

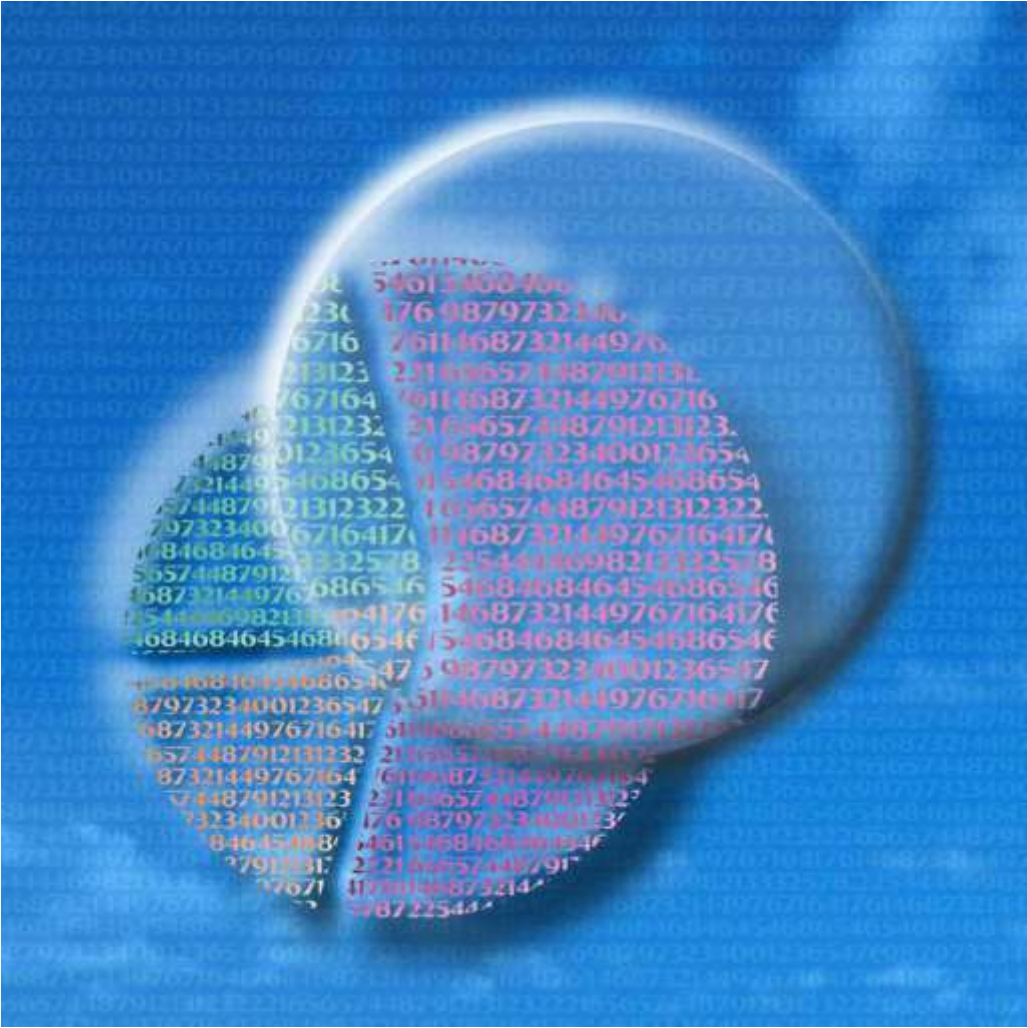
Crisis? Surely you must be joking

Andrea Saltelli

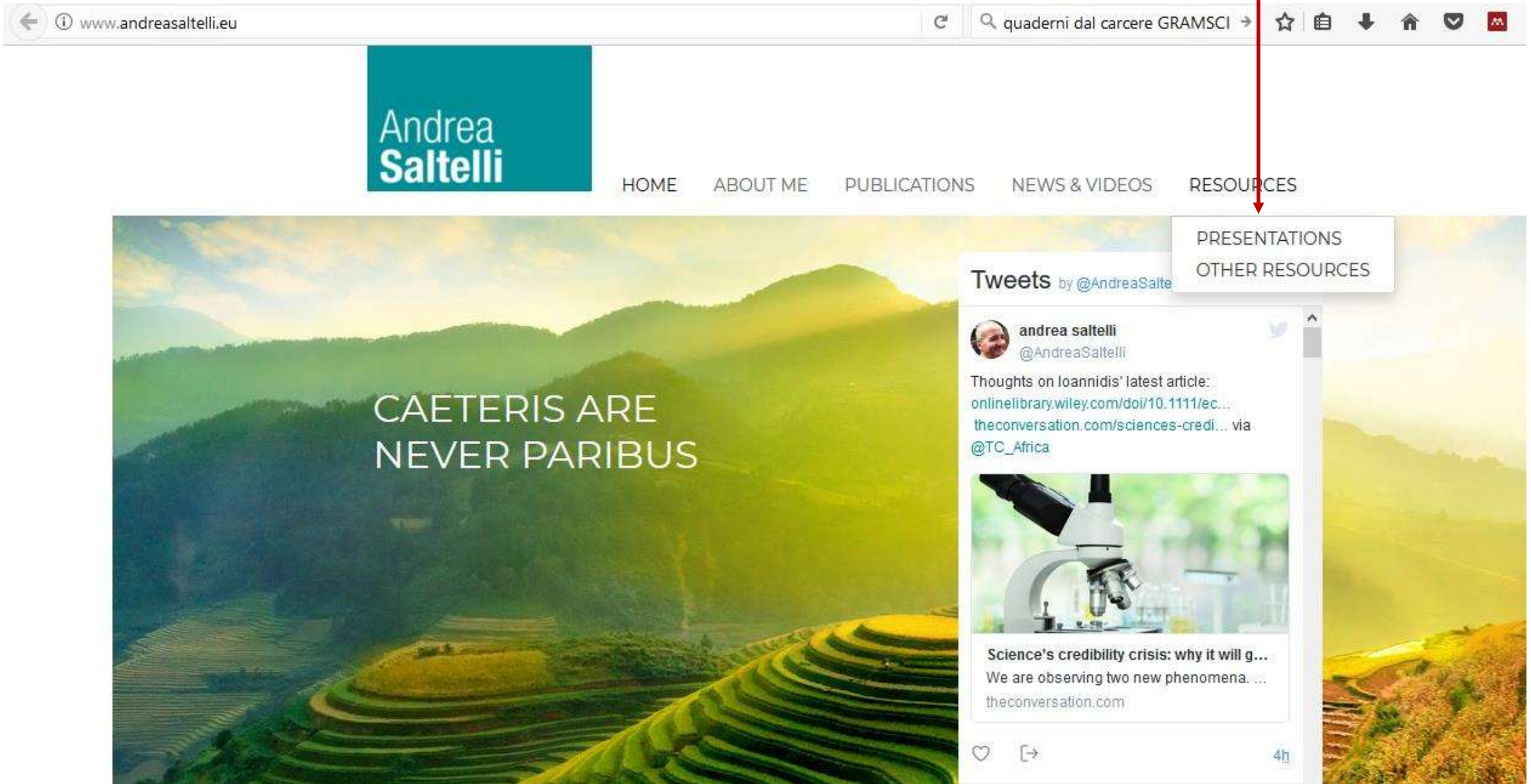
Centre for the Study of the Sciences and the Humanities, University of Bergen, and Open Evidence Research, Open University of Catalonia

Monday July 30, 2018,

Institute for Science, Innovation and Society, Oxford University, Seminar Crisis, what crisis in Science?



Where to find this talk: www.andreasaltelli.eu



The image shows a screenshot of the website www.andreasaltelli.eu. The browser address bar shows the URL. The website header features the name "Andrea Saltelli" in a teal box. Below the header is a navigation menu with the following items: HOME, ABOUT ME, PUBLICATIONS, NEWS & VIDEOS, and RESOURCES. A red arrow points from the search bar area down to the "RESOURCES" menu item. A dropdown menu is open under "RESOURCES", showing "PRESENTATIONS" and "OTHER RESOURCES". The main content area features a large background image of terraced rice fields with the text "CAETERIS ARE NEVER PARIBUS" overlaid. On the right side, there is a "Tweets" section by @AndreaSalte, featuring a tweet from andrea saltelli (@AndreaSaltelli) with a link to an article and a photo of a microscope.

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Andrea Saltelli

HOME ABOUT ME PUBLICATIONS NEWS & VIDEOS RESOURCES

PRESENTATIONS OTHER RESOURCES

Tweets by @AndreaSalte

andrea saltelli @AndreaSaltelli

Thoughts on Ioannidis' latest article: onlinelibrary.wiley.com/doi/10.1111/ec... theconversation.com/sciences-credi... via @TC_Africa

Science's credibility crisis: why it will g...
We are observing two new phenomena...
theconversation.com

4h

Crisis in statistics?

Statistics is experiencing a quality control crisis



Effect or no
effect?



nature
International journal of science

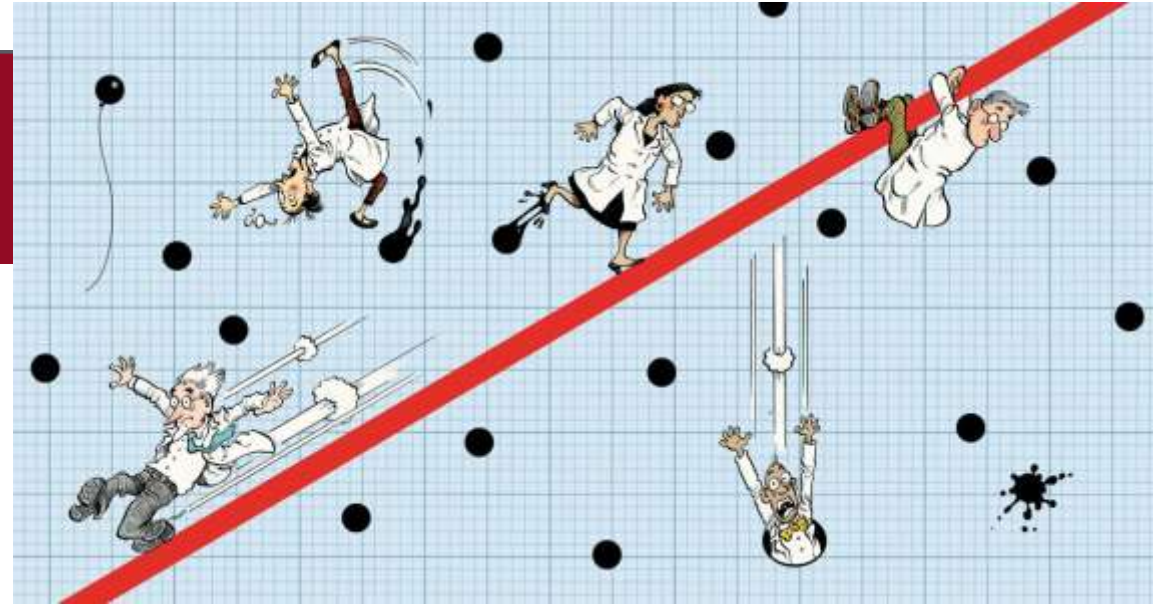


nature
International journal of science

COMMENT • 28 NOVEMBER 2017

Five ways to fix statistics

As debate rumbles on about how and how much poor statistics is to blame for poor reproducibility, Nature asked influential statisticians to recommend one change to improve science. The common theme? The problem is not our maths, but ourselves.



Jeff Leek , Blakeley B. McShane, Andrew Gelman , David Colquhoun , Michèle B. Nuijten  & Steven N. Goodman 

—
CORRESPONDENCE • 16 JANUARY 2018

nature
International journal of science

Fixing statistics is more than a technical issue

[Andrea Saltelli](#)  & [Philip Stark](#)

<https://www.nature.com/articles/d41586-018-00647-9>

—
CORRESPONDENCE • 16 JANUARY 2018

nature
International journal of science

Integrity must underpin quality of statistics

[Jerome Ravetz](#) 

<https://www.nature.com/articles/d41586-018-00648-8>

The great paradox of science is that passionate practitioners must carefully produce dispassionate facts (J. Ravetz *Scientific Knowledge and its Social Problems* Oxford Univ. Press; 1971). Meticulous technical and normative judgement, as well as morals and morale, are necessary to navigate the forking paths of the statistical garden (Saltelli and Stark, 2018)

All users of statistical techniques, as well as those in other mathematical fields such as modelling and algorithms, need an effective societal **commitment** to the maintenance of quality and integrity in their work. If imposed alone, technical or administrative solutions will only breed manipulation and evasion (Ravetz, 2018)

Crisis in science?

