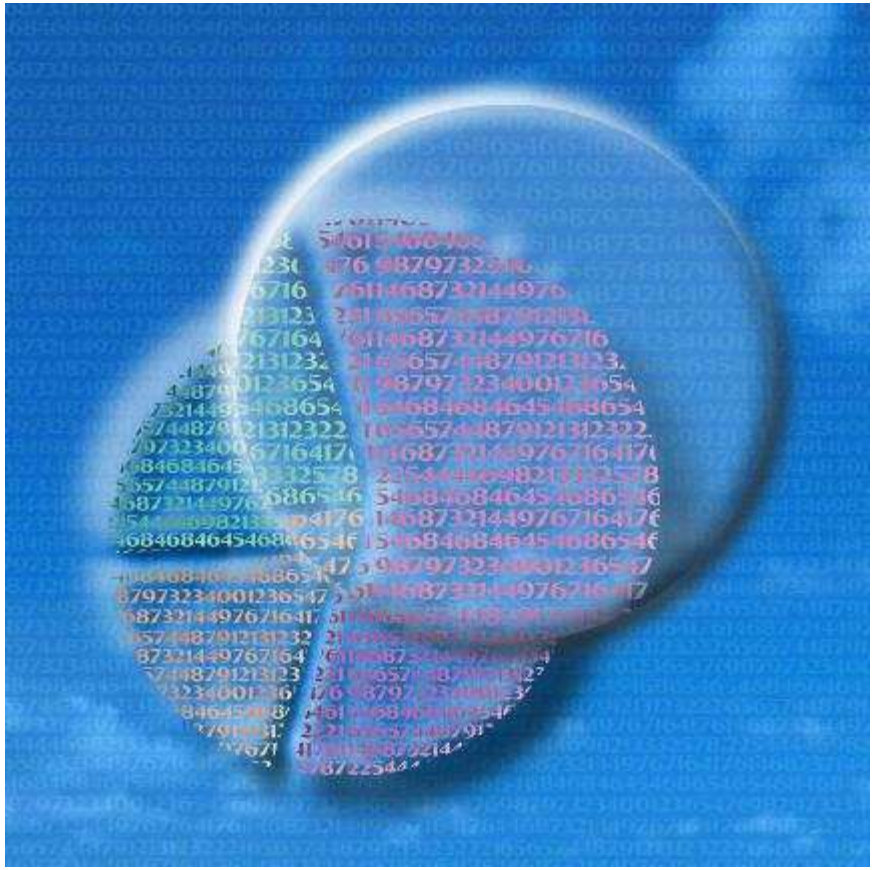
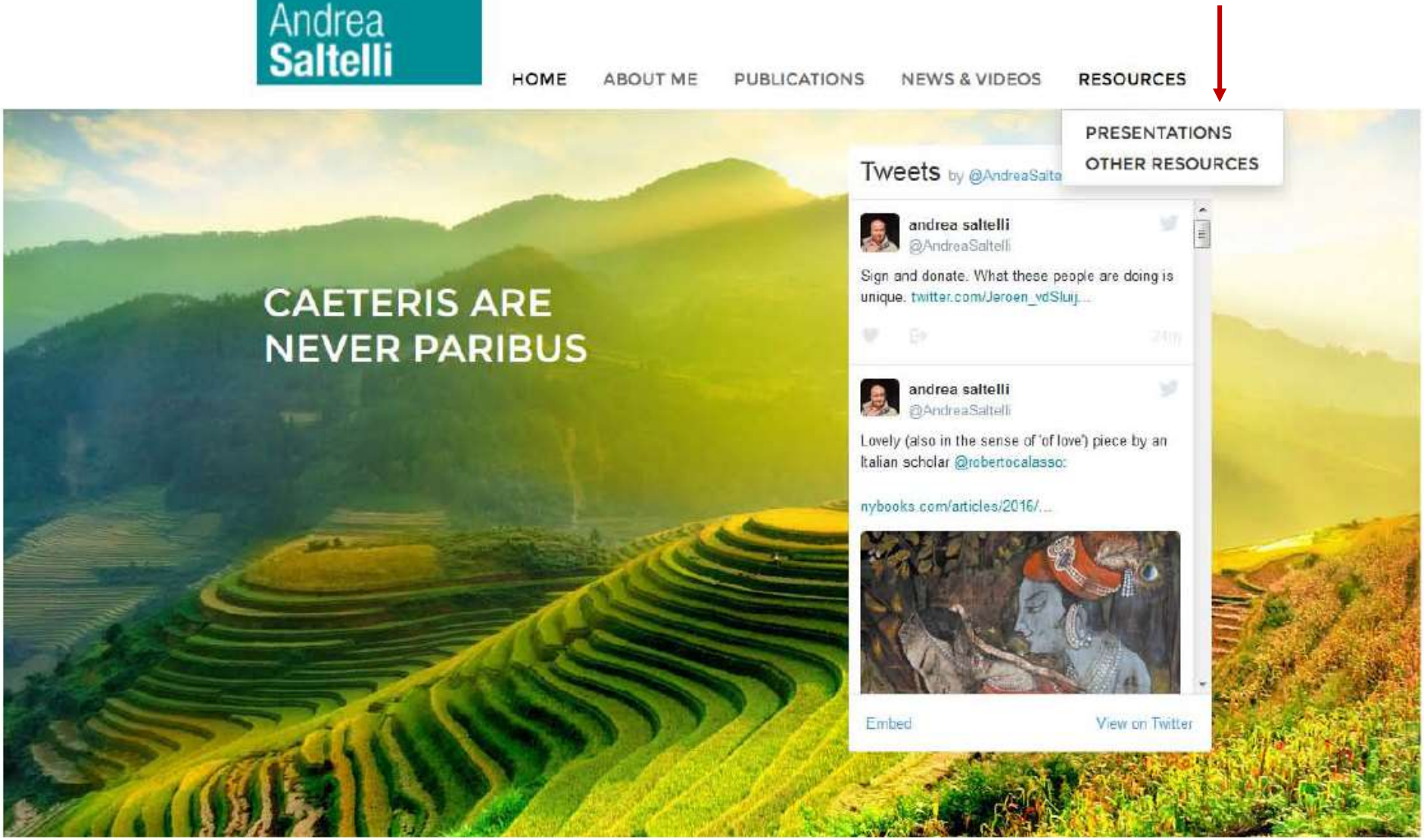


Course at ICTA: ‘Sensitivity analysis, sensitivity auditing and beyond’ Lesson 2: Sensitivity Auditing

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

Barcelona, Bellaterra Campus, February 6-8 2017

Where to find this talk: www.andreasaltelli.eu



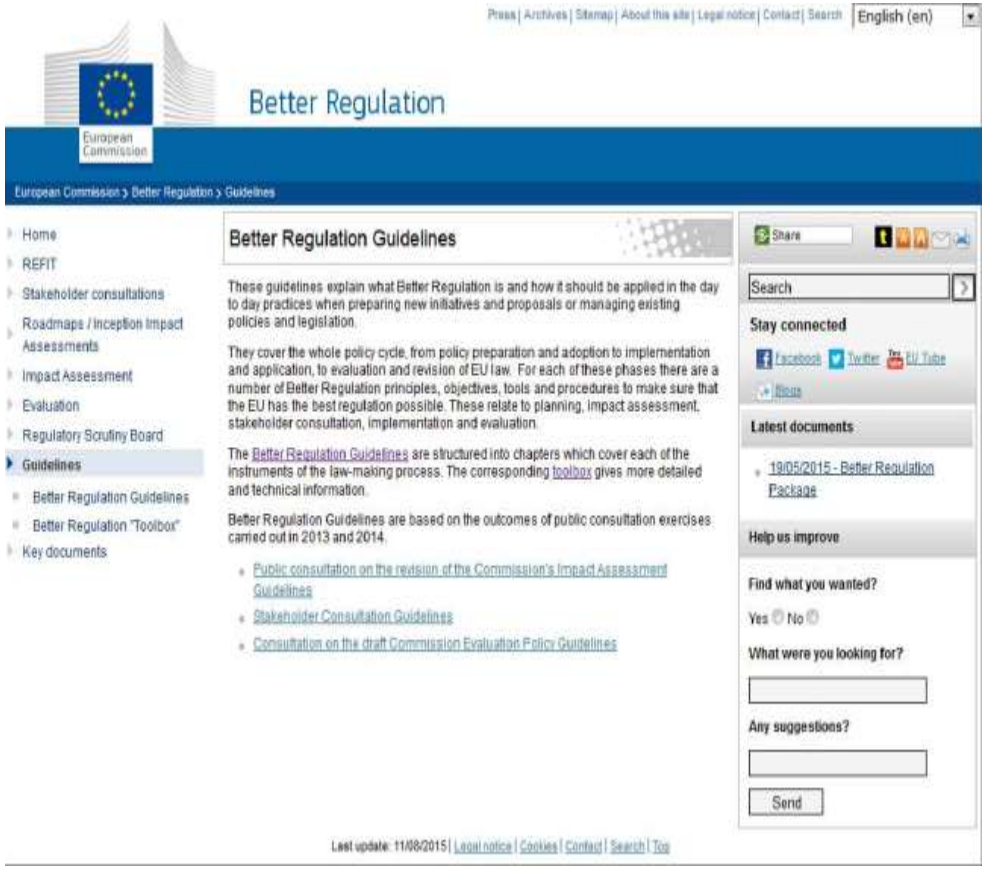
sensitivity analysis, sensitivity auditing, science for policy, impact assessment

= more material on my web site

= discussion time

Sensitivity auditing in the European Commission Impact Assessment toolbox

EC impact assessment guidelines: what do they say about sensitivity auditing ?



http://ec.europa.eu/smart-regulation/guidelines/docs/br_toolbox_en.pdf

p. 392

… where there is a major disagreement among stakeholders about the nature of the problem, … then sensitivity auditing is more suitable but sensitivity analysis is still advisable as one of the steps of sensitivity auditing.

Sensitivity auditing, [⋯] is a wider consideration of the effect of all types of uncertainty, including structural assumptions embedded in the model, and subjective decisions taken in the framing of the problem.
[⋯]
The ultimate aim is to communicate openly and honestly the extent to which particular models can be used to support policy decisions and what their limitations are.

p. 393

“In general sensitivity auditing stresses the idea of honestly communicating the extent to which model results can be trusted, taking into account as much as possible all forms of potential uncertainty, and to anticipate criticism by third parties.”

p. 393

“In particular, one should avoid giving the impression of false confidence by “quantification at all costs”. In some cases there is simply not enough data, or the process is too complex, to give a meaningful quantitative prediction.”

