



UNIVERSITY OF MINNESOTA

Driven to Discover™



HealthPartners®

VA



U.S. Department
of Veterans Affairs

Systemic Threats to Research Integrity Require Systemic Responses

Brian C. Martinson, PhD

Retractions Conference, Colorado State University
July 21, 2016, Fort Collins, CO

Disclaimers

- ▶ The views expressed here are my own and do not necessarily reflect the position or policy of HealthPartners Institute, the Department of Veterans Affairs or the United States government.

Research Integrity ≠ Absence of FFP

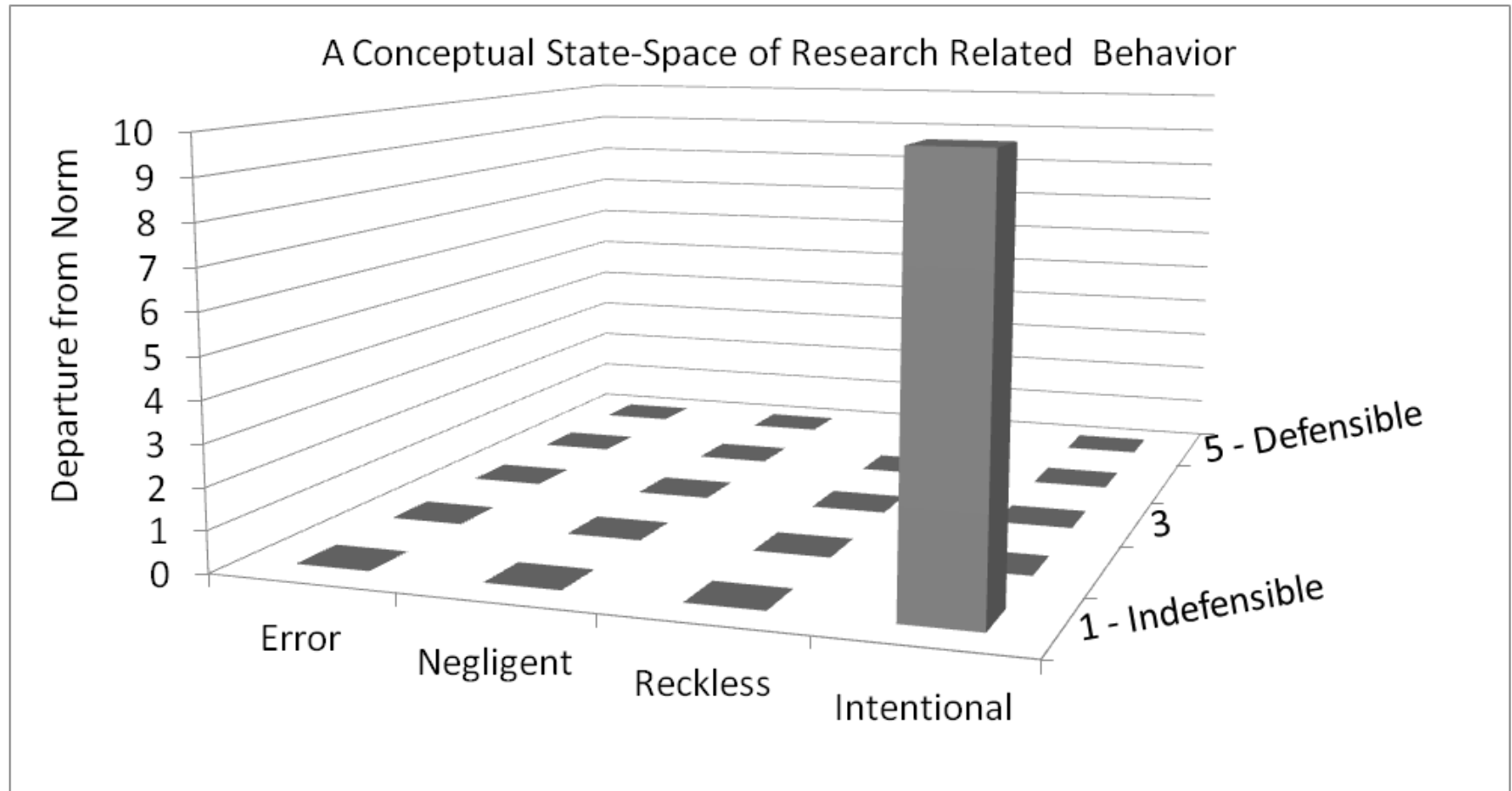
- ▶ Empirical research – primarily among biomedical researchers in academe
 - ▶ Has documented high levels of undesirable research related behaviors⁽¹⁻³⁾
 - ▶ Misconduct (FFP): 1% to 8%
 - ▶ Misappropriation: 10% – 25%
 - ▶ Circumventing federal regulations: 14%–18%
-
- ▶ 1. B. C. Martinson, M. S. Anderson, R. De Vries, Scientists behaving badly, *Nature* 435, 737–8 (2005)
 - ▶ 2. B. C. Martinson, A. L. Crain, R. De Vries, M. S. Anderson, The Importance of Organizational Justice in Ensuring Research Integrity, *Journal of Empirical Research on Human Research Ethics* 5, 67–83 (2010)
 - ▶ 3. A.L. Crain, B. C. Martinson, and C. R. Thrush. 2013. “Relationships Between the Survey of Organizational Research Climate (SORC) and Self-Reported Research Practices.” *Science and Engineering Ethics* 19 (3): 835–50

Misbehavior \neq Intentional Deceit

- ▶ “Neglect” was defined as having engaged in 1 or more of the following in the prior 3 yrs:
 - Inadequate record keeping related to research
 - Inadequate monitoring of research projects
 - Cutting corners in a hurry to complete a project
 - Circumventing or ignoring aspects of materials–handling research requirements
- ▶ 46.7% endorsed one or more of these items
- ▶ Of those admitting to any of these – more than half admitted to at least 2 of the 4, and nearly a quarter admitted to 3 of the 4.

