

Issues in quantitative research

Andrea Saltelli

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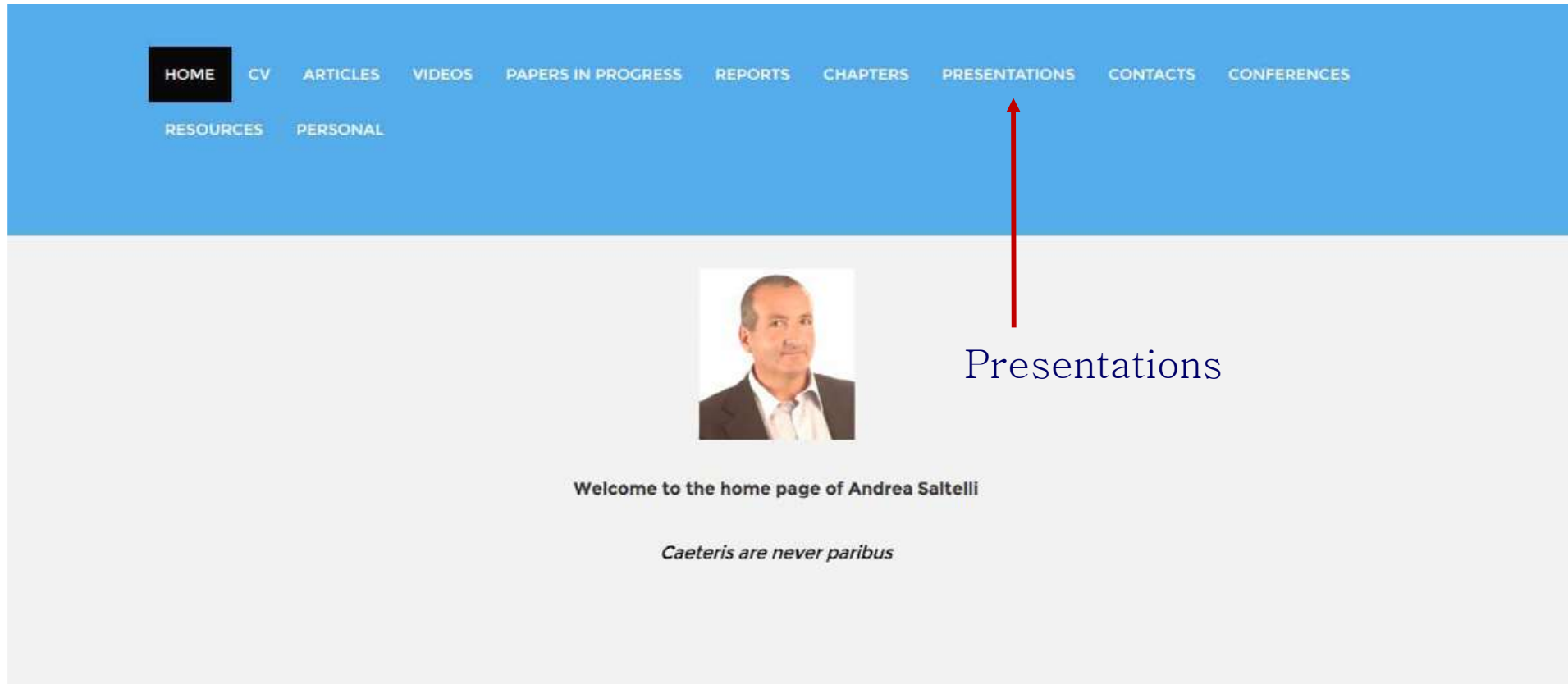
&

Institut de Ciència i Tecnologia Ambientals (ICTA) –
Universitat Autònoma de Barcelona (UAB)

PhD Course: Maintaining Scientific Integrity in
Present Day Academic Reality

Utrecht, February 26, 2016

www.andreasaltelli.eu



Where to find this presentation

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sensitivity analysis,
sensitivity auditing,
science for policy,
impact assessment, ...

The promised content

- Issues in quantitative research. The role of statistical and mathematical modelling in the context of science advice.
- Ethics of quantification (T. Porter).
- Instrumental use of inference (e.g. P-hacking).
- Ingenuous and disingenuous uses of sensitivity analysis.
- Have you ever been asked to 'quantify'? Have you encountered problems or doubts in doing so? Bring examples of challenges you are confronted with.

What you asked for

CONTRADICTION SCIENCE – TECHNOSCIENCE (I)

- “Science driven research against founding driven research. Many times the topics of our research are tailored to satisfy client requirements. Until what extent shall we please our clients and which are the limits to consider our research ‘scientific’?”

What you asked for

CONTRADICTION SCIENCE – TECHNOSCIENCE (II)

- “Can scientists deliver sound academic work and be active in a company at the same time?”
- “Independency (Pressure of co-authors or funding agencies/companies to steer conclusions towards their preferred direction)”

What you asked for

CONTRADICTION SCIENCE – TECHNOSCIENCE (III)

- “I think my project is a very interesting topic: my PhD is completely funded by Shell. I have to balance between company restrictions and academic restrictions. What can I share with everybody, what is prohibited? Where is the integrity line for companies/academics and where is the line for me personally? I think these are all interesting discussion points.”

What you asked for

GRIM ACADEMY REALITIES (I)

- “I want to publish a paper and my supervisor specifically wants me to cite a lot of his papers, even though I don’t agree that these papers have a lot to do with, or add value to my own paper. What should I do?”
- “I want to publish a paper and my supervisor specifically wants me to add one of his good friends as a co-author, even though he did not contribute significantly at all. What should I do?”

What you asked for

GRIM ACADEMY REALITIES (II)

- “Self-citation. How to maintain scientific integrity when the pressure to publish is so high and dominant in the scientific community.”
- “I hope to learn a bit about academic politics, and how to deal with them in an honest way.”

What you asked for

INTEGRITY

- “What does scientific integrity mean in a public–private project? What is the value and role of science in these projects?”
- “Is there consensus in the academic world about the meaning and importance of scientific integrity? How has scientific integrity evolved in the history of science?”

What you asked for

STRIVING FOR QUALITY (I)

- “Increasing demand of the number of publications. What is the strategy of UU, aiming for larger number of publications or for fewer publications of better quality? How can we measure quality, only by the impact factor of the journal where our work is published?”
- “Transparency (data)”

What you asked for

STRIVING FOR QUALITY (II)

- “Data sharing after publication: I experience that it is sometimes very difficult or impossible to get the underlying data or model code that is used for an article. In my opinion, more openness is needed in this regard, but how to get this? Once published, I am convinced that we should be open and be prepared to share underlying data/codes or assumptions.”
- “How to critically question the assumptions, and arguments that guide our research; looking for possible biases.”

What you asked for

TAKING SIDE?

- “How to deal with scientific and social dilemmas”

- ➔ Contradictions we live by as scientists and their root causes
- ➔ Science and technoscience
- ➔ Publish or perish and perverse metrics
- ➔ Issues with trust
- ➔ Responsible quantifications and recipes
- ➔ Your wish list again

- ➔ Slides & reading materials at www.andreasaltelli.eu/
 - ➔ Prize for the most engaged/engaging discussant

Demarcation: facts
separate from values

On demarcation:

“the incoming commission must find better ways of separating evidence-gathering processes from the ‘political imperative’”, A. Glover, former Chief Science Adviser of President Barroso (Wildson, 2014).

Wildson, J. 2014. Evidence-based Union? A new alliance for science advice in Europe. In The Guardian. Available at:
<http://www.theguardian.com/science/political-science/2014/jun/23/evidence-based-union-a-new-alliance-for-science-advice-in-europe>



Anne Glover

Evidence based policy – in the prevailing positivistic narrative – is predicated on a separation of facts from values, of scientists from their customers, on demarcation of roles.

‘Demarcation model’ of science’s input to policy

- Protecting science from the political interference...
- Preventing possible abuse of science...
- ... and scientific information driven by agendas...
- Prescribes a clear demarcation between the institutions (and individuals) who provide the science, and those where it is used.

Funtowicz, S. 2006. What is Knowledge Assessment? In Guimarães Pereira, Â., Guedes Vaz, S. and Tognetti, S. (eds) Interfaces between Science and Society. Greenleaf Publishers, Sheffield.

The demarcation model is challenged in more recent epistemologies:

‘Post Normal Science’ (Funtowicz and Ravetz, 1993), ‘Co-production of knowledge’ model (Jasanoff, 1996).

Funtowicz, S. O. & Ravetz, J. R. 1993. Science for the post-normal age. *Futures*, 25(7), 739–755.

Jasanoff, S. 1996, *Beyond Epistemology: Relativism and Engagement in the Politics of Science*. *Social Studies of Science*. 26(2) 393–418.



Sheila Jasanoff

Post Normal Science's model of Extended Participation across disciplines – acknowledging that different disciplines see through different lenses, and across communities of both experts and stakeholders;

Jerry Ravetz and
Silvio Funtowicz



From ‘speaking truth to power’ towards ‘working deliberatively within imperfections’;

Science is but one among a plurality of relevant knowledges;

Facts become ‘extended facts’.

Funtowicz, S. O. & Ravetz, J. R. 1993. Science for the post-normal age. *Futures*, 25(7), 739–755.

Funtowicz, S and Ravetz J 1990, *Uncertainty and Quality in Science for Policy*, Kluwer Academic Publishers, Dordrecht.

Where did this separation originate?



Francis Bacon
(1561–1626)

Magnalia Naturae, in the
New Atlantis (1627),
*‘Wonders of nature, in
particular with respect to
human use’*

Demarcation is part of the
Cartesian dream of man as
master and possessor of
nature, of prediction and
control, of Bacon’s wonders
of science and Condorcet’s
mathematique sociale...



René
Descartes
(1596–1650)

Discourse on Method
(1637)



Nicolas de Caritat,
marquis de Condorcet
(1743– 1794)

‘Sketch for a Historical Picture of the
Progress of the Human Spirit’



Francis Bacon
(1561–1626)

Magnalia Naturae, in the
New Atlantis (1627),
*‘Wonders of nature, in
particular with respect to
human use’*

Magnalia Naturae, in the New Atlantis (1627),
‘Wonders of nature, in particular with respect to human use’

The prolongation of life; The restitution of youth in some degree; The retardation of age; The curing of diseases counted incurable; The mitigation of pain; More easy and less loathsome purgings; The increasing of strength and activity; The increasing of ability to suffer torture or pain; The altering of complexions, and fatness and leanness; The altering of statures; The altering of features; The increasing and exalting of the intellectual parts; Versions of bodies into other bodies; Making of new species; Transplanting of one species into another; Instruments of destruction, as of war and poison; Exhilaration of the spirits, and putting them in good disposition; Force of the imagination, either upon another body, or upon the body itself; Acceleration of time in maturations; Acceleration of time in clarifications; Acceleration of putrefaction; Acceleration of decoction; Acceleration of germination; Making rich composts for the earth; Impressions of the air, and raising of tempests; Great alteration; as in induration, emollition, &c; Turning crude and watery substances into oily and unctuous substances; Drawing of new foods out of substances not now in use; Making new threads for apparel ; and new stuffs, such as paper, glass, &c; Natural divinations; Deceptions of the senses; Greater pleasures of the senses; Artificial minerals and cements.



Francis Bacon
(1561–1626)

Magnalia Naturae, in the
New Atlantis (1627),
*‘Wonders of nature, in
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human use’*

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mitigation of pain;
[...]

Drawing of new foods out of substances not now
in use; Making new threads for apparel; and new
stuffs, such as paper, glass, &c; Natural
divinations; Deceptions of the senses; Greater
pleasures of the senses; Artificial minerals and
cements.

The study of letters leading to “doubts and errors”; Comparing “disquisitions of the ancient moralists to very towering and magnificent palaces with no better foundation than sand and mud”; condemnation of humanities and exaltation of mathematics.



René
Descartes
(1596–1650)

Discourse on Method
(1637)

“I perceived it to be possible to arrive at knowledge highly useful in life; and in room of the Speculative Philosophy [...], to discover a Practical, by means of which, knowing the force and action of fire, water, air, the stars, the heavens, and all the other bodies that surround us, [...]we might also apply them [...], and thus render ourselves the lords and possessors of nature.”



René
Descartes
(1596–1650)

Discourse on Method
(1637)

In the formulation of Condorcet:

“All the errors in politics and in morals are founded upon philosophical mistakes, which, themselves, are connected with physical errors” (Ninth Epoch)



Nicolas de Caritat,
marquis de Condorcet
(1743– 1794)

‘Sketch for a Historical Picture of the
Progress of the Human Spirit’

Considering the possibility of overpopulation leading to war due to scarcity of resources, he concludes that this would not happen because technical progress and ethical progress will go hand in hand. Man will understand that his duty “will consist not in the question of giving existence to a greater number of beings, but happiness.” (Tenth Epoch)



Nicolas de Caritat,
marquis de Condorcet
(1743– 1794)

‘Sketch for a Historical Picture of the
Progress of the Human Spirit’

‘mathématique sociale’

‘Condorcet method’, ‘Condorcet winner’, ‘Condorcet–Kemeny–Young–Levenglick (C–K–Y–L) ranking procedure’



Nicolas de Caritat,
marquis de Condorcet
(1743– 1794)

‘Sketch for a Historical Picture of the
Progress of the Human Spirit’

Feldman, J., 2005, Condorcet et la mathématique sociale: enthousiasmes et bemols, *Mathematics and Social Sciences*, 172(4), 7–41,
<http://www.ehess.fr/revue-msh/pdf/N172R955.pdf>

Munda G. (2007) – *Social multi-criteria evaluation*, Springer–Verlag, Heidelberg, New York, Economics Series

Closer to our times Vannevar Bush's dream was couched in the 'Endless Frontier' metaphor (1945):

“One of our hopes is that after the war there will be full employment. [...] To create more jobs we must make new and better and cheaper products [...] founded on [...] basic scientific research. [...]the] Government [...] opened the seas to clipper ships and furnished land for pioneers. Although these frontiers have more or less disappeared, the frontier of science remains.”



