Academic Careers: What's Really Out There?

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Scope

PhD-trained individuals* pursuing **academic careers** in post-secondary institutions in the U.S. in biomedical and/or STEM fields.

*generally who earned the PhD in the U.S.
STEM = science, technology, engineering, & math

Game Plan

- History of post-secondary education in the U.S. (BRIEF)
- Carnegie Classification – types and numbers of U.S. institutions
- Academic career as a function of institution type
- Salaries
- Academic employment patterns for PhDs in the biomedical sciences

Game Plan (cont'd)

- Interest in research-intensive academic positions may be waning
- PhDs Wanted!
  - In the clinical departments of medical schools
  - In dental schools
  - In nursing schools

A Brief History of Post-secondary Education in the U.S.

- Earliest U.S. colleges (*e.g.,* Harvard - 1636, William and Mary, Yale)
- First academic departments (1820s)
- Graduate education imported from Germany: 1876, Johns Hopkins and the ACS
- AAUP Statement on Tenure: 1940

Academics in the U.S. - History

- Post World War II investment in scientific research in universities
- GI Bill, baby boomers, and tremendous academic expansion
- Title IX of the Educational Amendments of 1972 prohibits sex discrimination in education
- 1994 amendment to the Age Discrimination in Employment Act abolishes mandatory retirement age for faculty

Carnegie Classifications

- A taxonomy of U.S. colleges and universities
- Developed by the Carnegie Foundation for the Advancement of Teaching in 1970 and revised multiple times since

1994 Classification

- Research universities I and II
- Doctoral universities I and II
- Masters (Comprehensive) college/universities I and II
- Baccalaureate (Liberal Arts) colleges I and II
- Associate of Arts Colleges
- Specialized institutions
- Tribal college and universities

Evolution of the Carnegie Classifications

- Research I University (1994)
- Doctoral/Research University – Extensive (2000)
- Research University (very high research activity) (2006)

Top Doctorate Granting Institutions: Life Sciences 2007

- Harvard 218
- U. Wisconsin 211
- Johns Hopkins 205
- U. Florida 204
- U. Minnesota 201
- UC, Davis 190
- UC, Berkeley 186
- U. Washington 183
- Ohio State 170
- UCLA 168
- UNC, Chapel Hill 163
- Cornell 143
- U. Michigan 141
- Penn State 138
- Boston U. 124
- Texas A&M 122
- U. Arizona 117

Institutions Receiving the Largest Amount of Federal Funding: 2007

- Johns Hopkins
- U. Washington
- U. Michigan (all campuses)
- U. Pennsylvania
- UCLA
- Duke
- UC, San Diego
- UC, San Francisco
- Harvard
- U. Pittsburgh (all campuses)
- Columbia U.
- Stanford
- Wash. U St. Louis
- Yale
- MIT
- U. Minn. (all campuses)
- U. Wisconsin
- Penn State (all campuses)

Institution Number

Institution Type	Number of Institutions
2-year colleges	1814
Baccalaureate colleges	767
Master's institutions	664
Research institutions	282
Medical schools/centers	57
Total	4391

Chronicle for Higher Education Almanac 2008-09

Institution Number and Enrollment

Institution Type	Percent of Institutions	Percent of Enrollment
2-year colleges	41.3%	38.9%
Baccalaureate colleges	6.4%	7.9%
Master's institutions	15.7%	22.2%
Research institutions	6.4%	27.9%
Medical schools/centers	1.3%	0.5%
Other	18.4%	3.3%

Chronicle for Higher Education Almanac 2008-09

Research

Reviewing grants, manuscripts

Getting grants and publishing

Attending professional meetings

Supervising postdocs, graduate students

Teaching

Advising students

Holding office hours

Service

Advising student organizations/clubs

Experiential learning

Community outreach

Living/dining in residence halls

Committee work

Faculty governance

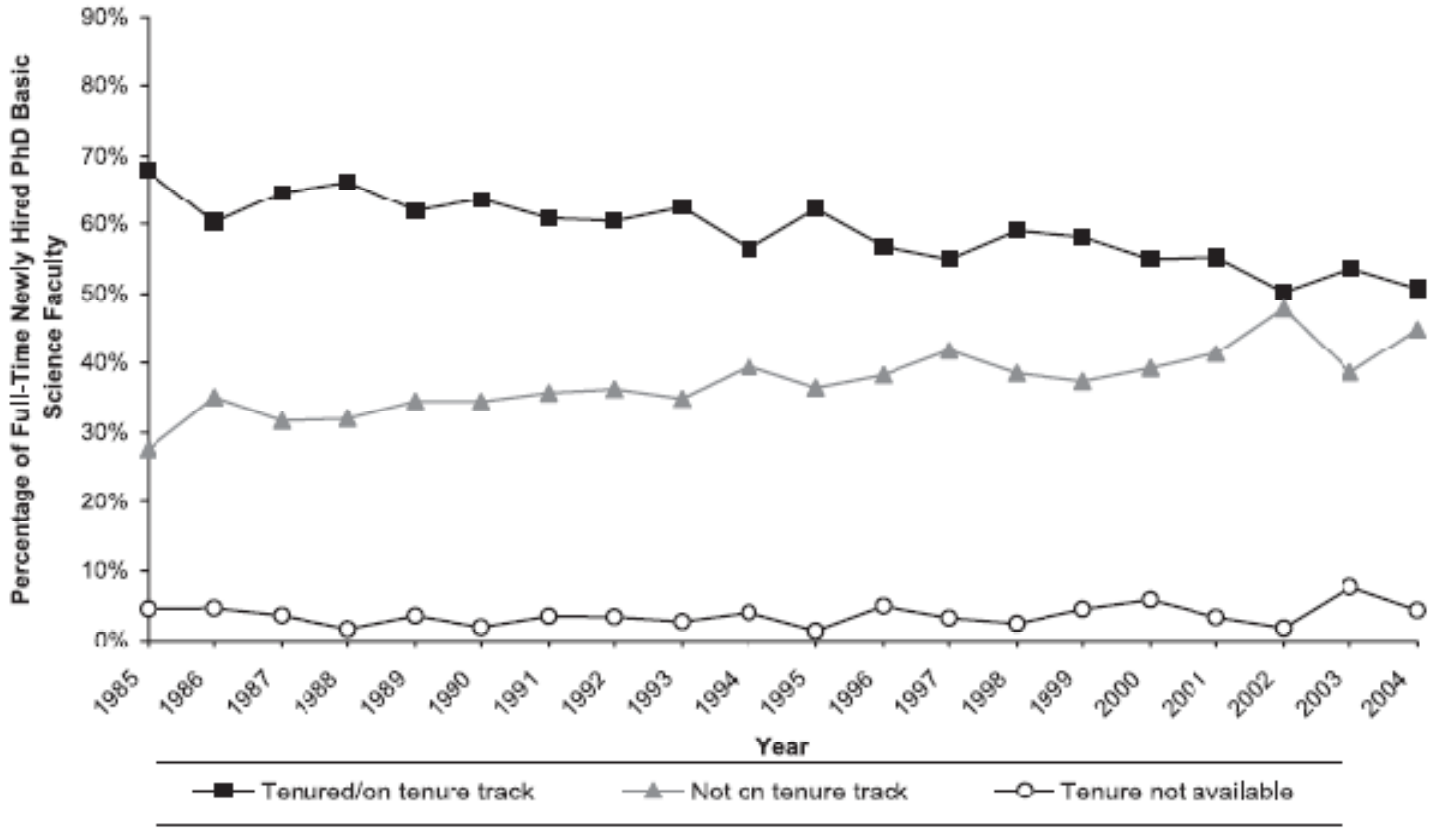
Recruiting

Agricultural extension services

Average Salaries
(9-month)

Institution Type	**Full**	**Associate**	**Assistant**
		Professor ($ x 10^{-3})	
2-year colleges	72	58	51
Baccalaureate colleges	84	64	53
Master's institutions	87	69	58
Research institutions	118	80	**68**
Medical schools/centers*	113	76	60

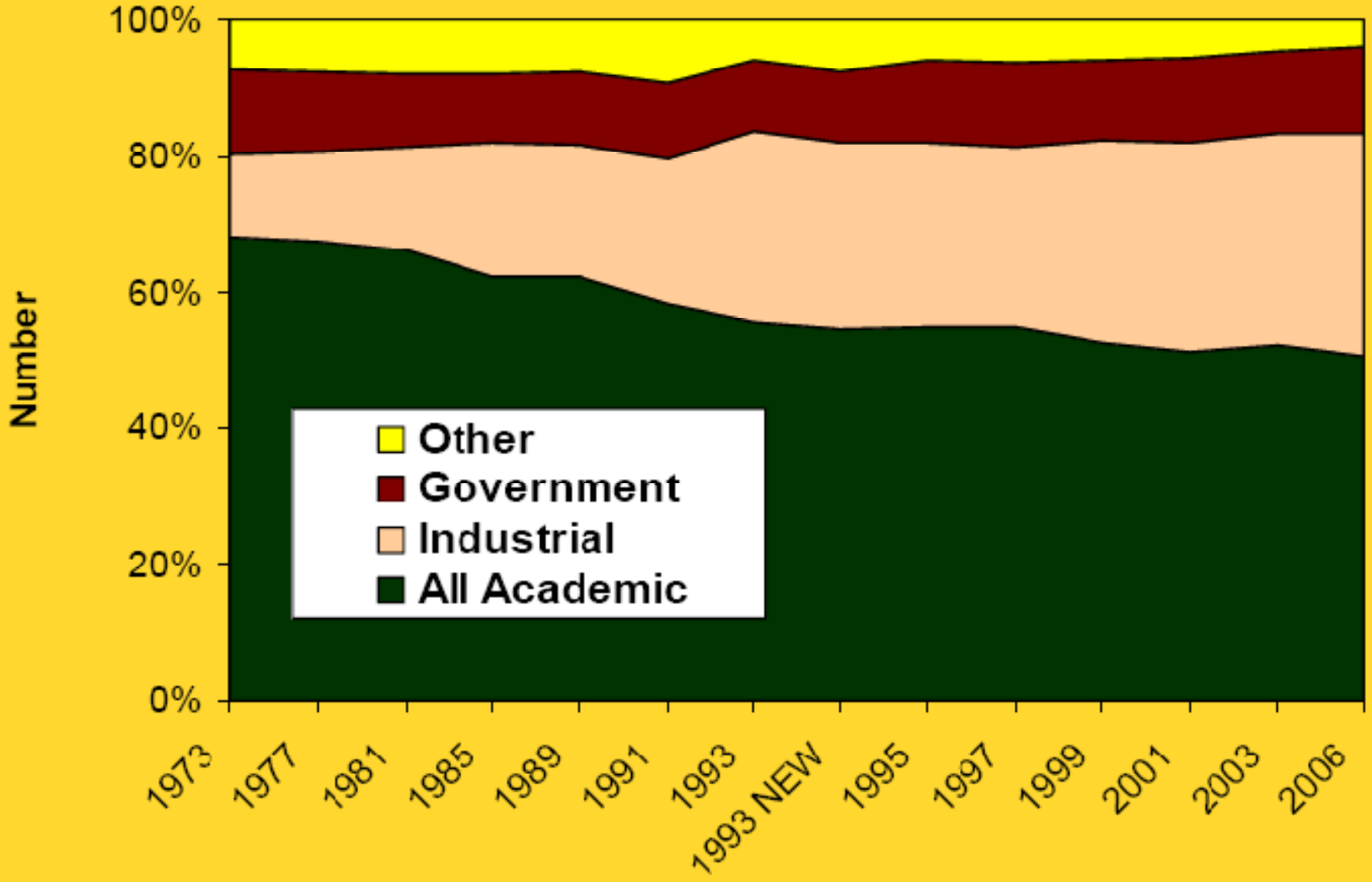
Chronicle for Higher Education April 18, 2008
**Report of Medical School Faculty Salaries*, AAMC, January 2008



