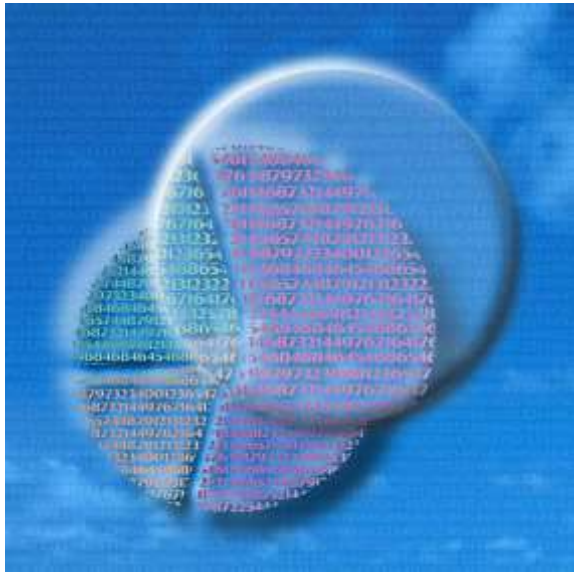


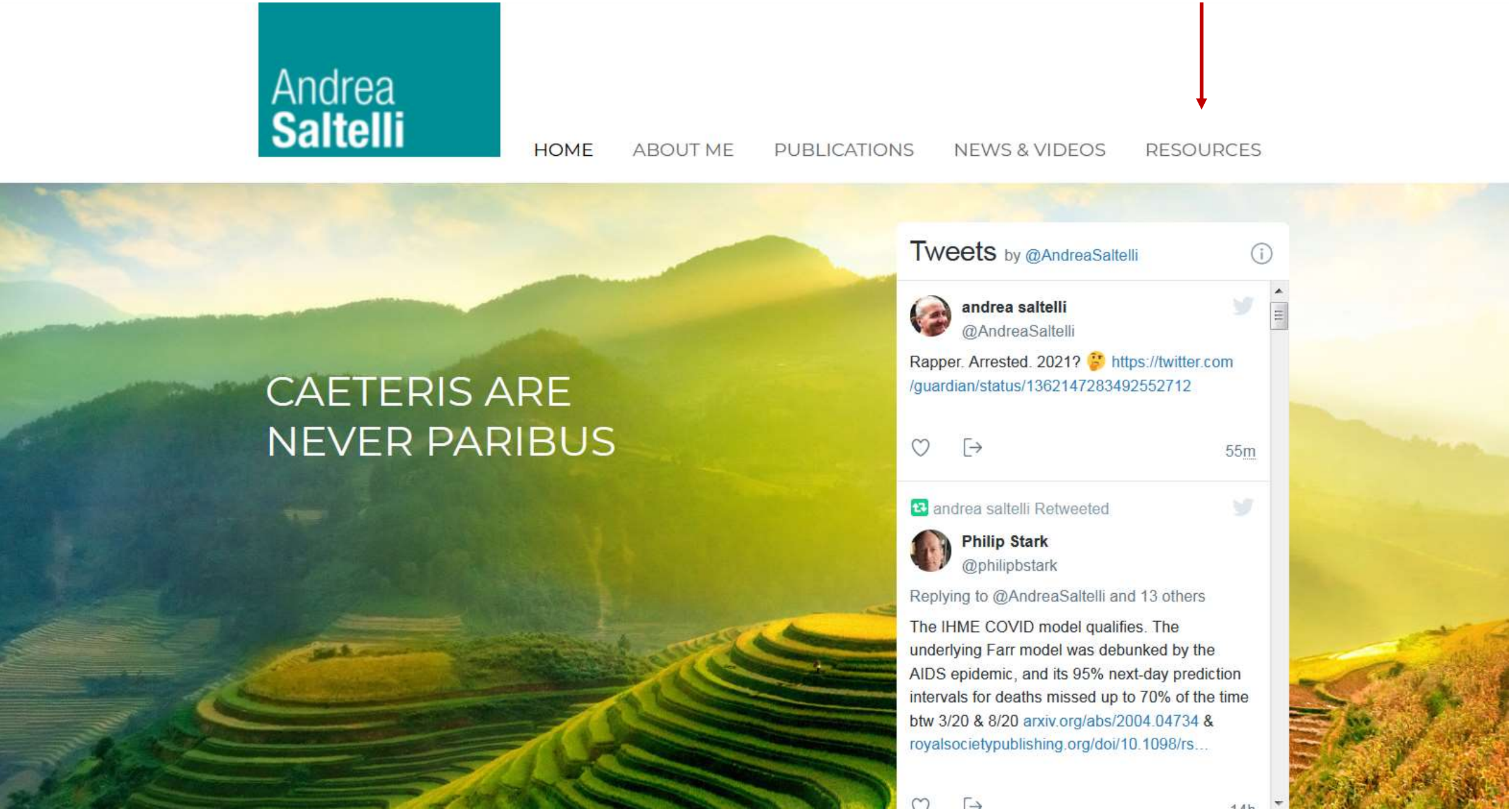
Scientific integrity

Andrea Saltelli
Open Evidence Research, Open University of Catalonia

Lesson at Scuola di Specializzazione Medica in Statistica Sanitaria e Bometria, Università di Firenze, Dipartimento di Statistica, Informatica, Applicazioni 'G. Parenti' (DiSIA)

Florence, June 9, 2021

Where to find this talk: www.andreasaltelli.eu



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

Definition of *integrity*

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

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.

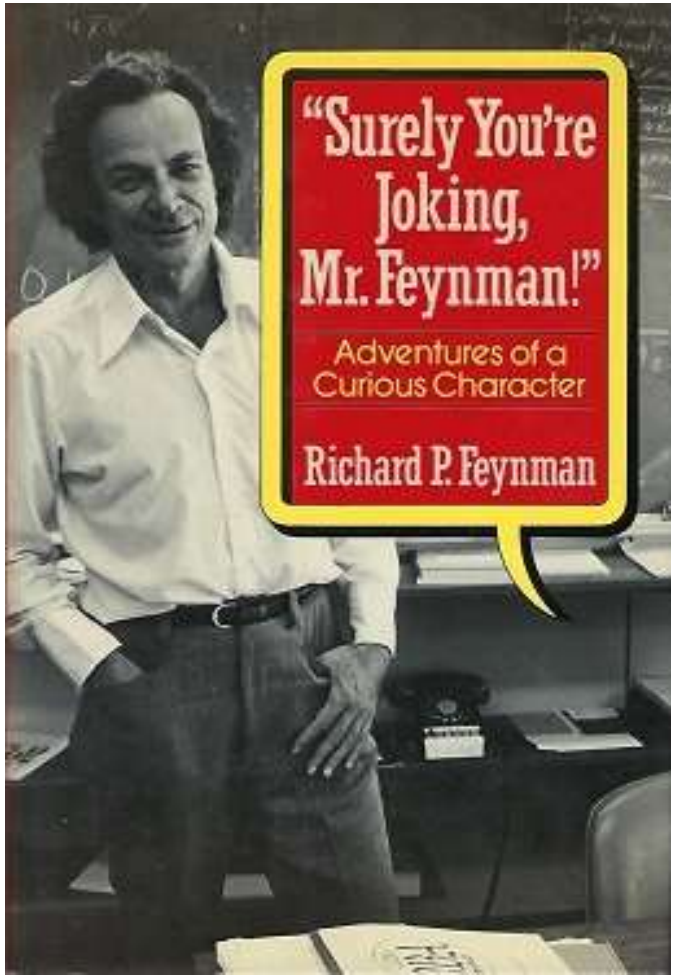
Communalism – the common ownership of scientific discoveries, according to which scientists give up intellectual property rights in exchange for recognition and esteem (Merton actually used the term Communism, but had this notion of communalism in mind, not Marxism);

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.