There have recently been alarms as to the scientific quality arrangement in several disciplines. The most visible symptom of this possible dysfunction is the so-called reproducibility crisis

The
Economist

Washington's lawyer surplus
How to do a nuclear deal with Iran
Investment tips from Nobel economists
Junk bonds are back
The meaning of Sachin Tendulkar

OCTOBER 19TH - 25TH 2013

Economist.com

HOW
SCIENCE
GOES
WRONG

On the radar:
October 2013



The Economist

**HOW
SCIENCE
GOES
WRONG.**

Why Most Published Research Findings Are False

John P. A. Ioannidis

2005



John P. A.
Ioannides

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

Failed replications, entire subfields going bad,
fraudulent peer reviews, predatory publishers,
perverse metrics, statistics on trial ...

... misleading science advice, institutions on
denial, a new breed of science wars

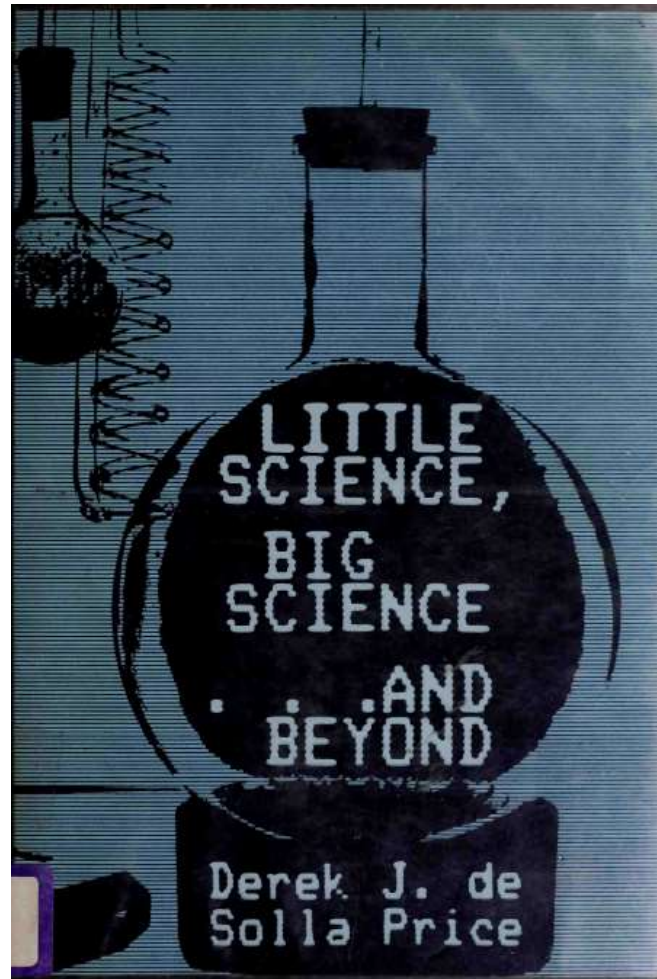
The crisis is methodological, epistemological,
ethical and metaphysical

Scholars who saw it coming

...

and how they were vindicated

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.

~ 2.2 million
articles a year
(2016) over
~ 30,000 journals

newsblog

Nature brings you breaking news from the world of science

NEWS BLOG

Global scientific output doubles every nine years

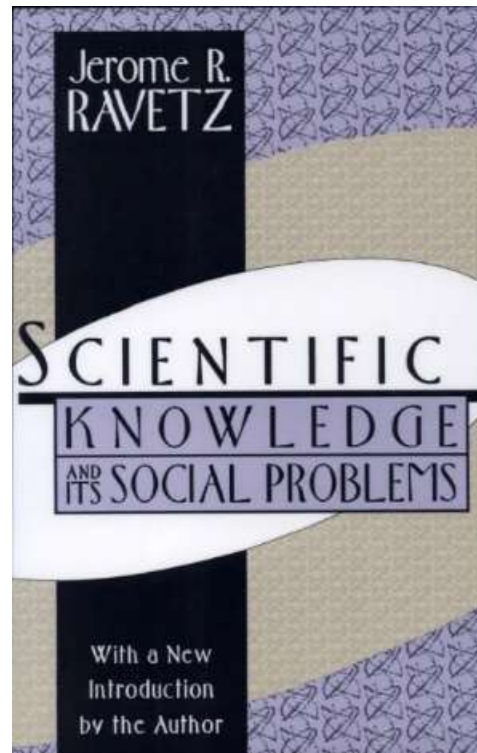
07 May 2014 | 16:46 GMT | Posted by Richard Van
Noorden | Category: Policy, Publishing

<https://www.aje.com/en/arc/scholarly-publishing-trends-2016/>

<http://blogs.nature.com/news/2014/05/global-scientific-output-doubles-every-nine-years.html>

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

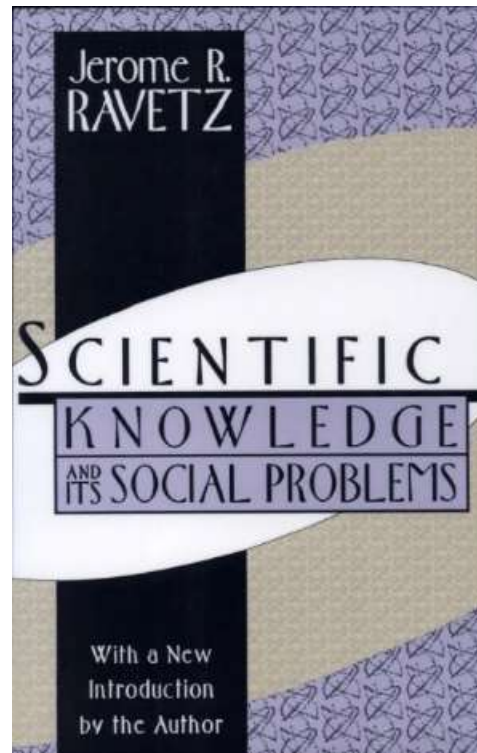
Ravetz, J., 1971, Scientific Knowledge and its Social Problems, Oxford University Press.



Jerome R.
Ravetz

“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”

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



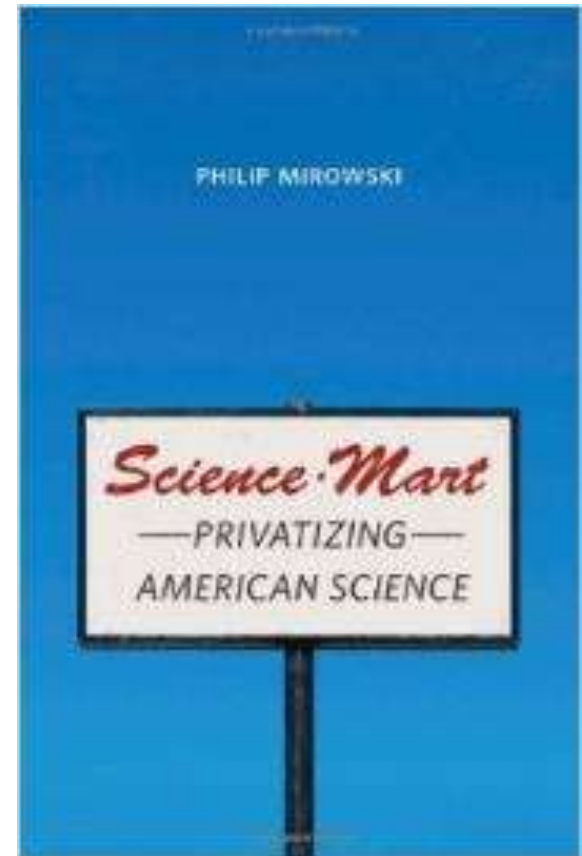
Jerome R.
Ravetz

… neoliberal ideologies lead to decreasing state funding of science, which becomes privatized … knowledge as a monetized commodity replaces knowledge as a public good → collapse of quality



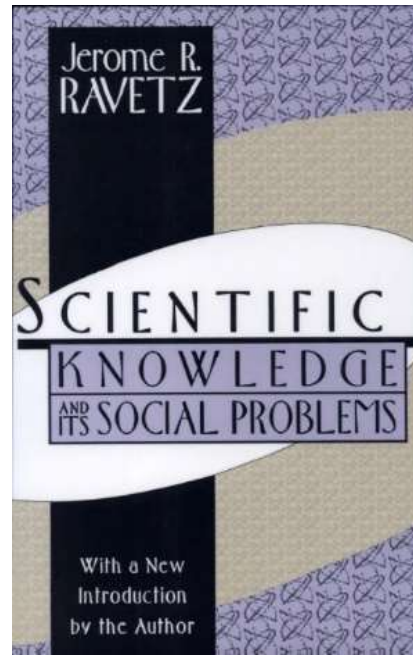
Philip Mirowski

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



p. 179. For it is possible for a field to be diseased [...] reforming a diseased field is a task of great delicacy [...] not even an apparatus of institutional structures can do anything to maintain or restore the health of a field **in the absence of an essential ethical element operating through the interpersonal channel of communication.**

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



Jerome R.
Ravetz

 OPEN ACCESS

ESSAY

June 21, 2017

Why Most Clinical Research Is Not Useful

John P. A. Ioannidis 

Published: June 21, 2016 • <https://doi.org/10.1371/journal.pmed.1002049>

THE POWER OF BIAS IN ECONOMICS RESEARCH*

John P. A. Ioannidis, T. D. Stanley and Hristos Doucouliagos

October 27, 2017

Rather than isolated instances
of corruption now entire fields
of research are found diseased

Statistics in the fray

The discipline of statistics has been going through a phase of critique and self-criticism, due to mounting evidence of poor statistical practice of which misuse and abuse of the P-test is the most visible sign

**AMERICAN STATISTICAL ASSOCIATION RELEASES STATEMENT ON
STATISTICAL SIGNIFICANCE AND P-VALUES**

*Provides Principles to Improve the Conduct and Interpretation of Quantitative
Science*

March 7, 2016

+ twenty ‘dissenting’ commentaries

Wasserstein, R.L. and Lazar, N.A., 2016. ‘The ASA's statement on p-values: context, process, and purpose’, *The American Statistician*, DOI:10.1080/00031305.2016.1154108.

See also Christie Aschwanden at <http://fivethirtyeight.com/features/not-even-scientists-can-easily-explain-p-values/>

P-hacking (fishing for favourable p-values) and
HARKing (formulating the research Hypothesis
After the Results are Known);
Desire to achieve a sought for – or simply
publishable – result leads to fiddling with the data
points, the modelling assumptions, or the research
hypotheses themselves

Leamer, E. E. Tantalus on the Road to Asymptopia. *J. Econ. Perspect.* 24, 31–46 (2010).

Kerr, N. L. HARKing: Hypothesizing After the Results are Known. *Personal. Soc. Psychol. Rev.* 2, 196–217 (1998).

A. Gelman and E. Loken, “The garden of forking paths: Why multiple comparisons can be a problem, even when there is no ‘fishing expedition’ or ‘p-hacking’ and the research hypothesis was posited ahead of time,” 2013.

IN PRACTICE

Cargo-cult statistics and scientific crisis

ROYAL
STATISTICAL
SOCIETY
DATA · EVIDENCE · DECISIONS

ASA
AMERICAN STATISTICAL
ASSOCIATION

significance

The mechanical, ritualistic application of statistics is contributing to a crisis in science. Education, software and peer review have encouraged poor practice – and it is time for statisticians to fight back. By **Philip B. Stark** and **Andrea Saltelli**

An existential crisis?

Most observers have noted that the crisis has technical as well as ethical and behavioural elements which interact with one another – e.g. the ‘publish or perish’ obsession has an impact on selection bias – the tendency to favour positive over negative results

Bad science reproduces
better than the good sort

ROYAL SOCIETY
OPEN SCIENCE

rsos.royalsocietypublishing.org

Research



CrossMark
click for updates

Cite this article: Smaldino PE, McElreath R.

2016 The natural selection of bad science.

R. Soc. open sci. **3**:160384.

<http://dx.doi.org/10.1098/rsos.160384>

Received: 1 June 2016


Accepted: 17 August 2016

The natural selection of bad science

Paul E. Smaldino¹ and Richard McElreath²

¹Cognitive and Information Sciences, University of California, Merced, CA 95343, USA

²Department 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

[redacted] 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. [redacted]

[redacted] Improving the quality of research requires change at the institutional level.

