

# Evidence based policy: handle with care

SCIENCE VS. LOBBYING  
HOW TO ESCAPE REGULATORY CAPTURE?

A conference on the uses and misuses of scientific evidence in EU policy-making

22/23 SEPTEMBER 2015 – MUNDO-B & EUROPEAN PARLIAMENT, BRUSSELS

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EUROPEAN PARLIAMENT'S INTERGROUP ON INTEGRITY, TRANSPARENCY, ANTI-CORRUPTION AND ORGANISED CRIME (ITCO)

Andrea Saltelli  
(@andreasaltelli)

Centre for the Study of the Sciences and the Humanities (SVT) - University of Bergen (UIB), and Institut de Ciència i Tecnologia Ambientals (ICTA) - Universitat Autònoma de Barcelona (UAB).

The use of science for policy is at the core of a perfect storm generated by the insurgence of concurrent crises of trust, of science's governance, of economic thought.

The crises of science (reproducibility, quality control, skills) and economic thought (loss of diversity, physics envy, mathematization) although apparently unrelated are in fact twin crises.

Concerned institutions discount the severity of the crisis.

The prevailing 'demarcation' model' for the use of science in policy is implausible.

Quantification in the context of evidence based policy is often problematic.

Talk based on:

Saltelli, A., and Giampietro, M., 2015, The Fallacy of Evidence Based Policy.

<https://ec.europa.eu/jrc/sites/default/files/PaperPolicyCartesianDream.pdf>

# Crises



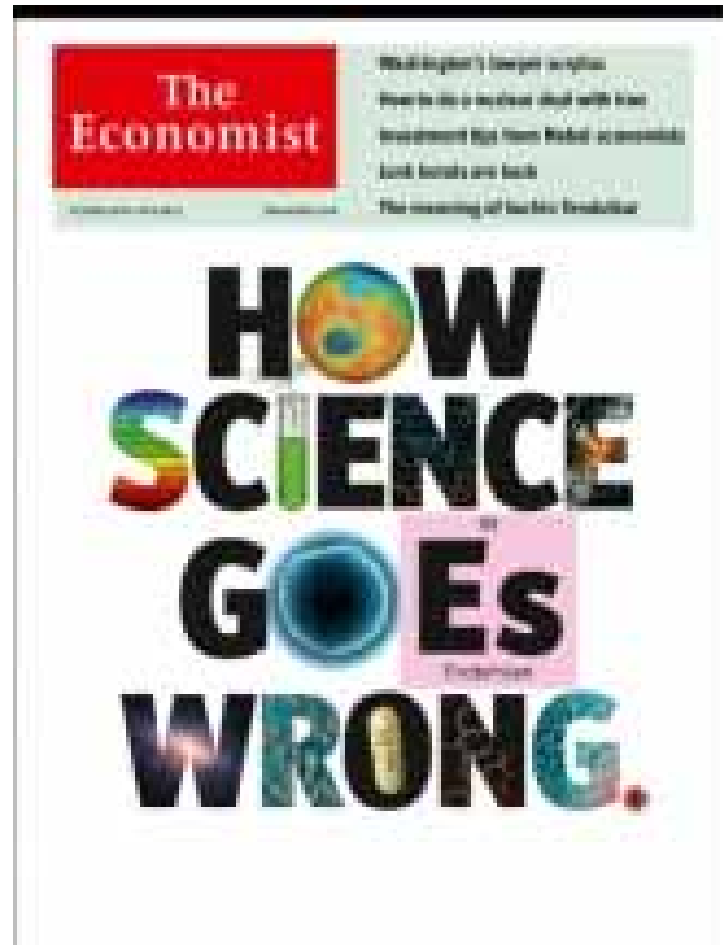
## More controversy - wicked issues



More and more issues become 'wicked', meaning by this deeply entangled in a web of hardly separable facts, interests and values... (GMO, climate, the use of statistics in Education (PISA), bees and pesticides, children born to gay couples, culling of badgers, ...)



