

# Next Generation Research Initiative and Related Priorities

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Deputy Director for Extramural Research  
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Biophysical Society Public Affairs Committee  
Wednesday, October 18, 2017 (2 PM)  
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Disclosures: None



# YOUNG, TALENTED AND **FED-UP**

BY KENDALL POWELL

**M**artin Tingley was coming undone. It was late autumn 2014, just over a year into his assistant-professor job at Pennsylvania State University in State College, and he was on an eight-hour drive home after visiting his wife in Boston. He was stressed, exhausted and close to tears. As the traffic zipped past in the dark hours of the early morning, the headlights gave him the surreal feeling that he was inside a video game.

Usually, Tingley thought of himself as a “pretty stoic guy” — and on paper, his career was going well. He’d completed a master’s degree in statistics and a PhD in Earth science, both at Harvard University. With these, and four years of postdoctoral experience, he had landed a rare tenure-track faculty position. He thought he would soon be successfully combining statistics and climate science to produce the type of interdisciplinary research that funding agencies say they want.

In fact, scientific life was proving tough. He found himself working 60–80 hours per week doing teaching and research. His start-up funding had run out, he had yet to secure a major grant and, according to a practice com-

**Scientists starting labs say that they are under historically high pressure to publish, secure funding and earn permanent positions — leaving precious little time for actual research.**

an opportunity to direct their own creative,

Young scientists and senior scientists alike feel an acute pressure to publish and are weighed down by a growing bureaucratic burden, with little administrative support. They are largely judged on their record of publishing and of winning grants — but without clear targets, they find themselves endlessly churning out paper after paper. The crucial question is whether this is harming science and scientists. Bruce Alberts, a prominent biochemist at the University of California, San Francisco, and former president of the US National Academy of Sciences, says that it is. The current hyper-competitive atmosphere is stifling creativity and pushing scientists “to do mediocre science”, he says — work that is safe and uninteresting. “We’ve got to reward people who do something differently.”

Our informal survey suggests that the situation is already making research an unwelcoming career. “Frankly, the job of being a principal investigator and running a lab just looks horrible,” wrote one neuroscientist from the United States. Tingley wouldn’t disagree.

## FUNDING FIGHT

Tingley has always had broad interests. At

Nature 2016;538:446-9



**“The funding cycle is brutal.”**

MARTIN TINGLEY



## SUFFERING IN SCIENCE

We asked young scientists to tell us their concerns. This is what they said.

- Desperate pursuit of grants
- Long hours, but no time for science
- Extreme competition ... to cut corners
- Dependence on senior scientists
- Administrative overload ... No help

Nature 2016;538:446-9



LOST IN ACADEMIA

## So Many Research Scientists, So Few Openings as Professors

Gina Kolata @ginakolata JULY 14, 2016



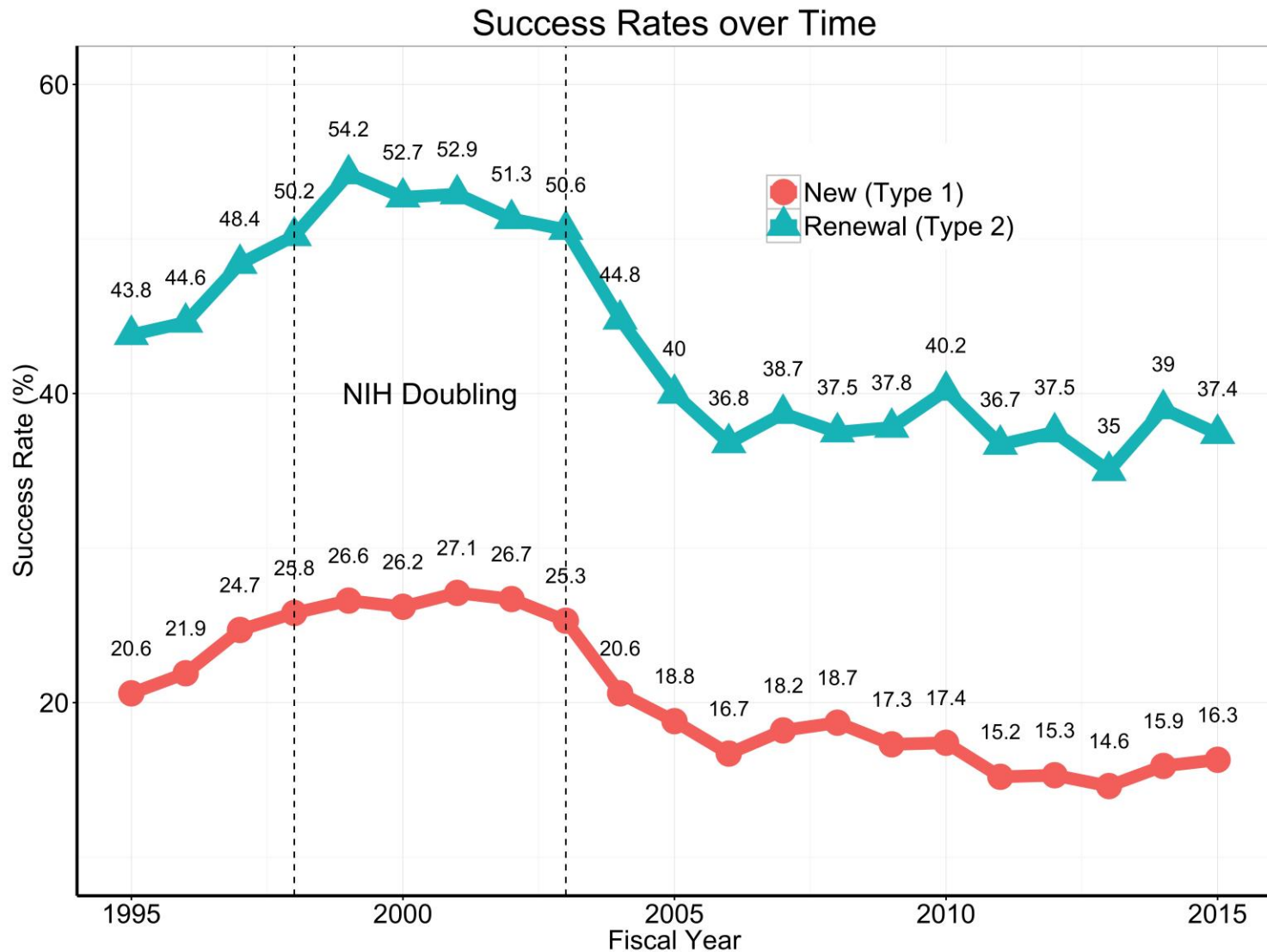
“The average age at which the lucky few actually get a grant has steadily increased — it is now 42, up from 35 in 1980, which means biomedical scientists in academia are essentially apprentices until middle age. And the tendency is for the grants to go to scientists who already have them, making it harder and harder to break into the system.”