Burton, SA, and Mallon, WT, *Acad. Med.* **82**: 281 (2007)

Distribution of Biomedical Science PhDs by Sector of Employment

FASEB



Source: http://sestat.nsf.gov/

Employment of Biomedical Science PhDs by Sector of Employment

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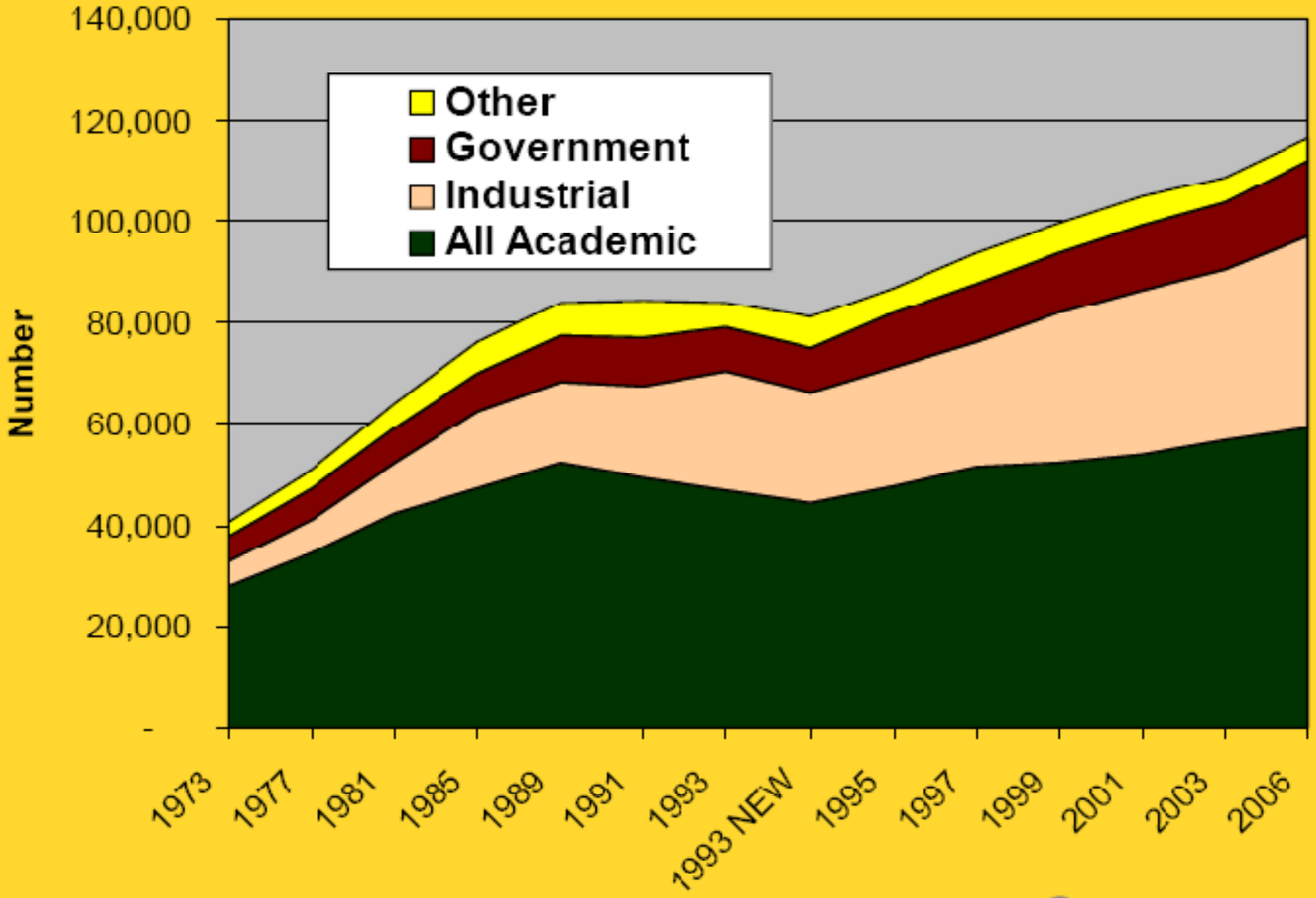

Source: http://sestat.nsf.gov/

How Many Academic Jobs Are There?

Total Full-time Faculty (2003)	630,092
Total Science/Eng/Health (2006)	233,800
Total Biomedical (2006)	58,800
Total PhDs in Med, Dent, Vet Schools (2008)	17,000
Jobs resulting from retirement	1500 - 2300

Doctorate Degrees Awarded in the Biological and Medical Sciences by Sex

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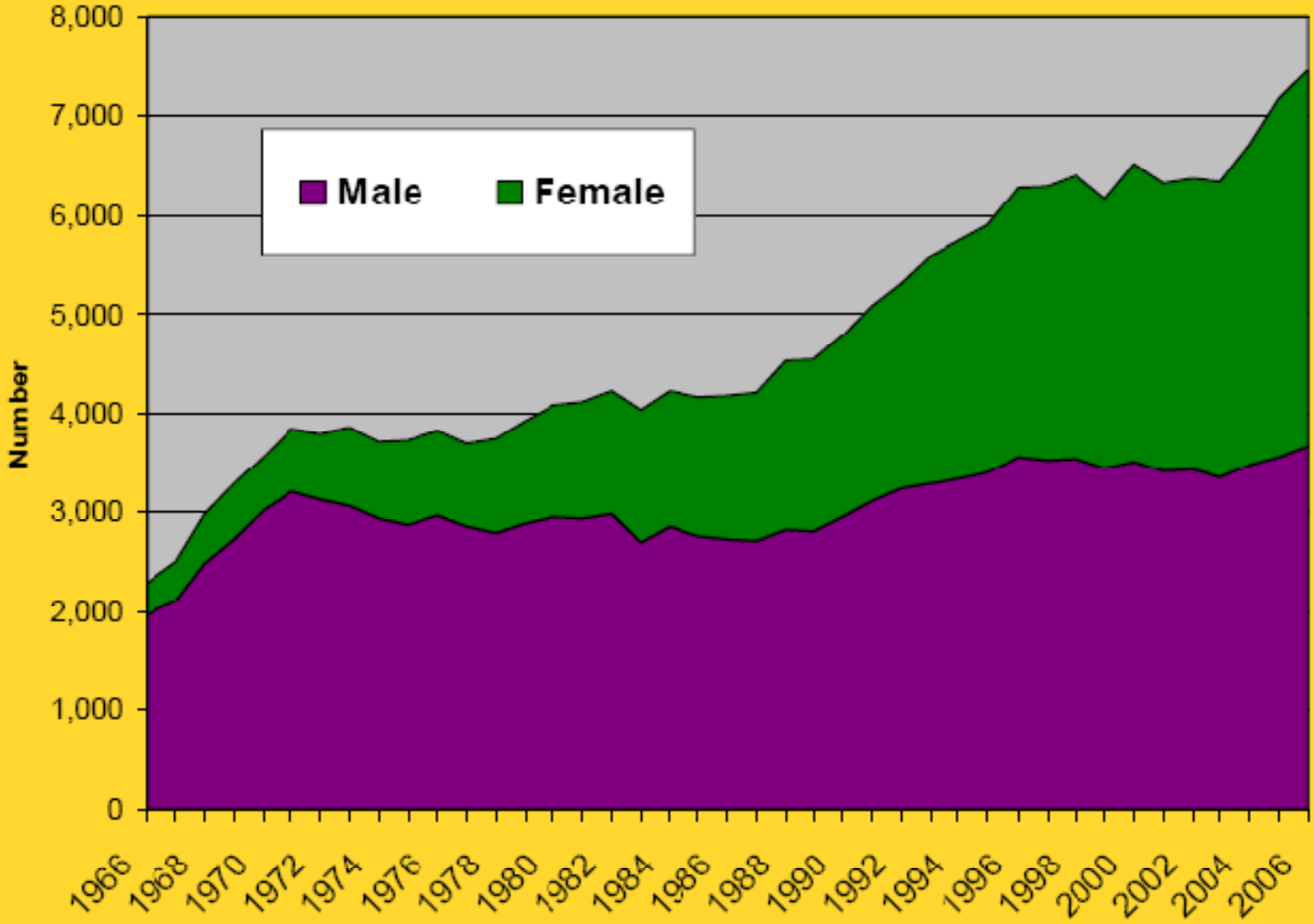

Source: http://www.nsf.gov/statistics/doctorates/

How Many PhDs Are Being Awarded?