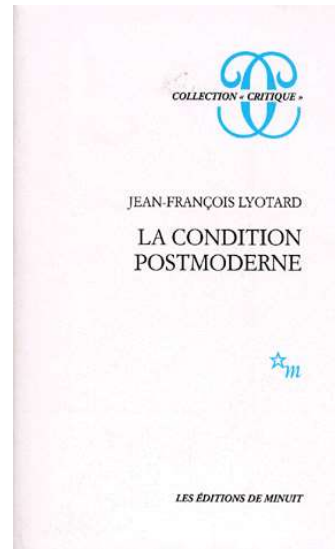
Vannevar Bush
(1890–1974)

Bush, V. (1945) Science: the endless frontier, United States Office of Scientific Research and Development, U.S. Govt. print office.

Science the Endless frontier (1945)

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

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

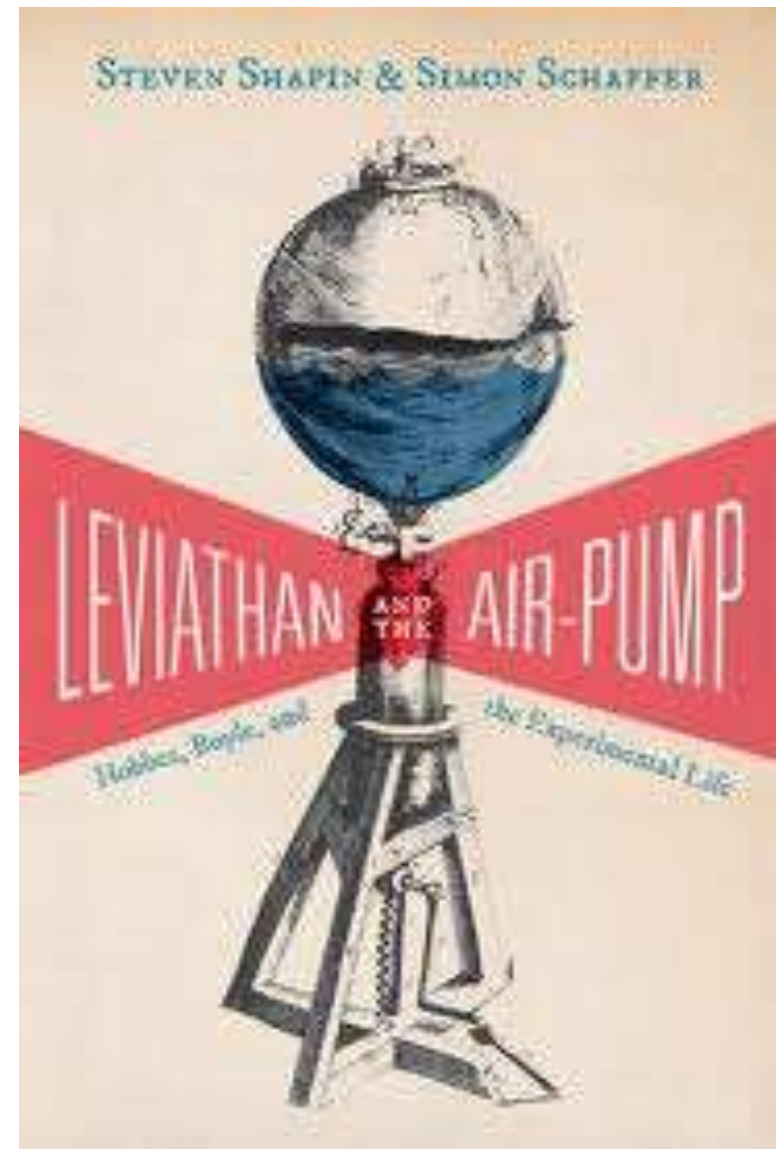


Jean-François Lyotard

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

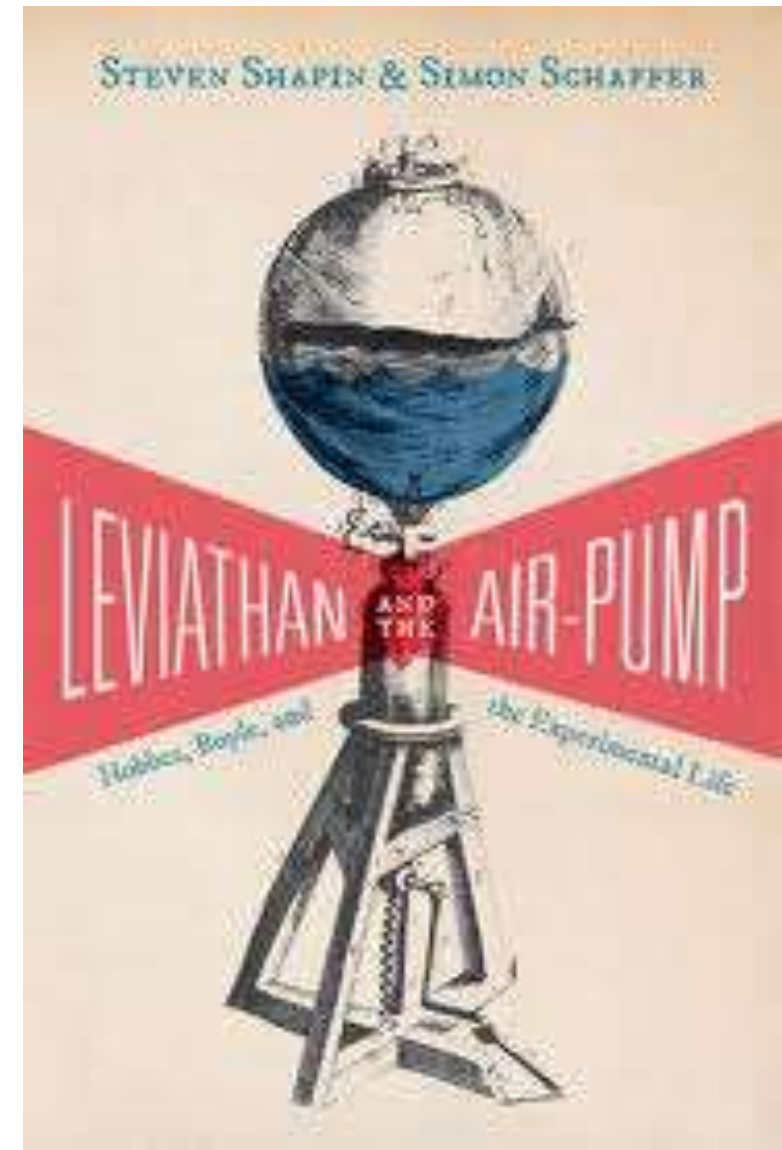
[...] Trust in Science and trust in the prevailing social order are linked.”

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 ...

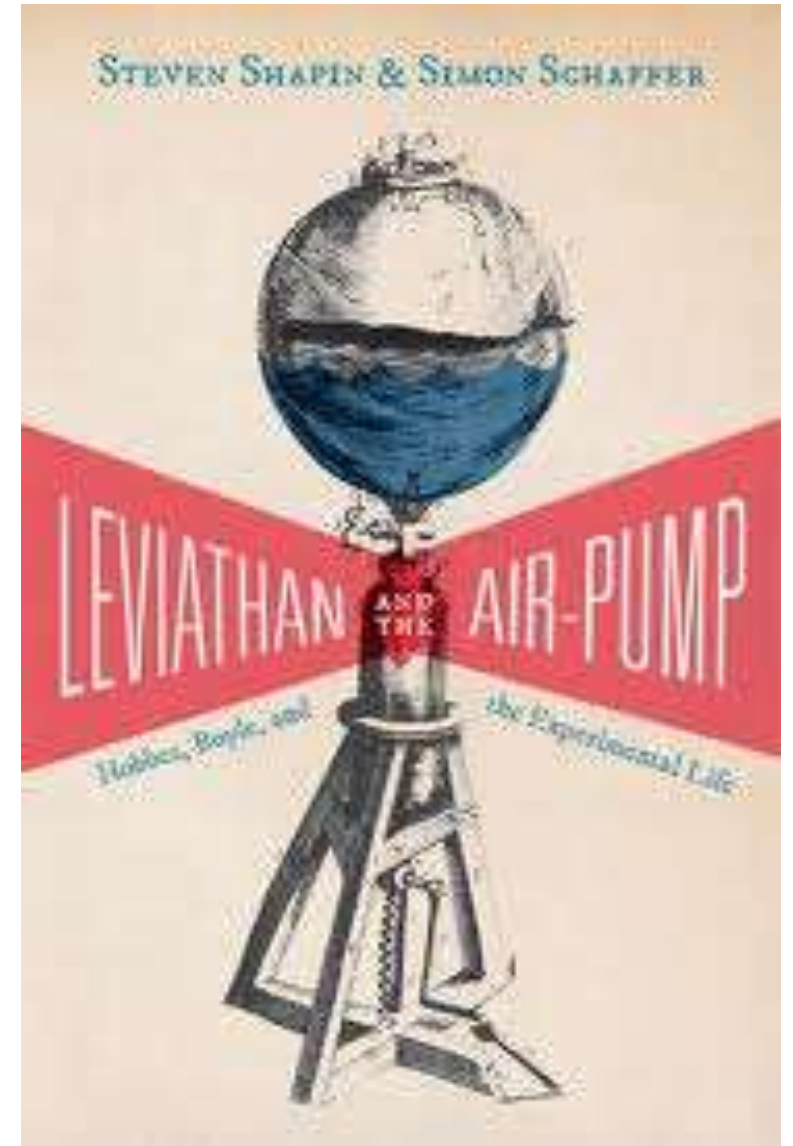
Shapin, S., Schaffer, S., 1985, *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life*, Princeton, 2011 Edition



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



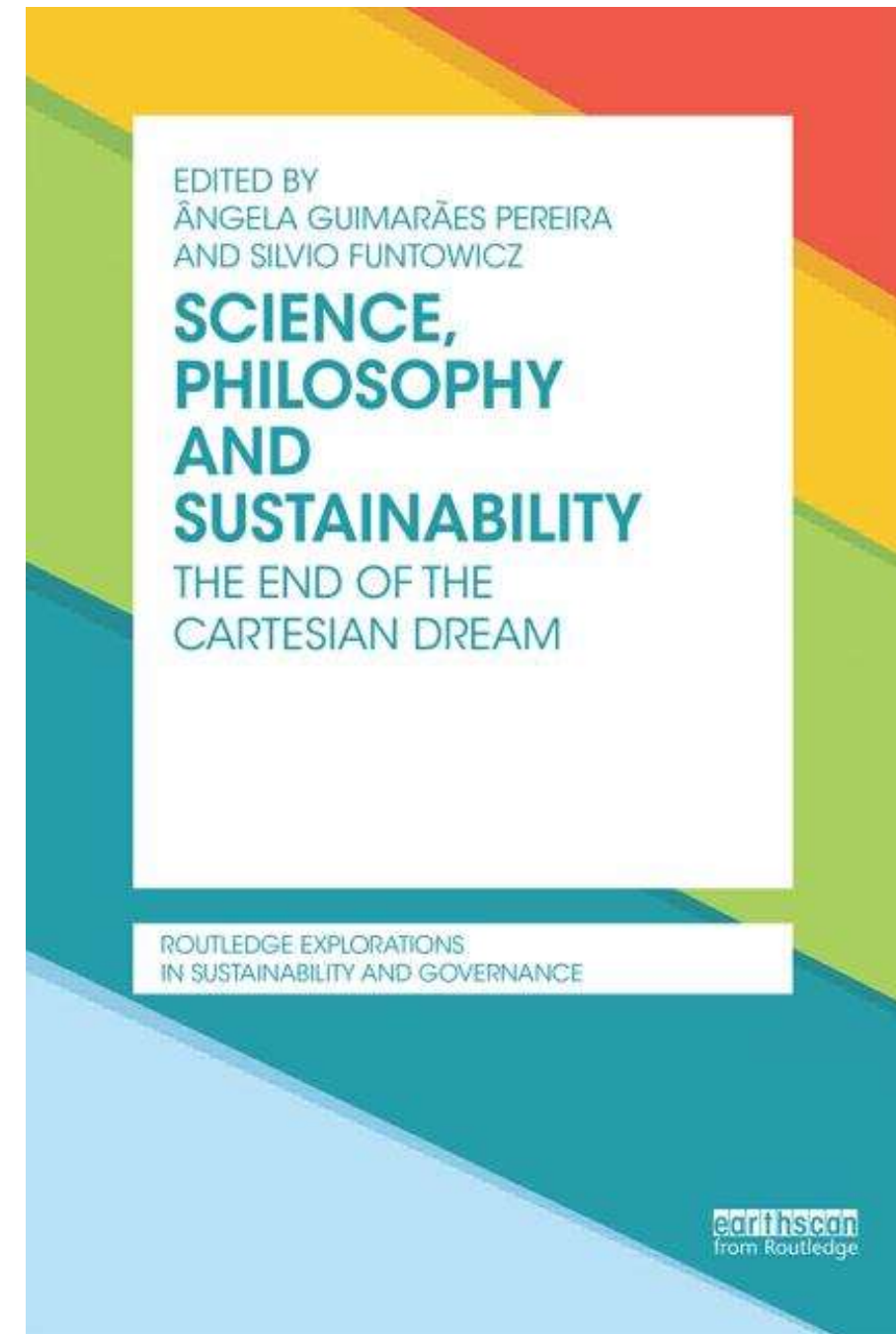
Bruno Latour



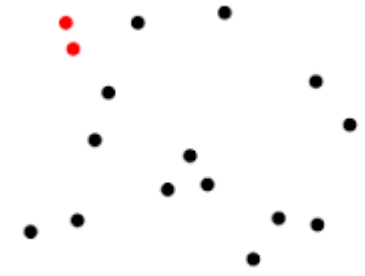
Latour, B., 1991, *Nous n'avons jamais été modernes*, Editions La découverte, 1993; *We Have Never Been Modern*. Cambridge, Harvard UP.

