Rethinking Graduate Education for the 21st Century

Council of Graduate Schools Policy Forum
June 5, 2017
Never Discuss Floods
With Noah In the Audience
I’d like your input into a committee I’m chairing for the National Academies of Sciences, Engineering and Medicine
Committee on Revitalizing Graduate STEM Education for the 21st Century
What’s the issue?

- Over 60% of new Ph.D.’s do NOT go into academic research
  - But we train them the same way we have for 100 years
Work Activities of Former NRSA Trainees and Fellows with Biomedical Sciences Ph.D.s, 2013

- Research and Development
- Management or Administration
- Professional Services
- Other
- Teaching

Percent

Years From Degree:
- ≤ 5
- 6-10
- 11-15
- 16-20
The world of science has changed substantially over the last 50-100 years

- The enterprise has grown tremendously
  - Funding
Figure 4-2


NOTE: Data for 2013 include some estimates and may later be revised.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, National Patterns of R&D Resources (annual series).

Science and Engineering Indicators 2016
The world of science has changed substantially over the last 50-100 years

- The enterprise has grown tremendously
  - Funding
- The science and engineering workforce is growing
Figure 3-3

Individuals employed in S&E occupations in the United States: Selected years, 1960–2013

NOTE: Data include people at all education levels.


Science and Engineering Indicators 2016
PhD Production: 1920-2011

Compiled from administrative records and the SED
Research is being done in different settings

SEI 2016: Recent Trends in U.S. R&D Performance, Chapter 4.
The nature of science has changed

Science has become global
Most problems are multi-disciplinary
More and more scientists work in teams
What makes a scientific career has changed
  Variety has expanded greatly
  Many are not linear
One likely will not follow a “traditional” route

- >60% of new Ph.D.’s go into non-academic careers
- Many people change jobs one or more times over their career
Current system works well for almost everyone

- Mentors/PIs
- Institutions
- Funding agencies
Except

- Some employers
- The STUDENTS
The Committee’s task:

- A systems analysis of current state of graduate education and career paths
- Identify policies, programs and practices that could better meet the career needs of graduate students
- Identify strategies to improve the alignment of graduate education with the needs of prospective employers and students
- Identify possible changes to federal and state programs and funding priorities
- Identify how best to provide students and faculty with information about career paths
- Identify implications of the increasingly international nature of science
- Investigate the new models that are influencing graduate education
Committee Members

Chair: Alan I. Leshner
Chief Executive Officer Emeritus, AAAS

Sherilynn Black
Assistant Professor and Director of the Office of Biomedical Graduate Diversity
Duke University School of Medicine

Mary Sue Coleman
President
Association of American Universities (AAU)

Jaime Curtis-Fisk
STEM Program Leader and an R&D Scientist
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Maureen Grasso
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Sally Mason
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Keith Yamamoto
Vice Chancellor for Science Policy & Strategy
Vice Dean for Research, School of Medicine
Professor of Cellular & Molecular Pharmacology
University of California, San Francisco
What do we hope to accomplish?

- Start a national conversation
- Distill overarching principles of where graduate education should be evolving
  - Without compromising what it means to be a Ph.D.
- Help figure out how to make changes in the system
What are we hearing?

- These are not our recommendations!!
  - They’re things we’re hearing
Deal with Master’s degrees and Ph.D.’s separately

- Of all graduate students (non-health sciences)
  - > 75% master’s
  - ~ 20% Ph.D.s
- Are typically very different curricula
Institutions should be transparent about career paths of their graduates
Engage a broader and more diverse cross section of population in STEM fields
Establish core competencies for master’s and Ph.D.’s
Core competencies for all master’s

- Disciplinary and interdisciplinary knowledge
- Professional competences
- Foundational and transferrable skills
  - E.g., communication
  - Leadership
  - Working in teams
- Research
Establish core competencies for all Ph.D.’s

- Add on other skills?
  - Required or optional?

- Expose to non-academic career options
  - Internships during Ph.D. training
  - Post-doc internships
Core competencies for all STEM Ph.D.’s

- Conduct of original research
- Broad science literacy
- Quantitative skills
- Science communication
Other skills needed for a STEM career:

- Research integrity
- Management and budgeting
- Working in teams
- Grant writing
- Communication with non-scientists
How to make change happen?

- Propagate model programs
- Incentives
Incentives

How might the current incentive(s) system(s) for institutions, faculty and students be better aligned to the ways graduate education should evolve?

Where are the most critical leverage points in the system?
Enough from me...

- What do you think?
- What are your experiences and ideas?