Emmanuelle Charpentier, who became leader of the Max Planck Institute for Infection Biology last year, spent the previous 25 years moving through nine institutions in five countries. Karsten Moran for The New York Times

[https://www.nytimes.com/2016/07/14/upshot/so-many-research-scientists-so-few-openings-as-professors.html?\\_r=0](https://www.nytimes.com/2016/07/14/upshot/so-many-research-scientists-so-few-openings-as-professors.html?_r=0)

# Is This True (Part 1)?



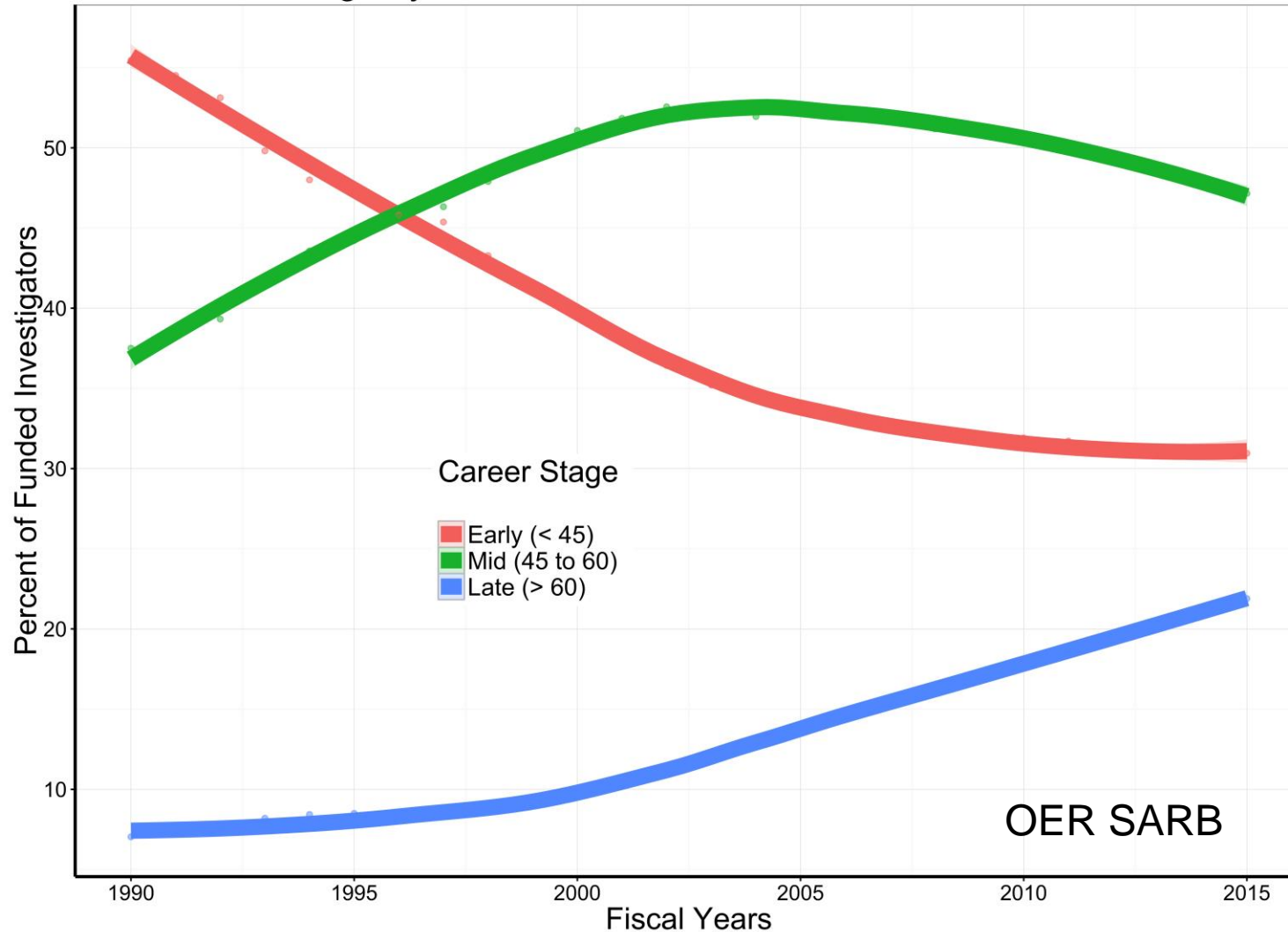
Much easier to get a grant renewed than to get it funded in the first place

OER SARB



# Is This True (Part 2)?

Career Stage by Fiscal Year for RPGs and Other Select Activities



## Future of fundamental discovery in US biomedical research

Michael Levitt<sup>a,1</sup> and Jonathan M. Levitt<sup>b</sup>



“What caused the drop in number of young scientists? Older grantees are getting money at the expense of younger grantees ... Study sections are biased against those whose ages are ...”





POINT OF VIEW

## Strategies from UW-Madison for rescuing biomedical research in the US

**Abstract** A cross-campus, cross-career stage and cross-disciplinary series of discussions at a large public university has produced a series of recommendations for addressing the problems confronting the biomedical research community in the US.

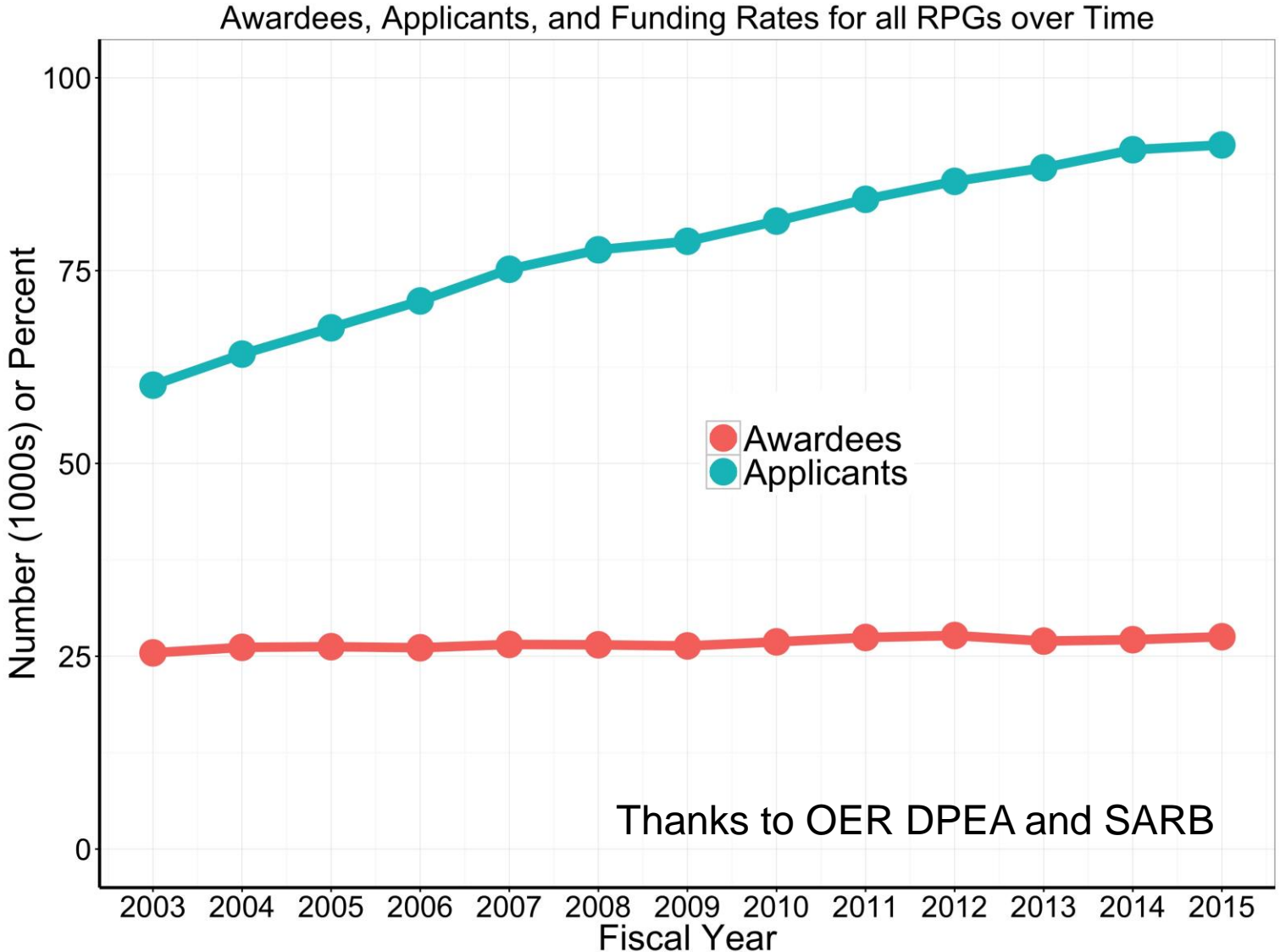
DOI: [10.7554/eLife.09305.001](https://doi.org/10.7554/eLife.09305.001)

