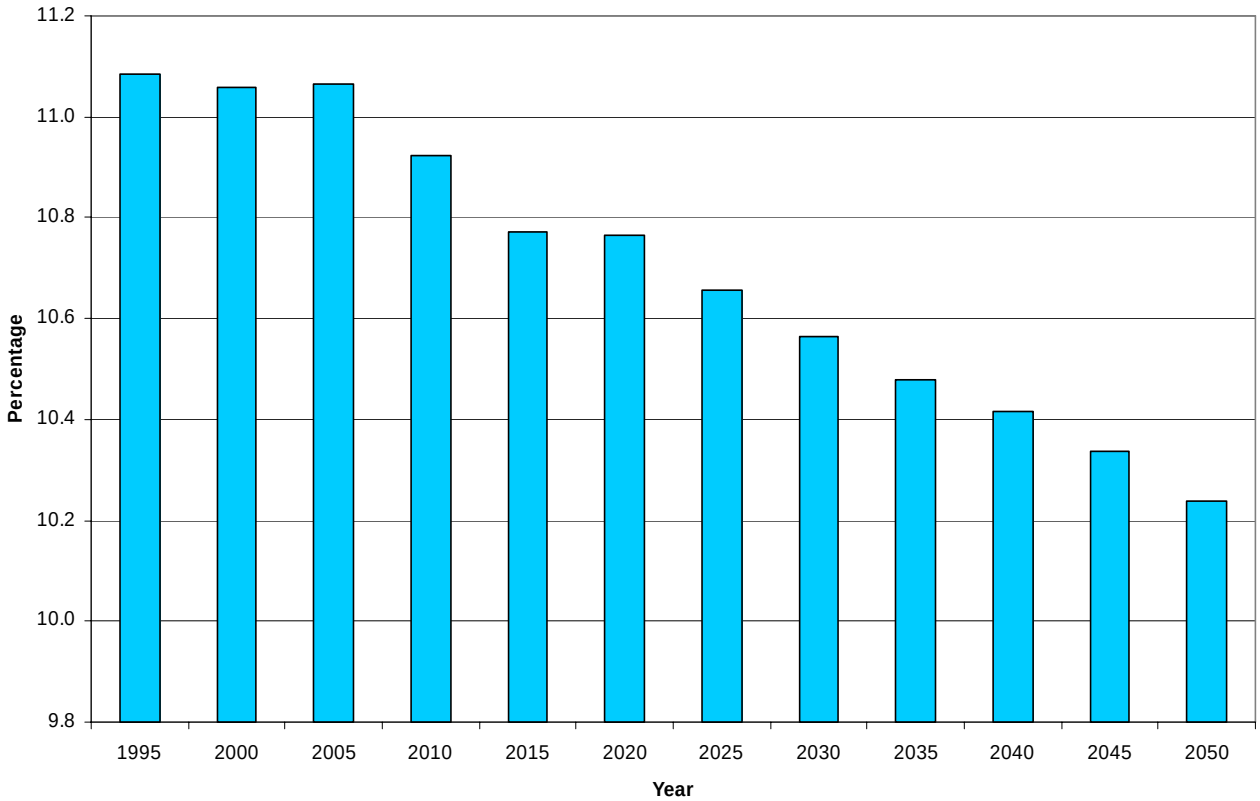
- African-Americans - 5.7
- Asians - 21.6
- Hispanic - 4.8
- non-Hispanic White Females - 11.8
- non-Hispanic White Males - 13.8

Projections of Future Situation

- **If** participation rates of all the groups remain the same and demographic projections are correct,
- **then** fraction of workforce that is ST&E will decrease significantly at time when increase is likely to be needed.

Calculated Fraction of 22 Year Olds Receiving Bachelors Degrees in Science & Engineering if Award Rates of Various Groups Remain Constant

Figure 1-4.



