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)
- 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

<table>
<thead>
<tr>
<th>Institution Type</th>
<th>Number of Institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-year colleges</td>
<td>1814</td>
</tr>
<tr>
<td>Baccalaureate colleges</td>
<td>767</td>
</tr>
<tr>
<td>Master’s institutions</td>
<td>664</td>
</tr>
<tr>
<td>Research institutions</td>
<td>282</td>
</tr>
<tr>
<td>Medical schools/centers</td>
<td>57</td>
</tr>
<tr>
<td>Total</td>
<td>4391</td>
</tr>
</tbody>
</table>

*Chronicle for Higher Education Almanac 2008-09*
## Institution Number and Enrollment

<table>
<thead>
<tr>
<th>Institution Type</th>
<th>Percent of Institutions</th>
<th>Percent of Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-year colleges</td>
<td>41.3%</td>
<td>38.9%</td>
</tr>
<tr>
<td>Baccalaureate colleges</td>
<td>6.4%</td>
<td>7.9%</td>
</tr>
<tr>
<td>Master’s institutions</td>
<td>15.7%</td>
<td>22.2%</td>
</tr>
<tr>
<td>Research institutions</td>
<td>6.4%</td>
<td>27.9%</td>
</tr>
<tr>
<td>Medical schools/centers</td>
<td>1.3%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Other</td>
<td>18.4%</td>
<td>3.3%</td>
</tr>
</tbody>
</table>

*Chronicle for Higher Education Almanac 2008-09*
<table>
<thead>
<tr>
<th>Research</th>
<th>Teaching</th>
<th>Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reviewing grants, manuscripts</td>
<td>Advising students</td>
<td>Advising student organizations/clubs</td>
</tr>
<tr>
<td>Getting grants and publishing</td>
<td>Holding office hours</td>
<td>Experiential learning</td>
</tr>
<tr>
<td>Attending professional meetings</td>
<td></td>
<td>Community outreach</td>
</tr>
<tr>
<td>Supervising postdocs, graduate students</td>
<td></td>
<td>Living/dining in residence halls</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Committee work</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Faculty governance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recruiting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Agricultural extension services</td>
</tr>
</tbody>
</table>
## Average Salaries

(9-month)

<table>
<thead>
<tr>
<th>Institution Type</th>
<th>Full</th>
<th>Associate</th>
<th>Assistant</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-year colleges</td>
<td>72</td>
<td>58</td>
<td>51</td>
</tr>
<tr>
<td>Baccalaureate colleges</td>
<td>84</td>
<td>64</td>
<td>53</td>
</tr>
<tr>
<td>Master’s institutions</td>
<td>87</td>
<td>69</td>
<td>58</td>
</tr>
<tr>
<td>Research institutions</td>
<td>118</td>
<td>80</td>
<td>68</td>
</tr>
<tr>
<td>Medical schools/centers*</td>
<td>113</td>
<td>76</td>
<td>60</td>
</tr>
</tbody>
</table>

*Report of Medical School Faculty Salaries, AAMC, January 2008

*Chronicle for Higher Education April 18, 2008*
Distribution of Biomedical Science PhDs by Sector of Employment

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

### How Many PhDs Are Being Awarded?

<table>
<thead>
<tr>
<th>Description</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total PhDs (2007)</td>
<td>42,637</td>
</tr>
<tr>
<td>Total Science/Eng/Health (2007)</td>
<td>28,774</td>
</tr>
<tr>
<td>Total Biomedical (2006)</td>
<td>7,500</td>
</tr>
</tbody>
</table>
Percent of US Biomedical Science PhDs Holding Tenure or Tenure-Track Positions, Total

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?


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?