Smaldino PE, McElreath R., 2016 The natural selection of bad science. R. Soc. open sci. 3: 160384. <http://dx.doi.org/10.1098/rsos.160384>

Bad science is 'sticky'

Article | **Open Access**  

Do rebuttals affect future science?

Jeannette A. Banobi , Trevor A. Branch, Ray Hilborn

First published: 30 March 2011 | <https://doi.org/10.1890/ES10-00142.1> | Cited by: 13

“We examined seven high-profile original articles and their rebuttals, finding that original articles were cited 17 times more than rebuttals, and that annual citation numbers were unaffected by rebuttals”

For Gigerenzer & Marewski statistics has
changed the nature all disciplines ...

... Creating a persistent surrogate
science based on worshipping P-values

Better to have no beliefs than to embrace
falsehoods... (→ F. Bacon's idols)

G. Gigerenzer and J. N. Marewski, "Surrogate Science," J. Manage., vol. 41, no. 2, pp. 421–440, Feb. 2015.

MBI: Magnitude-based inference:
persistent bad stats in sports research

MBI false positive rate two to six times
higher than in NHST (Null hypothesis significance testing)

Christie Aschwanden and Mai Nguyen, How Shoddy Statistics Found A Home In Sports Research, Fivethirtyeight, May 16, 2018, <https://fivethirtyeight.com/features/how-shoddy-statistics-found-a-home-in-sports-research/>

K. L. Sainani, The Problem with 'Magnitude-Based Inference,' Medicine & Science in Sports & Exercise (MSSE), p. 1, Apr. 2018.

Bad science in
bad journals?



frontiers

in Human Neuroscience

Prestigious Science Journals Struggle to Reach Even Average Reliability

“...an accumulating body of evidence suggests that methodological quality & reliability of published research works in several fields may be decreasing with increasing journal rank” (20 February, 2018)

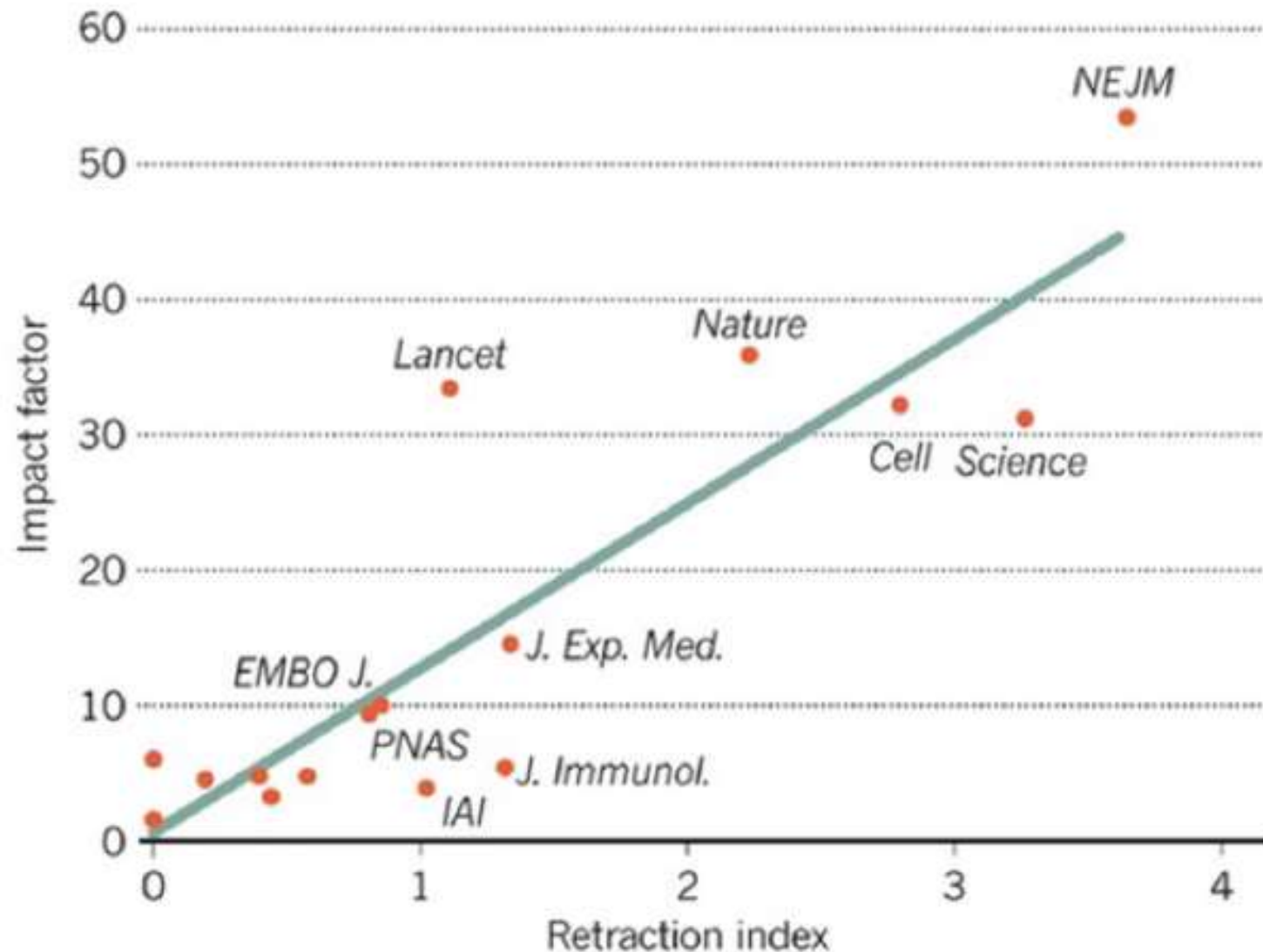
Cutting corners effect?



Björn Brembs*

RETRACTION RELATION

Journals with higher impact factors also have a higher rate of retractions.



Fang FC, Casadevall A and Morrison R (2011) Retracted science and the retraction index. *Infection and Immunity* 79(10): 3855–3859

The 'bad' in bad science is
not just methodological

Evidence based medicine hijacked to serve corporate agendas. “Under market pressure, clinical medicine has been transformed to finance-based medicine”
(David Sackett interviewed by J.P.A. Ioannidis)

J. P. A. Ioannidis, “Evidence-based medicine has been hijacked: a report to David Sackett,”
J. Clin. Epidemiol., vol. 73, pp. 82–86, May 2016.

Power asymmetries in the framing of issues:
those who have the deepest pockets marshal
the best evidence → Instrumental use of
quantification to obfuscate

A. Saltelli and M. Giampietro, “What is wrong with evidence based policy, and how can it be improved?,” *Futures*, vol. 91, pp. 62–71, Feb. 2017.

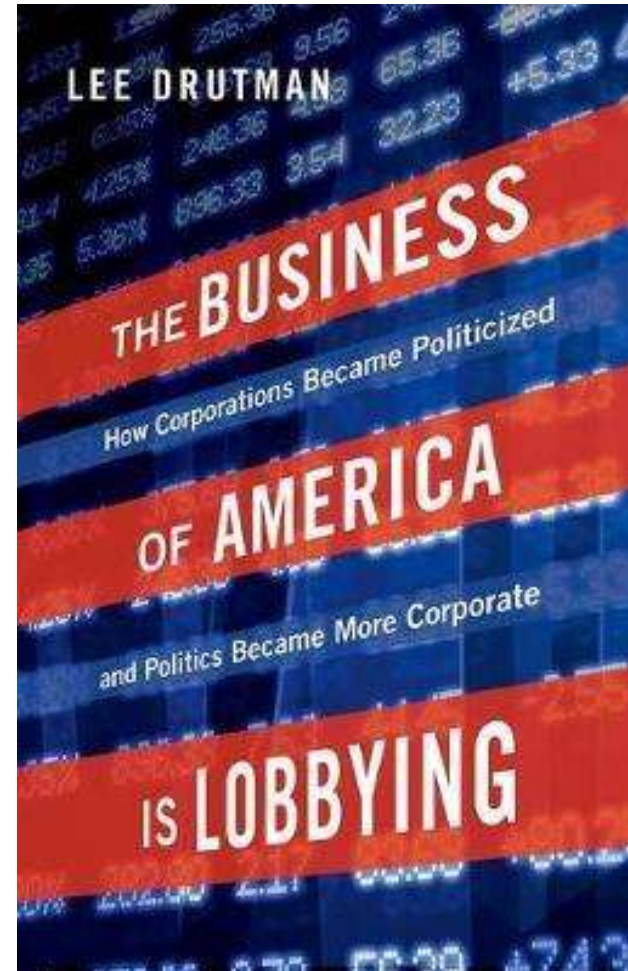
A. Saltelli and S. Funtowicz, “What is science’s crisis really about?,” *Futures*, vol. 91, pp. 5–11, 2017.

Science and lobbying

(US) corporate interest can spend on lobbying
\$34 for each dollar spent by diffuse interest
and unions combined



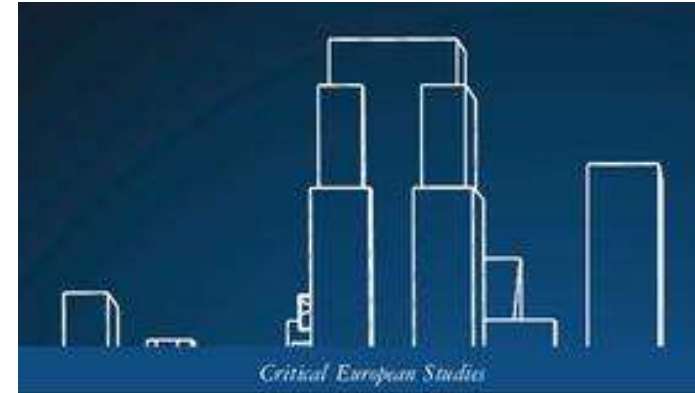
Lee Drutman



(EU) the Brussels concentration effect



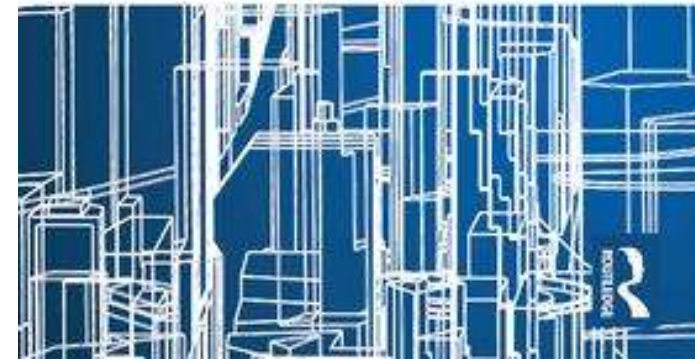
Sylvain Laurens



LOBBYISTS AND BUREAUCRATS IN BRUSSELS

CAPITALISM'S BROKERS

Sylvain Laurens



For both scholars a salient aspect of this power is lobbyists' access to more and better disseminated science

→ Urgent a remedial action to give citizens and political staffers some structured mechanism of access to independent scientific evidence (L. Drutman)

See discussion on OTA in Adam Keiper, 2004, Science and Congress, The New Atlantis, <https://www.thenewatlantis.com/publications/science-and-congress>



“HIS MASTER’S VOICE”

REG. U.S. PAT. OFF.

“Regulatory policy is increasingly made with the participation of experts, especially academics. A regulated firm or industry should be prepared whenever possible to co-opt these experts. This is most effectively done by identifying the leading expert in each relevant field and hiring them as consultants or advisors or giving them research grant or the like”

Owen, B. M., & Braeutigam, R., 1978 *The regulation game, : Strategic Use of the Administrative Process*, Ballinger Press

“This activity requires a modicum of finesse; it must not be too blatant, for the experts themselves must not recognize that they have lost their objectivity and freedom of action”

Thanks to Erik Millstone

Owen, B. M., & Braeutigam, R., 1978 The regulation game, : Strategic Use of the Administrative Process, Ballinger Press

Unintended effects of reforms

Good intentions going bad

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

Incentive

“Researchers rewarded for increased number of publications.”

