Where Will a Ph.D. in Science Take You?

Stefano Bertuzzi, Ph.D., M.P.H.  
Executive Director/CEO  
American Society for Cell Biology
Mortality from Medical Causes

Peak 1965-1995

Current 2009-2012

- Stroke
  - 20,000

- HIV/AIDS
  - 30,000

- Heart Disease
  - 1.1 Million

- ALL (Leukemia)
  - 6,000
Where’s the magic?

- Basic science
- An innovation strategy
- Training
The science careers pipeline

Undergraduate Science Major

Graduate training

Postdoctoral training

Tenure-track faculty (“PI in academia”)

Closer to reality...

Graduate Training

Postdoctoral training

Research in industry, government

Tenure-track faculty <25%

Policy, teaching, writing, law, business of science

Where will a biology PhD take you?

A faculty job is an "alternative" career.

At this rate, <10% of entering PhD students will become tenure-track faculty. Yet, 53% rank research professorships as their most desired career.²

Arrows represent annual fluxes. Circles are total current workforce numbers.

- 86,000 current US biology PhD students
- 1,900 to 3,900 foreign-trained PhDs start postdocs
- 600 leave the US
- 720 current postdocs
- 70% (5,800) postdoc
- 37-68,000 current postdocs
- 30% do more than one postdoc¹
- 29,000 current tenured and tenure-track faculty
- 17,000 current bio PhDs doing non-science jobs
- 22,500 current industry researchers
- 24,000 current non-research, science related jobs
- 7,000 current gov’t researchers

Every year, ~16,000 students start biology PhD programs

7 years average time to degree

37% drop out

9,000 receive PhDs

70% (5,800) postdoc

US PhDs spend an average of 4 years, but others must spend longer to account for number of postdocs.

18% of PhDs get non-tenure track academic jobs within 6 years post grad.²

25,000 current non-tenure track academic positions

10% of former postdocs (up from 2% in 2010) consider themselves unemployed.¹

Sources:
3. Sauermann & Roach 2012 PLOS ONE DOI: 10.1371/journal.pone.0036307

Unless otherwise noted, NIH Biomedical Workforce Working Group (2012)
The disappearing tenure track position

Source: NSF, Survey of Doctorate Recipients

Job Positions in Biological Sciences

- Tenure Track
- Non Tenure/Post Doc
- Other
- Industry
- PT/Out of LF/Unemployed

Source: NSF, Survey of Doctorate Recipients
Students enter graduate school hoping to move into a research career... but by Year 3, \( \frac{1}{3} \) seek non-research careers.

UCSF graduate students; \( N=469 \) (62% response rate)

Instead of banned words:

Career Paths

Alternative Career
A Different Kind of Impact: My life after Being a tenured professor
NIH Public Access Policy Details

The NIH Public Access Policy implements Division F Section 217 of PL 111-8 (Omnibus Appropriations Act, 2009). The law states:

The Director of the National Institutes of Health ("NIH") shall require in the current fiscal year and thereafter that all investigators funded by the NIH submit or have submitted for them to the National Library of Medicine's PubMed Central an electronic version of their final, peer-reviewed manuscripts upon acceptance for publication, to be made publicly available no later than 12 months after the official date of publication: Provided, that the NIH shall implement the public access policy in a manner consistent with copyright law.
Bureaucracy Hindering Science?
Act to put Science First!

- Policy language did not allow U.S. Scientists to be funded by the European Commission (EC)
- Worked with EU Member States (funding agencies)
- Raised the issue with the EC
- Dr. Elias Zerhouni and Commissioner Janez Potočnik met in Washington on February 13, 2008
- Established a bilateral working group
- Reversed policy and published the agreement in *Science* Magazine on November 14, 2008
- Model agreement for other agencies (NSF, DOE, EPA...)

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**LETTERS**

*edited by Jennifer Sills*

**European Union and NIH Collaborate**

THE NATIONAL INSTITUTES OF HEALTH (NIH) AND THE EUROPEAN Commission (EC) recently decided to reinforce our mutual interest in scientific collaboration. We believe that greater trans-Atlantic cooperation and smarter competition in science will lead to faster breakthroughs in health research and ultimately to a better quality of life for the citizens of the world.

The NIH has a long tradition of funding collaborations between U.S. and European scientists. To this end, the NIH recently clarified its policies for funding global collaborations (1). And on 3 September 2008, the European Commission published a new call for proposals within the health theme of its Seventh Framework Programme for Research and Development (2). For the first time, the EC has announced that researchers working in U.S. institutions are eligible not only to participate in EC-supported research projects but also to receive funds from the EC if they are part of a consortium with European Union (EU) investigators.
Evaluation of the French Biomedical Research System

• Lead Staff to Dr. Zerhouni, on advising the French government on restructuring the biomedical research system

• Consulted with all relevant stakeholders
  • President Sarkozy
  • Minister of Research
  • Minister of Health
  • Heads of Funding Agencies
  • Presidents of Universities
  • Scientists

• Developed the Strategic Plan

• Report to the French government
Return on Investments

• Develop an empirical framework and methodologies to address NIH research impact
  • Strategic planning
  • Improve effectiveness
  • Better management
  • Tout success
  • Learn from mistakes
• Build expertise in the field with NIH
• Provide transparency and accountability
Measuring the Results of Science Investments

Julia Lane and Stefano Bertuzzi

Historically, federally funded basic and applied scientific research has promoted scientific knowledge, innovation, economic growth, and social well-being. However, there is increasing pressure to document the results of these research investments in a scientific manner (1, 2) and to quantify how much of the work is linked to innovation (3).