(Crain, A. Lauren, Brian C. Martinson, and Carol R. Thrush. 2013. “Relationships Between the Survey of Organizational Research Climate (SORC) and Self-Reported Research Practices.” *Science and Engineering Ethics* 19 (3): 835–50)

Typical headline news...



UNIVERSITY OF MINNESOTA
Driven to Discover™



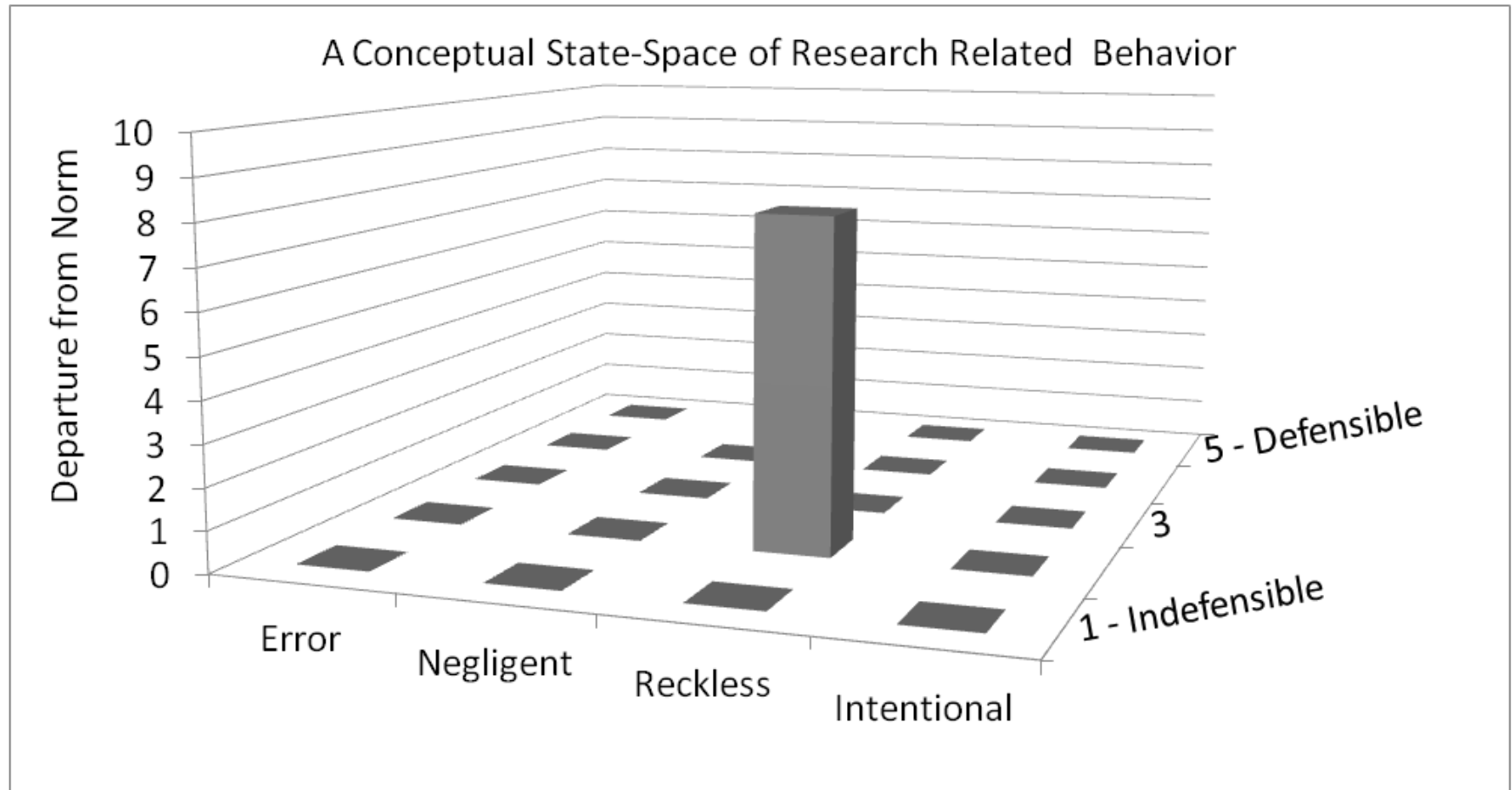
HealthPartners®

VA

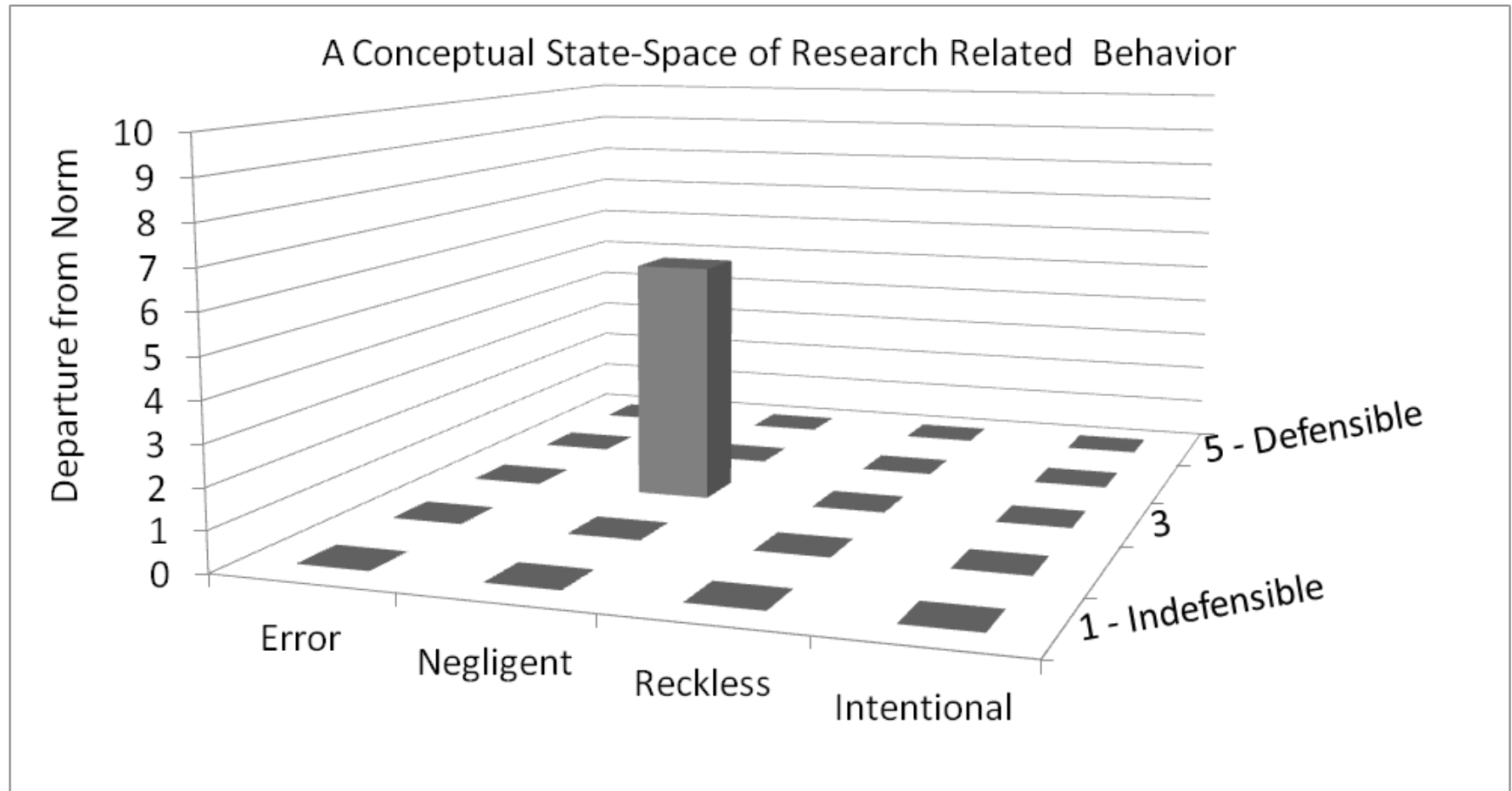


U.S. Department
of Veterans Affairs

But what about this...



Or this...