Go to https://calteches.library.caltech.edu/51/2/CargoCult.htm or buy the book … read Caltex's speech (1974) of Richard Feynman about what organized scepticism is about



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

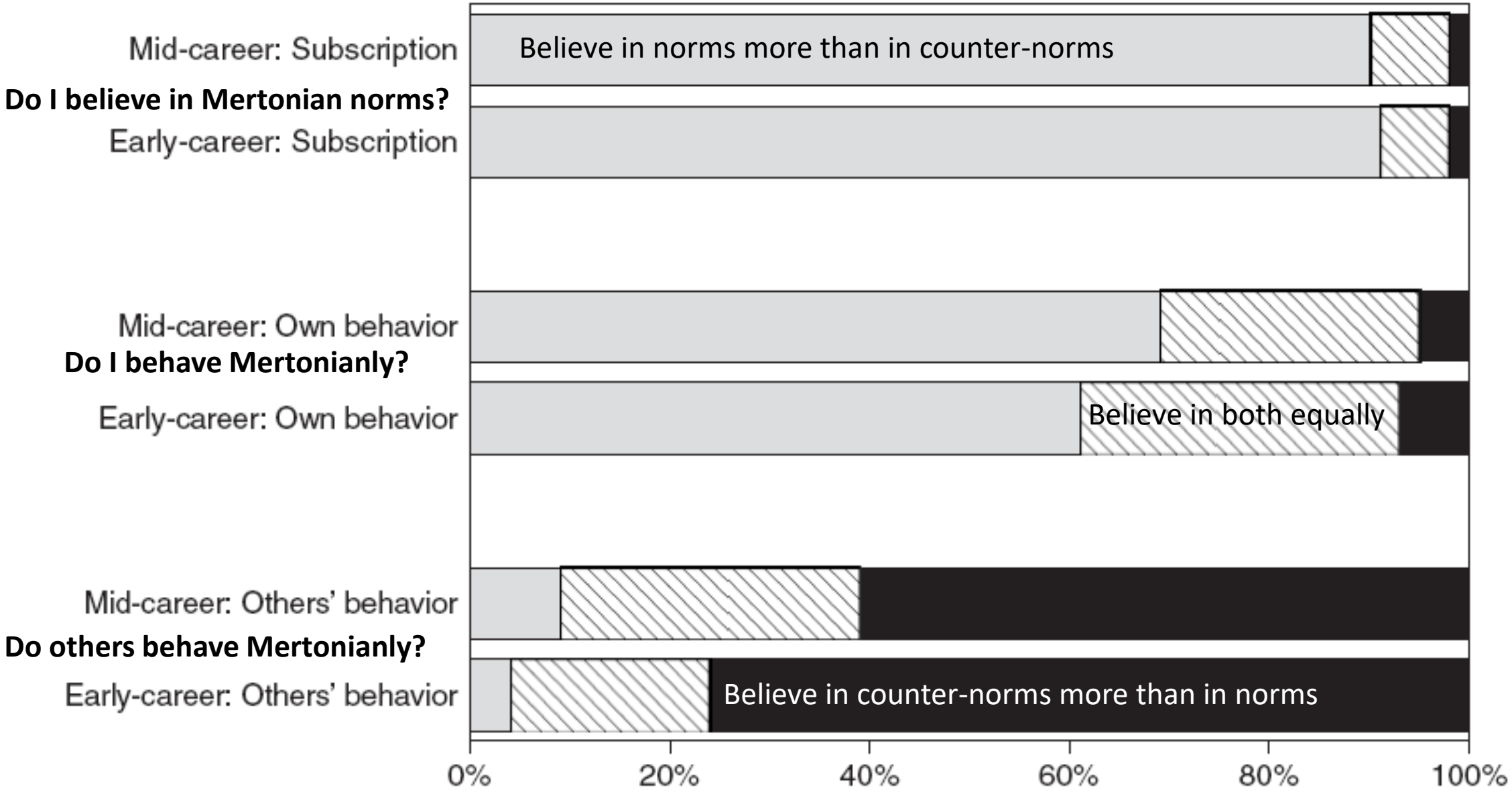


FIG. 3. Norm versus Counternorm Scores: Percent with Norm > Counternorm (dotted), Norm = Counternorm (striped), Norm < Counternorm (solid).

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

https://ec.europa.eu/info/research-and-innovation/strategy/goals-research-and-innovation-policy/open-science_en

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 …

… 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

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*

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*

What Philip Mirowski has to say about the dangers of open science

Article

S|S|S

The future(s) of open science

Social Studies of Science
2018, Vol. 48(2) 171–203
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journals.sagepub.com/home/sss
SAGE

Philip Mirowski
John J. Reilly Center, University of Notre Dame, Notre Dame, IN, USA

We already struggle with "author-paid Article Publishing Charges (APCs) that range from $500 to $5,000 USD [Elsevier OA]";

Corporate publishers have easily assimilated open access into their profit model.

Article

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The future(s) of open science

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SAGE

Philip Mirowski
John J. Reilly Center, University of Notre Dame, Notre Dame, IN, USA

“the agenda [of open science] is effectively to re-engineer science along the lines of platform capitalism, under the misleading banner of opening up science to the masses”

Article

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The future(s) of open science

Philip Mirowski
John J. Reilly Center, University of Notre Dame, Notre Dame, IN, USA

“the open science movement is an artifact of the current neoliberal regime of science, [to] reconfigures both the institutions and the nature of knowledge to better conform to market imperatives”

Article

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The future(s) of open science

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Philip Mirowski
John J. Reilly Center, University of Notre Dame, Notre Dame, IN, USA

Open science is not there to solve

- Distrust of science in the general population
- Science's democracy deficit
- Slowdown in scientific productivity
- Reproducibility crisis

Article

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The future(s) of open science

Philip Mirowski
John J. Reilly Center, University of Notre Dame, Notre Dame, IN, USA

How a neoliberal agenda has damaged science

Article

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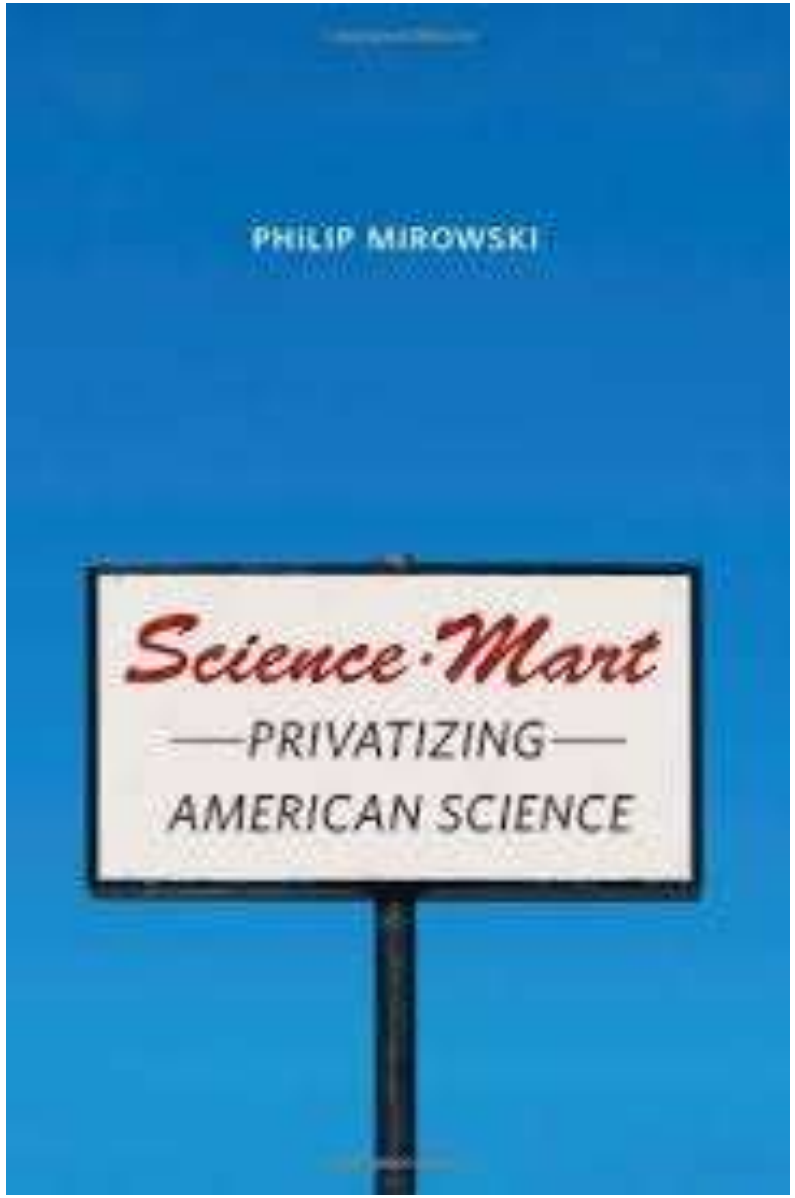
John J. Reilly Center, University of Notre Dame, Notre Dame, IN, USA



What is hence the danger for Mirowski?