Total PhDs (2007)	42,637
Total Science/Eng/Health (2007)	28,774
Total Biomedical (2006)	7,500

Academically Employed Biomedical PhDs by Tenure Status

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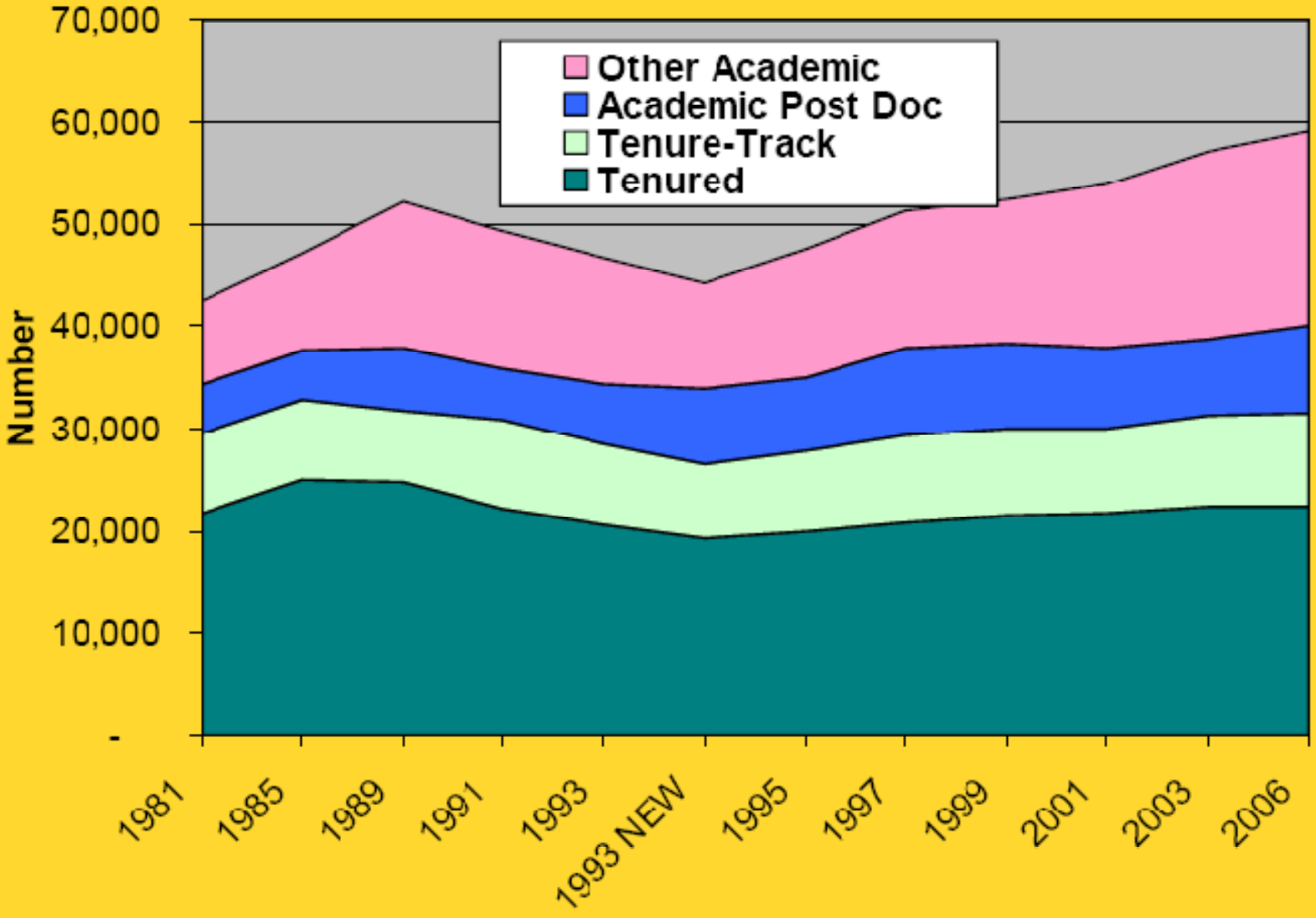

Source: http://sestat.nsf.gov/

Distribution of Academically Employed Biomedical PhDs by Tenure Status

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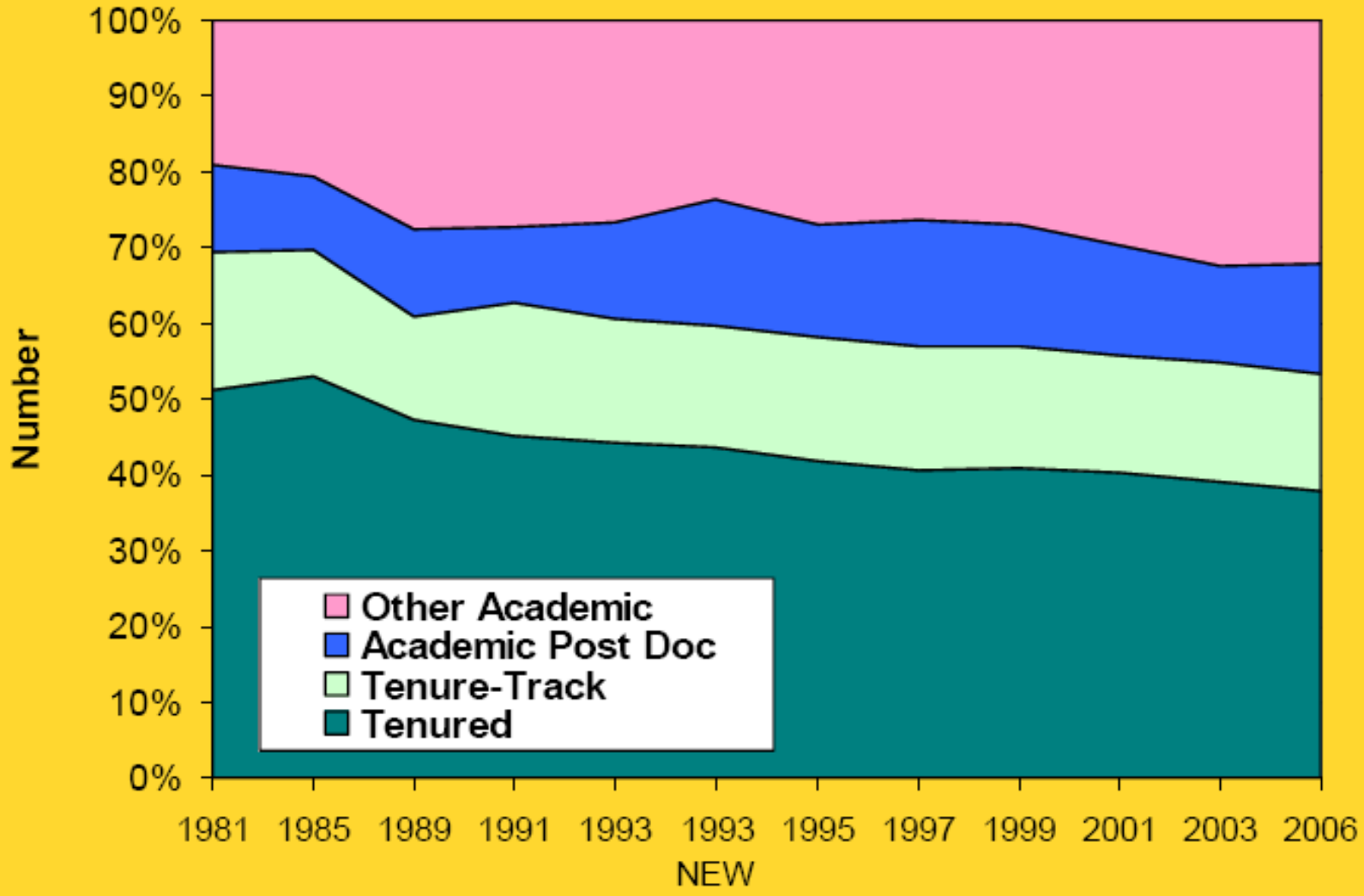

Source: http://sestat.nsf.gov/

Percent of US Biomedical Science PhDs Holding Tenure or Tenure-Track Positions, Total

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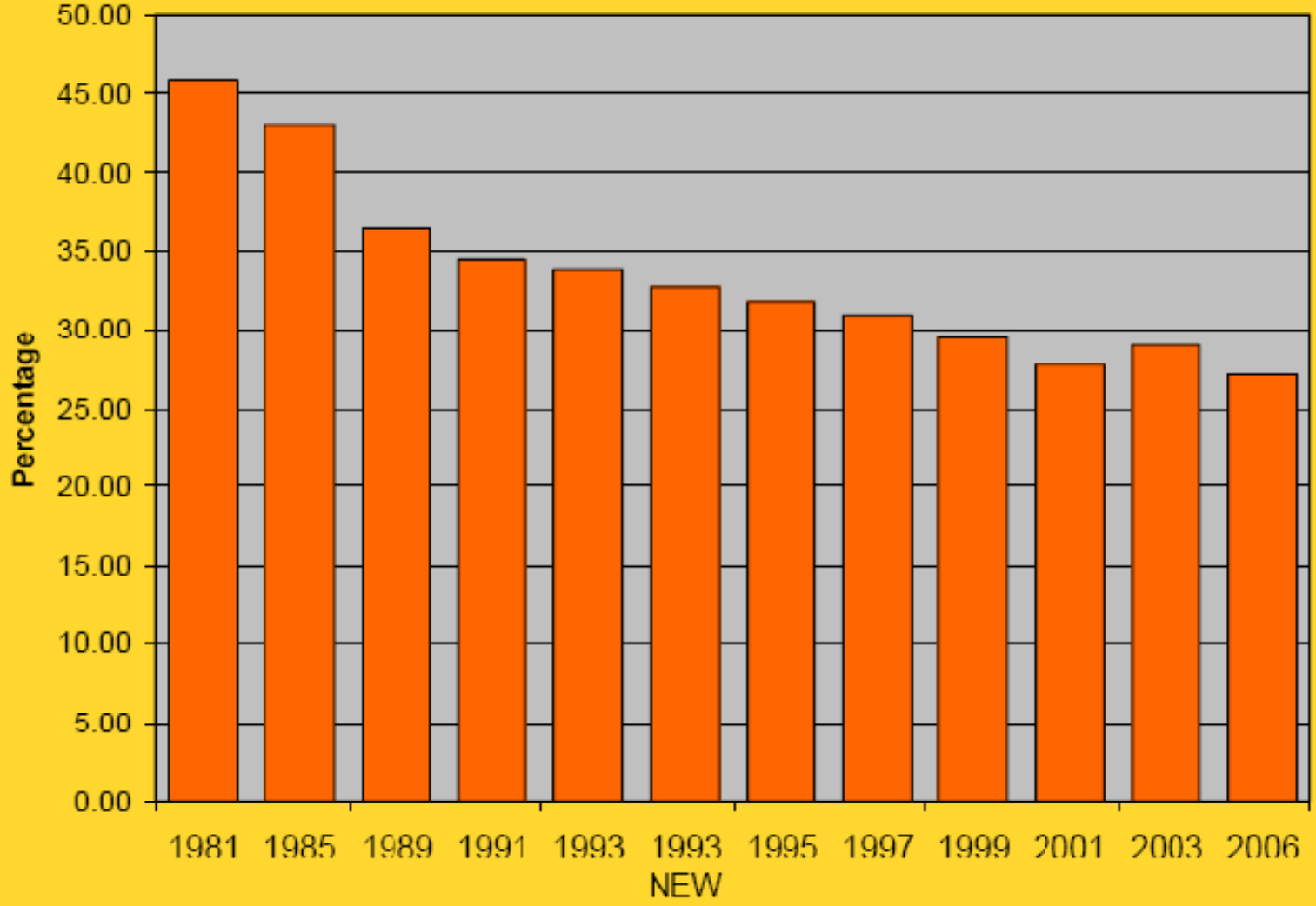
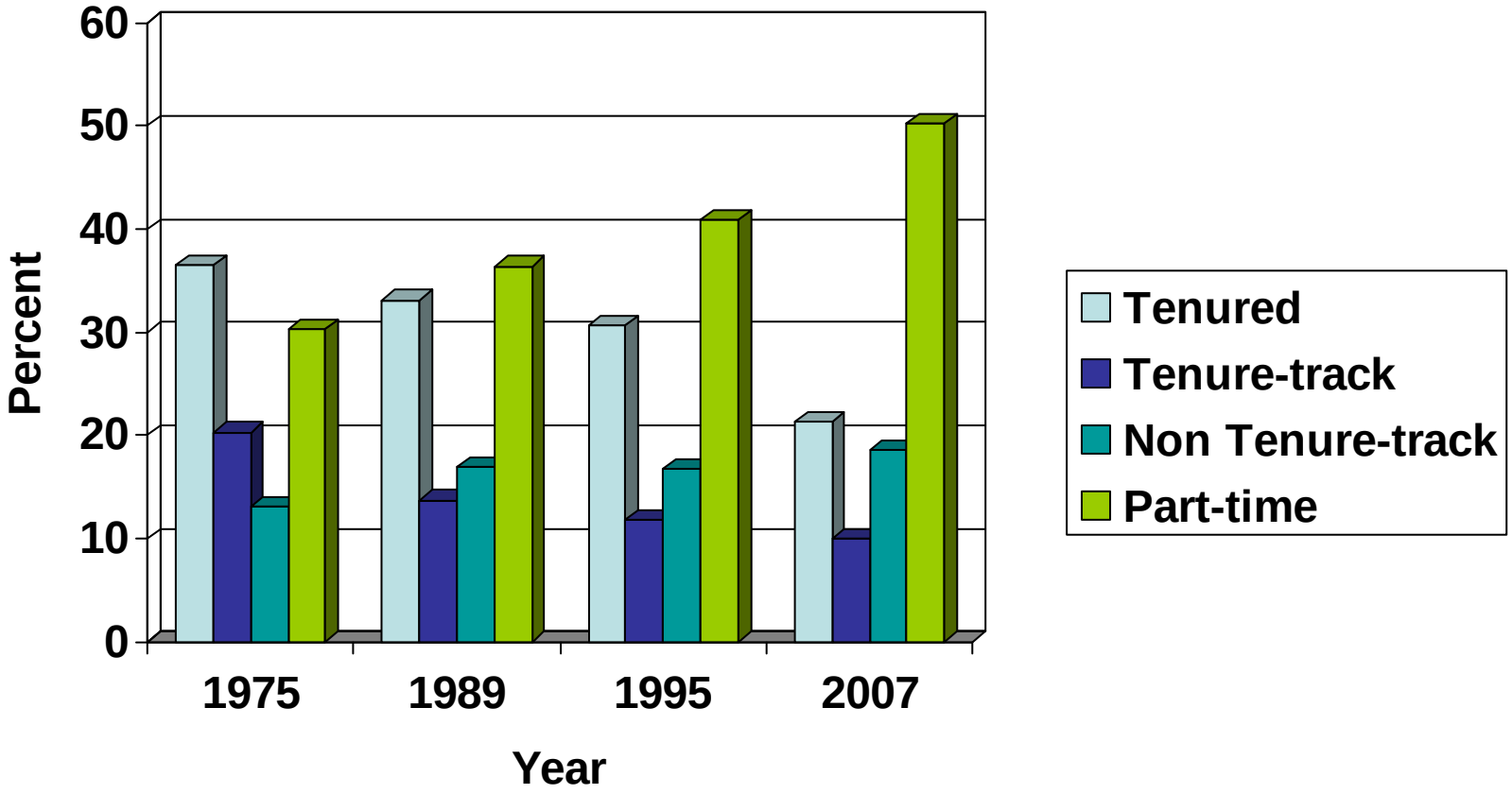


