An Unlikely Success in Unstable Times

NATIONAL POSTDOCTORAL ASSOCIATION
NATIONAL CONFERENCE
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Discuss 3 convergent topics relevant to NPA

1. Quality of postdoctoral experience
2. Career prospects for current & prospective postdocs
3. Unhealthy instabilities of basic research

Then return to NPA - a real but unlikely success story
1. Quality of postdoc experience: NPA focus

- **Six core competencies (NPA)**
  1. *Discipline-specific conceptual knowledge*
  2. *Research skill development*
  3. *Communication skills*
  4. *Professionalism*
  5. *Leadership and management skills*
  6. *Ethics: Responsible conduct of research*

- Encourage training for a variety of careers
- Adequate $ support for postdocs
- Individual Development Plans (IDP)
2. Career prospects for postdocs

- Claims of S&E “shortages” prevail (concerted lobbying)
- Realities very different, with large variations
- **Academic** tenure-track
  - some postdocs will pursue, but not majority
- **Non-academic** careers
  - no longer “alternative” careers
  - employers value professional skills & breadth vs narrow research skills
- **Smart**: NPA “core” enhances career prospects for postdocs
  1. Communication skills
  2. Professionalism
  3. Leadership and management skills
  4. Ethics: Responsible conduct of research
Other parallel efforts underway

- **UCSF: Graduate Student Internships for Career Exploration Program (GSICE)**
  - “...allows graduate students to do internships outside of academic research. The goal of GSICE is to provide UCSF basic and biomedical science graduate students with hands-on experience in appropriate career environments in order to help them make informed decisions about which of the many career paths to pursue post graduation.”
  - [http://gsice.ucsf.edu/info-students](http://gsice.ucsf.edu/info-students)

- **Professional Science Masters (PSM) degrees:**
  - “...advanced training in science or mathematics, while simultaneously developing workplace skills highly valued by employers...two years of academic training in an emerging or interdisciplinary area, along with a professional component that may include internships and "cross-training" in workplace skills, such as business, communications, and regulatory affairs....”
  - [www.sciencemasters.com](http://www.sciencemasters.com)

- **Keck Graduate Institute: Postdoctoral Professional Masters in Bioscience Management**
  - “...a groundbreaking professional masters program for post-doctoral students with backgrounds in science and engineering...helps PhD scientists and engineers acquire the business and management skills needed to pursue senior management positions within the life sciences industry or embark on entrepreneurial ventures that are intended to commercialize technologies developed in laboratories.”
  - [http://www.kgi.edu/academic-programs/postdoc-professional-masters-program-(ppm).html](http://www.kgi.edu/academic-programs/postdoc-professional-masters-program-(ppm).html)
Robust growth of the PSM degree

300!
The Professional Science Masters Program reached its 300th affiliated program in 2013.

2001: A Sloan grant to the Council of Graduate Schools (CGS) extends the PSM initiative to master's-focused institutions, which award 40% of science/math master's degrees and whose faculty are heavily invested in high quality master's education.

1997: Beginning in 1997, the Sloan Foundation makes grants to 14 research universities to support the founding of programs in the natural sciences and mathematics, followed by a targeted bioinformatics set of programs at another 12 research institutions.

2006: The Council of Graduate Schools, seeking to improve and advance graduate education, assumes primary responsibility for supporting and expanding the Sloan Professional Science Masters' (PSM) initiative, with the goal of making it a regular feature of high quality U.S. graduate education.

2007: The National Professional Science Master's Association forms to engage businesses, industries, nonprofit organizations, government agencies, and professional associations in the development of PSM degree programs and with internship and job placement for PSM degree program students and graduates.

2011: The number of PSM programs expands rapidly as university systems in California, North Carolina, New York, Florida, and New Jersey implement system-wide PSM initiatives.

2012: Responsibility for PSM Affiliation and curation of the sciencemasters.com website transferred to the Council of Graduate Schools to a newly-established National PSM Office that is housed at Rice Graduate Institute.

2013: Our 300th program.

To date, 16 higher education systems, alliances and states have adopted PSM programs with conversations underway with system administrators in additional states.

"PSM graduates understand the contribution of STEM knowledge to real issues. They will become the leaders in innovation that will spur the next generation of economic development."