Platform capitalism and the uberization of science

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Philip Mirowski
John J. Reilly Center, University of Notre Dame, Notre Dame, IN, USA

Platforms competing to become the ‘Facebook for Science’

Article

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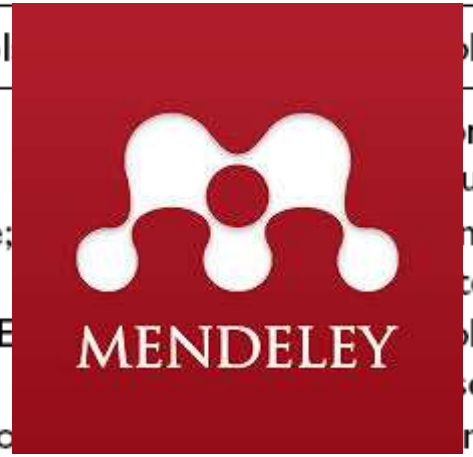
John J. Reilly Center, University of Notre Dame, Notre Dame, IN, USA



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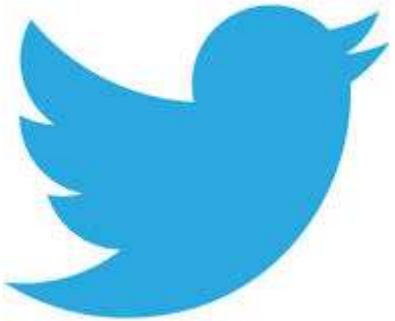
Outsider citizens	Wilson Ctr CS	SETI@hom; Foldit	DIY bio; zooniverse	Publication managers		
Kibitzers	Twitter		Open source software			



The future is with us already

Article

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The future(s) of open science

Social Studies of Science
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SAGE

Philip Mirowski
John J. Reilly Center, University of Notre Dame, Notre Dame, IN, USA

we as scientists already live in “a quasi-market that constantly monitors [our] ‘net worth’ through a range of metrics, scores and indicators"

H-index, impact factors, peer contacts, network affiliations, and the like”

Definition of *integrity*

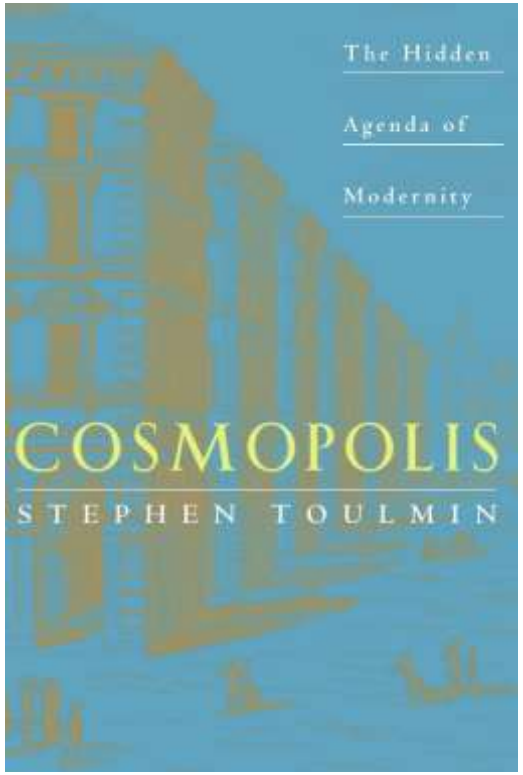
1 **:** firm adherence to a code of especially moral or artistic values **:** incorruptibility

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

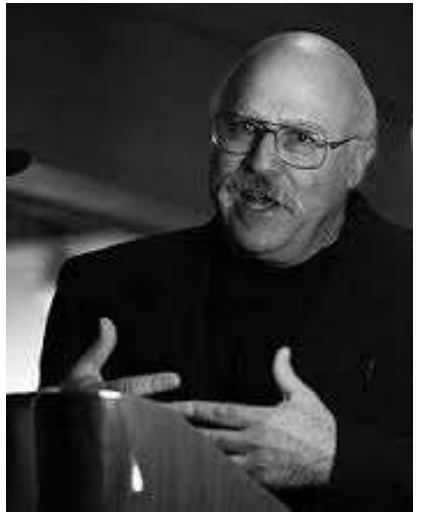
If you are a scientists you were nourished and trained in what Stephen Toulmin calls ‘The hidden agenda of modernity’

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

Stephen Toulmin



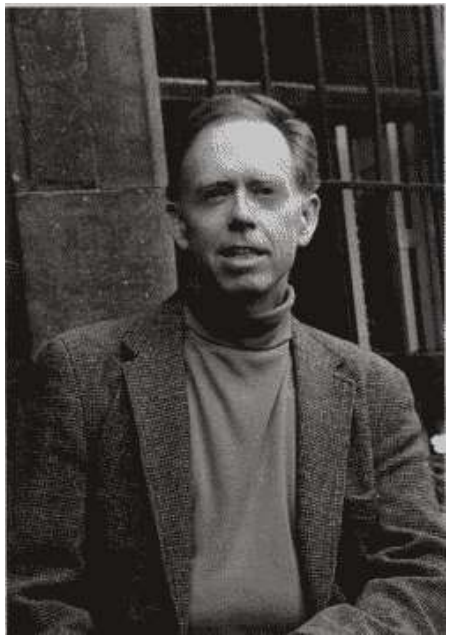
The dream was spectacularly successful, in all fields of endeavor, leading to what Steven Shapin calls ‘invisible science’



Steven Shapin

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

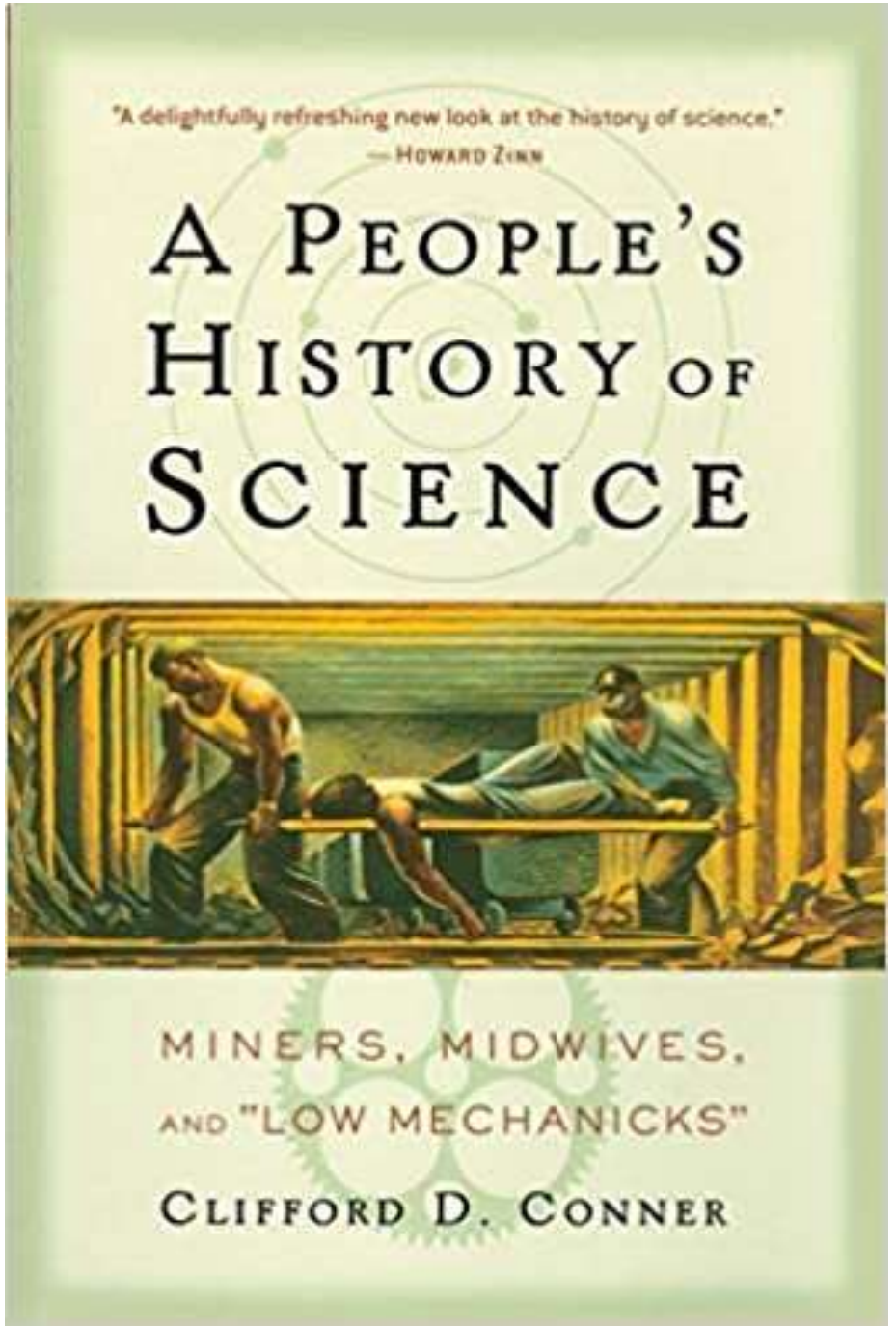
What is science?

