

# Perspectives on Faculty Diversity: Research and Market Forces

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ADVANCING SCIENCE. SERVING SOCIETY

## Graduate and Faculty “Ecosystems”

- Growing the candidate pool
- Shaping the candidate pool
- Tapping the candidate pool
- Market forces in talent development
- Success in the professoriate

## What We Know about Decision Making

- Parent and community influences
- Type of undergraduate experiences  
(opportunity for research, type of institution)
- Type of institution completed → type of institution accepted
- Peer group
- Presence of minority faculty models

## The Graduate “Ecosystem”

- What do we know about the environment of the department?
- How many other URM? URM and others involved in issues?
- What is the mix of foreign nationals and U.S. citizens – in department, in lab group?
- What about permanent residents?
- What connection to URM in other STEM departments?
- Is there a community, or is there isolation?
- What expectations of minority scholars?
- What is faculty makeup?

## The Graduate “Ecosystem” continued

- How are they supported?
- Does their presence as students change / affect departments? If so, how?
- Is there greater interest in interdisciplinary issues?
- Do their research interests disadvantage them? (especially SBE fields)
- Student output (number, diversity and/or citizenship requirement)
- Do some fields / departments / labs have more success than others? If so, why?
- Male or female? Male or female traditional field?

## How Is This Being Accomplished?

- Identification?
- Recruitment?
- Is there any concept of graduate retention?
- What are the legal barriers to strategies that can be employed?
- What is legal environment surrounding diversity efforts? (“Proposition” states, states under court-ordered desegregation?)

