

Scientific integrity

Andrea Saltelli

Presentation for the course Gestión y Evaluación de la Ciencia, held by **Michele Catanzaro** & co-organized by Universitat Autònoma de Barcelona (UAB), Universidad Autónoma de Madrid (UAM) and Universidad Carlos III de Madrid



UAB Campus September 29 2023

Where to find this talk: www.andreasaltelli.eu



HOME ABOUT ME PUBLICATIONS NEWS & VIDEOS RESOURCES



August 25 2023: The politics of modelling is out!



Praise for the volume

"A long awaited examination of the role —and obligation —of modeling."

Nassim Nicholas Taleb, Distinguished Professor of Risk Engineering, NYU Tandon School of Engineering. Author, of the 5 -volume series *Incerto*.

"A breath of fresh air and a much needed cautionary view of the ever-widening dependence on mathematical modeling."

Orrin H. Pilkey, Professor at Duke University's Nicholas School of the Environment, co-author with Linda Pilkey-Jarvis of *Useless Arithmetic: Why Environmental Scientists Can't Predict the Future*, Columbia University Press 2009.

"The methods by which power insinuates itself

Mastodon Toots by

[@AndreasSaltelli](https://mastodon.social/@AndreasSaltelli)



AndreaSaltelli

2023/8/28 11:24

August 26 Podcast (16m) - interview for ABC NET RADIO, AUS: Assumptions and consequences: the politics of modelling, Guests: Ehsan Nabavi and Andrea Saltelli, Producer - Chris Bullock.

abc.net.au/listen/programs/sun

View on mstdn.social

- Different integrities
- Merton
- Open Science, Paul A. David
- ~~Mirowski~~
- Toulmin
- Conner
- Zilsel
- Hessen
- Laurens, Drutman
- Declining creativity
- Predatory publishers
- Reproducibility crisis
- Scientific Publishing
- Donations
- Grants
- Lotteries
- Borrowed plumes
- ~~The immodest scientist~~
- Reviewer-coerced citations
- Salaries
- Science Wars

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Innovations in Education and Teaching International >
Latest Articles

Submit an article Journal homepage

Research Article

Teaching scientific research integrity: A case study

Andrea Saltelli  

Published online: 24 Jul 2023

 Cite this article  <https://doi.org/10.1080/14703297.2023.2237949>

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 Full Article

 Figures & data

 References

 Citations

 Metrics

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The plan: follow the three meanings of the word integrity found in the Webster dictionary

- Norms
- Function
- Completeness



Definition of *integrity*

1 : firm adherence to a code of especially moral or artistic values : incorruptibility

2 : an unimpaired condition : soundness

3 : the quality or state of being complete or undivided : completeness



Examples

“Firm adherence to a code of especially moral or artistic values; incorruptibility”

➔ ‘a person of a remarkable integrity’



Examples

“An unimpaired condition, soundness”

→ ‘the reactor vessel has not lost its integrity’



Examples

“The quality or state of being complete or undivided; completeness”

➔ ‘the manuscript has arrived to us in its integrity’



Definition of *integrity*

1 : firm adherence to a code of especially moral or artistic values : incorruptibility

As in 'a person of a remarkable integrity'

The ethos of open science:
CUDOS, by R.K. Merton, a
system of universal norms



Robert K. Merton

R. Merton, *The sociology of science: Theoretical and empirical investigations*, 1973.

Communalism – the common ownership of scientific discoveries, according to which scientists give up intellectual property rights in exchange for recognition and esteem (Merton actually used the term Communism, but had this notion of communalism in mind, not Marxism);

Universalism – according to which claims to truth are evaluated in terms of universal or impersonal criteria, and not on the basis of race, class, gender, religion, or nationality;

Disinterestedness – according to which scientists are rewarded for acting in ways that outwardly appear to be selfless;

Organized Skepticism – all ideas must be tested and are subject to rigorous, structured community scrutiny.

Journal of Empirical Research on Human Research Ethics

Normative Dissonance in Science: Results from a National Survey of U.S. Scientists

Melissa S. Anderson, Brian C. Martinson, Raymond De Vries

First Published December 1, 2007 | Research Article | [Find in PubMed](#)

<https://doi.org/10.1525/jer.2007.2.4.3>

survey responses from 3,247 mid- and early-career scientists who had research funding from the U.S. National Institutes of Health

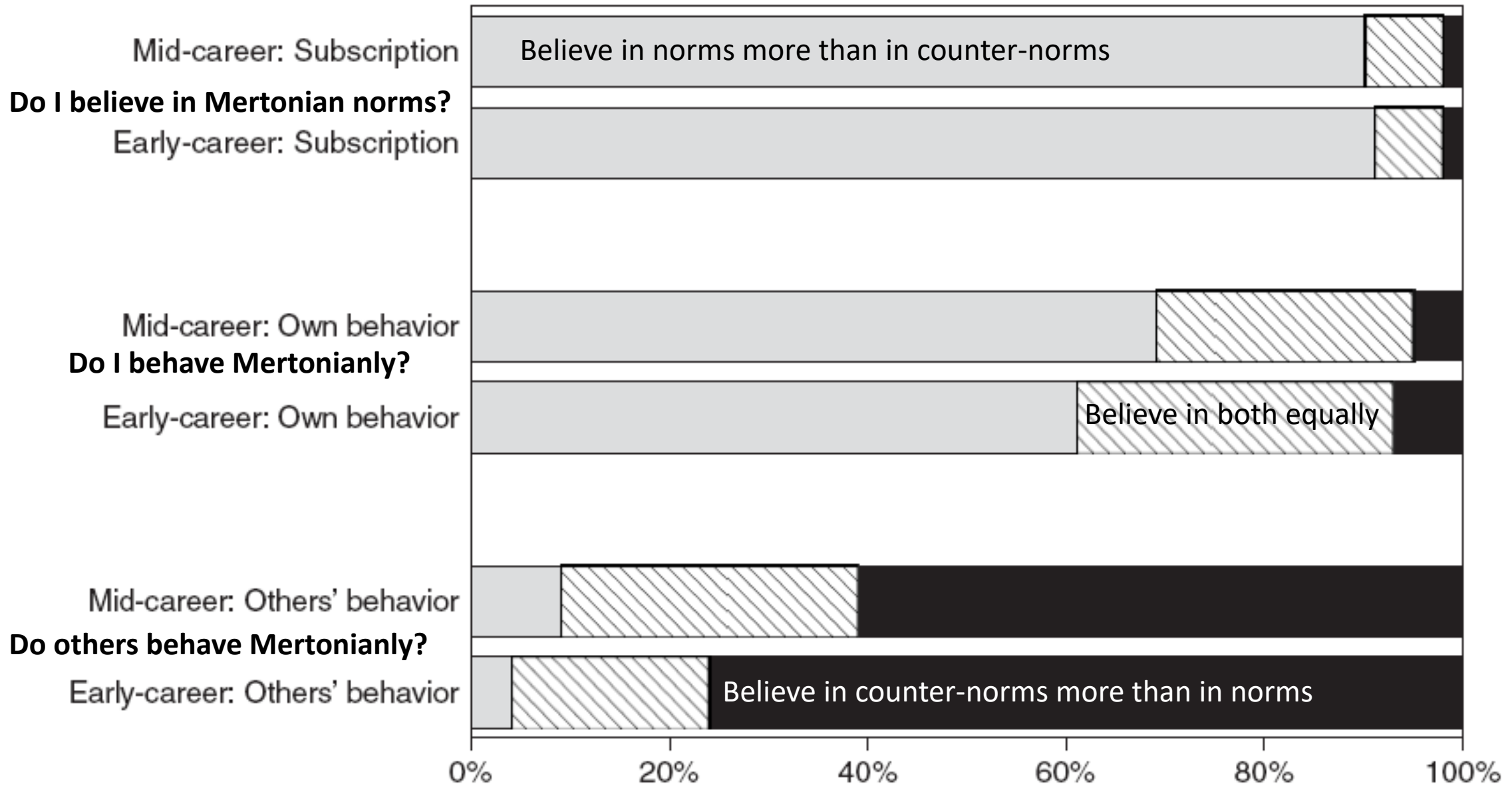


FIG. 3. Norm versus Counternorm Scores: Percent with Norm > Counternorm (dotted), Norm = Counternorm (striped), Norm < Counternorm (solid).



Definition of *integrity*

1 : firm adherence to a code of especially moral or artistic values : incorruptibility

Integrity (sense 1) is one of the eight pillars of the EC Open Science – Plan S agenda

1. Rewards and incentives
2. Research indicators and next-generation metrics
3. Future of scholarly communication
4. European open science cloud
5. FAIR data
6. Research integrity
7. Skills and education
8. Citizen science



Jefferson Pooley, February 21st, 2020, blogs.lse.ac.uk/:

Plan S accelerates read-and-publish deals in the Global North. They lock in and exacerbate existing inequalities in scholarly publishing.