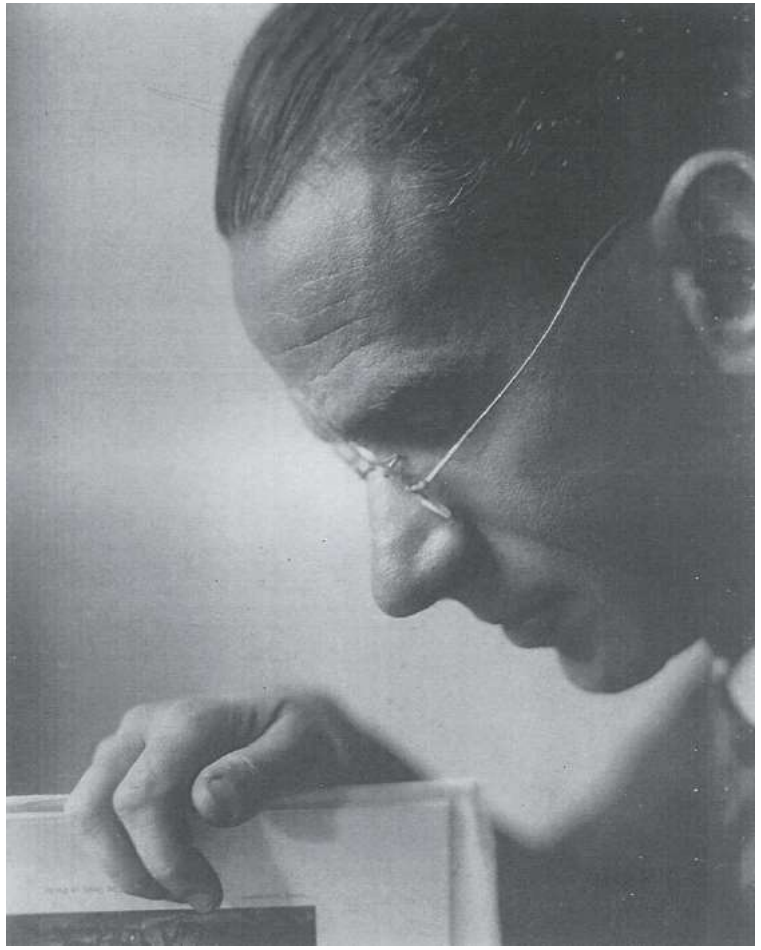


Clifford D. Conner

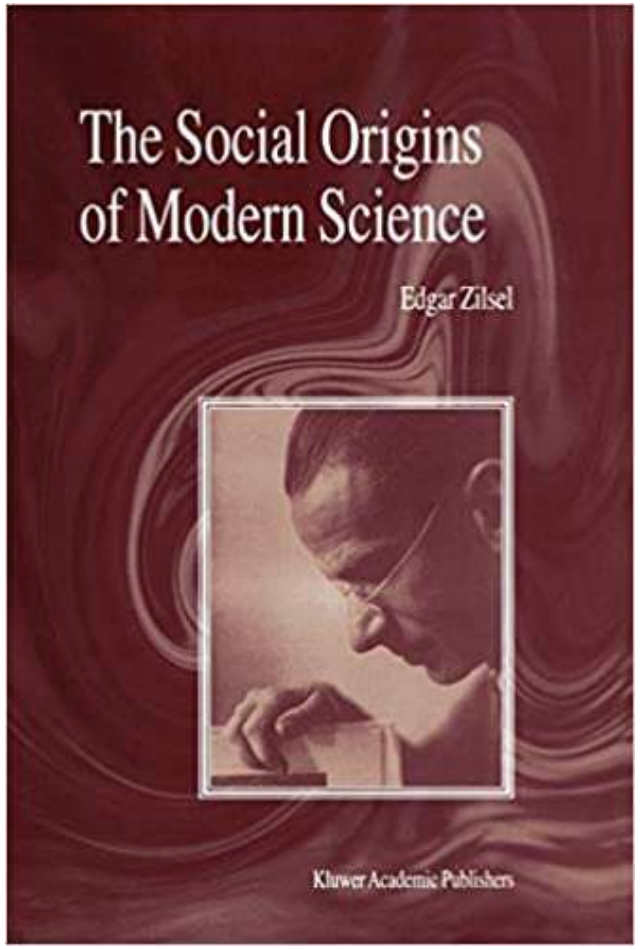
An antidote to a vision of the history of science as the fruit of the intuition of great (mostly) men

‘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

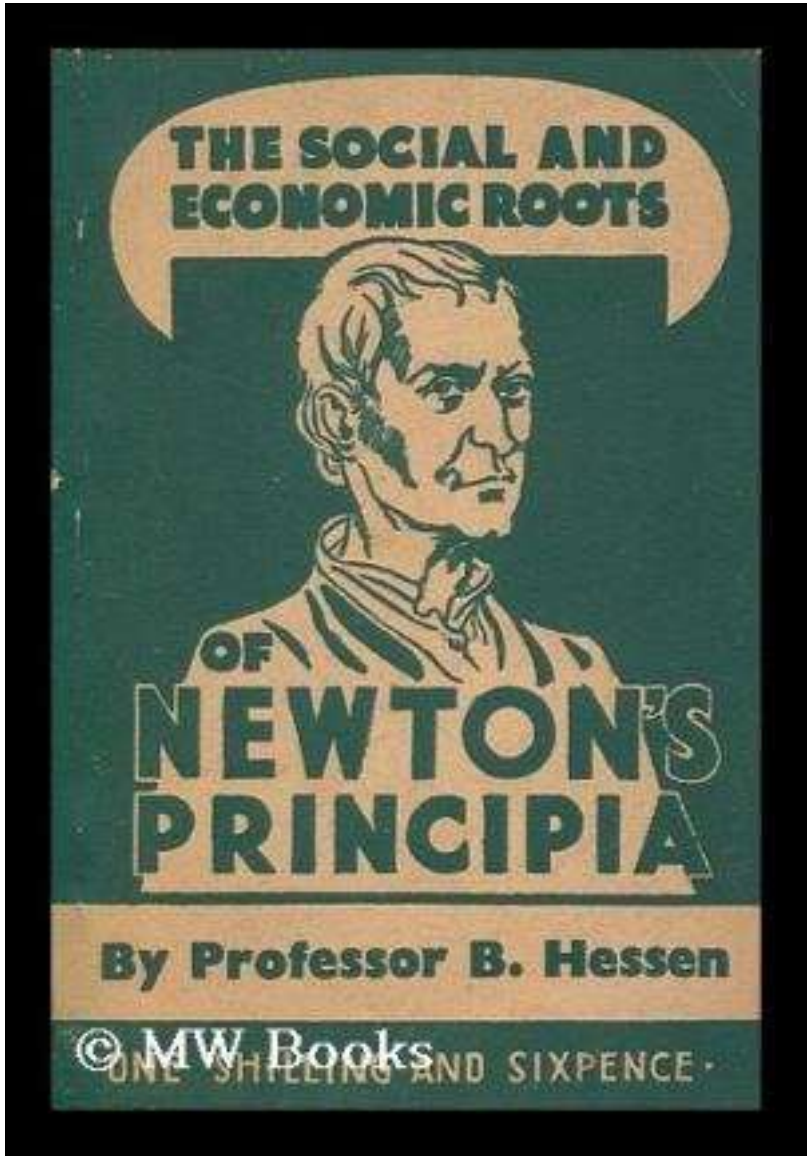
"Science originates in urban cultures, money economy, market economy…"

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’



How about the way we are taught our science?

Kuhn said that the “educational initiation that prepares and licenses the student for professional practice… is both rigorous and rigid”

and “It is a narrow and rigid education [in physics/science], probably more so than any other except perhaps in orthodox theology”

Thomas Kuhn, The structure of scientific revolution, 192, Chapters I and XIII

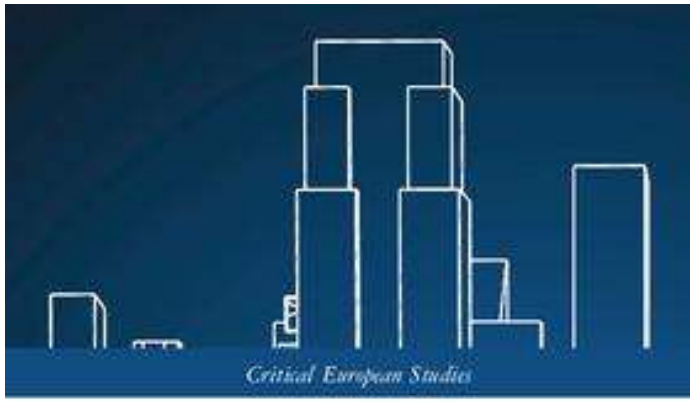
and “the member of a mature scientific community is, like the typical character of Orwell’s 1984, the victim of a history rewritten by the powers that be.”

Thomas Kuhn, The structure of scientific revolution, 192, Chapter XIII

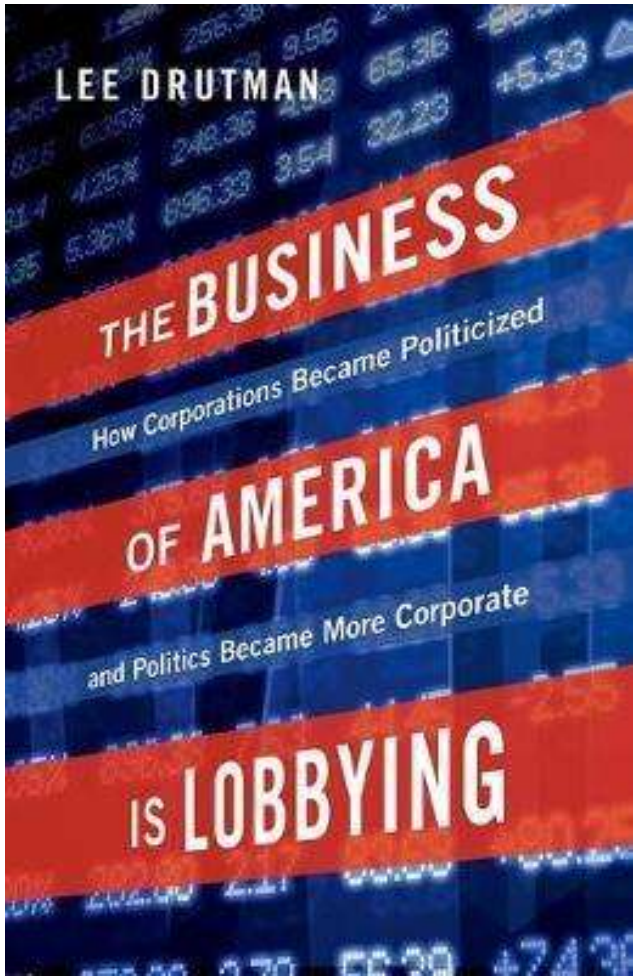
What is science?