UNIVERSITY OF MINNESOTA
Driven to Discover™



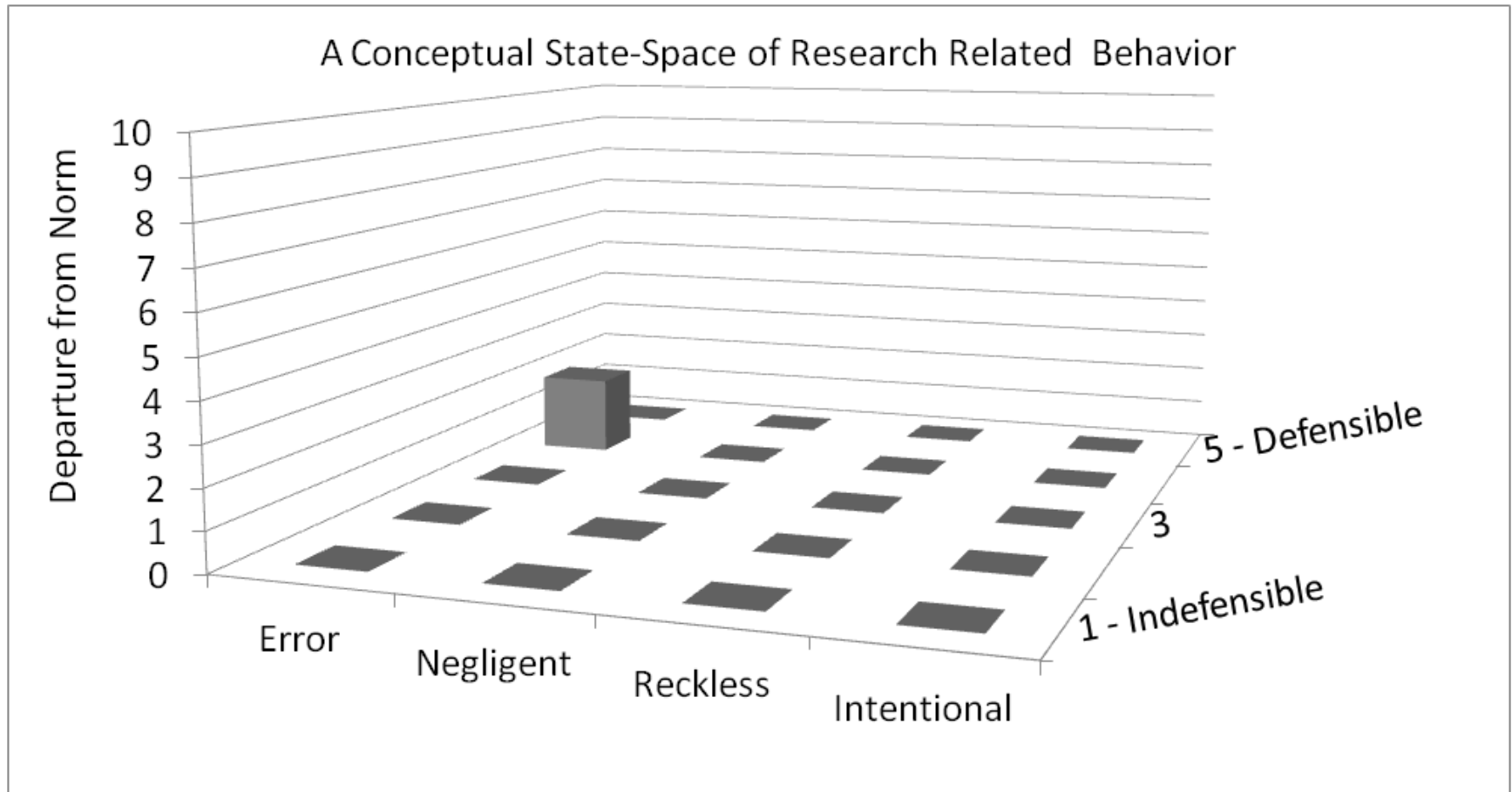
HealthPartners®

VA



U.S. Department
of Veterans Affairs

Or this...?



Systemic Factors



Case study – A case of scientific misconduct

- ▶ UW–Madison – lab studying genetics of sex determination in nematode worm – *C. elegans*
- ▶ Tenure track faculty member Elizabeth Goodwin was accused by graduate students in her lab of misrepresenting findings in applications to NIH
- ▶ Allegations led to a university inquiry and Goodwin's resignation in 2006
- ▶ ORI investigation and ultimately a finding of misconduct
- ▶ Given probation, made to pay some restitution and barred from obtaining federal research funding for several years



Explore Worm Biology

facilitating insights into nematode biology

browse

WormMart, Blast and more

login OR become a member

see a star? click on it to save to My Wormbase

control what you see on the page

skip tutorial

Page Content

- News
- Discussion
- Activity
- Upcoming Meetings

My WormBase

- My Favourites
- My Library

Recent Activity

turn on history >

history logging is off

News

[Poster abstract deadline extended for Neuro Topic Meeting 2014!](#) Wed, 21 May 2014

The poster abstract deadline for the *C. elegans* topic meeting in Neuronal Development, Synaptic Function and Behavior has been extended! Submissions will be accepted through the end of the

[Abstracts due today for 2014 C. elegans Topic Meeting!](#) Mon, 05 May 2014

The 2014 *C. elegans* "Topics" Meeting, covering Aging, Metabolism, Pathogenesis, Stress, and Small RNAs, will be held July 10-13, 2014 on the campus of the University of Wisconsin, Madison.

[WormBase and the "Heartbleed" security issue](#) Wed, 09 Apr 2014

Recently, a serious security gap was identified in the software that provides the "secure" component of many websites. Called "Heartbleed", this issue could possibly affect upwards of 2/3

[View More >](#)

Discussion

Forums:

[Re: Cuticular defects and hypo-osmotic shock sensitivity phenotype](#) Wed, 28 May 2014

Yeah-bus-8 is a great control and available from the CGC. I used the e2885 allele in a recent PLoS

Activity

Random page:

go term: [outer membrane](#) ★

The external membrane of Gram-negative bacteria or certain organelles such as mitochondria and chloroplasts; freely

What's popular on WormBase:

*information gathered from consenting users

turn on history >

history logging is off

You must activate history logging to view the popular items on WormBase

You can save items on WormBase!

When you see a star on WormBase:

1. Click on the [Questions, Feedback, and Help](#) link in the top right corner.

Google Analytics



Page Content

- Overview
- Lab Affiliation
- Lineage
- Publications
- Tracking

Tools

- Tree Display

My WormBase

- My Favourites
- My Library

Recent Activity

[turn on history](#)

history logging is off

Comments (0)

Overview

Sydney Brenner

Salk Institute for Biological Studies
10010 North Torrey Pines Road
La Jolla, CA 92037
United States of America

Institution: Institute of Molecular and Cell Biology, Singapore

Web Page: http://nobelprize.org/nobel_prizes/medicine/laureates/2002/brenner-autobio.html

Updates: [Add or update](#) your information in the lineage of *C. elegans* biologists and other nematologists.
[Add or update](#) your contact information.

▶ Previous Addresses

Email: sbrenner@salk.edu
sydney_brenner@a-star.edu.sg

Also known as: S Brenner

WormBase ID: WBPerson77

Lab Affiliation

Previous affiliations: [CB \(Jonathan Hodgkin\)](#)

Lineage

Supervised:

