

# AGENDA

## SEMINAR

**"What is post-normal science  
and why do we need it today?"**

**Silvio Funtowicz and Andrea  
Saltelli**

Friday, June 9th  
11.30 h Room Z/023

**UAB**

Universitat Autònoma de Barcelona



icta



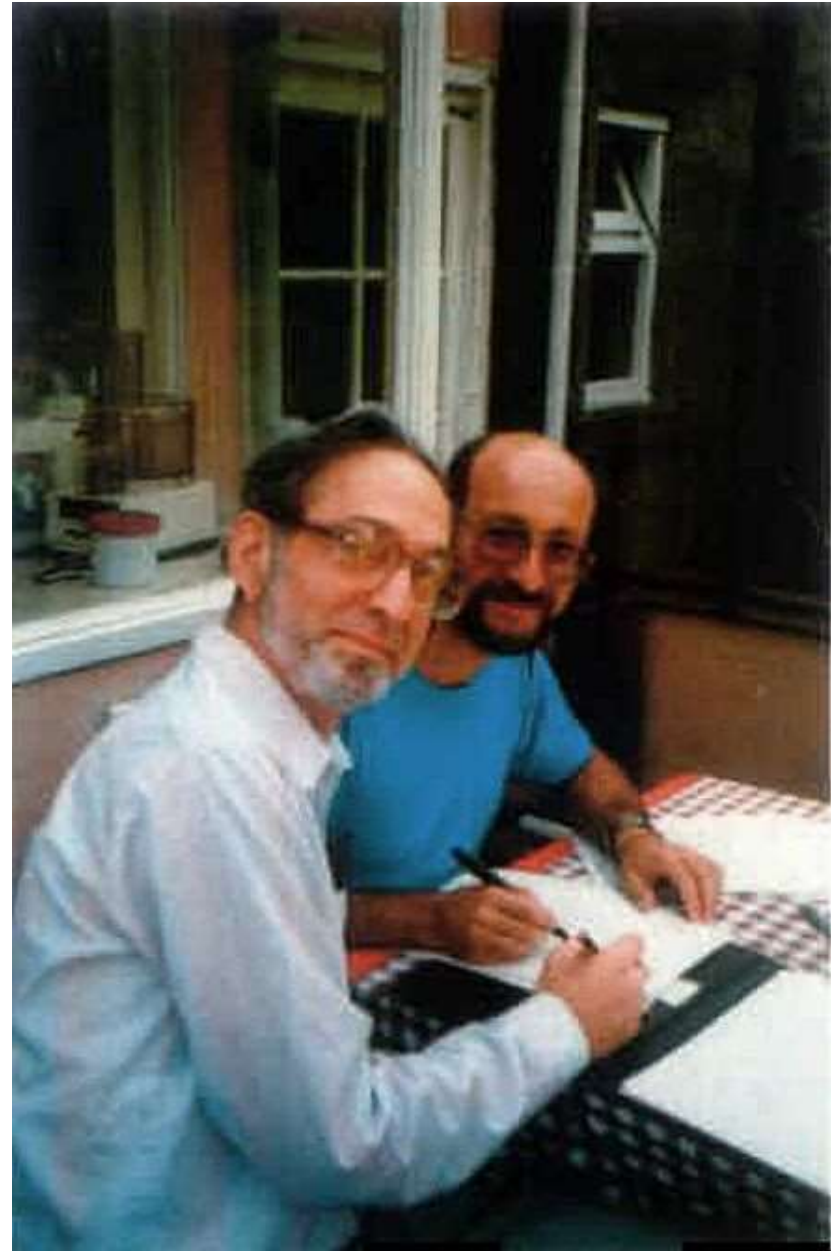
Institut de Ciència  
i Tecnologia Ambientals • UAB

# The emergence of post normal science

@SFuntowicz

Centre for the Study of the Sciences and the  
Humanities,  
University of Bergen

Seminar at ICTA-UAB, June 9, 2017



Marie Jean Antoine de Condorcet 1795:

**“Sketch for a Historical Picture of the Progress of the Human Mind”**

“Will increased welfare and improved health of man lead to largely increased populations?”

Technological progress may bring the answers.

People’s ethics and morality will progress alongside reason.

Our moral duty is not to make sure that unborn life is born, but that those that are born are secured a life in reasonable welfare, dignity and happiness.”

1962	Thomas Kuhn	The Structure of Scientific Revolutions
1963	Rachel Carson	Silent Spring
1963	D. de Solla Price	Little Science, Big Science
1972	Jerry Ravetz	Scientific Knowledge &
1972		Limits of Growth
1974	Robert Pirsig	Zen & The Art of motorcycle maintenance
1974	A. Weinberg	Science & Trans-Science (Minerva)
1970s (Woburn) 1980s (Love Canal) Popular Epidemiology		
1979	A. Cochrane	collaboration
1985	F&R	3 Types of Risk Assessment
1986	Edwards Deming	Out of the Crisis
1987	S. McGill	The Politics of Anxiety
(1992	Brian Wynne	Misunderstood misunderstandings...)
1988	Liora Salter	Mandated Science

## Eisenhower's Farewell Address to the Nation January 17, 1961

<http://www.informationclearinghouse.info/article5407.htm>

Today, the solitary inventor, tinkering in his shop, has been overshadowed by task forces of scientists in laboratories and testing fields. In the same fashion, the free university, historically the fountainhead of free ideas and scientific discovery, has experienced a revolution in the conduct of research. Partly because of the huge costs involved, a government contract becomes virtually a substitute for intellectual curiosity. For every old blackboard there are now hundreds of new electronic computers.

The prospect of domination of the nation's scholars by Federal employment, project allocations, and the power of money is ever present – and is gravely to be regarded. **Yet, in holding scientific research and discovery in respect, as we should, we must also be alert to the equal and opposite danger that public policy could itself become the captive of a scientific-technological elite.**



**Weinberg A M.** Science and trans-science. *Minerva* 10:209-22, 1972.  
[Oak Ridge National Laboratory, TN]

## Origins of Science and Trans-Science

Alvin M. Weinberg  
Medical Sciences Division  
Oak Ridge Associated Universities  
Oak Ridge, TN 37831-0117

I c  
time  
becoming involved in the debate over nuclear power—in particular the debate over the hazard of low levels of radiation.

the hazard of low levels of radiation. The public's exaggerated estimate of risk was at the root of the difficulties nuclear energy was facing.<sup>4</sup> If ever there was a trans-science question, this was it.

After the paper was published, Harvey Brooks added another dimension to "trans-science"—the evolution in time of systems governed by large classes of nonlinear equations. *Harvard was one of the first to stress*

such *trans-science*. Brooks suggested that an analysis of such situations was beyond the power of mathematics, and therefore, was trans-scientific.<sup>2</sup>

The term "trans-science" is used quite widely now. Perhaps most notable was W. Ruckelhaus's admission in 1985 that many of the EPA's regulations hang on the answers to questions that can be asked of science but cannot be answered by science—i.e., are trans-scientific.<sup>3</sup>

is gradually being recognized in many quarters. For example, W.C. Wagner concludes: "...in order to accommodate trans-science, the judicial framework must change... Trans-scientific obstacles can be circumvented by referring to more predictable notions of qualitative causation and unreasonable conduct—then the courts may be able to reincorporate the principle of deterrence into the adjudication of toxic torts."<sup>4</sup>

In addition to giving a name to an idea that regulators and toxic torts lawyers had been grappling with, "science and trans-science" has added another dimension to the perennial quest for limits to science. To the limits of science posed by Heisenberg's uncertainty principle, or the second law of

mits of science. *Proceedings of the Symposium on Phenotypic Assessment*, December 7-10, 1986. Brookhaven National Laboratory.

*Minerva* 10:484-6, 1972.

*Technol.* 1:19-38, 1985.

4. Wagner W G. Trans-science and torts. *Yale Law J.* 9:428-49, 1986.

Funtowicz, S. and Ravetz, J. (1985) "Three types of risk assessment: a methodological analysis", in: C. Whipple & V. T. Covello (eds): Risk Analysis in the Private Sector, Plenum Press, pp. 217-231.