# Full-Time Graduate Students in All Institutions, Fall 2006

## Physics

Total: 12,439

Women: 19.5 %

Citizens and Permanent Residents: 54.1 %

African Americans: 1.57 %

Hispanics: 2.5 %

American Indians: 0.17 %

# Full-Time Graduate Students in All Institutions, Fall 2006

## Computer Science

Total: 28,760

Women: 23.7 %

Citizens and Permanent Residents: 41.6 %

African Americans: 2.57 %

Hispanics: 1.84 %

American Indians: 0.17 %

# Full-Time Graduate Students in All Institutions, Fall 2006

## Engineering

Total: 87,818

Women: 23.6 %

Citizens and Permanent Residents: 45.9 %

African Americans: 2.44 %

Hispanics: 2.88 %

American Indians: 0.21 %

# Full-Time Graduate Students in All Institutions, Fall 2006

## Economics

Total: 10,018

Women: 35.2 %

Citizens and Permanent Residents: 40.45 %

African Americans: 2.29 %

Hispanics: 2.33 %

American Indians: 0.14 %

## Engineering Enrollments, by Sex and Race / Ethnicity, Ph.D. Graduate Students (Full-Time), Fall 2006

Total: 99,750

Women: 22.2 %

African American: 2.2 %

Hispanic: 2.8 %

American Indian: 0.2 %

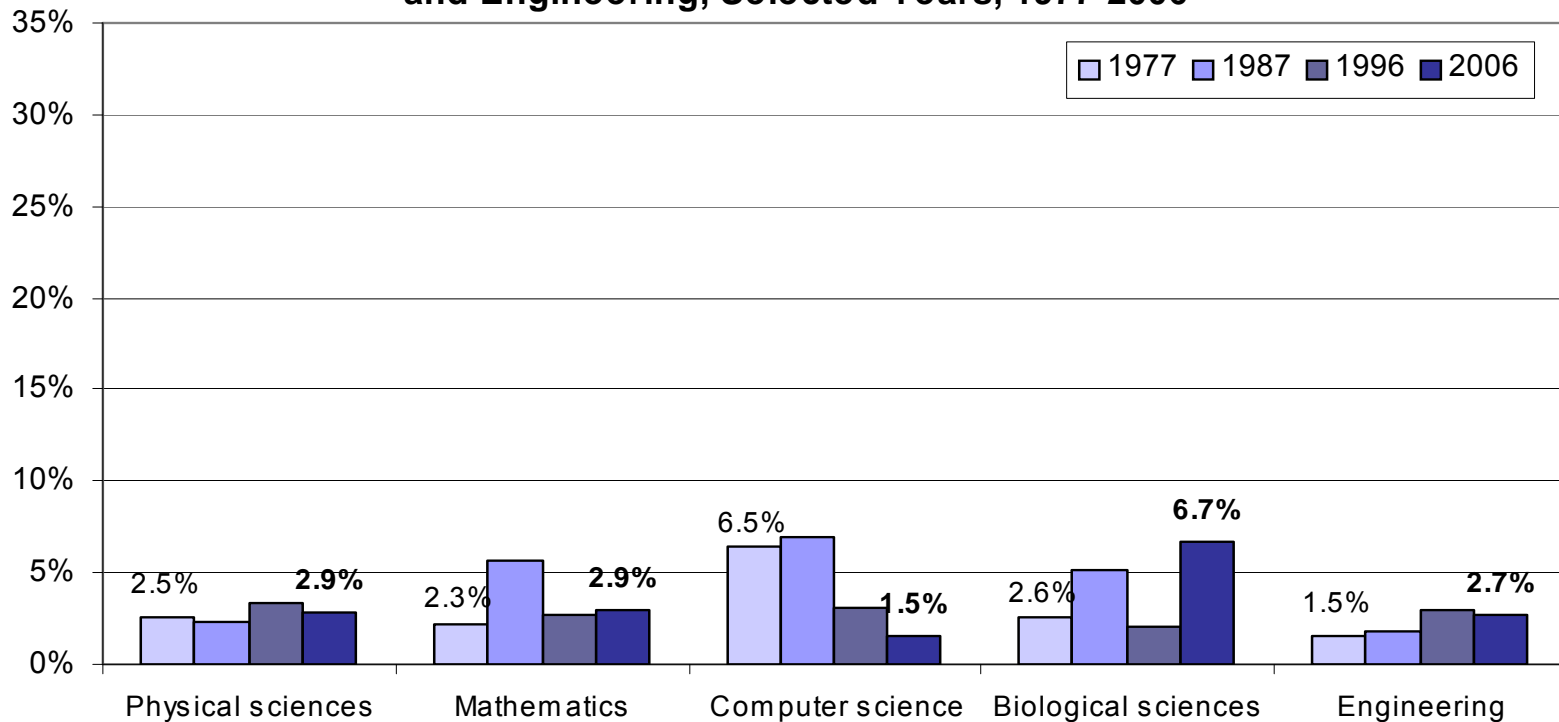
Asian: 7.4 %

Foreign National: 52.1 %

## PhDs Earned by URM

Little gain between 1977 and 2006, except in the biological sciences  
(with actual decline in computer science)