Search: Show entries

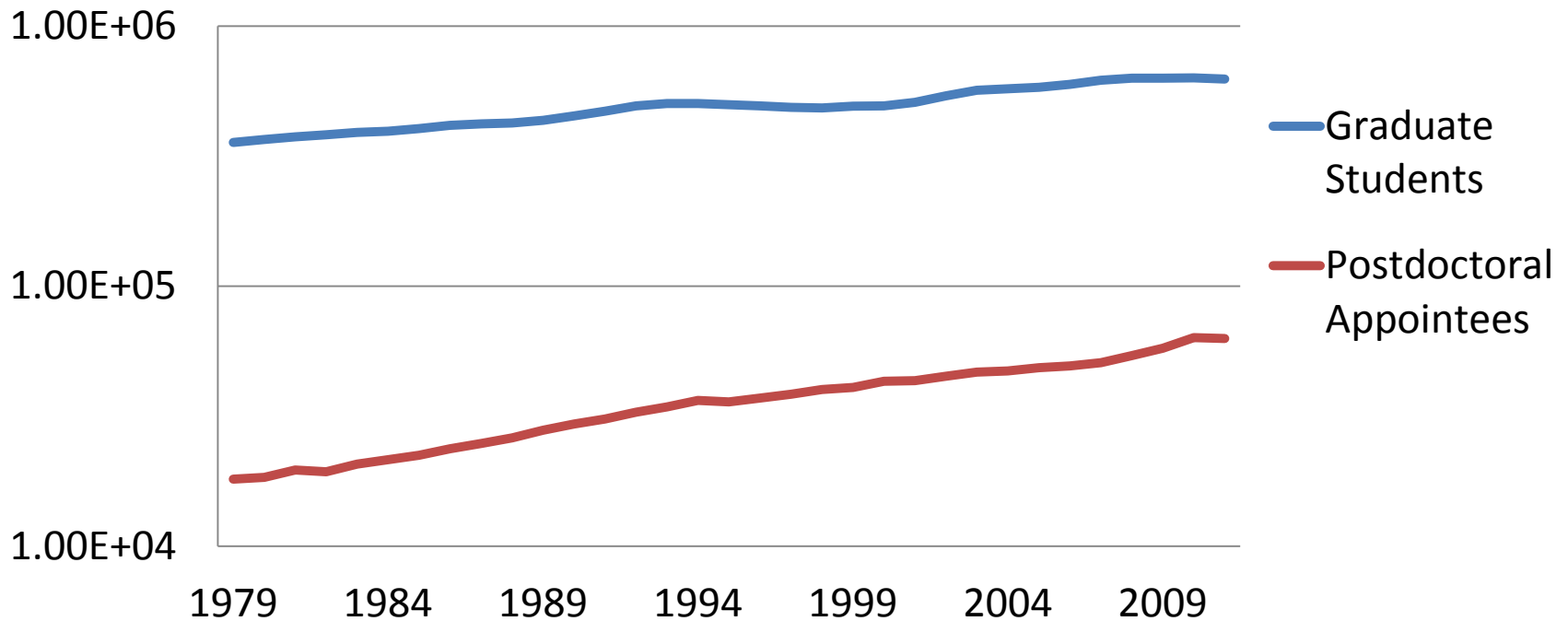
Name	Position	Period
Andras Fodor	Lab_visitor	1976 - 1977
Andrew Fire	Unknown	-
Anthony Otsuka	Postdoc	1979 - 1981
Antony Stretton	Postdoc	1961 - 1971
Barbara Meyer	Postdoc	-
Bob Edgar	Unknown	-
Bob Horvitz	Postdoc	1974 - 1978
Cynthia Kenyon	Postdoc	1981 - 1986

[Questions, Feedback & Help](#) +

Go to Prezi (6mins)

»» https://prezi.com/p75rojb0mt0z/goodwin_case_study/

Science, Engineering & Health - Early Career Populations - 1979-2011

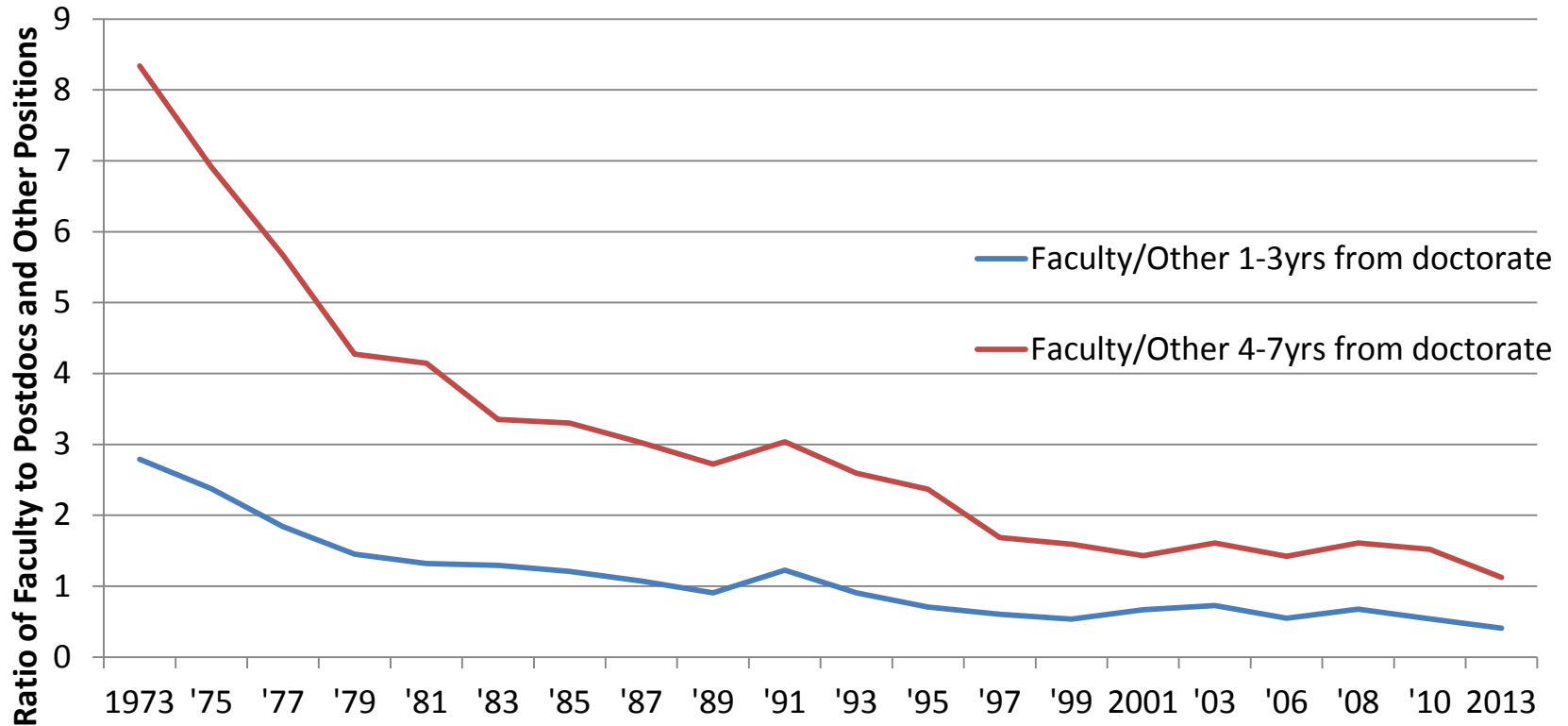


Sources:

National Science Board. 2014. *Science and Engineering Indicators 2014*. Arlington VA: National Science Foundation (NSB 14-01)

World Bank <http://data.worldbank.org/indicator/SP.POP.GROW?page=4>

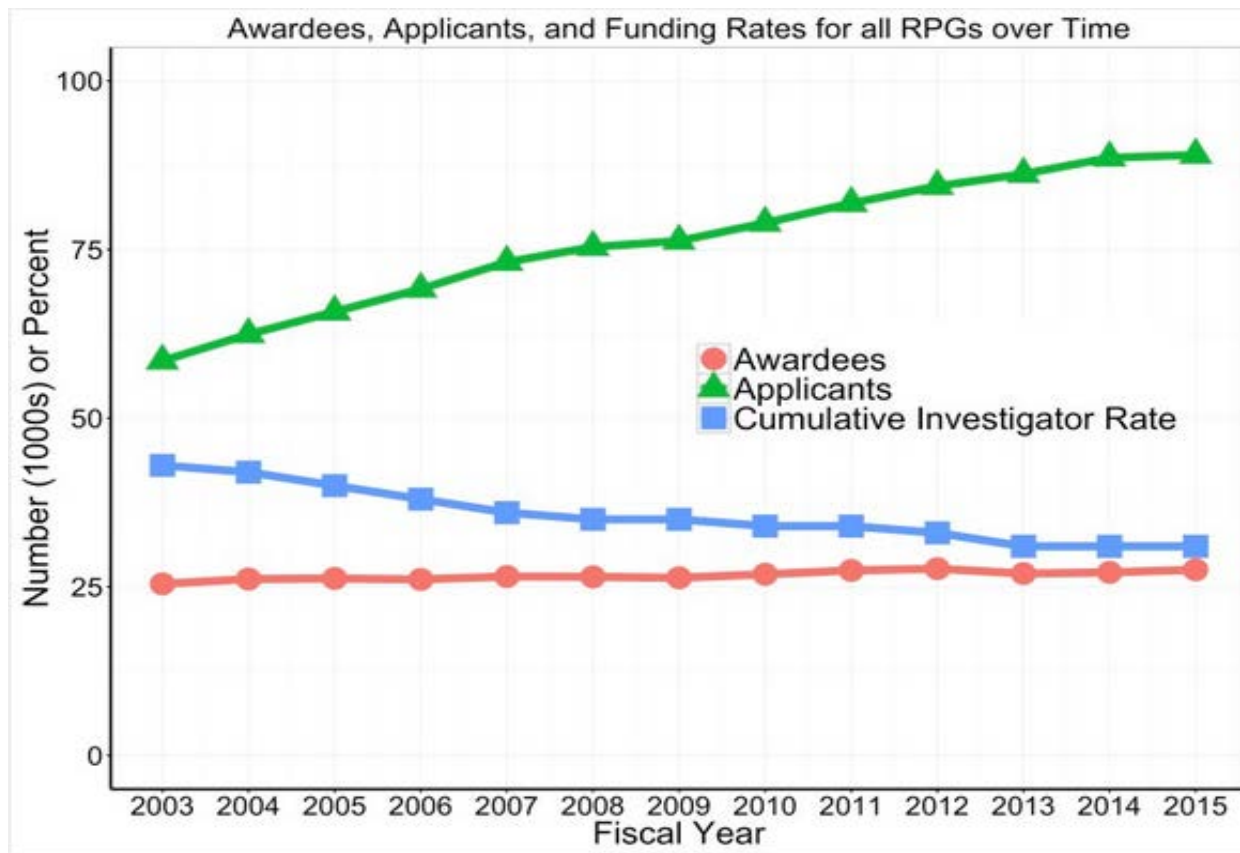
Science, Engineering and Health Doctorates Employed in Academia - Ratio of Faculty to Postdocs and Others By Year and Years Since Doctorate



Source: National Science Board. Science and Engineering Indicators 2012, 2014, & 2016. Arlington VA: National Science Foundation.

How Many Principal Investigators Does NIH Fund?

- ▶ Dr. Michael Lauer – NIH Deputy Director for Extramural Research
- ▶ A May 31, 2016 blog posting on his “Open Mike” blog page



Low federal research grant funding rates – Move to a Lottery?



Research Funding: the Case for a Modified Lottery

Ferric C. Fang^a, Editor in Chief, *Infection and Immunity*, Arturo Casadevall^b,
Founding Editor in Chief, *mBio*

[+](#) Author Affiliations

Address correspondence to Ferric C. Fang, fccfang@uw.edu.

ABSTRACT

The time-honored mechanism of allocating funds based on ranking of proposals by scientific peer review is no longer effective, because review panels cannot accurately stratify proposals to identify the most meritorious ones. Bias has a major influence on funding decisions, and the impact of reviewer bias is magnified by low funding paylines. Despite more than a decade of funding crisis, there has been no fundamental reform in the mechanism for funding research. This essay explores the idea of awarding research funds on the basis of a modified lottery in which peer review is used to identify the most meritorious proposals, from which funded applications are selected by lottery. We suggest that a modified lottery for research fund allocation would have many advantages over the current system, including reducing bias and improving grantee diversity with regard to seniority, race, and gender.

FOOTNOTES

Citation Fang FC, Casadevall A. 2016. Research funding: the case for a modified lottery. *mBio* 7(2):e00422–16. doi:10.1128/mBio.00422–16.