Immigration & the ST&E Workforce - 1995

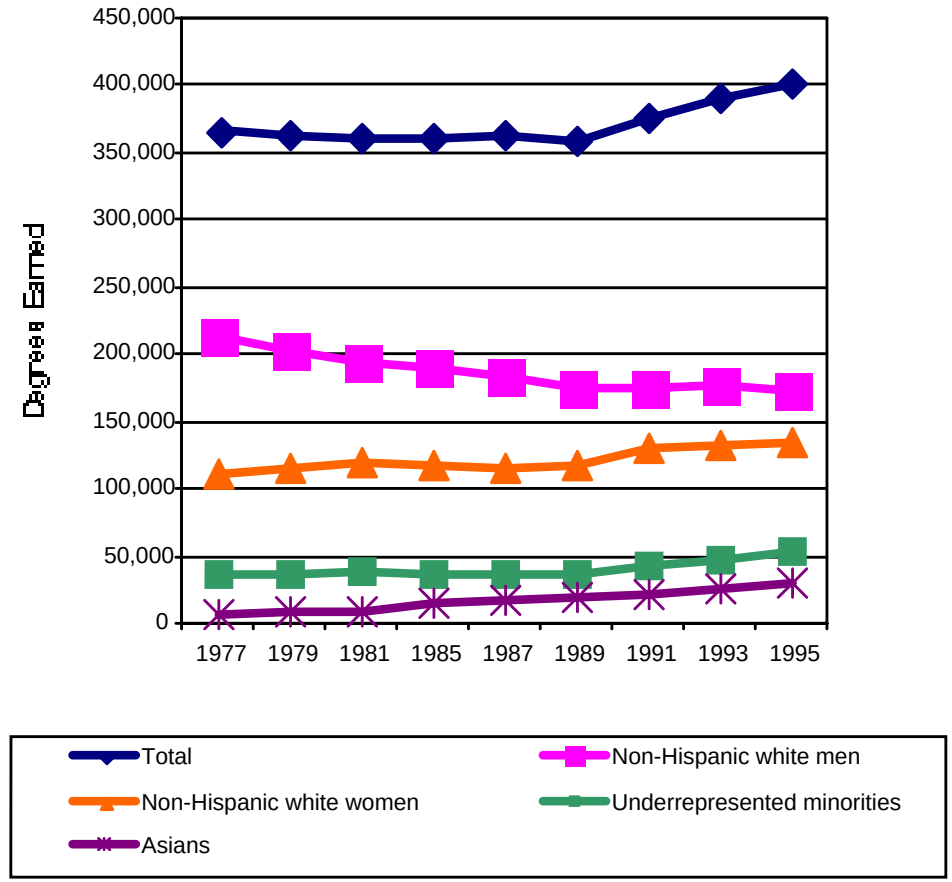
- 12% of people in U.S. holding S&E bachelor's degrees were naturalized citizens or non-U.S. citizens
- Would have to increase immigration significantly to hold ST&E fraction of workforce constant if don't increase domestic participation rates
- Nations providing immigrants are building their own ST&E workforces and economies

Basic Conclusion

- Must remain attractive for immigration
- Must increase participation rates of all groups in ST&E
- Under-represented minorities, women and persons with disabilities represent largest potential pools

There has been progress

Figure 1-14. Earned BS/BA degrees in ST&E fields, by Race/Ethnicity, 1977-1 (U.S. citizens and permanent residents)