Intended effect

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

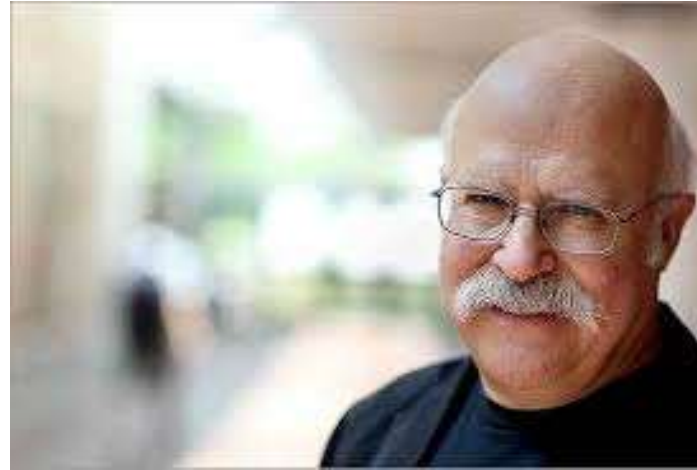
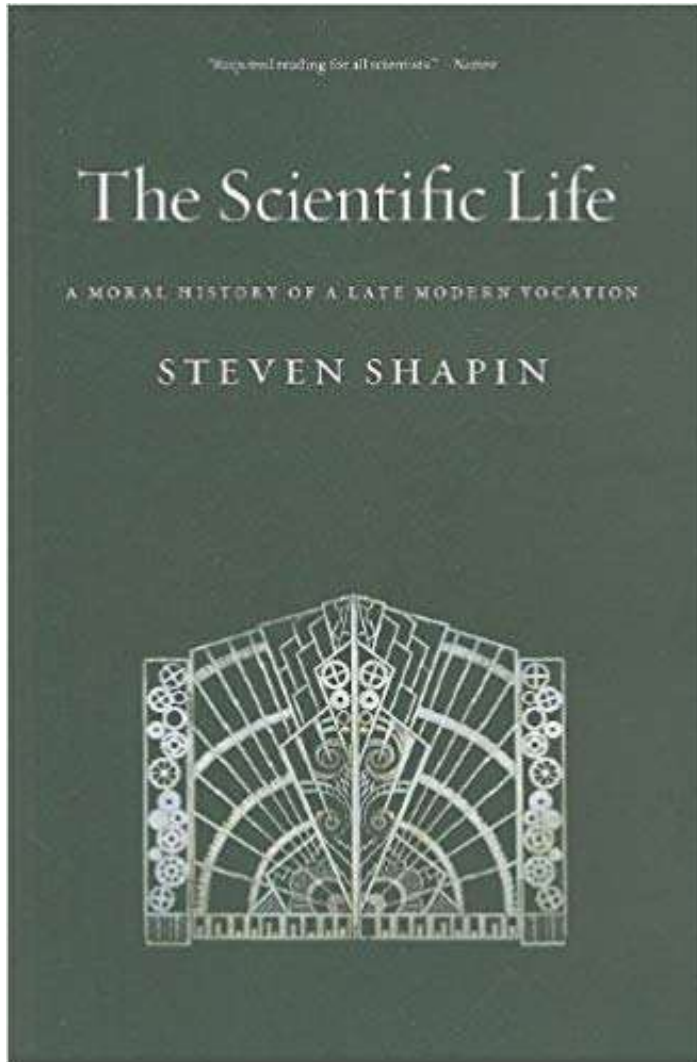
Academic Research in the 21st Century: Maintaining Scientific Integrity in a Climate of Perverse Incentives and Hyper-competition, Marc A. Edwards and Siddhartha Roy, ENVIRONMENTAL ENGINEERING SCIENCE, 34(1), 2017

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

See also P. Mirowski, “The future(s) of open science,” Soc. Stud. Sci., vol. 48, no. 2, pp. 171–203, Apr. 2018.

Lost ethos?



Steven Shapin

Is scientists' civility to each other what holds the venture together?

But someone disagrees: J.R. Ravetz, *Morals and manners in modern science*, *Nature*, 457(5), 662–663.

Renewable sources
100% of energy in US by
2050, says Jacobson...

...and sues for \$10-
million a dissenter



Los Angeles Times

A Stanford professor drops his ridiculous defamation lawsuit against his
scientific critics

<http://www.latimes.com/business/hiltzik/la-fi-hiltzik-jacobson-lawsuit-20180223-story.html>

World court should rule on climate science to quash sceptics, says Philippe Sands

International Court of Justice ruling would settle the scientific dispute and pave the way for future legal cases on climate change, says high-profile lawyer

Adam Vaughan

 @adamvaughan_uk


Friday 18 September 2015 10.34 BST



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 Philippe Sands QC says a court ruling would carry more weight with public opinion than science alone.
Photograph: Antonio Zazueta Olmos/Antonio Olmos

Not all disciplines
the same

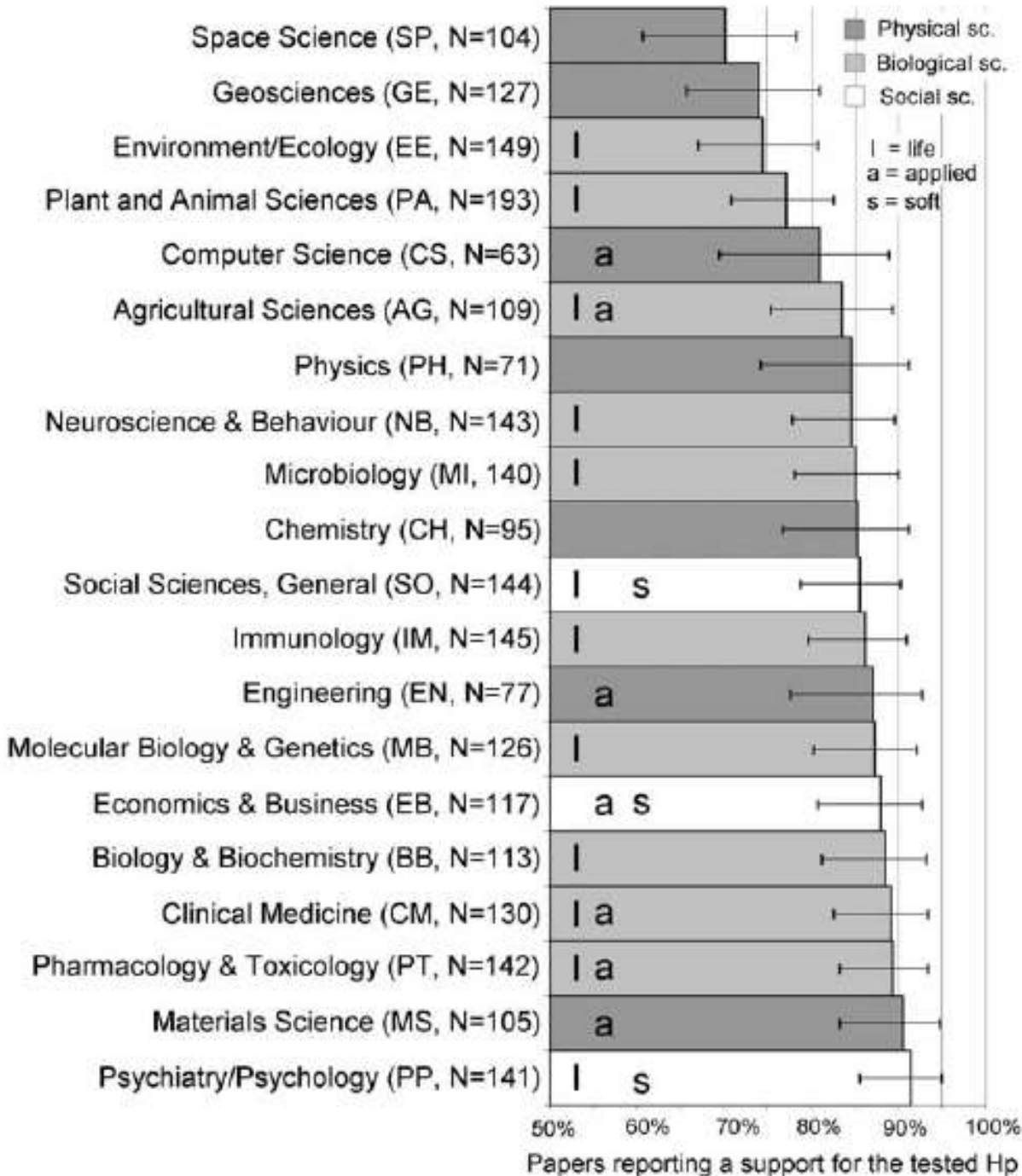
“Positive” Results Increase Down the Hierarchy of the Sciences

Daniele Fanelli*

INNOGEN and ISSI-Institute for the Study of Science, Technology & Innovation, The University of Edinburgh, Edinburgh, United Kingdom

“odds of reporting a positive result ~5 times higher among papers in the disciplines of Psychology and Psychiatry and Economics and Business than Space Science”

April 7, 2010



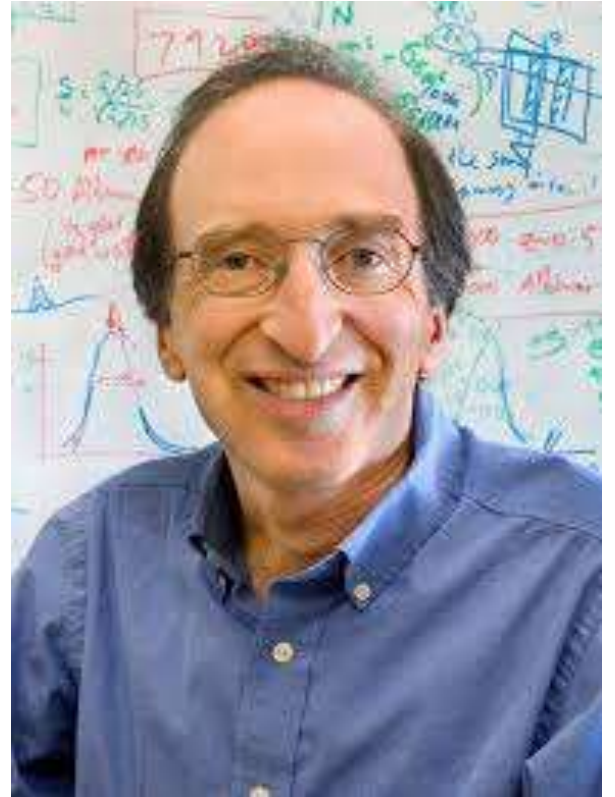
Physics as a model:

Following several high-profile errors, the **particle physics community** now invests **great effort** into intensive **checking and re-checking of data** prior to publication. **By filtering results through independent working groups**, physicists are encouraged to criticise.

R. Horton, “Offline: What is medicine’s 5 sigma?,” **Lancet**, vol. 385, p. 1380, 2015.

Saul Perlmutter, an astrophysicist at the University of California, Berkeley.

“Science is an ongoing race between our inventing ways to fool ourselves, and our inventing ways to avoid fooling ourselves.



Saul Perlmutter

R. Nuzzo, “How scientists fool themselves – and how they can stop,”
Nature, vol. 526, no. 7572, pp. 182–185, Oct. 2015.

From science crisis to
science wars?

A new breed of science wars, predicted in 2016



January 27, 2017

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

Andrea Saltelli, *University of Bergen* and Silvio Oscar Funtowicz, *University of Bergen*

Scientists must bear some responsibility for the post-truth era and the current crisis in democracy.



November 16, 2016

Science wars in the age of Donald Trump

Andrea Saltelli, *University of Bergen* and Silvio Oscar Funtowicz, *University of Bergen*

Is the election of Donald Trump going to reignite a futile war between science and anti-science?

What the present science war looks like:

Opinion: Is science really facing a reproducibility crisis, and do we need it to?

Daniele Fanelli

PNAS March 12, 2018. 201708272; published ahead of print March 12, 2018. <https://doi.org/10.1073/pnas.1708272114>



“The new “science is in crisis” narrative is not only empirically unsupported, but also quite obviously counterproductive. Instead of inspiring younger generations to do more and better science, it might foster in them cynicism and indifference. Instead of inviting greater respect for and investment in research, it risks discrediting the value of evidence and feeding antiscientific agendas.”