Published 12 April 2016



« Previous | Next Article »
Table of Contents

This Article

doi: 10.1128/mBio.00422-16
12 April 2016 *mBio* vol. 7 no. 2
e00422-16

All Free via Open Access: OA

» Abstract

OA Figures
OA Full Text
OA PDF

A correction has been published

[+](#) Classifications

[-](#) Article Usage Stats

Article Usage Statistics

[-](#) Services

Email this article to a colleague

Similar articles in ASM journals

Alert me when this article is cited

Alert me if a correction is posted

Similar articles in this journal

Similar articles in PubMed

alert me to new issues of *mBio*

Download to citation manager

Reprints and Permissions

Copyright Information

Books from ASM Press

MicrobeWorld

mBio print on demand

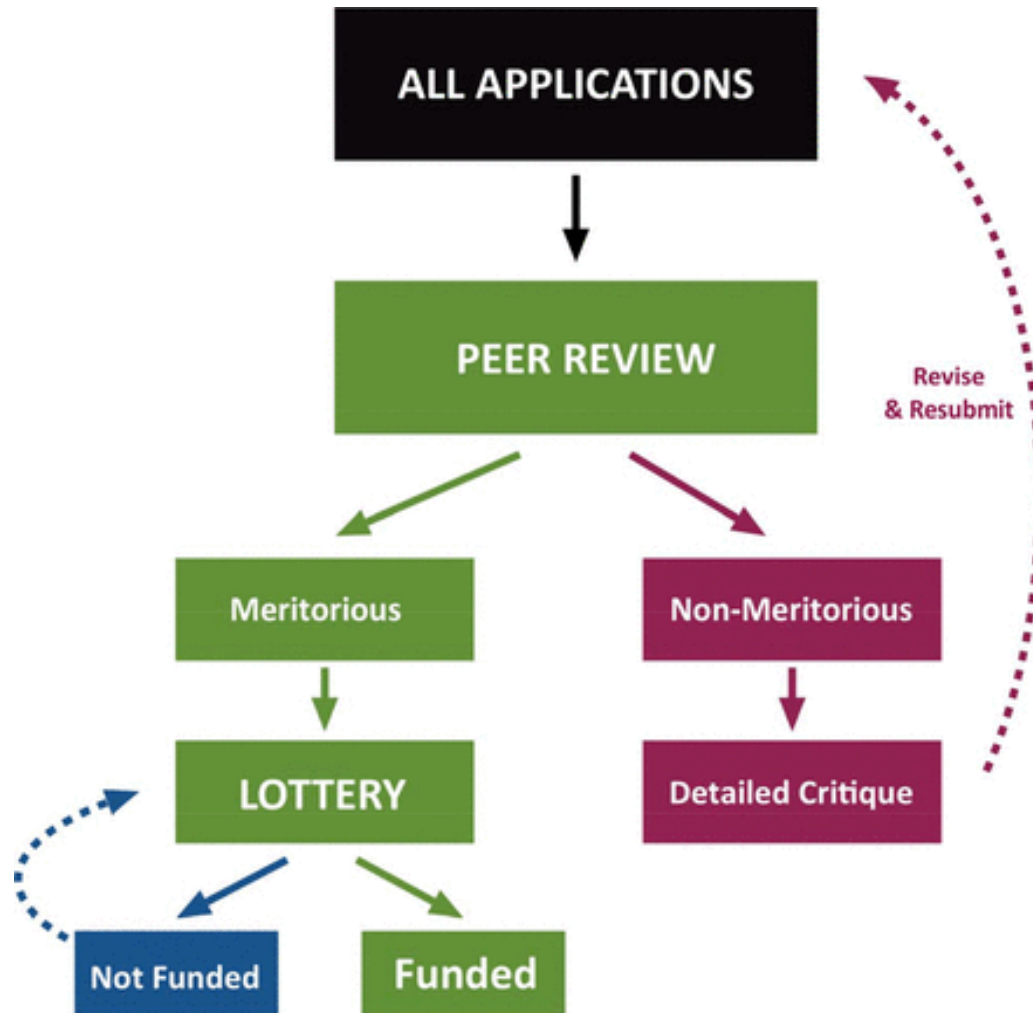
[+](#) Google Scholar



Arturo Casadevall @ACasadevall1 · Jul 16

Getting a grant is already a lottery but the process is not random. A random process would be fairer and less biased

Figure from Fang & Casadevall mBio paper:



Hypercompetition & Perverse Incentives

- ▶ “The long-held but erroneous assumption of never-ending rapid growth in biomedical science has created an unsustainable **hypercompetitive** system... making it difficult for seasoned investigators to produce their best work.” (Alberts, Kirschner, Tilghman & Varmus, 2014)
- ▶ Hypercompetition: “a visceral state that leads a person to take actions he or she would normally deem to be unacceptable” (Rick & Loewenstein, 2008)
- ▶ Kahneman & Tversky’s (1979) – “loss aversion”
- ▶ Motivation to avoid loss is $>$ motivation for gain
- ▶ Competition for resources \neq Competition of ideas!



“Future of Research”

- ▶ futureofresearch.org
- ▶ Consortium of concerned graduate students and postdoctoral fellows
- ▶ “In the experience of the organizers, the current hyper-competitive environment **stunts** scientific **curiosity** and **productivity**, **breeds fabrication** and **carelessness** in the publication of data, and leads to a **waste of valuable resources** and intellectual capital.”

(McDowell GS, Gunsalus KTW, MacKellar DC *et al.* Shaping the Future of Research: a perspective from junior scientists [v2; ref status: indexed, <http://f1000r.es/4yc>] *F1000Research* 2015, 3:291)



UNIVERSITY OF MINNESOTA
Driven to Discover™



HealthPartners®

VA



U.S. Department
of Veterans Affairs

On the folly of hoping for “A” while rewarding “B”

– Steven Kerr, 1995, Acad Mgmt Exec.