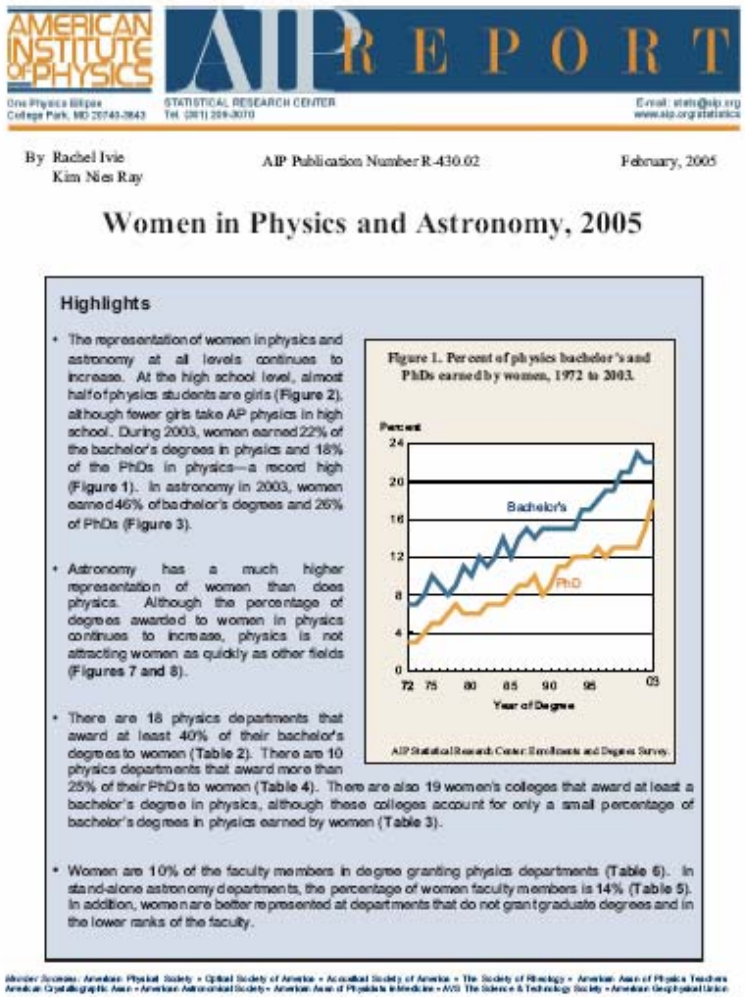


H-1B Visa

- **H-1B Visa Caps**
  - **65,000 Standard**
  - **Additional 20,000: "Advanced Degree Exemption Category"**
    - **Designated for M.S. & Ph.D. recipients from U.S. universities**
  - **Reached application limit in one day**

From Amy Flatten's talk at 4-07 APS Council on International Affairs

AIP Publication Number R-430.02
Women in Physics and Astronomy, 2005
Rachel Ivie and Kim Nies Ray



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Women in Physics and Astronomy, 2005

Highlights

- The representation of women in physics and astronomy at all levels continues to increase. At the high school level, almost half of physics students are girls (Figure 2), although fewer girls take AP physics in high school. During 2003, women earned 22% of the bachelor's degrees in