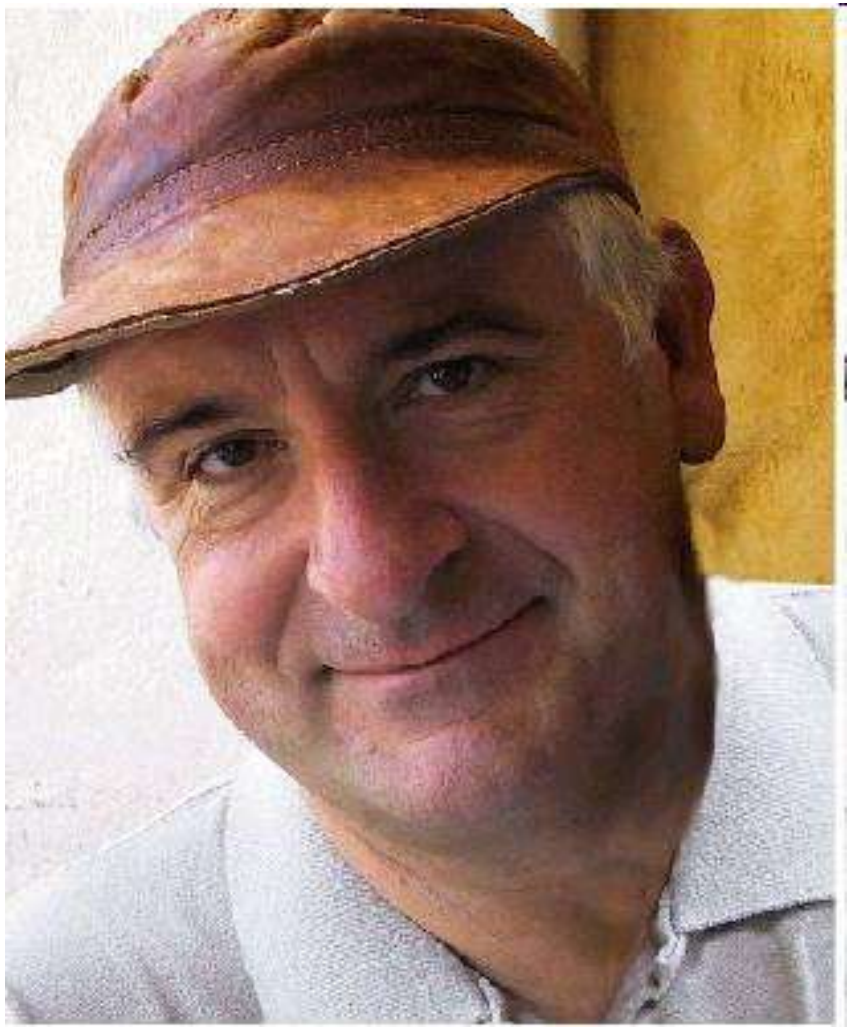
Sensitivity auditing

- Originates from uncertainty & sensitivity analysis
- Addresses model-based evidence used for policy

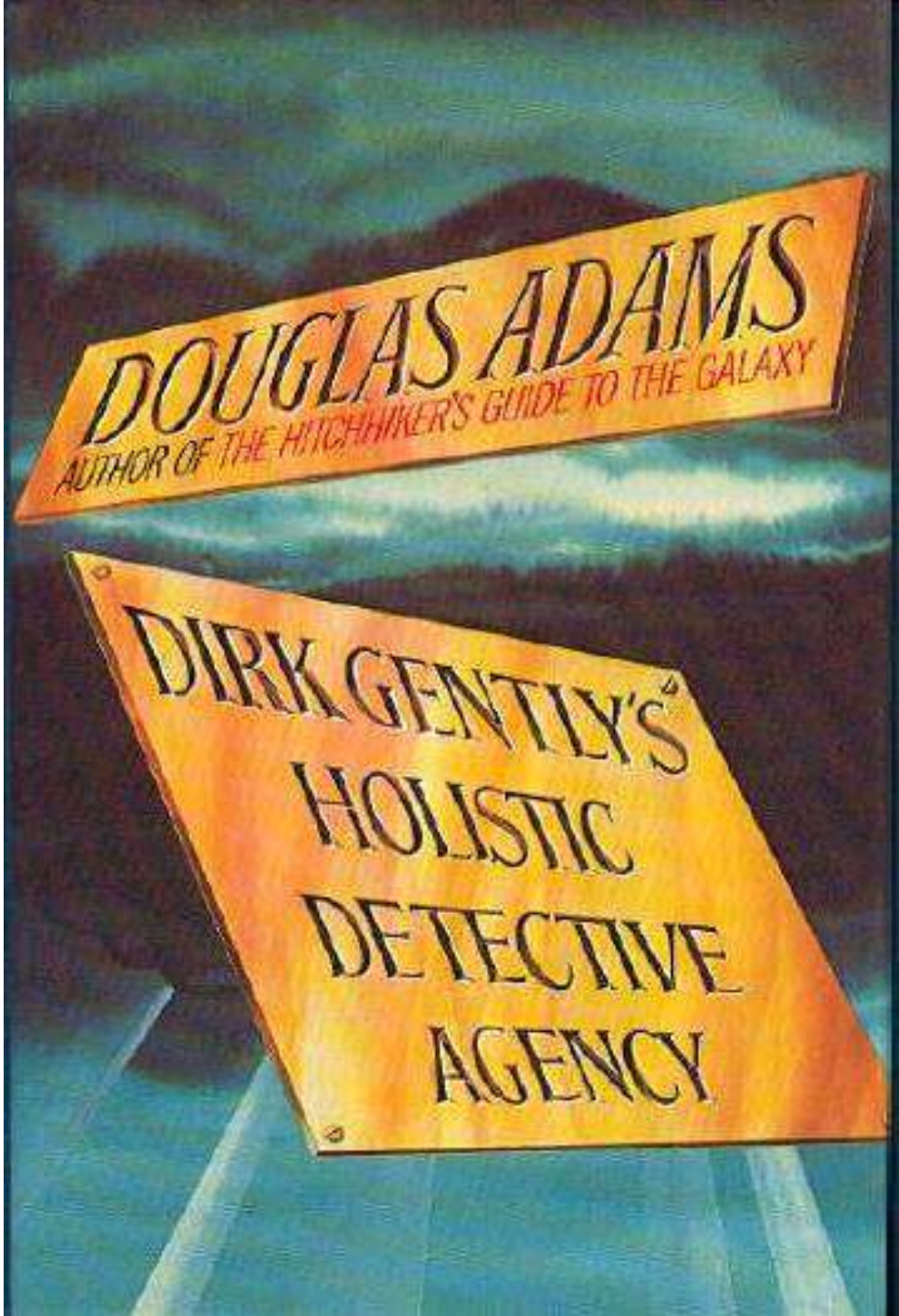
Saltelli, A., Guimarães Pereira, Â., Van der Sluijs, J.P. and Funtowicz, S., 2013, What do I make of your latinorum? Sensitivity auditing of mathematical modelling, Int. J. Foresight and Innovation Policy, 9, 2/3/4, 213-234.

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/

What is special about modelling?



Pocket Books 1987, p.69



"Well, Gordon's great insight was to design a program which allowed you to specify in advance what decision you wished it to reach, and only then to give it all the facts. The program's task, […], was to construct a plausible series of logical-sounding steps to connect the premises with the conclusion."

<<[…] most simulation models will be complex, with many parameters, state-variables and non linear relations. Under the best circumstances, such models have many degrees of freedom and, with judicious fiddling, can be made to produce virtually any desired behaviour, often with both plausible structure and parameter values.>>

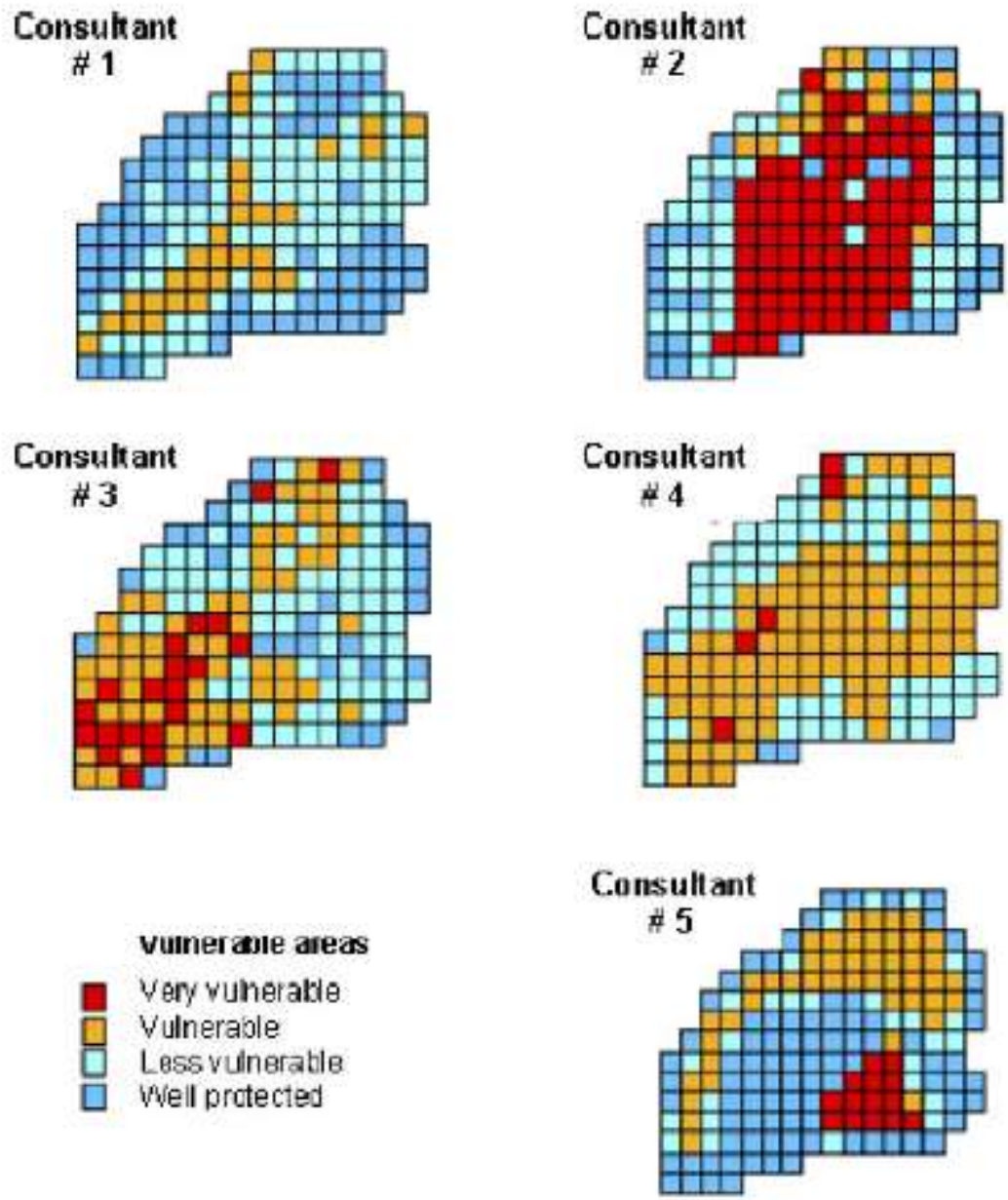
George M. Hornberger

Hornberger, G.M., Spear, R.C., 1981. An approach to the preliminary analysis of environmental systems, Journal of Environmental Management 12, 7e18.