**Percent URM Amongst Doctoral Degree Recipients in Natural Sciences and Engineering, Selected Years, 1977-2006**

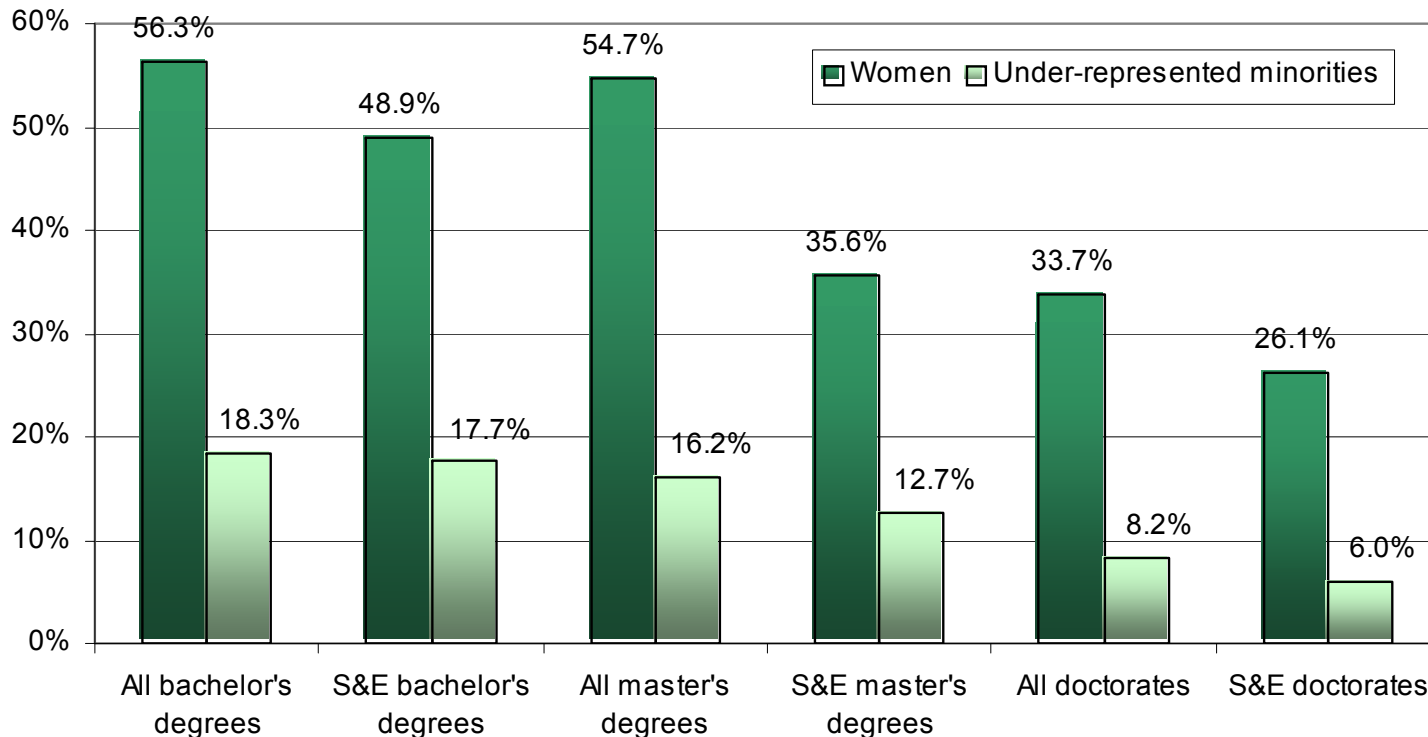


Source: Commission on Professionals in Science and Technology, analysis of data from NSF's WebCASPAR database system.

## Degrees in S&E

As degree level increases, women's and URMs' share of degrees decreases. At each level, these groups are less likely to earn degrees in S&E.

**Figure 3-1. Percent of U.S. Citizen and Permanent Resident Women and Under-Represented Minorities at Each Degree Level, 2005-06**