What the present science war looks like:

Crisis or self-correction: Rethinking media narratives about the well-being of science

Kathleen Hall Jamieson

PNAS March 13, 2018. 115 (11) 2620-2627, published ahead of print March 12, 2018. <https://doi.org/10.1073/pnas.1708276114>



“Because those whose work is prominently cited to certify that science is broken [Ioannidis, Oransky, Begley, and Nosek among them] are spearheading efforts to solve identified problems, their work is evidence of the resilience of science”

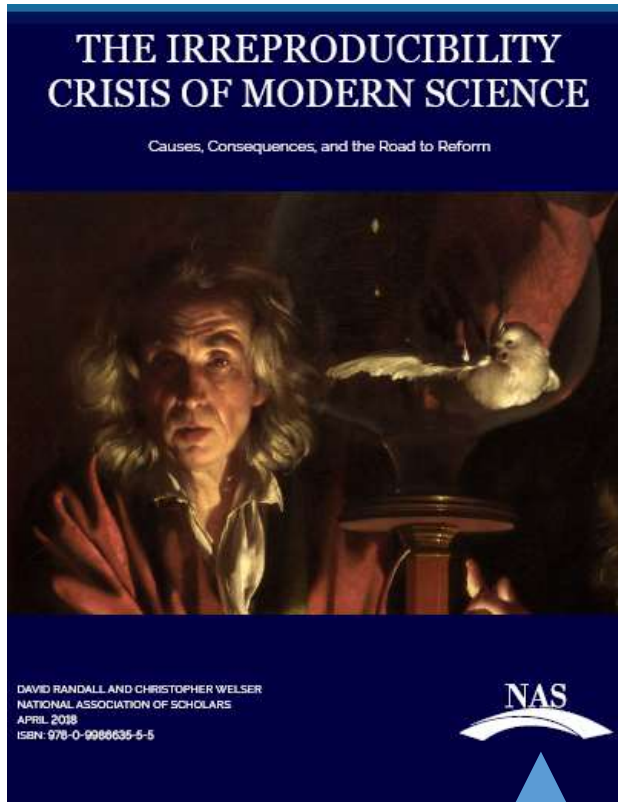
“Even well-intentioned academics, perceiving an attack on science, may be tempted to take an unproductive, hand-waving defensive position: ‘We have no problem with reproducibility’, ‘everything is fine’, ‘science is making progress’.”



John P. A.
Ioannides

J. P. A. Ioannidis, “All science should inform policy and regulation,” *PLOS Med.*, vol. 15, no. 5, p. e1002576, May 2018.

On the other side: (conservatives, corporations)



Crisis? Yes, due to progressives' assault on higher education with ideologies such as “neo-Marxism, radical feminism, historicism, post-colonialism, deconstructionism, post-modernism, liberation theology”

National Association of Scholars

THE IRREPRODUCIBILITY CRISIS OF MODERN SCIENCE

Causes, Consequences, and the Road to Reform



DAVID RANDALL AND CHRISTOPHER WELSER
NATIONAL ASSOCIATION OF SCHOLARS
APRIL 2018
ISBN: 978-0-9988635-5-5



“Congress should pass an expanded Secret Science Reform Act to prevent government agencies from making regulations based on irreproducible research ...”

THE GLOBAL WARMING
POLICY FOUNDATION

Director: Dr Benny Peiser



Common Sense on
Climate Change

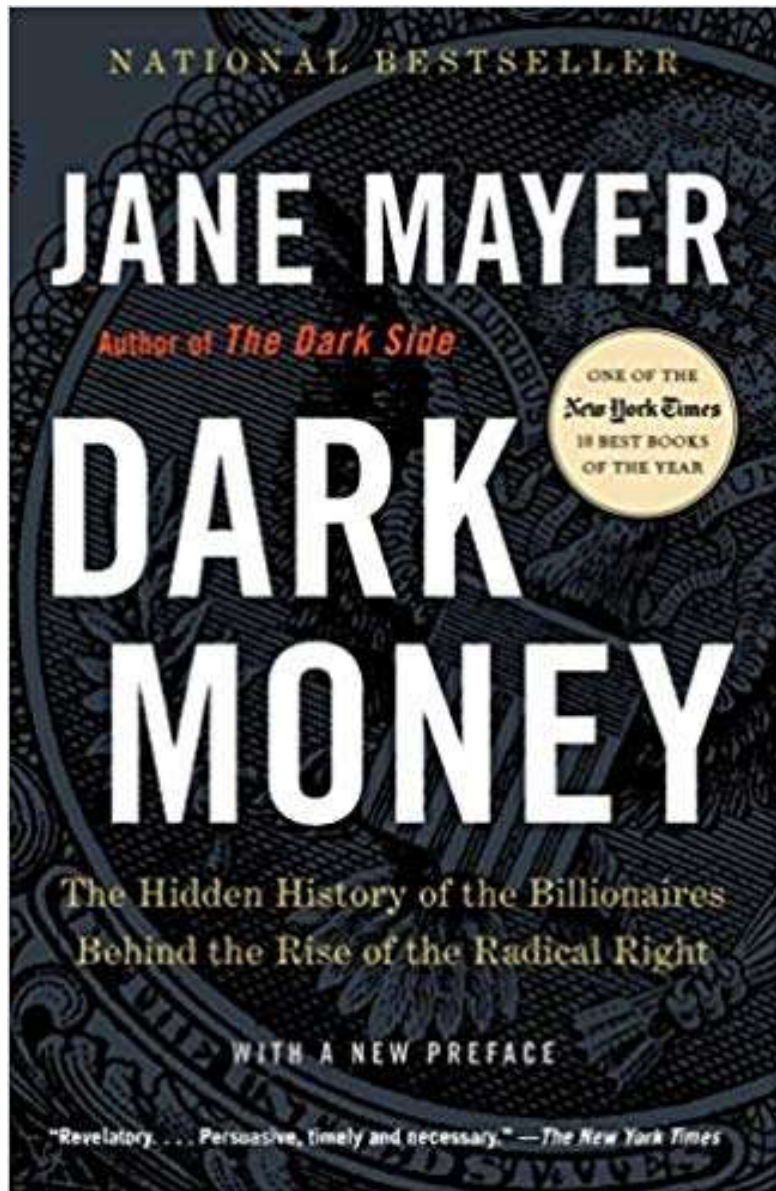
PEER REVIEW

Why skepticism is essential

Donna Laframboise

Date: 27/10/16 | Global Warming Policy Foundation

“If half of published, peer-reviewed papers ‘may simply be untrue’, half of the papers cited by the IPCC may also be untrue...”



Chapter 8, The fossils, on Koch brothers against climate

Gaming the crisis, also in Europe

Please cite this paper as:

OECD (2015), "Scientific Advice for Policy Making: The Role and Responsibility of Expert Bodies and Individual Scientists", *OECD Science, Technology and Industry Policy Papers*, No. 21, OECD Publishing, Paris.
<http://dx.doi.org/10.1787/5js3311jcpwb-en>



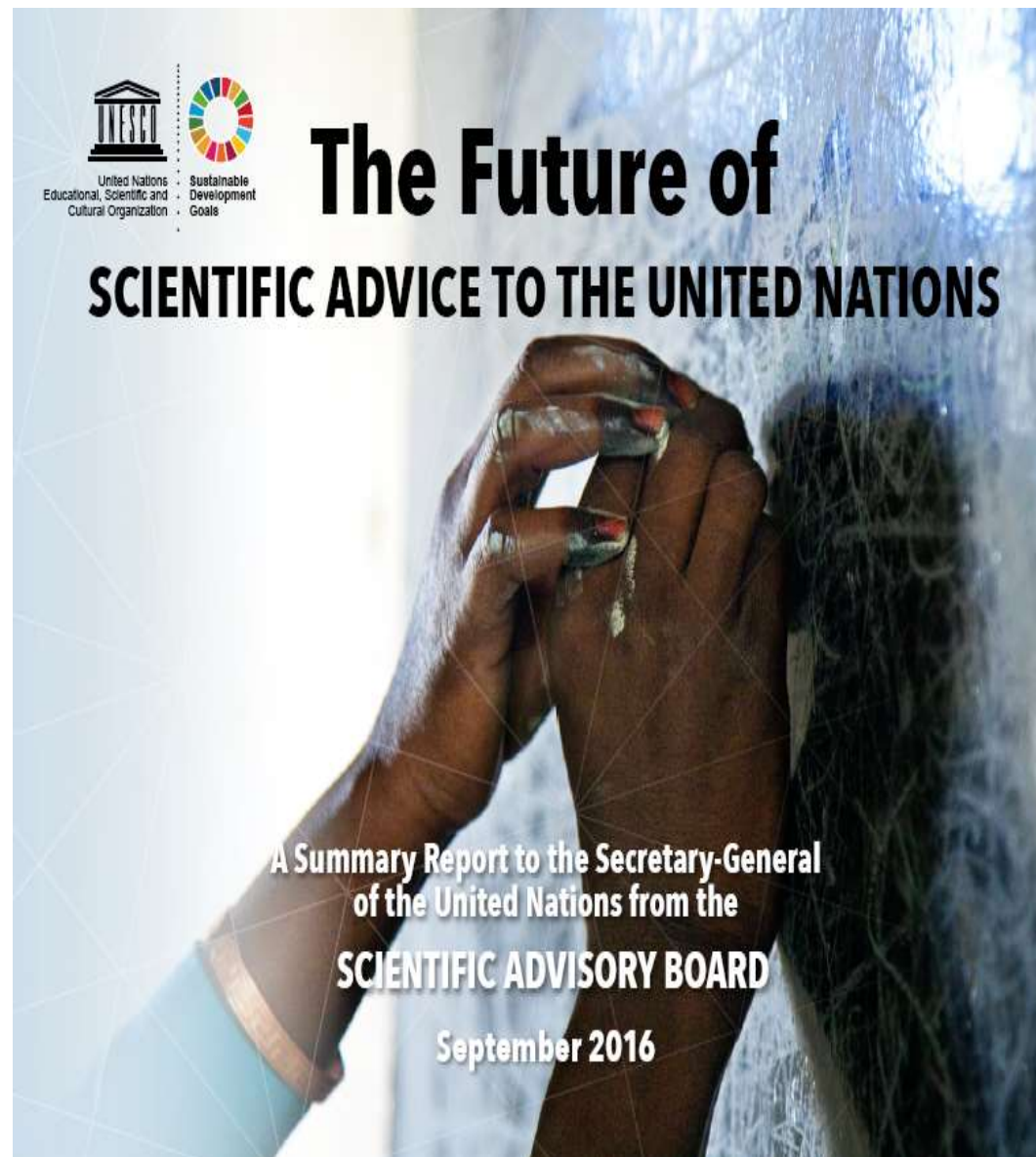
OECD Science, Technology and Industry
Policy Papers No. 21