- The legacy of Enlightenment
- The way to emancipation and Bildung
- …
- …
- A tool of corporate power?

Sylvain Laurens



Lee Drutman



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Science, the Endless Frontier of Regulatory Capture

30 Pages • Posted: 12 Mar 2021

Andrea Saltelli
Universitat Oberta de Catalunya

Dorothy Dankel
University of Bergen

Monica Di Fiore
Italian National Research Council (CNR) - Institute of Cognitive Sciences and Technologies (ISTC)

Nina Holland
Corporate Europe Observatory

Martin Pigeon
Corporate Europe Observatory

Date Written: March 1, 2021

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84 References

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 not trivial questions. They demand choices and come to a cost

Definition of *integrity*

2 **:** an unimpaired condition **:** soundness

Is the science we are receiving unimpaired?

Predatory publishing?

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

nature

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,

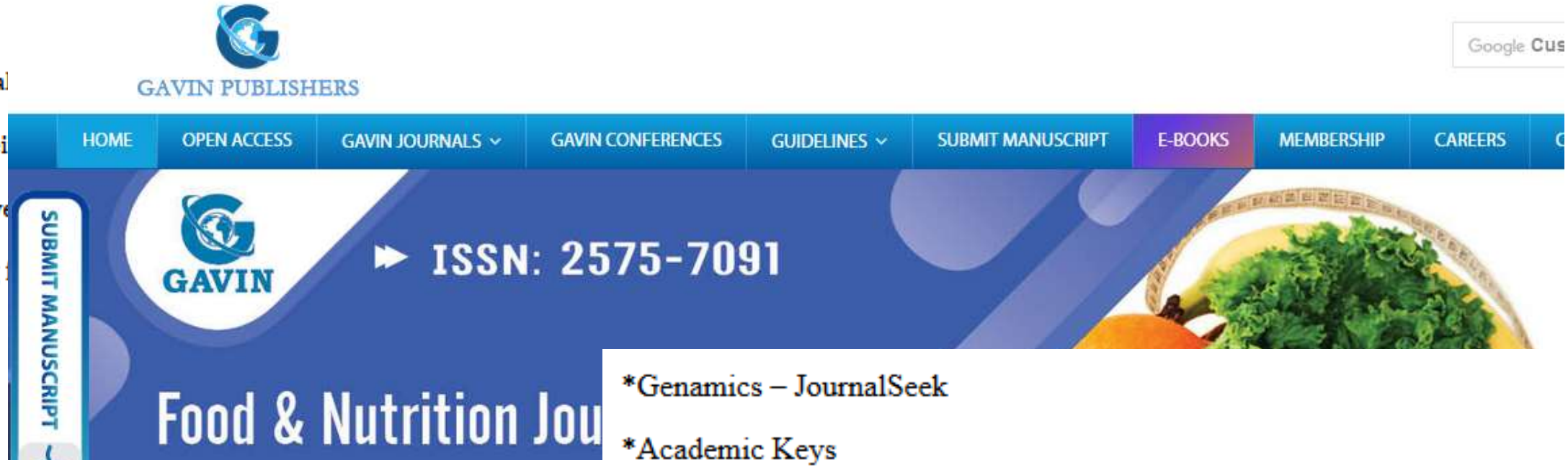
I hope everything is going well.

We cordial

As you bei

If you have

Hoping



About the Journal

Journal Impact Factor 1.2*

*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

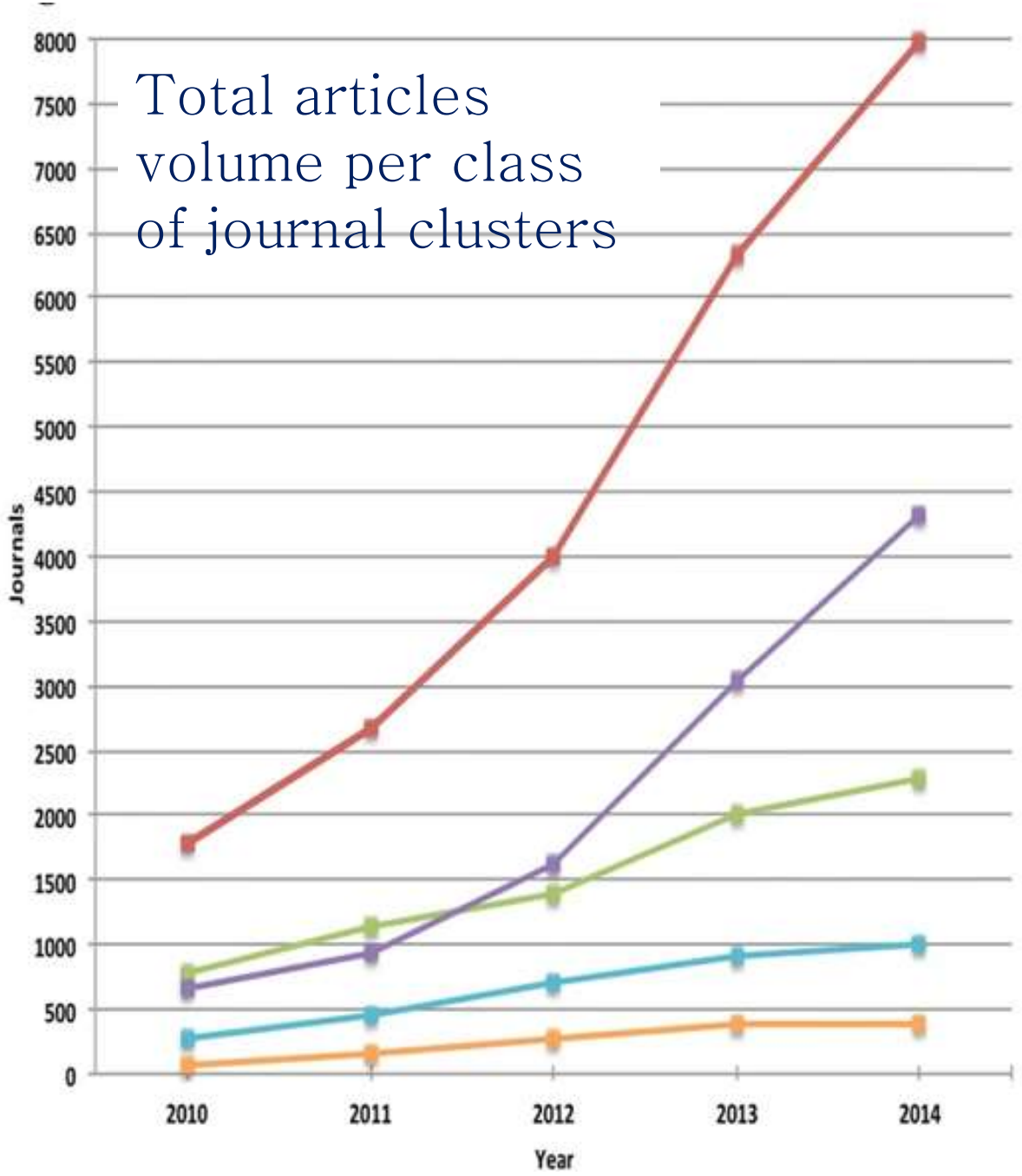
*Open J-Gate

* Directory of Journals indexing

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.

Total articles volume per class of journal clusters



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

Silvio Funtowicz

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

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, **127** (*October*), F236–F265. Doi: 10.1111/ecoj.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

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

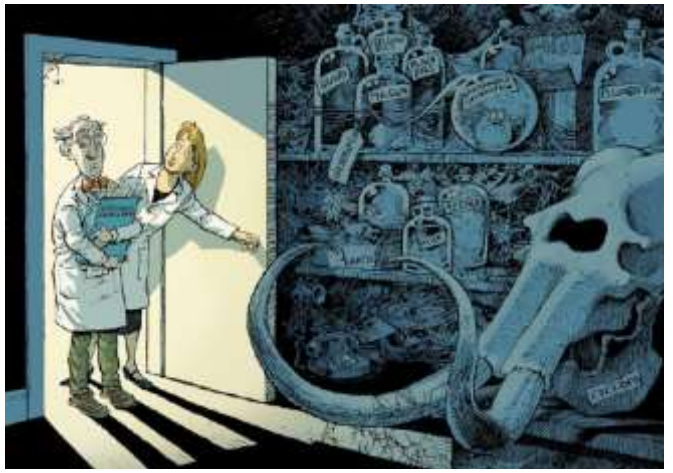
Opinion: Is science really facing a reproducibility crisis, and do we need it to?