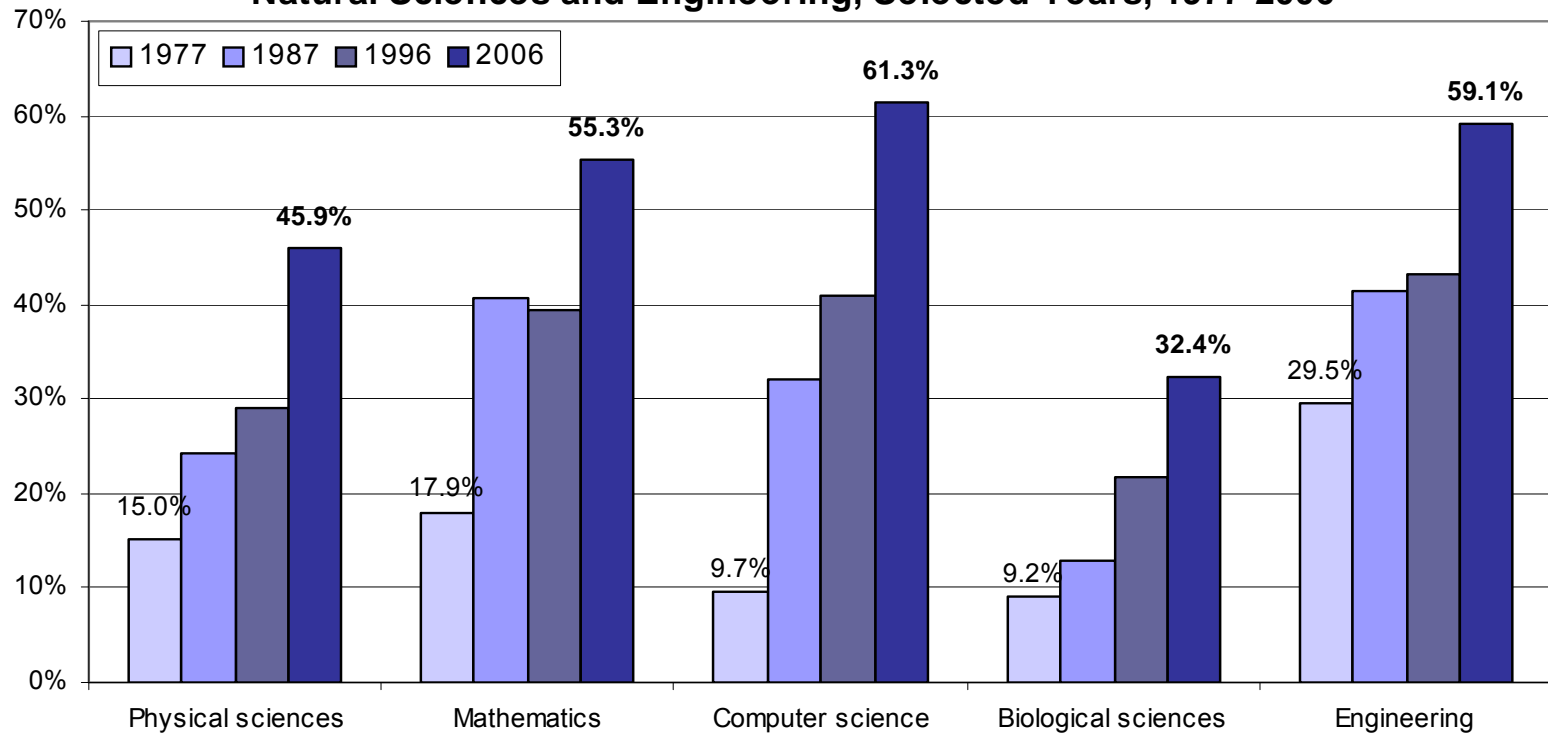


Source: CPST, data derived from National Science Foundation, *Science and Engineering Degrees, by Race/Ethnicity of Recipients: 1995-2006*.

## Temporary Residents and the PhD

They received the majority of engineering, computer science, and mathematics doctoral degrees from U.S. universities.

**Percent Temporary Residents Amongst Doctoral Degree Recipients in Natural Sciences and Engineering, Selected Years, 1977-2006**



Source: Commission on Professionals in Science and Technology, analysis of data from NSF's WebCASPAR database system.

## Market Forces Related to Talent Development

- How is graduate work for URMs supported?
- If supported differently, is there a relationship between time to degree and form of support?
- What is time to degree? Age at receipt of degree?
- What are the odds of receiving the STEM Ph.D. contrasted with other professional opportunities?

**PRIMARY SOURCES OF FINANCIAL SUPPORT FOR DOCTORAL RECIPIENTS  
BY BROAD FIELD AND DEMOGRAPHIC GROUP, 2006**

Primary Source of Support & Broad Field of Study	All Doctorates	Women	Men	U.S. Citizens	Non-U.S. Citizens		U.S. Citizens & Permanent Residents				
					Perm. Visas	Temp. Visas	African Amer.	Hispanic	Native Amer. <sup>1</sup>	Asian <sup>2</sup>	White
<b>Physical Sciences<sup>3</sup></b>	<b>6,731</b>	<b>1,870</b>	<b>4,858</b>	<b>3,173</b>	<b>324</b>	<b>3,213</b>	<b>64</b>	<b>108</b>	<b>5</b>	<b>221</b>	<b>2,682</b>
T.A.	25.3	24.4	25.7	21.4	25.6	29.2	17.2	20.4	N/A	19.9	21.9
R.A./Traineeship	46.6	43.9	47.6	37.4	47.5	55.4	17.2	26.9	N/A	35.3	38.4
Fellowship/Grant	21.3	24.5	20.1	30.9	18.2	12.2	54.7	47.2	N/A	36.2	29.2
Personal	4.2	4.9	4.0	7.3	4.6	1.1	7.8	4.6	N/A	6.3	7.4
Other	1.7	1.3	1.8	2.8	3.4	1.7	N/A	N/A	N/A	2.3	2.9
<b>Engineering</b>	<b>6,372</b>	<b>1,285</b>	<b>5,087</b>	<b>2,077</b>	<b>269</b>	<b>4,002</b>	<b>87</b>	<b>93</b>	<b>N/A</b>	<b>257</b>	<b>1,553</b>
T.A.	8.9	7.5	9.3	4.9	9.3	11.0	N/A	7.5	N/A	4.3	5.2
R.A./Traineeship	61.3	56.8	62.4	37.9	54.6	73.8	20.7	26.9	N/A	45.1	38.0
Fellowship/Grant	19.3	27.5	17.3	37.7	18.2	9.9	59.8	44.1	N/A	34.2	36.8
Personal	5.2	4.4	5.5	10.5	10.4	2.2	9.2	9.7	N/A	9.7	10.9
Other	3.5	2.3	3.8	8.9	7.1	2.6	8.0	11.8	N/A	6.6	9.0
<b>Life Sciences</b>	<b>8,683</b>	<b>4,532</b>	<b>4,150</b>	<b>5,741</b>	<b>399</b>	<b>2,521</b>	<b>256</b>	<b>245</b>	<b>13</b>	<b>466</b>	<b>4,591</b>
T.A.	8.9	8.5	9.4	7.9	11.8	10.8	3.5	2.4	N/A	4.7	8.8
R.A./Traineeship	29.2	27.2	31.3	19.8	36.3	49.5	11.7	14.3	N/A	16.5	21.0
Fellowship/Grant	46.8	47.0	46.6	53.9	42.4	31.4	63.7	69.4	46.2	68.0	50.7
Personal	10.4	12.4	8.3	13.9	7.8	3.0	15.6	9.4	N/A	7.9	14.7
Other	3.1	3.3	2.9	4.4	N/A	4.8	5.5	3.3	N/A	2.8	4.7
<b>Social Sciences</b>	<b>5,991</b>	<b>3,438</b>	<b>2,553</b>	<b>4,490</b>	<b>221</b>	<b>1,265</b>	<b>292</b>	<b>270</b>	<b>21</b>	<b>224</b>	<b>3,524</b>
T.A.	23.3	19.6	28.3	19.7	29.4	34.9	12.3	14.4	N/A	17.4	21.0
R.A./Traineeship	16.6	18.0	14.8	16.0	14.5	19.1	12.3	12.6	N/A	14.3	17.0
Fellowship/Grant	27.4	26.6	28.6	26.5	29.9	30.2	39.7	36.3	57.1	37.5	23.8
Personal	29.7	33.7	24.4	35.6	24.9	9.8	32.9	34.1	28.6	29.5	36.1
Other	1.7	1.4	2.0	2.1	N/A	5.5	2.7	2.2	N/A	N/A	2.1

