Putting your advanced degree to work

aka… how I got here from there*

Joanna Friesner
October 17, 2016

* 2004, PhD in Genetics @ UC Davis (in a plant biology lab)
## Presentation Overview

### Goals
- Provide national data on US-trained graduate students (Life Sciences / Biomedical Sciences)
- Provide examples of my friends and their careers after graduate training in plant biology
- Detail a career path of a Life Sciences PhD (me) that’s not tenure-track faculty
- Convey that there are various ways of putting your advanced degree to work

### Outline
- A bunch of data slides for the US; stats on US Doctorates over 11 year period; employment status, etc.
- Where are they now?
- My career path
- Some other academic coordinator examples
- Summary- some grad student advice (from some friends)
<table>
<thead>
<tr>
<th>Year</th>
<th>Total Grad Students in Science</th>
<th>Biological Sciences Grad students</th>
<th>% of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>352,307</td>
<td>66,565</td>
<td>19%</td>
</tr>
<tr>
<td>2005</td>
<td>357,710</td>
<td>68,479</td>
<td>19%</td>
</tr>
<tr>
<td>2006</td>
<td>363,246</td>
<td>69,941</td>
<td>19%</td>
</tr>
<tr>
<td>2007</td>
<td>384,523</td>
<td>71,932</td>
<td>19%</td>
</tr>
<tr>
<td>2008</td>
<td>391,419</td>
<td>72,666</td>
<td>19%</td>
</tr>
<tr>
<td>2009</td>
<td>401,008</td>
<td>73,304</td>
<td>18%</td>
</tr>
<tr>
<td>2010</td>
<td>407,291</td>
<td>74,928</td>
<td>18%</td>
</tr>
<tr>
<td>2011</td>
<td>414,440</td>
<td>75,423</td>
<td>18%</td>
</tr>
<tr>
<td>2013</td>
<td>417,251</td>
<td>76,649</td>
<td>18%</td>
</tr>
<tr>
<td>2014</td>
<td>437,395</td>
<td>78,490</td>
<td>18%</td>
</tr>
<tr>
<td>Sum</td>
<td>3,926,590</td>
<td>728,377</td>
<td>19%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Life sciences</th>
<th>Median age at doctorate&lt;sup&gt;a&lt;/sup&gt;</th>
<th>25 and under</th>
<th>26-30</th>
<th>31-35</th>
<th>36-40</th>
<th>41-45</th>
<th>Over 45</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life sciences</td>
<td>31.0 years</td>
<td>0.6%</td>
<td>49.3%</td>
<td>30.0%</td>
<td>9.5%</td>
<td>4.4%</td>
<td>6.2%</td>
</tr>
</tbody>
</table>
### Some stats on U.S. Doctorates (over 11 years, 2004-2014)

Guess how many US Doctorates are produced:

<table>
<thead>
<tr>
<th>Category</th>
<th>Average/Year (Sum, 11 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Life Sciences</td>
<td>10,961 (120,574)</td>
</tr>
<tr>
<td>Biological/Biomed Sciences (subset):</td>
<td>7,646 (84,105)</td>
</tr>
<tr>
<td>Plant-Biology and Molecular Biology only (subsets):</td>
<td>917 (10,085)</td>
</tr>
</tbody>
</table>

*NSF Science and Engineering Doctorates- Data from 2004-2014*
### US Life Sciences Doctorate Recipients

Top 5 doctorate-granting institutions ranked by # of doctorate recipients - broad field - 2013

<table>
<thead>
<tr>
<th>Rank</th>
<th>Field and institution</th>
<th>Doctorate recipients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Life sciences</td>
<td>12,305</td>
</tr>
<tr>
<td></td>
<td>From top 20 institutions</td>
<td>3,595</td>
</tr>
<tr>
<td>1</td>
<td>Johns Hopkins U.</td>
<td>274</td>
</tr>
<tr>
<td>2</td>
<td>U. FL</td>
<td>245</td>
</tr>
<tr>
<td>3</td>
<td>Harvard U.</td>
<td>232</td>
</tr>
<tr>
<td>4</td>
<td>U. MI, Ann Arbor</td>
<td>227</td>
</tr>
<tr>
<td>5</td>
<td>U. CA, Davis</td>
<td>223</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>All Fields-UC Davis, 2013</th>
<th>Total Life Sciences</th>
<th>Agricultural sciences</th>
<th>natural resources</th>
<th>Biological, biomedical sciences</th>
<th>Health sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>567</td>
<td>223</td>
<td>35</td>
<td>172</td>
<td>16</td>
<td></td>
</tr>
</tbody>
</table>
Employment Status of Individuals with PhDs from US Institutions
Employment of Biomedical Science PhDs by Sector of Employment - Survey of Doctorate Recipients