“Science still commands enormous—if sometimes bemused—respect. But its privileged status is founded on the capacity to be right most of the time and to correct its mistakes when it gets things wrong. [...] The false trails laid down by shoddy research are an unforgivable barrier to understanding”



## 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 [...in] 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.

## Issues with trust / quality in the scientific enterprise

In a landmark study of results in cancer science Begley and Ellis were able to reproduce only 11 per cent of the original findings (2012).

Begley, C. G., and Lee M. E., 2012, Drug Development: Raise Standards for Preclinical Cancer Research, *Nature*, 483, 531–533.

Another landmark effort to reproduce the findings of 100 recent papers in psychology failed in more than half the cases (Brian Nosek's work)

Baker, M., 2015, Over half of psychology studies fail reproducibility test. Largest replication study to date casts doubt on many published positive results, *Nature*, 27 August 2015.



## 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.



**The New York Times**

‘Scientists Who Cheat’

**nature**

Misplaced faith.

The public trusts scientists much more than scientists think. But should it?

New York Times, 2015, Scientists Who Cheat, Editorial, June 1.

Nature, 2015, Misplaced faith, Editorial, June 2. The public trusts scientists much more than scientists think. But should it?



“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.



And yet many institutions chose to ignore the connection between science's crisis and science advice.

The OECD report on Science Advice 2015; not a single mention of science's crisis. Only 'crisis situations' ignoring that science itself is into one.

<http://www.oecd-ilibrary.org/docserver/download/5js3311jcpwb.pdf?expires=1442656356&id=id&accname=guest&checksum=AF1467AD25FF8BE6516083077CCEE31A>

Instead those aspects of science most used in policy (mathematical and statistical modelling) are also those found more deficient in quality.

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

Saltelli, A. and Funtowicz, S., 2014, When all models are wrong: More stringent quality criteria are needed for models used at the science-policy interface, *Issues in Science and Technology*, vol. winter, pp. 79-85.

There were rare anticipations of this crisis. 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).

In 1971, Jerome R. Ravetz anticipated serious troubles to science's own quality assurance mechanism as a result of the mutated ethos of industrialized science (p. 22-23, 58).

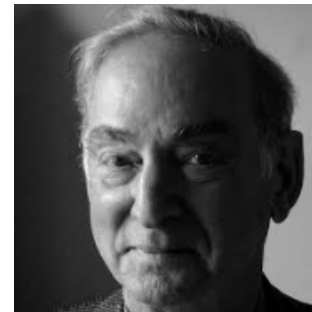
de Solla Price, D.J., 1963, Little science big science, Columbia University Press.

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

See also:

Liotard, 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



Derek J. de Solla Price



## A call to deal with the data deluge

Researchers debate whether an 'overflow' of data is straining biomedical science.

[Chris Woolston](#)

18 September 2015

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As the number of biomedical research papers continues its relentless growth, the quality and credibility of science is buckling under the weight of all the data. That is the conclusion of an [article](#) in the journal *eLife*<sup>1</sup> that triggered discussion online this week. The piece, which is based on interviews with 20 anonymous US senior scientists, suggests a radical rethinking of the peer-review system to deal with the 'overflow' of data. Erik Müllers, a cell biologist at the Karolinska Institute in Stockholm, summed up the issue on Twitter:



**Erik Müllers**  
[@AerikM](#)

 **Follow**

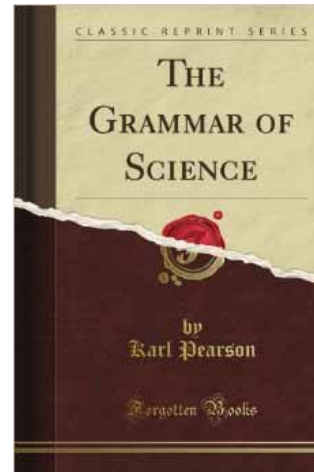
Too many journals, too many researchers,  
too low quality: Overflow in [#science](#) and  
its implications for trust [shar.es/17bNjo](https://www.shar.es/17bNjo)  
[@elife](#)

## 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.

Demarcation: facts  
separate from values



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 but:

“the more knowledge is produced in hybrid arrangements, the more the protagonists will insist on the integrity, even veracity of their findings” ...