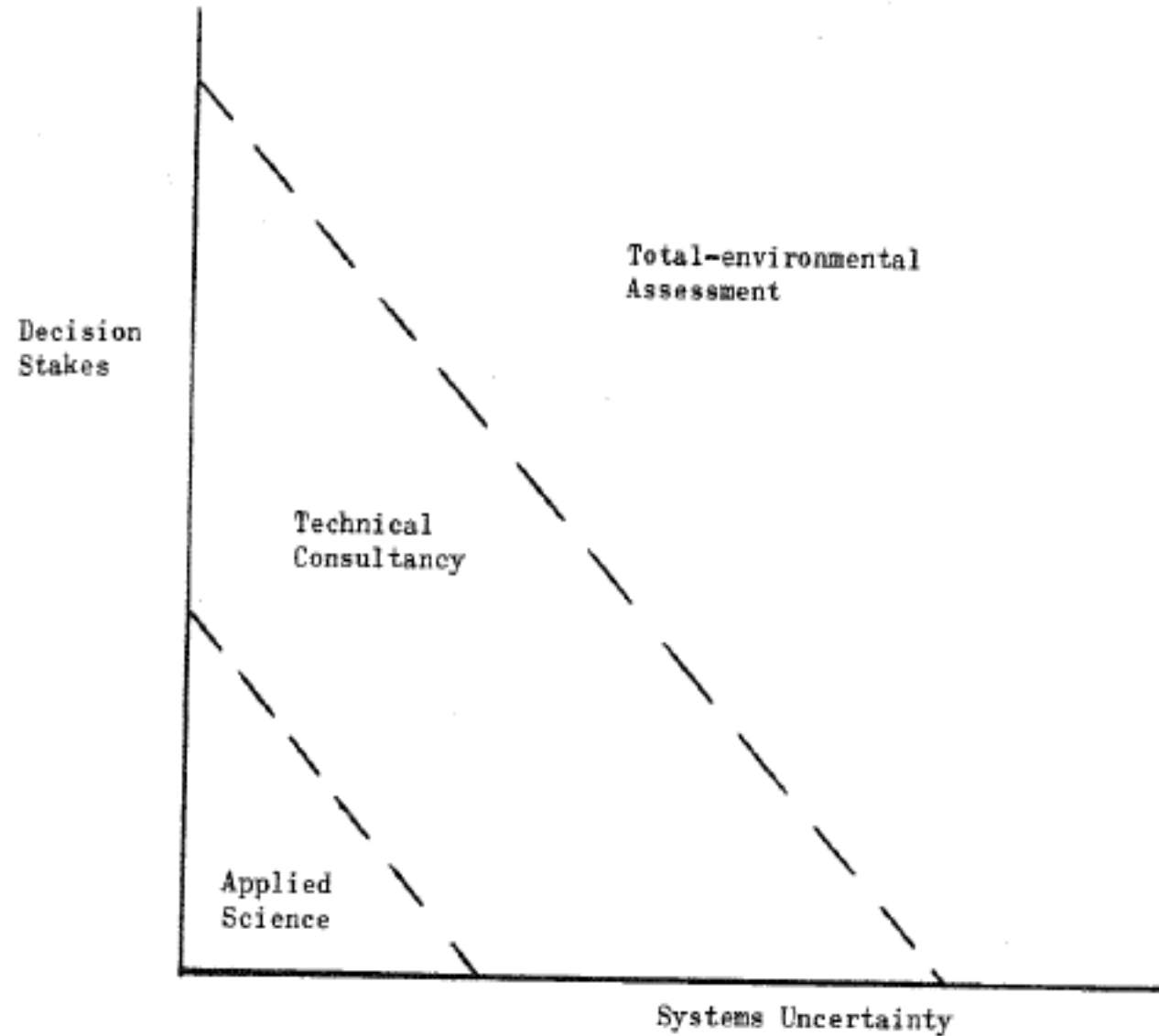


Fig. 1 : Classification of types of enquiry involved in Risk Assessment.

# PNS today? Theses for a PNS reading of the now

@andreasaltelli

Centre for the Study of the Sciences  
and the Humanities,  
University of Bergen & Institut De  
Ciència y Tecnologia Ambientals -  
Universitat Autònoma de Barcelona

Seminar at ICTA-UAB, June 9,  
2017





# Is there a crisis in science?

Unreliable research

## Trouble at the lab

Scientists like to think of science as self-correcting. To an alarming degree, it is not

Oct 19th 2013 | From the print edition

 Timekeeper

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The Economist runs its cover on the crisis  
(2013) based on a 2005 paper from J.P.  
Ioannidis

*Open access, freely available online*

Essay

## Why Most Published Research Findings Are False

John P. A. Ioannidis



John P. A.  
Ioannides

J. P. A. Ioannidis, Why Most Published Research Findings Are False, PLoS Medicine, August 2005, 2(8), 696–701.

## Summary Points

- Currently, many published research findings are false or exaggerated, and an estimated 85% of research resources are wasted.



John P. A.  
Ioannides

Ioannidis, J. P. (2014). How to Make More Published Research True. PLoS medicine, 11(10), e1001747

For Lancet (2015) an estimated US\$200 billion were wasted in the US in 2010.

Lancet, Editorial, 2015, Rewarding true inquiry and diligence in research, 385, p. 2121.

Ioannidis JPA, 2016, Why Most Clinical Research Is Not Useful, PLoS Med 13(6): e1002049. doi:10.1371/journal.pmed.1002049



**First thesis:** Science is in a deep existential crisis which has ethical, epistemological, methodological and even metaphysical dimensions.



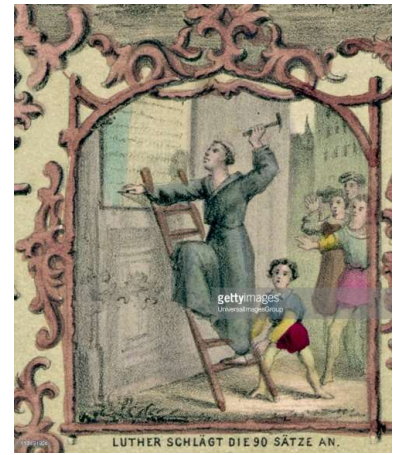
THE RIGHTFUL  
PLACE OF SCIENCE:  
**SCIENCE ON THE  
VERGE**

CONTRIBUTORS

Alice Benessia	Jerome R. Ravetz
Silvio Funtowicz	Andrea Saltelli
Mario Giampietro	Roger Strand
Ângela Guimarães Pereira	Jeroen P. van der Sluijs



A crisis looms over the scientific enterprise. Not a day passes without news of retractions, failed replications, fraudulent peer reviews, or misinformed science-based policies





# Retraction Watch

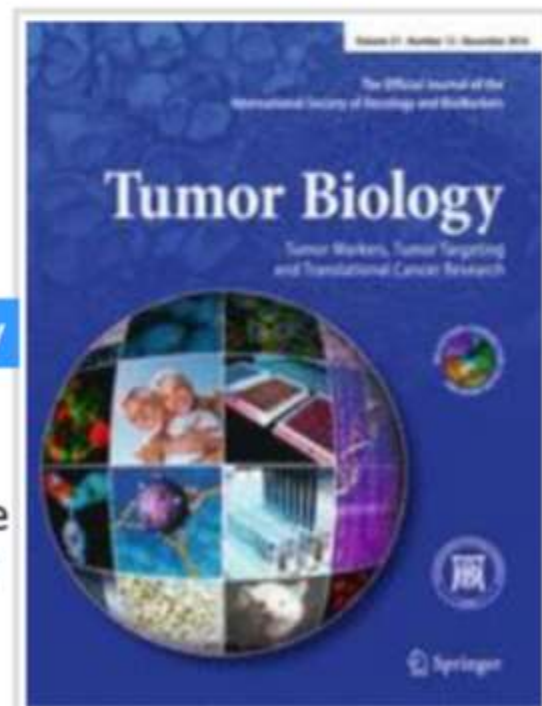
Tracking retractions as a

## A new record: Major publisher retracting more than 100 studies from cancer journal over fake peer reviews

with 11 comments

Springer is [retracting 107 papers](#) from one journal after discovering they had been accepted with fake peer reviews. Yes, 107.

To submit a fake review, someone (often the author of a paper) either makes up an outside expert to review the paper, or suggests a real researcher — and in both cases, provides a fake email address that comes back to someone who will invariably give the paper a glowing review. In this case, Springer, the publisher of *Tumor Biology* through 2016, told us that an investigation produced “clear evidence” the reviews were submitted under the names of real researchers with faked emails. Some of the authors may have used a third-party editing service, which may have supplied the reviews. The [journal is now published by SAGE](#).





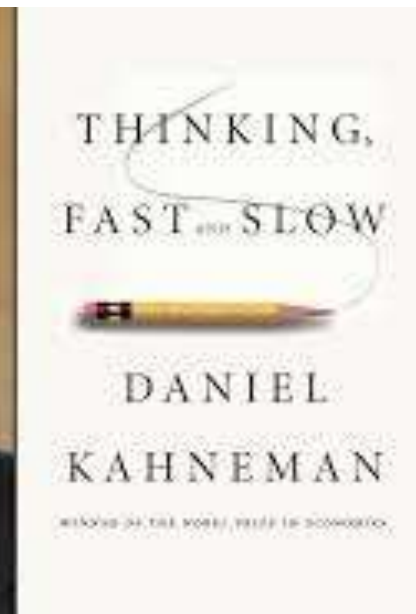
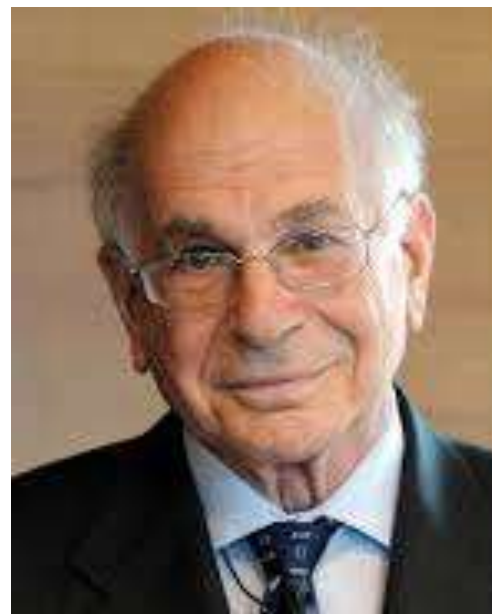
## Reconstruction of a Train Wreck: How Priming Research Went off the Rails

© February 2, 2017    📖 Kahneman, Priming,  $n$ -index, Statistical Power, Thinking Fast and Slow

**Authors: Ulrich Schimmack, Moritz Heene, and Kamini Kesavan**



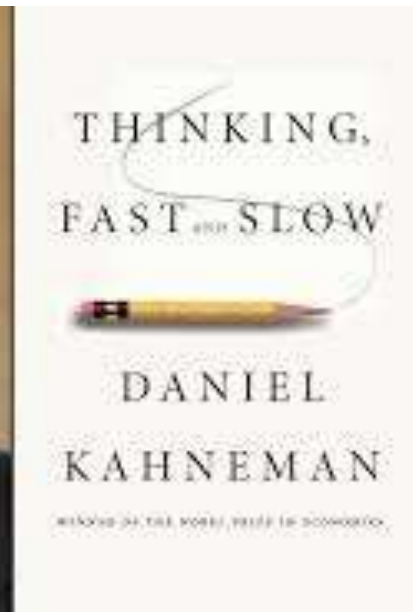
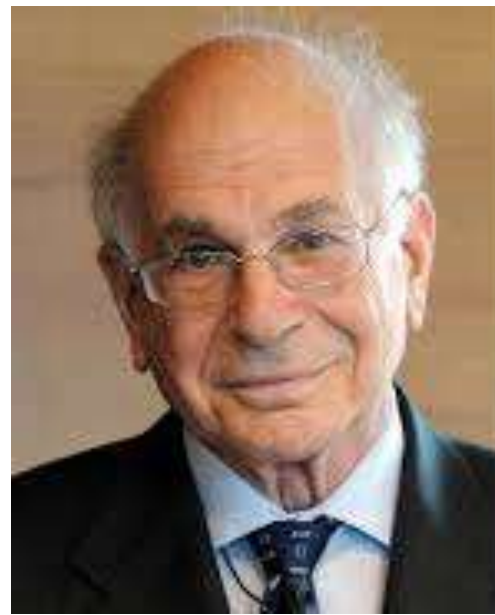
Reconstruction of a Train Wreck: How Priming Research Went off the Rails



“[...]questions have been raised about the robustness of priming results ... your field is now the poster child for doubts about the integrity of psychological research...”