physics and 18% of the PhDs in physics—a record high (Figure 1). In astronomy in 2003, women earned 46% of bachelor's degrees and 26% of PhDs (Figure 3).

- Astronomy has a much higher representation of women than does physics. Although the percentage of degrees awarded to women in physics continues to increase, physics is not attracting women as quickly as other fields (Figures 7 and 8).

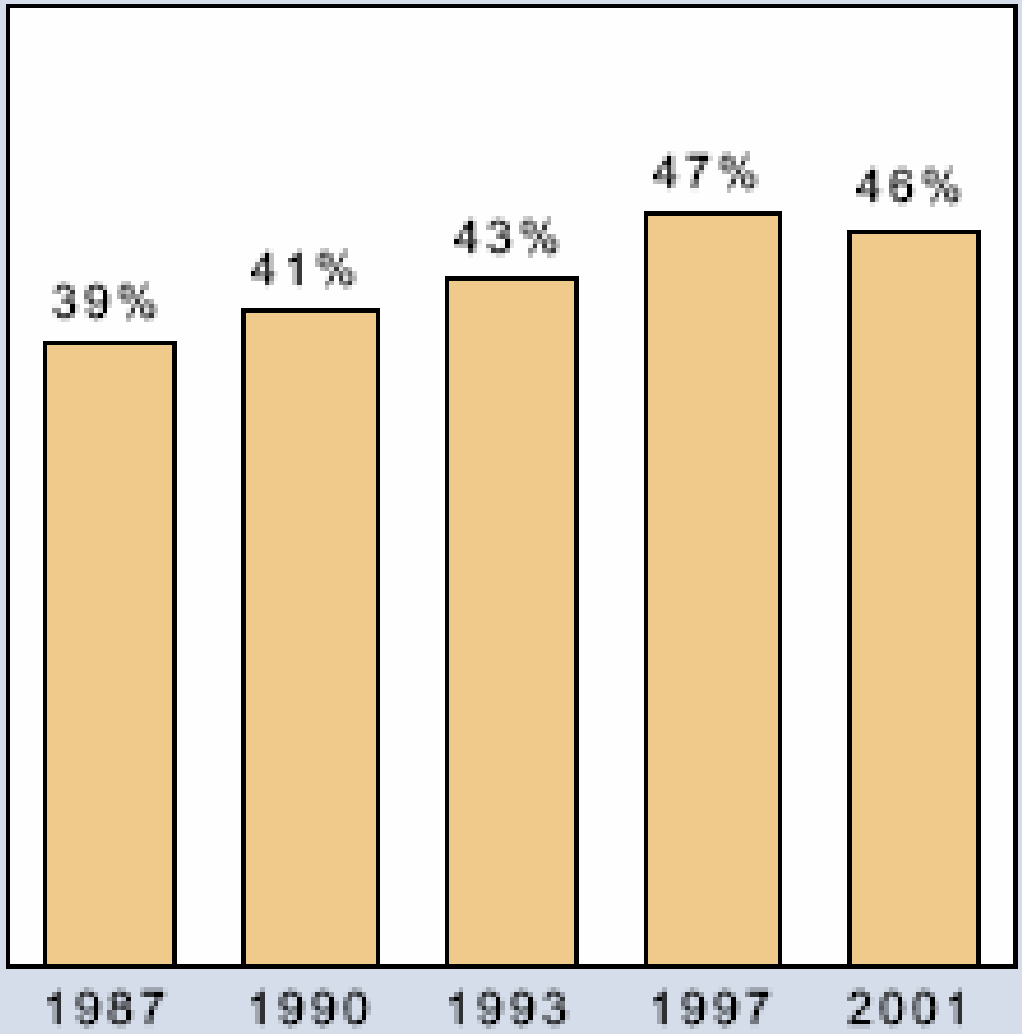
- There are 18 physics departments that award at least 40% of their bachelor's degrees to women (Table 2). There are 10 physics departments that award more than 25% of their PhDs to women (Table 4). There are also 19 women's colleges that award at least a bachelor's degree in physics, although these colleges account for only a small percentage of bachelor's degrees in physics earned by women (Table 3).