Capitalism and Society

Volume 3, Issue 2

2008

Article 5

The Historical Origins of 'Open Science': An Essay on Patronage, Reputation and Common Agency Contracting in the Scientific Revolution

Paul A. David, *Stanford University & The University of
Oxford*

Open science was always a fragile social construction ...

The Historical Origins of 'Open Science': An Essay on Patronage, Reputation and Common Agency Contracting in the Scientific Revolution

Paul A. David, *Stanford University & The University of Oxford*

... resulting from the movement away from secret knowledge and princely patronage toward state patronage, academies, and other modern institutions of science, taking place in the period between renaissance and the industrial revolution

What was before open science?

"Regarding the everyday duties, I shun only that type of prostitution consisting of having to expose my labor to the arbitrary prices set by every customer.

Instead, I will never look down on service a prince or a great lord or those who may depend on him, but, to the contrary, I will always desire such a position." (Galileo Galilei, 1564 – 1642)



Capitalism and Society

Volume 3, Issue 2

2008

Article 5

The Historical Origins of 'Open Science': An
Essay on Patronage, Reputation and Common
Agency Contracting in the Scientific
Revolution

Paul A. David, *Stanford University & The University of
Oxford*

Open science exists already, funded by public and private actors, based on a distinctive ethos

It coexists with commercially oriented research

Capitalism and Society

Volume 3, Issue 2

2008

Article 5

The Historical Origins of 'Open Science': An
Essay on Patronage, Reputation and Common
Agency Contracting in the Scientific
Revolution

Paul A. David, *Stanford University & The University of
Oxford*

Open science lives a tension between:

Defending the existing ethos of the republic of science, Merton's CUDOS, "public knowledge"

Proprietary science, secrecy, visions of a knowledge economy

Capitalism and Society

Volume 3, Issue 2

2008

Article 5

The Historical Origins of 'Open Science': An
Essay on Patronage, Reputation and Common
Agency Contracting in the Scientific
Revolution

Paul A. David, *Stanford University & The University of
Oxford*

An acceleration toward 'Intellectual Capitalism'
risks to move science back to the age of
princely patronage ...

... from CUDOS back to the pre-renaissance
ethos of secrecy in the pursuit of Nature's
Secrets

Capitalism and Society

Volume 3, Issue 2

2008

Article 5

The Historical Origins of 'Open Science': An
Essay on Patronage, Reputation and Common
Agency Contracting in the Scientific
Revolution

Paul A. David, *Stanford University & The University of
Oxford*

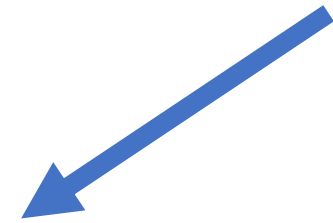
Open access
movement
(Plan S etc.)



Publishers multiply
their titles by creating
new OA journals



Which favours the
mimetic chances of
predatory publishers



Publishers increase
their already
incredible profits



OA titles (predatory
and non) need to
accept more articles
to fund themselves



The abundance of
OA titles plays into
the publish or perish
zeitgeist



Definition of *integrity*

1 : firm adherence to a code of especially moral or artistic values : incorruptibility

To what sort of science do I pledge my integrity to?



Source:

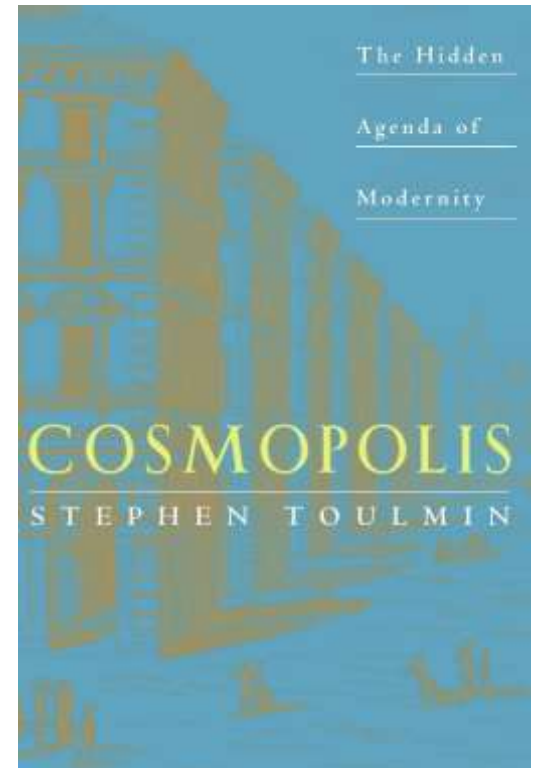
https://commons.wikimedia.org/wiki/File:John,_king_of_Scotland,_being_brought_before_Edward_I.png

If you are a scientist you were
nourished and trained in what Stephen
Toulmin calls 'The hidden agenda of
modernity'

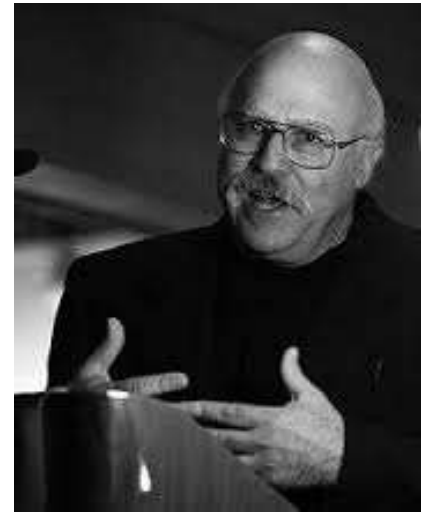
The vision of Cosmopolis, a society as
rationally ordered as the Newtonian
view of nature



Stephen Toulmin



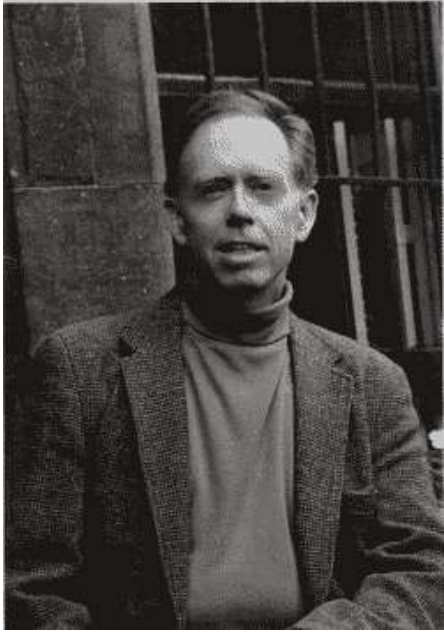
The dream was spectacularly successful, in all fields of endeavor, leading to what Steven Shapin calls ‘invisible science’



Steven Shapin

Steven Shapin, 2016, Invisible Science, The Hedgehog Review: Vol. 18 No. 3 (Fall 2016).

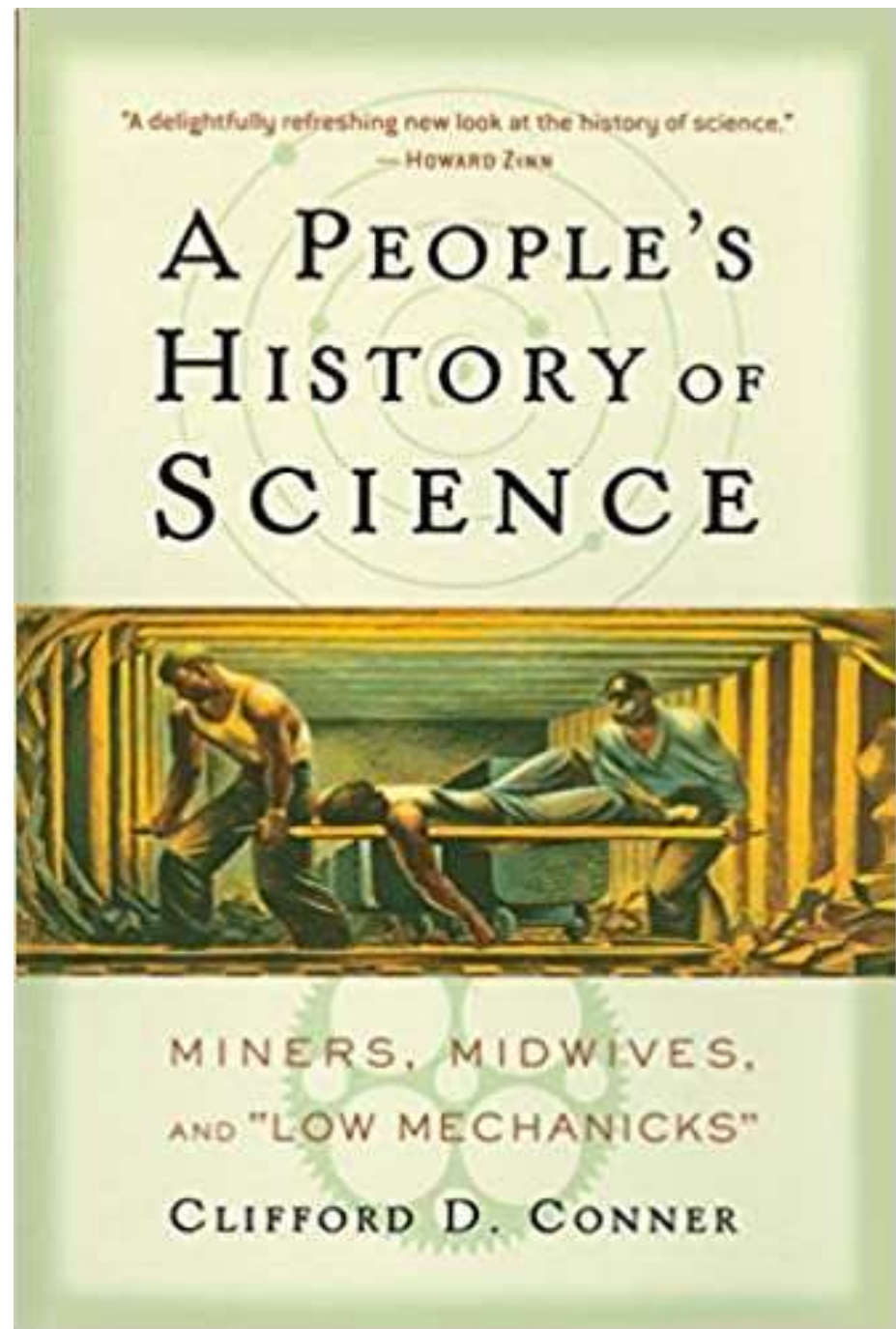
What is science?