Guimarães Pereira, Â., and Funtowicz, S., Eds., 2015, The end of the Cartesian dream, Routledge's series: Explorations in Sustainability and Governance.

Rommetveit K Strand R Fjelland R & Funtowicz S, 2013 What can history teach us about the prospects of a European Research Area? Study procured by the Joint Research Centre EUR report 2612 (http://www.uib.no/sites/w3uibno/files/attachments/histera_final_report_25_2pdf)



Discussion points for the demarcation discussion:



The Cartesian dream has profound governance implications due to the centrality of science in the formulation, adjudication and legitimacy of policies. Would you agree with the following:

- I was nourished (and/or professionally trained) with the principles of the Cartesian dream?
- We should we move away from this dream to achieve progress.



Crisis

Issues with trust / quality in the scientific enterprise

Laboratory experiments cannot be trusted without independent verification (Sanderson 2013), rules are proposed to spot “suspected work [...] the majority of preclinical cancer papers in top tier journals” (Begley 2013).

Begley CG 2013 Reproducibility: Six red flags for suspect work *Nature* 497 433–434.

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

Sanderson K 2013 Bloggers put chemical reactions through the replication mill *Nature* 21 January 2013.

The
Economist

OCTOBER 19TH-25TH 2013

Economist.com

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

HOW SCIENCE GOES WRONG

99
Einsteinium

Unreliable research

Trouble at the lab

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

Oct 19th 2013 | From the print edition



22K

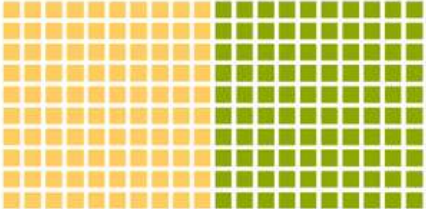


Jason Ford

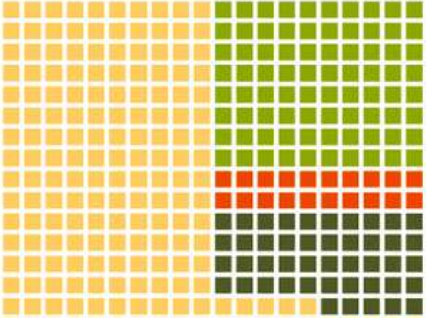
Unlikely results

How a small proportion of false positives can prove very misleading

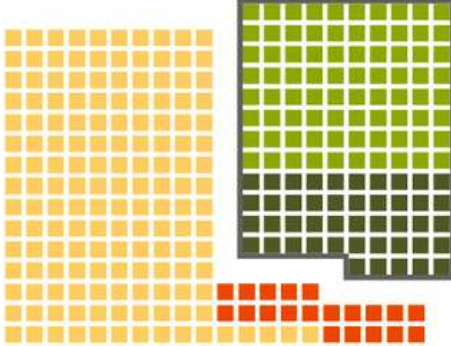
False True False negatives False positives



1. Of hypotheses interesting enough to test, perhaps one in ten will be true. So imagine tests on 1,000 hypotheses, 100 of which are true.



2. The tests have a false positive rate of 5%. That means they produce 45 false positives (5% of 900). They have a power of 0.8, so they confirm only 80 of the true hypotheses, producing 20 false negatives.



3. Not knowing what is false and what is not, the researcher sees 125 hypotheses as true, 45 of which are not. The negative results are much more reliable—but unlikely to be published.

Essay

Why Most Published Research Findings Are False

John P. A. Ioannidis

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

relationships, probes in each scientific field. In this framework, a research finding is less likely to be true when the studies conducted in a field are smaller; when effect sizes are smaller; when there is a greater number and lesser preselection of tested relationships; where there is greater flexibility in designs, definitions, outcomes, and analytical modes; when there is greater financial and other interest and prejudice; and when more teams are involved in a scientific field in chase of statistical significance.



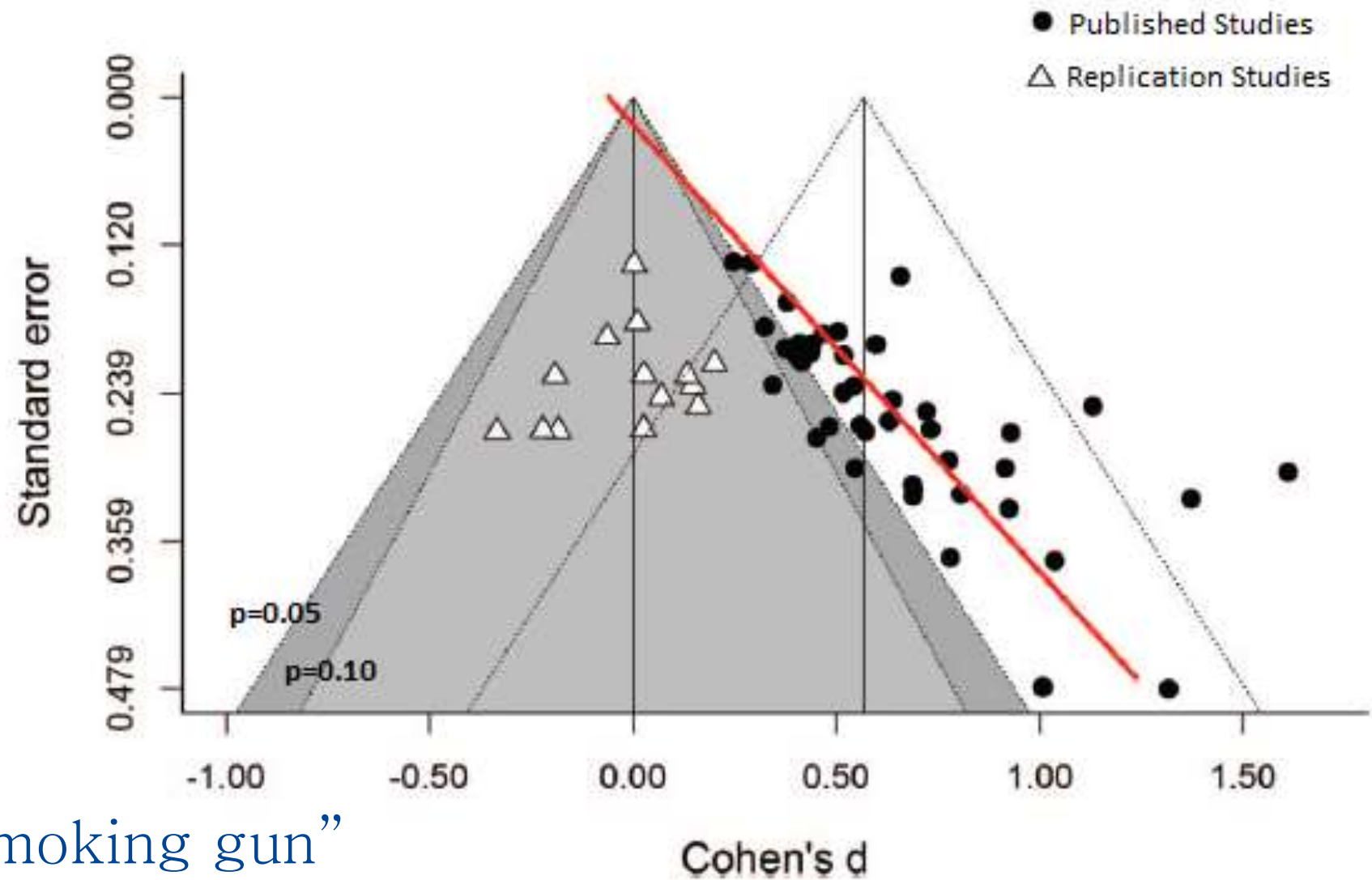
“A career structure which lays great stress on publishing copious papers exacerbates all these problems.”

The
Economist



“There is no cost to getting things wrong. The cost is not getting them published.” Brian Nosek, quoted by The Economist.





“P-hacking’s smoking gun”

Shanks et al. (2015) JEP: General

Journal of Experimental Psychology: General, 144(6), Dec 2015, e142–e158. “Romance, Risk, and Replication: Can Consumer Choices and Risk-Taking Be Primed by Mating Motives?”, Shanks DR, Vadillo MA, Riedel B, Clymo A, Govind S, Hickin N, Tamman AJ, Puhlmann LM.

“[...]a meta-analysis of this literature reveals strong evidence of either publication bias or p-hacking (or both).

None of the studies, including one that was fully preregistered, was successful.

The results question the claim that romantic primes can influence risk-taking and other potentially harmful behaviors.”

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

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

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

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



Issues with trust / quality in the scientific enterprise

Initiatives:

<http://retractionwatch.wordpress.com>

<http://www.reproducibilityinitiative.org>

Fixing the mess is not easy:

‘Sluggish data sharing hampers reproducibility effort’,
(Van Noorden, 2015).

Nature biotechnology. Further Confirmation Needed, Editorial, Nature Biotechnology 30, 2012, 806.

Van Noorden, R., Sluggish data sharing hampers reproducibility effort, Nature, News, June 3rd 2015.

Begley, C.G., Buchan A.M., and Dirnagl, U., 2015, Institutions must do their part for reproducibility, Nature, 525, p. 25–27.

Solutions from within:

Four international conferences have already been held on science integrity between 2007 and 2015 (May 31, 2015, about 600 delegates from over 50 countries and all continents, Rio de Janeiro)

San Francisco declaration, (2012), as of June 2015 signed by 12,000 individuals, and 570 organizations.

“Do not use journal-based metrics, such as Journal Impact Factor, as a surrogate measure of the quality of individual research articles to assess an individual scientist’s contributions, or in hiring, promotion, or funding decisions.”

Declaration: <http://am.ascb.org/dora/> , drafted by publishers, with separate recommendations for institutions, publishers, organizations that supply metrics and researchers.

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

Wilsdon, J., 2015, We need a measured approach to metrics, Nature, 523, 129.

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

Solutions from within:

How to Make More Published Research True (Ioannides 2014)



John P. A. Ioannides

“[...] adoption of large-scale collaborative research; replication culture; registration; sharing; reproducibility practices; better statistical methods; [...] and improvement in study design standards, peer review, reporting and dissemination of research, and training of the scientific workforce”

Solutions from within – incentives & currencies

How to Make More Published Research True
(Ioannides 2014)



John P. A. Ioannides

“Modifications [] in the reward system for science, affecting the exchange rates for currencies (e.g., publications and grants) and purchased academic goods (e.g., promotion and other academic or administrative power) and introducing currencies that are better aligned with translatable and reproducible research”

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

Brave efforts from within:

Jeffrey Beall, librarian, University of Colorado, Denver. Monitors predatory open access publishers.



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

“**Misleading metrics** list includes companies that “calculate” and publish counterfeit impact factors [...] The **Hijacked journals** list includes journals for which someone has created a counterfeit website, stealing the journal’s identity and soliciting articles submissions using the author-pays model (gold open-access)”

“Springer and Université Joseph Fourier release SciDetect to discover fake scientific papers”



“The open source software discovers text that has been generated with the SCIGen computer program and other fake-paper generators like Mathgen and Physgen [...]”

SciDetect [...] is a valuable building block for the future of academic publishing”

<https://www.springer.com/gp/about-springer/media/press-releases/corporate/springer-and-universit%C3%A9-joseph-fourier-release-scidetect-to-discover-fake-scientific-papers--/54166>



See Ravetz’s warning “If there were not a test of each paper ...”

Brave efforts from within:

Timothy Gowers, mathematician, Fields medalist, boycott of Elsevier, slogans: 'Academic Spring', 'Occupy Elsevier'.

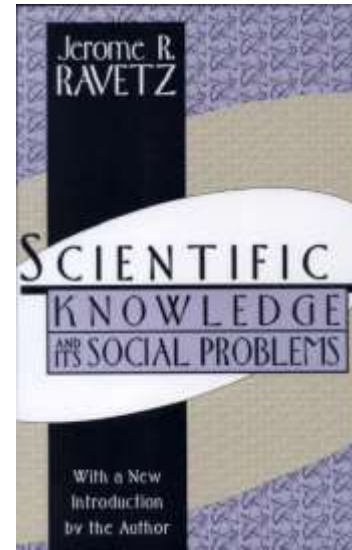


Whitfield, J., 2012, Elsevier boycott gathers pace: Rebel academics ponder how to break free of commercial publishers, Nature, doi:10.1038/nature.2012.10010

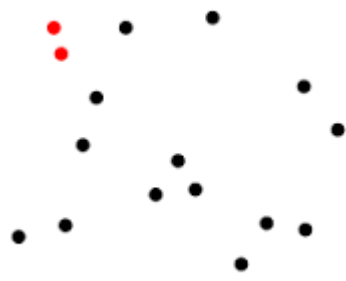
Larivière V, Haustein S, Mongeon P (2015) The Oligopoly of Academic Publishers in the Digital Era. PLoS ONE 10(6): e0127502, <http://journals.plos.org/plosone/article?id=10.1371%2Fjournal.pone.0127502>

p. 22-23: “Two separate factors are necessary for the achievement of worthwhile scientific results: a community of scholars with a shared knowledge of the standards of quality appropriate for their work and a shared commitment to enforce those standards by the informal sanctions the community possesses; and individuals whose personal integrity sets standards at least as high as those required by their community...”