Model structure uncertainty…

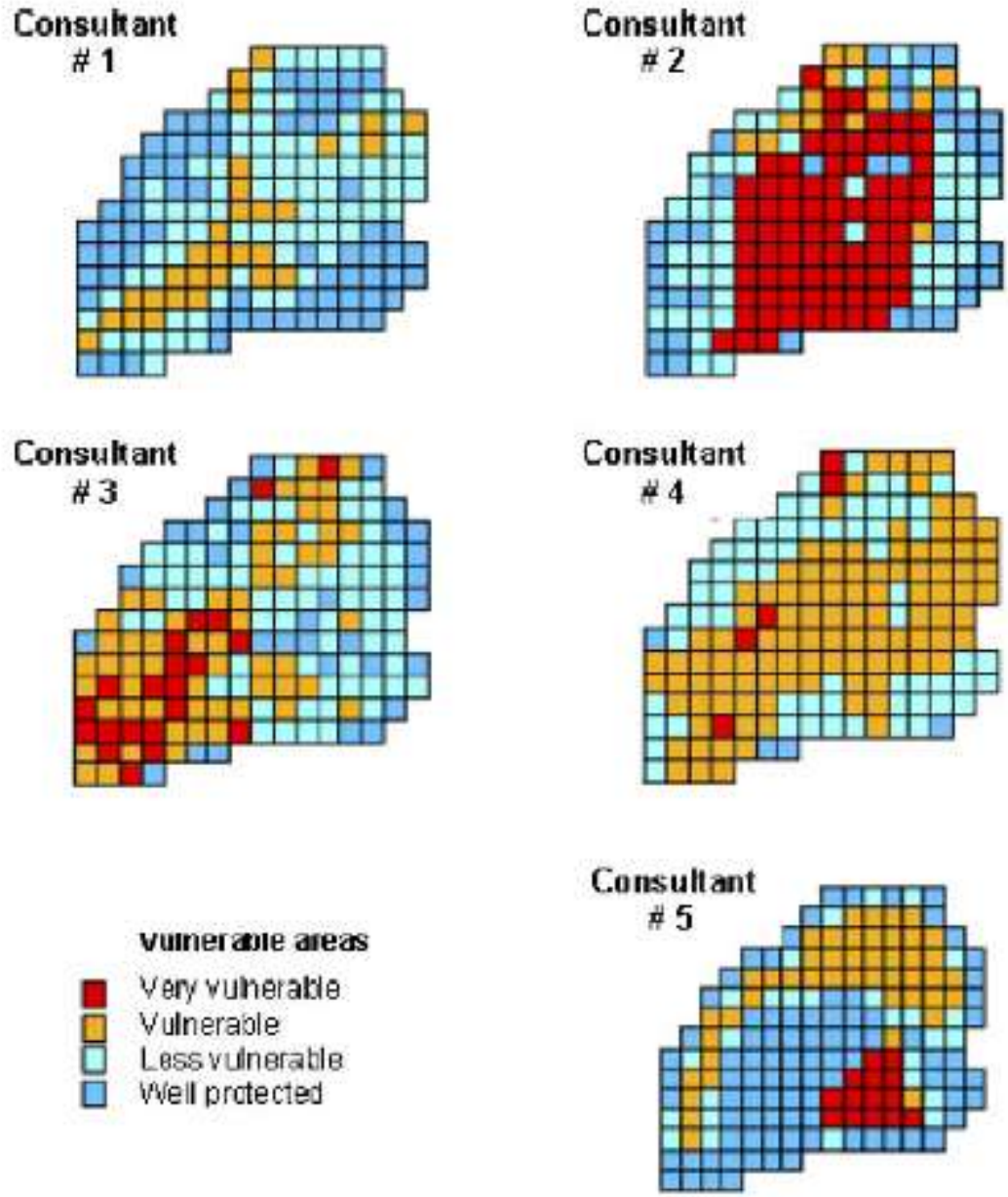
5 consultants, each using a different model were given the same question:
"which parts of this particular area are most vulnerable to pollution and need to be protected?"

(Refsgaard et al, 2006)



Courtesy of Dr. Jeroen P. van der Sluijs, Centre for the Studies of the Sciences and the Humanities (SVT), University of Bergen (NO)

What is your take?
What would you do?



Courtesy of Dr. Jeroen P. van der Sluijs, Centre for the Studies of the Sciences and the Humanities (SVT), University of Bergen (NO)

How to act upon such uncer

- **Bayesian** approach: 5 priors. A e likelihood of each grid-cell being red with data (b is no data and we need decisions now)
- IPCC approach: Lock the 5 con oom and don't release them before they have
- **Nihilist** approach: Dump the sci on an other basis
- **Precautionary** robus
- **Academic bureaucra** [-index) of consultant.
- Select the consultar
- Real life approach: olicy **agenda**
- Post normal: explore the relevance of our ignorance: **working deliberatively within imperfections**

Where do you belong?

Courtesy of Dr. Jeroen P. van der Sluijs, Centre for the Studies of the Sciences and the Humanities (SVT), University of Bergen (NO)

The IFPRI had raised about $460,000 for the modeling, which would have provided insights to help policymakers [⋯]

When economist Carl Pray heard about plans for the first international assessment of agricultural research, a gold standard sprang to mind: the Intergovernmental Panel on Climate Change (IPCC). But things didn't turn out the way he expected.

IPCC has been pivotal in proving that climate change is real and linking it to human activities. As an agricultural economist at Rutgers University who has worked in many poor countries, Pray is convinced that agricultural research—and genetic modification in

mentally, socially and economically sustainable development through the generation, access to, and use of agricultural knowledge, science and technology?" Critics say this broad mandate made conflict inevitable and stunted the assessment's analytical rigor.

On several key issues, consensus proved elusive. Industry scientists and some academics—mainly agricultural economists and plant biologists—believe the assessment was "hijacked" by participants who oppose genetically modified (GM) crops and other common

the outcome. They note that the voice and experience of small-scale farmers, particularly women, have finally been brought to the fore by the assessment. "It really deals with issues of power, influence, and benefits," says Marcia Ishii-Eiteman of the Pesticide Action Network North America in San Francisco, California. Toby Kiers, who studies sustainable agriculture at Vrije University in Amsterdam, the Netherlands, agrees. "For technology to be most effective, farmers must be at the center, influencing how it is developed, delivered, and

[⋯] But Greenpeace [⋯] objected that the models were not "transparent".

Source: Dueling visions for an hungry world, Erik Stokstad, 14 MARCH 2008, 319 SCIENCE

IAAS ITS web site, is a mouthful: "How can we reduce hunger and poverty, improve rural livelihoods, and facilitate equitable, environ-

* www.agassessment.org

community-based knowledge.

• Create space for diverse voices and include social scientists in policy.

Watson, then the World Bank's chief scientist, suggested that the bank review the entire range of agricultural technologies and policies. Convinced that agricultural research should be considered in the context of the myriad factors

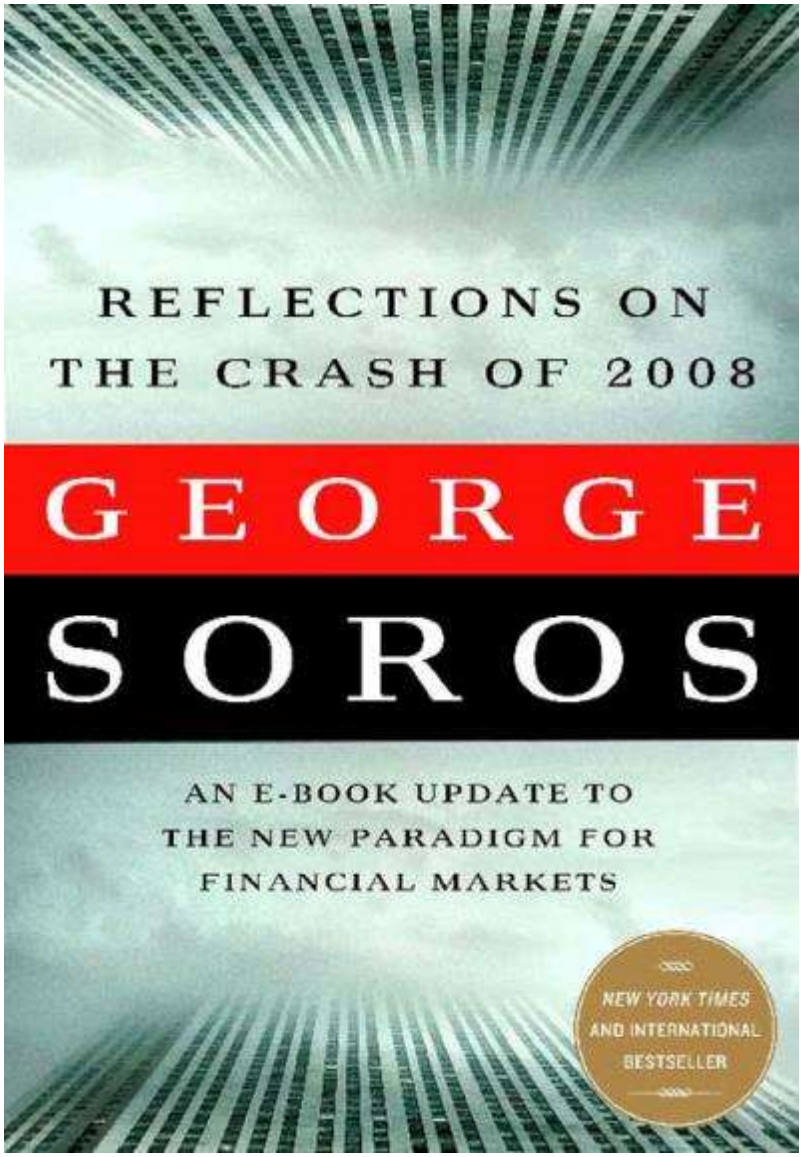
CREDIT: MARK BERN

We just can't predict, says N. N. Taleb, and we are victims of the ludic fallacy, of delusion of uncertainty, and so on. Modelling is just another attempt to 'Platonify' reality…

Nassim Nichola Taleb, The Black Swan, Penguin, London 2007

Postulate of 'radical fallibility':

"Whenever we acquire some useful knowledge, we tend to extend it to areas where it is no longer applicable”



Models by their nature are like blinders. In leaving out certain things, they focus our attention on other things. They provide a frame through which we see the world.