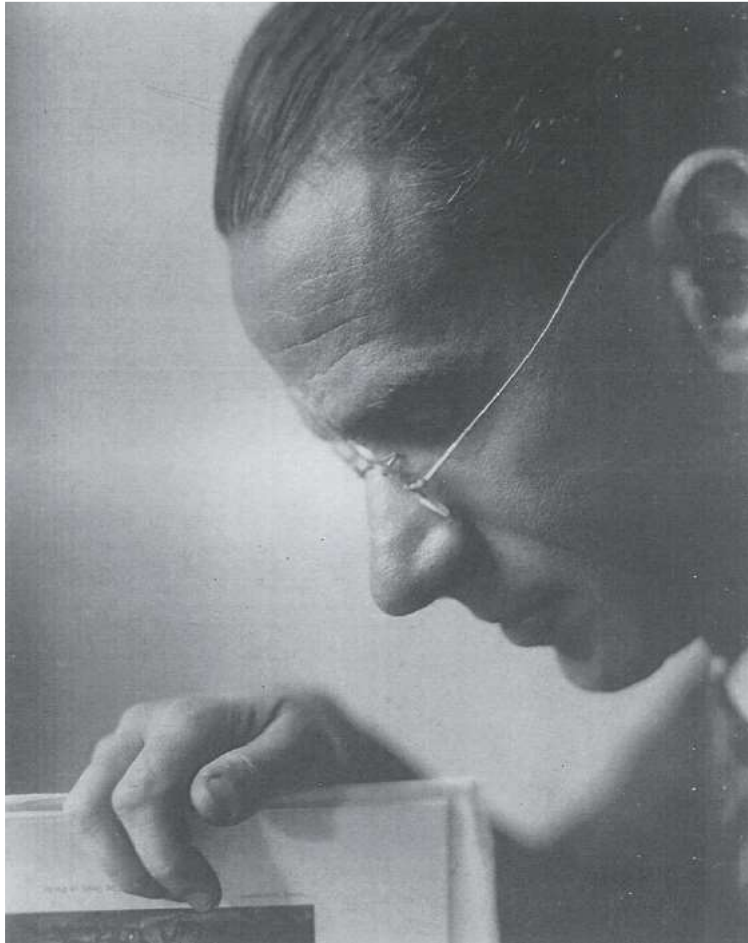


Clifford D. Conner

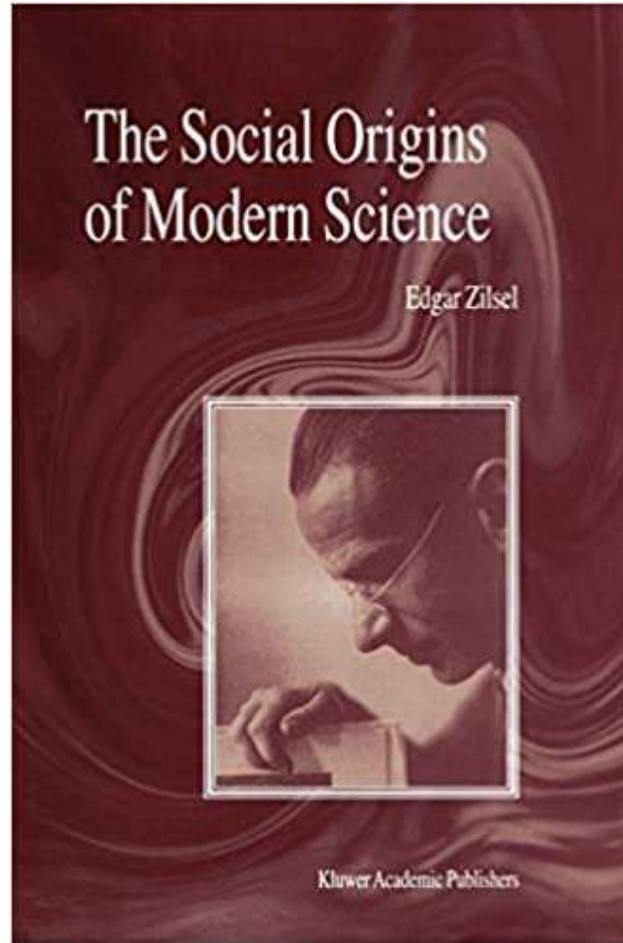
An antidote to a vision of the history of science as the fruit of the intuition of great (mostly) men

‘Knowing what’ was often only possible after ‘knowing how’ had been discovered





Edgar Zilsel
(1891–1944)



The Zilsel thesis:

- Superior artisans,
- Secular humanists,
- University scholars

“Science originates in urban cultures, money economy, market economy…”

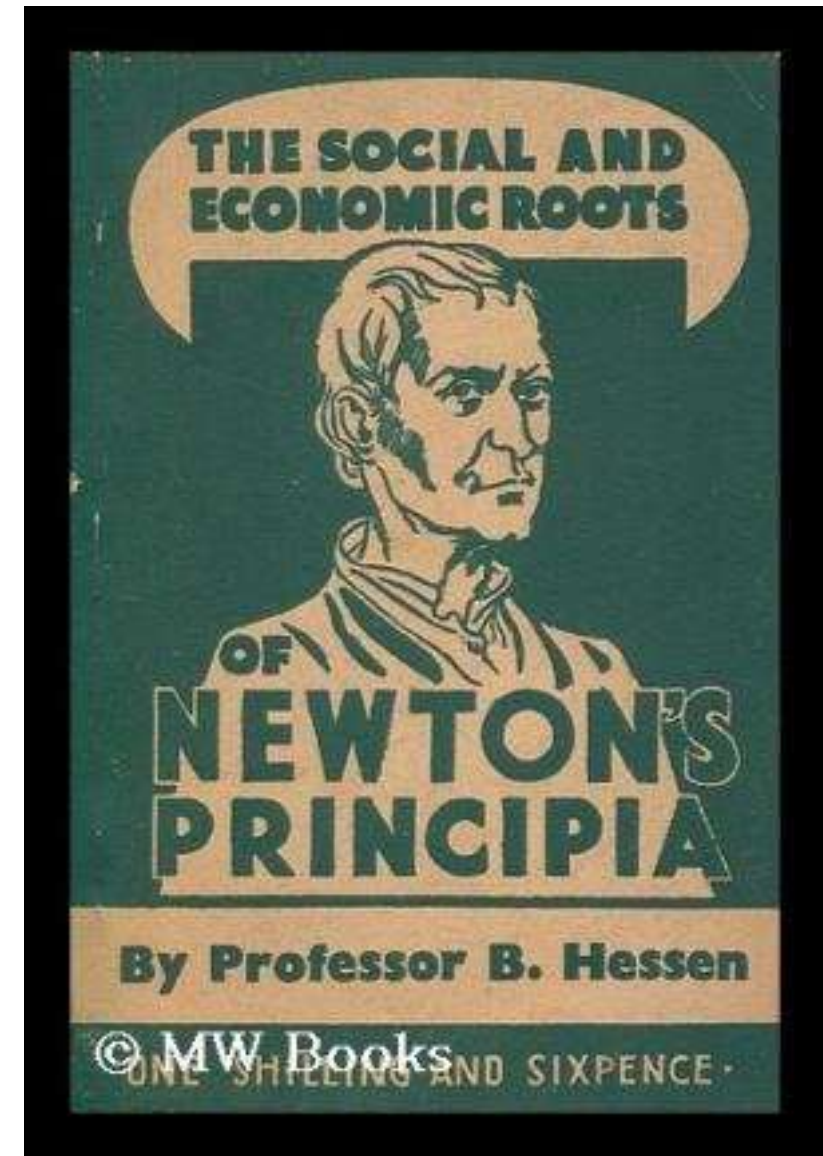


Boris Hessen
(1893–1936)

The Hessen thesis:

Science originates from the commercial and capitalistic needs of the XVII century nascent bourgeoisie ...