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



Jerome R. Ravetz



Discussion points of the discussion on the crisis:

Would you agree that there is a crisis in the science's own quality control mechanism?

In a quest for a solution what to believe: 'Better incentives' or 'shared commitment'?

Did this discussion meet some of your 'wish-list' entries?



Publish or perish

Metrics

theguardian

Pete Etchells

Pete Etchells is the Guardian's science blog network coordinator. You can find him on Twitter: @PeteEtchells

Friday 15 January 2016 12.30 GMT

How peer reviewers might hold the key to making science more transparent

A new initiative published this week outlines how scientists can make a change to open science practices at an individual level



<https://www.theguardian.com/science/head-quarters/2016/jan/15/pro-initiative-peer-reviewers-might-hold-the-key-to-making-science-more-transparent>

The Peer Reviewers' Openness (PRO) Initiative is, at its core, a simple pledge: scientists who sign up to the initiative agree that, from January 1 2017, **will not offer to comprehensively review, or recommend the publication of, any scientific research papers for which the data, materials and analysis code are not publicly available**, or for which there is no clear reason as to why these things are not available. To date, over 200 scientists have signed the pledge.

How peer reviewers might hold the key to making science more transparent

A new initiative published this week outlines how scientists can make a change to open science practices at an individual level



The Peer Reviewers' Openness Initiative: incentivizing open research practices through peer review

Richard D. Morey¹, Christopher D. Chambers¹,
Peter J. Etchells², Christine R. Harris³, Rink Hoekstra⁴,
Daniël Lakens⁵, Stephan Lewandowsky^{6,7},
Candice Coker Morey⁸, Daniel P. Newman⁹,
Felix D. Schönbrodt¹⁰, Wolf Vanpaemel¹¹,
Eric-Jan Wagenmakers¹² and Rolf A. Zwaan¹³

How peer reviewers might hold the key
to making science more transparent

A new initiative published this week outlines how scientists can make a change
to open science practices at an individual level





Berkeley Initiative for Transparency in the Social Sciences

Science is “show me,” not “trust me”

December 31, 2015

Guest post by [Philip B. Stark](#), Associate Dean of the Division of Mathematical and Physical Sciences, UC Berkeley Professor of Statistics, and winner of one of BITSS' [Leamer-Rosenthal Prizes for Open Social Science](#).



<http://www.bitss.org/2015/12/31/science-is-show-me-not-trust-me/>

“Reproducibility and open science are about providing evidence that you are right, not just claiming that you are right. Here’s an attempt to distill the principles and practices.

Shortest: Show your work.

Next shortest: Show your work. All your work.

[...]



Checklist

If you relied on Microsoft Excel for computations, fail.

[...]

If you published in a journal with a paywall and no open-access policy, fail.”

<http://www.bitss.org/2015/12/31/science-is-show-me-not-trust-me/>

“Pledge

I think reproducibility and open science would make huge strides if everyone pledged:

A. I will not referee any article that does not contain enough information to tell whether it is correct.”

[...]



<http://www.bitss.org/2015/12/31/science-is-show-me-not-trust-me/>

Gaming Metrics: Innovation & Surveillance in Academic Misconduct

ICIS/CSIS Event

When

Feb 04, 2016 09:00 AM to
Feb 05, 2016 03:30 PM

Where

Vanderhoef Studio Theatre / Kalmanovitz Appellate
Courtroom

Contact Name

[Alexandra Lippman](#)

Add event to
calendar



A recent conference:



GAMING METRICS: INNOVATION & SURVEILLANCE IN ACADEMIC
MISCONDUCT

UC Davis, February 4-5, 2016

Organized by the Innovating Communication in Scholarship Project (ICIS)
with support from the Center for Science and Innovation Studies (CSIS)

Misconduct has traditionally been tied to the pressures of “publish or perish” [...] Have we moved from "publish or perish" to "impact or perish"? If so, are metrics of evaluation now creating new incentives for misconduct? And can we still reliably draw a clear separation between gaming the metrics game and engaging in misconduct? [...] In sum, are new metrics-based forms of misconduct asking us to rethink and redefine misconduct?



WORLD VIEW

A personal take on events

JAMES WILSDON



We need a measured approach to metrics

Quantitative indicators of research output can inform decisions but must be supported by robust analysis, argues James Wilsdon.

Metrics:

“[...] only a minority of the scientists we consulted supported the increased use of metrics. [...] the description, production and consumption of metrics remains contested and open to misunderstanding.

[...] but there is legitimate concern that some quantitative indicators can be gamed, or lead to unintended consequences.”

Metrics:

“Borrowing from the Literary Review’s ‘Bad Sex in Fiction’ award, every year we will award a ‘Bad Metric’ prize to the most egregious example of an inappropriate use of quantitative indicators in research management.”

See <https://responsiblemetrics.org/the-metric-tide-report-now-published/>

The Metric Tide



Report of the Independent Review
of the Role of Metrics in Research
Assessment and Management

July 2015

http://www.hefce.ac.uk/media/HEFCE,2014/Content/Pubs/Independentresearch/2015/The,Metric,Tide/2015_metric_tide.pdf

Note: this is part of Research Excellence Framework (REF)

Against Excellence

theguardian

Jack Stilgoe

Universities are currently agonising about the Research Excellence Framework.

Jack Stilgoe doesn't have a problem with research assessment. He thinks that the real trouble lies with the word 'excellence'.

Friday 19 December 2014 10:38 GMT

Responsible Research and Innovation (Rome declaration).

Science should be “in the service of big social problems global health, environmental sustainability, and securing food, energy and water supplies.”

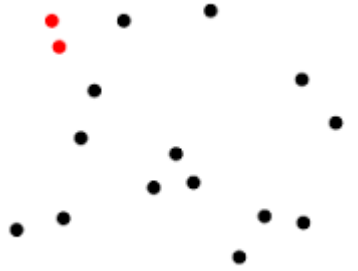
“In 1977, economist Richard Nelson posed a question [...]: how is a rich country like America able to put a man on the moon, but is unable to solve the problems of its own ghettos?”

“Excellence is judged by peers and backed up by numbers such as h-indexes and journal impact factors, all of which reinforces disciplinary boundaries and focuses scientists’ attention inwards rather than on the problems of the outside world. [...] journal rankings discourage interdisciplinarity by systematically evaluating disciplinary research more highly.”

<https://www.theguardian.com/science/political-science/2014/dec/19/against-excellence>



Jack Stilgoe



Discussion points of the discussion on publishing, peer reviewing, metrics:

Did this discussion meet some of your ‘wish-list’ entries?

Would you subscribe to pledges such as e.g. not to review certain papers or not to publish in certain journals?

When in a science carrier is there a contradiction between integrity and publish or perish?

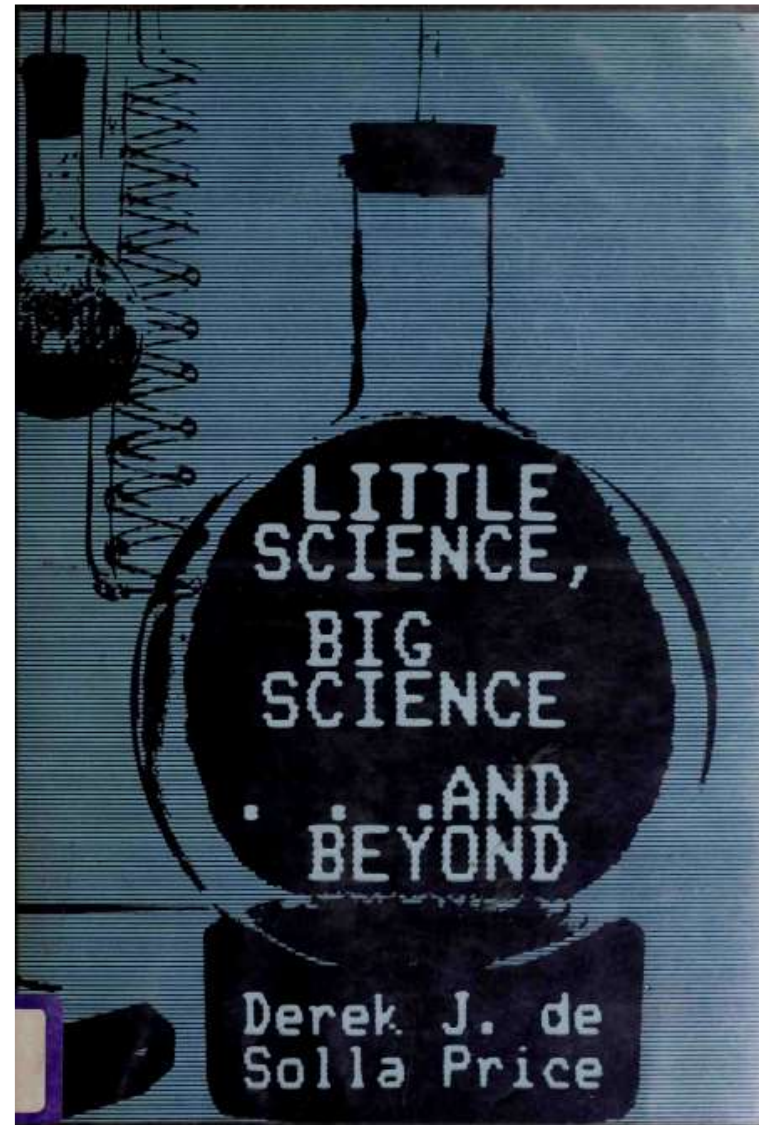


Science or technoscience ?

A perspective from science
and technology studies

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).

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



Derek J. de Solla Price

Science/knowledge degenerates when it becomes a commodity for Ravetz (1971), Lyotard (1979) and Mirowski (2011).

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

Lyotard, J.-F. 1979. *La Condition postmoderne. Rapport sur le savoir*, Paris : Minuit, Chapter 10.

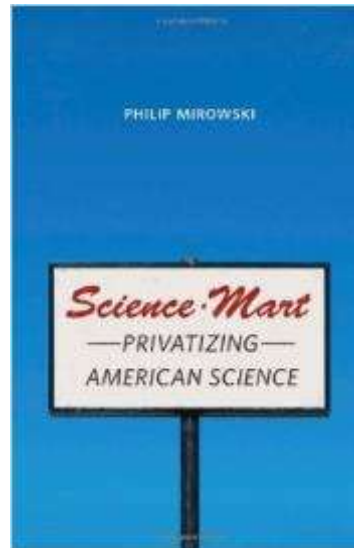
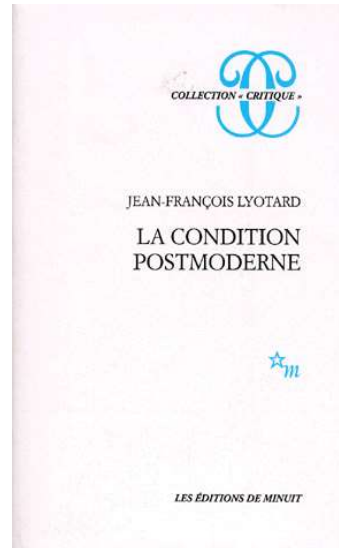
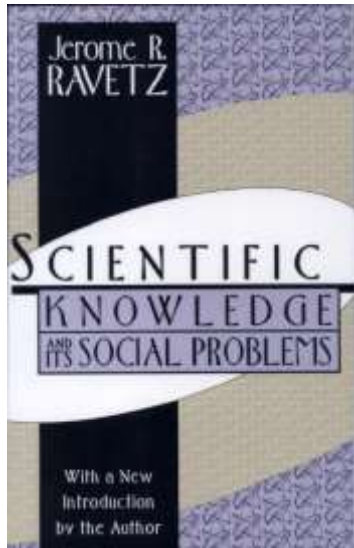
Mirowski, P. 2011. *Science-Mart: Privatizing American Science*, Harvard University Press.



Jerome R. Ravetz



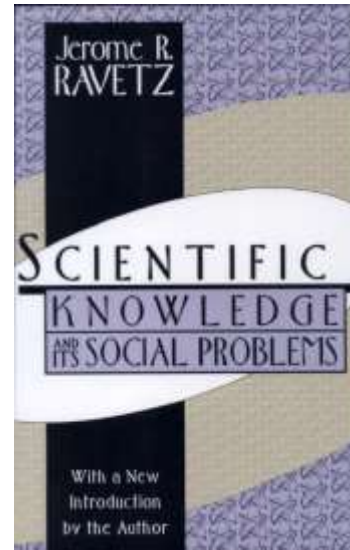
Jean-François Lyotard



Philip Mirowski

p.22: “with the industrialization of science, certain changes have occurred which weaken the operation of the traditional mechanism of quality control and direction at the highest level. [...] The problem of quality control in science is thus at the centre of the social problems of the industrialized science of the present period. If it 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”

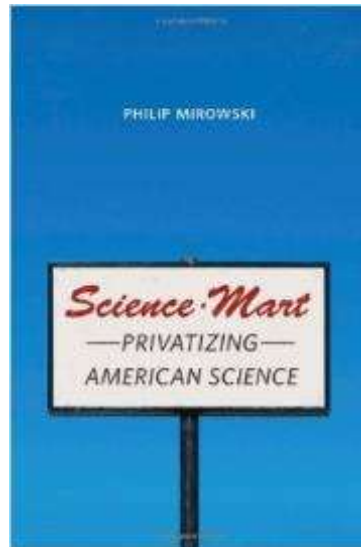
Ravetz, J., 1971, *Scientific Knowledge and its Social Problems*, Oxford University Press, p.22.