Women:
- Not applicable: 1%
- Not at all concerned: 4%
- Not too concerned: 11%
- Somewhat concerned: 31%
- Very concerned: 53%

N=3,948

Men:
- Not applicable: 1%
- Not at all concerned: 5%
- Not too concerned: 18%
- Somewhat concerned: 39%
- Very concerned: 35%

N=3,648

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

<table>
<thead>
<tr>
<th>Rank</th>
<th>Job Types</th>
<th>Total</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tenure-track faculty careers at teaching-intensive colleges</td>
<td>77%</td>
<td>82%</td>
<td>73%</td>
</tr>
<tr>
<td>2</td>
<td>Policy or managerial careers inside academia</td>
<td>76%</td>
<td>80%</td>
<td>73%</td>
</tr>
<tr>
<td>3</td>
<td>Research careers outside academia</td>
<td>75%</td>
<td>78%</td>
<td>72%</td>
</tr>
<tr>
<td>4</td>
<td>Policy or managerial careers outside academia</td>
<td>72%</td>
<td>74%</td>
<td>71%</td>
</tr>
<tr>
<td>5</td>
<td>Non-tenure-track faculty careers</td>
<td>63%</td>
<td>62%</td>
<td>64%</td>
</tr>
<tr>
<td>6</td>
<td>Research careers at research-intensive universities</td>
<td>47%</td>
<td>55%</td>
<td>40%</td>
</tr>
<tr>
<td>7</td>
<td>Tenure-track faculty careers at research-intensive universities</td>
<td>37%</td>
<td>46%</td>
<td>29%</td>
</tr>
</tbody>
</table>

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).

PhDs Wanted!

In the clinical departments of medical schools

Figure 1: Growth of U.S. Medical School Faculty

Number of Faculty

- Ph.D.s in Basic Science Deps.: 6,899 (1981), 9,714 (1999)

1981, 1999
Medical School Faculty Members by Degree and Department Type

Number


Source: http://www.aamc.org/data/facultyroster/reports.htm
### Table 1: Career choices by HST-MEMP biomedical engineering graduates compared with biosciences PhD and MD-PhD students

<table>
<thead>
<tr>
<th>Model type:</th>
<th>In-depth experience</th>
<th>Targeted exposure</th>
<th>Combined degree</th>
<th>&quot;Typical&quot; PHD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cohort description</td>
<td>PhD (engineering) with in-depth clinical experience</td>
<td>PhD (bioscience) with one-semester exposure to pathobiology</td>
<td>PhD (mostly bioscience) with full MD training</td>
<td>PhD (mostly bioscience) matched to MSTP cohort</td>
</tr>
<tr>
<td>Basic science/engineering department</td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>Clinical department</td>
<td>36</td>
<td>39</td>
<td>27</td>
<td>30</td>
</tr>
<tr>
<td>Both</td>
<td>26</td>
<td>28</td>
<td>23</td>
<td>25</td>
</tr>
<tr>
<td>Total academic positions</td>
<td>62</td>
<td>67</td>
<td>50</td>
<td>55</td>
</tr>
<tr>
<td>Industry/consulting</td>
<td>24</td>
<td>26</td>
<td>38</td>
<td>42</td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
<td>8</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>93</td>
<td>100</td>
<td>91</td>
<td>100</td>
</tr>
</tbody>
</table>

PhDs Wanted?

In dental schools

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

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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• Drs. Robert Angerer, Isabel Garcia, Kevin Hardwick, NIDCR
• Dr. Irwin Arias, NICHD and Demystifying Medicine
• Dr. Mary Kerr, Deborah Jennings, NINR
Doctorate Degrees Awarded in the Biological and Medical Sciences by Sex

Women S&E Faculty

Thirty-Three Years of Women in S&E Faculty Positions,
NSF InfoBrief, July, 2008
FIGURE 6
Ratio of Men to Women at Professor Rank, by Institutional Category, 1995–96 to 2008–09

Source: AAUP Faculty Compensation Survey.

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
Figure 3: Distribution of Ph.D. Faculty in Clinical Departments by School Research Intensity

Year totals may not add up to 100 due to rounding. Numbers in orange represent total clinical Ph.D. faculty members by school research intensity.

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

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

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