... not just from the work of 'great minds'



Decline in creativity

Papers and patents are becoming less disruptive over time

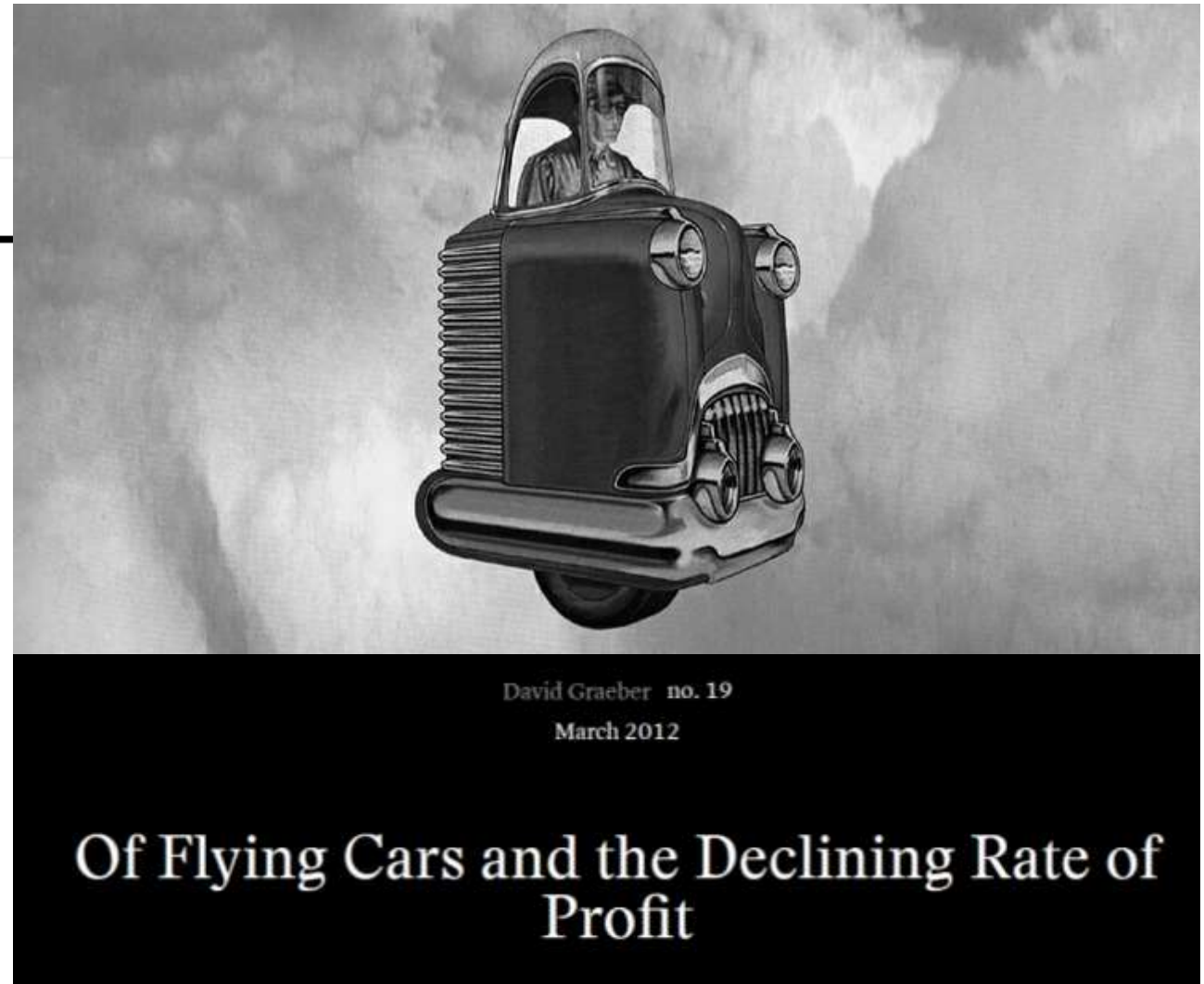
[Michael Park](#), [Erin Leahey](#) & [Russell J. Funk](#) 

[Nature](#) **613**, 138–144 (2023) | [Cite this article](#)

249k Accesses | **11** Citations | **3936** Altmetric | [Metrics](#)



“progress is slowing in several major fields”



Source: <https://thebaffler.com/salvos/of-flying-cars-and-the-declining-rate-of-profit>



Definition of *integrity*

1 : firm adherence to a code of especially moral or artistic values : incorruptibility

Wrapping up: what sort of science and what sort of integrity we embrace are related, non trivial questions



Definition of *integrity*

2 : an unimpaired condition : soundness

As in 'the reactor vessel has not lost its integrity'

Predatory publishing?



Credit: David Parkins, Nature,
<https://www.nature.com/articles/d41586-019-03759-y>

NEWS • 08 FEBRUARY 2021

Hundreds of ‘predatory’ journals indexed on leading scholarly database

Scopus has stopped adding content from most of the flagged titles, but the analysis highlights how poor-quality science is infiltrating literature.

[Dalmeet Singh Chawla](#)

Predatory: cloning existing journals



Recent cases:

- Talent Development and Excellence,
- Transylvanian Review
- Test Engineering and Management

<https://retractionwatch.com/2021/05/26/how-hijacked-journals-keep-fooling-one-of-the-worlds-leading-databases/>

Predatory publishers (the Achilles heel of the APC model)

Predatory open access publishers

<https://beallslist.net>

Beall was threatened by Omics International with a \$1billion lawsuit



Jeffrey Beall,
librarian,
University
of Colorado,
Denver

Dear Andrea Saltelli,

I hope everything is going well.



GAVIN PUBLISHERS

Google Cus

We cordial

As you bei

If you have

Hoping

HOME

OPEN ACCESS

GAVIN JOURNALS ▾

GAVIN CONFERENCES

GUIDELINES ▾

SUBMIT MANUSCRIPT

E-BOOKS

MEMBERSHIP

CAREERS

SUBMIT MANUSCRIPT



▶ ISSN: 2575-7091

Food & Nutrition Jou

*Genamics – JournalSeek

*Academic Keys

*ResearchBib - Academic Research Index

*Free Medical Journals - Geneva Foundation for Medical Education and Research

*International Innovative Journal Impact Factor (IIJIF)