Jerome R. Ravetz

After the eighties neoliberal ideologies succeeded in decreasing state intervention in the funding of science, which became increasingly privatized ... Knowledge as a monetized commodity replaces knowledge as public good...

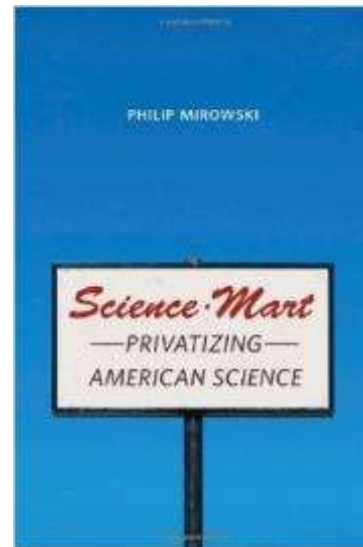
Mirowski, P. 2011. *Science-Mart: Privatizing American Science*, Harvard University Press.



Philip Mirowski

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

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



Philip Mirowski

More on a reading of the crisis:

The Rightful Place of Science: Science on the verge, by Alice Benessia, Silvio Funtowicz, Mario Giampietro, Jerome Ravetz, Angela Pereira, Andrea Saltelli, Roger Strand, Jeroen P. van der Sluijs, With a preface of Dan Sarewitz, Published by the Consortium for Science, Policy and Outcomes at Arizona State University, to appear March 2016.

<http://www.andreasaltelli.eu/science-on-the-verge>

Ravetz, J. R. and Saltelli, A., 2015b. "Policy: The future of public trust in science", Nature, 524: p. 161.



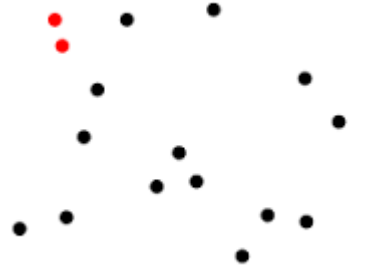
THE RIGHTFUL PLACE OF SCIENCE: **SCIENCE ON THE VERGE**

CONTRIBUTORS

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



Take home points from the lesson from science and technoscience:



Did this discussion meet some of your ‘wish-list’ entries?

Can science survive under technoscience conditions?



Problematic quantifications

Those aspect of science most used in policy (mathematical and statistical modelling) are also those more problematic.

Leek J.T., and Peng, R.D., 2015, P values are just the tip of the iceberg, Nature, 520, p. 612.

Sarewitz, D., 2015, Reproducibility will not cure what ails science, Nature, 525, p. 159.

The image is a screenshot of the Nature journal website. At the top, the 'nature' logo is displayed in white on a dark red background, with the tagline 'International weekly journal of science' below it. A navigation bar contains links for Home, News & Comment, Research, Careers & Jobs, Current Issue, Archive, Audio & Video, and For Authors. Below this, a secondary navigation bar shows the current path: Archive > Volume 520 > Issue 7549 > Comment > Article. The main content area has a header 'NATURE | COMMENT' and social media sharing icons. The article title 'Statistics: *P* values are just the tip of the iceberg' is prominently displayed, followed by the authors 'Jeffrey T. Leek & Roger D. Peng' and the date '28 April 2015'. A short summary or lead paragraph begins with 'Ridding science of shoddy statistics will require scrutiny of every step, not merely the last one, say Jeffrey T. Leek and Roger D. Peng.'

More stringent quality criteria are needed for models used at the science–policy interface [...] current modeling practices [...] are a significant threat to the legitimacy and the utility of science in contested policy environments [...]



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Volume XXX Issue 2, Winter 2014

When All Models Are Wrong

by [Andrea Saltelli](#), [Silvio Funtowicz](#)

Available online:

<http://issues.org/30-2/andrea/>

The myth of scientific quantification via risk or cost benefit analyses, including of the impact of new technologies, has been at the hearth of the critique of the ecological moment (e.g. Schumacher, 1973; Winner, 1986; Funtowicz and Ravetz, 1994)

E. F. Schumacher, 1973, *Small Is Beautiful. Economics as if People Mattered*, Penguin Perennial,

Winner, L., 1986. *The Whale and the Reactor: a Search for Limits in an Age of High Technology*. The University of Chicago Press, 1989 edition.

Funtowicz, S.O. and Ravetz, J.R. (1994). The worth of a songbird: Ecological economics as a post-normal science. *Ecological Economics* 10(3), 197–207.

[...] quality is much more difficult to 'handle' than quantity, just as the exercise of judgment is a higher function than the ability to count and calculate. Quantitative differences can be more easily grasped and certainly more easily defined than qualitative differences: their concreteness is beguiling and gives them the appearance of scientific precision, even when this precision has been purchased by the suppression of vital differences of quality.



Ernst Friedrich "Fritz"
Schumacher

E. F. Schumacher, 1973, *Small Is Beautiful. Economics as if People Mattered*, Penguin Perennial,

Techniques (such as CBA) is never neutral; according to Winner (1986) ecologists should not fall into the trap of cost benefit and risk analyses

(Chapter ON NOT HITTING THE TAR-BABY)



Langdon Winner

Winner, L., 1986. *The Whale and the Reactor: a Search for Limits in an Age of High Technology*. The University of Chicago Press, 1989 edition.

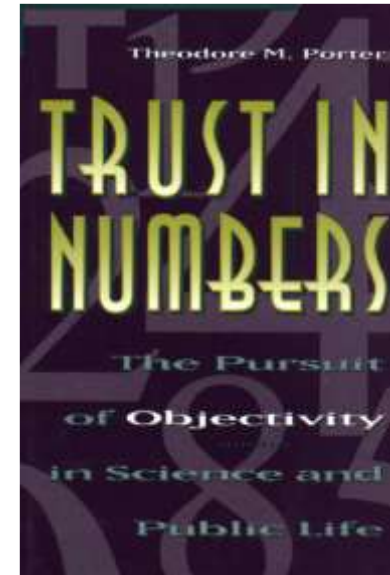
The development of Post-Normal Science can be seen as a reaction to the hyper precision of cost benefit and risk analysis as applied to solve ecological problems: “How much is a songbird worth?”

Example: deconstruction of the economics of climate change.

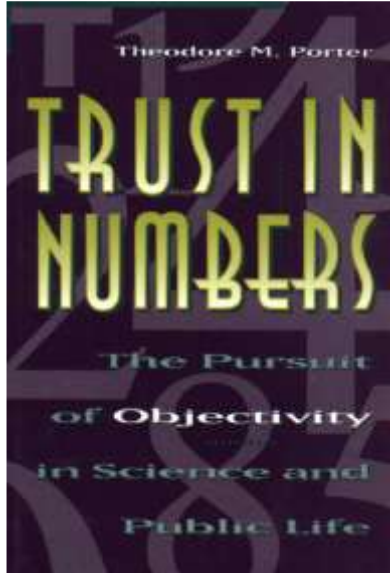
p. 8: “The appeal of numbers is especially compelling to bureaucratic officials who lack the mandate of a popular election, or divine right. Arbitrariness and bias are the most usual grounds upon which such officials are criticized. A decision made by the numbers (or by explicit rules of some other sort) has at least the appearance of being fair and impersonal.”



Theodor M. Porter

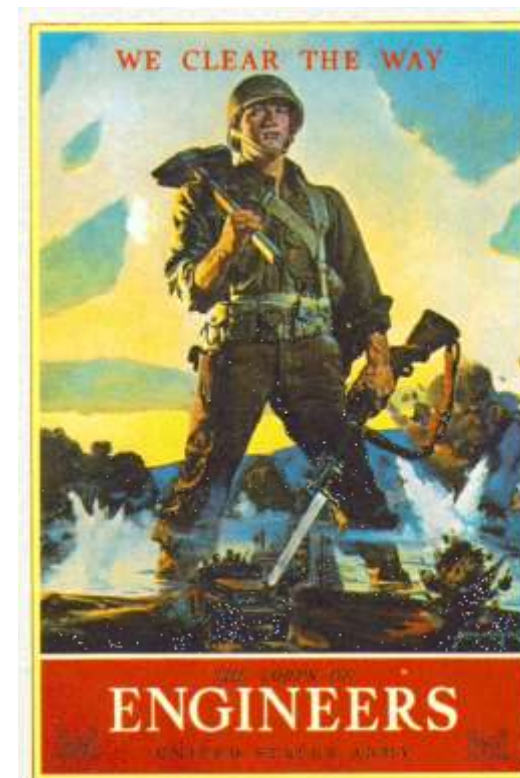
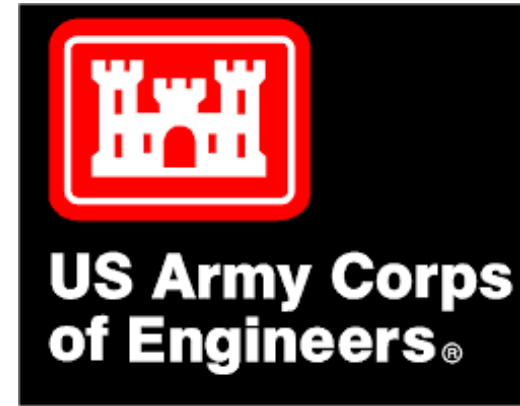


Theodore M. Porter, *Trust in Numbers, The Pursuit of Objectivity in Science and Public Life*, Princeton 1995

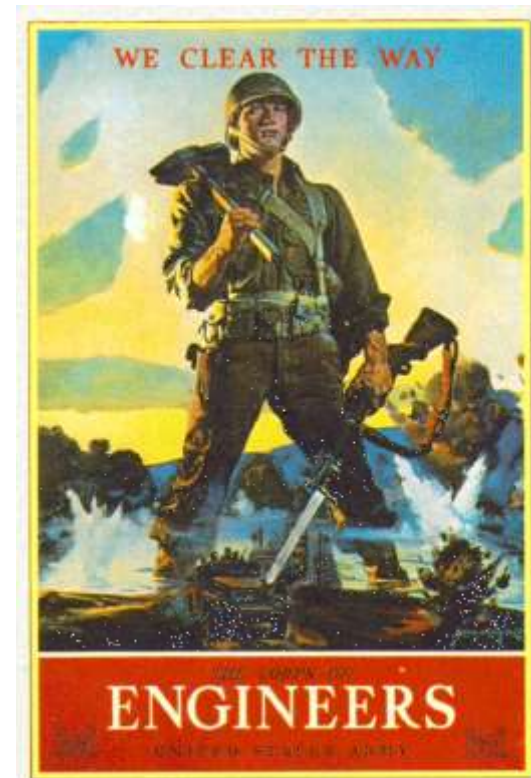


p. 8: “Scientific objectivity thus provides an answer to a moral demand for impartiality and fairness. Quantification is a way of making decisions without seeming to decide. Objectivity lends authority to officials who have very little of their own.”

Trust, authority and styles of quantification: two different stories



Porter's story: Quantification needs judgment which in turn needs trust ...without trust quantification becomes mechanical, a system, and 'systems can be played'.



Quantification as an instrument of hypocognition = radical simplifications, linearization and compressions of understandings → Socially constructed ignorance

Ravetz, J. R., 1987. “Usable Knowledge, Usable Ignorance, Incomplete Science with Policy Implications, Knowledge, Creation, Diffusion, Utilization, 9(1): 87–116.

Rayner, S., 2012. “Uncomfortable knowledge: the social construction of ignorance in science and environmental policy discourses”, Economy and Society, 41(1): 107–125.

Saltelli, A., Giampietro, M., 2015, The fallacy of evidence based policy, Verge book →





Charles Goodhart

p. 44 “Any ... measures necessarily involve a loss of information ... [and distorts behavior]” (Porter, 1995)

This is what we normally call Goodhart’s law, from Charles Goodhart. "When a measure becomes a target, it ceases to be a good measure."

http://cyberlibris.typepad.com/blog/files/Goodharts_Law.pdf



John Kay, Financial Times

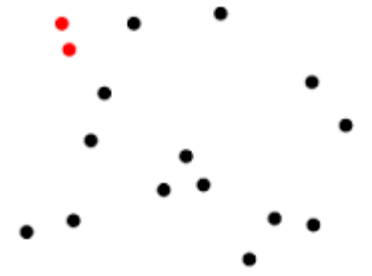
Watch the videos from the workshop
'Significant digits. Responsible Use of
Quantitative Information', Brussels,
11,9–10 June 2015.

<https://ec.europa.eu/jrc/en/event/conference/use-quantitative-information>



Philip Stark,
University of Berkeley

Discussion points on problematic quantifications



Did this discussion meet some of your ‘wish-list’ entries?

Do you agree that mathematical and statistical modelling are particularly prone to abuse? Do you have direct experience of this?

What would you do if ‘forced’ to quantify?



Trust

“In economics, medicine, energy and a host of other subjects, there are fears that financial conflicts of interest give the impression that academic findings are up for sale.”

Matthews, D., 2015, Is industry funding undermining trust in science?, Times Higher Education, <https://www.timeshighereducation.com/features/is-industry-funding-undermining-trust-in-science>



Film 'Inside Job'. Interview with Frederic Mishkin, a banking professor at Columbia University, praising Iceland's "strong" banking regulation system two year before it went bust. Mishkin had been paid \$124,000 by the Icelandic Chamber of Commerce to write the paper. The story of the work's title exposed by the film.