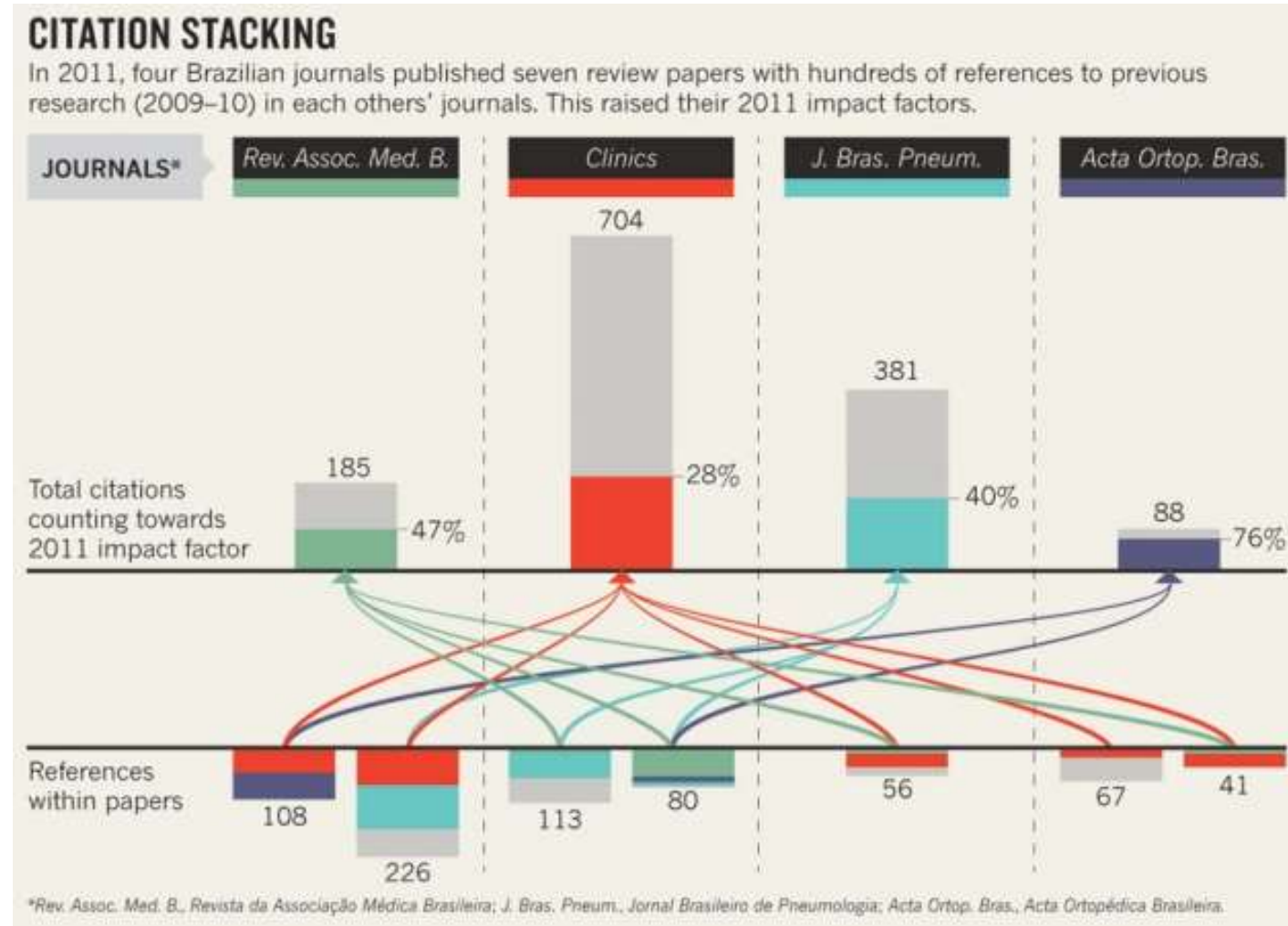
Reconstruction of a Train Wreck: How Priming Research Went off the Rails



“... people have now attached a question mark to the field, and it is your responsibility to remove it... I recently wrote a book that emphasizes priming research ... My reason for writing this letter is that I see a train wreck looming” (Kahneman, 2012)



# Use and abuse of metrics: from self-citation to citation cartels to citation stacking ...



Richard Van Noorden, 2017, Brazilian citation scheme outed. Thomson Reuters suspends journals from its rankings for 'citation stacking'. Nature, 27 August 2013

# Reproducibility in cancer biology: Making sense of replications

Brian A Nosek, Timothy M Errington

Center for Open Science, United States; University of Virginia, United States

DOI: <http://dx.doi.org/10.7554/eLife.23383>

Published January 19, 2017

Cite as: eLife 2017;6:e23383

January 19, 2017

## 1-1 Abstract

The first results from the Reproducibility Project: Cancer Biology suggest that there is scope for improving reproducibility in pre-clinical cancer research.

DOI: <http://dx.doi.org/10.7554/eLife.23383.001>

PART OF A  
REPRODUCIBILITY PROJECT  
Cancer Biology

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[Home](#) > [Current Issue](#) > vol. 114 no. 14 > Daniele Fanelli, 3714–3719, doi: 10.1073/pnas.1618569114



## Meta-assessment of bias in science

April 04, 2017

Daniele Fanelli<sup>a,1</sup>, Rodrigo Costas<sup>b</sup>, and John P. A. Ioannidis<sup>a,c,d,e</sup>

Author Affiliations

Edited by Susan T. Fiske, Princeton University, Princeton, NJ, and approved February 14, 2017 (received for review November 8, 2016)

## This Issue



April 4, 2017  
vol. 114 no. 14  
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# JAMA Internal Medicine

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Special Communication | September 12, 2016

## Sugar Industry and Coronary Heart Disease Research

### A Historical Analysis of Internal Industry Documents FREE

ONLINE FIRST

Cristin E. Kearns, DDS, MBA<sup>1,2</sup>; Laura A. Schmidt, PhD, MSW, MPH<sup>1,3,4</sup>; Stanton A. Glantz, PhD<sup>1,5,6,7,8</sup>

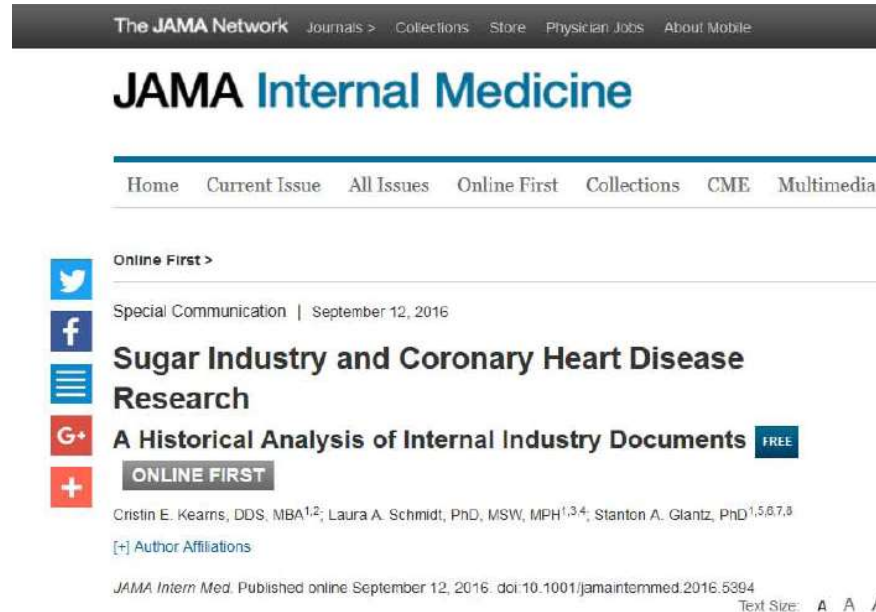
[+] Author Affiliations

JAMA Intern Med. Published online September 12, 2016. doi:10.1001/jamainternmed.2016.5394

Text Size: A A A

See also <https://www.theguardian.com/society/2016/apr/07/the-sugar-conspiracy-robert-lustig-john-yudkin>, and the story of US President Dwight Eisenhower heart attack,...