Source: http://sestat.nsf.gov/

Trends in Faculty Status

NOTE: all faculty



On the Brink, AAUP, 2008-09

Does this really describe the academic work world?

Mervis, J. “And Then There Was One,” *Science* **321**: 1622 – 1628 (2008)

The Yale Molecular Biophysics and Biochemistry graduate program

- 30 entering students in 1991
- 26 earned PhDs in 1997 or 1998

Where Are They Now?

Academia (8)

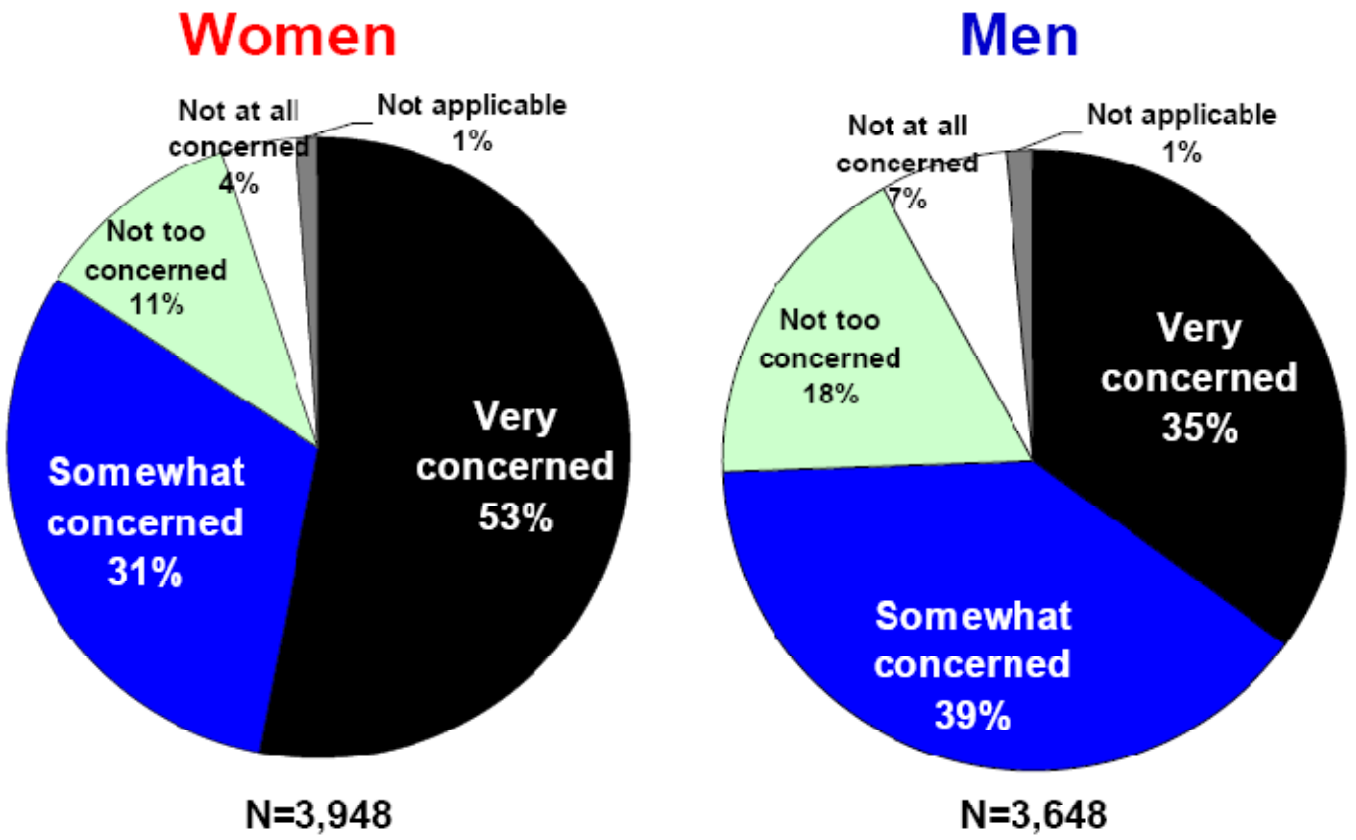
- Tenured: 1
- Tenure-track: 1
- Other: 6

Biotechnology Industry (11)

Other (4)

- Patent law
- IT Industry: 2
- Entrepreneur

UC Doctoral Students: *As you think about your future career plans, how concerned are you about the family friendliness of possible career paths?*



Source: Mason, Mary Ann and Marc Goulden. 2008. "UC Doctoral Student Career Life Survey." (http://ucfamilyedge.berkeley.edu/grad%20life%20survey.html).

As you think about possible future career paths and family issues, how family friendly do you imagine each of the following job types to be?

UC Doctoral Students by Gender

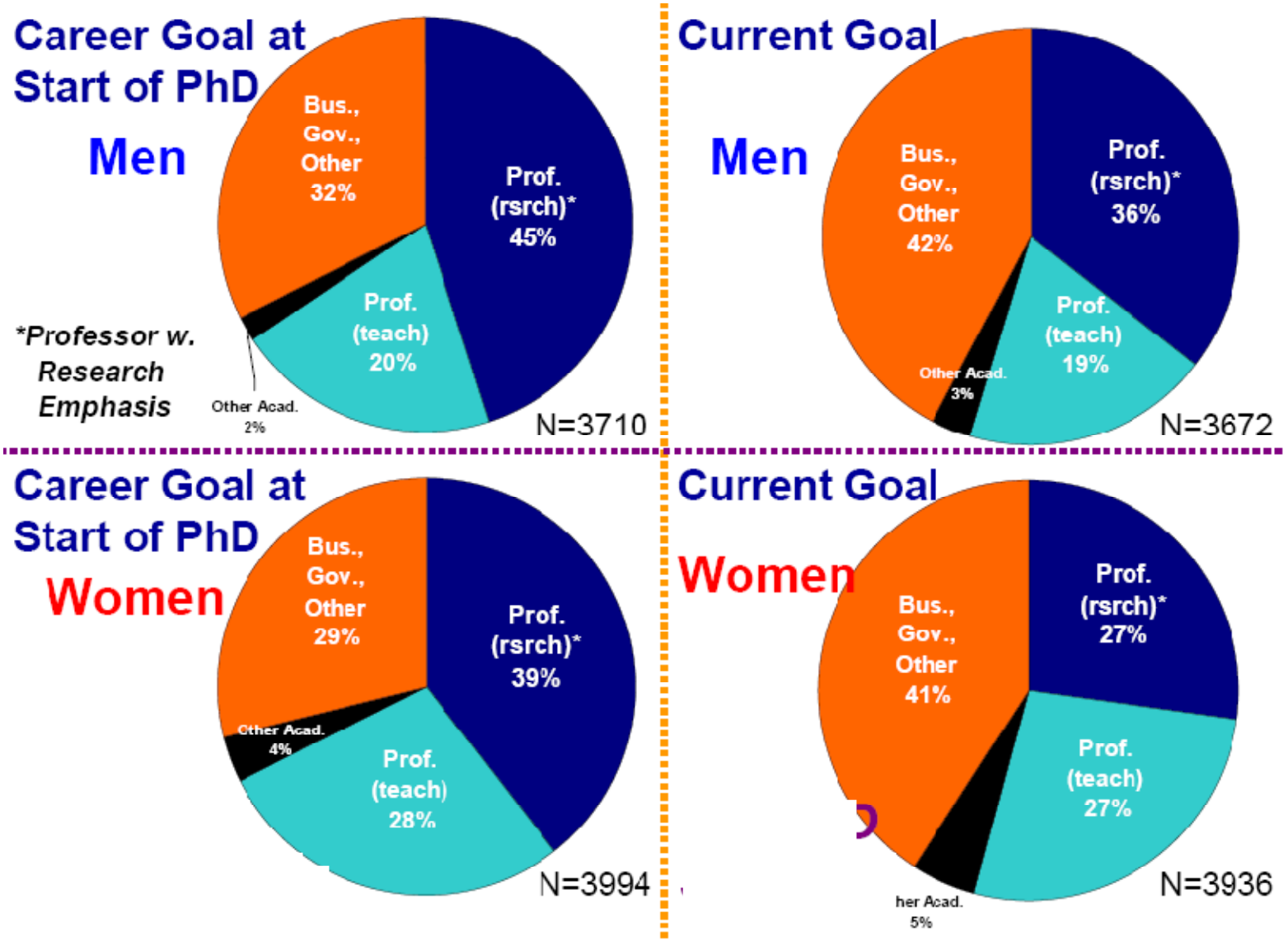
Percent Imagining Job Type to Be Very or Somewhat Family Friendly*				
Rank	Job Types	Total	Men	Women
1	Tenure-track faculty careers at teaching-intensive colleges	77%	82%	73%
2	Policy or managerial careers inside academia	76%	80%	73%
3	Research careers outside academia	75%	78%	72%
4	Policy or managerial careers outside academia	72%	74%	71%
5	Non-tenure-track faculty careers	63%	62%	64%
6	Research careers at research-intensive universities	47%	55%	40%
7	Tenure-track faculty careers at research-intensive universities	37%	46%	29%