“We identified two **core problems**:

- Too many researchers vying for too few dollars.
- Too many postdocs competing for too few positions.

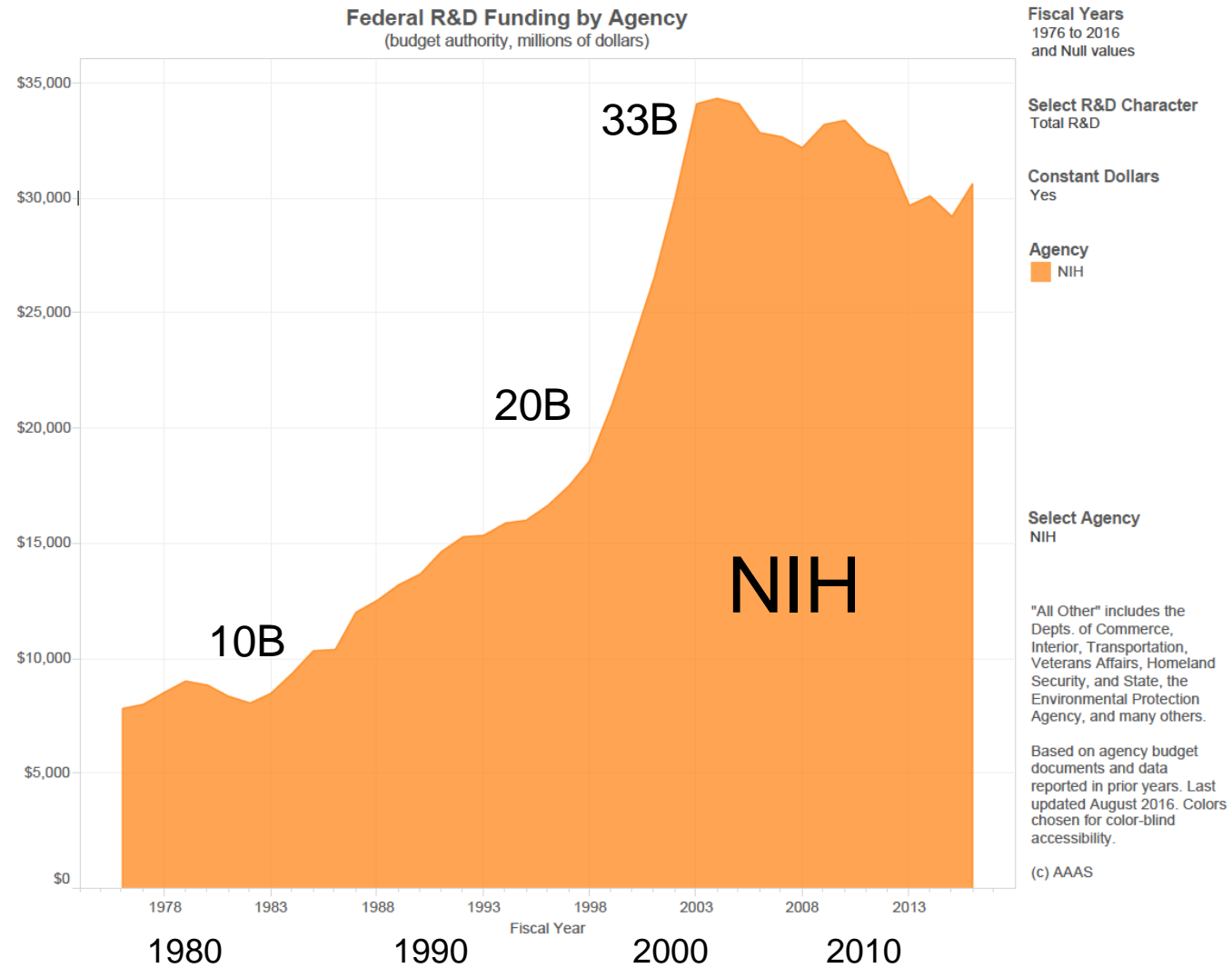
Most other issues can be viewed as symptoms.”