Joseph E. Stiglitz, 2011, RETHINKING MACROECONOMICS: WHAT FAILED, AND HOW TO REPAIR IT, Journal of the European Economic Association August 2011 9(4):591–645

Caeteris are never paribus!

The rethorical question Keynes asks is (Keynes, 1940):

"It will be remembered that the seventy translators of the Septuagint were shut up in seventy separate rooms with the Hebrew text and brought out with them, when they emerged, seventy identical translations. Would the same miracle be vouchsafed if seventy multiple correlators were shut up with the same statistical material?“

Keynes, J. M. , 1940, On a Method of Statistical Business-Cycle Research. A Comment, The Economic Journal, Vol. 50, No. 197 (Mar., 1940), 154-156.

The case of the dynamic stocastic general equilibrium models (DSGE)

Pages 275-286
How dynamic stochastic general models (DSGE) were the subject of a hearing in the US Senate

Philip Mirowski

"an event in 2010 that was literally unprecedented in the history of economic thought in America with sworn testimony by economists such as Sidney Winter, Scott Page, Robert Solow, David Colander and V.V. Chari"

July 20, 2010 hearing on DSGE

[…] The basic stance of the hearings was defined in the opening comments by Chairman Brad Miller:

"According to the model's most devoted acolytes, the model's insights rival the perfect knowledge Paul described in the First Letter to the Corinthians; but unlike the knowledge Paul described, DSGE's insights are available in the here and now…

“…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?"

Can model be used as part of a ritual?

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"(Szenberg, 1992)

Szenberg, M. (ed.), 1992. Eminent Economists: Their Life Philosophies. Cambridge: Cambridge University Press.

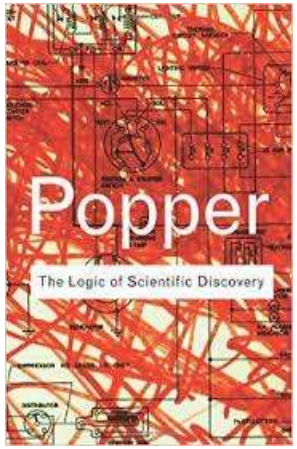
Why is it so easy to use models rhetorically?

"In many cases, these temporal predictions are treated with the same respect that the hypothetic-deductive model of science accords to logical predictions. But this respect is largely misplaced"

Naomi Oreskes

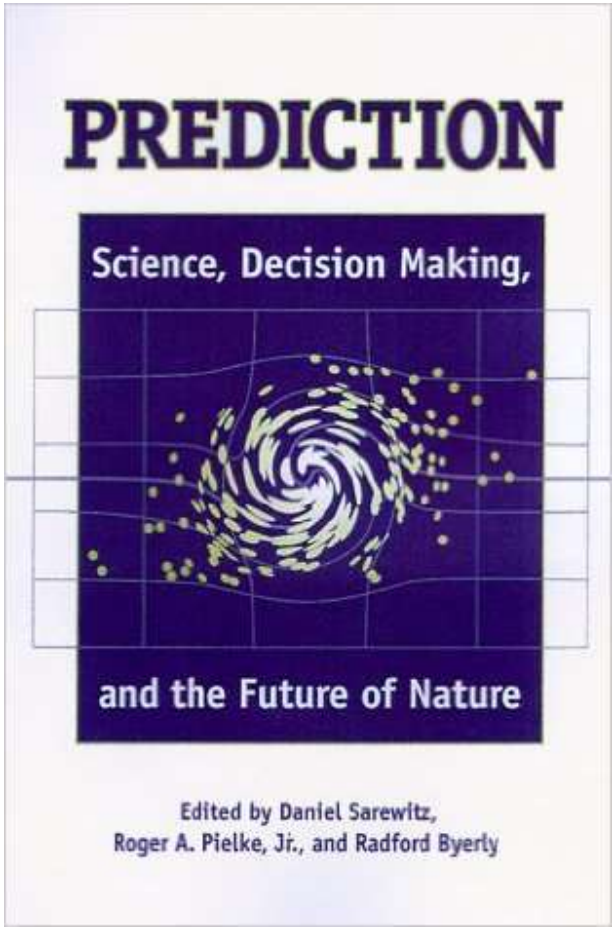
Oreskes, N., 2000, Why predict? Historical perspectives on prediction in Earth Science, in *Prediction, Science, Decision Making and the future of Nature*, Sarewitz et al., Eds., Island Press, Washington DC

"[…] to be of value in theory testing, the predictions involved must be capable of refuting the theory that generated them."



What when the 'theory' is not a law but a mathematical model?

"This is where predictions […] become particularly sticky"

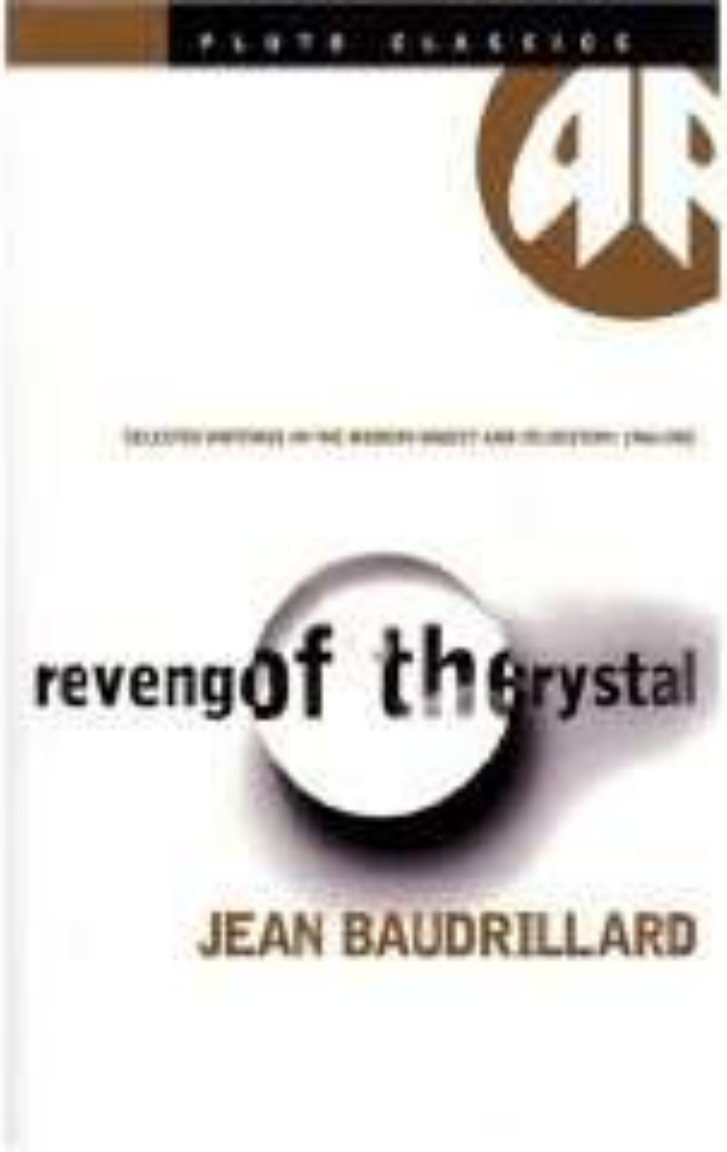


Oreskes, N., 2000, Why predict? Historical perspectives on prediction in Earth Science, in *Prediction, Science, Decision Making and the future of Nature*, Sarewitz et al., Eds., Island Press, Washington DC

"[…] models are complex amalgam of theoretical and phenomenological laws (and the governing equations and algorithms that represent them), empirical input parameters, and a model conceptualization […]

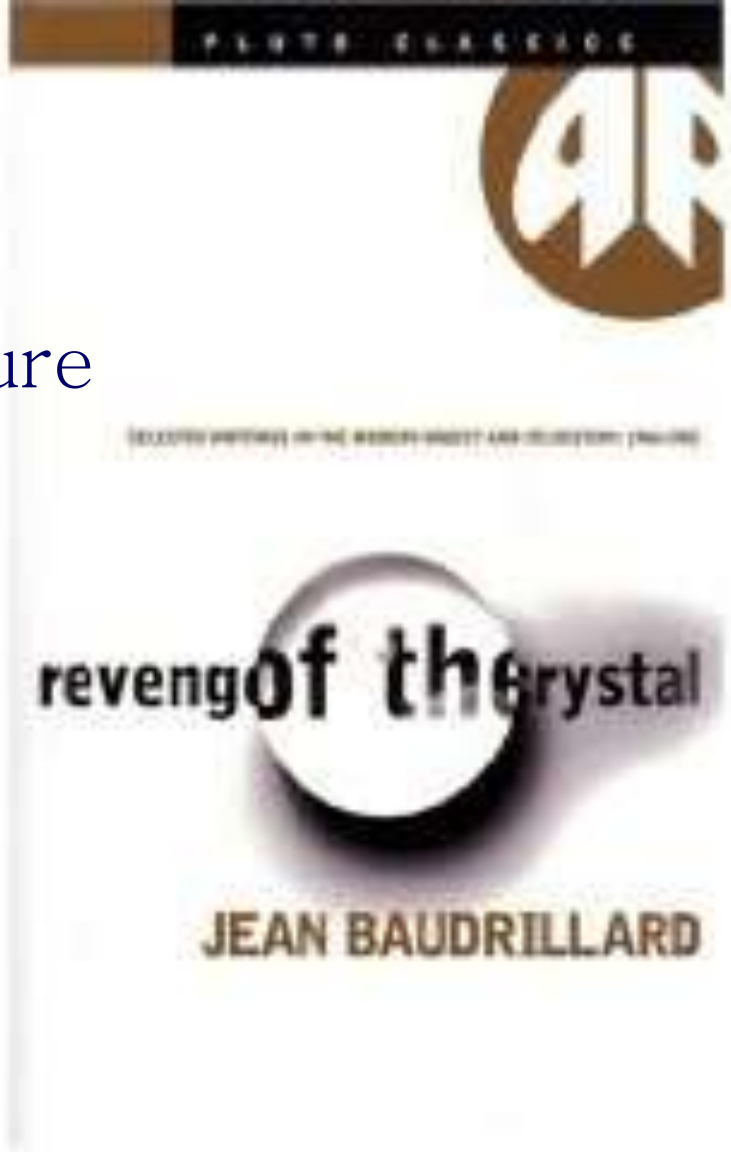
When a model generates a prediction, of what precisely is the prediction a test? The laws? The input data? The conceptualization? Any part (or several parts) of the model might be in error, and there is no simple way to determine which one it is"

An immense process of simulation has taken place throughout all of everyday life, in the image of those 'simulation models' on which operational and computer sciences are based.