N=7,294 to 7,550 3,481 to 3,596 3,784 to 3,923

*vs. not too or not at all family friendly.

Yellow shading indicates the group's response is significantly higher than the other group's response (P<.001).

Source: Mason, Mary Ann and Marc Goulden. 2006. "UC Doctoral Student Career Life Survey." (http://ucfamilyedge.berkeley.edu/grad%20life%20survey.html).



Source: Mason, Mary Ann and Marc Goulden. 2006. "UC Doctoral Student Career Life Survey." (http://ucfamilyedge.berkeley.edu/grad%20life%20survey.html).

PhDs Wanted!

In the clinical departments of medical schools

Rosenberg, L.E. (1999) *Science* **283**: 331. Physician-Scientists—Endangered and Essential.

Gray, M.L., and Bonventre, J.V. (2002) *Nature Medicine* **8**: 433.

Training PhD Researchers to Translate Science to Clinical Medicine.

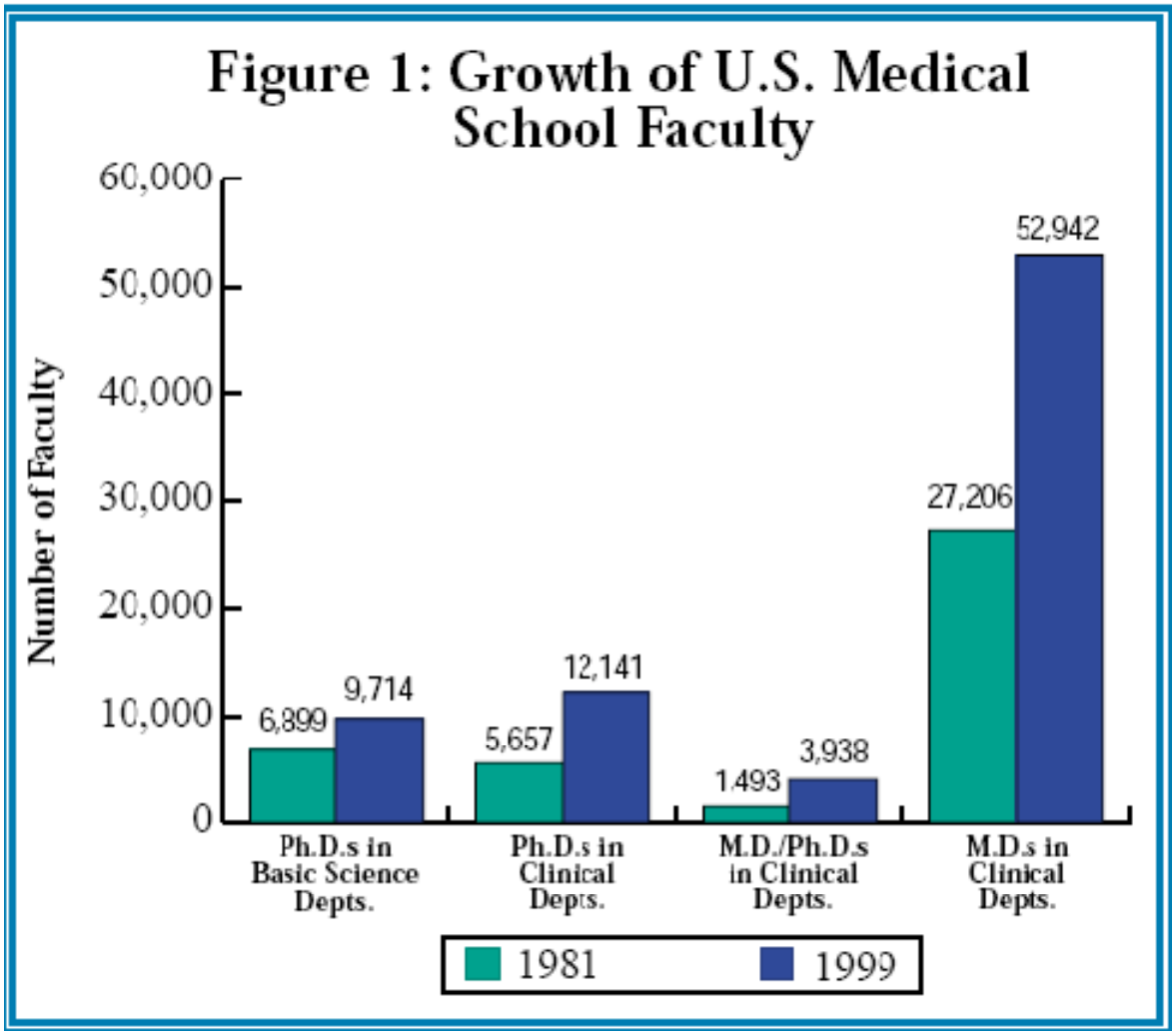


Figure 1: Growth of U.S. Medical School Faculty
Number of Faculty
60,000
50,000
40,000
30,000
20,000
10,000
0
6,899
9,714
5,657
12,141
1,493
3,938
27,206
52,942
Ph.D.s in Basic Science Depts.
Ph.D.s in Clinical Depts.
M.D./Ph.D.s in Clinical Depts.
M.D.s in Clinical Depts.
1981
1999

Medical School Faculty Members by Degree and Department Type

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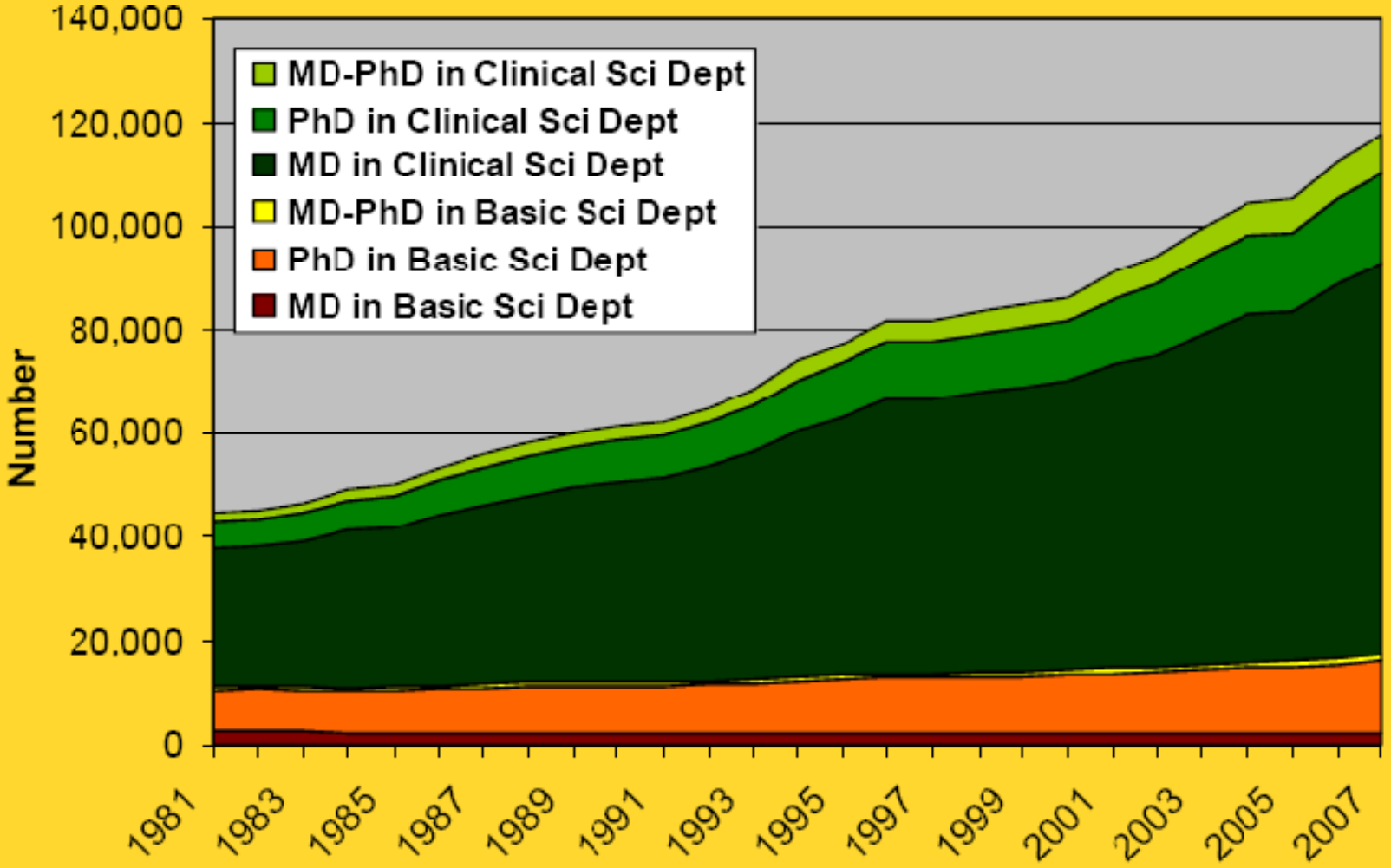

Source: http://www.aamc.org/data/facultyroster/reports.htm

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Table 1 Career choices by HST-MEMP biomedical engineering graduates compared with biosciences PhD and MD-PhD students

Model type:	In-depth experience		Targeted exposure		Combined degree	"Typical" PHD
Cohort description	PhD (engineering) with in-depth clinical experience		PhD (bioscience) with one-semester exposure to pathobiology		PhD (mostly bioscience) with full MD training	PhD (mostly bioscience) matched to MSTP cohort
Data source	HST-MEMP Alumni (1984–2001)		Tufts Alumni * (1984–1998)		NIH MSTP study ** (1971–1990)	
	#	%	#	%	%	%
Basic science/engineering department	36	39	27	30	19	53
Clinical department	26	28	23	25	43	8
Both	-	-	-	-	20	5
Total academic positions	62	67	50	55	83	65
Industry/consulting	24	26	38	42	6	30
Other	7	8	3	3	11	5
Total	93	100	91	100	100	100

Gray, M.L., and Bonventre, J.V. (2002) *Nature Medicine* **8**: 433.
Training PhD Researchers to Translate Science to Clinical Medicine.