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"

The crisis is methodological, epistemological, ethical and metaphysical



COMMENT · 20 MARCH 2019

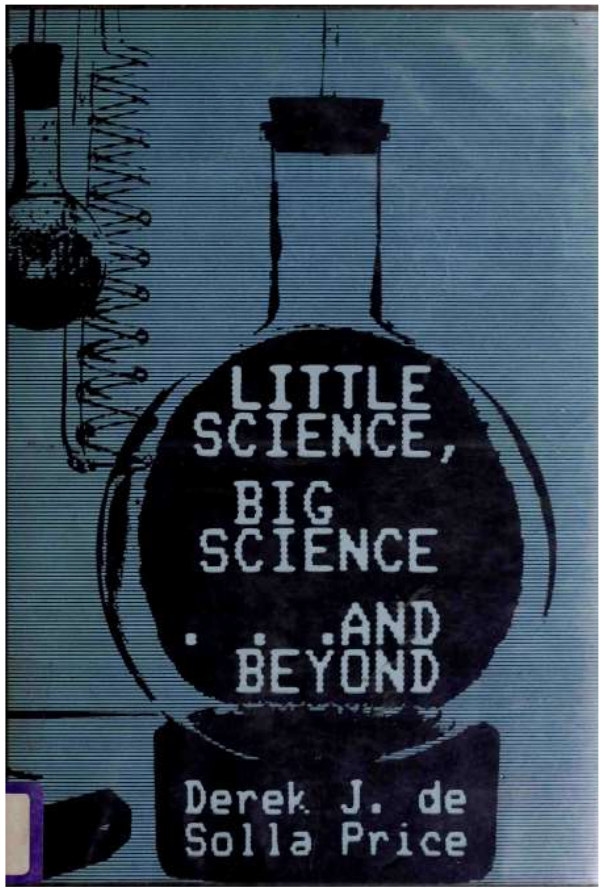
Scientists rise up against statistical significance

Valentin Amrhein, Sander Greenland, Blake McShane and more than 800 signatories call for an end to hyped claims and the dismissal of possibly crucial effects.

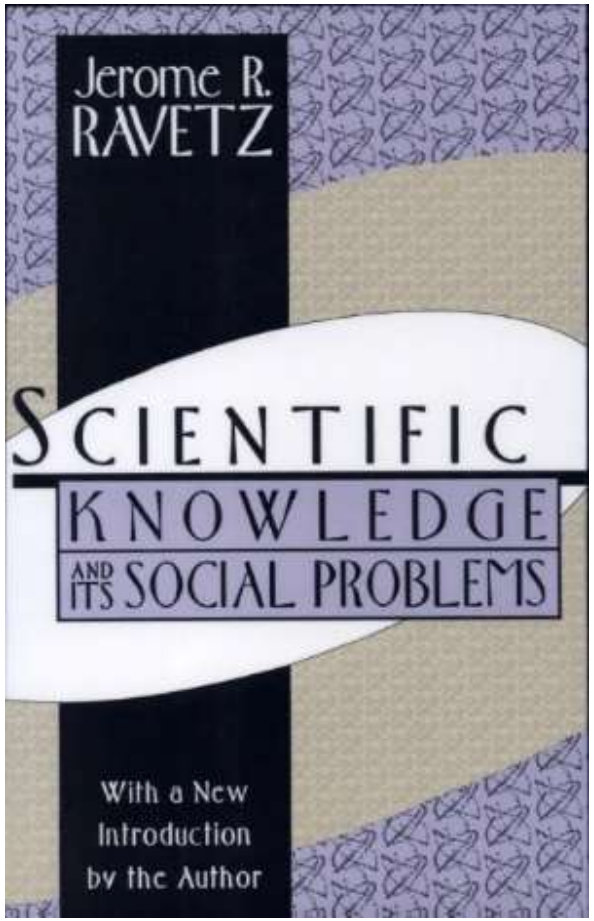
Valentin Amrhein ✉, Sander Greenland & Blake McShane

nature
International journal of science

The crisis was predicted



Derek J. de Solla Price



Jerome R. Ravetz

de Solla Price, D.J., **1963**, Little science big science, Columbia University Press;
Ravetz, J., **1971**, Scientific Knowledge and its Social Problems, Oxford University Press.

Powerful drivers: the crisis will be worse before it can be better

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

ROYAL SOCIETY OPEN SCIENCE

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. Smaldino[1] and Richard McElreath[2]

[1]Cognitive and Information Sciences, University of California, Merced, CA 95343, USA
[2]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

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.

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

Credits: https://www.benitaepstein.com/

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

Kazakhstani scientist Alexandra Elbakyan

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

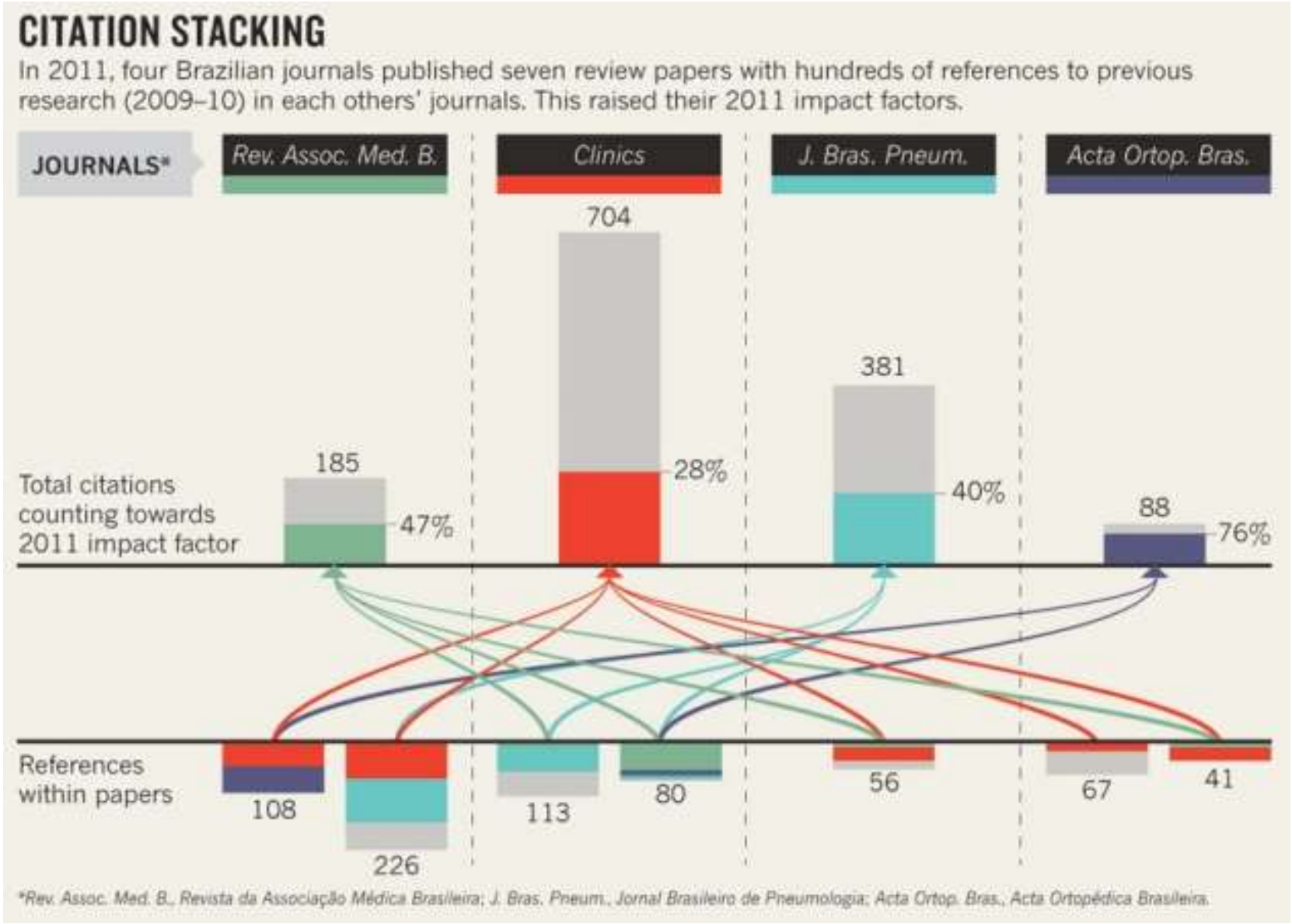
Elsevier profits 2010 = £724m on £2bn revenue: a 36% margin – higher than Apple, Google, or Amazon

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”

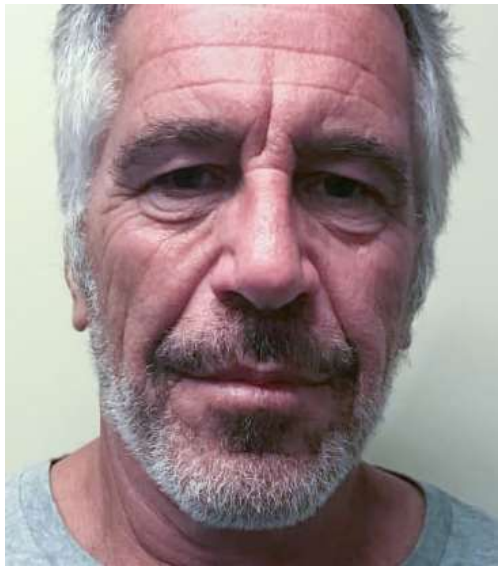
Stephen Buranyi, The Guardian, 27 Jun 2017.