Source: CPST, data derived from National Opinion Research Center (NORC), Summary Report 2006.

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Primary Source of Support & Broad Field of Study	All Doctorates	Women	Men	U.S. Citizens	Non-U.S. Citizens		U.S. Citizens & Permanent Residents				
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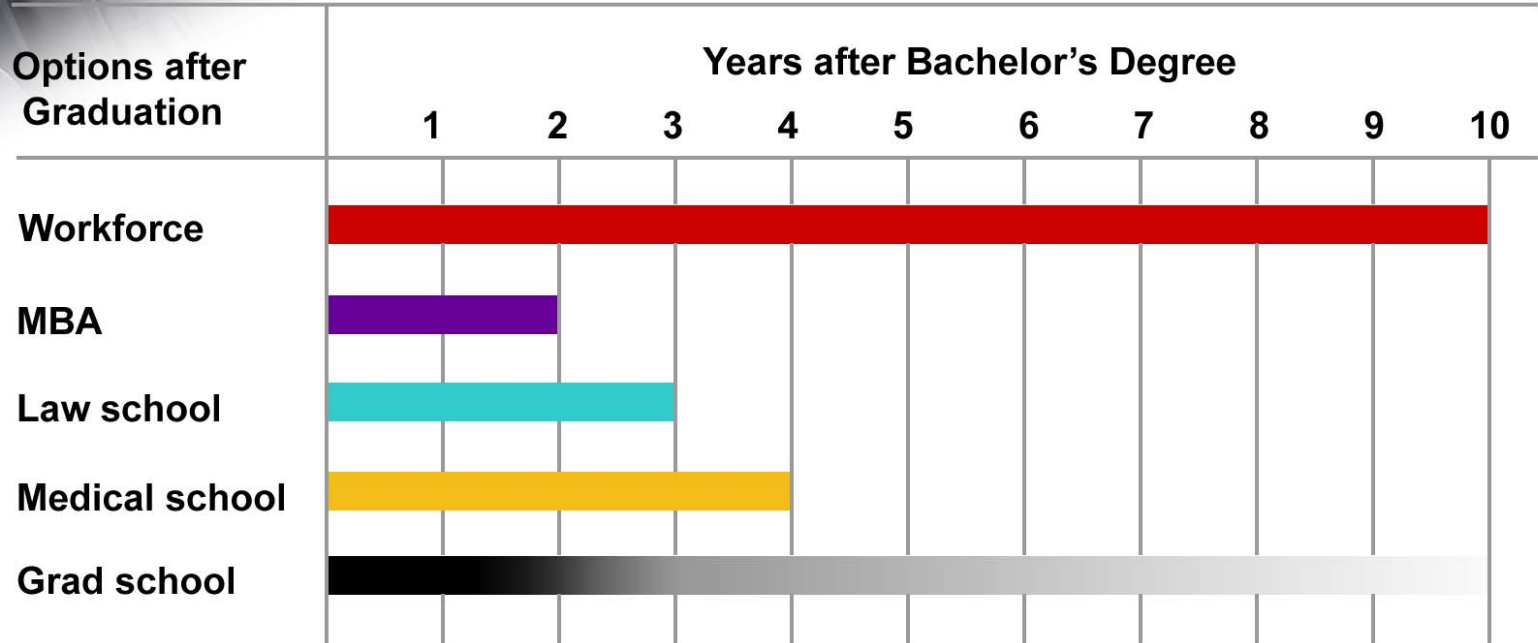
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Other	1.7	1.4	2.0	2.1	N/A	5.5	2.7	2.2	N/A	N/A	2.1