PhDs Wanted?

In dental schools

Herzberg, M.C. *et al.* (2006) *J. Dent. Res.* **85**: 486. Driving the Future of Dental Research.

Rank	Institution	FY 2008 Amount
1	UNIVERSITY OF CALIFORNIA SAN FRANCISCO	9,428,862
2	UNIVERSITY OF MICHIGAN AT ANN ARBOR	8,716,685
3	UNIVERSITY OF WASHINGTON	8,238,451
4	UNIVERSITY OF FLORIDA	8,146,663
5	UNIVERSITY OF ROCHESTER	8,125,340
6	BOSTON UNIVERSITY MEDICAL CAMPUS	7,400,912
7	UNIVERSITY OF NORTH CAROLINA CHAPEL HILL	7,183,465
8	UNIVERSITY OF ALABAMA AT BIRMINGHAM	6,395,388
9	NEW YORK UNIVERSITY	6,303,728
10	FORSYTH INSTITUTE	5,736,652
11	UNIVERSITY OF CALIFORNIA LOS ANGELES	5,730,992
12	UNIVERSITY OF LOUISVILLE	4,522,390
13	UNIVERSITY OF PITTSBURGH AT PITTSBURGH	3,795,400
14	UNIVERSITY OF IOWA	3,468,766
15	UNIVERSITY OF MARYLAND BALTIMORE	3,464,509
16	UNIVERSITY OF SOUTHERN CALIFORNIA	3,264,192
17	UNIVERSITY OF TEXAS HLTH SCI CTR SAN ANT	2,989,041
18	UNIVERSITY OF MINNESOTA TWIN CITIES	2,936,004
19	UNIVERSITY OF COLORADO DENVER	2,782,438
20	UNIVERSITY OF ILLINOIS AT CHICAGO	2,731,403

http://www.nidcr.nih.gov/GrantsAndFunding/NIDCR_Funding_to_US_Schools/DentalSchools/

PhDs Wanted?

In nursing schools

"Nursing Research" Chapter 6 in *Advancing the Nation's Health Needs* (2005)

American Association of Colleges of Nursing *Nursing Faculty Shortage Fact Sheet*, 3/10/09

Acknowledgments

- Dr. Elizabeth Rudd, Center for Innovation and Research in Graduate Education, U. Washington
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- Dr. Irwin Arias, NICHD and Demystifying Medicine
- Dr. Mary Kerr, Deborah Jennings, NINR

Doctorate Degrees Awarded in the Biological and Medical Sciences by Sex

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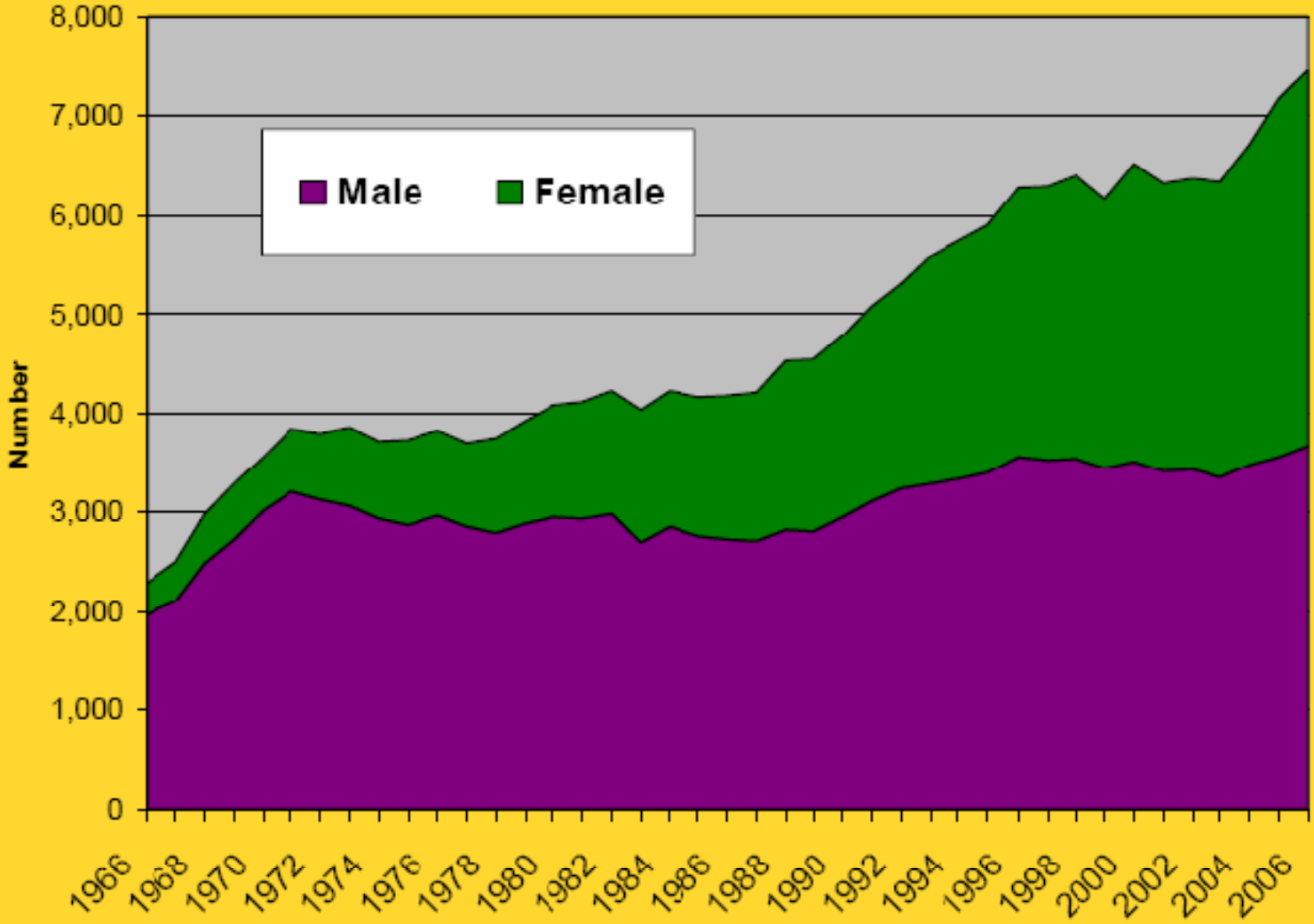
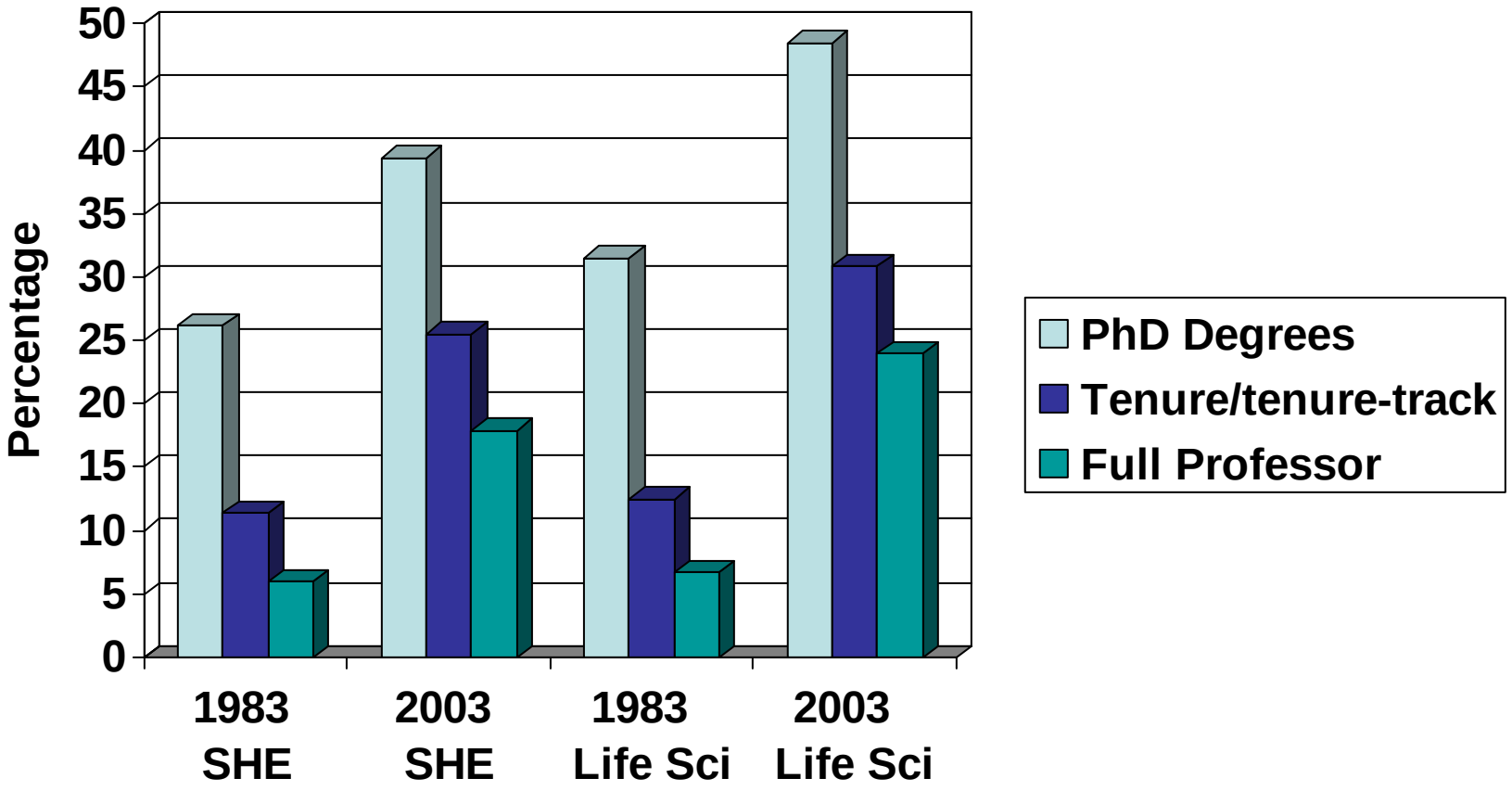
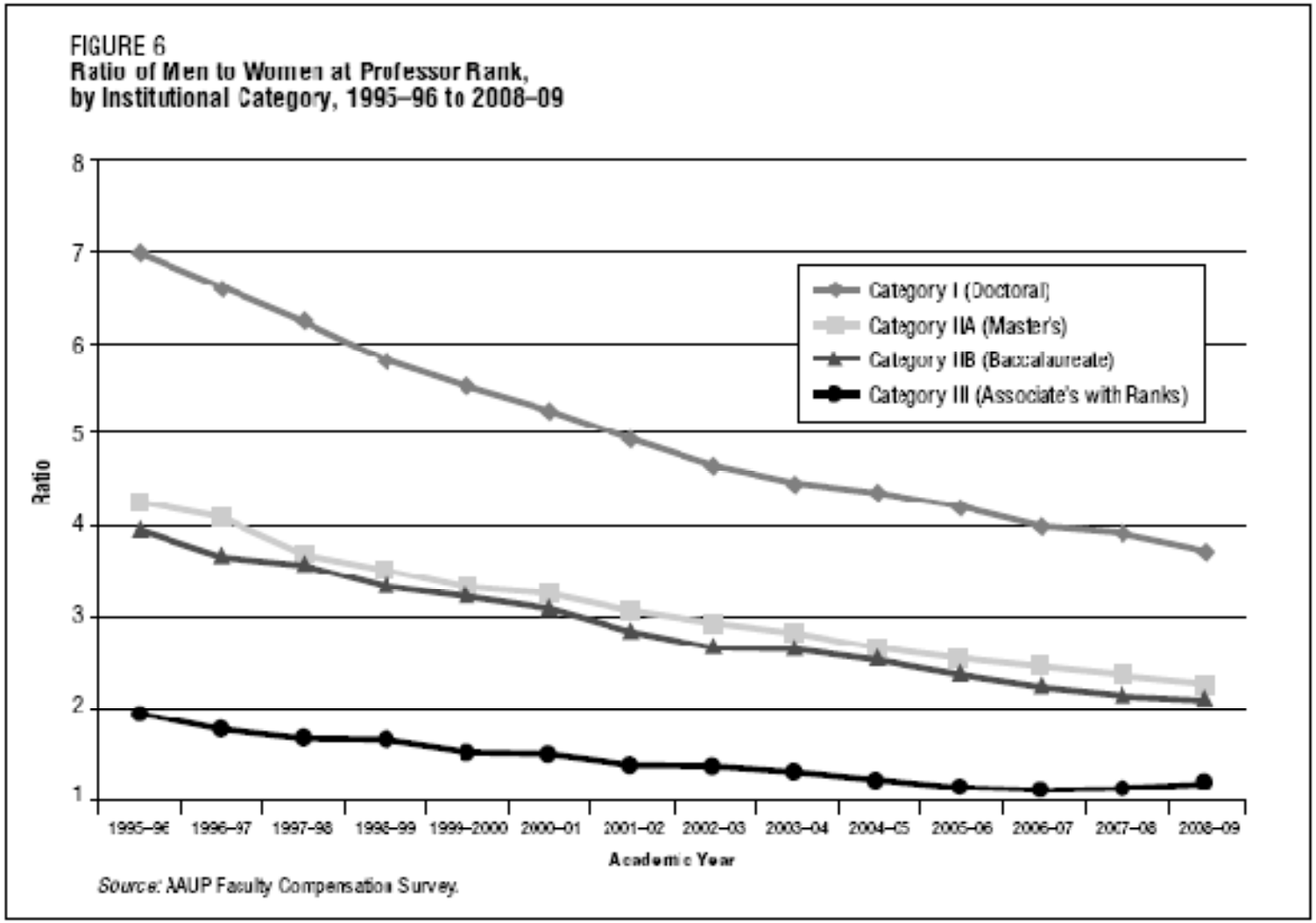