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?



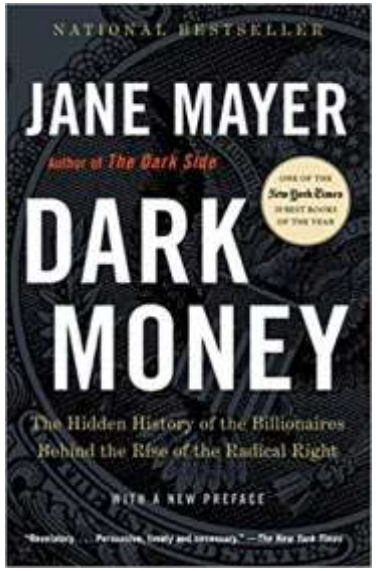
Jeffrey Epstein
& paedophilia

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



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

Undivided or strained by contradictions?

Contradiction: a situation in which inherent factors, actions, or propositions are inconsistent or contrary to one another

Bending to reviewer-coerced citation or not?

nature

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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?

The New York Times

U.S. Accuses Harvard Scientist of Concealing Chinese Funding

Prosecutors say Charles M. Lieber, the chair of Harvard's chemistry department, lied about contacts with a Chinese state-run initiative that seeks to draw foreign-educated talent.

By Ellen Barry

Jan. 28, 2020

"one of Harvard's scientific luminaries was in handcuffs, … 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?

SIGNIFICANCE

Business Culture Politics S

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

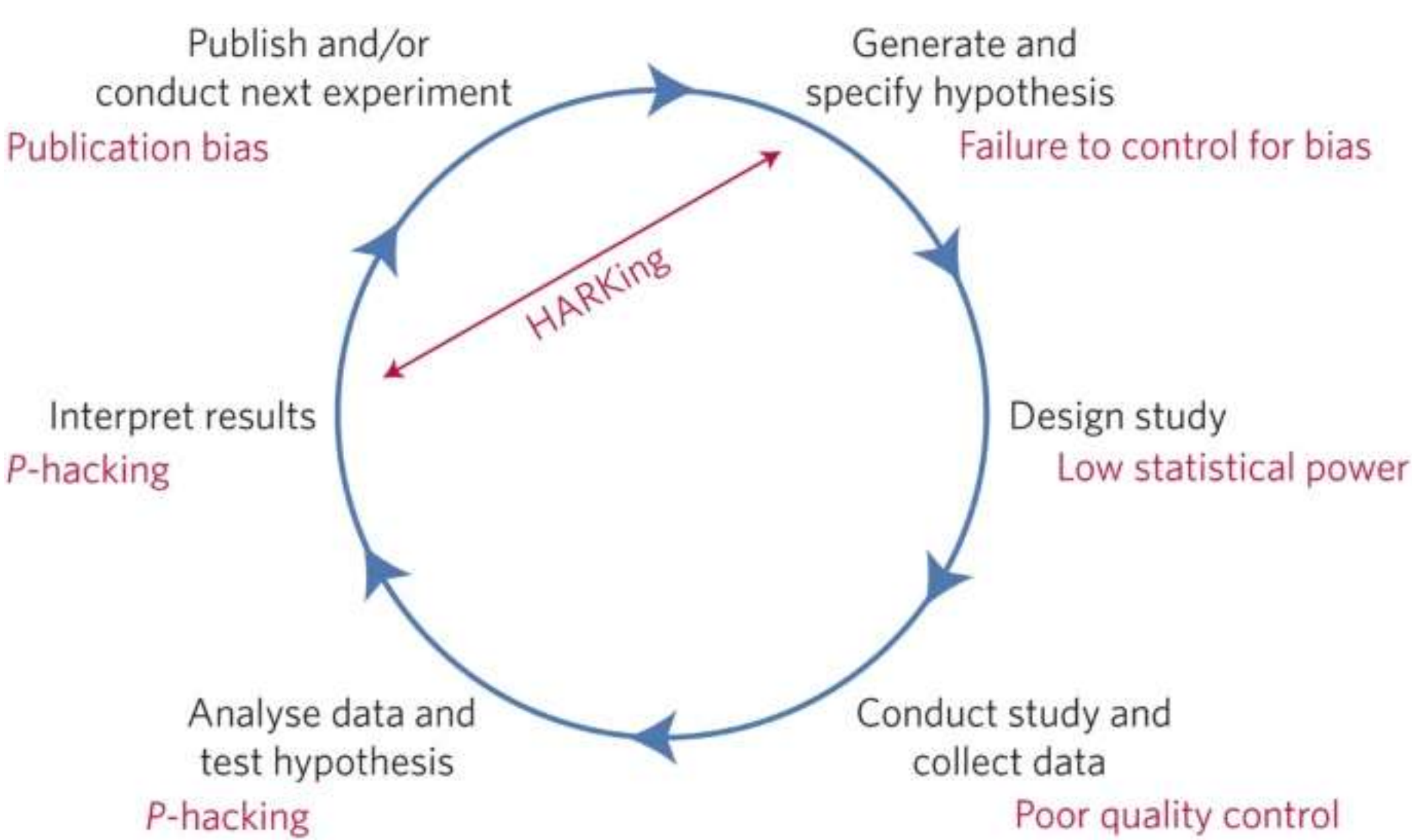
Nature Materials **4**, 1(2005) | Cite this article

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


Publish and/or
conduct next experiment
Publication bias
Generate and
specify hypothesis
Failure to control for bias
HARKing
Interpret results
P-hacking
Design study
Low statistical power
Analyse data and
test hypothesis
P-hacking
Conduct study and
collect data
Poor quality control

Are the numbers you produce responsible?

Models ‘too big to fail’

COMMENT · 24 JUNE 2020

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.