Source: CPST, data derived from National Opinion Research Center (NORC), Summary Report 2006.

**Percent of U.S. Citizen Doctorate Recipients with Levels of Graduate School Debt Greater than \$30,000, by Broad Field of Study and Race/Ethnicity, 2005**

<b>Broad Field</b>	<b>Total</b>	<b>Asian</b>	<b>Black</b>	<b>Hispanic</b>	<b>American Indian</b>	<b>White</b>	<b>Other</b>
<b>All Fields</b>	<b>20.2</b>	<b>12.1</b>	<b>36.2</b>	<b>27.0</b>	<b>31.8</b>	<b>19.1</b>	<b>23.1</b>
<b>Physical Sciences</b>	<b>9.1</b>	<b>5.6</b>	<b>22.5</b>	<b>10.4</b>	<b>11.1</b>	<b>9.0</b>	<b>5.6</b>
<b>Engineering</b>	<b>7.7</b>	<b>5.2</b>	<b>16.7</b>	<b>8.3</b>	<b>0</b>	<b>7.6</b>	<b>9.1</b>
<b>Life Sciences</b>	<b>13.7</b>	<b>7.7</b>	<b>27.6</b>	<b>17.6</b>	<b>21.1</b>	<b>13.4</b>	<b>16.7</b>
<b>Social Sciences</b>	<b>33.8</b>	<b>29.2</b>	<b>45.7</b>	<b>43.4</b>	<b>46.7</b>	<b>32.5</b>	<b>33.7</b>

# Growing the Candidate Pool



## Shaping the Candidate Pool

- Type of institution attended
- Research resources at the institution
- Opportunities for building critical skills
- Papers presented and published
- International experiences and networking
- Postdoctoral possibilities
- Field differences re: post-docs

## Tapping the Candidate Pool

- Recruitment vs. “over the transom”
- What is typical role of the advisor?
- To what networks do they belong?
- What other options beyond the academy are they considering? What are plans B and C?
- Can they afford to “profess”? (salaries vs. debt)
- What messages did they receive from faculty about joining the faculty?
- What are the legal issues related to faculty diversity?

## Market Forces in Talent Development

- Time to degree
- Family responsibilities
- Age at receipt of degree
- Funding of graduate education
- Debt levels and opportunity costs
- Sector of experience / employment
- Reaction to supply and demand forces

**Median Number of Years from Bachelor's to Ph.D.,  
by Selected Demographic Group  
and Broad Field, 2005**

<b>Broad Field</b>	<b>Elapsed Time from Bachelor's to Ph.D. (in years)</b>				
	<b>Asian</b>	<b>Black</b>	<b>Hispanic</b>	<b>American Indian</b>	<b>White</b>
<b>Physical Sciences</b>	7.5	8.0	7.4	8.4	7.0
<b>Engineering</b>	7.6	8.3	7.4	8.9	7.4
<b>Life Sciences</b>	8.0	8.6	7.8	9.0	8.3
<b>Social Sciences</b>	9.2	10.9	9.7	11.9	10.0