“our findings suggest the industry sponsored a research program in the 1960s and 1970s that successfully cast doubt about the hazards of sucrose while promoting fat as the dietary culprit in CHD [coronary hearth disease]”



The screenshot shows the JAMA Internal Medicine website. At the top is a dark navigation bar with links: The JAMA Network, Journals >, Collections, Store, Physician Jobs, and About Mobile. Below this is the JAMA Internal Medicine logo. A secondary navigation bar contains links: Home, Current Issue, All Issues, Online First, Collections, CME, and Multimedia. The main content area features a vertical sidebar on the left with social media icons for Twitter, Facebook, LinkedIn, Google+, and a plus sign. The main text area displays 'Online First >' followed by 'Special Communication | September 12, 2016'. The article title is 'Sugar Industry and Coronary Heart Disease Research' with a subtitle 'A Historical Analysis of Internal Industry Documents' and a 'FREE' badge. Below the title is an 'ONLINE FIRST' badge. The authors listed are 'Cristin E. Kearns, DDS, MBA<sup>1,2</sup>; Laura A. Schmidt, PhD, MSW, MPH<sup>1,3,4</sup>; Stanton A. Glantz, PhD<sup>1,5,6,7,8</sup>'. A link for '[+] Author Affiliations' is provided. At the bottom, it states 'JAMA Intern Med. Published online September 12, 2016. doi:10.1001/jamainternmed.2016.5394' and a 'Text Size' option with three icons (A, A, A).

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## JAMA Internal Medicine

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Online First >

Special Communication | September 12, 2016

### Sugar Industry and Coronary Heart Disease Research

#### A Historical Analysis of Internal Industry Documents FREE

**ONLINE FIRST**

Cristin E. Kearns, DDS, MBA<sup>1,2</sup>; Laura A. Schmidt, PhD, MSW, MPH<sup>1,3,4</sup>; Stanton A. Glantz, PhD<sup>1,5,6,7,8</sup>

[+] Author Affiliations

JAMA Intern Med. Published online September 12, 2016. doi:10.1001/jamainternmed.2016.5394

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## Feature

# Coca-Cola's secret influence on medical and science journalists

*BMJ* 2017 ; 357 doi: <https://doi.org/10.1136/bmj.j1638> (Published 05 April 2017)

Cite this as: *BMJ* 2017;357:j1638

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*Paul Thacker, freelance journalist*

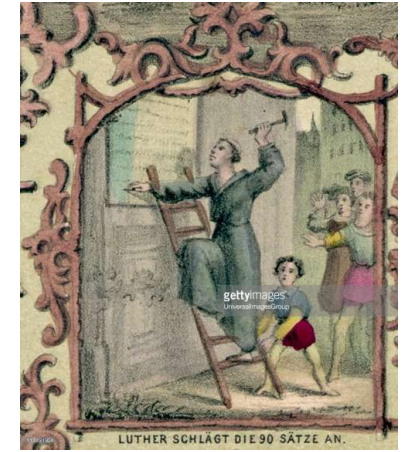
[Author affiliations ▾](#)

[thackerpd@gmail.com](mailto:thackerpd@gmail.com)

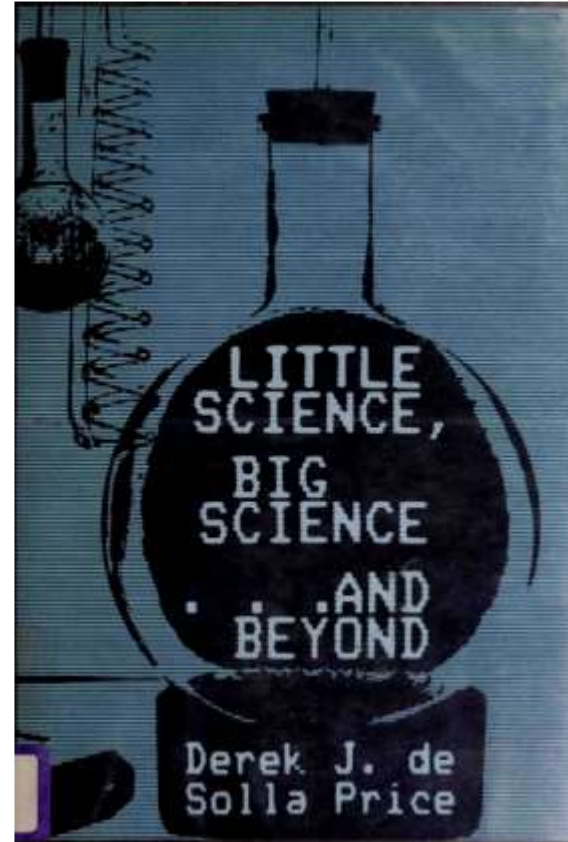
“Industry money was used to covertly influence journalists with the message that exercise is a bigger problem than sugar consumption in the obesity epidemic, documents obtained under freedom of information laws show.

The documents detail how Coca-Cola funded journalism conferences at a US university in an attempt to create favourable press coverage of sugar sweetened drinks. When challenged about funding of the series of conferences, the academics involved weren't forthcoming about industry involvement.”

**Second thesis:** PNS offered a penetrating analysis of the present collapse in science's quality control (reproducibility, retraction), societal function (misdiagnoses, hijacking) and ethos (corruption)



In 1963 Derek J. de Solla Price prophesized that Science would reach saturation (and in the worst case senility) under its own weight, victim of its own success and exponential growth (pp 1-32).



Derek J. de Solla Price

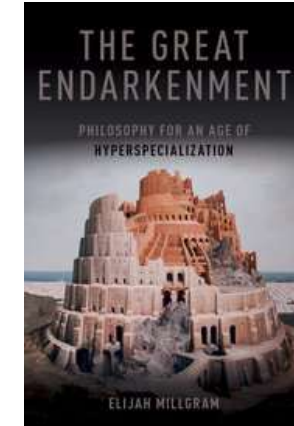
de Solla Price, D.J., 1963, Little science big science, Columbia University Press.





Derek de Solla Price ↔ Elijah Millgram

The Great Endarkenment.  
Philosophy for an Age of Hyperspecialization  
By Elijah Millgram



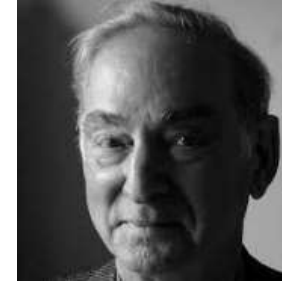
Describes a world in which all knowledge and products are the result of some form of extremely specialized expertise, and in which expertise is itself highly circumscribed, since experts depend in turn on other experts whose knowledge claims and styles of argumentation cannot be exported from one discipline to the next. → “serial hyperspecializers” (p. 26)

Experts thus become “logical aliens” (p. 32)

Science/knowledge degenerates when it becomes a commodity for Ravetz (1971), and Mirowski (2011).

Ravetz, J., 1971, *Scientific Knowledge and its Social Problems*, Oxford University Press, p. 22.

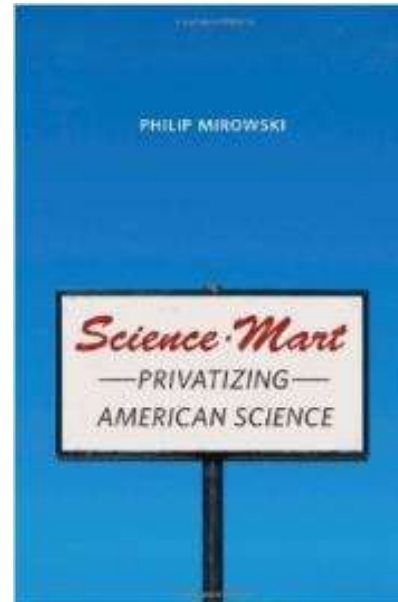
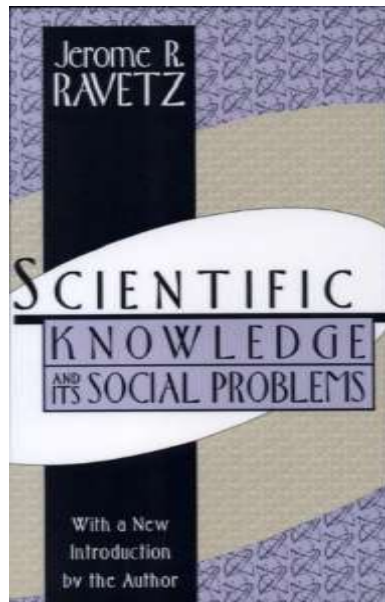
Mirowski, P. 2011. *Science-Mart: Privatizing American Science*, Harvard University Press.



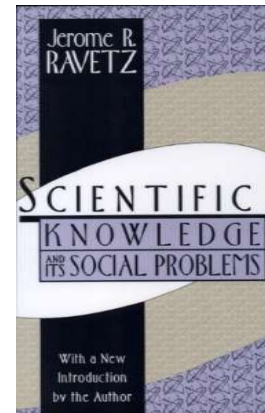
Jerome R.  
Ravetz



Philip  
Mirowski



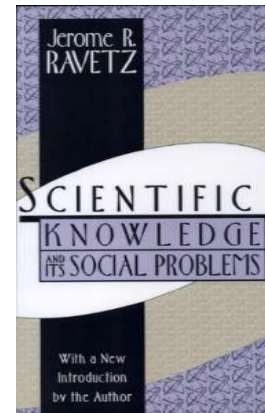
p.22: “with the industrialization of science, certain changes have occurred which weaken the operation of the traditional mechanism of quality control and direction at the highest level.”



Jerome R.  
Ravetz

Ravetz, J., 1971, Scientific Knowledge and its Social Problems, Oxford University Press, p.22.

p.22: “[...] The problem of quality control in science is thus at the centre of the social problems of the industrialized science of the present period.”