*Al-Azhar University

*Open J-Gate

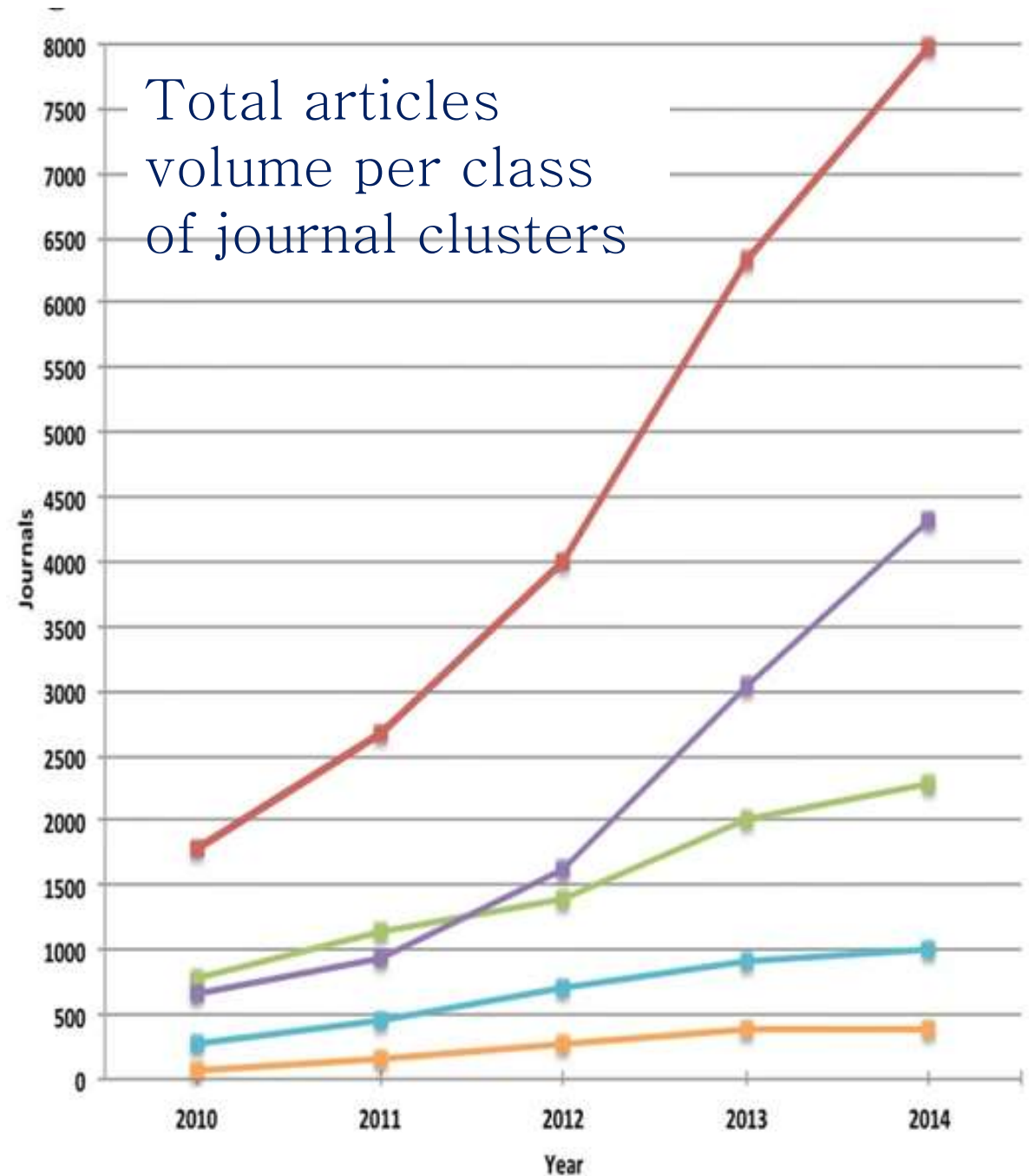
* Directory of Journals indexing

About the Journal

Journal Impact Factor 1.2*

Is on Beall's list ←

C. Shen and B.-C. Björk, “‘Predatory’ open access: a longitudinal study of article volumes and market characteristics,” BMC Med., vol. 13, no. 1, p. 230, Dec. 2015.



Crisis of reproducibility

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




Brow

 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
ECONOMIC
JOURNAL



The Economic Journal, 127 (October), F236–F265. Doi: 10.1111/eoj.12461 © 2017 Royal Economic Society. Published by John Wiley & Sons, 9600 Garsington Road, Oxford OX4 2DQ, UK and 350 Main Street, Malden, MA 02148, USA.

THE POWER OF BIAS IN ECONOMICS RESEARCH*

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

October 27, 2017



Futures

Volume 91, August 2017, Pages 5-11



What is science's crisis really about?

Andrea Saltelli ^{a, b}  , Silvio Funtowicz ^a



Futures

Volume 104, December 2018, Pages 85-90



Why science's crisis should not become a political battling ground

Andrea, Saltelli 



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



Darwinian fitness of malpractices

Downloaded from <http://rsos.royalsocietypublishing.org/> on September 23, 2016

ROYAL SOCIETY
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rsos.royalsocietypublishing.org

Research



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>

Is the present publishing
system sound?

Opinion

Peer review and scientific publishing

Thu 13 Sep 2018

Scientific publishing is a rip-off. We fund the research - it should be free

George Monbiot



Those who take on the global industry that traps research behind paywalls are heroes, not thieves





I. Graber-Stiehl, “Science’s pirate queen,” *Verge*, Feb-2018.



Kazakhstani scientist
Alexandra Elbakyan



The long read

Is the staggeringly profitable business of scientific publishing bad for science?

Elsevier profits 2010 = £724m on £2bn revenue: a 36% margin – higher than Apple, Google, or Amazon

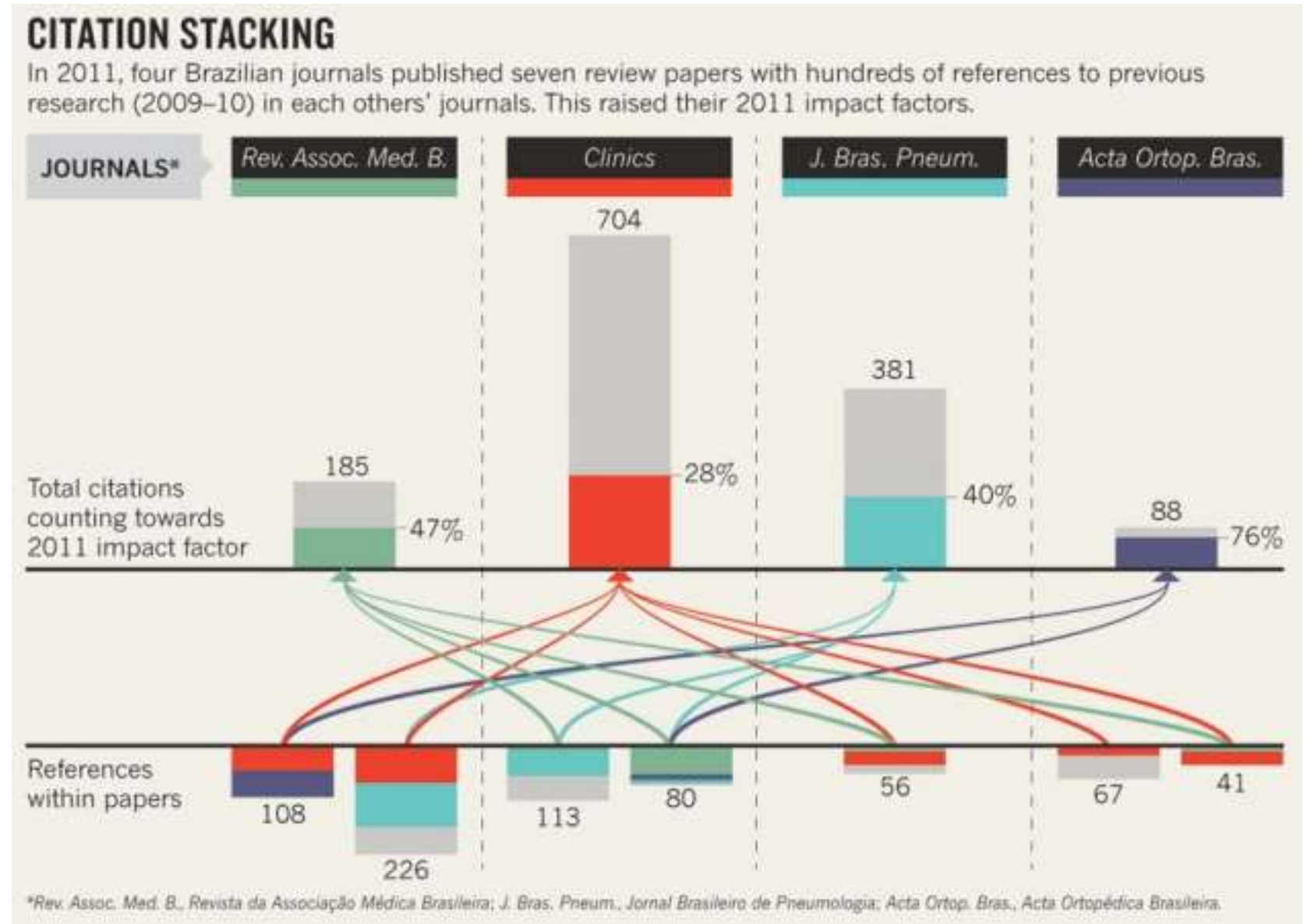
Stephen Buranyi, The Guardian, 27 Jun 2017.



A 2005 Deutsche Bank report referred to it as a “bizarre” “triple-pay” system, in which “the state funds most research, pays the salaries of most of those checking the quality of research, and then buys most of the published product”

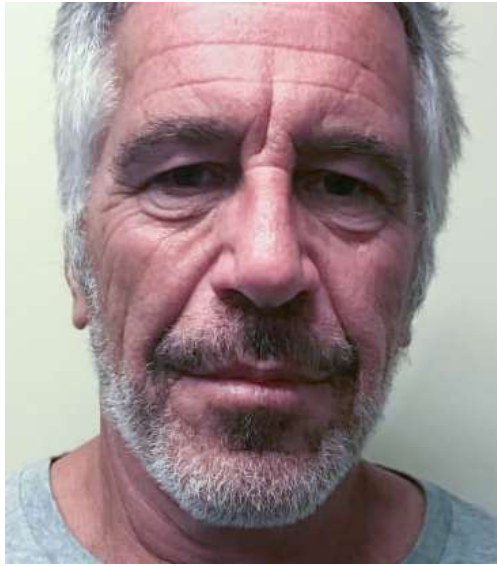
Stephen Buranyi, The Guardian, 27 Jun 2017.

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

Sound donations?



Jeffrey Epstein
& paedophilia



Sackler family
& opioids



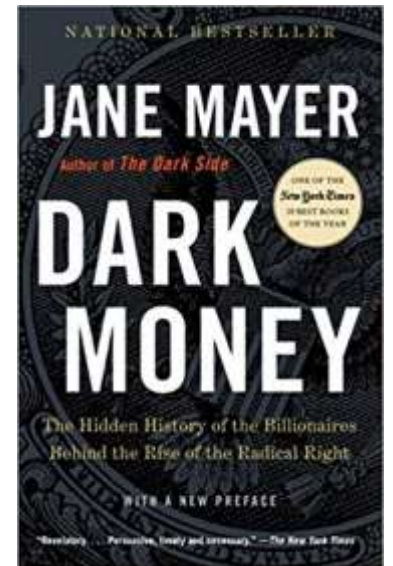
Koch brothers
& climate

How Rich Donors Like Epstein (and Others) Undermine Science

ADAM ROGERS

SCIENCE 09.15.2019 07:00 AM

WIRED



Is the grant
system sound?