Distribution of Biomedical Science PhDs by Sector of Employment

Academically Employed Biomedical PhDs by Tenure Status

% US Biomedical Science PhDs with Tenure or Tenure-Track Positions-Survey of Doctorate Recipients

PhD Biomedical Research Workforce

1st time enrolling ('09): 16,000

2009: Median time to degree: 5.5-7 years
Graduated: 9,000

92% of 9,000 Stay in US
30% = non PD work
70% = PD work

2009: Grad School:
Total enrolled: 83,000

10 Yr PhD Completion Rate:
Life Sciences: 62.9%
NIH-funded trainees: 74.9%

Total PDs ('09): 37K-68K (median 4 Yrs)

2008 Snapshot*- 128K PhDs

Science Related Non-Research
18%* 24,000

Government Research
6%* 7,000

Academic Research or Teaching
55K, 43%*
23%-TT
20%-non

Industrial Research
18%* 22,500

Non-Science Related
13%* 17,000

Unemployed
2%* 2,500

* US-trained doctoral recipients

Graduate Education & Training

Postdoctoral Training

Post-Training Workforce

College Graduates

International
Of 15 friends & colleagues when I was in grad school- *Where are they now?*

Includes 12 grad students and 3 postdocs when I knew them

<table>
<thead>
<tr>
<th>Faculty-related positions</th>
<th>Non-faculty related positions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. S- Asst. Prof, Thailand</td>
<td>1. J- Project Director- University</td>
</tr>
</tbody>
</table>

Approximately 9-12 years post-PhD:

<table>
<thead>
<tr>
<th>Faculty-related positions:</th>
<th>Non-faculty-related positions:</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 of 15 (20%)</td>
<td>12 of 15 (80%)</td>
</tr>
</tbody>
</table>

1. S- Asst. Prof, Thailand
2. J- Asst. Prof, US

| 1. J- Project Director- University |
| 2. D- Lab researcher- University |
| 3. N- Staff scientist, National lab |
| 4. E- R &D, Biotech industry |
| 5. S- Molecular breeding, industry |
| 6. M- Group Leader, Biotech industry |
| 7. J- Criminal Investigative Service |
| 8. N- Journal editor for plant biology cooperative she co-created |
| 9. K- International germplasm manager |
| 10. K- Researcher- University |
| 11. K- M.S. then PhD in different lab, now research scientist- University |
| 12. A- Technology licensing, University |
Two ways to look at careers..

The ladder:

The jungle gym:

“Careers are a jungle gym, not a ladder.

[If] I had planned out my career... I would have missed my career.

--Sheryl Sandberg

Both these options are valid. Other approaches work too.
My ‘career path’- Part A- the standard sort of thing

1. Undergraduate- Molecular, Cellular Biology- Emphasis- Genetics: 4 years, B.S. (UCB)
2. Graduate School- Genetics- Plant Biology Lab: 6 years, PhD (UCD)
3. (Christine Mirzayan Science and Technology Policy Fellowship- National Academy of Sciences)
4. Postdoc in same lab at UCD, continuing previous research: 1 year
My ‘career path’ - Part B: all science-related, in academia

   Coordinating plant faculty in the US and internationally

2. Consultant - NAASC Coordinator: 2009- present (part-time)
   Coordinating plant faculty in the US

3. Consultant - IAIC Coordinator: 2011-present (part-time)
   Coordinating faculty in the US and internationally

4. Academic Coordinator - UCD Agriculture Sustainability Institute - National Coordinator: 2012-present (50%)
   Coordinating sustainable agriculture faculty in the US

5. Academic Coordinator - UCD, helping develop a Quantitative Biology undergrad major: 2015-present (50%)
   RED indicates inter-connected positions
Example of the inter-connectedness of my past decade of Arabidopsis community support...

1st ICAR 2006 → Community discussion @ ICAR 2009 → Community Workshops 2010 → IAIC 2011 → Community discussion @ ICAR 2014 on the future of Arabidopsis and plant biology:

1. What is the role of Arabidopsis research and its community in the next 10 years?
2. What are the key strengths of this reference organism?
Outcomes of the ICAR 2014 Discussions led to development of the ART-21 Project

Key strengths of Arabidopsis and its closely-knit community:

- The development of emerging genomics technologies
- Management of increasingly available and complex bioinformatic datasets
- The creation of novel resources and tools

How to leverage, and build on, these strengths to address 21st century challenges in biology?
Arabidopsis Research and Training for the 21st Century

ART-21

1. Key training areas:
   - Computational and Quantitative Knowledge and Skills
   - Emerging Genomic Technologies and Techniques

2. Enhance interdisciplinary training for multiple careers

3. Increase diversity of Arabidopsis researchers

Several Key Recommendations:
- Combine biology with breeding, engineering, computational application
- Integrate data with statistical models
- Expand training beyond traditional PhD programs