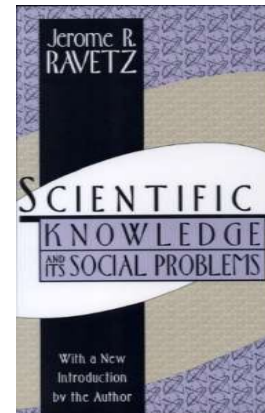


Jerome R.  
Ravetz

Ravetz, J., 1971, Scientific Knowledge and its Social Problems, Oxford University Press, p.22.



p.22: “If [science] fails to resolve this problem [...] then the immediate consequences for morale and recruitment will be serious; and those for the survival of science itself, grave”

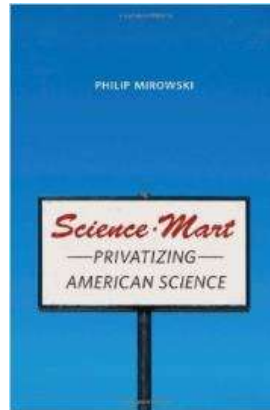


Jerome R.  
Ravetz

Ravetz, J., 1971, Scientific Knowledge and its Social Problems, Oxford University Press, p.22.

Jerome R. Ravetz ↔ Philip Mirowski

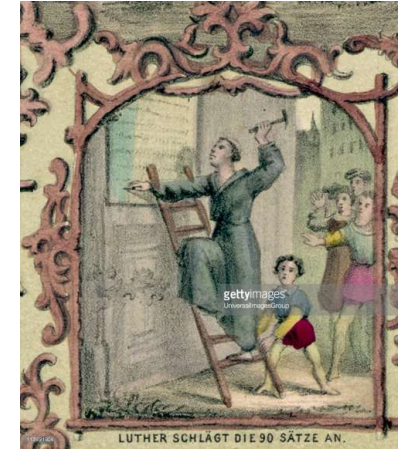
In house science labs of major corporation were closed and research outsourced to universities which ... became more and more looking as profit seeking organization (technology transfer offices in every campus) ... then research ended up outsourced again to contract-based research organizations (CRO's)...



Philip Mirowski

Mirowski, P. 2011. Science-Mart: Privatizing American Science, Harvard University Press.

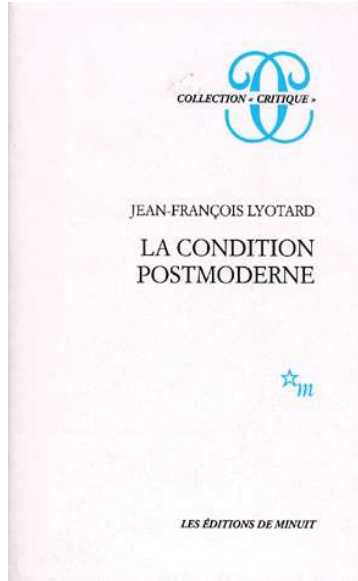
**Thesis 3:** PNS reading warns us about the problems with the double legitimacy arrangement. PNS hence situate the crisis at the core of the present political crisis



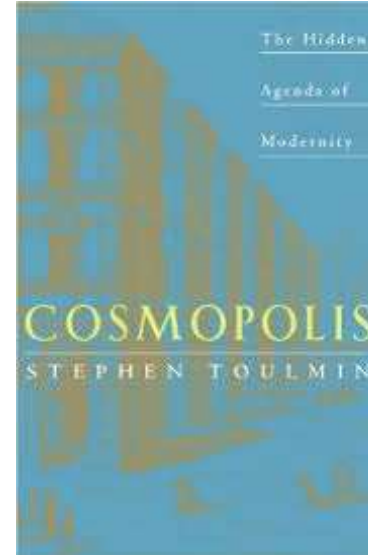
Science does  
the facts

Policy (power) does  
the values

This moment was announced as a crisis of modernity by various philosophers and scholars



Jean-  
François  
Lyotard



Stephen Toulmin



The pivotal farewell speech of Dwight D. Eisenhower:  
and the danger that public policy becomes captive of a  
scientific–technological elite (Silvio Funtowicz)



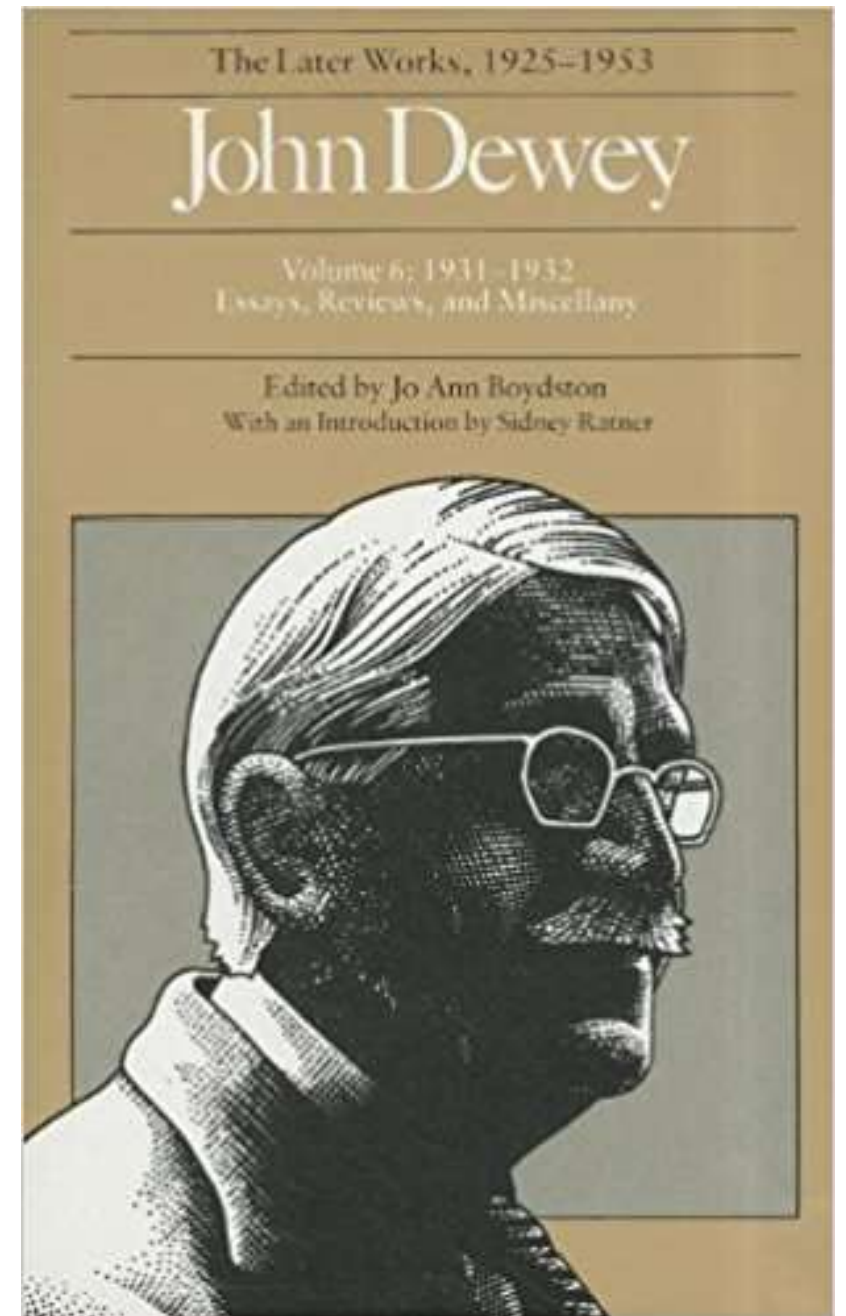
Dwight D. Eisenhower

See Benessia, A., and Funtowicz, S., 2016, Never late, never lost, never unprepared, Science on the Verge.

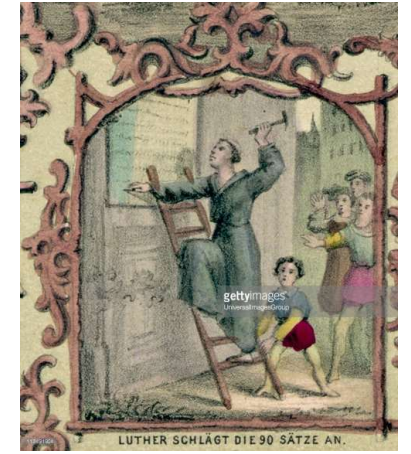
Here lies the heart of our present social problem. Science has hardly been used to modify men's fundamental acts and attitudes in social matters. It has been used to extend enormously the scope and power of interests and values which anteceded its rise. Here is the contradiction in our civilization. The potentiality of science as the most powerful instrument of control which has ever existed puts to mankind its one outstanding present challenge.

**From J. Dewey 'Science and Society' in John Dewey: The Later Works, 1925-1953: 1931-1932, Vol. 6-ExLibrary**

John Dewey  
1859-1952



Thesis 4: PNS critique engages science and its institutions: are these committed to the status quo & attempt to evade a critical reflection?