Grundmann, R., 2009, The role of expertise in governance processes, *Forest Policy and Economics* 11, 398–403, citing Latour, B., 1993. *We Have Never Been Modern*. Cambridge, Harvard UP.

## ‘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.



Silvio Funtowicz

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



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 prediction of the wonders of science.



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”



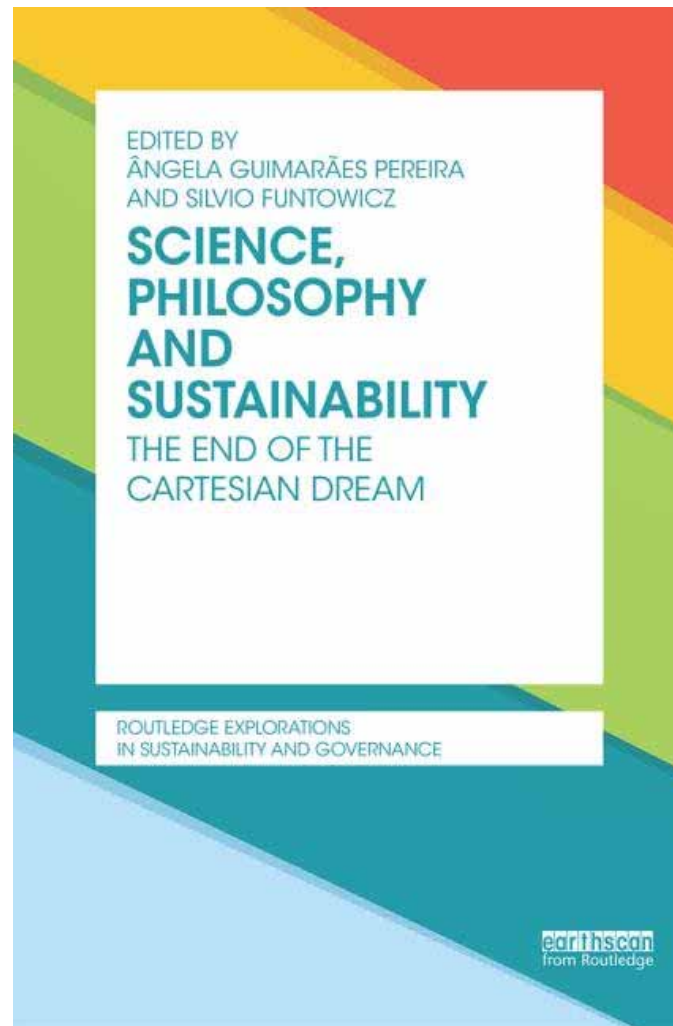
Nicolas de Caritat, marquis de  
Condorcet  
(1743- 1794)

‘Sketch for a Historical Picture of the Progress of the  
Human Spirit’, Ninth Epoch.

## More reading

### Contributors:

Jerry Ravetz, Silvio Funtowicz,  
Ângela Guimarães Pereira,  
Ragnar Fjelland, David Waltner-Toews,  
Edvin Schei, Roger Strand,  
Fern Wickson, Alice Benessia,  
Mariachiara Tallacchini, Paula Curvelo,  
Daniel Sarewitz, Andrea Saltelli



2015

Economics as master  
discipline to frame  
issues and adjudicate  
solutions?

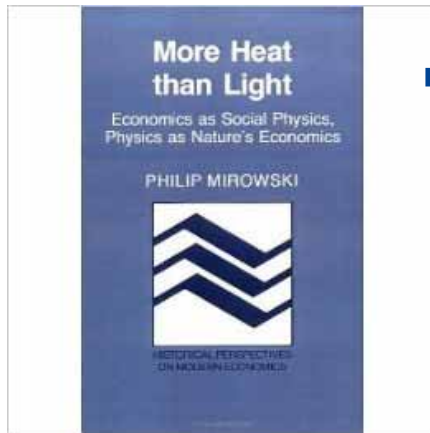
# Twin crises in science and economic thought: Four conferences on science integrity