- ▶ As noted by Mary Devereaux:
 - “The predicament facing [ethics in the responsible conduct of research] is rather that we have failed to address the gap between the normative ideals of science and science’s institutional reward system.” (p. 167)
 - “The real threat to ethical conduct in science lies here—in the tension between the existing reward systems and the norms of science. (p. 168)

(Devereaux, M.L., 2014, Rethinking the Meaning of Ethics in RCR Education, *J Microbiol Biol Educ*, 15(2):165–8.)

On the folly of hoping for “A” while rewarding “B”

“A”	“B”
Collaboration & openness	Competition & “getting there first”
Objectivity of double-blind research	Peer review processes open to effects of reputation & established professional relationships
Open competition & meritocracy	Scientists typically not taught how to manage their own biases
Calls for increased entry & retention of women and underrepresented minorities in STEM fields	Assumptions about gender, ethnicity & race go unexamined

(Devereaux, M.L., 2014, Rethinking the Meaning of Ethics in RCR Education, *J Microbiol Biol Educ*, 15(2):165–8.)

“Soft–money” and Conflict of Interests

- ▶ “If...even a \$5,000 financial interest might bias the design, conduct, or reporting of research, then how much more risk of bias will be in play when what is at stake is ongoing funding of short–term research grants on which a researcher's salary and job depend?”

(Grinnell, F., 2014, The interrelationship between research integrity, conflict of interest, and the research environment, *J Microbiol Biol Educ*, 15(2):162–4.)

“Soft-money” and Conflict of Interests

- ▶ A doubling of the number of “academic centers of excellence” in the U.S. and
- ▶ Increased federal support to increase the size of university faculties
- ▶ BUT ALSO...
- ▶ A warning, of “...the need for avoiding situations in which a professor becomes partly or wholly responsible for raising his own salary...”

(Grinnell, F., 2014, The interrelationship between research integrity, conflict of interest, and the research environment, *J Microbiol Biol Educ*, 15(2):162-4.)



UNIVERSITY OF MINNESOTA
Driven to Discover™



HealthPartners®

VA



U.S. Department
of Veterans Affairs

Institutional Conflicts of Interest

- ▶ Handling of the Anil Potti misconduct case by Duke leadership
- ▶ See Paul Goldberg's piece in November 13, 2015 issue of *The Cancer Letter*
- ▶ http://cancerletter.com/articles/20151113_1/

Institutional Factors



Institutional Climates Matter

- 2002 IOM report, *Integrity in Scientific Research: Creating an Environment That Promotes Responsible Conduct*
- Explicitly recognized the role of the local environment – the lab, the department, the university – in shaping the behavior of scientists
 - “The extent to which the organization is highly competitive, along with the extent to which its rewards...are based on extramural funding and short-term research production, may have negative impacts on integrity in research.”



What? I'm out of time?

- ▶ Please come to my talk at tomorrow's Ethics Colloquium!
- ▶ Rm 107, Behavioral Sciences
- ▶ **Survey of Organizational Research Climates (SOuRCe)**, which measures key institutional-level factors related to research integrity



UNIVERSITY OF MINNESOTA
Driven to Discover™



HealthPartners®

VA



U.S. Department
of Veterans Affairs

The Natural Selection of Bad Science

Paul E. Smaldino, Richard McElreath

(Submitted on 31 May 2016)

Poor research design and data analysis encourage false-positive findings. Such poor methods persist despite perennial calls for improvement, suggesting that they result from something more than just misunderstanding. The persistence of poor methods results partly from incentives that favor them, leading to the natural selection of bad science. This dynamic requires no conscious strategizing—no deliberate cheating nor loafing—by scientists, only that publication is a principle factor for career advancement. Some normative methods of analysis have almost certainly been selected to further publication instead of discovery. In order to improve the culture of science, a shift must be made away from correcting misunderstandings and towards rewarding understanding. We support this argument with empirical evidence and computational modeling. We first present a 60-year meta-analysis of statistical power in the behavioral sciences and show that power has not improved despite repeated demonstrations of the necessity of increasing power. To demonstrate the logical consequences of structural incentives, we then present a dynamic model of scientific communities in which competing laboratories investigate novel or previously published hypotheses using culturally transmitted research methods. As in the real world, successful labs produce more "progeny", such that their methods are more often copied and their students are more likely to start labs of their own. Selection for high output leads to poorer methods and increasingly high false discovery rates. We additionally show that replication slows but does not stop the process of methodological deterioration. Improving the quality of research requires change at the institutional level.

Comments: 41 pages, 7 figures

Subjects: **Physics and Society** (physics.soc-ph); Applications (stat.AP)

MSC classes: 62A01, 62Pxx, 91D10

ACM classes: J.3; J.4

Cite as: [arXiv:1605.09511](https://arxiv.org/abs/1605.09511) [physics.soc-ph]

<http://arxiv.org/abs/1605.09511>)



UNIVERSITY OF MINNESOTA
Driven to Discover™



HealthPartners®

VA



U.S. Department
of Veterans Affairs

Summing Up...

- ▶ Misbehavior in science has typically been seen as a failing of the individual
- ▶ Scientists' don't behave in a void
- ▶ "...science is, indeed, a profoundly social activity." –Jeremy Berg, Science, July 8, 2016
- ▶ Influenced by the situational imperatives of their positions within the structures of the science enterprise
- ▶ Incentives and disincentives to quality research exist at both systemic and institutional levels
- ▶ Structural & Institutional reforms needed
- ▶ We've got plenty of work to do



Coming soon...

- ▶ National Research Council Report – Responsible Science
- ▶ In development since 2013
- ▶ Likely publication late Summer or early Fall of this year
- ▶ www.nap.edu

Thank You!

Brian C. Martinson, Ph.D.

brian.c.martinson@healthpartners.com

brian.martinson@va.gov



UNIVERSITY OF MINNESOTA
Driven to Discover™



HealthPartners®

VA



U.S. Department
of Veterans Affairs