Dr. James Moran, Vice Chancellor Pennsylvania State System of Higher Education (PASSHE)

The PSM degree is designed to train the next generation of STEM professionals for integrator and leadership roles in science-intensive industries. By helping translate research into commercialization, PSM graduates are able to fuel innovation and economic growth.
3. Instabilities for basic research

- **US has led world in basic research since WWII**
- **Wise decisions after WW II facilitated (Vannevar Bush)**
- **Basic research heavily funded by Federal government**
  - Primarily to universities rather than in-house labs
- **US basic research still globally predominant**
  - and strengthening
  - but other countries are catching up (Europe especially)
Origins and evolution of current system

- Vannevar Bush’s prescient report to President
  - *Science: The Endless Frontier* (1945)
  - 5 principals for a “National Research Foundation” (NRF)
    - 1. *stability of funds over period of years*
    - 2. non-political board
    - 3. *Federal research support to non-Federal institutions*
    - 4. research free of Federal control
    - 5. *NRF responsible to the President and Congress*
- No NRF – NSF, NIH extramural, DoD research
- Yet Principles 2-5 implemented (#3 critical)
- HOWEVER: #1, *funding stability*, not achieved
Symptoms of distress in successful system

- Low (& declining?) grant success rates
- **Established researchers: Pressures & threats**
  - Increased time/effort devoted to grant-writing & peer review
  - Incentives for risk-aversion in research
  - Institutional pressure to fund more salary from external grants
  - Funding gaps threaten successful careers and labs
- **Junior researchers: Special challenges**
  - Long time-to-PhD, more/longer postdocs = large opportunity costs
  - Arguably deteriorating career prospects
  - Declining % tenure-track
  - Grant success even lower (but recent trend reversal at NIH)
Instabilities are inherently structural

- Positive feedback, with limited information for entrants
- Federal research $ and industry demand both erratic
- More $ => more proposals, PhD students, postdocs
  - Most grad students/postdocs financed by research funding
    - NSF: ~86% of 44,000 NSF-financed graduate students
    - NIH: ~78% of NIH-financed grad students & postdocs
- Entrants: Limited info about past PhDs and postdocs
- Universities: no limits on int’l students/postdocs
  - Limits any market adjustments
- A recipe for instability, oscillation
Challenges to research institutions

- **Perverse incentives to “leverage up” (esp biomedical)**
  - Increase PhD students & postdocs as lab workforce
    - International students/postdocs financed with Federal research $
  - Borrow to build labs (“condo labs”?): OMB Circular A-21
  - Maximize faculty/staff salaries on research grants (w/overheads)
  - “NIH actually rewards institutions for paying faculty salaries with unguaranteed “soft money” from research grants by providing increased overhead payments. Amazingly, any institution that draws on its own finances to pay its professors is doubly disadvantaged: It must not only use its own funds but also loses the overhead on the salaries that it would otherwise accrue.”

- **But “crisis” without sustained budget increases**
  - Biomedical research: needs minimum +6% per year for stability?
Research funding system causes harms

- **Federal funding booms and busts**
  - Political decisions, disconnected from workforce demand?
- **Students: seek careers that wane before graduate**
- **Established researchers: disruption**
- **Institutions: leverage = risk**
  - Expanded labs/staff assuming continuing $ increase
  - Increased exposure to risk from funding busts
Can increased Federal funding solve?

- Only if continues indefinitely (Korn et al, 2002)
- Evolved system structured for budgetary expansion
- No effective negative feedbacks
  - NIH doubling provides a valuable natural experiment
- A system without a governor
NSF Funding History, constant 2013 dollars, 1951-2014
Increased funding, declining success rates

Success Rates of R01 Equivalent Competing Applications (1962-1969 estimated by NIH)

Fiscal Year

- Applications
- Awards
- Success Rate
NPA: an (unlikely) real success story

- Why “unlikely”?
  - New organization born into hard times in academe - just over 10 years old
  - NPA leadership: limited experience, no obvious stable sources of revenue
  - Postdocs are high turnover group
  - Risk of sliding toward confrontation vs. cooperation

- Yet NPA turned out to be mature, credible, stable, effective
  - Chose to work with established organizations
    - NIH, NSF, AAAS, AAMC, NRC, Sigma Xi, leading research universities
  - Identified revenue sources; small but stable
  - Leadership breadth: current & former postdocs, faculty, administrators

- NPA improved understanding of postdoc problems & potentials
- More attention now paid to quality of postdoctoral experience
- Meager stipends and benefits improved by NIH, NSF
Despite these successes

- We still have little knowledge about postdoc population
  - My opinion: a shocking gap
- Structural challenges faced by basic research system
  - Painful and destructive to all, especially junior researchers
- These challenges affect quality, desirability of postdoc
- How address in future? Should NPA support?...
  - more research funding (if => more postdocs)?
  - unlimited global recruitment of postdocs?
  - structural reforms of system?
To Sum Up

- NPA a remarkable success story -- you should be proud
- But need remains for mature & effective NPA
- Problems facing research & postdoc systems are real…
- …and fundamentally structural
- You will not be lacking for challenges!…

THANK YOU!
Comments most welcome

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