**Median Number of Years in Graduate School,  
by Selected Demographic Group  
and Broad Field, 2005**

<b>Broad Field</b>	<b>Years in Graduate School</b>				
	<b>Asian</b>	<b>Black</b>	<b>Hispanic</b>	<b>American Indian</b>	<b>White</b>
<b>Physical Sciences</b>	<b>6.7</b>	<b>7.3</b>	<b>6.5</b>	<b>7.2</b>	<b>6.2</b>
<b>Engineering</b>	<b>6.7</b>	<b>7.6</b>	<b>7.0</b>	<b>8.7</b>	<b>6.7</b>
<b>Life Sciences</b>	<b>6.7</b>	<b>7.3</b>	<b>6.8</b>	<b>7.7</b>	<b>6.7</b>
<b>Social Sciences</b>	<b>8.0</b>	<b>9.1</b>	<b>8.2</b>	<b>9.4</b>	<b>8.0</b>

## Do Their Choices of Doctoral Institution Define Their Possible Institutional Choices for Faculty Positions?

- Departments: peer to peer
- Pedigree
- Publications record
- Access to resources

## Post-Doc Possibilities

- Taking a job vs. taking a post-doc position
- Field differences in post-doc traditions
- Salary considerations
- Long-term impact on career success
- Family responsibilities
- Dual-career couples (endogamy)
- Can one “upgrade” her/his Ph.D. with a high-status post-doc?

## Success in the Professoriate: What Are the Odds of Tenure?

- Attending the right doctoral university
- Getting the right post-doc
- Institutional fit (faculty)
- Early funding
- Clarity of expectations and criteria for tenure
- Formal vs. informal systems
- The declining significance of tenure?
- Are they as likely to be mentored? Will they have the right mentor?
- Part-time / adjunct
- Male / female
- Dual-career couples

## “Off-Track Betting”

- Taking an off-tenure track position as a road to tenure track position?
- Going first to government or industry?
- Extended post-docs?
- Trading up?
- Part-time → full-time?

## What Messages Are Sent by Current Faculty about Joining the Faculty?

- Are they invited?
- Are they dissuaded?
- Issues of “fit”
- What image of faculty?
- Age for first RO1

## Racial/Ethnic Group Representation — U.S. Population to Faculty in Four-Year Institutions

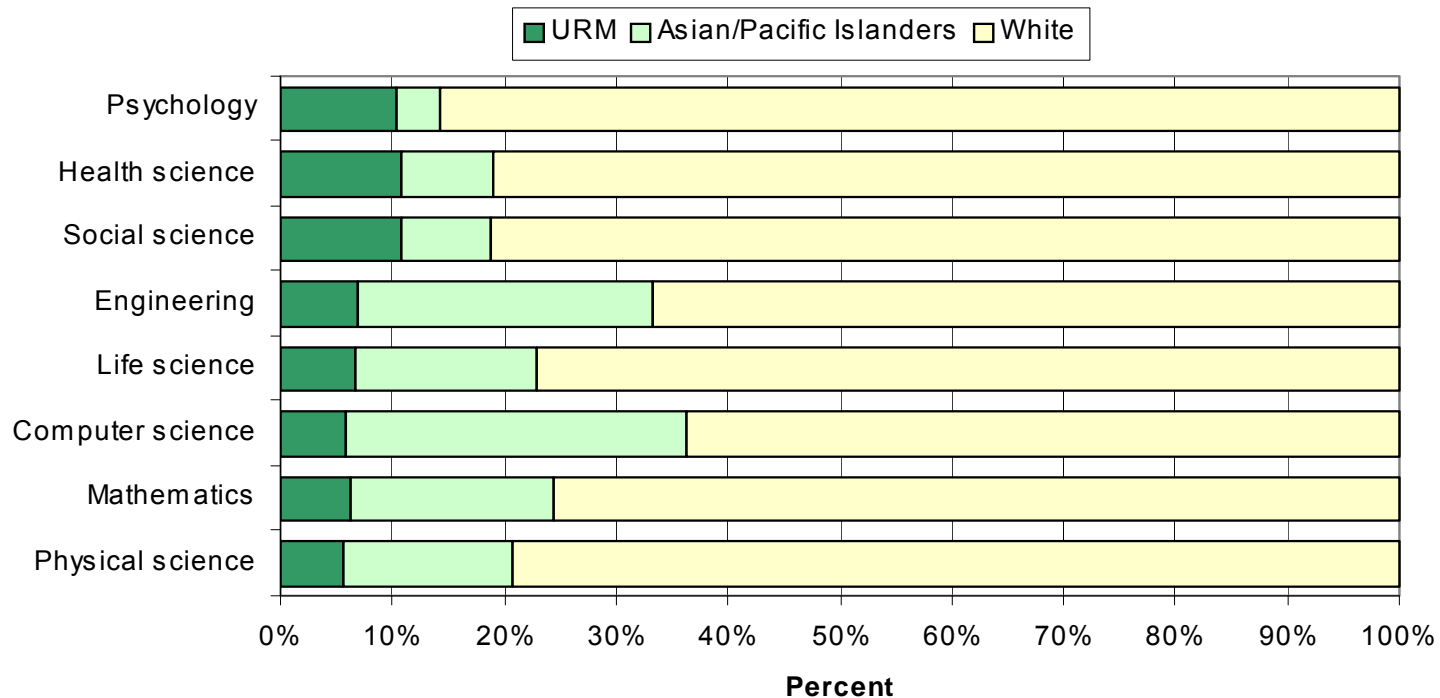
Racial/ Ethnic Group	U.S. Populati- on	Under- graduate s	Faculty							
			All Fields	Education	Engi- neering	Humanities	Life Sciences	Physical, Math and Computer Sciences	Prof. Fields	Social Sci.
Native American	1%	1%	0%	1%	0%	0%	0%	0%	0%	0%
Asian/ Pacific Islander	4%	6%	9%	5%	<b>24%</b>	5%	<b>11%</b>	<b>16%</b>	<b>11%</b>	5%
Black	12%	12%	5%	7%	4%	5%	3%	4%	6%	7%
Hispanic	14%	10%	3%	4%	2%	4%	2%	3%	2%	5%
White	67%	68%	81%	81%	68%	85%	82%	77%	79%	82%