# Does the house of science downplay the crisis?

Denial

Dismissal

Diversion

Displacement

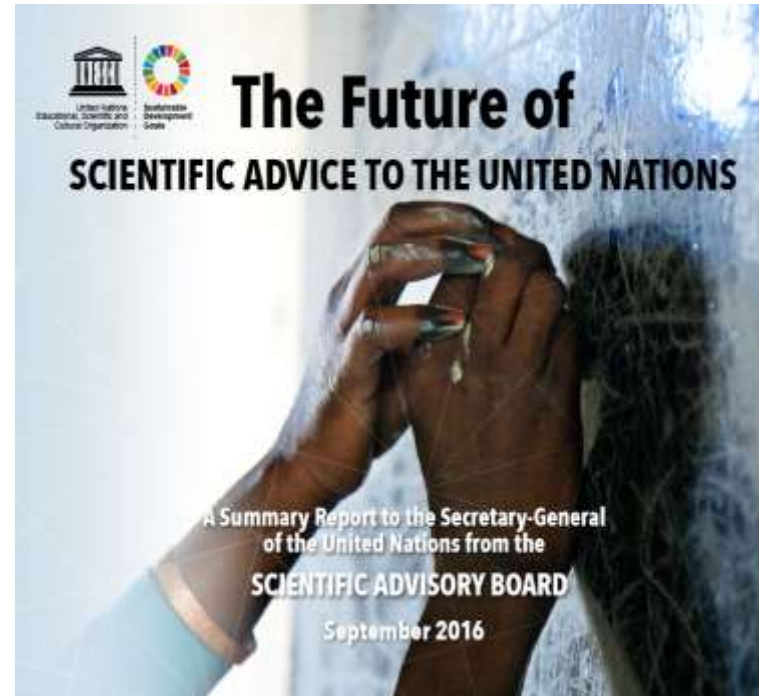




# Denial (1)



2015

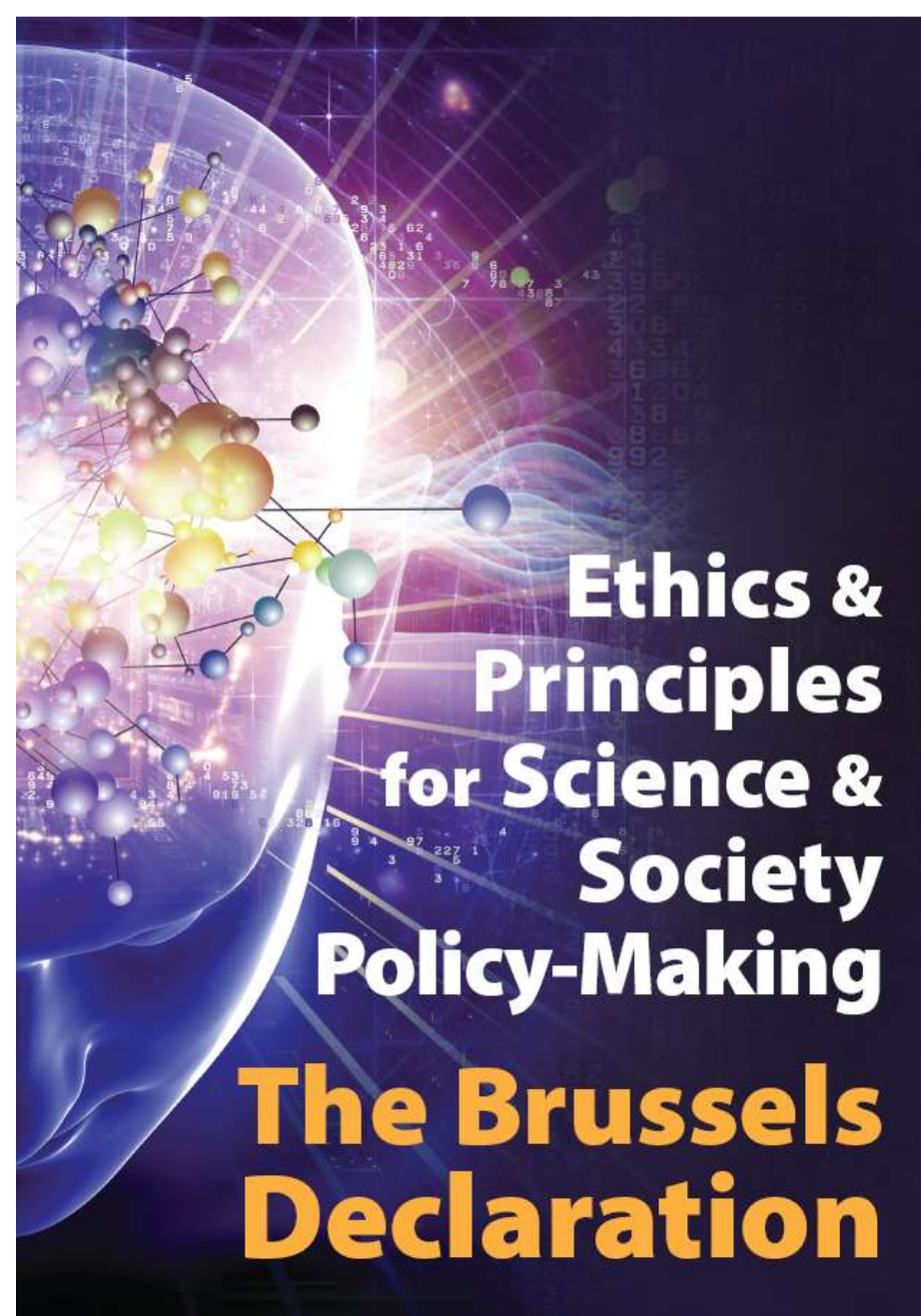


2016

## Denial (2)

Adopted on 17th February, 2017, at symposium of American Association for the Advancement (AAAS) after 5 y gestation, hundreds of experts involved

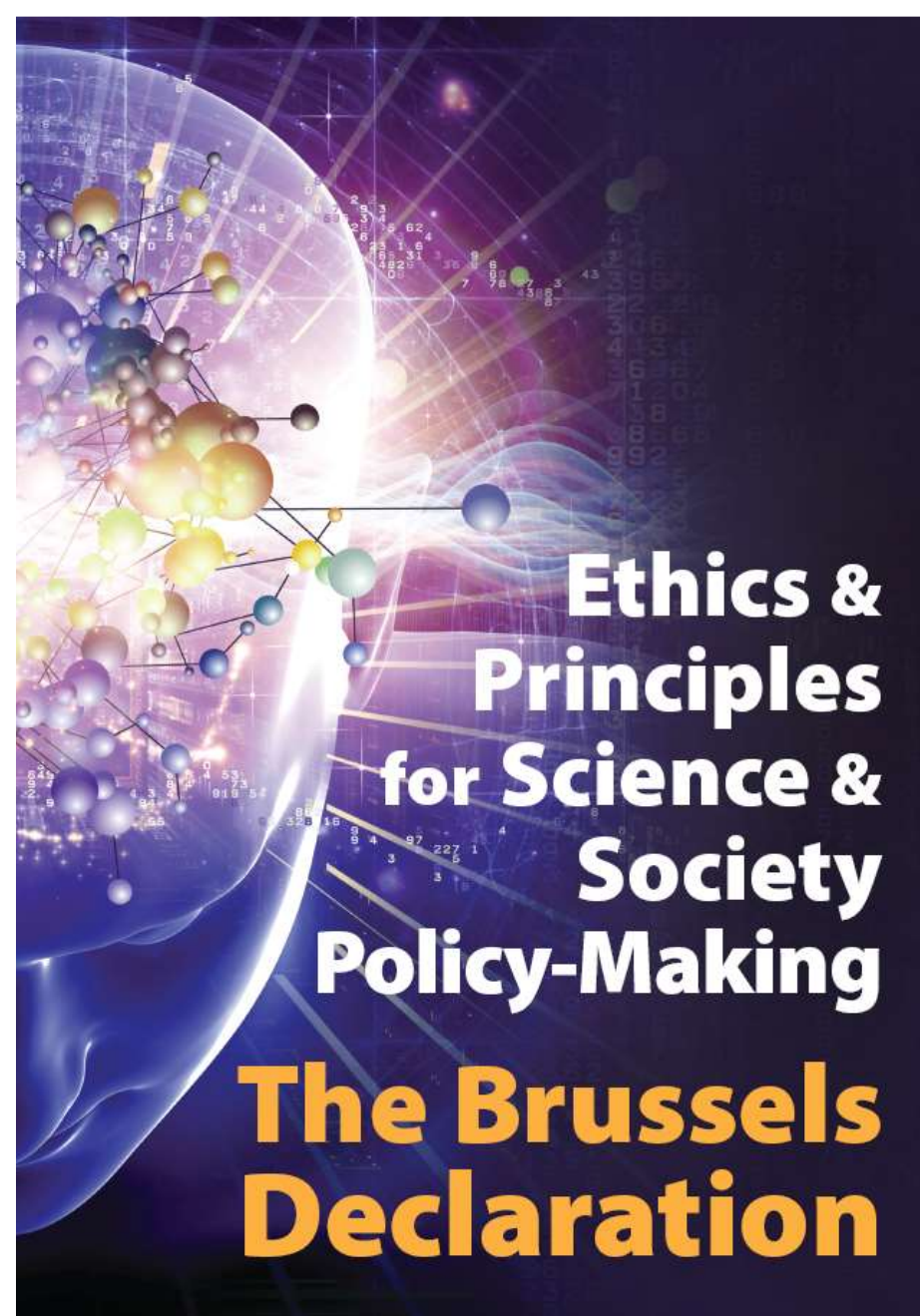
2017



## Denial (2)

- No crisis
- No effect of crisis on evidence based policy
- No asymmetries in the use and availability of evidence for policy (citizens same power as lobbyists)

2017







Contents lists available at [ScienceDirect](#)

Futures

journal homepage: [www.elsevier.com/locate/futures](http://www.elsevier.com/locate/futures)



Original research article

## What is wrong with evidence based policy, and how can it be improved?

Andrea Saltelli<sup>a,b,c,\*</sup>, Mario Giampietro<sup>a,c,d</sup>



*Journal of Clinical Epidemiology* 73 (2016) 82–86

**Journal of  
Clinical  
Epidemiology**

## Evidence-based medicine has been hijacked: a report to David Sackett

John P.A. Ioannidis<sup>a,b,c,d,\*</sup>

<sup>a</sup>*Department of Medicine, Stanford Prevention Research Center, Stanford, CA 94305, USA*

<sup>b</sup>*Department of Health Research and Policy, Stanford University School of Medicine, Stanford, CA 94305, USA*