Cambridge Journal of Economics 2012, 36, 43–63
doi:10.1093/cje/ber036

Dangerous interconnectedness: economists' conflicts of interest, ideology and financial crisis

Jessica Carrick-Hagenbarth and Gerald A. Epstein★

Matthews, D., 2015, Is industry funding undermining trust in science?, Times Higher Education,
<https://www.timeshighereducation.com/features/is-industry-funding-undermining-trust-in-science>

Campaign for Accountability's ("CfA") new report, **Academic Deception**, reveals how a payday lending industry trade association paid for and edited a controversial academic paper claiming that payday loans do not leave consumers trapped in cycles of debt.

"Internal Arkansas Tech University documents reveal a close working relationship between the payday lending industry and the author of a key academic paper. The Consumer Credit Research Foundation (CCRF), an industry trade group, paid a professor at the Arkansas Tech University College of Business, nearly \$40,000 to produce the study, and CCRF's chairman edited the study and directed the professor to remove negative information. Unsurprisingly, the paper concluded payday loans are not responsible for a "cycle of debt," an important industry talking point."

<https://www.scribd.com/doc/288230891/Academic-Deception>

“medical paradigms found, then lost, then regained, then placed in a kind of scientific limbo occur in the field of nutrition”

- dietary cholesterol and
- trans-fats
- caffeine
- wine
- sugar
- gluten...

Junk Science Week: Lipophobia
and the bad science diet.
How a now discredited diet
theory became a national mania

“Fear of Food: A History of
Why We Worry about What We
Eat,” by Harvey Levenstein, –
published 2012 by University of
Chicago Press.



Two of many Time magazine covers since the 1950s that promoted physiologist Ancel Keys's alleged link between fat, cholesterol and heart disease.

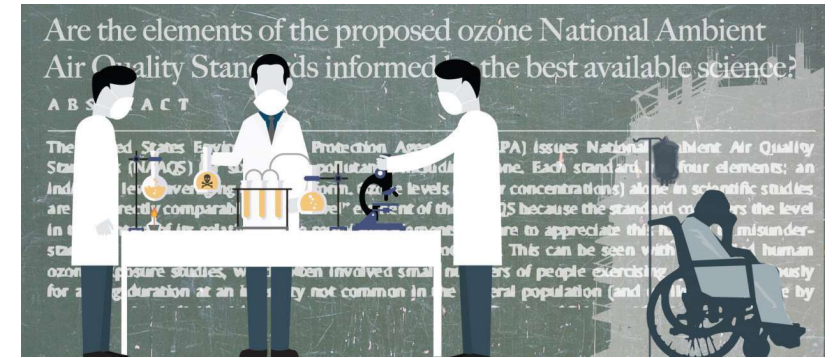
<http://business.financialpost.com/fp-comment/book-excerpt-lipophobia-and-the-bad-science-diet>

Meet the ‘rented white coats’ who defend toxic chemicals – How corporate-funded research is corrupting America’s courts and regulatory agencies, by David Heath

<http://www.publicintegrity.org/2016/02/08/19223/meet-rented-white-coats-who-defend-toxic-chemicals>



Some horror stories about litigations where law companies enrolled by defendants in turn enroll scientists to defend their clients ... asbestos, clean air act, ...



<http://www.publicintegrity.org/2016/02/08/19223/meet-rented-white-coats-who-defend-toxic-chemicals>

“Nearly half of Gradient’s articles that are peer-reviewed are published in two journals with strong ties to industry, Critical Reviews in Toxicology and Regulatory Toxicology and Pharmacology, the Center’s analysis found.” [Gradient is the research services company enrolled by law firms]



<http://www.publicintegrity.org/2016/02/08/19223/meet-rented-white-coats-who-defend-toxic-chemicals>

“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. 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. ”

“Belinda Phipps, who took over at the Science Council last year, accused the sector of complacency and said the public trusted scientists only because they did not understand their work.”

Whipple, T., The Times, February 22, 2016

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Welcome to your preview of The Times

Scientists ‘should take ethics oath like doctors’



Tom Whipple Science Editor

Published at 12:01AM, February 22 2016

Scientists need their own version of the Hippocratic oath and a regulation system similar to doctors to avoid a big scandal, the head of their standards body has said.

Studies suggest that a significant proportion of scientific papers are not repeatable

Monty Rakusen/Corbis

Post a comment

“What struck me, coming into this sector is just how unregulated it is compared to the medical profession,” Ms Phipps said. “Think what damage a scientist could do if he or she behaved badly or fraudulently. The potential damage is enormous, yet there is almost no regulation.”

Whipple, T., The Times, February 22, 2016

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Monty Rakusen/Corbis

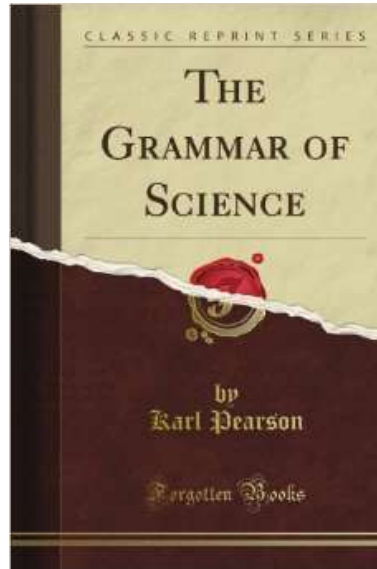
Post a comment

Science as a solution? Karl Pearson (a social Darwinist) suggests not wasting resources on social programs as:

“No degenerate and feeble stock will ever be converted into healthy and sound stock by the accumulated effects of education, good laws, and sanitary surroundings”

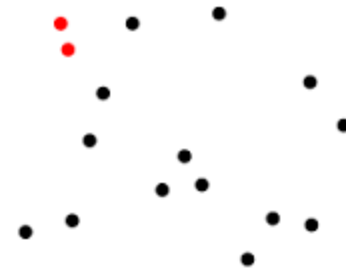


Karl Pearson



Pearson, K., 1892, *The Grammar of Science*, Walter Scott Publisher, London, p.32.

Discussion point of the discussion of trust



Did this discussion meet some of your ‘wish-list’ entries?

Can I trust science on being right most of the time?

When in a science carrier is there a contradiction between integrity and survival?



Recipes for diligent quantification

Some recipes from
sensitivity analysis and
sensitivity auditing

Sensitivity analysis

Saltelli, A., Annoni P., 2010, How to avoid a perfunctory sensitivity analysis, Environmental Modeling and Software, 25, 1508–1517.

Saltelli, A., M. Ratto, S. Tarantola and F. Campolongo, 2012 (Perennial Review of the 2005 paper), Sensitivity Analysis for Chemical Models, Chemical Reviews, 112 (5), pp PR1–PR21.

When testing the evidence behind inference some reasonable people (and guidelines) suggest that ‘sensitivity analysis would help’



...

<<I have proposed a form of organised sensitivity analysis that I call “global sensitivity analysis” in which a neighborhood of alternative assumptions is selected and the corresponding interval of inferences is identified.>>



Edward E. Leamer
UCLA

Edward E. Leamer, 1990, Let's Take the Con Out of Econometrics, American Economics Review, 73 (March 1983), 31–43.

<<Conclusions are judged to be sturdy only if the neighborhood of assumptions is wide enough to be credible and the corresponding interval of inferences is narrow enough to be useful.>>



Edward E. Leamer, 1990, Let's Take the Con Out of Econometrics, American Economics Review, 73 (March 1983), 31-43.

“... my observation of economists at work who routinely pass their data through the filters of many models and then choose a few results for reporting purposes.”



Tantalus on the Road to Asymptopia, Edward E. Leamer, 2010 Journal of Economic Perspectives, 24, (2), 31–46



“One reason these methods are rarely used is their honesty seems destructive” ...

“... or, to put it another way, a fanatical commitment to fanciful formal models is often needed to create the appearance of progress.”

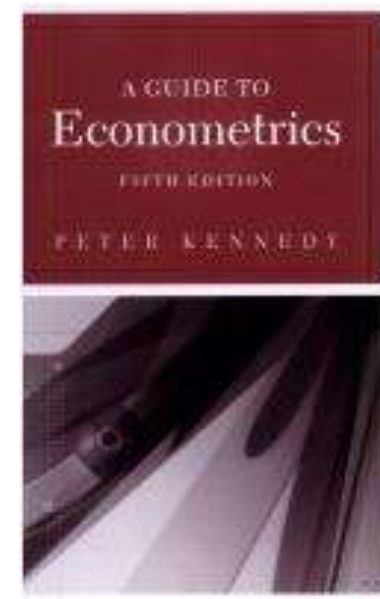
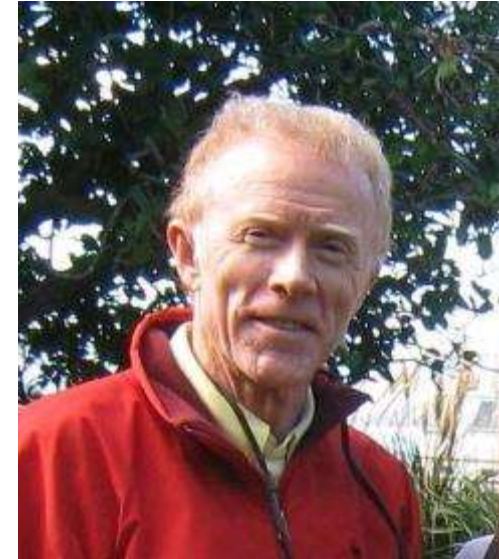
Ibidem

Peter Kennedy, A Guide to Econometrics.

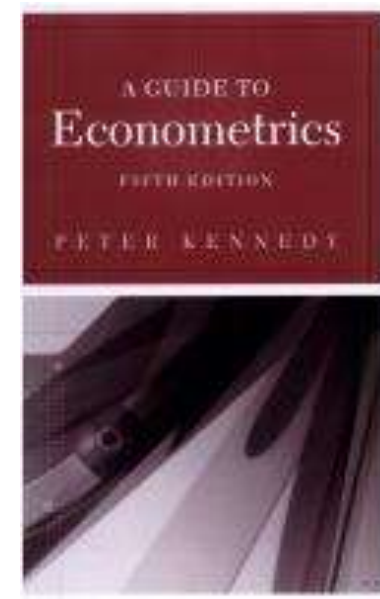
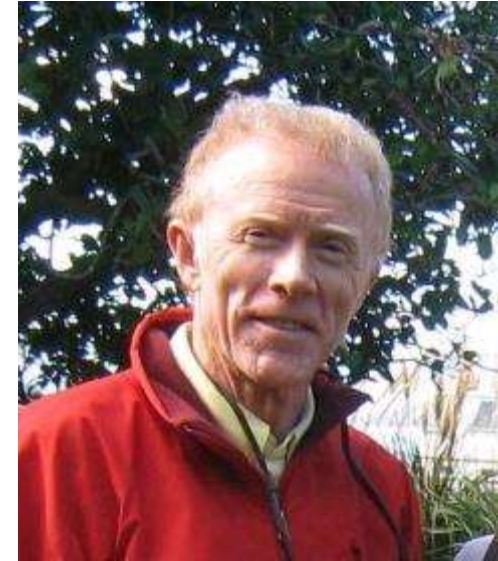
SA=one of the ten commandments of applied econometrics:

<<Thou shall confess in the presence of sensitivity.

Corollary: Thou shall anticipate criticism >>



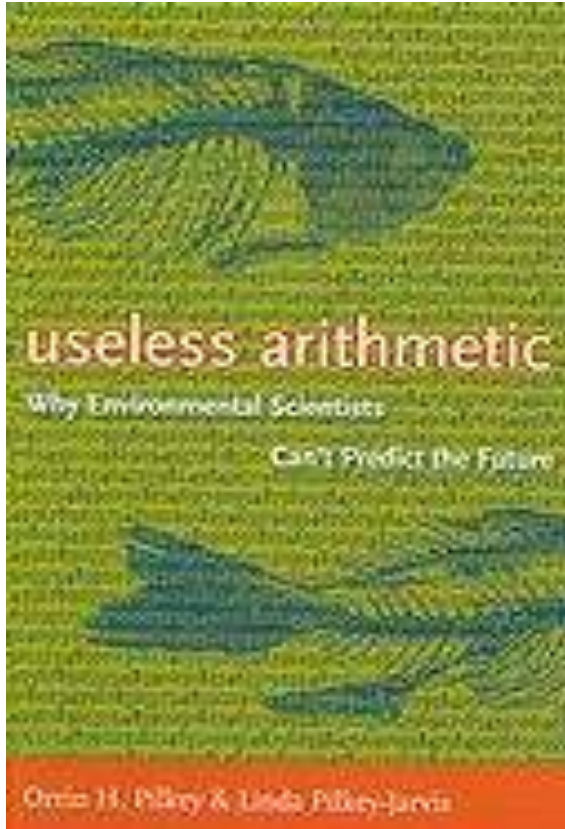
<<When reporting a sensitivity analysis, researchers should explain fully their specification search so that the readers can judge for themselves how the results may have been affected. This is basically an 'honesty is the best policy' approach, [...]'.>>



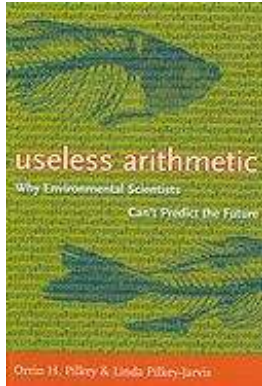


Orrin H. Pilkey
Duke University,
NC

Useless Arithmetic: Why Environmental Scientists Can't Predict the Future by Orrin H. Pilkey and Linda Pilkey-Jarvis




‘Quantitative mathematical models used by policy makers and government administrators to form environmental policies are seriously flawed’



<<It is important, however, to recognize that the sensitivity of the parameter in the equation is what is being determined, not the sensitivity of the parameter in nature.