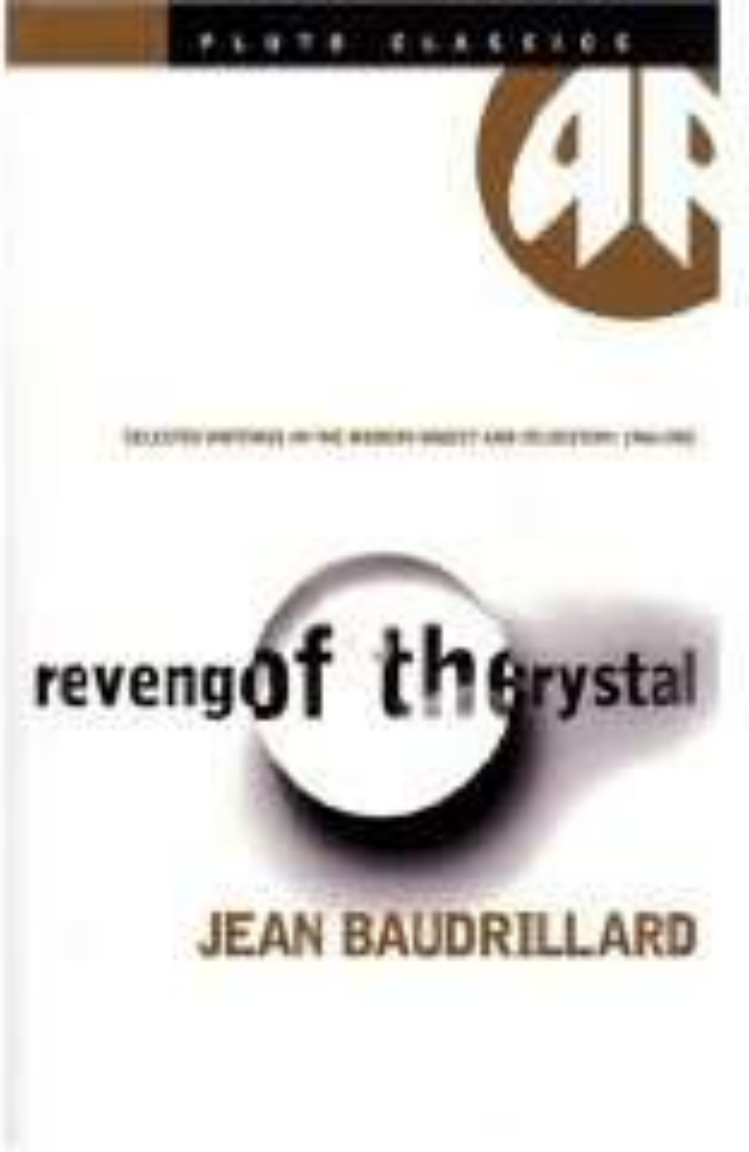
Jean Baudrillard, Revenge of the Crystal, PLUTO Press 1999, p. 92

One 'fabricates' a model by combining characteristics or elements of the real; and, by making them 'act out' a future event, structure or situation, tactical conclusions can be drawn and applied to reality.



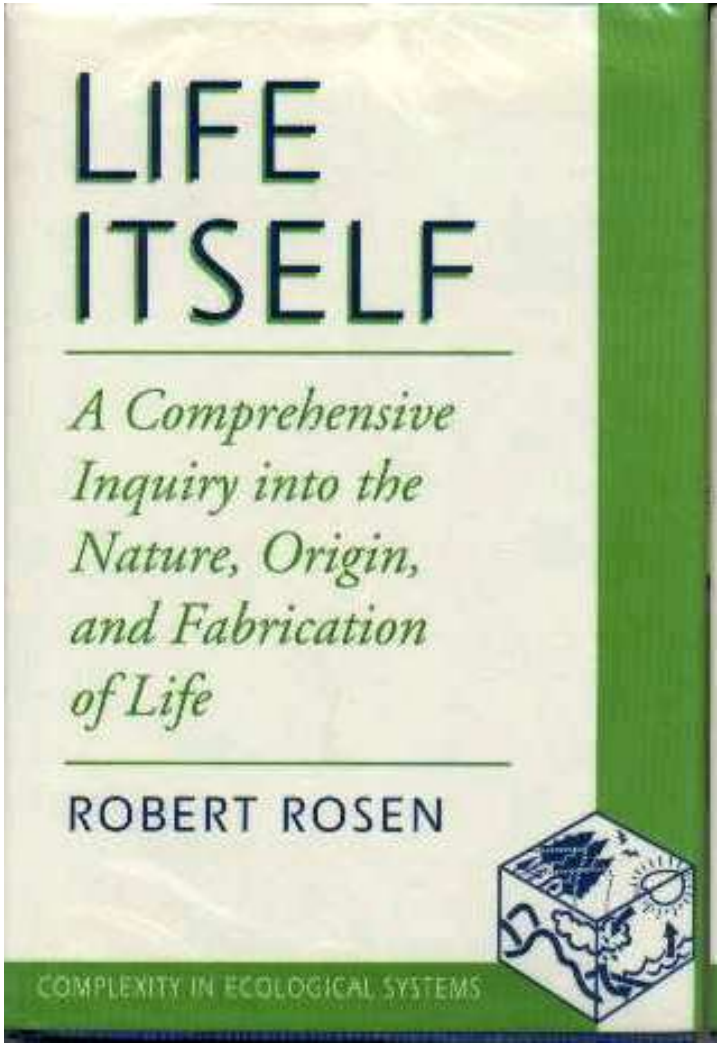
Jean Baudrillard, Revenge of the Crystal, PLUTO Press 1999, p. 92

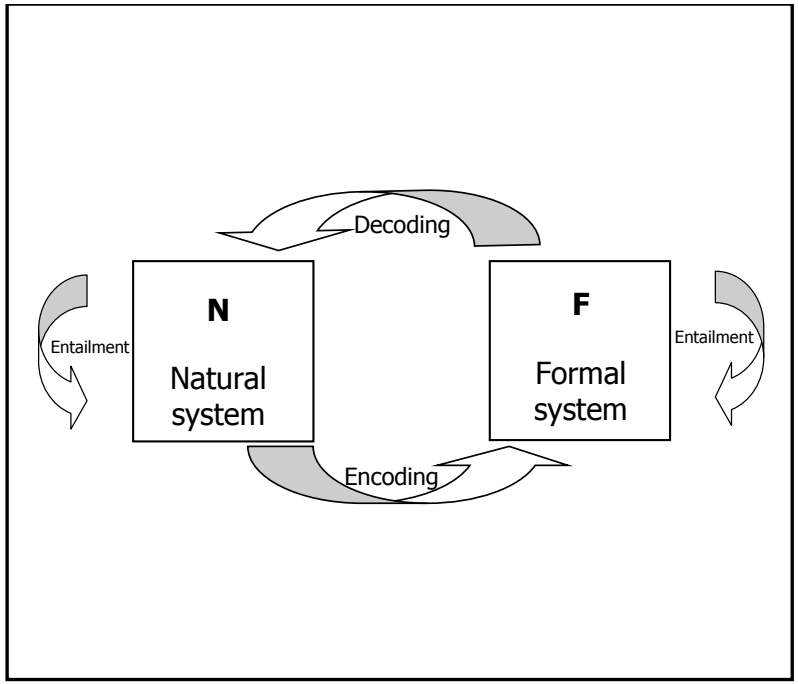
It can be used as an analytic tool under controlled scientific conditions. In mass communication, this procedure assumes the force of reality, abolishing and volatilizing the latter in favour of that neo-reality of a model materialized by the medium itself.