# “Too Many Researchers...”





# “... Vying for Too Few Dollars”



# What's Happening? Scientists and Everyone Else

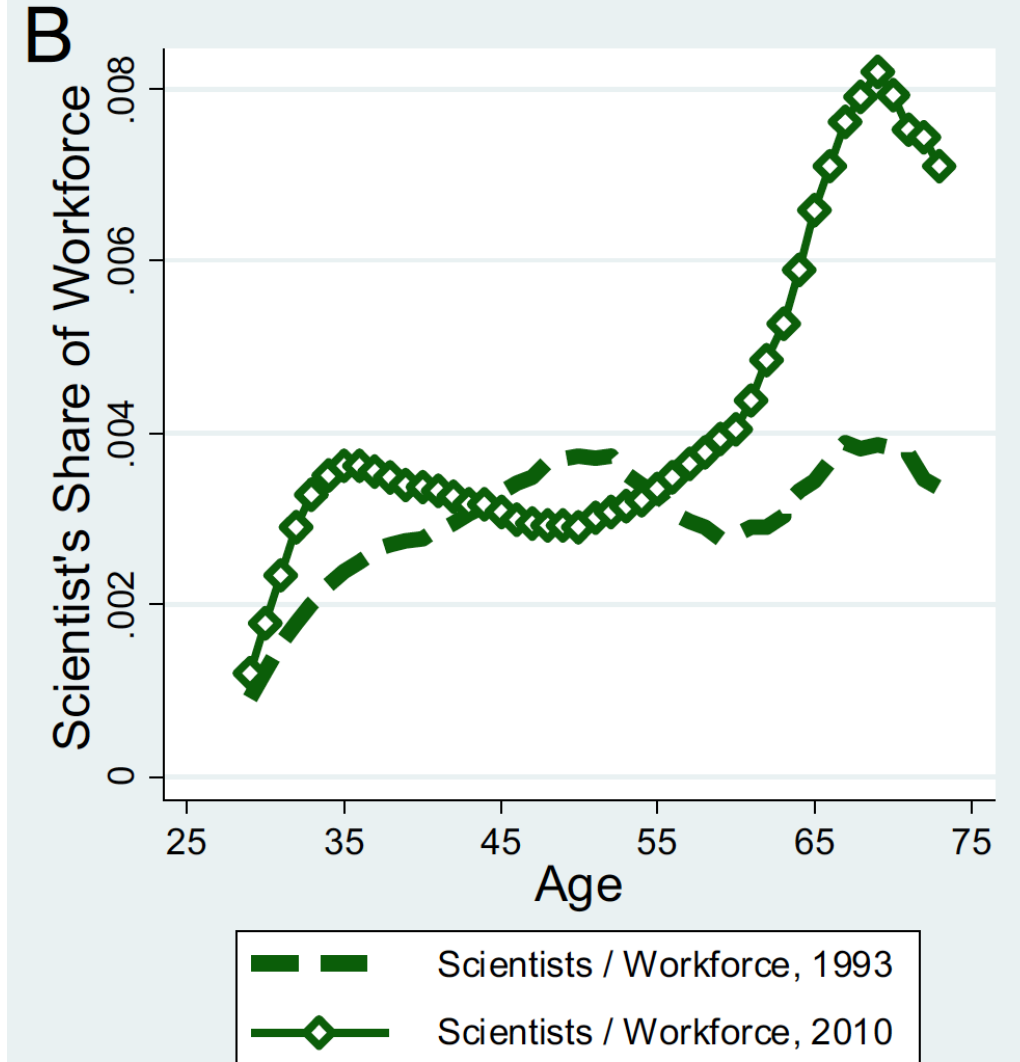


## Why the US science and engineering workforce is aging rapidly

David M. Blau<sup>a,b,1</sup> and Bruce A. Weinberg<sup>a,b,c</sup>

<sup>a</sup>Department of Economics, Ohio State University, Columbus, OH 43210; <sup>b</sup>Institute of Labor Economics (IZA), 53113 Bonn, Germany; and <sup>c</sup>National Bureau of Economic Research, Cambridge, MA 02138

“The scientific workforce has aged rapidly in recent years relative to the workforce as a whole... Decline in retirement ... ”



# Who is Most Affected by Hypercompetition?



“In the United States, for example, **funding success rates for all age brackets are less than half what they were in 1980**, so researchers have to spend more time seeking funds. That **burden falls most heavily on new faculty members ... makes them conservative rather than ambitious.**”

Nature 2016;538:427




The screenshot shows the NIH Office of Extramural Research website. The top navigation bar includes 'HOME', 'ABOUT GRANTS', 'FUNDING', 'POLICY & COMPLIANCE' (highlighted in green), and 'NEWS & EVENTS'. A breadcrumb trail reads: Home » Policy & Compliance » Select Policy Topics » A History of New and Early Stage Investigator Policies and Data. On the left sidebar, there are links for 'NIH Grants Policy Statement', 'Notices of Policy Changes', and 'Compliance & Oversight'. The main content area features the title 'A History of New and Early Stage Investigator Policies and Data' and the subtitle 'History of Commitment to New Investigators'.

“New investigators are the innovators of the future - they pioneer new areas of investigation. Entry of new investigators into the ranks of independent, NIH-funded researchers is essential to the health of our country's biomedical research enterprise.”

Sally Rockey, PhD

[http://grants.nih.gov/policy/new\\_investigators/history.htm](http://grants.nih.gov/policy/new_investigators/history.htm)





CrossMark  
← click for updates

**PERSPECTIVE**

## Rescuing US biomedical research from its systemic flaws

**Bruce Alberts<sup>a</sup>, Marc W. Kirschner<sup>b</sup>, Shirley Tilghman<sup>c,1</sup>, and Harold Varmus<sup>d</sup>**

<sup>a</sup>Department of Biophysics and Biochemistry, University of California, San Francisco, CA 94158; <sup>b</sup>Department of Systems Biology, Harvard Medical School, Boston, MA 02115; <sup>c</sup>Department of Molecular Biology, Princeton University, Princeton, NJ 08540; and <sup>d</sup>National Cancer Institute, Bethesda, MD 20892

Edited by Inder M. Verma, The Salk Institute for Biological Studies, La Jolla, CA, and approved March 18, 2014 (received for review March 7, 2014)

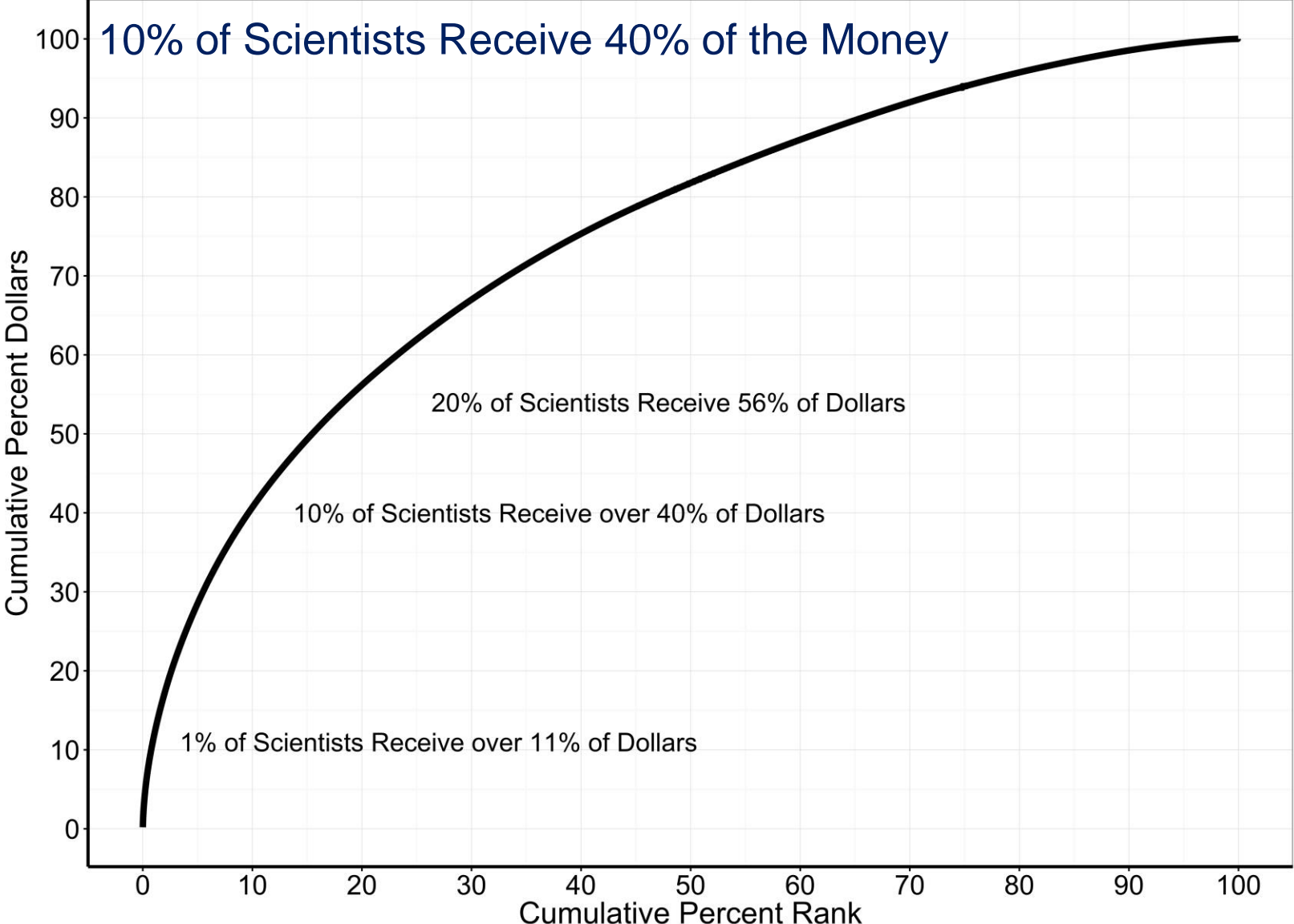
The long-held but erroneous assumption of never-ending rapid growth in biomedical science has created an unsustainable hypercompetitive system that is discouraging even the most outstanding prospective students from entering our profession—and making it difficult for seasoned investigators to produce their best work. This is a recipe for long-term decline, and the problems cannot be solved with simplistic approaches. Instead, it is time to confront the dangers at hand and rethink some fundamental features of the US biomedical research ecosystem.