<sup>c</sup>*Department of Statistics, Stanford University School of Humanities and Sciences, Stanford, CA 94305, USA*

<sup>d</sup>*Meta-Research Innovation Center at Stanford (METRICS), Stanford University, Stanford, CA 94305, USA*

Accepted 18 February 2016; Published online 2 March 2016



Power asymmetries in the framing of issues: those who have the deepest pockets marshal the best evidence; Instrumental use of quantification to obfuscate; (Saltelli and Giampietro, 2017)

---

Evidence based medicine hijacked to serve corporate agendas. Meta-analyses and guidelines serving vested interests. “Under market pressure, clinical medicine has been transformed to finance-based medicine” (Ioannidis, 2016)

# Dismissal? We can solve it!

nature.com > nature human behaviour > perspectives > article

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## A manifesto for reproducible science

Marcus R. Munafò , Brian A. Nosek, Dorothy V. M. Bishop, Katherine S. Button, Christopher D. Chambers, Nathalie Percie du Sert, Uri Simonsohn, Eric-Jan Wagenmakers, Jennifer J. Ware & John P. A. Ioannidis

*Nature Human Behaviour* **1**,  
Article number: 0021 (2017)  
[doi:10.1038/s41562-016-0021](https://doi.org/10.1038/s41562-016-0021)

Published online: 10 January 2017

“[...] measures [to] improving the transparency, reproducibility and **efficiency** of scientific research”

# But ...can we do it from the inside?

TABLE 1. GROWING PERVERSE INCENTIVES IN ACADEMIA

<i>Incentive</i>	<i>Intended effect</i>	<i>Actual effect</i>
"Researchers rewarded for increased number of publications."	"Improve research productivity," provide a means of evaluating performance.	"Avalanche of" substandard, "incremental papers": poor methods and increase in false discovery rates leading to a "natural selection of bad science" (Smaldino and McElreath, 2016); reduced quality of peer review
"Researchers rewarded for increased number of citations."	Reward quality work that influences others.	Extended reference lists to inflate citations; reviewers request citation of their work through peer review
"Researchers rewarded for increased grant funding."	"Ensure that research programs are funded, promote growth, generate overhead."	Increased time writing proposals and less time gathering and thinking about data. Overselling positive results and downplay of negative results.
Increase PhD student productivity	Higher school ranking and more prestige of program.	Lower standards and create oversupply of PhDs. Postdocs often required for entry-level academic positions, and PhDs hired for work MS students used to do.
Reduced teaching load for research-active faculty	Necessary to pursue additional competitive grants.	Increased demand for untenured, adjunct faculty to teach classes.
"Teachers rewarded for increased student evaluation scores."	"Improved accountability; ensure customer satisfaction."	Reduced course work, grade inflation.
"Teachers rewarded for increased student test scores."	"Improve teacher effectiveness."	"Teaching to the tests; emphasis on short-term learning."
"Departments rewarded for increasing U.S. News ranking."	"Stronger departments."	Extensive efforts to reverse engineer, game, and cheat rankings.
"Departments rewarded for increasing numbers of BS, MS, and PhD degrees granted."	"Promote efficiency; stop students from being trapped in degree programs; impress the state legislature."	"Class sizes increase; entrance requirements" decrease; reduce graduation requirements.
"Departments rewarded for increasing student credit/contact hours (SCH)."	"The university's teaching mission is fulfilled."	"SCH-maximization games are played": duplication of classes, competition for service courses.

Modified from Regehr (pers. comm., 2015) with permission.

Academic Research in the 21st Century: Maintaining Scientific Integrity in a Climate of Perverse Incentives and Hyper-competition, Marc A. Edwards and Siddhartha Roy, ENVIRONMENTAL ENGINEERING SCIENCE, 34(1), 2017

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## *Incentive*

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“Researchers rewarded for increased number of publications.”

### *Intended effect*

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“Improve research productivity,”  
provide a means of evaluating  
performance.

### *Actual effect*

---

“Avalanche of” substandard, “incremental papers”; poor methods and increase in false discovery rates leading to a “natural selection of bad science” (Smaldino and McElreath, 2016); reduced quality of peer review

Academic Research in the 21st Century:  
Maintaining Scientific Integrity in a  
Climate of Perverse Incentives and  
Hyper-competition, Marc A. Edwards  
and Siddhartha Roy,  
ENVIRONMENTAL ENGINEERING  
SCIENCE, 34(1), 2017

Dismissal: too many scientists=many bad papers (stick to the good, high impact factor scientists)

But

"studies by highly cited authors ... were not more affected by bias than average"

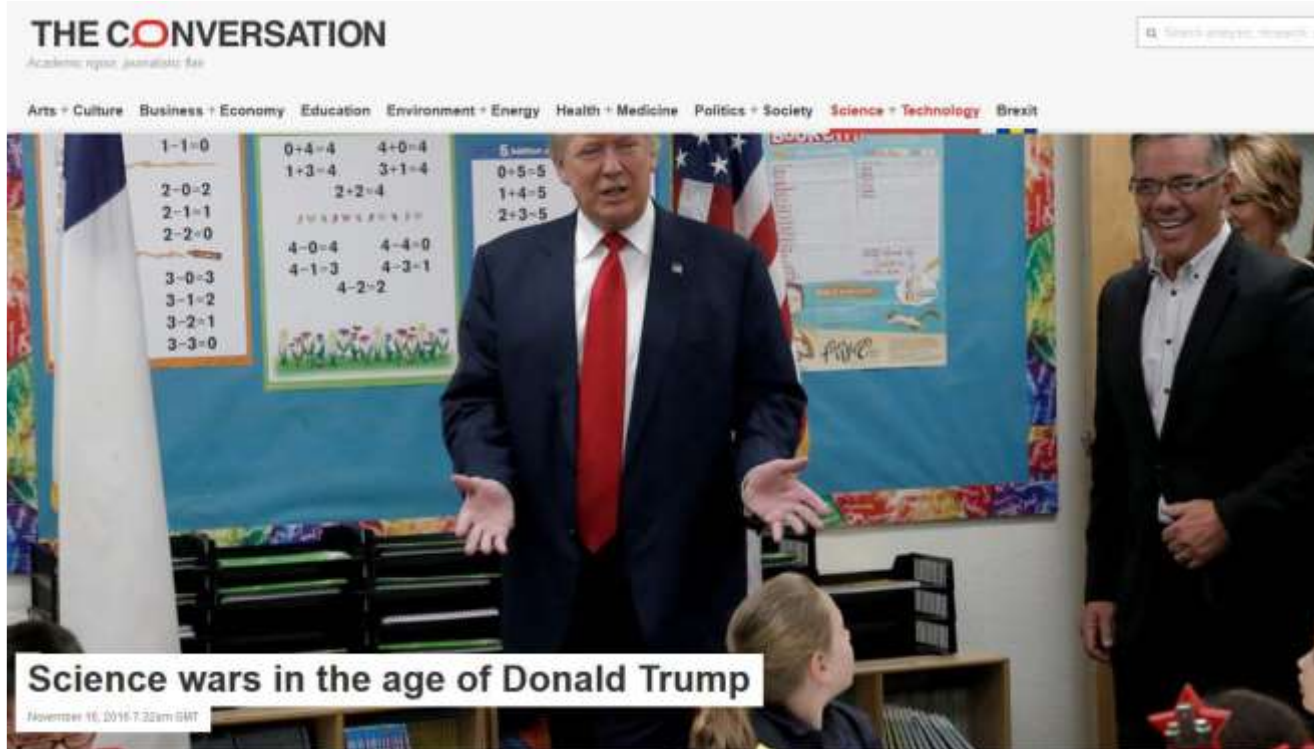
<https://phys.org/news/2017-03-scientific-bias-problems.html>

<http://www.pnas.org/content/114/14/3714.abstract>

Daniele Fanelli, Rodrigo Costas, and John P. A. Ioannidis, Meta-assessment of bias in science, PNAS vol. 114 no. 14, 3714–3719



Diversion: (There is a problem, and this is due to an ongoing war on science between the educated liberal left and the ignorant conservative right)



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<https://theconversation.com/science-wars-in-the-age-of-donald-trump-67594>


# Displacement: This is the post-truth era!

**THE CONVERSATION**  
Academic rigour, journalistic flair

Arts + Culture Business + Economy Education Environment + Energy Health + Medicine Politics + Society **Science + Technology** Brexit


## To tackle the post-truth world, science must reform itself


January 27, 2017 7:33am GMT



**Authors**

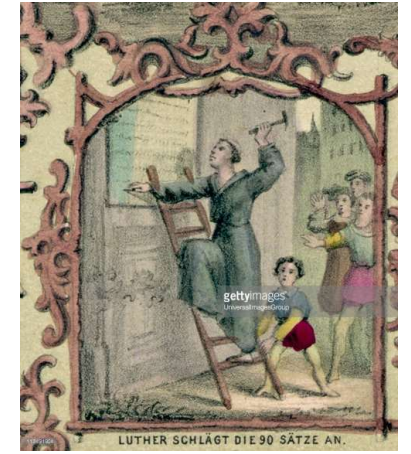
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<https://theconversation.com/to-tackle-the-post-truth-world-science-must-reform-itself-70455>

Thesis 5: More PNS reading:  
Solutions aren't forthcoming anytime soon



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[rsos.royalsocietypublishing.org](http://rsos.royalsocietypublishing.org)

Research



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# The natural selection of bad science


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Paul E. Smaldino<sup>1</sup> and Richard McElreath<sup>2</sup>

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<sup>2</sup>Department of Human Behavior, Ecology, and Culture, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany

 PES, 0000-0002-7133-5620; RME, 0000-0002-0387-5377

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 favour 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 principal factor for

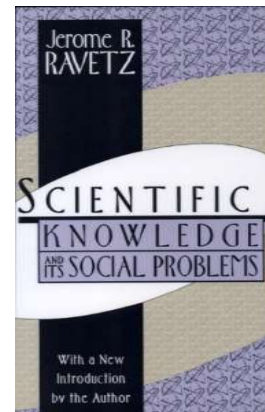
The persistence of poor methods results partly from incentives that favour them, leading to the natural selection of bad science. This dynamic requires no conscious strategizing—no deliberate cheating nor loafing—by scientists, only that publication is a principal factor for career advancement.