Is it possible to create a system in which the effects of scientific research can be described? If so, what would be the inputs, outputs, and structure of the system? What scientific disciplines should inform the formulation of such a model? Creating a system in which the effects of scientific research can be described on an ongoing basis—without increasing the burden on research institutions and principal investigators—is difficult.

The current scientific data infrastructure is based on identifying, funding, and managing high-quality science, not on understanding its impact. The main sources of data on research and development in the United States—the Survey of Federal Funds for Research and Development (the federal funds survey) and the Survey of Federal Science and Engineering Support to Universities, Colleges, and Nonprofit Institutions—were designed to describe the types and levels of science investments, not their impact or effects (4).

There are systems available to capture outcomes (for example, various health and economic information systems) but they do not link inputs with outcomes and outcomes. Historically, there have been limited resources and complex (7). In 2009, the European Union EUFORDIHA conference, which examined the impact of the Framework Programme (FP) 6, included, as a major recommendation, of building a database of project results for future FP, noting that “getting robust data on the FP in terms of participation and results is the foundation for any evaluation” (8). In 2011, the Japanese government is creating a program to advance the science of science and innovation.

A high-quality system should be based on describing the activities of scientists and clusters of scientists. Of course, the direct output of research is knowledge, which includes even research “failures,” and is difficult to measure. Despite this, the system should include proximal measures of scientific output (such as publications, citations, and patents) and go well beyond simple publication counts to the identification of emerging and complex (7).

The challenge is not limited to the United States; other countries have been developing systematic ways of describing the results of science investments. Since 1986, the Higher Education Funding Councils in England has assessed research with its Research Assessment Exercises (now a Research Assessment Framework) intended to assess the quality, impact, and vitality of funded research. Their lessons are salutary: Although the exercises did help to improve research quality, the process of producing the data was burdensome.

Science agencies and research institutions are building the infrastructure to evaluate results of federal funding of scientific research.

“The intent is to leverage revolutionary digital technology to capture the broad scientific, social, economic, and workforce impacts of science investments.”

Developing such a system and the associated data infrastructure will require financial and intellectual resources. Other efforts to put together a data infrastructure describing the outcomes of research and development (R&D) investments, both by the private and the public sectors, no longer function for a variety of reasons (11). The new focus on accountability, combined with new technology and the broad-based commitment of key stakeholders, may result in a better outcome.

Currently, key data elements are dispersed across federal agencies and research institutions or are in third-party databases. For example, information about what science is being funded is often neither in structured format nor systematically shared across agencies; administrative information about the students supported by federal funding is housed at research institutions, but not by the agencies; and the universe of data on patents,
As someone who spends a lot of time monitoring the economy, let me put a plug for more work on finding better ways to measure innovation, R&D activity, and intangible capital.

We will be more likely to promote innovation activity if we were able to measure it more effectively and document its role in economic growth.

Ben Bernanke, Chairman of the Federal Reserve

May 16, 2011
DORA is about culture change in the scientific community
San Francisco declaration on research assessment

San Francisco DORA
Declaration on Research Assessment

- Editors and publishers met at ASCB 2012 in SF
- 155 original signers
- 82 organizations (HHMI, Wellcome Trust, AAAS, EMBO, PNAS...)

- Released on May 16, 2013:
  - As of August 31, 2014
    - 11,214 Individuals
    - 492 organizations
The most recent reports...

- National Institutes of Health (NIH)
  - NIH Advisory Committee to the Director Biomedical Workforce working groups (2012)

- COSEPUP – Committee on Science, Engineering, and Public Policy
  - State of the Postdoctoral Experience for Scientists & Engineers Revisited (2014)

- Four thought leaders—Call to rescue the US biomedical research system (PNAS, Spring 2014)
What should be done?

• Ideally, increase demand
  • Imperative to support young investigators
• Rigorous criteria for entering postdoctoral training
  • Separate training grants from research grants?
• Increase postdoc salaries
• Set a limit for postdoc training (six years?)
• Staff scientist career
• Advertise program outcomes
  • Job placement
  • Average salary
  • Gender ratio
What can you do?

Be demanding with your PI on mentorship
Seek mentorship outside of the lab
Take advantage of training opportunities
Seek information
Cast the widest possible net
Don’t feel you are stuck in a rut
Form a postdoc committee
http://ascb.org/career-development/
Different training options from ASCB

Two-Week Bioscience Management Course

Organized by The American Society for Cell Biology and Keck Graduate Institute Claremont, California, 
July 12-24, 2015
More year-round opportunities

• One on one CV review
• Contests for science outreach
• Organize local meetings
• Leadership opportunities with COMPASS
• Write for the ASCB Post

Christina Szalinski
The 4th International Conference and
the 1st ASCB Local Meeting on
Cellular Dynamics & Chemical Biology

November 13-16, 2014, Hefei, China

CDCB Organized by Yunyu Shi, Xuebiao Yao & Chuanhai Fu
ASCB Local Meeting Organized by Xing Liu & Zhikai Wang
Professional Development at our Annual Meeting

- Presentation help
- Career coaching
- Grant writing training
- Networking
- Learn to give an elevator speech
- Strong focus on diversity
  - URM
  - Women in science
  - LGBTQ
- Get funds to attend
ASCB supports the best and brightest

2014 ASCB Kaluza Prize for scientific achievement in graduate student research

- $5,000
- $3,000
- $1,000
- Speak at mynismoisium
- Keynote at Danaher S&T summit
Thank you!

@AmerSocCellBio

facebook.com/ascbiology

sbertuzzi@ascb.org