Source: http://www.nsf.gov/statistics/doctorates/

Women S&E Faculty



Thirty-Three Years of Women in S&E Faculty Positions, NSF InfoBrief, July, 2008



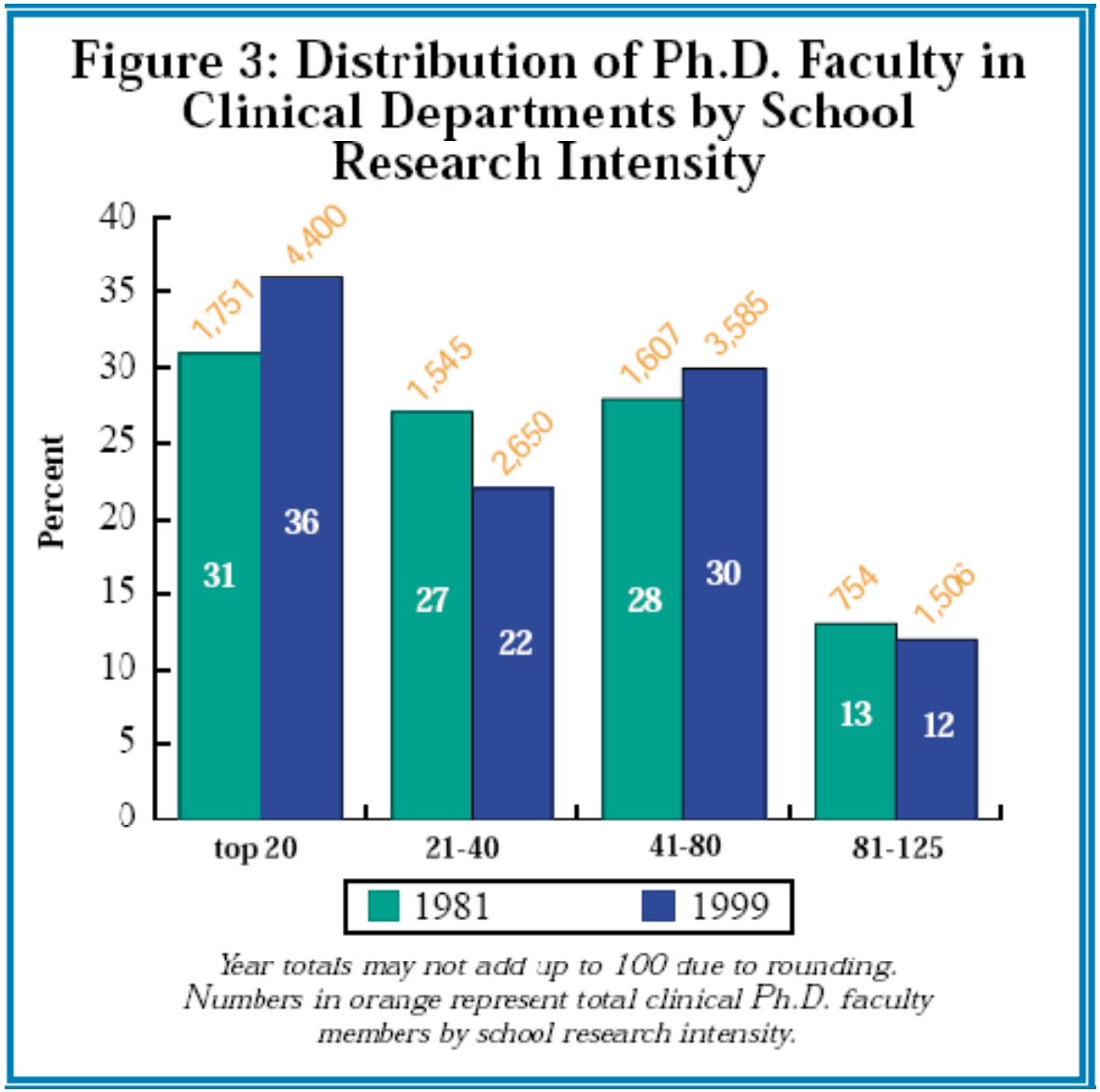
On the Brink, AAUP 2008-09

Women's Academic Salaries as a Percent of Men's

NOTE: these data summarize 2005-06 results for all disciplines and all institutions (doctoral institutions)

All ranks	81% (78%)	
Full Professors	88% (91%)	
Associate/Assistant Professors	93%	
Associate Professors		(93%)
Assistant Professors		(92%)

AAUP Faculty Gender Equity Indicators 2006



Analysis **1** (2), July 2001, AAMC

Changing Faculty Profile

1969

- White male Protestant
- Native-born
- Research university
- Full-time
- Tenured/tenure-track
- Liberal arts/sciences

Contemporary

- Increasingly diverse
- 2- or 4-year public university
- Part-time
- Non-tenure-track
- Professions