**PERSPECTIVE**

“Agencies should be sensitive to ***the total numbers of dollars granted to individual laboratories...***—although ***different research activities have different costs***—at some point, ***returns per dollar diminish.***”

Alberts B et al. PNAS. 2014;111:5773-7

# Skewed Funding Distribution



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DIGITAL ACCESS TO  
SCHOLARSHIP AT HARVARD

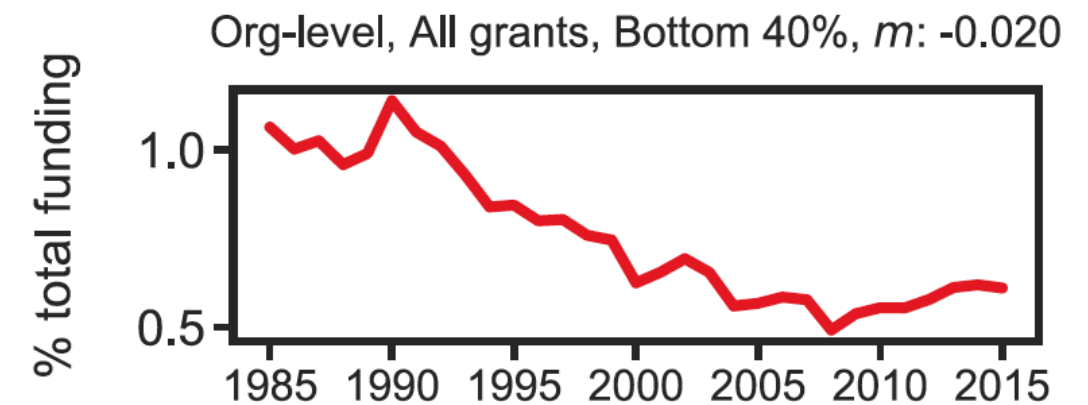
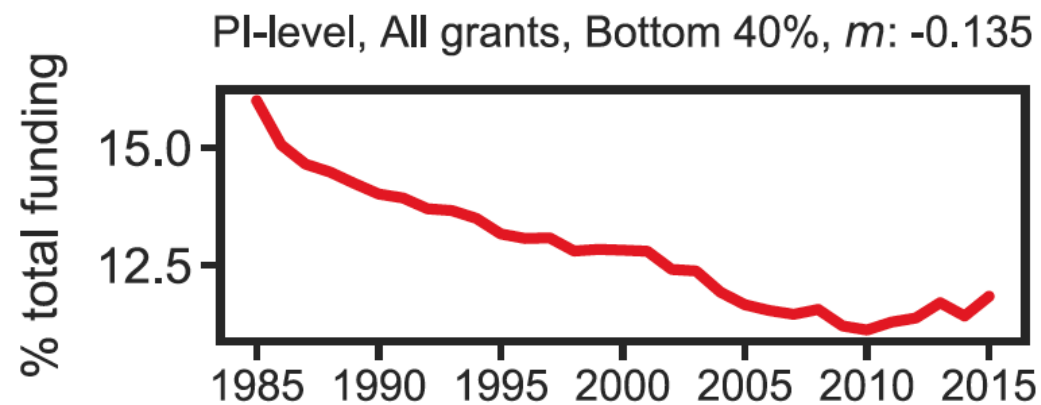
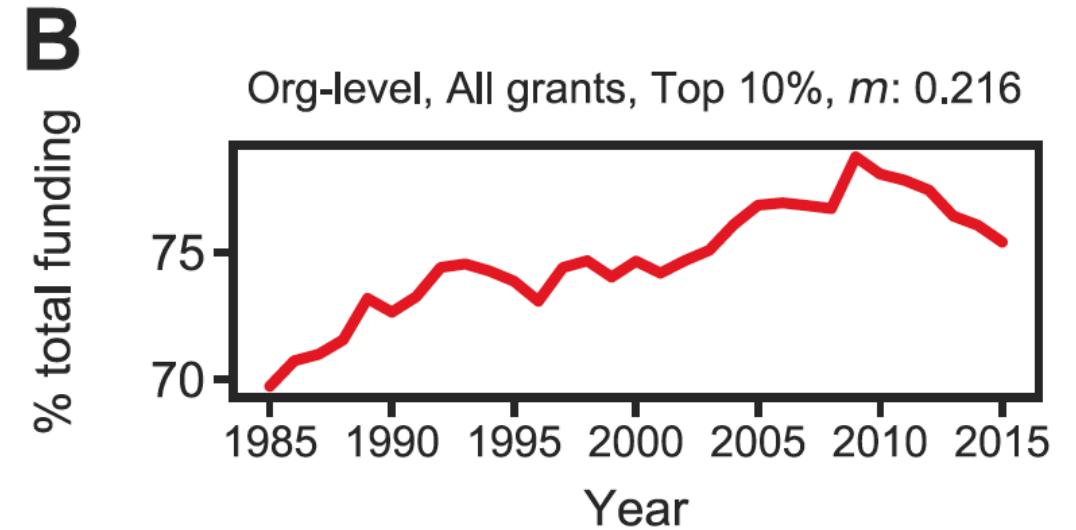
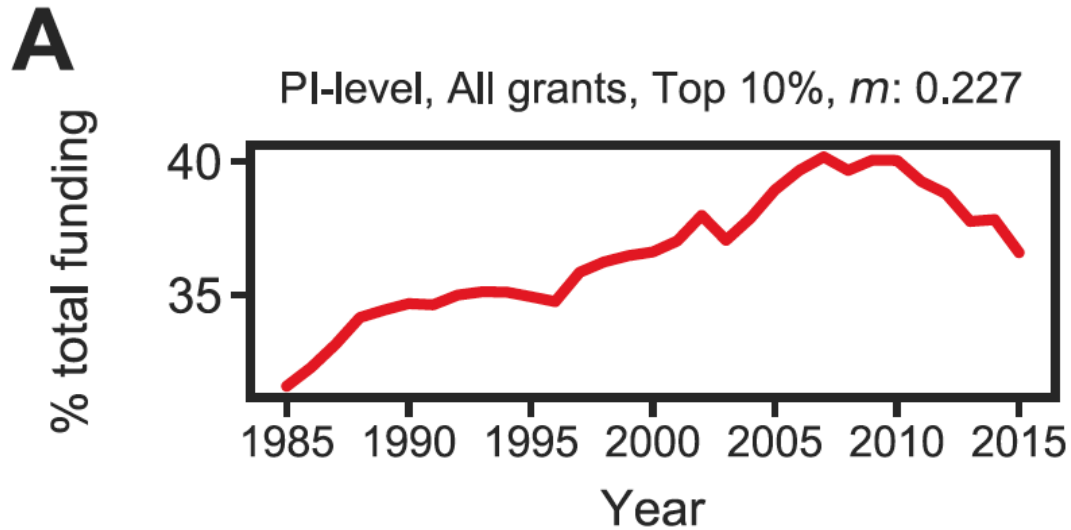
**Yarden Katz**  
**Ulrich Matter**