<http://www.wcri2015.org/>

# A conference on ‘What’s Wrong with the Economy—and with Economics?’

<http://www.nybooks.com/blogs/gallery/2015/mar/29/whats-wrong-with-the-economy/>





➔ 1991



Philip Mirowski

➔ 2013





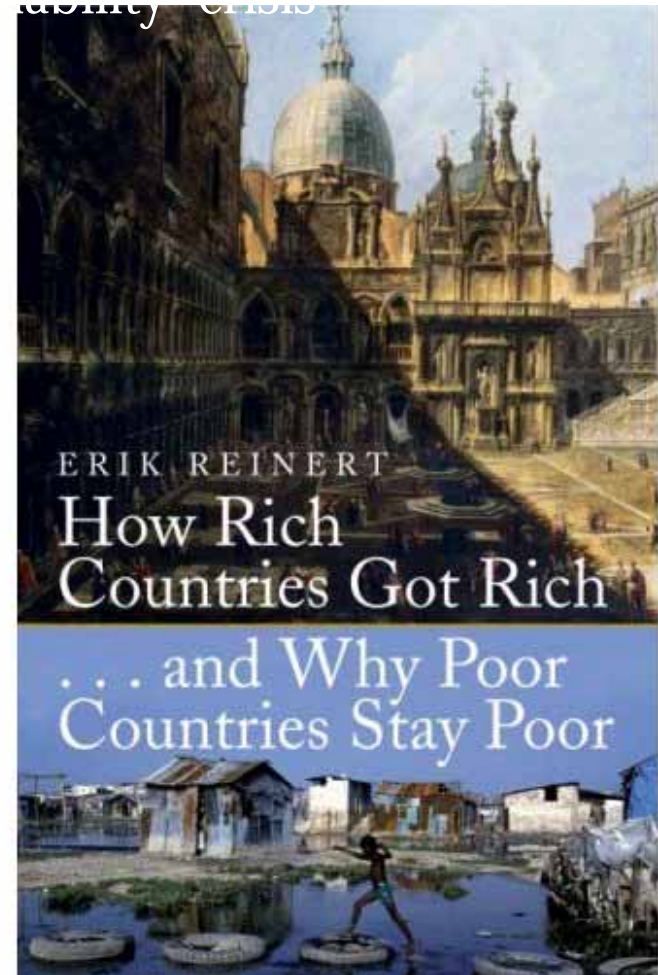
Erik Reinert

See: Reinert, E.S., 2012, Economics and the Public Sphere: The Rise of Esoteric Knowledge, Refeudalization, Crisis and Renewal.

Social Science Research Council, Essay,

<http://publicsphere.ssrc.org/reinert-economics-and-the-public-sphere/>

→ 2008



# Common element of the two crises: statistics and mathematical modelling: a new lingo: statisticulation, mathiness,...

**Mathiness:** *'uses a mixture of words and symbols, but instead of making tight links, it leaves ample room for slippage between statements in natural versus formal language and between statements with theoretical as opposed to empirical content'*, Romer, P. M., Mathiness in the Theory of Economic Growth, American Economic Review: Papers & Proceedings 2015, 105(5): 89–93.

## See also Paul Romer's Blog and his surprising quote of Feynman's Cargo Cult lecture in relation to intellectual honesty

<http://paulromer.net/feynman-integrity/>

**Statisticulation:** Statistical manipulation, Huff, D., 1993, How to lie with statistics, Norton & Company

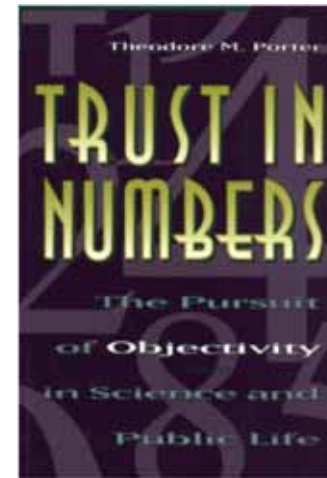
See also: Leek J.T., and Peng, R.D., 2015, P values are just the tip of the iceberg, Nature, 520, p. 612.