- Women are 10% of the faculty members in degree granting physics departments (Table 6). In stand-alone astronomy departments, the percentage of women faculty members is 14% (Table 5). In addition, women are better represented at departments that do not grant graduate degrees and in the lower ranks of the faculty.

Figure 1. Percent of physics bachelor's and PhDs earned by women, 1972 to 2003.

AIP Statistical Research Center: Enrollments and Degrees Survey

Figure 2. Girls as a percentage of total enrollment in high school physics over time.



AIP Statistical Research Center: 1986-87, 1989-90, 1992-93, 1996-97 & 2000-01 High School Teacher Surveys.

U.S. Bachelors Degrees in Physics Show Dependence on Women

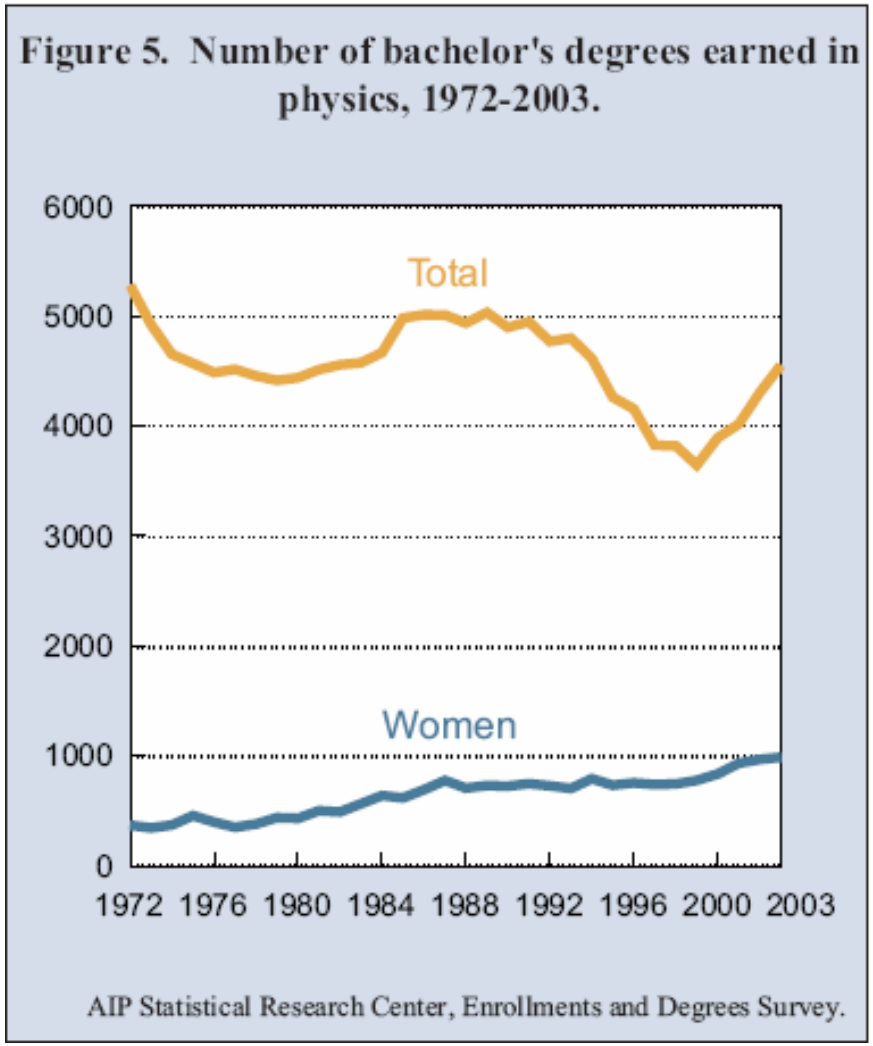
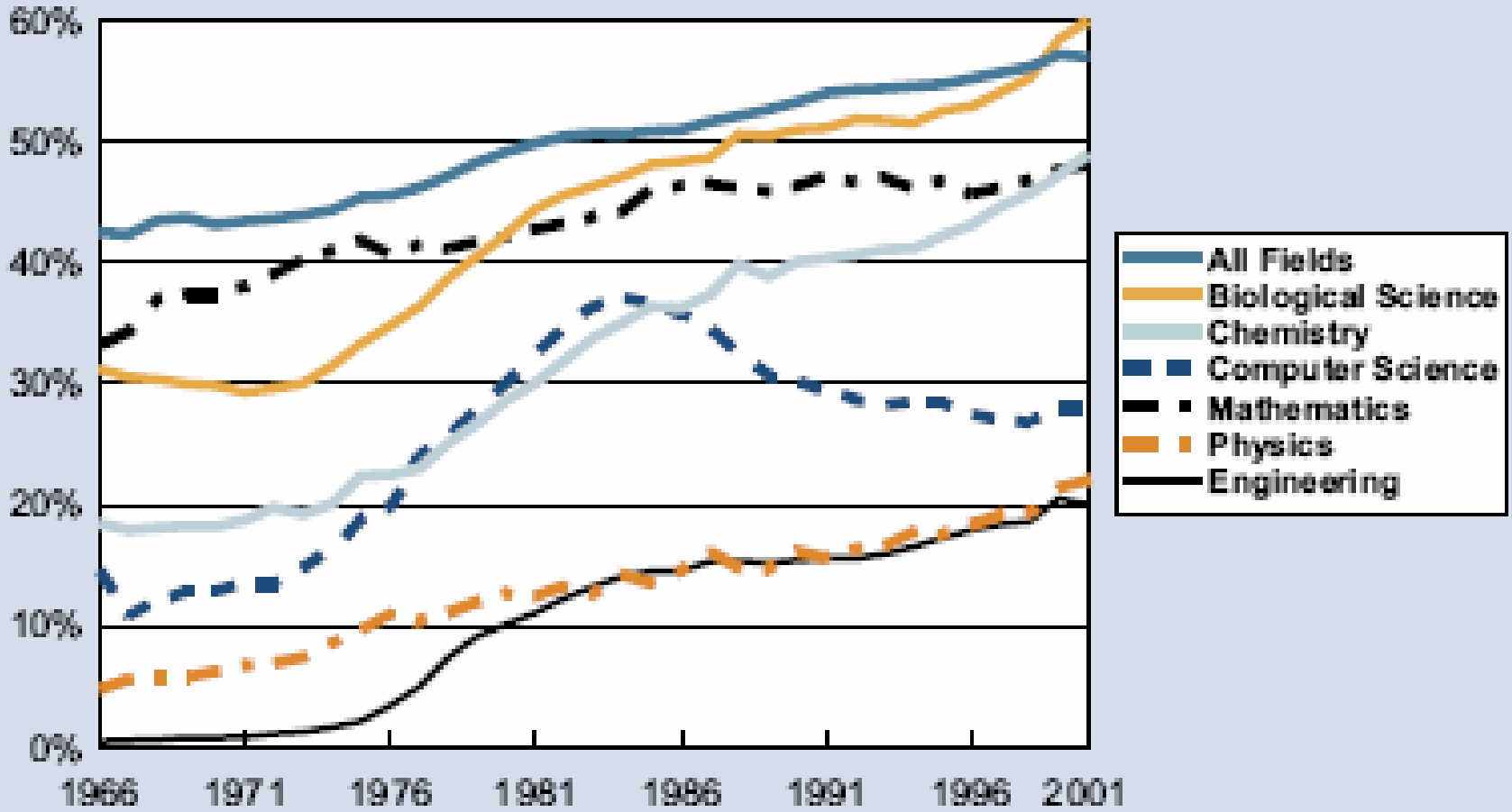
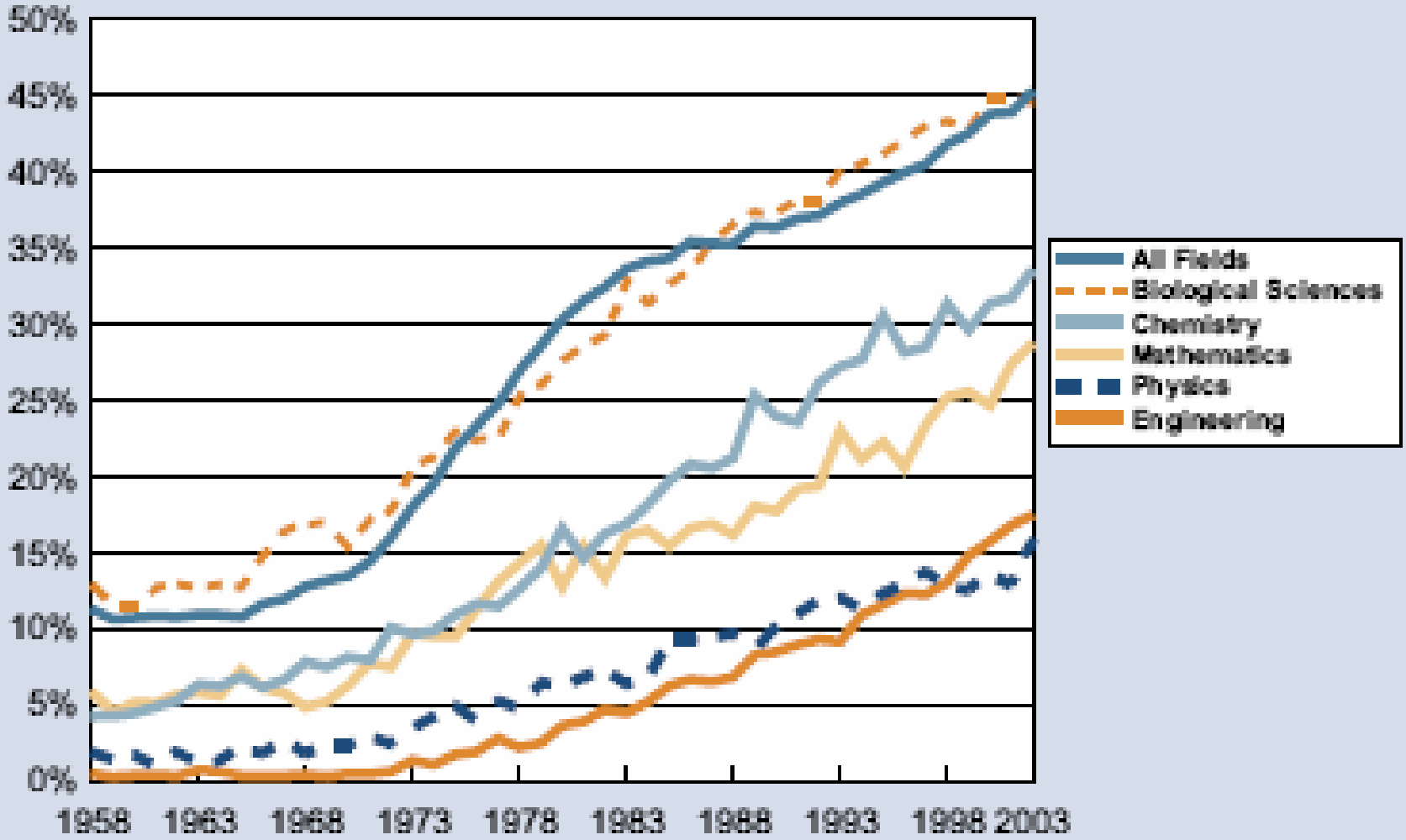