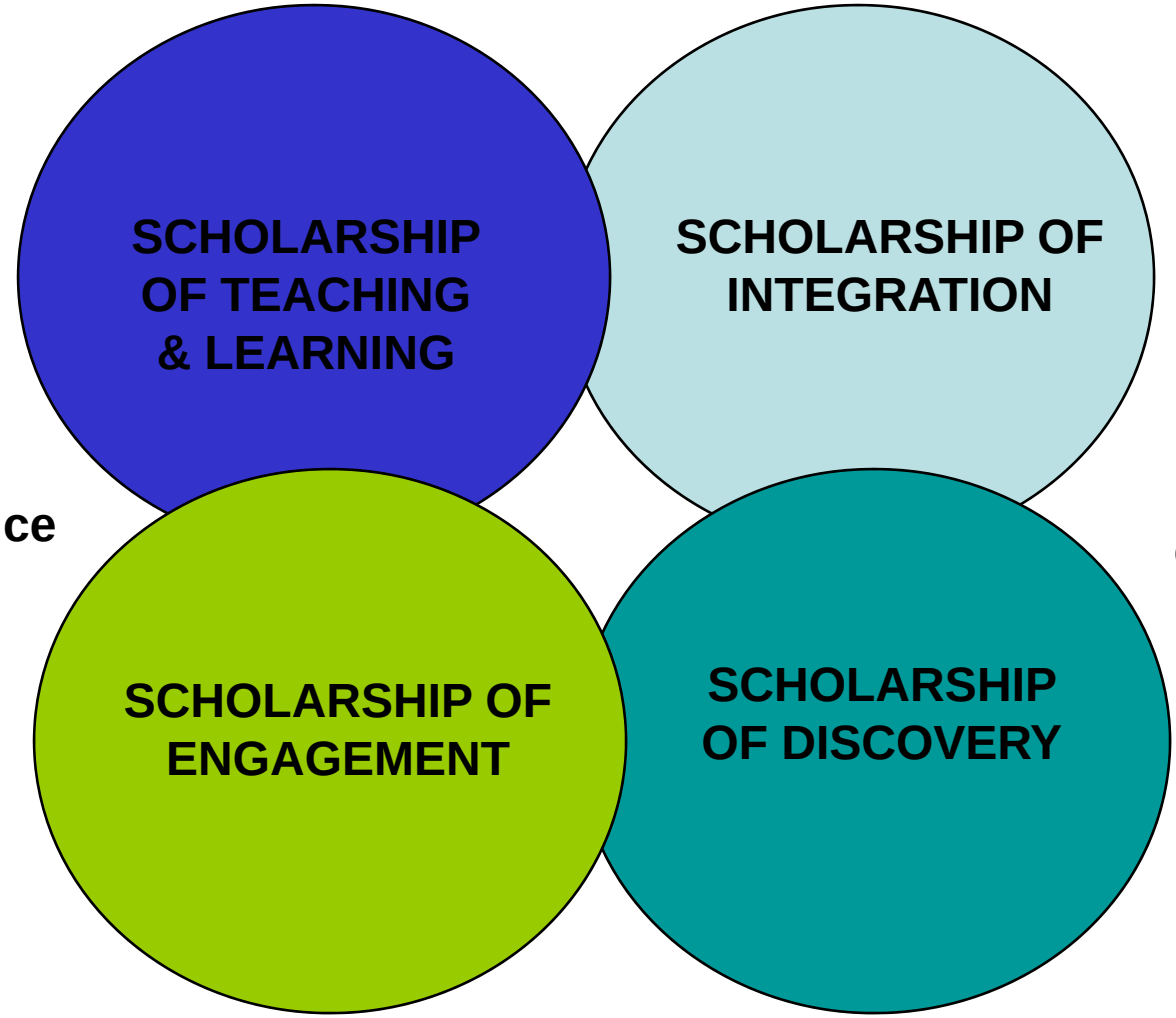
Survey of Earned Doctorates

- Conducted by the NSF every year
- Seeks data from every individual who
  - received his/her first research doctorate
  - from an accredited U.S. institution
  - during the calendar year from July 1 to June 30.

Survey of Doctoral Recipients

- Conducted by the NSF every two years
- Samples individuals who
  - received a research doctorate from a U.S. university in a science, engineering, or health discipline,
  - are not institutionalized, and
  - are under age 76

concrete, connected learning

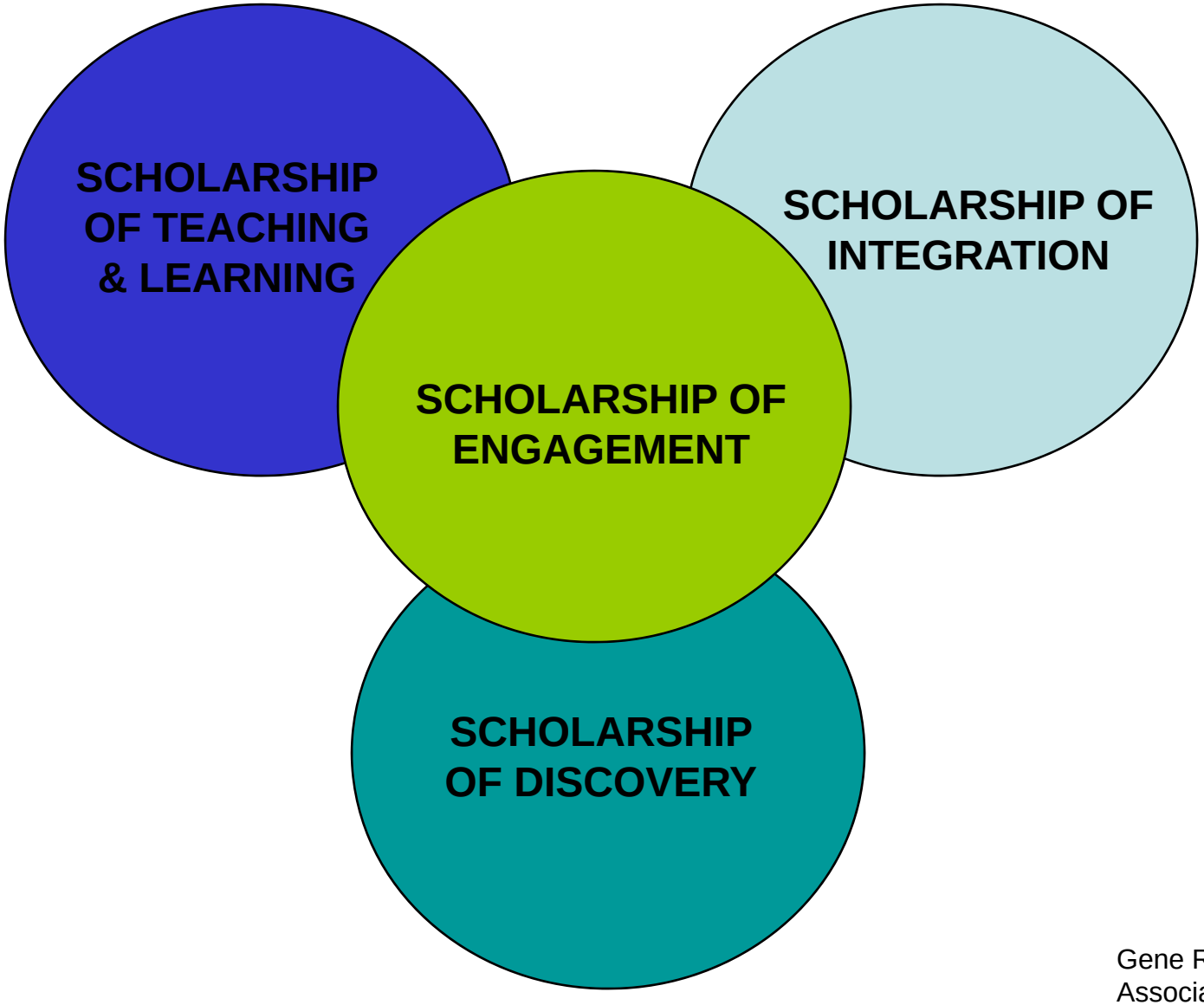


active practice

reflective, observational learning

abstract, analytical knowing

Gene Rice, American Association of Colleges and Universities



Gene Rice, American Association of Colleges and Universities

Percent of US Biomedical Science PhDs Holding Tenure or Tenure-Track Positions 5-6 Years Post-PhD

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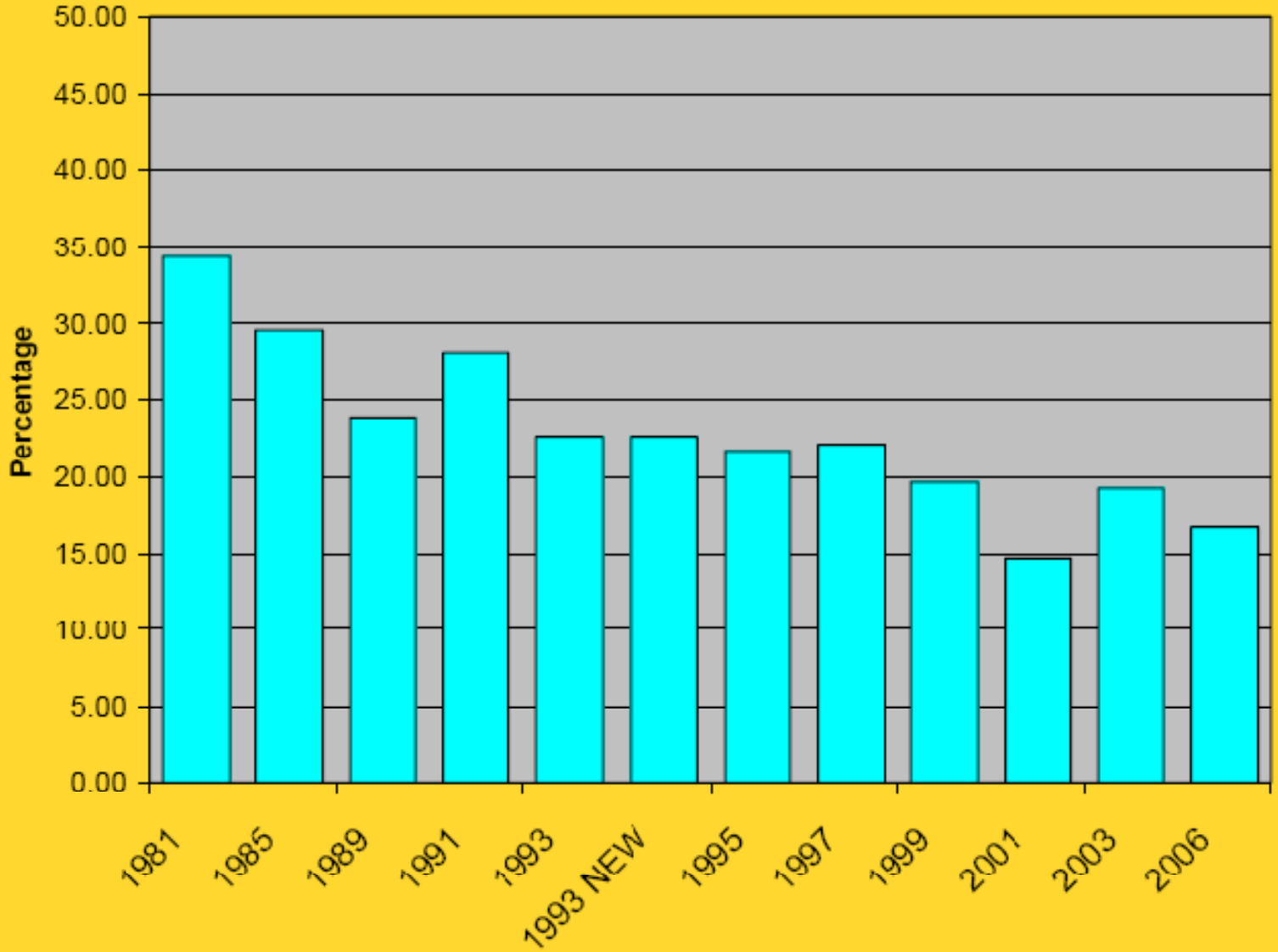

Source: http://sestat.nsf.gov/