# Problematic quantifications

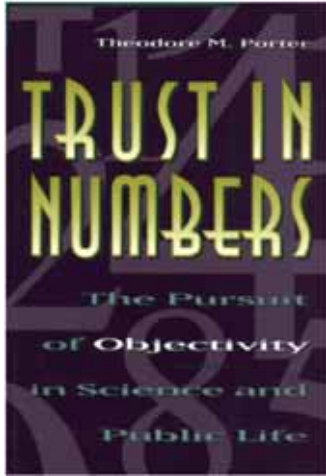
p. 8: “The appeal of numbers is especially compelling to bureaucratic officials who lack the mandate of a popular election, or divine right. Arbitrariness and bias are the most usual grounds upon which such officials are criticized. A decision made by the numbers (or by explicit rules of some other sort)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

Quantification: the discrete charm of bureaucracies?

Fabricating uncertainty is just one among the possible strategies. Uncertainty can be amplified or minimized instrumentally.

Saltelli A, Guimarães Pereira A, van der Sluijs JP & Funtowicz S 2013, 'What do I make of your Latinorum? Sensitivity auditing of mathematical modelling', *International Journal of Foresight and Innovation Policy*, vol. 9, no. 2-4, pp. 213-234.

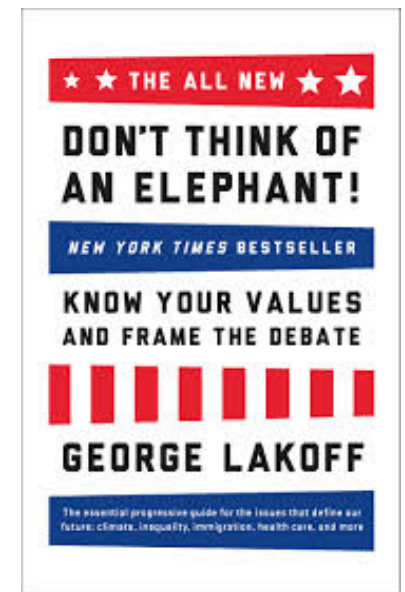
The issue of frames. How do we perceive the world. Socially constructed ignorance etc.

Lakoff, G., 2010, *Why it Matters How We Frame the Environment*, *Environmental Communication: A Journal of Nature and Culture*, 4:1, 70-81.

Lakoff, G., 2004-2014, *Don't think of an elephant: know your values and frame the debate*, Chelsea Green Publishing.



George Lakoff





## Questions about GMO deemed relevant by citizens (Marris, 2001)

- Why do we need GMOs? What are the benefits?
- Who will benefit from their use?
- Who decided that they should be developed and how?
- Why were we not better informed about their use in our food, before their arrival on the market?
- Why are we not given an effective choice about whether or not to buy and consume these products?
- Do regulatory authorities have sufficient powers and resources to effectively counter-balance large companies who wish to develop these products?





Frames; GMO presented as a food scare.

“Montpelier is **America’s only McDonald’s-free state capital**. A fitting place, then, for a law designed to satisfy the unfounded fears of foodies [...] genetically modified crops, declared safe by the scientific establishment, but reviled as **Frankenfoods** by the **Subarus-and-sandals set**”, (The Economist, 2014).



The Economist, Vermont v science, The little state that could kneecap the biotech industry, May 10th 2014

## Key suggestions

Dont' ignore the crisis of science and and impact on evidence based policy;

Beware the limits of the demarcation model, (where facts are separated from values and science from policy);

Be inquisitive of all quantifications;

Allow science and technology studies a voice in matters scientific.