- … researchers spend much of their research time writing research proposals
- … the costs of peer review and non-granted project applications are often higher than the total budget of a call
- … grants are preferentially allocated to well endowed labs and teams …
- … strategic behavior of evaluators
- … a system based on lotteries would be way more efficient



nature

NEWS • 20 NOVEMBER 2019

David Adam

Science funders gamble on grant lotteries

A growing number of research agencies are assigning money randomly.



What can one learn from the Health Research Council of New Zealand?



Research Policy

Volume 49, Issue 1, February 2020, 103831



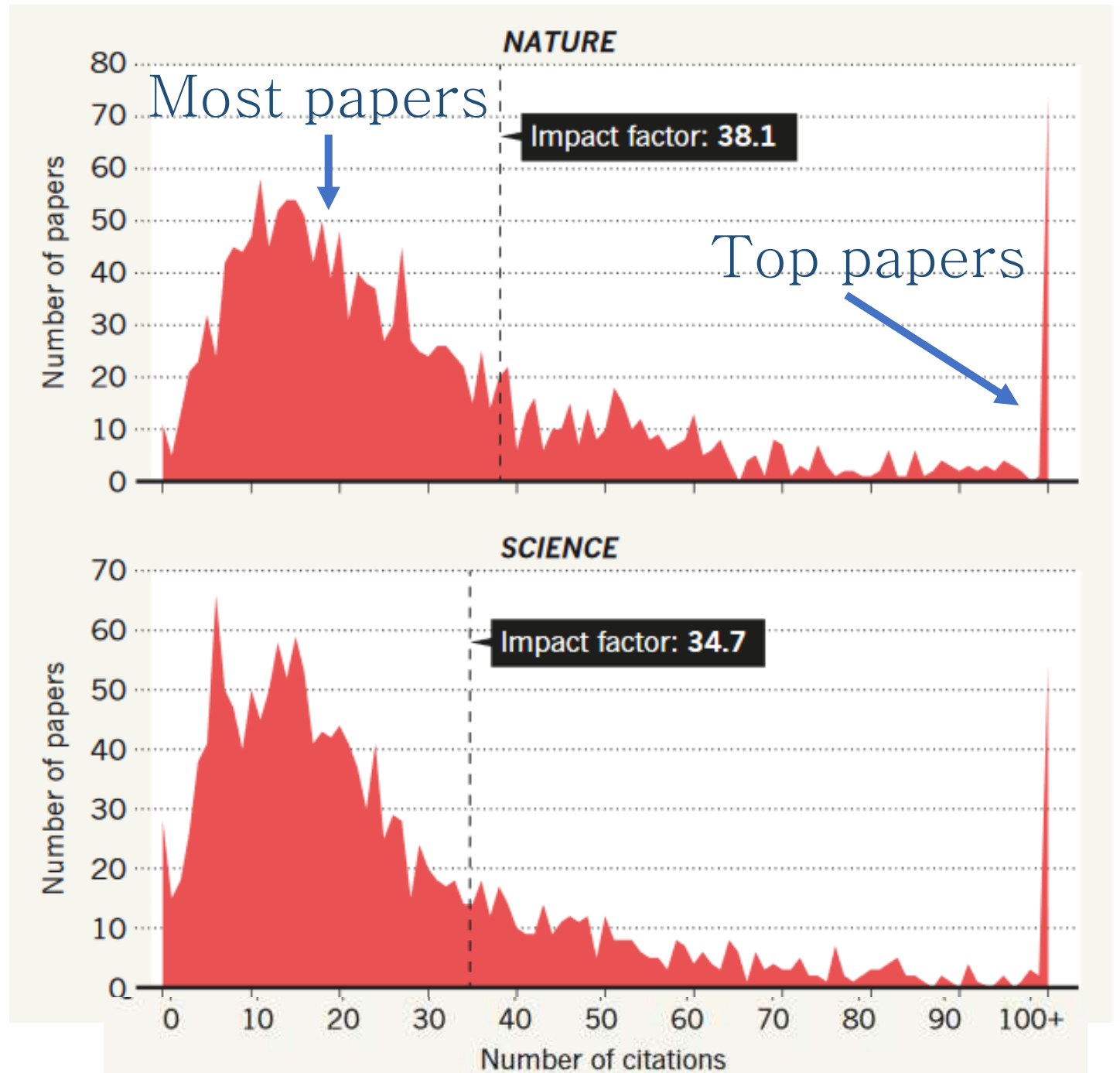
How to avoid borrowed plumes in academia

Margit Osterloh  , Bruno S. Frey 

The impact factor is a misleading measure
of the importance of an individual article.

The average paper is cited much less than the journal's impact factor

Source: E. Callaway, 2014
Publishing elite turns against impact factor, Nature, 535, 210–211.



Bending to reviewer-coerced
citation or not?



NEWS • 06 FEBRUARY 2020

Highly cited researcher banned from journal board for citation abuse

Investigation finds that biophysicist Kuo-Chen Chou repeatedly suggested dozens of citations be added to papers.

[Richard Van Noorden](#)

Accepting a seducing salary ...
without too much thought?

U.S. Accuses Harvard Scientist of Concealing Chinese Funding



Prosecutors say Charles M. Lieber, the chair of Harvard's chemistry department, lied about concealing Chinese state-run initiative that seeks to develop

NEWS

Harvard Doesn't Have to Pay Legal Fees for Professor Convicted of Hiding Ties to China

BY LORA KORPAR ON 1/10/22 AT 5:02 PM EST



Jan. 28, 2020

Source: <https://www.newsweek.com/harvard-doesnt-have-pay-legal-fees-professor-convicted-hiding-ties-china-1667672>

... U.S. scientific luminaries was in ... false statement to federal authorities about his financial relationship with the Chinese ... Thousand Talents program”

\$50,000 monthly salary, \$150,000 in annual in living expenses and more than \$1.5 million for a second laboratory in Wuhan

Cutting corners or not?

Cargo-cult statistics and scientific crisis

Written by Philip B. Stark and Andrea Saltelli on 05 July 2018. Posted in [Science](#)



P-hacking,
HARKing, salami
slicing, ...

nature materials

Published: January 2005

The cost of salami slicing


Nature Materials 4, 1(2005) | [Cite this article](#)