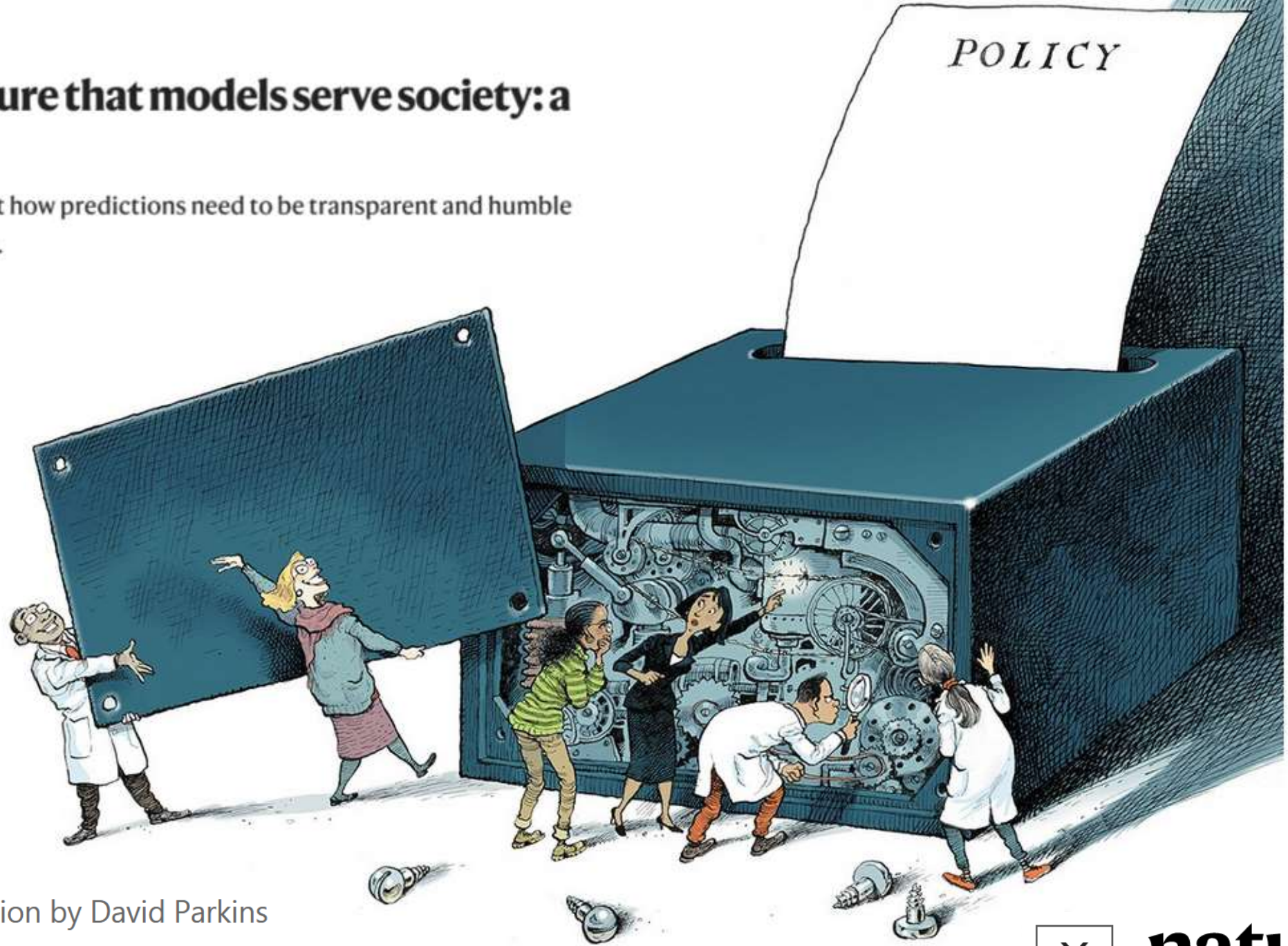


Illustration by David Parkins

nature

COMMENT · 24 JUNE 2020

nature

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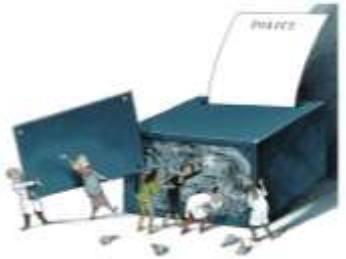
Andrea Saltelli ✉, Gabriele Bammer, Isabelle Bruno, Erica Charters, Monica Di Fiore, Emmanuel Didier, Wendy Nelson Espeland, John Kay, Samuele Lo Piano, Deborah Mayo, Roger Pielke Jr, Tommaso Portaluri, Theodore M. Porter, Arnald Puy, Ismael Rafols, Jerome R. Ravetz, Erik Reinert, Daniel Sarewitz, Philip 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).

Contradictions in the unintended effects of reforms?

Good intentions going bad

TABLE 1. GROWING PERVERSE INCENTIVES IN ACADEMIA

Incentive	*Intended effect*	*Actual effect*
"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 Reseh[illegible] (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	
"Researchers rewarded for increased number of citations."	*Actual effect*
Intended effect	Extended reference lists to inflate citations; reviewers request citation of their work through peer review
Reward quality work that influences others.	

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Incentive	*Actual effect*
"Teachers rewarded for increased student test scores." "Departments rewarded for increasing U.S. News ranking."	"Teaching to the tests; emphasis on short-term learning." Extensive efforts to reverse engineer, game, and cheat rankings.
Intended effect	
"Improve teacher effectiveness." "Stronger departments."	

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

Contradictions in CUDOS?

The same R.K. Merton realized later in life that norms have corresponding counter norms

Mitroff, I. I. 1974, Norms and Counter-Norms in a Select Group of the Apollo Moon Scientists: A Case Study of the Ambivalence of Scientists, American Sociological Review, 39, 579-595.

NORMS AND COUNTER-NORMS IN A SELECT GROUP OF THE APOLLO MOON SCIENTISTS: A CASE STUDY OF THE AMBIVALENCE OF SCIENTISTS*

IAN I. MITROFF

American Sociological Review 1974, Vol. 39 (August): 579-595

This paper describes a three and a half year study conducted over the course of the Apollo lunar missions with forty-two of the most prestigious scientists who studied the lunar rocks. The paper supports the Merton-E. Barber concept of sociological ambivalence, that social institutions reflect potentially conflicting sets of norms. The paper offers a set of counter-norms for science, arguing that if the norm of universalism is rooted in the impersonal character of science, an opposing counter-norm is rooted in the personal character of science. The paper also argues that not only is sociological ambivalence a characteristic of science, but it seems necessary for the existence and ultimate rationality of science.

Three-and-a-half-year study conducted over the course of the Apollo lunar missions with forty-two of the most prestigious scientists who studied the lunar rocks

The paper supports the Merton-E. Barber concept of **sociological ambivalence, that social institutions reflect potentially conflicting sets of norms**

[We must] consider, first, how potentially contradictory norms develop in every social institution; next, how in the institution of science conflicting norms generate marked ambivalence in the lives of scientists; and finally, how this ambivalence affects the actual, as distinct from the supposed, relations between men of science (Merton, 1963a:80).

- Solitariness (secrecy, miserism) is often used to keep findings secret in order to be able to claim patent rights…

Instead of Communalism

- Particularism […] a real issue, particularly when you consider the ratio of researchers in rich countries compared with those in poor countries

Instead of Universalism

- Interestedness arises because scientists have genuine interests at stake in the reception of their research…

Instead of Disinterestedness

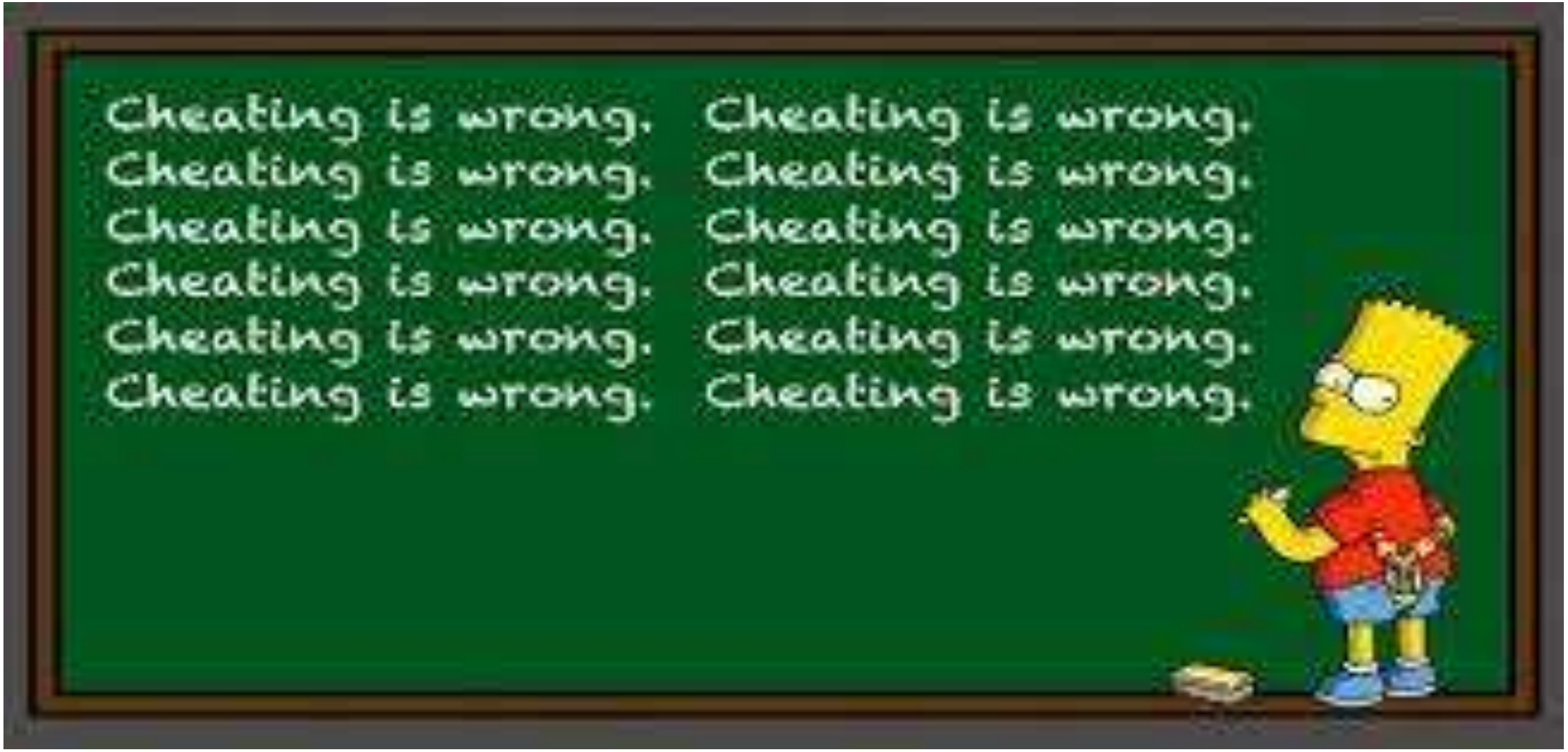
- Dogmatism because careers are built upon a particular premise (theory) being true…

Instead of Organized Skepticism

Definition of *integrity*

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

Wrapping up: being of ‘one piece’ in the present configuration is fraught with difficulties



@andreasaltelli