Demographics of Ocean Science Graduate Programs
Some Long Term Perspectives

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Professor Emeritus, UW School of Oceanography
37 Years of Data

- First Data Gathering In 1978 Dating to 1975
- Over The Years Many Thanks to Charley Hollister, Arthur Nowell, Jake Pierson, John Farrington, Mel Briscoe; Henry Hope, Sue Cook, Allison Miller, Amanda Holloway
- JOI -> 1994, CORE 1995-2007, COL 2007-
- Alas: Preservations, Scope and Format Inconsistent
A Promise

- No pie charts, no bar charts
- And I’ll restrain myself from using ternary diagrams and log-linear plots
- A few tables though
Some Perspectives

- Existing Data (Long Term and Decadal)
- Moving Forward
Applications Down ~33%
Enrollment and Graduation Rate Steady, 90 PhD/y
Women Enrollment from 20% to 29%
GRE Scores Very Stratified (Three Institutions with Medians Above 90th Percentile)
80% of Students Supported, 66% From Federal Research Grants
Recent Surveys (Past Decade)

- Applications, Offers and First Year Enrollment by Discipline, Gender, Citizenship, Ethnicity
- Characteristics of Student Body by Discipline, Gender, Citizenship, Ethnicity, Support
- Characteristics of MS and PhD Graduates by Discipline, Gender, Citizenship, Ethnicity, Next Position, Time in Program
- 34 responding institutions in 2011-2012
Data Fidelity and Consistency
Some (and Perhaps Substantial) Limitations

- Changing mix of responding institutions from year to year
- Internal consistency of data provided
- Continuity of record as survey instrument changes
- Heterogeneous set of institutions
- Ever changing institutional representatives
Program Characteristics 2011-2012

- 375 New Enrollees
- 2749 Graduate Students in Residence
- ~1/3 Biological Oceanography or Marine Biology, ~1/3 Chemical, Physical, Geological, ~1/3 Other Ocean Science
- 79% US Citizens
- Among US Citizens: 88% Caucasian
- Degrees Granted: 358 MS, 219 PhD
- 67% supported by RA/Fellowship/Traineeship, 15% as TA, 18% Unsupported
Admissions Sequence

- ~2000 Applicants (51% Women, 49% Men)
- Offers To ~570 of These Applicants, 28% of Applicant Pool (Women 32%, Men 24%)
- Enroll ~375 Of These Applicants, 19% of Applicant Pool (Women 19%, Men 19%)

- Multiple Offers? Non-Ocean Science Trajectory? (Pre-FERPA Suggests Few Multiple Applications 1984-1985)
Disciplinary Expertise: New Enrollment
### "Core Ocean Sciences"

<table>
<thead>
<tr>
<th>Discipline</th>
<th>84-85 Apps</th>
<th>11-12 Apps</th>
<th>Ratio Then/Now</th>
<th>11-12 Enrolls</th>
<th>Ratio Enroll/Ap p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bio</td>
<td>39%</td>
<td>48%</td>
<td>1.2</td>
<td>40%</td>
<td>0.8</td>
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<tr>
<td>Chem</td>
<td>10</td>
<td>16</td>
<td>1.6</td>
<td>16</td>
<td>1.0</td>
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<tr>
<td>Phys</td>
<td>16</td>
<td>20</td>
<td>1.3</td>
<td>25</td>
<td>1.3</td>
</tr>
<tr>
<td>GG</td>
<td>35</td>
<td>16</td>
<td>0.5</td>
<td>18</td>
<td>1.1</td>
</tr>
</tbody>
</table>
A Flow Model (OSM 2012)
Methodology

- Composite Data from Subset of 14 Institutions Responding to Four Years of Surveys in 07-08, 08-09, 09-10, 10-11
- Quasi Steady State Model (N is adjusted for dN/dt Δt), Only Inferred Variable is “No Advanced Degree”
- Separately Tracks Gender (Except for Post Degree Outcomes)
Degree Pathways

286 Students Enrolling
- 47% Male
- 53% Female

1159 Master’s and PhD Students
- 47% Male
- 53% Female

112 Graduate with Master’s Degree
- 44% Male
- 56% Female

123 Graduate with PhD
- 51% Male
- 49% Female

18 Leave w/o Advanced Degree
- 77% Male
- 23% Female

*Terminal MS*

Academia Job
- 14% Male
- 48% Female

Non-Academia Job
- 63% Male
- 22% Female

*Missing percentages unknown.*
Degrees Granted: Women-Men

![Graph showing the relationship between the fraction of Ph.D. degrees received by women and the fraction of M.S. degrees received by women, with points marked for Other, AES, and Chem.]
## Program Population: Ethnicity

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Fraction of Graduate Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caucasian</td>
<td>88</td>
</tr>
<tr>
<td>Hispanic</td>
<td>4</td>
</tr>
<tr>
<td>Asian American</td>
<td>5</td>
</tr>
<tr>
<td>Native American</td>
<td>1</td>
</tr>
<tr>
<td>African American</td>
<td>2</td>
</tr>
</tbody>
</table>
Degrees Granted: Ethnicity

![Graph showing the relationship between the fraction of M.S. received and the fraction of Ph.D. received for Caucasian and non-Caucasian groups. The graph indicates a linear relationship with both points falling on the line.]
Ethnicity: New Enrollment
Ethnicity: Institutional Success

* ~1/3 of institutions: no new students from underrepresented groups
* ~1/3: one or more up to 15% of new students
* ~1/3: more than 15% of new students
* (no obvious geographic pattern)
(My) Worries

- About 43% of Incoming Students Continue Into Academia: Do Curricula Reflect This? Are Faculty Supportive Mentors? Are We Meeting Expectations of Funders?
- Attrition Among Women
- Weak Asian American Participation
The Future

- Existing Data (Long Term and Decadal)
- Making Data Available
  - Preserving and Providing Meaningful Access: Challenges and Pathways
  - My Personal Transition
(Good thing): I religiously back up data
(Bad Thing) Data in Excel... sheets very, very wide
(Okay?) One-off analysis, no consistent workflow
(How do?) More analysis welcomed, as aggregated data and for individual institutions to compare to aggregated data, but data are inaccessible
Work to Date

- ~2/5 of data from 2003 onward ingested
- Particular tool used is SQLShare, developed by the UW e-Science Institute for “big data”
- SQLShare meant as a scientific tool, e.g. UW genomics/proteomics research groups are power users
- An important attribute: these are durable, shareable workflows (a key characteristic of reproducibility)
And Coming

- Amazon Web Services Willing to Host Data Gratis
- And AWS Will Provide An Accessible Virtual Machine on AWS Running SQLShare Linked to These Data
- Initially Locking Data for Individual Institutions vs Aggregated Data
- As Community, Must Find a Data Sharing Model: Otherwise I Am Not Empowered to Unlock