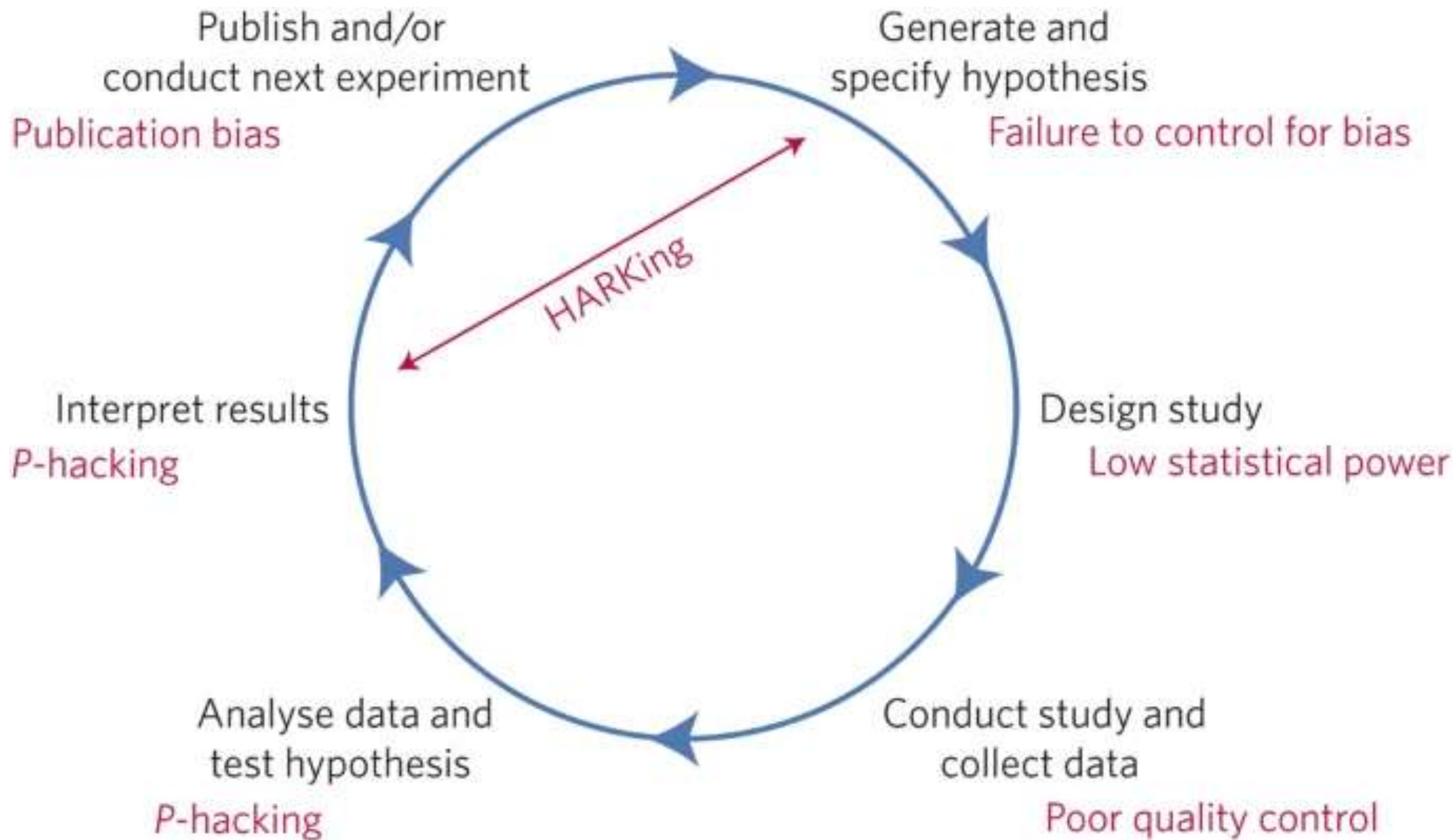


nature human behaviour

Open Access | Published: 10 January 2017

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



Are the numbers you produce responsible?

Models 'too big to fail'

Five ways to ensure that models serve society: a manifesto

Pandemic politics highlight how predictions need to be transparent and humble to invite insight, not blame.



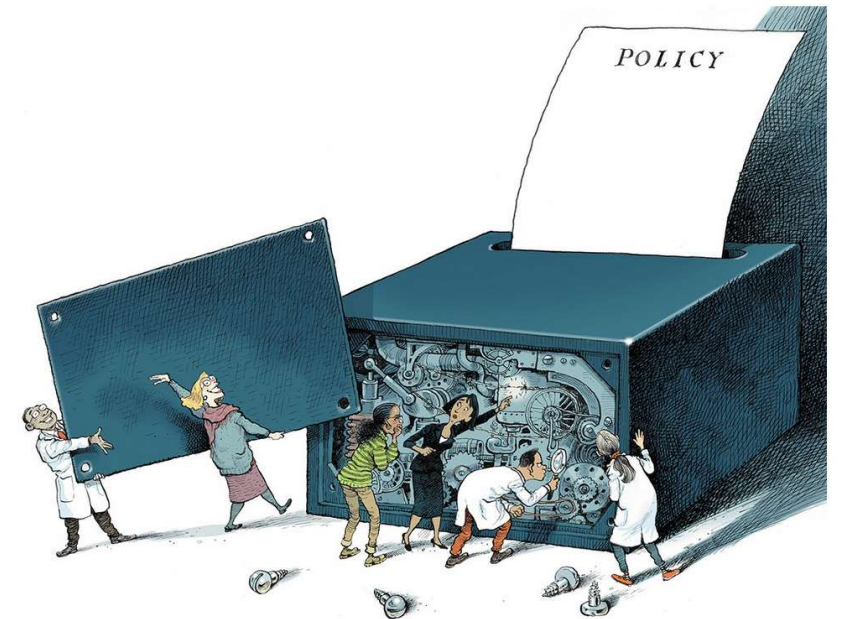
Illustration by David Parkins



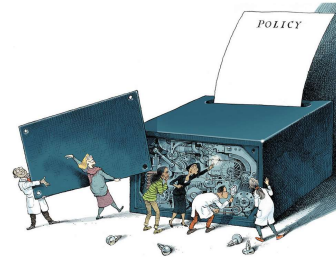
Five ways to ensure that models serve society: a manifesto

Pandemic politics highlight how predictions need to be transparent and humble to invite insight, not blame.

[Andrea Saltelli](#) ✉, [Gabriele Bammer](#), [Isabelle Bruno](#), [Erica Charters](#), [Monica Di Fiore](#), [Emmanuel Didier](#), [Wendy Nelson Espeland](#), [John Kay](#), [Samuele Lo Piano](#), [Deborah Mayo](#), [Roger Pielke Jr](#), [Tommaso Portaluri](#), [Theodore M. Porter](#), [Arnald Puy](#), [Ismael Rafols](#), [Jerome R. Ravetz](#), [Erik Reinert](#), [Daniel Sarewitz](#), [Philip B. Stark](#), [Andrew Stirling](#), [Jeroen van der Sluijs](#) & [Paolo Vineis](#)



COVID-19 policies dictated by ‘science’ with several digits precision in the presence of fundamental uncertainties



Undocumented research code used as a policy tool (chameleon models)



Pfleiderer, P. Chameleons: The Misuse of Theoretical Models in Finance and Economics. *Economica* 87, 81–107 (2020).



Definition of *integrity*

2 : an unimpaired condition : soundness

Wrapping up: The science we receive in heritage from our fathers has aspects which are unsound



Definition of *integrity*

3 : the quality or state of being complete or undivided : completeness

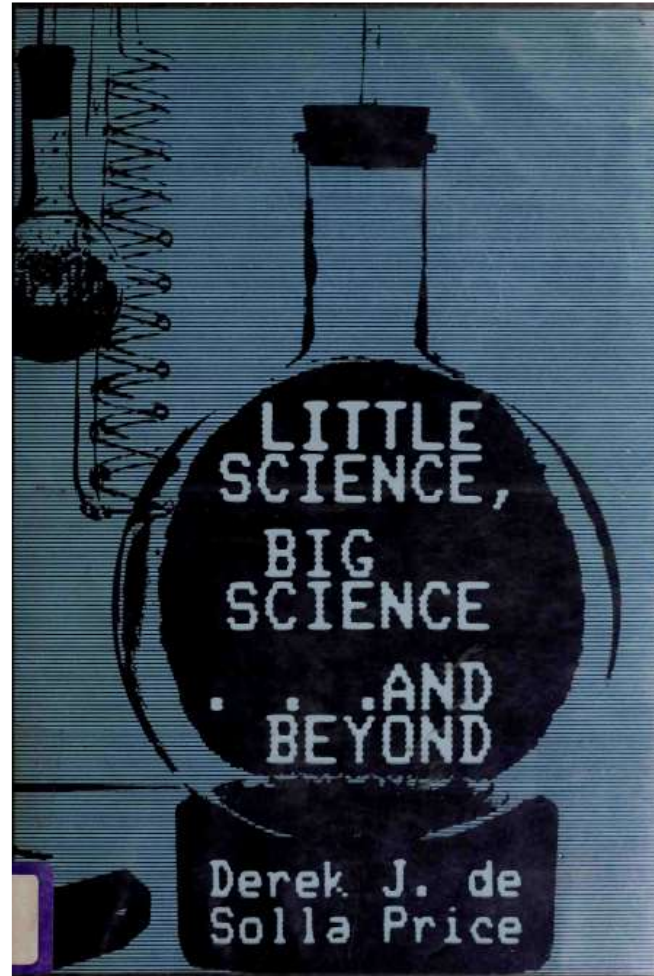
As in 'the manuscript has arrived to us in its integrity'

Has the 'manuscript' of science arrived in its integrity?

If not, what has gone lost?

- 1) Science as (small) communities of peers
- 2) Science as a self ruled republic

Recall the
prophecy of
senility)

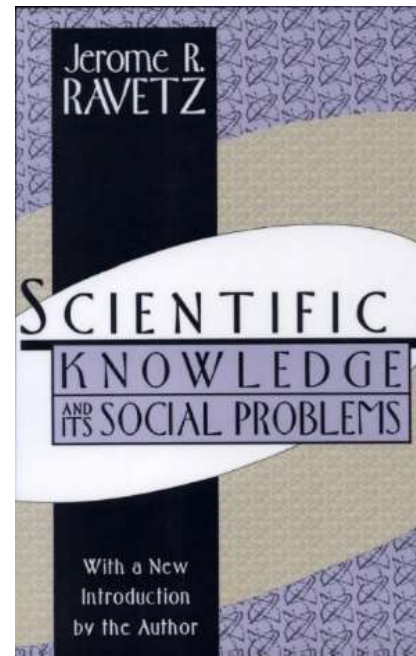


Derek J. de
Solla Price

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

Recall Ravetz's diagnosis of the predicaments of science when moving from a 'Gemeinschaft' to a 'Gesellschaft'