[...] If the model is wrong or if it is a poor representation of reality, determining the sensitivity of an individual parameter in the model is a meaningless pursuit.>>

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Better regulation

Better regulation is about designing EU policies and laws so that they achieve their objectives at minimum cost. It ensures that policy is prepared, implemented and reviewed in an open, transparent manner, informed by the best available evidence and backed up by involving stakeholders.

To ensure that EU action is effective, the Commission assesses the expected and actual impacts of policies, legislation and other important measures at every stage of the policy cycle - from planning to implementation, to review and subsequent revision.

The [Commission decided on 19 May 2015](#) (172 kB) to create a REFIT Platform to advise the Commission on simplifying and making EU laws more effective and efficient.

The Commission publishes regularly [provisional dates of adoption of Commission initiatives](#).

Before the EU takes action

- The Commission publishes [roadmaps and inception impact assessments](#) describing planned new initiatives and evaluations of existing legislation.
- Commission [impact assessments](#) examine the potential economic, social and environmental consequences of proposed options for action.

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- Guidelines**
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 - Better Regulation "Toolbox"
 - Key documents

Better Regulation Guidelines

These guidelines explain what Better Regulation is and how it should be applied in the day to day practices when preparing new initiatives and proposals or managing existing policies and legislation.

They cover the whole policy cycle, from policy preparation and adoption to implementation and application, to evaluation and revision of EU law. For each of these phases there are a number of Better Regulation principles, objectives, tools and procedures to make sure that the EU has the best regulation possible. These relate to planning, impact assessment, stakeholder consultation, implementation and evaluation.

The [Better Regulation Guidelines](#) are structured into chapters which cover each of the instruments of the law-making process. The corresponding [toolbox](#) gives more detailed and technical information.

Better Regulation Guidelines are based on the outcomes of public consultation exercises carried out in 2013 and 2014.

- [Public consultation on the revision of the Commission's Impact Assessment Guidelines](#)
- [Stakeholder Consultation Guidelines](#)
- [Consultation on the draft Commission Evaluation Policy Guidelines](#)

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Yes ☐ No ☐

What were you looking for?

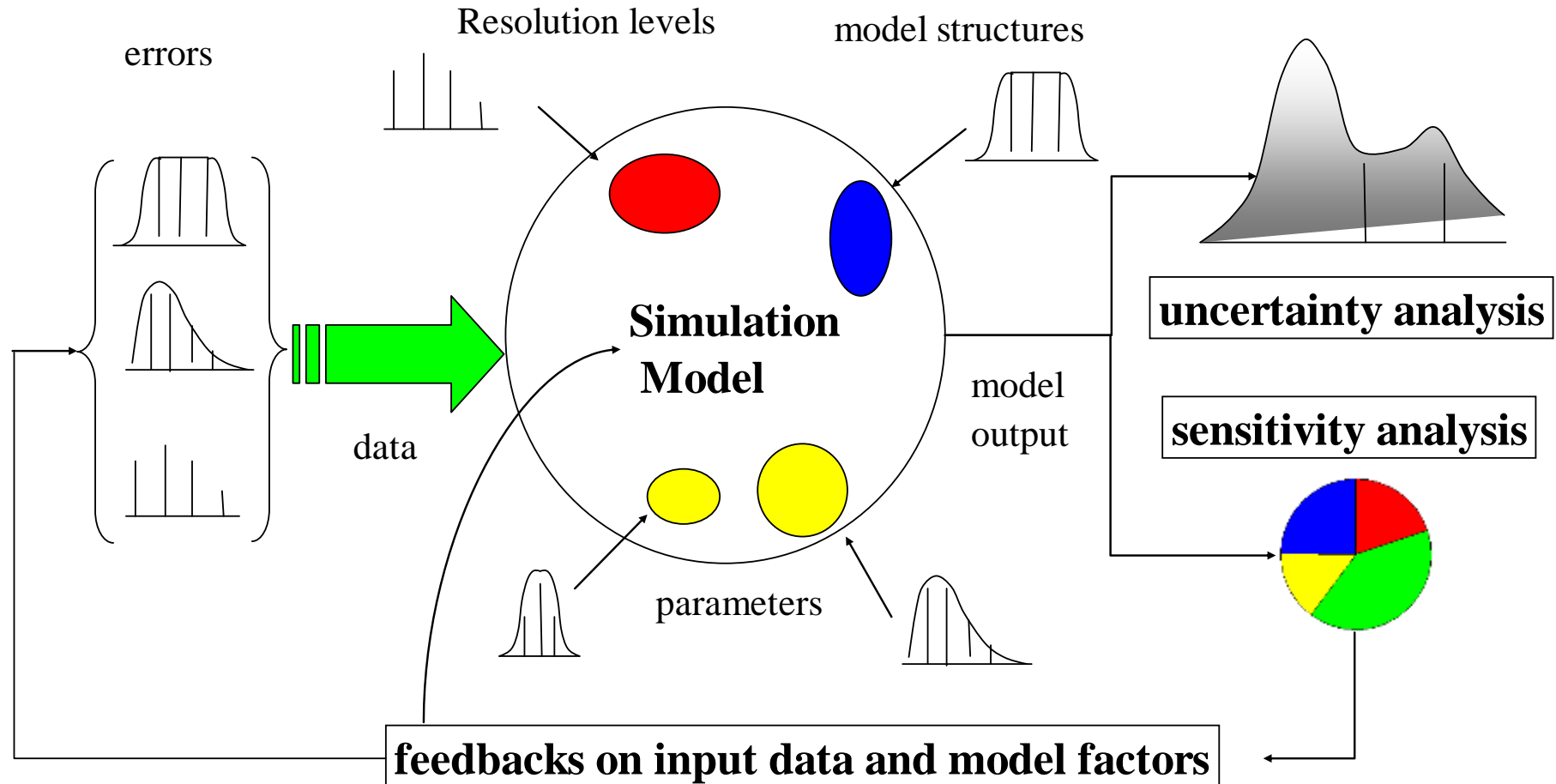
Any suggestions?

Main recipe in sensitivity analysis:

Modelling in an ideal Monte Carlo framework

All uncertainties activated simultaneously;
uncertainty and sensitivity analysis run together

An engineer's vision of UA, SA



Sensitivity auditing

Saltelli, A., Guimarães Pereira, Â., Van der Sluijs, J.P. and Funtowicz, S., 2013, What do I make of your latinorum? Sensitivity auditing of mathematical modelling, Int. J. Foresight and Innovation Policy, 9, 2/3/4, 213–234.

Saltelli, A., Funtowicz, S., When all models are wrong: More stringent quality criteria are needed for models used at the science–policy interface, Issues in Science and Technology, Winter 2014, 79–85.<http://issues.org/30-2/andrea/>

RULE ONE: Check against rhetorical use of mathematical modelling



The instrumental use of mathematical modelling to advance one's agenda can be termed rhetorical, or strategic, like the use of Latin by the elites and the clergy in the classic age.

RULE ONE: Check against rhetorical use of mathematical modelling

The problem of legitimization – quantitative analysis as a rhetorical or ritual device – the story of Nobel prize laureate Kenneth Arrow:

“The commanding general is well aware that the forecasts are no good. However, he needs them for planning purposes”.

RULE TWO: Adopt an 'assumption hunting' attitude;

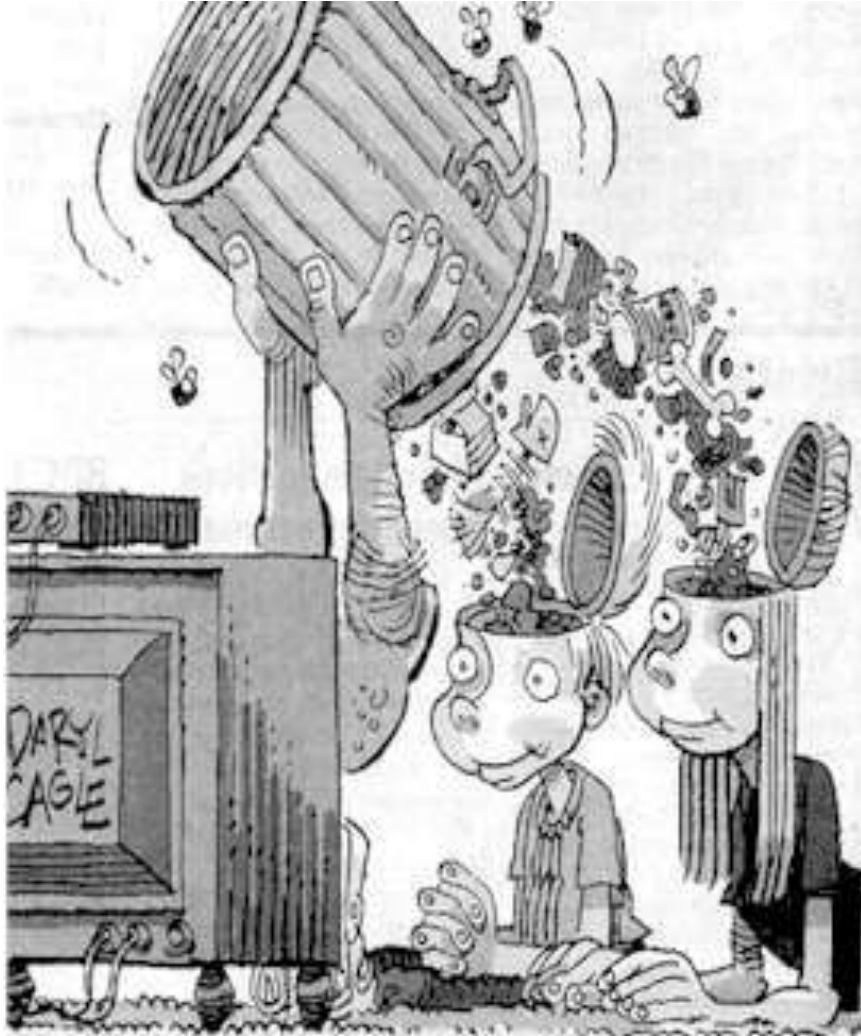
What was 'assumed out'? What are the tacit, pre-analytic, possibly normative assumptions underlying the analysis?

E.g. in 'Bogus Quantification: Uses and Abuses of Models' John Kay uncovers that the UK transport WebTAG model (the standard for transport policy simulation) needs as input 'Annual Percentage Change in Car Occupancy up to 2036.'



John Kay, London School
Economics, Columnist
Financial Times

RULE THREE: detect GIGO (Garbage In, Garbage Out) Science or pseudo-science



A precept in both Post
Normal Science and
Econometrics

RULE FOUR: find sensitivities before sensitivities
find you;



RULE FOUR: find sensitivities before sensitivities
find you;

Example: a deconstruction of the sensitivity
analysis done in the Stern Review

See: Saltelli, A., D'Hombres, 2010, Sensitivity analysis didn't help. A practitioner's critique of the Stern review, GLOBAL ENVIRONMENTAL CHANGE, 20, 298–302.

RULE FIVE: aim for transparency

Doubts raised over Europe's green energy plan

Host of questions/ from advisers

Economic model lacks transparency

By Peter Clark in London

The credibility of a European energy reform has been put into doubt by specialists. Advisers who are due to set out their recommendations up to 1000 are based on an economic model based by a single think-tank, severely criticised for its lack of transparency.

The energy experts have "raised a host of questions" as for the European Commission's role of a new transparent model could affect the reform, according to a leaked report by advisers chosen by Brussels to scrutinise the "Energy Feasibility Study".

The industrial sector, known as Enrion, is used in the National Technical University of Athens and is designed to show how the use of different mixes of energy sources affect the water resources.

The European Commission has asked it for advice on how to help guide the EU's energy policies. But advisers critics complain that its assumptions are opaque. In question because the model is not clearly stated. One main group, however, Enrion, has asked for the Commission to use other, more transparent models.

The forthcoming reform of the energy market, which will involve the effect of increasing gas, coal and oil use, will be a major factor in the EU's energy policy. The Commission has requested a report from the Enrion group, which will be a major factor in the EU's energy policy. The Commission has requested a report from the Enrion group, which will be a major factor in the EU's energy policy.

"There was considerable debate about the role of Enrion. But, with its reputation for the Enrion model," said the report by the group, which is chaired by David Miles, an Oxford University economics professor, and



A rising plant in Germany: the credibility of plan to cut CO emissions has been called into question by experts

Enrion has been used in the International Energy Agency.

There were also questions as "the costs of different technologies" and "the assumption of perfect competition by companies but not by individuals".

The group also criticised the "lack of transparency" of the Enrion work, and in particular the "lack of transparency" in the data.

Independent parties cannot replicate the results because the model is private property

Enrion and its advisers provided "a host of questions" as for the European Commission's role of a new transparent model could affect the reform, according to a leaked report by advisers chosen by Brussels to scrutinise the "Energy Feasibility Study".

"The model is the private property of the National Technical University of Athens," it says.

The commission is the "dominant" partner in the reform. This is a "dominant" partner in the reform. This is a "dominant" partner in the reform.

of the reform. This is a "dominant" partner in the reform. This is a "dominant" partner in the reform.

The Enrion group has requested that the Enrion model be made public. "It is not the Enrion model," it says.

Enrion has been used in the International Energy Agency. The Enrion group has requested that the Enrion model be made public. "It is not the Enrion model," it says.

A spokesman for the Enrion Commission, Enrion Commission, said that the Enrion model is a "dominant" partner in the reform. This is a "dominant" partner in the reform.

Enrion has been used in the International Energy Agency. The Enrion group has requested that the Enrion model be made public. "It is not the Enrion model," it says.



RULE FIVE: aim for transparency

I

113TH CONGRESS
2D SESSION

H. R. 4012

To prohibit the Environmental Protection Agency from proposing, finalizing, or disseminating regulations or assessments based upon science that is not transparent or reproducible.