**On the Biomedical Elite: Inequality and Stasis in Scientific  
Knowledge Production**

“We find that funding inequality has been rising since 1985, with a small segment of investigators and institutes getting an increasing proportion of funds, and that investigators who start in the top funding ranks tend to stay there ... favors a minority of elite, highly funded researchers and institutes ... likely to further reduce diversity in the research community.”

<http://nrs.harvard.edu/urn-3:HUL.InstRepos:33373356>





<http://nrs.harvard.edu/urn-3:HUL.InstRepos:33373356>



*Research Evaluation*, 25(4), 2016, 396–404  
doi: 10.1093/reseval/rww007  
Advance Access Publication Date: 25 March 2016  
Article



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## Concentration of research funding leads to decreasing marginal returns

Philippe Mongeon<sup>1,\*</sup>, Christine Brodeur<sup>2</sup>, Catherine Beaudry<sup>3,4</sup> and Vincent Larivière<sup>1,5</sup>

“The main determinant of scientific production is not so much the money invested but rather the number of researchers at work, and that by **funding a greater number of researchers, we increase the overall research productivity.** Furthermore, there is a certain degree of serendipity associated with scientific discoveries and **funding the work of as many researchers as possible increases the likelihood that some of them make major discoveries.**”



*A Framework for Discussion*



“Research sponsors should monitor ... Limiting the amount of funding awarded to any individual scientist would enable **more people to be actively engaged in research ...** Might enhance productivity overall ...”

DATA CHECK

BEHIND THE NUMBERS

## Critics challenge NIH finding that bigger labs aren't necessarily better

By Jocelyn Kaiser

“A strident debate has erupted among biomedical researchers over a proposed NIH policy that would shift money from richer to poorer labs ... Critics, many of them well-funded investigators or leaders at powerhouse research institutions, have questioned NIH’s study and its use of the RCR ... They have also argued that it’s unwise to make such a dramatic, rigid policy move ...”

*Science* 356 (6342), 997.  
DOI: 10.1126/science.356.6342.997

BIOMEDICAL RESEARCH

## *NIH abandons grant cap, offers new help to younger scientists*

After controversy, agency aims to build \$1 billion “next-generation” fund

By Jocelyn Kaiser

*Science* 356 (6343), 1108.  
DOI: 10.1126/science.356.6343.1108

## *NIH’s ineffective funding policies*

On 2 May, National Institutes of Health (NIH) Director Francis Collins announced a new policy to limit the amount of research grant funding per investigator (1). The policy was warranted and long overdue (2), but was abandoned by 8 June (3). However, the problems that triggered the policy remain in place and need to be addressed.

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10.1126/science.aan6504



CONGRESS.GOV

Legislation

## H.R.34 - 21st Century Cures Act

114th Congress (2015-2016) | [Get alerts](#)

### Subtitle C—Supporting Young Emerging Scientists

**SEC. 2021. INVESTING IN THE NEXT GENERATION OF RESEARCHERS.**

(a) IN GENERAL.—Part A of title IV of the Public Health Service Act ([42 U.S.C. 281 et seq.](#)) is amended by adding at the end the following:

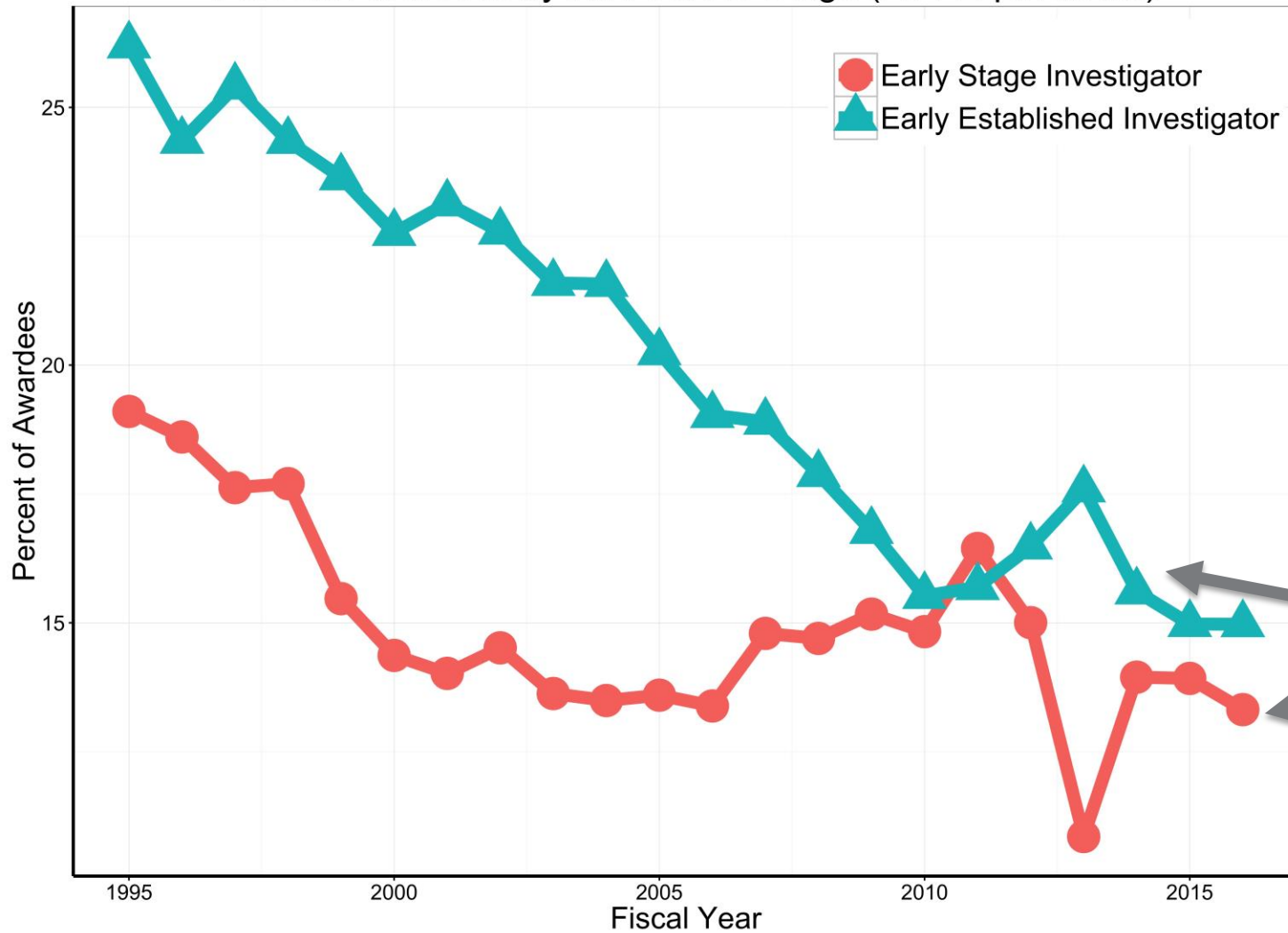
**“SEC. 404M. NEXT GENERATION OF RESEARCHERS.**