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



Jerome R.
Ravetz

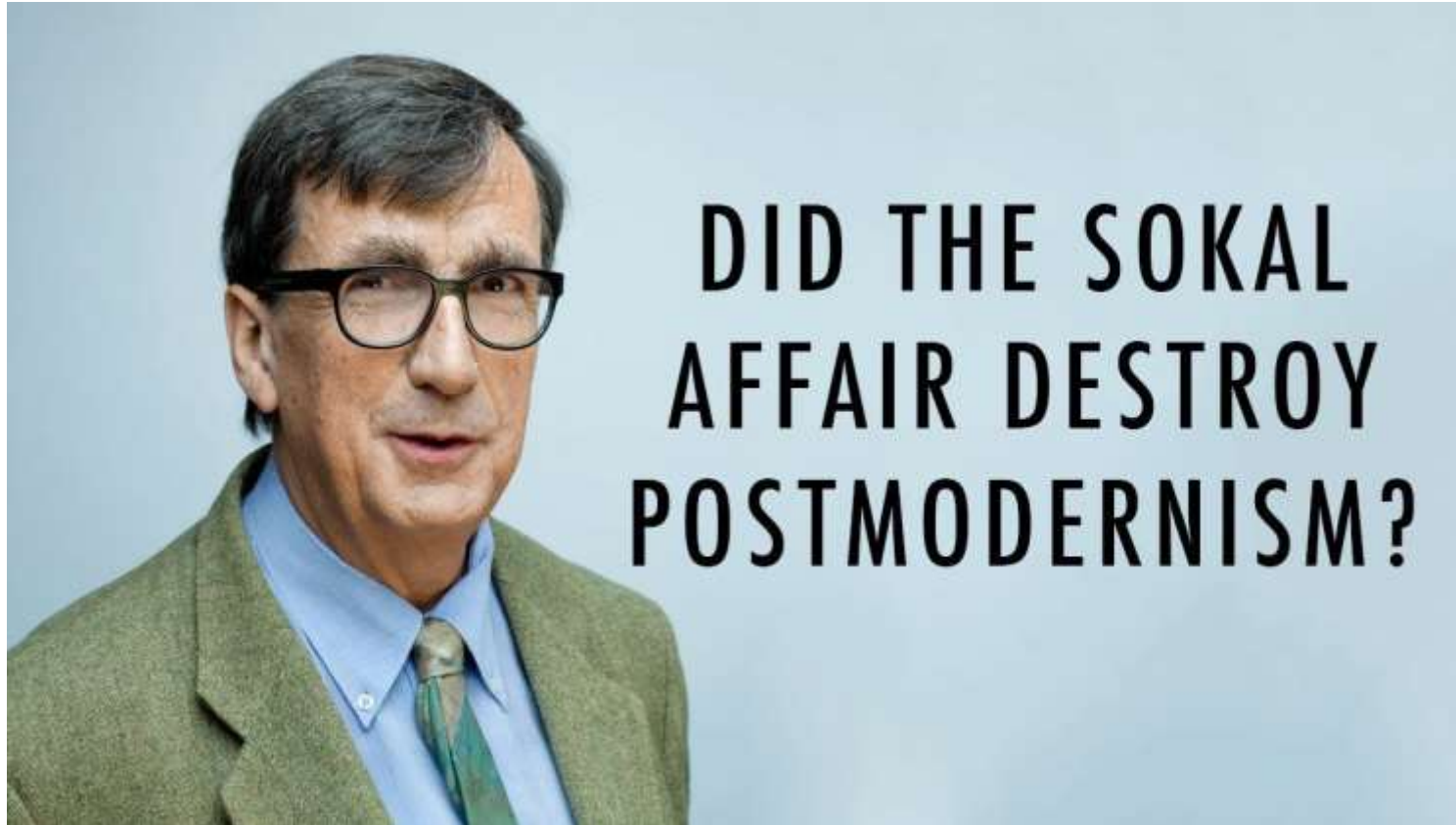
Science is divided: the Sokal affair (1996)



The birth of 'scholarly hoax'

"Transgressing the
Boundaries: Towards a
Transformative Hermeneutics
of Quantum Gravity"

The hoax generated soul searching in the community of science and technology studies



Bruno Latour, source <https://medium.com/the-humanities-in-transition/part-1-sokals-hoax-371af59bde3f>

The Conceptual Penis as a Social Construct: A Sokal-Style Hoax on Gender Studies

BY PETER BOGHOSSIAN, ED.D. (AKA PETER BOYLE, ED.D.)

AND JAMES LINDSAY, PH.D. (AKA, JAMIE LINDSAY, PH.D.)

Source: https://www.skeptic.com/reading_room/conceptual-penis-social-construct-sokal-style-hoax-on-gender-studies/

Another hoax
in 2018
(aka: Sokal-squared)

HOME \ CULTURE

Grievance Studies exposes college corruption with hoax papers

The Washington Times

America's Newspaper

Source: <https://www.washingtontimes.com/news/2018/oct/3/grievance-studies-exposes-college-corruption-hoax/>

Beryl L. Crowe: “two insular scientific communities – the natural and the social-between which there is very little communication and a great deal of envy, suspicion, disdain, and competition for scarce resources”

**The Tragedy of the
Commons Revisited**

28 November 1969, Volume 166, Number 3909

SCIENCE

Beryl L. Crowe: “Perhaps the major problems of modern society have, in large part, been allowed to develop and intensify through this structure of insularity and specialization”

**The Tragedy of the
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28 November 1969, Volume 166, Number 3909

SCIENCE



Definition of *integrity*

3 : the quality or state of being complete or undivided : completeness

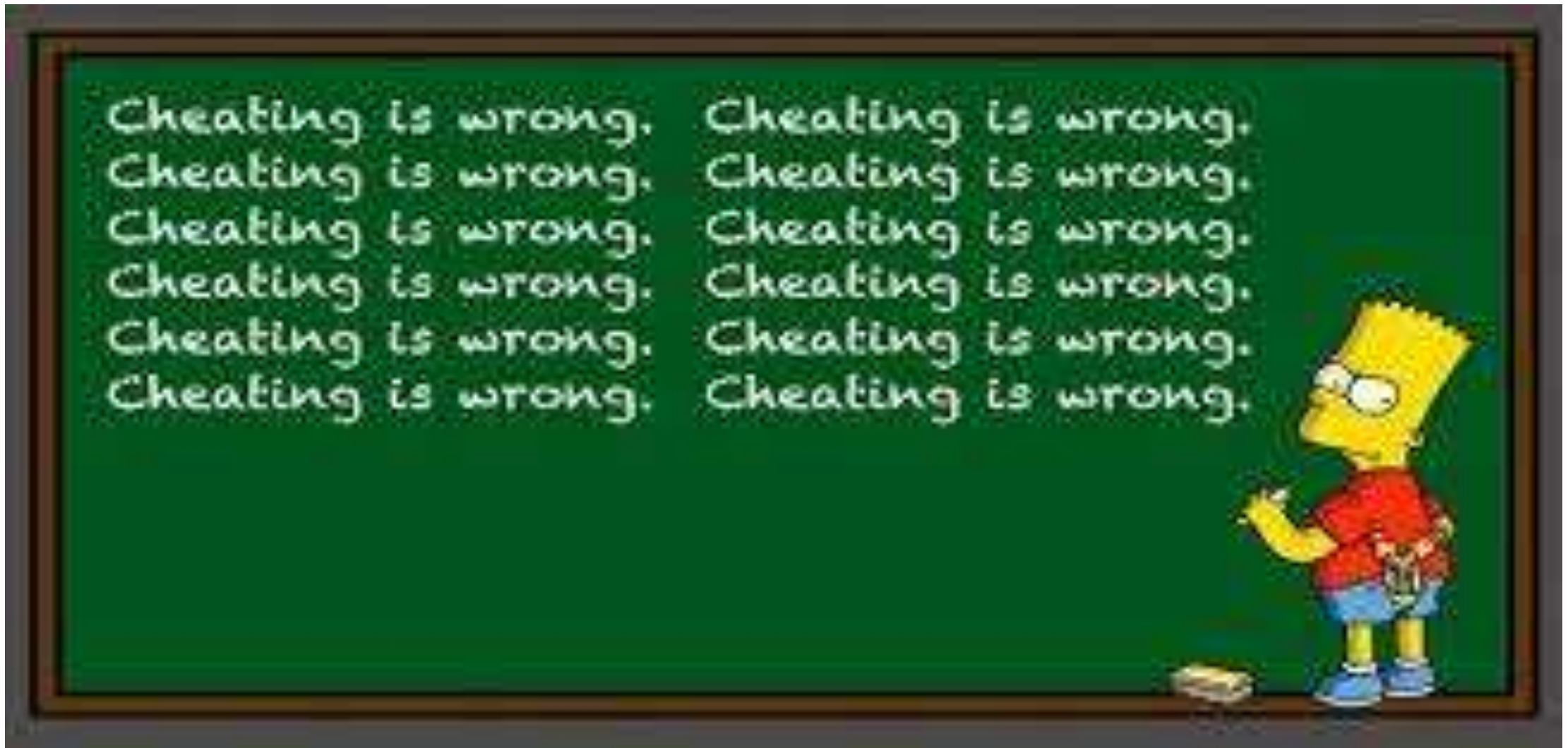
Wrapping up: science is not in 'one piece'

Epilogue

Science's integrity has implications for society

Those implications are unfolding at an unprecedented rate

...but this is another lecture!



E N D

Source: The Simpsons, Twentieth Century
Fox Film Corporation