Priorities:
- Information technologies
- Cross-disciplinary collaborations
- Integrate physical sciences into biology

This material is based upon work supported by the National Science Foundation under Grant No. #1518280. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.
Focus Groups and ICAR Community Workshops Feed into pre-ICAR 2017 Hands-On Workshop

ICAR 2015
Community Workshop:
Bioinformatics, Computational Biology Training

ICAR 2016
Community Workshop:
Emerging Genomics Techniques

ICAR 2017
Community Workshop:
Computational and Genomics Techniques

ICAR 2018
Community Workshop:
Inter-disciplinary & cross-training

ICAR 2019
Community Workshop:
Wrap-Up Assessment, Recommendations

Summary Dissemination to Community

Focus Groups and ICAR Community Workshops Feed into Final Wrap-Up, Assessment and Recommendations Publication
First Focus Group, May 2016
Computational training and education of plant biologists for 21st century careers

Overarching Framework:
1. Bioinformatics, computational skills for 21st century biology and bottlenecks, obstacles to getting those skills
2. What employers need/want from employees, marketable skills

Second Focus Group, February 2017
Genomic experimental biology techniques for academia and industry in the 21st Century

Overarching Framework:
1. Emerging genomic experimental biology technologies and best practices needed by plant scientists of the 21st century
2. What employers need/want from employees, marketable skills
ART-21 Leadership and Steering Committee

UC Davis
PI: Siobhan Brady (Assoc Prof)  Co-PI: Joanna Friesner

Current NAASC
1. Erich Grotewold
2. Sally Assmann
3. Rick Vierstra
4. Doris Wagner
5. Jose Dinneny
6. Elizabeth Haswell
7. Peter McCourt
8. Roger Innes

Former NAASC
1. Blake Meyers
2. Nick Provat
3. Jose Alonso
4. Keiko Torii

NAASC Minority Affairs Committee co-chair
– Terri Long

International Members
– Jim Murray, UK
– Ute Kraemer, Germany

This material is based upon work supported by the National Science Foundation under Grant No. #1518280. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.
## What is an “Academic Coordinator”?

<table>
<thead>
<tr>
<th>Academic Coordinator titles are for appointees who administer academic programs that provide service closely related to the teaching or research mission of the University. This service may be provided to academic departments, to students, or to the general public.</th>
</tr>
</thead>
</table>

**UC Davis** is unique for having the only Academic Federation for Academic employees, a parallel organization to Academic Senate (regular faculty).
There are currently about 95 Academic Coordinators at UC Davis

- Me - Ph.D. in Genetics (I didn’t describe my other position developing a new undergraduate major in Quantitative Biology…)
- 6 AC’s that I work with here on campus:
  1. Associate Director, Biotechnology Program
     Ph.D. in Genetics
  2. Director, Educational Enrichment and Outreach Programs
     Ph.D. in Biology
  3. Director of the Student Farm
     M.S. degrees in Plant Breeding and Pest Management
  4. Works in Agriculture Resources & Environment
     Ph.D. Geography, M.S. International Agricultural Development
  5. Deputy Director ASI; works as the Food Systems Coordinator for Food and Society
     Ph.D. in Nutrition Education
  6. School Garden Program Director and Ecological Garden Coordinator
     M.S. in Crop Production
There are lots of ways to do science and contribute to society

- Science works best when there is a community
- There are lots of ways to support the scientific community and participate
- The common thread in my jobs are that they all support faculty that are contributing to scientific communities: primarily through service activities
Some advice/comments from grad school friends…

- **Flexibility is good, but don't undervalue yourself** (if one is not following set tracks (academic, industry) it can be mystifying what to expect as salary. It's easy to forget to keep adding up experience as the years go by and therefore let salary levels stagnate.)

- Also be flexible with what kind of job you try. You never know what might float your boat.

- I always tell grad students to think about what they want to do afterward, instead of doing a default postdoc, or staying on to do a postdoc in your professor's lab because you haven't decided what else to do. Don't let yourself become an expert in something you don't want to do! Think about what you like and don't like and try to cultivate the likes
A couple grad or post-grad school opportunities to consider

The Christine Mirzayan Science & Technology Policy Graduate Fellowship Program provides early career individuals with the opportunity to spend 12 weeks at the National Academies in Washington, DC learning about science and technology policy and the role that scientists and engineers play in advising the nation.

AAAS Science & Technology Policy Graduate Fellowships: Provides opportunities for scientists and engineers to learn first-hand about policymaking and implementation while contributing their knowledge and analytical skills in the federal policy realm. **Year long program in DC.**

AAAS Mass Media Science and Engineering Fellows Program: This 10-week summer program places science, engineering, and mathematics students at media organizations nationwide. Fellows use their academic training as they research, write, and report today’s headlines, sharpening their abilities to communicate complex scientific issues to the public.