Scientific Advice for Policy Making

THE ROLE AND RESPONSIBILITY OF EXPERT
BODIES AND INDIVIDUAL SCIENTISTS

OECD

2015

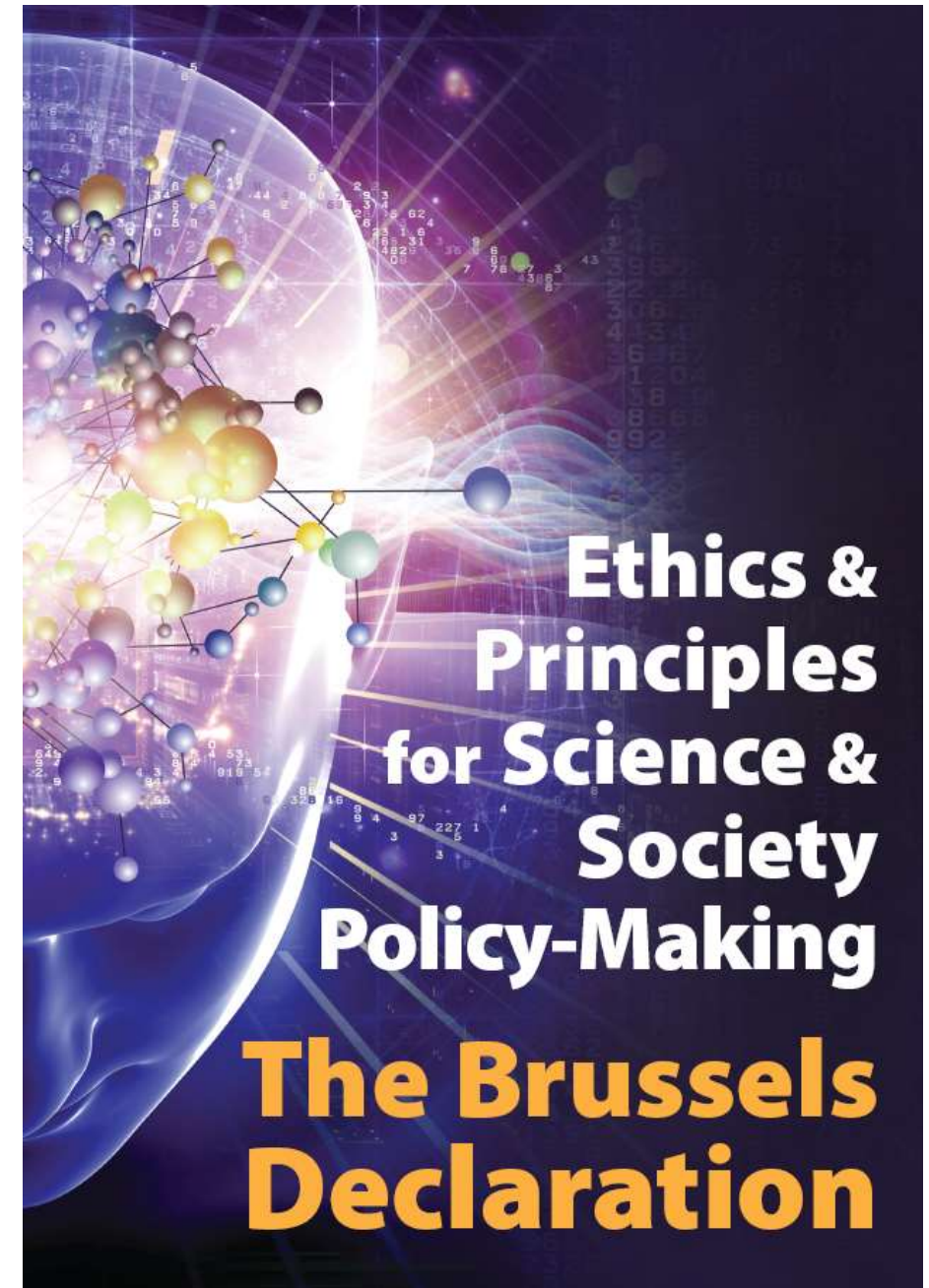


2016

Adopted Feb. 2017 at AAAS
symposium, 5y gestation

Hundreds of experts involved

- No crisis
- No effect of crisis on
evidence based policy



… extensive involvement of tobacco and alcohol industry actors… the Declaration offers potential to serve as a vehicle for advancing the vested interests of corporate sectors in public policymaking and appears to have been regarded in this way by a range of organisations related to the alcohol industry

J. McCambridge, M. Daube, and M. McKee, “Brussels Declaration: a vehicle for the advancement of tobacco and alcohol industry interests at the science/policy interface?,” *Tob. Control*, p. tobaccocontrol-2018-054264, Jun. 2018.

L. Bero, “Ten tips for spotting industry involvement in science policy.,” *Tob. Control*, p. tobaccocontrol-2018-054386, Jun. 2018.

A left–right divide in the reading of the present predicaments is unhelpful and dangerous

The same for a too complacent attitude of science institutions toward corporate interests

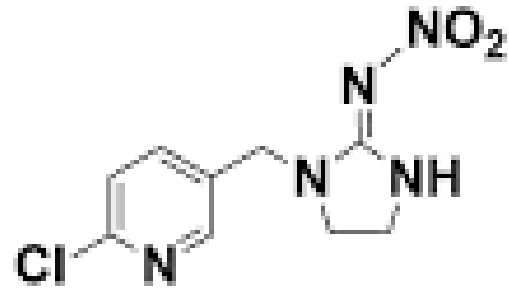
Ewen Callaway, 2018, CRISPR plants now subject to tough GM laws in European Union, Top court's ruling threatens research on gene–edited crops in the bloc, Nature, doi: 10.1038/d41586–018–05814–6, <https://www.nature.com/articles/d41586–018–05814–6>

Alternative reading of the crisis: structural contradictions have emerged in modern science

Addressing them should be the focus of our attention

J.R. Ravetz, Postnormal Science and the maturing of the structural contradictions of modern European science, *Futures*, 43(2), (2011), pp. 142-148.

Shoddy science, entrepreneurial science, reckless science, and dirty science (Ravetz, 1971)



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

Contradictions between:

- the public image of science and its roles;
- real and acknowledged uncertainty in science's pronouncements;
- technological progress and technological risk

...

J.R. Ravetz, Postnormal Science and the maturing of the structural contradictions of modern European science, *Futures*, 43(2), (2011), pp. 142-148.

What is science, or who is a scientist?



Mark Edwards,
Aleksandr Kogan

Paolo Macchiarini,
Rick Mishkin



Where to?

- Reformation
- Collapse
- Techno-split

Reformation?

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



Silvio Funtowicz

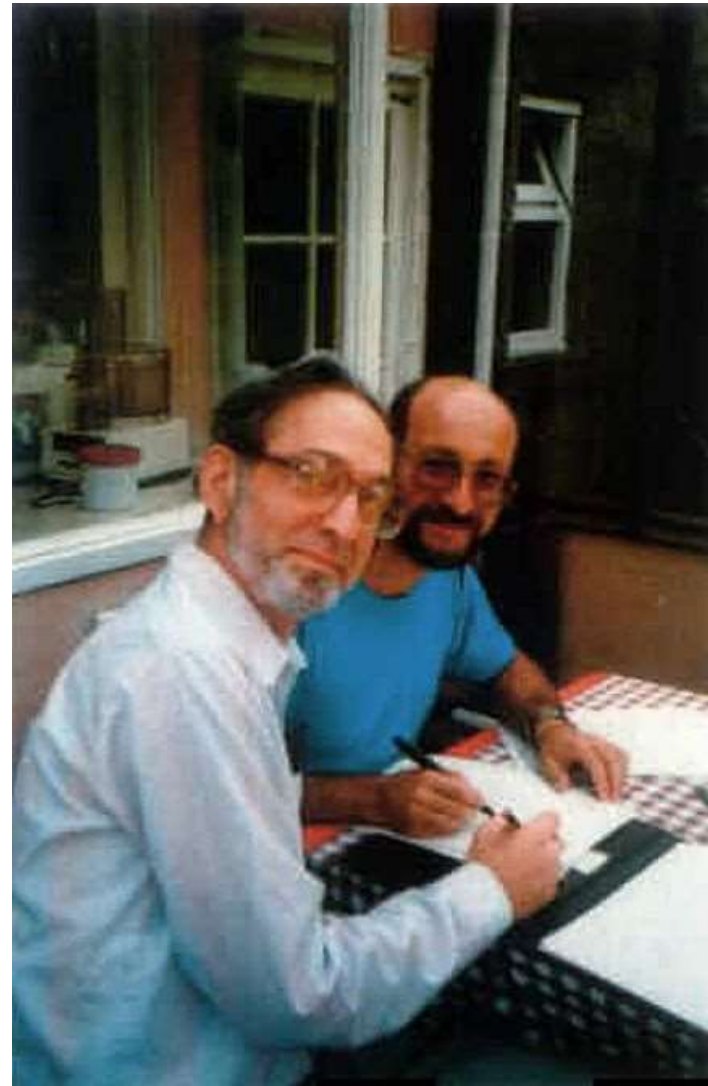
The internet the new press?

Reformation from combination of
corruption, indignation and
revolutionary technology

Is the same possible for
science?



Silvio Funtowicz



Funtowicz and Ravetz, Sheffield ~1988

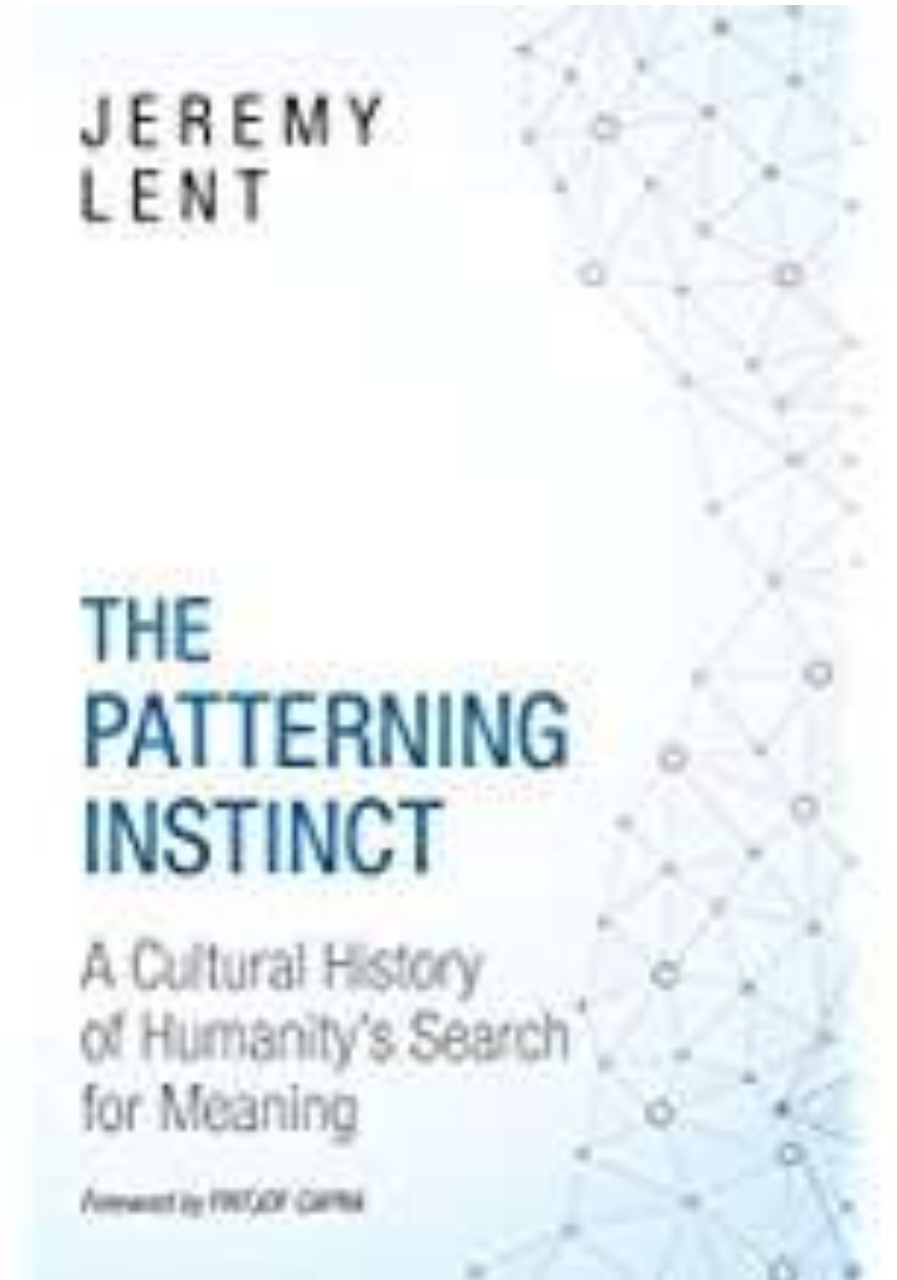
Collapse?