<http://beta.congress.gov/bill/113th-congress/house-bill/4012>

Accessed February 2016

RULE SIX: Do the right sums

Do the sum right
Versus
Do the right sums

Peter Kennedy's commandment
of applied econometrics: 'Thou
shall answer the right question',
Kennedy 2007



Expertise and responsibility – Rule 6

- Example: most analyses offered as input to policy are framed as cost benefit analysis (monetization, the occupational psychosis of economists) or risk analyses.
- Techniques (such as CBA) is never neutral; according to Winner (1986) ecologists should not fall into the trap of CBA.



Langdon Winner

Winner, L., 1986. *The Whale and the Reactor: a Search for Limits in an Age of High Technology*. The University of Chicago Press, 1989 edition.

RULE SEVEN: Explore diligently the space of the assumptions

Environmental Modelling & Software 25 (2010) 1508–1517



Contents lists available at ScienceDirect

Environmental Modelling & Software

journal homepage: www.elsevier.com/locate/envsoft

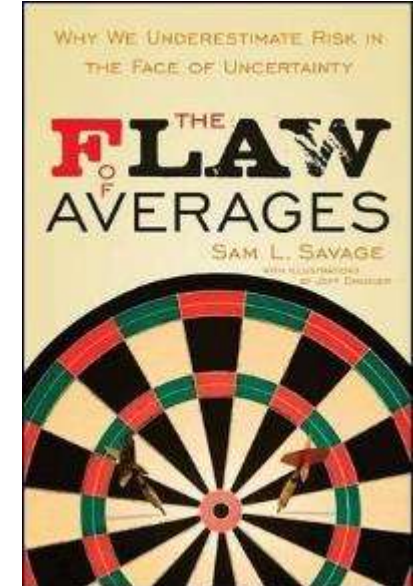
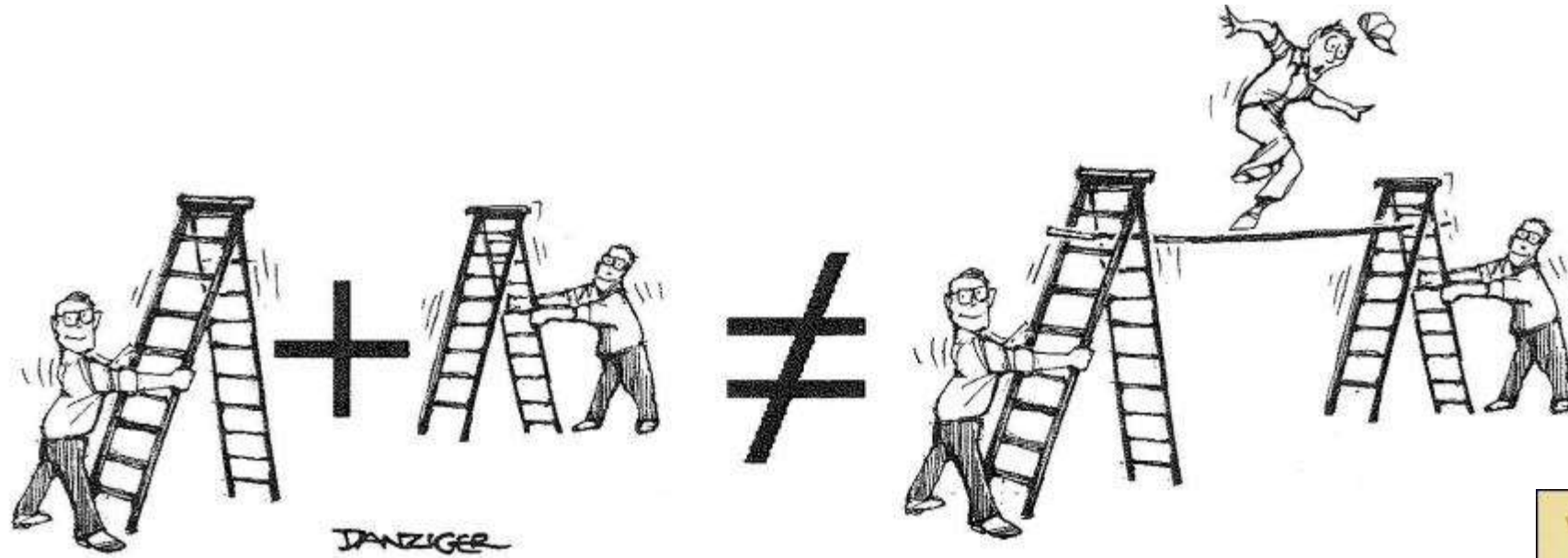


How to avoid a perfunctory sensitivity analysis

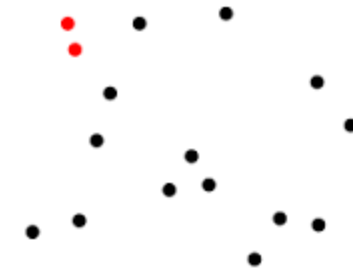
Andrea Saltelli*, Paola Annoni

Joint Research Center, Institute for the Protection and Security of the Citizen, via E.Fermi, 2749, Ispra VA 21027, Italy

RULE SEVEN: Explore diligently the space of the assumptions



Discussion point of the discussion on Recipes for diligent quantification



Did this discussion meet some of your ‘wish-list’ entries?

Do you see any use for this in your line of work?

What is missing?



Back to your wishlist

...

Taking side?

“How to deal with scientific and social dilemmas”

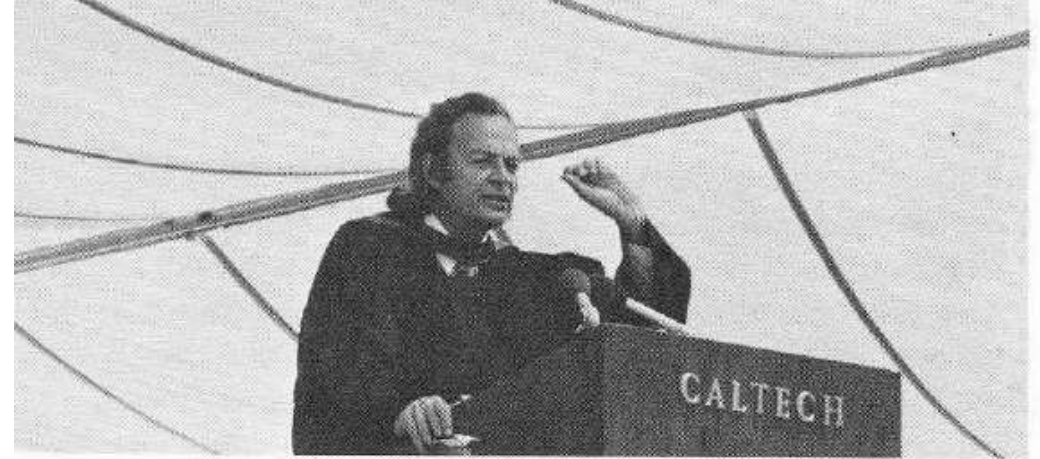
Different ways of taking sides

Endorsing pledges or creating new ones
Joining the fray ... But how?

Andrea's pick –caveat emptor...

- Feynman's 'bend backward' to give others a chance to prove that you are wrong.

Suggested read: Feynman's Cargo Cult Lecture;



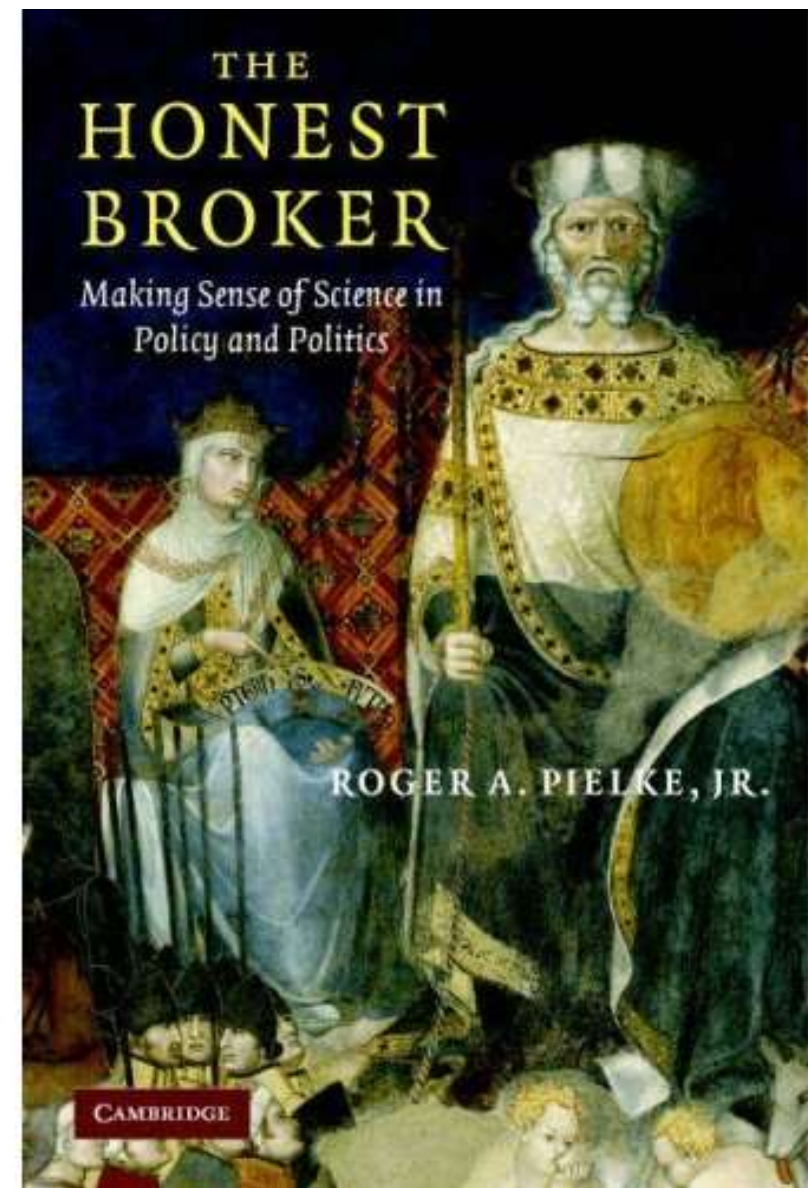
Cargo Cult Science

by RICHARD P. FEYNMAN

Some remarks on science, pseudoscience, and learning how to not fool yourself. Caltech's 1974 commencement address.

Andrea's pick –caveat emptor...

- Avoid stealth advocay;



Andrea's pick –caveat emptor...

- Refrain from useless wars.
See an example here:

<http://www.nature.com/news/research-integrity-don-t-let-transparency-damage-science-1.19219>

The image is a screenshot of a web browser displaying a page from the journal Nature. The top navigation bar is dark red with the 'nature' logo in white. Below the logo, it says 'International weekly journal of science'. The navigation menu includes links for Home, News & Comment, Research, Careers & Jobs, Current Issue, Archive, Audio & Video, and For Authors. A secondary navigation bar shows 'Archive', 'Volume 529', 'Issue 7587', 'Comment', and 'Article'. The main content area has a sub-header 'NATURE | COMMENT' and social media sharing icons. The article title is 'Research integrity: Don't let transparency damage science' by 'Stephan Lewandowsky & Dorothy Bishop', dated '25 January 2016'. The article text begins with 'Stephan Lewandowsky and Dorothy Bishop explain how the research community should protect its members from harassment, while encouraging the openness that has become essential to science.'

nature International weekly journal of science

Home | News & Comment | Research | Careers & Jobs | Current Issue | Archive | Audio & Video | For Authors

Archive > Volume 529 > Issue 7587 > Comment > Article

NATURE | COMMENT

Research integrity: Don't let transparency damage science

Stephan Lewandowsky & Dorothy Bishop

25 January 2016

Stephan Lewandowsky and Dorothy Bishop explain how the research community should protect its members from harassment, while encouraging the openness that has become essential to science.

Andrea's pick –caveat emptor...

– Becoming a scientist citizen? Mike Marinetto

<https://www.timeshighereducation.com/features/could-academics-take-on-the-role-of-investigative-journalists>

“Investigative social scientists would need to unashamedly reject any notion of balance or objectivity. A bias towards the interests of the weakest and most vulnerable and an unqualified contempt for power and the powerful would be a moral and intellectual necessity.”

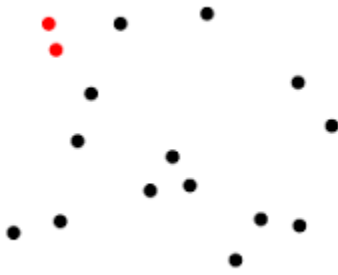
Andrea's pick –caveat emptor...

- Becoming a scientist citizen? Mike Marinetto

<https://www.timeshighereducation.com/features/could-academics-take-on-the-role-of-investigative-journalists>

“[...] any ensuing revelations would need to be communicated outside the limited-circulation academic publishing system, which typically favours the kind of narrow and parochial papers that chalk up professional points but are responsible for shrinking the world rather than changing it.”

Discussion point of the discussion on taking side



Did this discussion meet some of your ‘wish-list’ entries?

Does this make any sense at all?



Epilogue: a smile on
our grim academic
realities

- I want to publish a paper and my supervisor specifically wants me to cite a lot of his papers, even though I don't agree that these papers have a lot to do with, or add value to my own paper. What should I do?
- I want to publish a paper and my supervisor specifically wants me to add one of his good friends as a co-author, even though he did not contribute significantly at all. What should I do?
- How to maintain scientific integrity when the pressure to publish is so high and dominant in the scientific community.
- I hope to learn a bit about academic politics, and how to deal with them in an honest way.