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.

Improving the quality of research requires change at the institutional level.

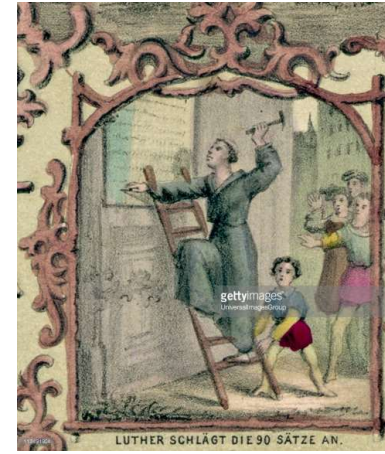
p. 407 “No formal system of imposed penalties and rewards will guarantee the maintenance of quality, for the tasks of scientific inquiry are generally too subtle to be so crudely assessed; nor will the advantages to an individual of a good reputation of his group be sufficient to induce a self-interested individual to make sacrifices to maintain it. Only the identification with his colleagues, and the pride in his work, both requiring good morale, will ensure good work.”



Jerome R.  
Ravetz

Ravetz, J., 1971, Scientific Knowledge and its Social Problems, Oxford University Press, p.22.

## Thesis 6: Puzzling signals; a new zeitgeist populated by heroes and billionaires



# Old and new heroes, while old patterns re-emerge



Jeffrey Beall



Lois Gibbs



Timothy Gowers



Marc Edwards

<http://scholarlyoa.com/2015/01/02/bealls-list-of-predatory-publishers-2015/#more-4719>

<https://www.bu.edu/lovecanal/canal/>

<http://journals.plos.org/plosone/article?id=10.1371%2Fjournal.pone.0127502>

[https://en.wikipedia.org/wiki/Flint\\_water\\_crisis](https://en.wikipedia.org/wiki/Flint_water_crisis); <http://flintwaterstudy.org/>;

<http://www.nytimes.com/2016/08/21/magazine/flints-water-crisis-and-the-troublemaker-scientist.html>

# Has science become an endeavor where attempts to fix a diseased system lead you to disgrace?



Jeffrey Beall



<http://www.npr.org/sections/thetwo-way/2013/05/15/184233141/publisher-threatens-librarian-with-1-billion-lawsuit>

<http://retractionwatch.com/2017/01/17/bealls-list-potential-predatory-publishers-go-dark/>



# Heroes and billionaires?



John and Laura  
Arnold



Brian Nosek, the  
Reproducibility  
Project.



John Ioannidis,  
Meta-research  
innovation  
centre at  
Stanford



Ben  
Goldacre,  
alltrials.net



Gary Taubes, The  
case against sugar

“Bill & Melinda Gates ... the world’s biggest source of charitable money for scientific endeavours (\$4bn a year) [...its research] must be freely available to all [...and] will pay the cost of putting such research in one particular repository of freely available papers.

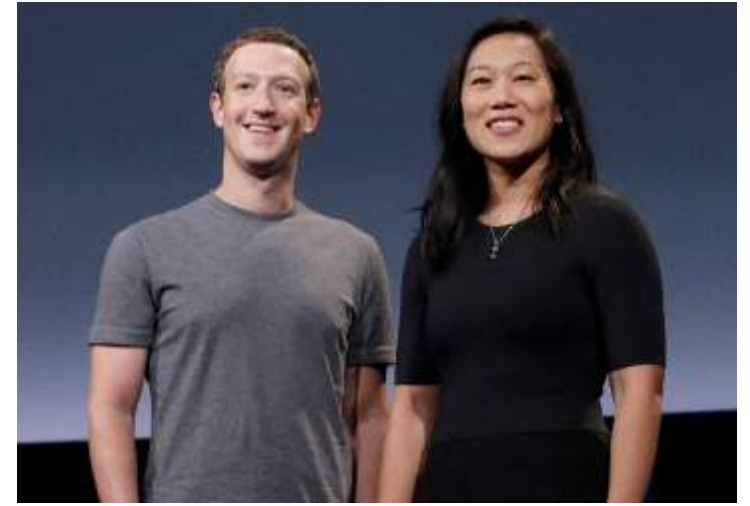


Bill & Melinda Gates

... offered the publishers of Science, \$100,000 to make papers published this year about Gates-sponsored research free to read from the beginning.

<http://www.economist.com/news/science-and-technology/21719438-about-change-findings-medical-research-are-disseminated-too>

Mark Zuckerberg & Priscilla Chan will disburse \$50m to 47 local scientists on condition they made their work available as preprints.”



Mark Zuckerberg &  
Priscilla Chan

<http://www.economist.com/news/science-and-technology/21719438-about-change-findings-medical-research-are-disseminated-too>

## Different cultures, different reactions



Yoshiki Sasai

<http://www.nature.com/news/stem-cell-pioneer-blamed-media-bashing-in-suicide-note-1.15715>

# Thesis 7: Reformation?





Science exhibits pathologies /  
corruptions comparable to the  
traffic in indulgencies which  
enraged Luther ~1517

3

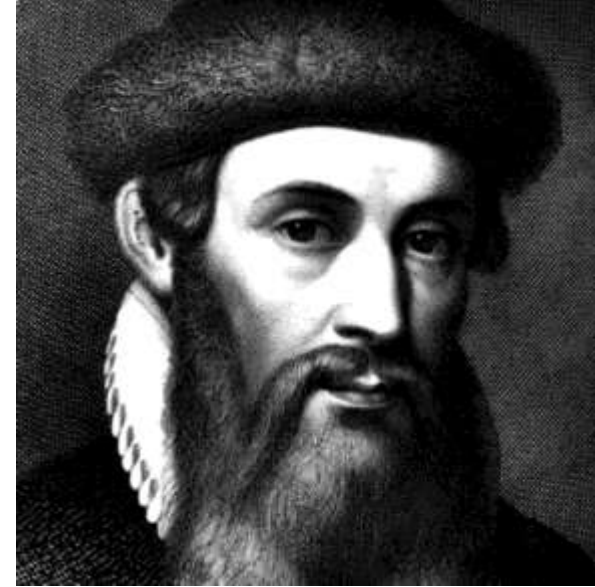


Martin Luther



Johann Tetzel

The internet the new press?



Johannes  
Gutenberg

The combination of corruption,  
indignation and revolutionary  
technology made the Reformation  
possible

Is the same possible for science?

## Scientists' march on Washington is a bad idea – here's why

March 8, 2017 8:54pm AEDT



Some questioned the concept of the Women's March on Washington. Now scientists will march against Donald Trump: Is that a good idea?

Author

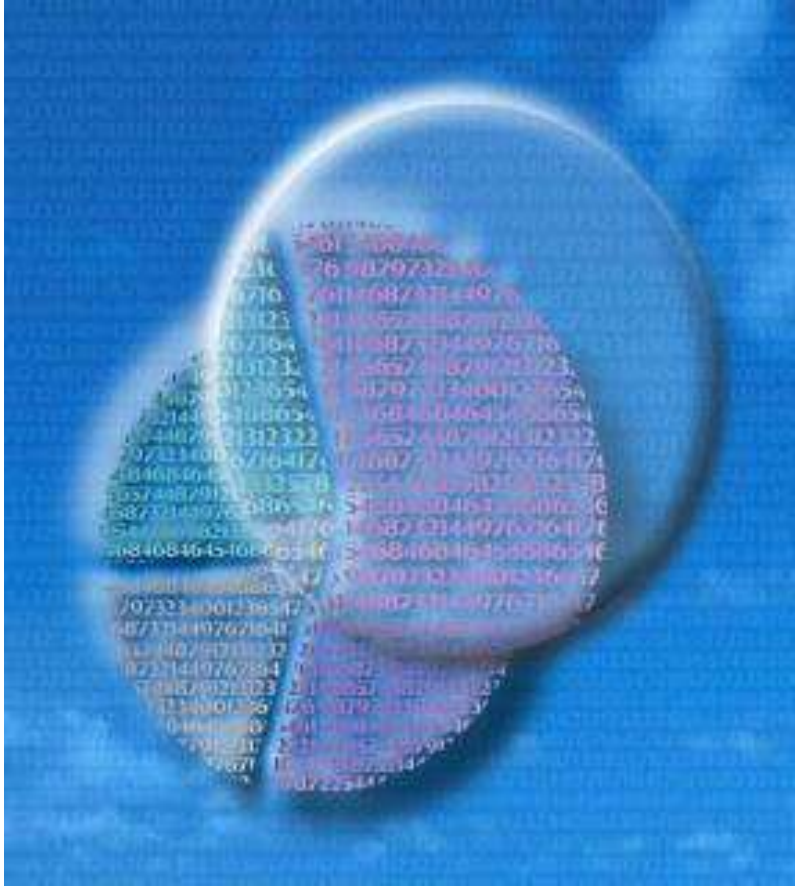


**Andrea Saltelli**

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Study of the Sciences and the  
Humanities, University of Bergen,  
University of Bergen

“Our activism would be better inspired by the radical 1970s-era movements that sought to change the world by changing first science itself. They sought to provide scientific knowledge and technical expertise to local populations and minority communities while giving those same groups a chance to shape the questions asked of science.”

<https://theconversation.com/scientists-march-on-washington-is-a-bad-idea-heres-why-73305>



# END

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