Figure 8. Percent of bachelor's degrees earned by women in selected fields, 1966-2001.



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

Figure 7. Percent of PhDs earned by women in selected fields, 1958-2003.



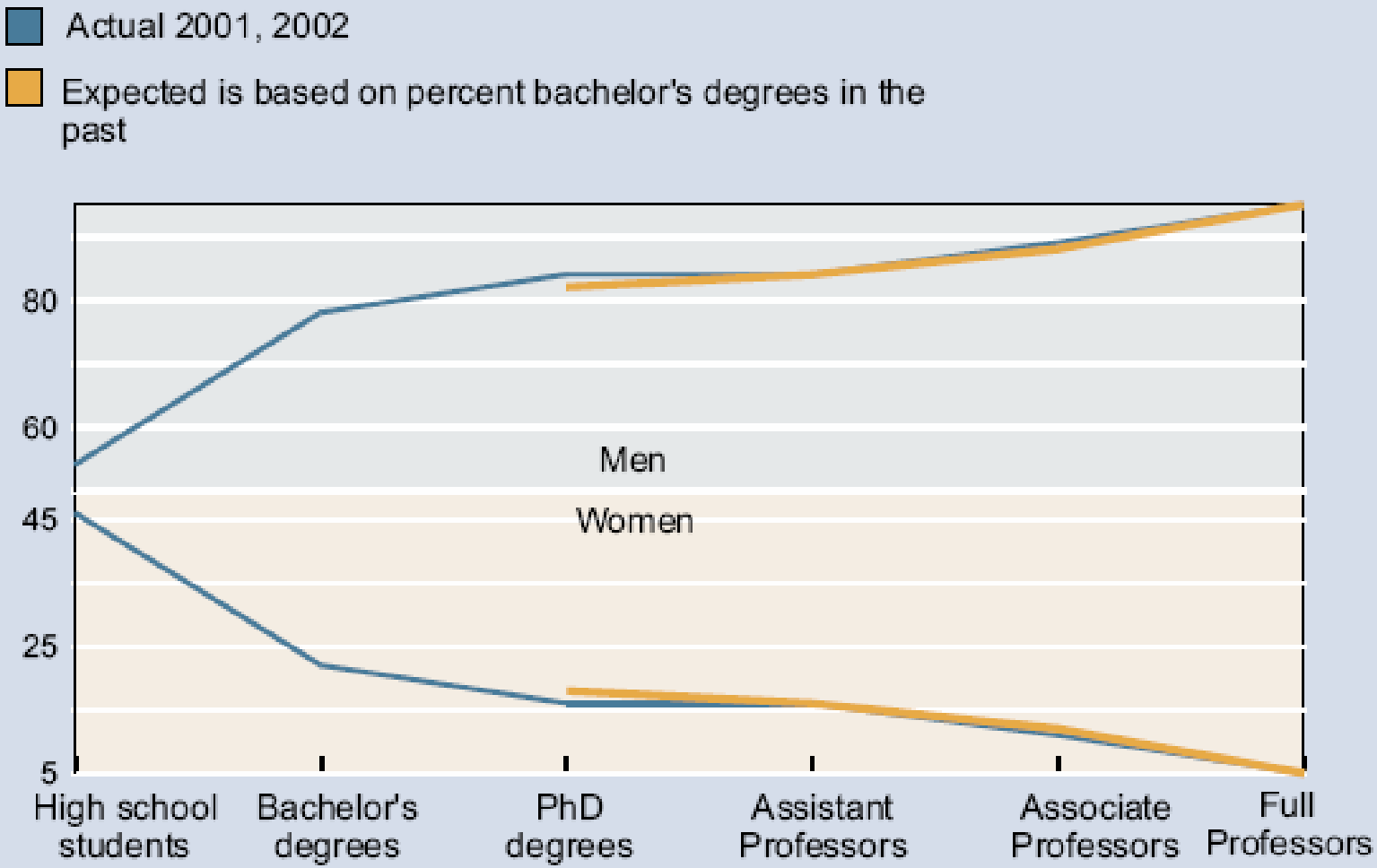
National Science Foundation. Compiled by AIP Statistical Research Center.

Table 6. Percent of faculty positions in physics held by women, 1994, 1998 and 2002.

	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

AIP Statistical Research Center: 2002 Academic Workforce Survey.

Figure 11. Actual and expected percentage of women and men in physics in the US.



AIP Statistical Research Center.

How Meet Nation's Needs?

- Increase participation of woman by making physics more attractive for secondary school, B.S. and M.S. students
- Team with schools of education to produce high quality secondary school teachers of physics
  - Heavy emphasis of APS on PhysTEC and PTEC
- Encourage women to study physics and be physicists
  - Women faculty
  - Taking maternity and child-care into account
  - Gender equity