Sources: U.S. Census Bureau, Population Estimates Program; U.S. Department of Education, National Center for Education Statistics IPEDS and NSOPF; University Leadership Council analysis, all 2008.

## Minority Faculty

Doctoral-degreed URMs account for less than 10 percent of most S&E faculty at U.S. colleges and universities

**Figure 5-15. Race/Ethnicity of Doctoral Scientists and Engineers Employed at Four-Year Colleges and Universities by Field of Doctorate, 2006**



URM = underrepresented minorities, includes African Americans, American Indians, and Hispanics.  
 Source: CPST data derived from National Science Foundation, *2006 Survey of Doctorate Recipients, Characteristics of Doctoral Scientists and Engineers in the United States, 2006*.

Table 3. URM's Among Degree Recipients and All Professors (%)

Discipline	B.S.		Ph.D.		Top 50 Faculty	
	2000	2005	2000	2005	FY2002	FY2007
Chemistry	17.0	16.7	8.4	8.5	3.2	3.7
Math	14.4	13.1	5.5	9.1	3.6	2.3
Computer Sci	17.6	20.6	7.4	6.5	1.6	2.5
Astronomy	6.4	8.6	3.8	4.5	2.4	2.2
Physics	9.5	10.3	5.9	5.6	2.6	2.5
Chemical Engr	14.2	14.7	7.2	11.0	4.9	5.6
Civil Engr	14.0	14.3	6.3	8.2	5.4	6.6
Electrical Engr	15.8	16.1	6.8	9.5	4.3	3.6
Mechanical Engr	12.5	11.5	8.6	8.9	3.9	4.3
Economics	12.4	13.1	9.2	10.7	4.3	5.7
Political Science	20.1	20.8	12.1	13.9	6.9	6.9
Sociology	27.0	28.7	17.7	19.2	10.1	12.9
Psychology	20.1	21.6	13.3	13.4	6.3	7.1
Biological Sci	15.5	16.5	7.4	9.6	3.0	3.8
Earth Sciences	5.4	6.6	5.2	6.7	na	3.4
average -->	15.5%	16.2%	8.5%	9.9%	4.5%	5.0%
5-yr increase -->	0.7%		1.4%		0.5%	
US population -->	25.7%	27.6%	=1.9% increase			

## An Empirical Basis for Optimism

“One of the most important findings from our research is that success in faculty diversity is no mere historical accident. A significant amount of the variation in faculty diversity reflects individual university effort and practice—strategies that can be replicated at other institutions.”

Source: University Leadership Council, *Breakthrough Advances in Faculty Diversity*, 2008, p. 14.

## Where Are the Minority PhD Scientists and Engineers?

- Distribution in the workforce; comparison with Whites and Asians; male/female comparisons within race...
- Employment by sector

## What Is Their Primary Work?

- If teaching, where is it done? (Differences in types of institution)
- Has this changed over time?