END

 @andreasaltelli  
[www.andreasaltelli.eu](http://www.andreasaltelli.eu)

## Intolerance:

Climate debate:

From 'deniers' to 'Nazis';

Calls for a world court to rule on climate science to quash sceptics

Snydersept, T., 2015, The Next Genocide, New York Times, Sept. 12,  
[http://www.nytimes.com/2015/09/13/opinion/sunday/the-next-genocide.html?action=click&pgtype=Homepage&module=opinion-c-col-top-region%C2%AEion=opinion-c-col-top-region&WT.nav=opinion-c-col-top-region&\\_r=1](http://www.nytimes.com/2015/09/13/opinion/sunday/the-next-genocide.html?action=click&pgtype=Homepage&module=opinion-c-col-top-region%C2%AEion=opinion-c-col-top-region&WT.nav=opinion-c-col-top-region&_r=1)

Vaughan, A., World court should rule on climate science to quash sceptics, says Philippe Sands, The Guardian, Friday 18 September 2015, [http://www.theguardian.com/environment/2015/sep/18/world-court-should-rule-on-climate-science-quash-sceptics-philippe-sands?CMP=tw\\_t\\_a-science\\_b-gdnscience](http://www.theguardian.com/environment/2015/sep/18/world-court-should-rule-on-climate-science-quash-sceptics-philippe-sands?CMP=tw_t_a-science_b-gdnscience)

The demarcation model is challenged in more recent epistemologies:

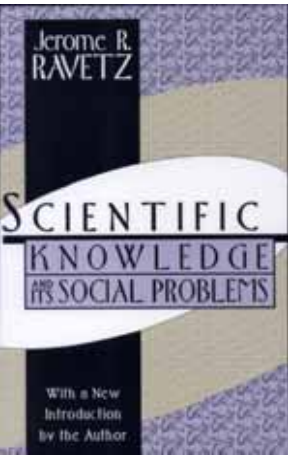
‘Post Normal Science’ (Funtowicz and Ravetz, 1993), ‘Co-production of knowledge’ model (Jasanoff, 1996).

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



## In relation to the predicaments of evidence based policy and the possible diseases of economics:

Ravetz, J., 1971, p. 366 [Chapter on IMMATURE AND INEFFECTIVE FIELDS OF INQUIRY]



[...] The situation becomes worse when an immature or ineffective field is enlisted in the work of resolution of some practical problem. In such an uncontrolled and perhaps uncontrollable context, where facts are few and political passions many, the relevant immature field functions to a great extent as a 'folk-science'. This is a body of accepted knowledge whose function is not to provide the basis for further advance, but to offer comfort and reassurance to some body of believers.

See also Jerry Ravetz, Economics as an elite folk science: the suppression of uncertainties, *Journal of Post-Keynesian Economics*, Winter 1994-95, 17(2).

# THE NEW YORKER

“Carmen Reinhart and Kenneth Rogoff [...] famous (now infamous) research that conservative politicians around the world had seized upon to justify pennypinching Policies ...”

John Cassidy, April 2013 issue

“... rising levels of government debt are associated with much weaker rates of economic growth, indeed negative ones ...”

It was instead a coding error uncovered by three researchers at the university of Michigan.

“In Britain and Europe, great damage has been done as a result.”

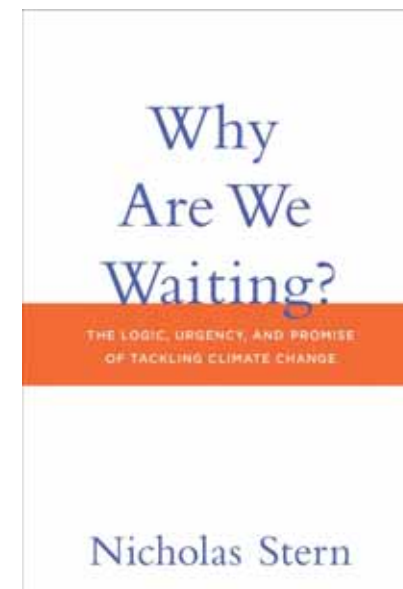
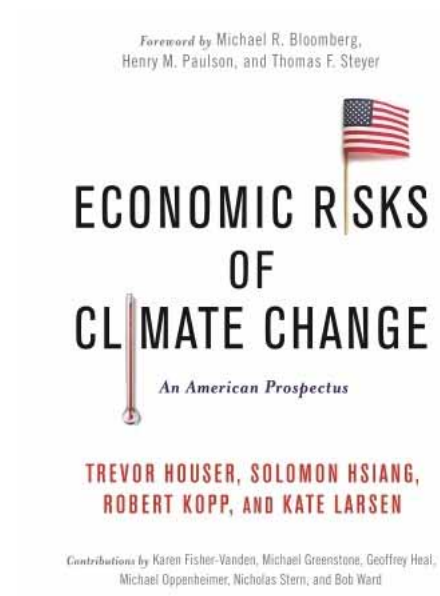


THE NEW YORKER

Saltelli, A. and Funtowicz, S., 2014, When all models are wrong: More stringent quality criteria are needed for models used at the science-policy interface, *Issues in Science and Technology*, vol. winter, pp. 79-85.