“The Director of the National Institutes of Health shall ... develop, modify, or prioritize policies, as needed ... to promote opportunities for new researchers and **earlier research independence**, such as policies **to increase opportunities for new researchers to receive funding**, enhance training and mentorship programs for researchers, and **enhance workforce diversity.**”

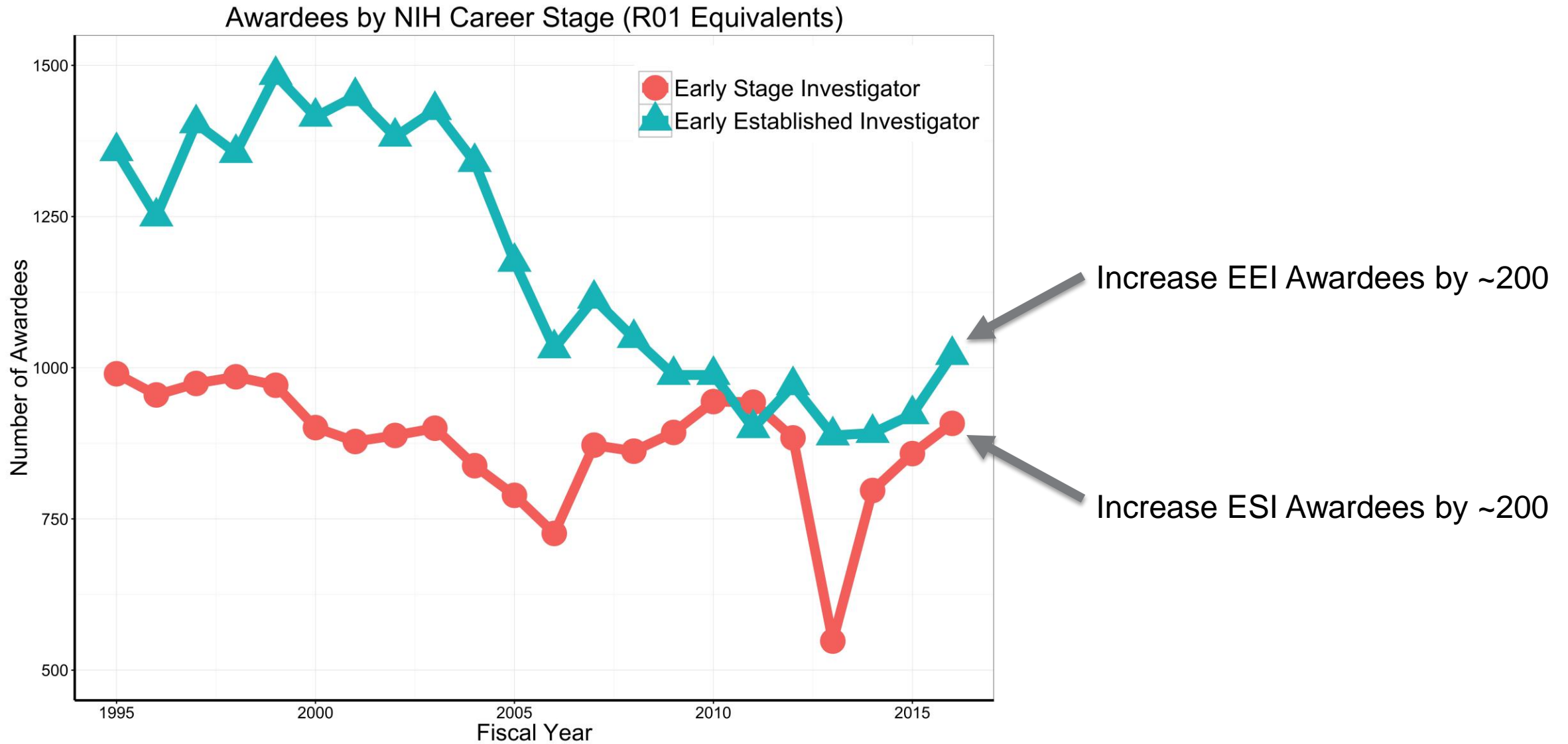
# Next Generation Researchers Initiative

Percent Awardees by NIH Career Stage (R01 Equivalents)