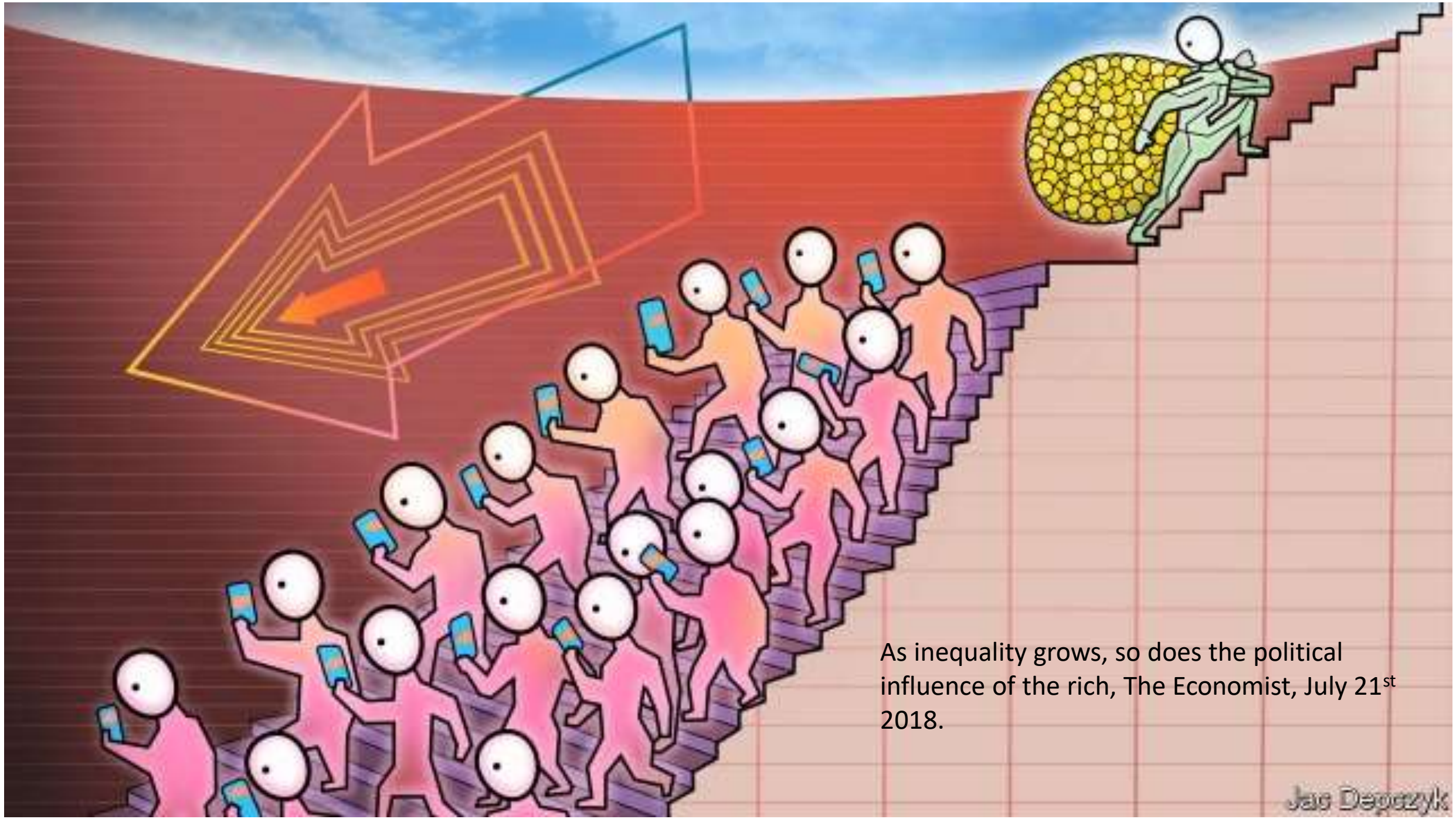
Planetary boundary or reckless science
(Insectageddon)

Conspiracy theories obfuscate actual
misdeeds of authorities and corporations

...

Techno-split (*sensu* Jeremy Lent)





As inequality grows, so does the political influence of the rich, *The Economist*, July 21st 2018.

Techno-split?



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

<https://www.wired.com/2017/01/john-arnold-waging-war-on-bad-science/>

Science' reproducibility crisis: a political and industrial battleground

Conservatives and corporate interests: weaken regulations

Their opponents: deny the existence of a crisis

This right-left divide unhelpful and dangerous

Structural contradictions have matured in modern science

Time we address them

The End

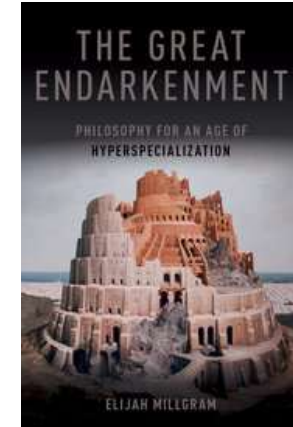


@andreasaltelli

Extra slides

Derek de Solla Price ↔ Elijah Millgram

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



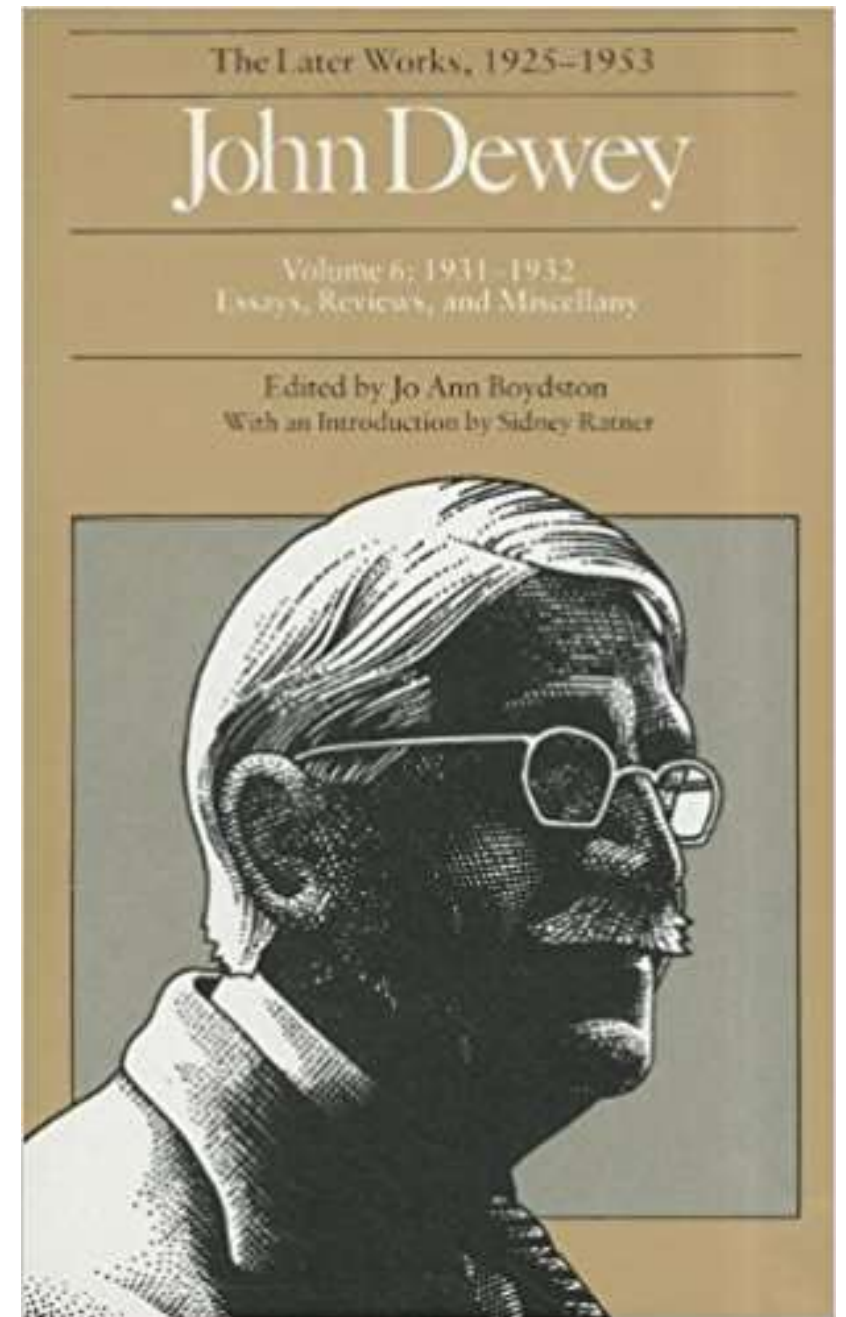
Describes a world in which all knowledge and products are the result of some form of extremely specialized expertise, and in which expertise is itself highly circumscribed, since experts depend in turn on other experts whose knowledge claims and styles of argumentation cannot be exported from one discipline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

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

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



“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.

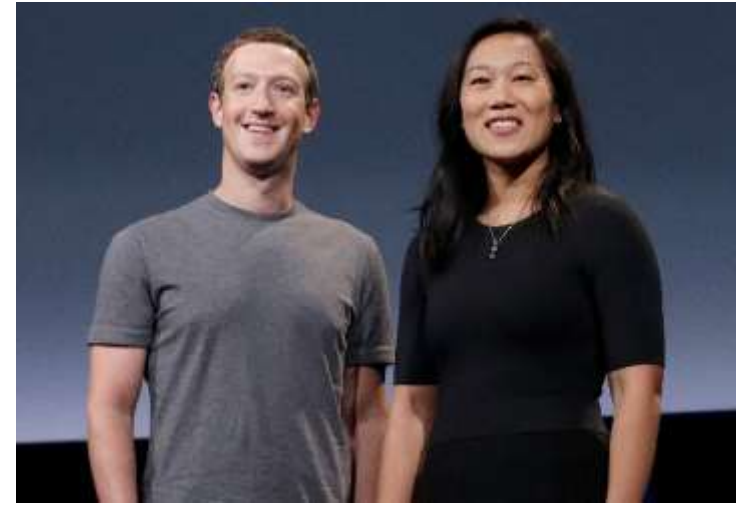


Bill & Melinda Gates

… 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>

Different cultures, different reactions

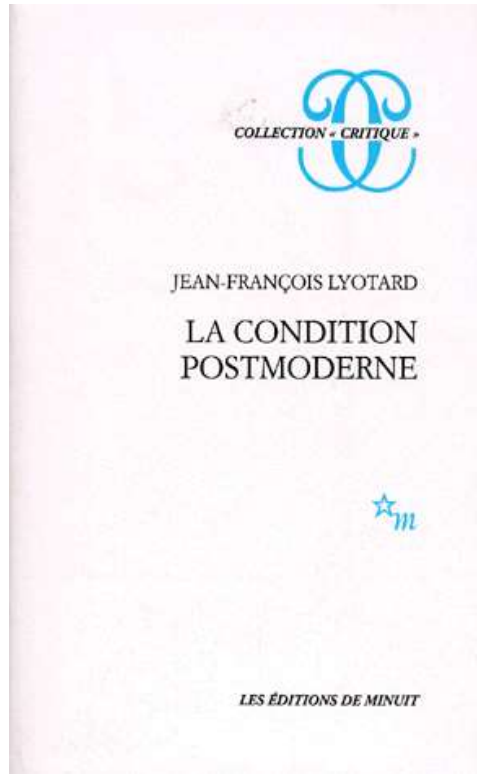


Aaron Swartz, 1986 – 2013

<https://www.rollingstone.com/culture/news/the-brilliant-life-and-tragic-death-of-aaron-swartz-20130215>

The last word to the
post moderns

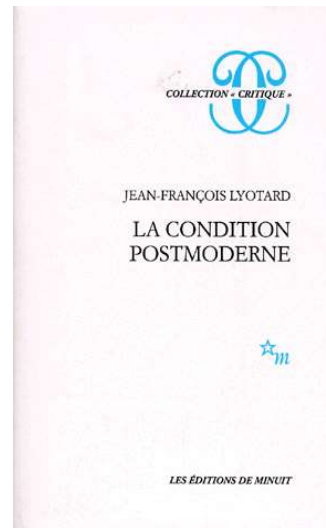
“The question of the legitimacy of science has been indissociably linked to that of the legitimation of the legislator since the time of Plato.



Jean-François
Lyotard

Lyotard, J.-F. 1979. La Condition postmoderne. Rapport sur le savoir, Paris : Minuit.

From this point of view, the right to decide what is true is not independent of the right to decide what is just, [...] there is a strict interlinkage between the kind of language called science and the kind called ethics and politics ...”



Jean-François
Lyotard

Lyotard, J.-F. 1979. La Condition postmoderne. Rapport sur le savoir, Paris : Minuit.