Jean Baudrillard, Revenge of the Crystal, PLUTO Press 1999, p. 92

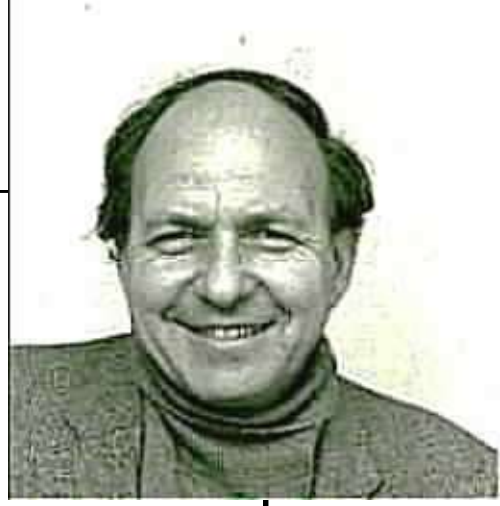
Robert Rosen's modelling relationship

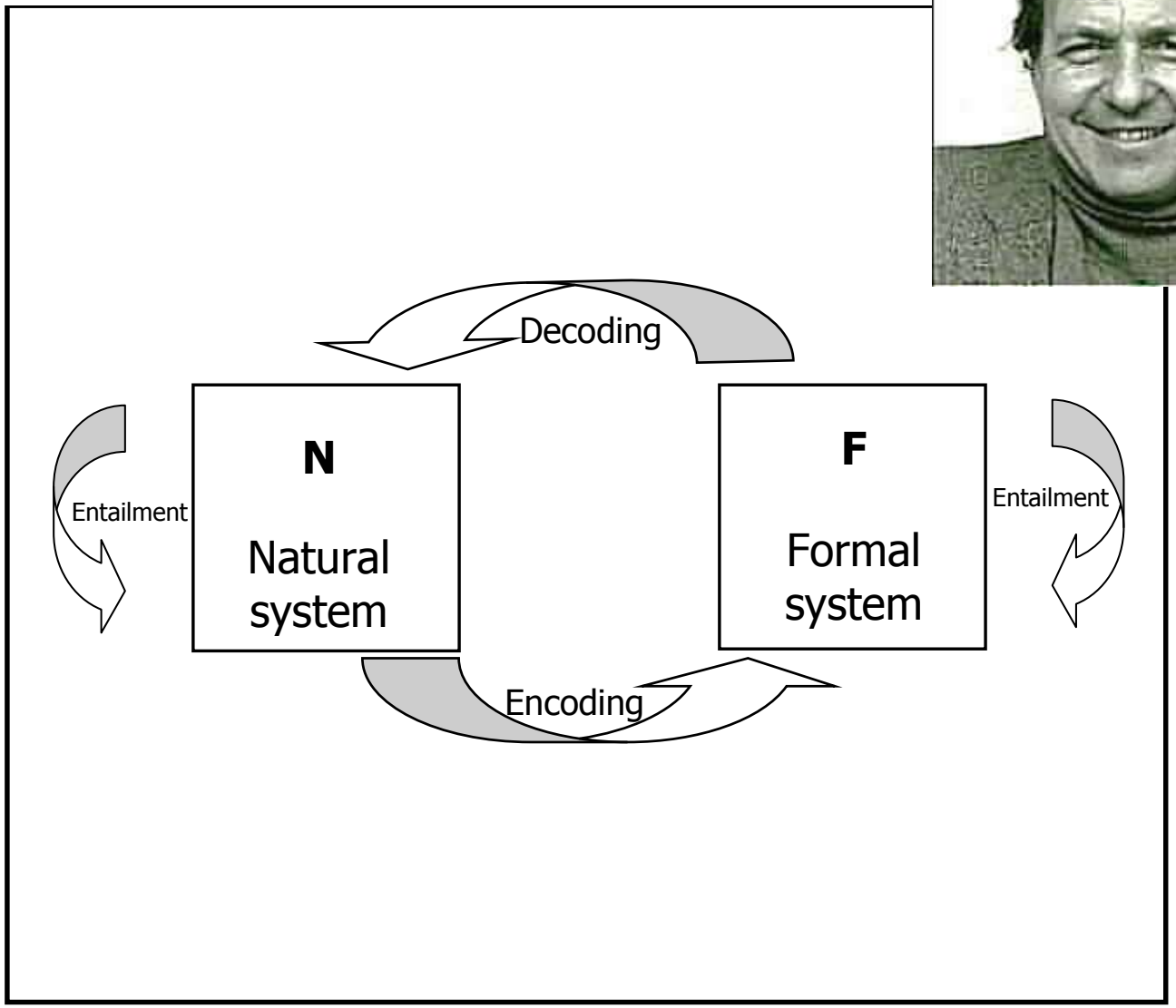

LIFE ITSELF
A Comprehensive Inquiry into the Nature, Origin, and Fabrication of Life
ROBERT ROSEN
COMPLEXITY IN ECOLOGICAL SYSTEMS


Decoding
N
Natural system
F
Formal system
Entailment
Entailment
Encoding

The critique of models

The nature of models, after R. Rosen





The model I am working on …

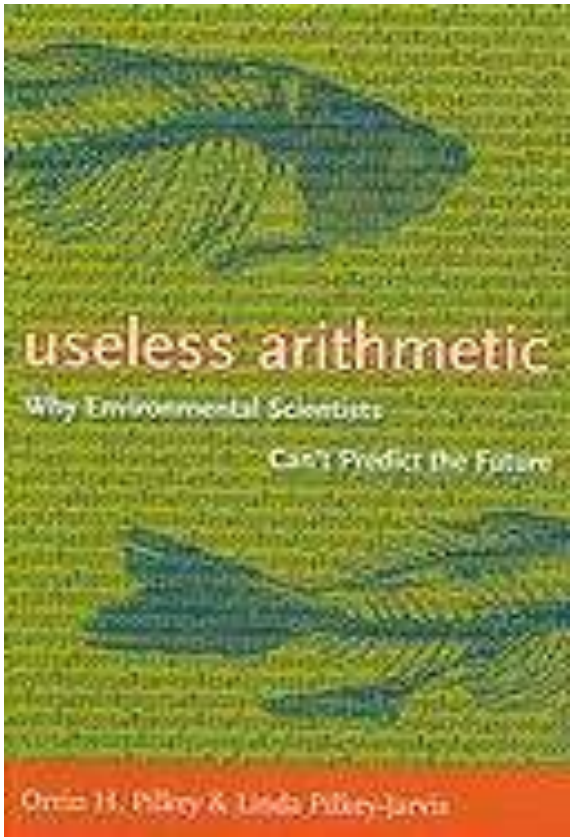
… is special because …

… is indeed rhetoric because…

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

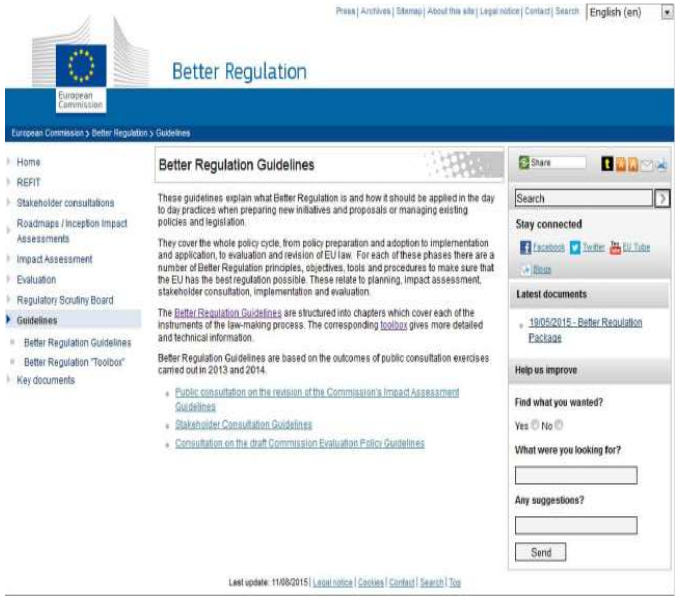


Useless Arithmetic: Why Environmental Scientists Can't Predict the Future by Orrin H. Pilkey and Linda Pilkey-Jarvis

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

"Modellers could usefully consider the following principles:

"1. Before entering into contractual arrangements with third party consultants, consider the full spectrum of available models [⋯] [and check that] the complexity of the model is justified by the quality of information used to calibrate it, i.e. that a large model is not being used rhetorically to convey a spurious impression of accuracy."



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

“[…] The models share a common approach. They pose the question: “How would we make our decision if we had complete knowledge of the world?” With such information you might make a detailed assessment […]. But little of this knowledge exists. So you make the missing data up. You assume the future will be like the past […]. The impression of rationality these procedures convey is spurious.”

“[…] If you do not know the answer to a question, the right response is not to make a number up, but to rethink and frame an alternative question that is capable of being answered.”

John Kay's approach is called 'Assumptions hunting' in Dutch circles …

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

Contents lists available at ScienceDirect

Energy Policy

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

On the contribution of external cost calculations to energy system governance: The case of a potential large-scale nuclear accident

Erik Laes [a,*], Gaston Meskens [b], Jeroen P. van der Sluijs [c]

Contents lists available at ScienceDirect

Environmental Modelling & Software

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

A method for the analysis of assumptions in model-based environmental assessments

Penny Kloprogge [a], Jeroen P. van der Sluijs [a,b,*], Arthur C. Petersen [c]

Contents lists available at ScienceDirect

Energy Policy

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

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'[…] calculation of the external costs of a potential large-scale nuclear accident […] 'An [analysis] resulted in a list of 30 calculation steps and assumptions' …

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[…]30 calculation steps and assumptions' …

What would you do if this happened to you in the course of your PhD project?

What would you do if this happened to you in the course of a paid consultancy work?

Who should do the hunting? Implication of Rule 2 for participatory approaches introducing a worked example from flood management.

Lane, S. N., Odoni, N., Landström, C., Whatmore, S. J., Ward, N. and Bradley, S., 2011. "Doing flood risk science differently: an experiment in radical scientific method." Transactions of the Institute of British Geographers, 36: 15-36.

Transactions of the Institute of British Geographers

Royal Geographical Society with IBG
Advancing geography and geographical learning

Doing flood risk science differently: an experiment in radical scientific method

S N Lane*, N Odoni*, C Landström**, S J Whatmore**, N Ward† and S Bradley‡

Trans Inst Br Geogr NS 36 15–36 2011
ISSN 0020-2754

[…] knowledge regarding flooding was co-produced. This illustrates a way of working with experts, both certified (academic natural and social scientists) and noncertified (local people affected by flooding), […] We reveal a deep and distributed understanding of flood hydrology across all experts, certified and uncertified, …

Years of modeling stream flow and cost/benefit ratios for flood protection structures had failed to consider an alternative intervention—upstream storage of flood waters—until local stakeholders were brought into the modeling process.