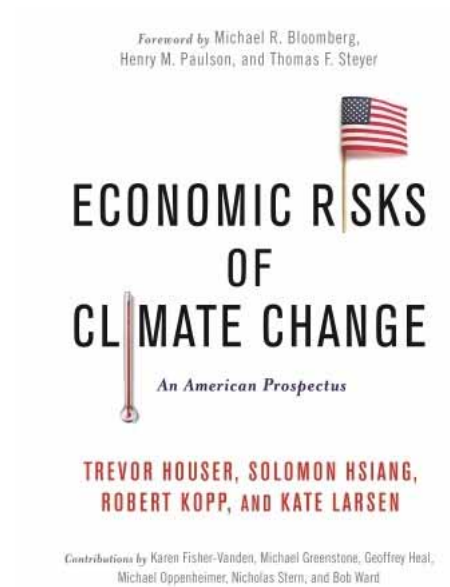


## Counting climate's dollars. Occupational psychosis or valuable input?



“[...] the report forecasts—at the level of individual counties in the U.S.—energy costs and demand, labor supply, mortality, violent crime rates, and real estate property prices up to the year 2100 [...] The report presents the amount of computer power and data generated as evidence of the scientific legitimacy of the enterprise. The authors note, however, that out of an abundance of caution they did not model deterioration in cognitive performance as temperatures rise”

Saltelli, A., Stark, P.B., Becker, W., and Stano, P., 2015, Climate Models As Economic Guides Scientific Challenge or Quixotic Quest? Spring issue of Science and Technology (IST) April 2015.  
<http://issues.org/31-3/climate-models-as-economic-guides-scientific-challenge-or-quixotic-quest/>

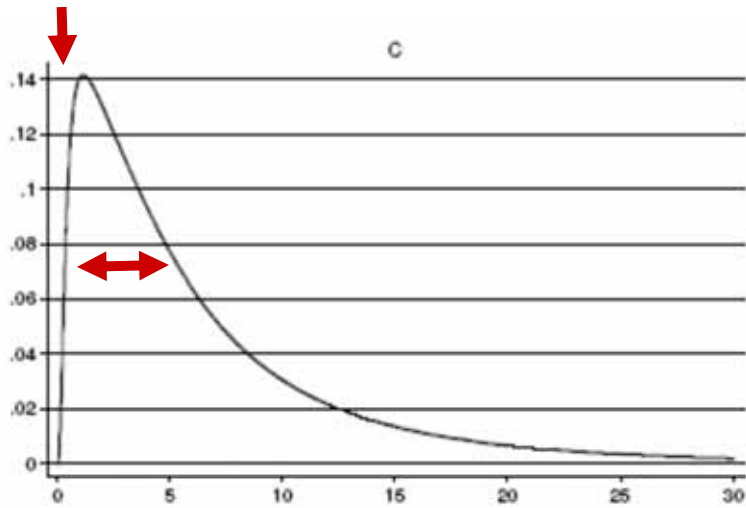


Abuse

The Stern review makes the case for urgent action against climate change based on a cost benefit analysis (CBA). We have shown that the stipulated uncertainties in the CBA do not allow any useful conclusion.



Missing points



Saltelli, A., and d'Hombres, B. 2010, 'Sensitivity Analysis Didn't Help. A Practitioner's Critique of the Stern Review', *Global Environmental Change*, vol. 20, pp. 298–302.