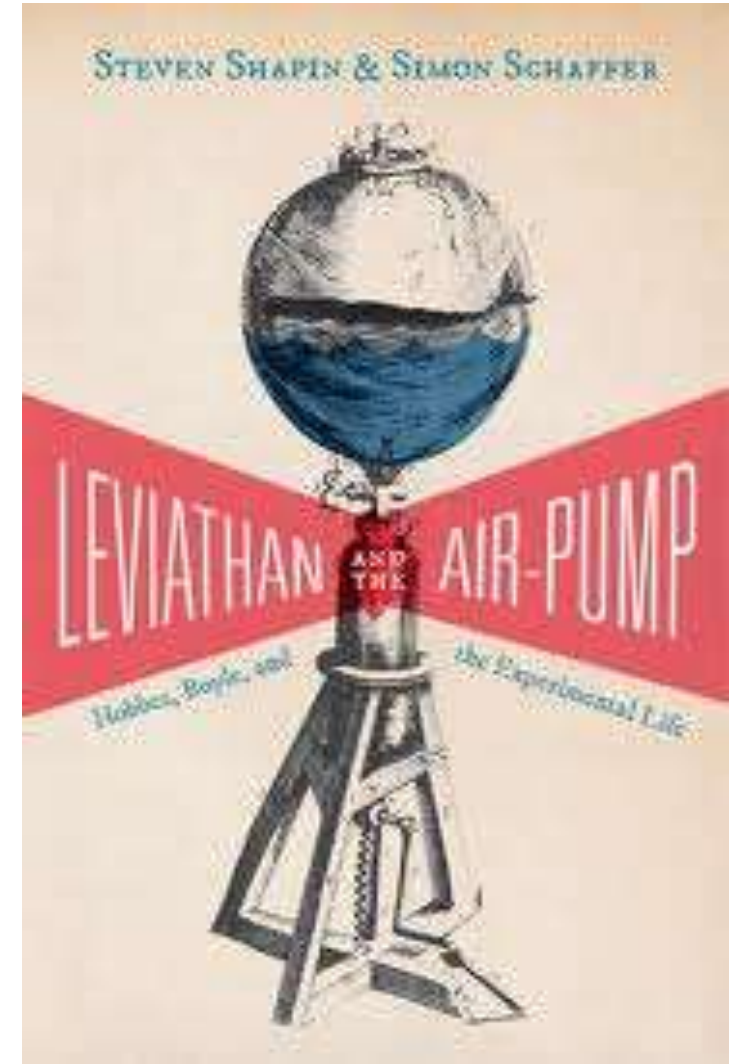
“Solutions to the problem of knowledge are solutions to the problem of social order.

[...] Trust in Science and trust in the prevailing social order are linked.”



Shapin, S., Schaffer, S., 1985, Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life, Princeton, 2011 Edition

Establishing ‘matter of facts’
under controlled ‘laboratory’
experiments before witnesses
as a way to subtract the
discourse about knowledge
from religious squabbles ...

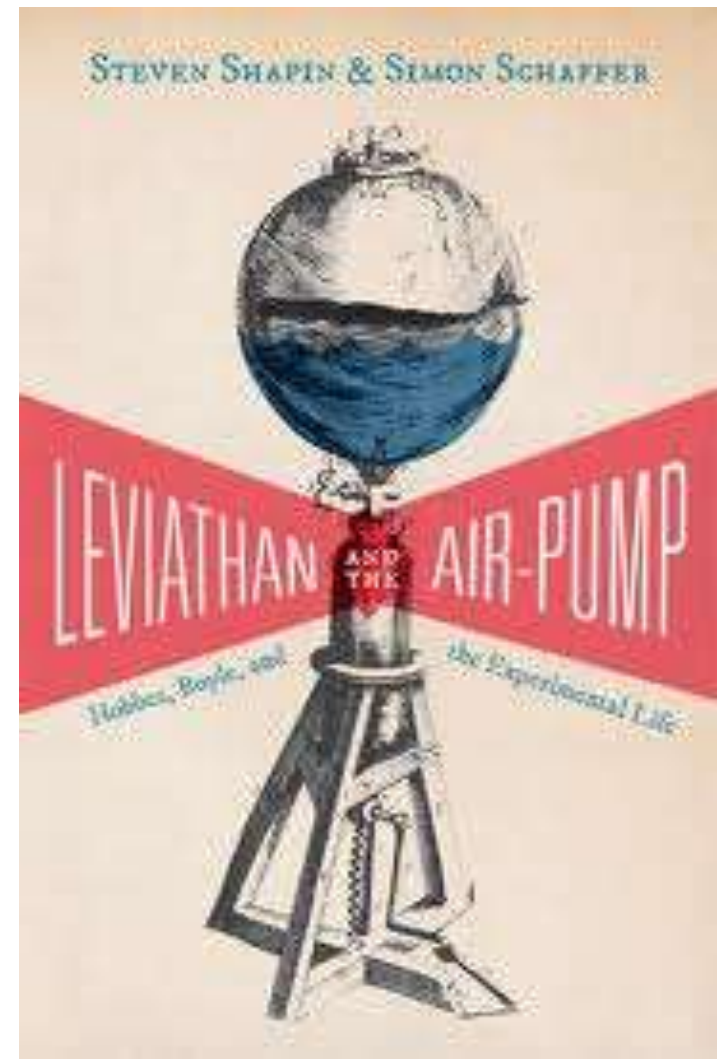


Shapin, S., Schaffer, S., 1985, Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life, Princeton, 2011 Edition

Shapin and Schaffer's book inspired Bruno Latour's 'Nous n'avons jamais été modernes', 1991, and was 'hot' during the 'science wars'.



Bruno Latour



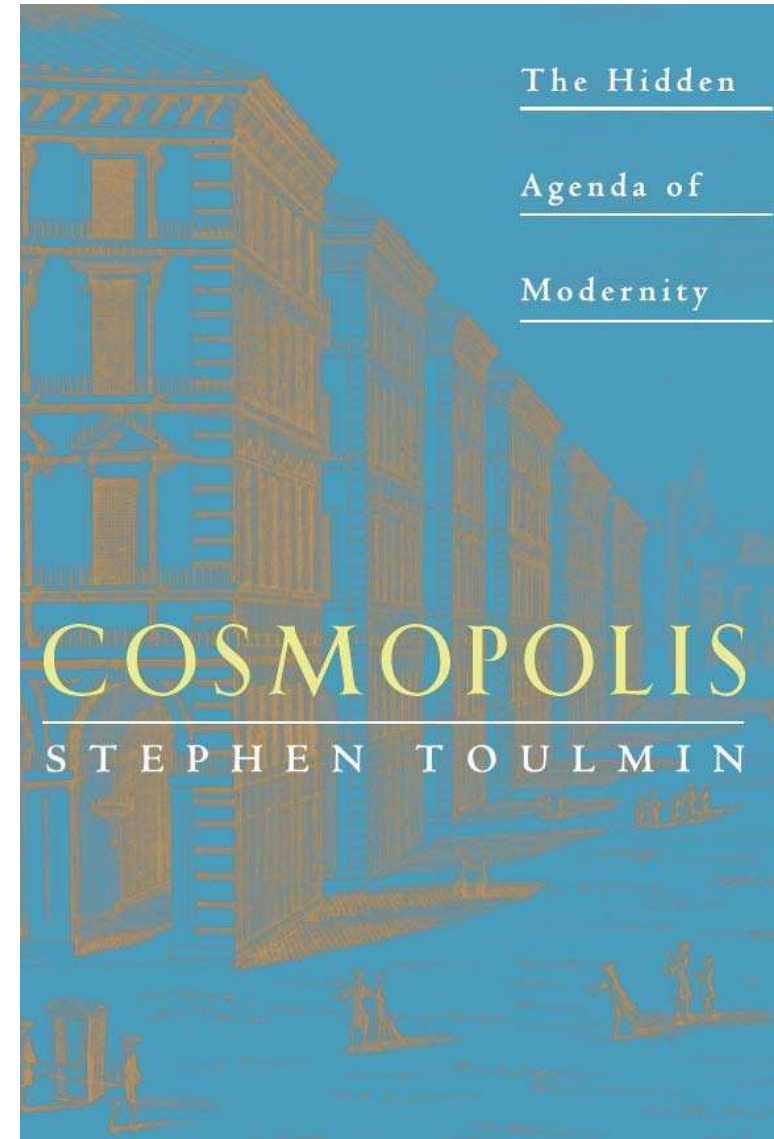
Latour, B., 1991, *Nous n'avons jamais été modernes*, Editions La découverte, 1993; *We Have Never Been Modern*. Cambridge, Harvard UP.

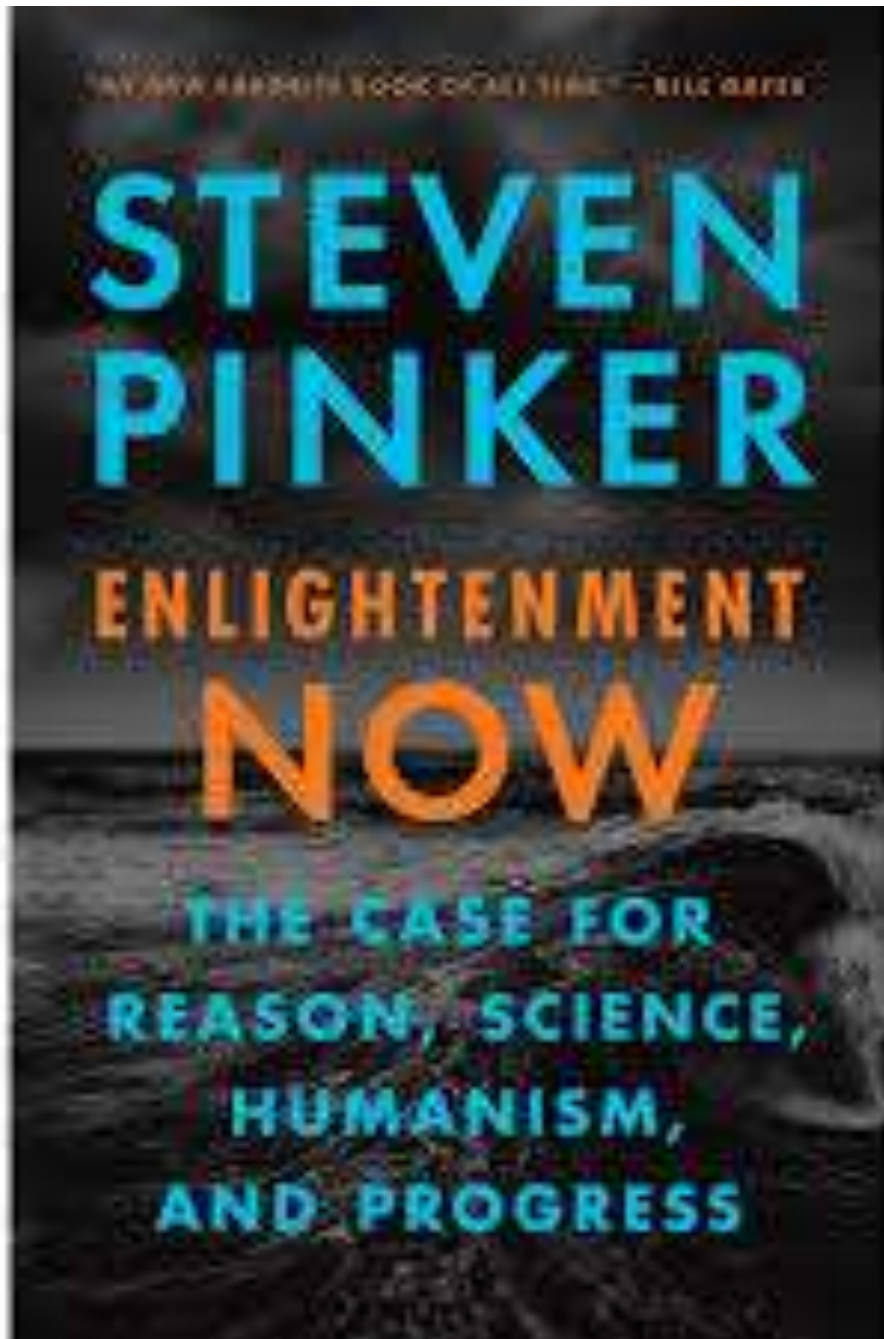
Stephen Toulmin: Modernity as a counter-Renaissance; Descartes versus Montaigne; the delusion of a Newtonian view of society



Stephen Toulmin

Stephen Toulmin, 1990, *Cosmopolis: The Hidden Agenda of Modernity*, The University of Chicago Press





“a monumental apologia for a currently fashionable version of Enlightenment thinking”
(John Gray, New Statesman)

<https://www.newstatesman.com/culture/books/2018/02/unenlightened-thinking-steven-pinker-s-embarrassing-new-book-feeble-sermon>

See also Gunnar Skirbekk’s idea of half-modern

More reading



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

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See a review by
Deepanwita Dasgupta
(2017) in International
Studies in the Philosophy
of Science, 31:1, 108–110.