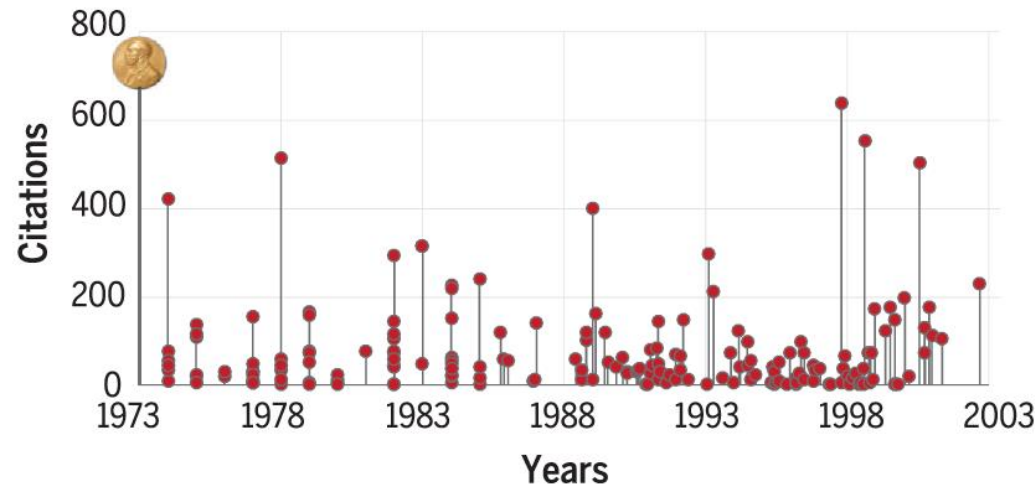


Turn These Curves

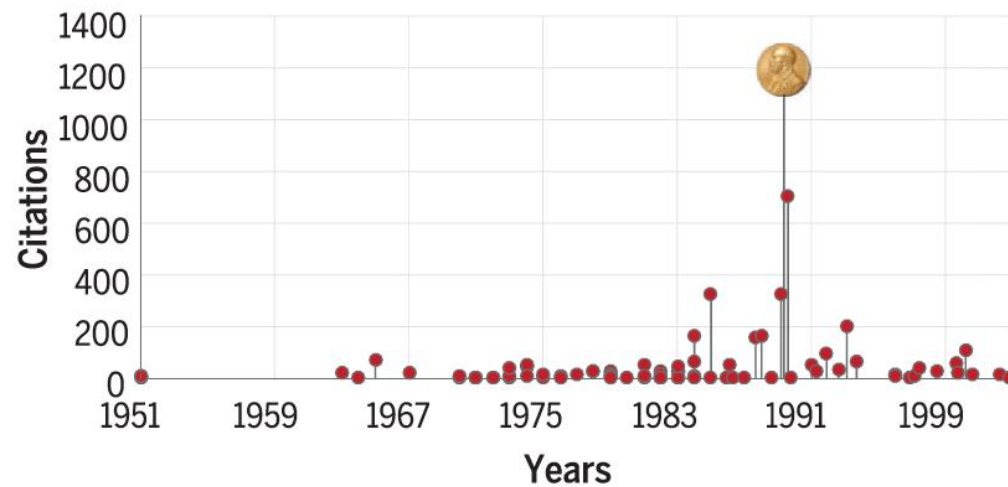
# Next Generation Researchers Initiative



# Will We be Funding Worse Science?



Frank A. Wilczek  
Physics Nobel,  
2004

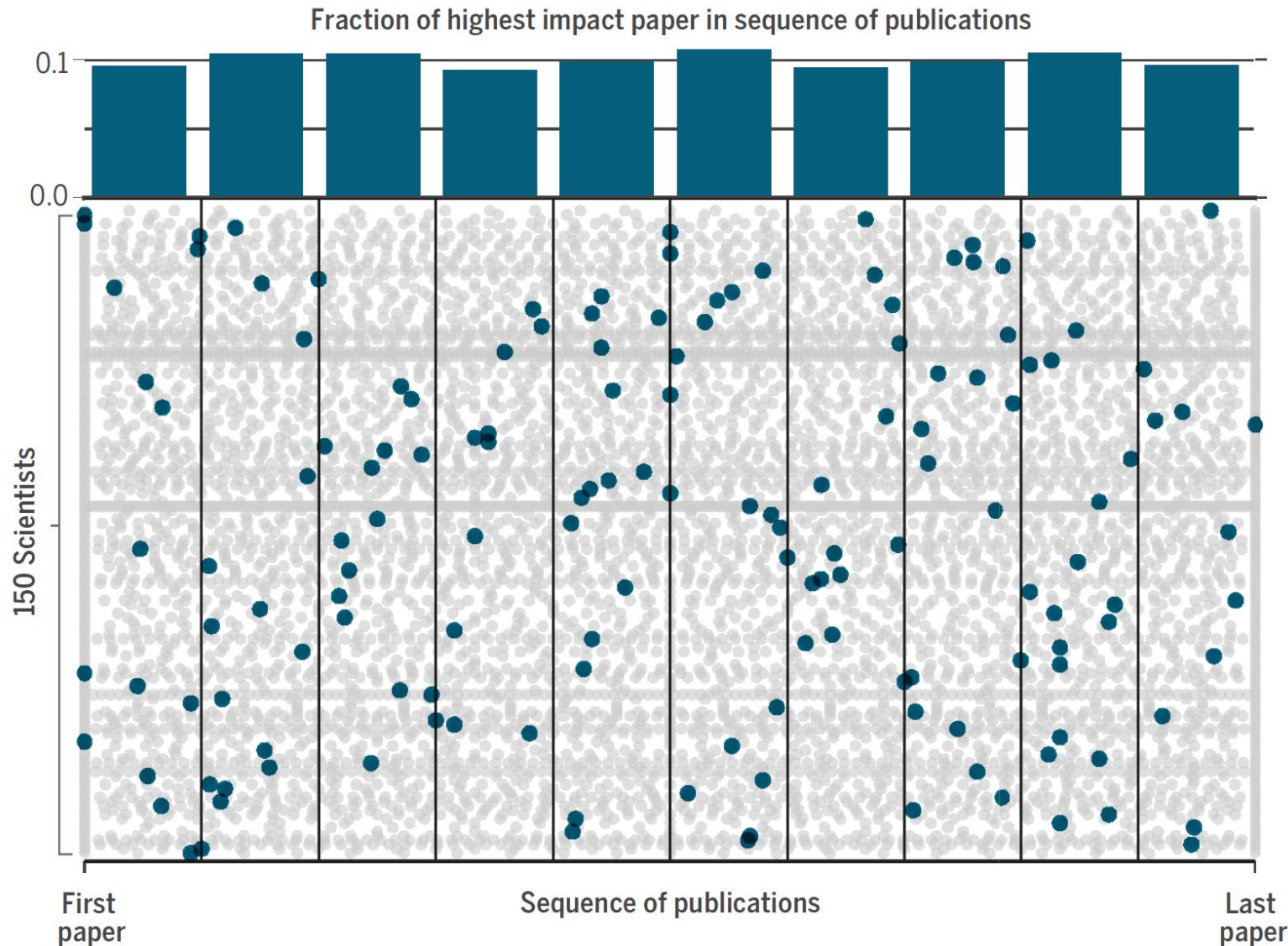


John B. Fenn  
Chemistry Nobel,  
2002

R. Sinatra et al., Science 354, aaf5239 (2016).  
DOI: 10.1126/science.aaf5239



# When Does the Highest Impact Happen? It's Random!



“We find that the highest-impact work in a scientist’s career is **randomly distributed** ... The highest-impact work ... could be the first publication, could appear mid-career, or could be a last publication.”

R. Sinatra et al., Science 354, aaf5239 (2016).  
DOI: 10.1126/science.aaf5239

Clauset et al., Science 355, 477–480 (2017)



- Where will the money come from?
  - IC Priorities
  - Budget increase
- Monitoring
  - Workforce size and diversity
  - Scientific excellence and outcome

## Extramural *Nexus*

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### Open Mike

*Helping connect you with the NIH perspective, and helping connect us with yours*

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Posted on **June 16, 2017** by **Mike Lauer**

### NIH's Next Generation Researchers Initiative



<https://nexus.od.nih.gov/all/2017/06/16/nih-next-generation-researchers-initiative/>