% loss in GDP per capita

Abuse

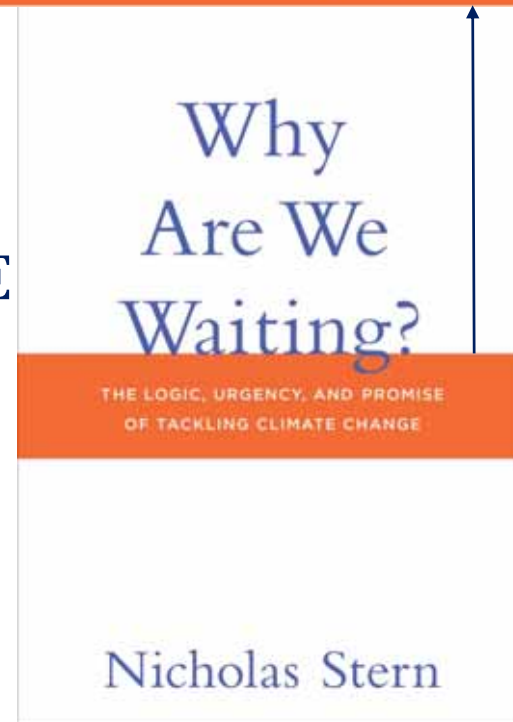
## THE LOGIC, URGENCY, AND PROMISE OF TACKLING CLIMATE CHANGE

“Integrated assessment models have produced valuable insights” p. 139

“In Chapter six of the Stern review we made use of the PAGE model” p. 345

Then, after a list of criticism moved to the realism of IAM’s:

“[...] the point is that estimates based on these models are very sensitive to assumptions and are likely to lead to gross underestimation” p.139



Abuse

Things to be incorporated in ‘formal modelling’ [sic]

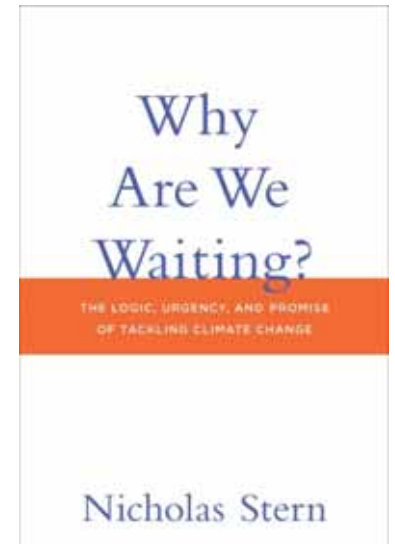
“Damage to social, organizational or environmental capital [...]

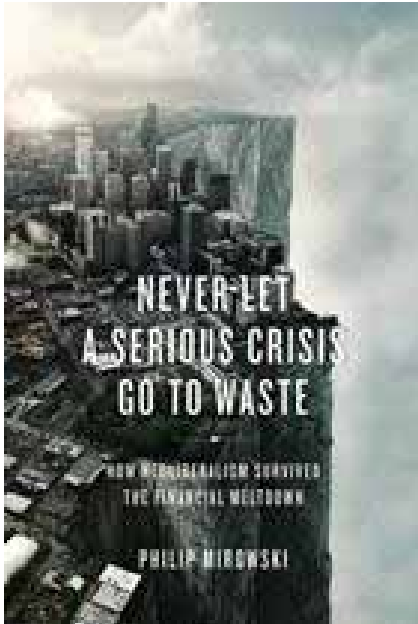
Damage to stock of capitals and land [...]

Damage to overall factor productivity [...]

Damage to learning and endogenous growth”, p. 145

‘formal modelling’ as to produce ‘numbers’?





“To be fair, DSGE and similar macroeconomic models were first conceived as theorists’ tools. But why, then, are they being relied on as the platform upon which so much practical policy advice is formulated? And what has caused them to become, and to stay, so firmly entrenched?”

Quote from Miller, B., 2010, Opening Address, The Hearing Charter of the House Committee on Science and Technology and sworn testimony of economists Sidney Winter, Scott Page, Robert Solow, David Colander and V.V. Chari, in Mirowski, P., 2013, *Never Let a Serious Crisis Go to Waste: How Neoliberalism Survived the Financial Meltdown*, Verso Books.