According to Lane and colleagues, upstream storage was neglected in the models because of the "use of a pit-filling algorithm that made sure that all water flows downhill"!

p. 393

“Modellers could usefully consider the following principles:

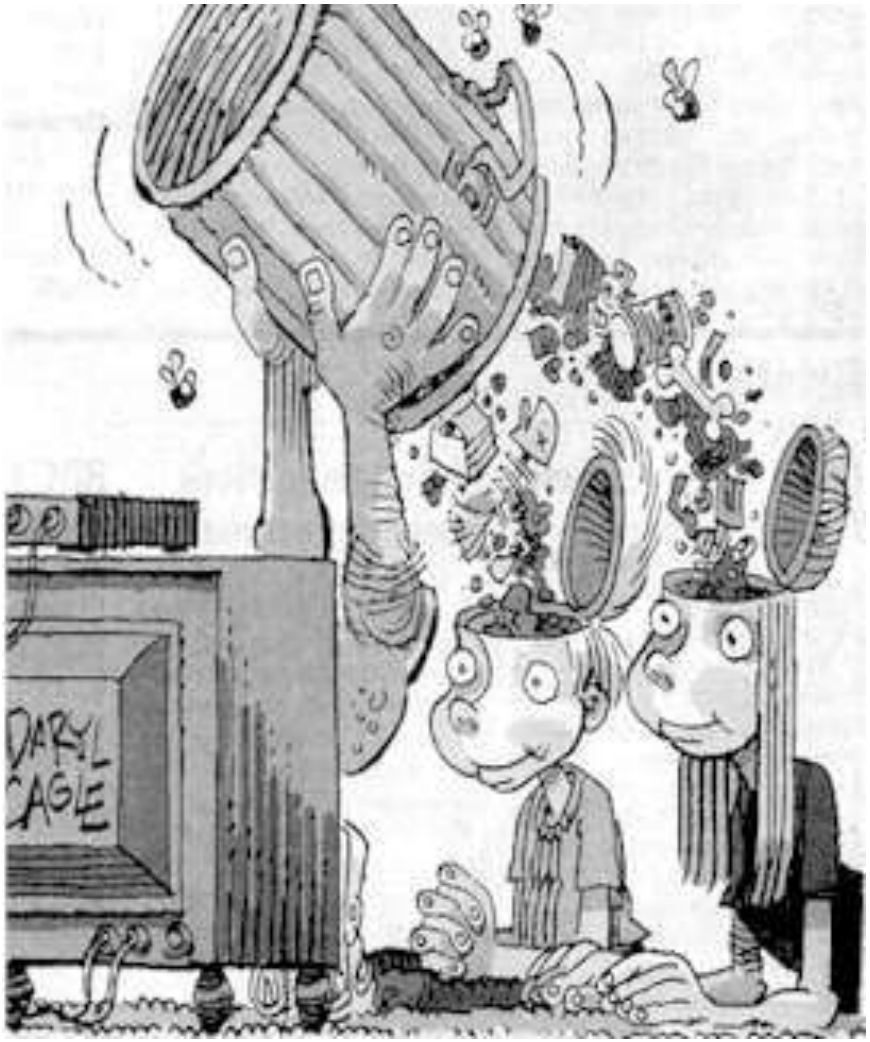
2. Critically examine all model assumptions. Are there implicit or hidden assumptions which a third party might point to? Would it be possible to evaluate the impact of taking a different approach to tackle the issue?”

Discussion points

- Am I haunted by a hidden assumptions, or by elephants in the room nobody else sees?

RULE THREE: detect GIGO (Garbage In, Garbage Out)

Science or pseudo-science



What is GIGO (Garbage In, Garbage Out) Science or pseudo-science “where uncertainties in inputs must be suppressed lest outputs become indeterminate” (Funtowicz and Ravetz, 1990)

Funtowicz & Ravetz's GIGO (Garbage In, Garbage Out) Science – or pseudo-science in this book

Funtowicz, S. O. and Ravetz, J. R., 1990. Uncertainty and quality in science for policy. Dordrecht: Kluwer.

Funtowicz & Ravetz's GIGO (Garbage In, Garbage Out) Scienc – or pseudo-science – "where uncertainties in inputs must be suppressed least outputs become indeterminate"

Leamer's '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'.

"Modellers could usefully consider the following principles:

3. Be careful not to over or under-estimate uncertainties in model input parameters. […] Where uncertainty is particularly difficult to quantify, it may be better to discuss it in qualitative terms rather than give a spurious impression of accuracy."

RULE FOUR: find sensitivities before sensitivities find you;

The RIVM media scandal (1999):

Other Newspaper headlines:

"Environmental institute lies and deceits"

"Fuss in parliament after criticism on environmental numbers"

"The bankruptcy of the environmental numbers"

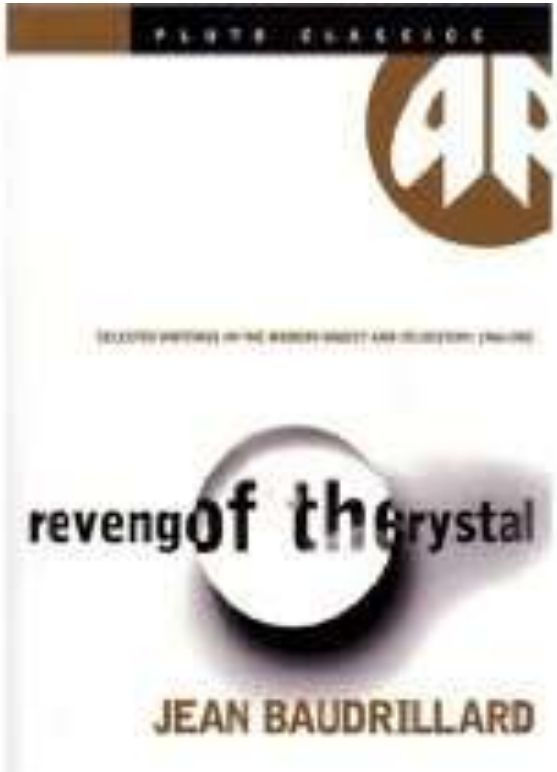
"Society has a right on fair information, RIVM does not provide it"

Jeroen van der Sluijs, A way out of the credibility crisis around model-use in Integrated Environmental Assessment, *Futures*, **34** (2002) 133-146.

The RIVM media scandal (1999):

"RIVM over-exact prognoses based on virtual reality of computer models"

Words used by French philosopher Jean Baudrillard in Revenge of the Crystal, PLUTO Press 1999, p. 92



Jeroen van der Sluijs, A way out of the credibility crisis around model-use in Integrated Environmental Assessment, *Futures*, **34** (2002) 133-146.

See also www.nusap.net

He co-authored the RIVM/MNP Guidance on Uncertainty Assessment and Communication (Leidraad).

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

“The fact that software is commercial is no guarantee that it does what it's supposed to do” (Philip B. Stark)

http://www.stat.berkeley.edu/~stark/Preprints/auditingPosition09.htm#excel

Philip B. Stark

Perils of placing faith in a thin theory

By Wolfgang Münchau April 21, 2013

Reinhart and Rogoff told policy makers what they wanted to hear

John Kenneth Galbraith [about] Milton Friedman: "Milton's misfortune was that his policies had been tried.
[…]
As for Profs Reinhart and Rogoff, I suspect that they, too, will be mostly remembered for the fact that their policies have been tried"

RULE FOUR: find sensitivities before sensitivities find you;

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

The case of Stern's Review – Technical Annex to postscript

Nicholas Stern, London School of Economics

William Nordhaus, University of Yale

Stern, N., Stern Review on the Economics of Climate Change. UK Government Economic Service, London, www.sternreview.org.uk.
Nordhaus W., Critical Assumptions in the Stern Review on Climate Change, SCIENCE, 317, 201-202, (2007).

RULE FOUR: find sensitivities before sensitivities find you;

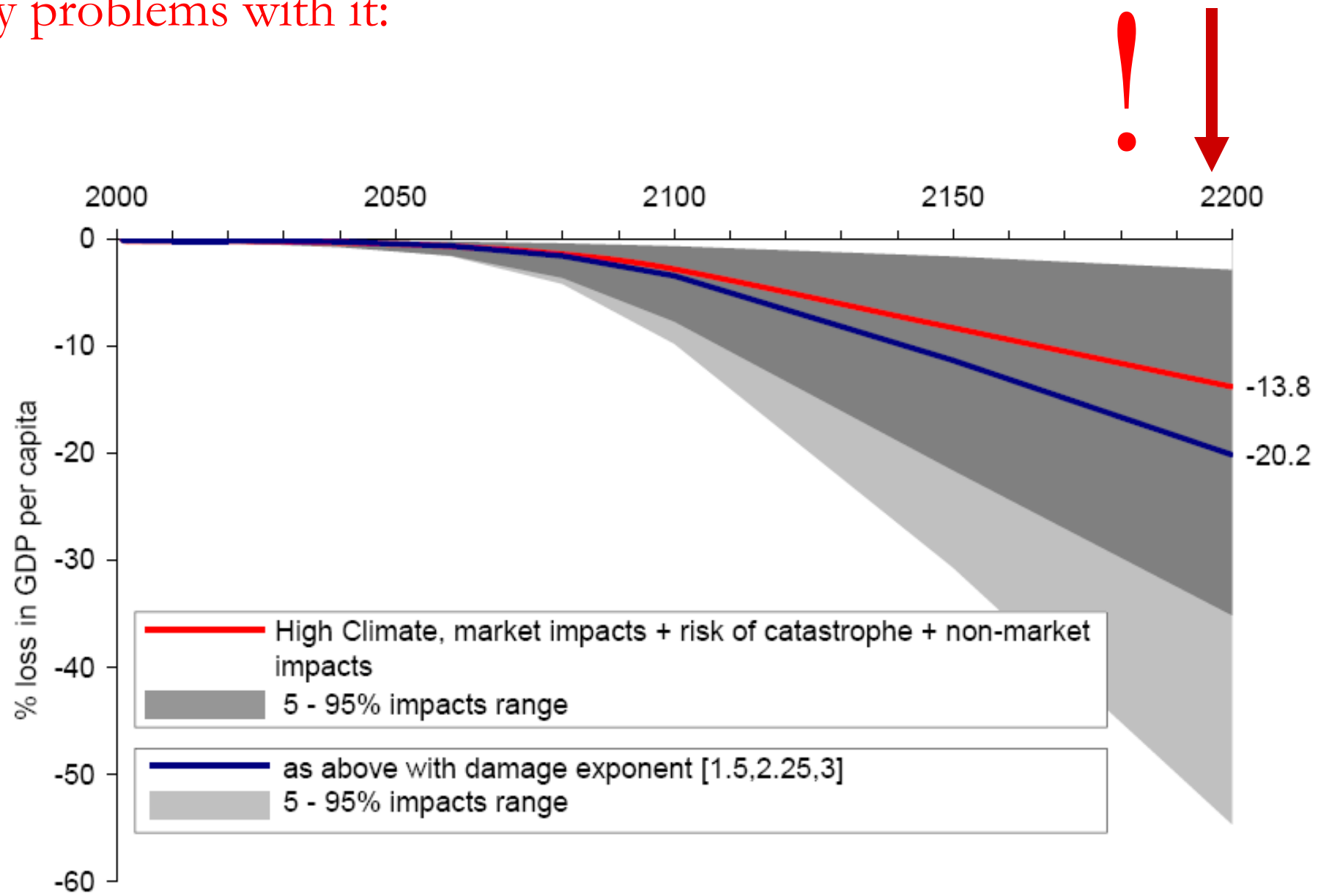
The Stern - Nordhaus exchange on *SCIENCE*

1) Nordhaus falsifies Stern based on 'wrong' range of discount rate

2) Stern's complements its review with a postscript: a sensitivity analysis of the cost benefit analysis

3) Stern infers: My analysis shows robustness'

My problems with it:

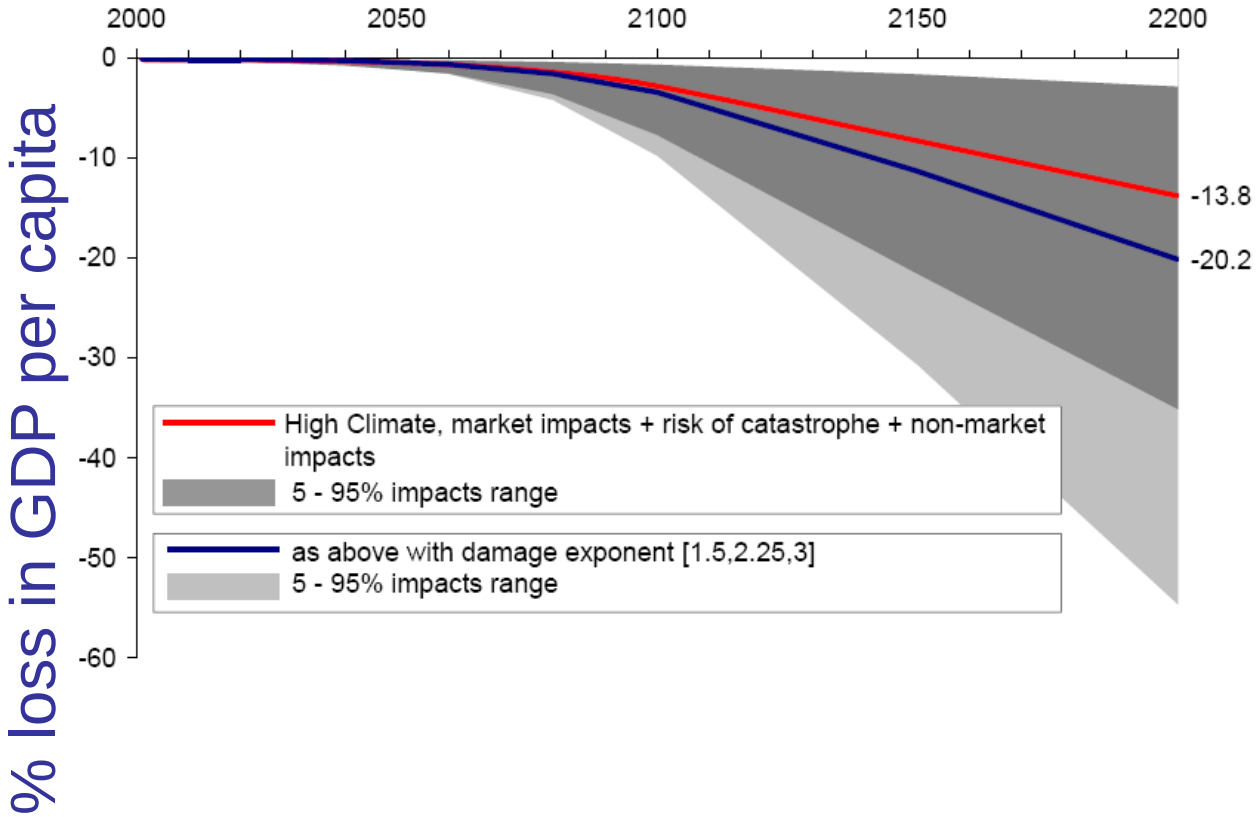


… but foremost Stern says:

changing assumptions → important effect

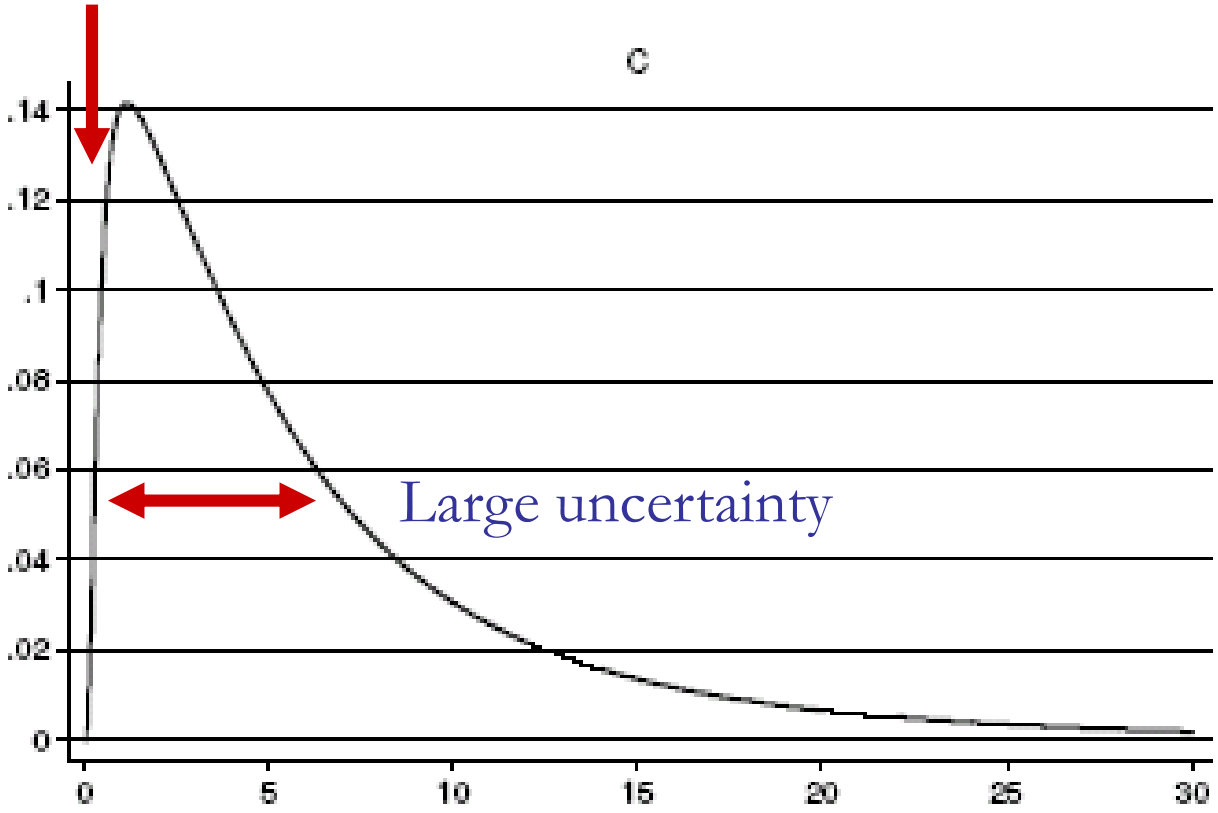
when instead he should admit that:

changing assumptions → all changes a lot



How was it done? A reverse engineering of the analysis

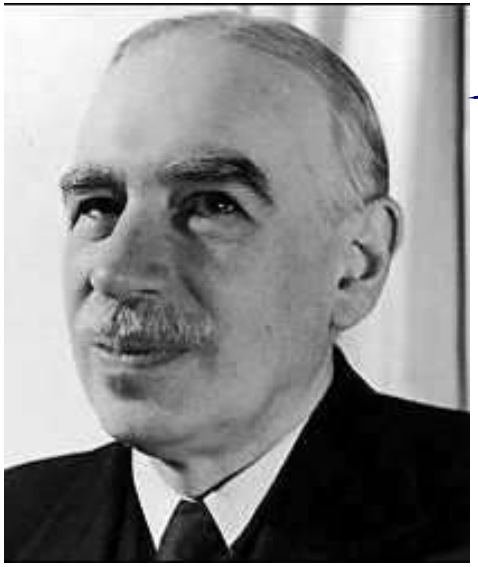
Missing points



% loss in GDP per capita

RULE FOUR: find sensitivities before sensitivities find you;

Same criticism applies to Nordhaus – both authors frame the debate around numbers which are …



… precisely wrong

… and the story continues to these days …

Saltelli, A., Stark, P.B., Becker, W., and Stano, P., 2015, Climate Models As Economic Guides Scientific Challenge or Quixotic Quest?, Issues in Science and Technology, Volume XXXI, Issue 3, spring 2015.

Saltelli, A., Funtowicz, S., Giampietro, M., Sarewitz, D., Stark, P.B., van der Sluijs, J.P., 2016, Climate costing is politics not science, Nature, 14 April, 532, 177.

Costing climate?

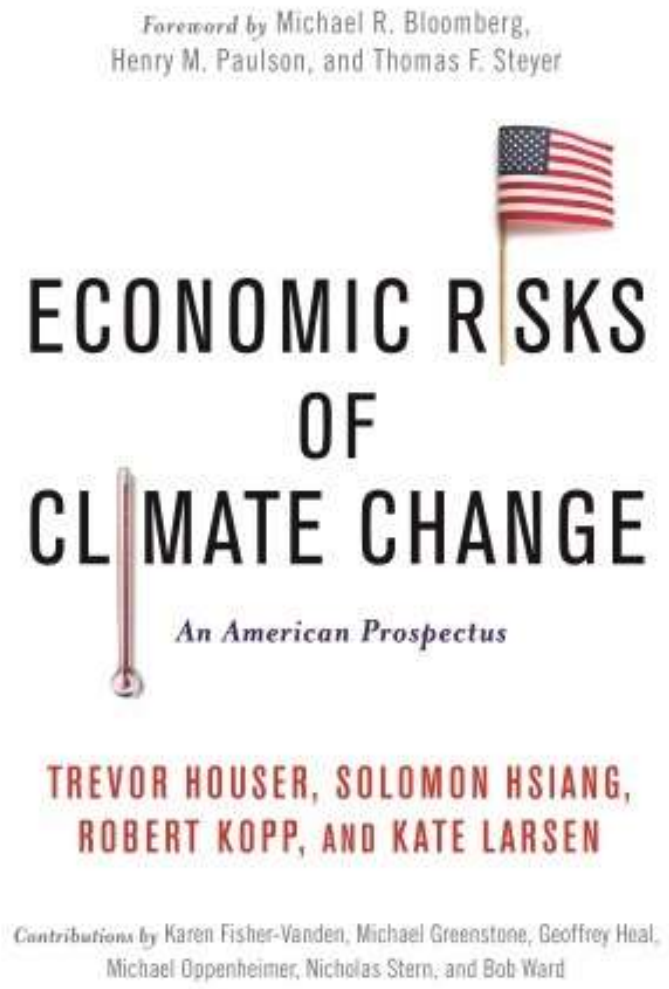
ANDREA SALTELLI
PHILIP B. STARK
WILLIAM BECKER
PAWEL STANO

Climate Models as Economic Guides

Scientific Challenge or Quixotic Quest?

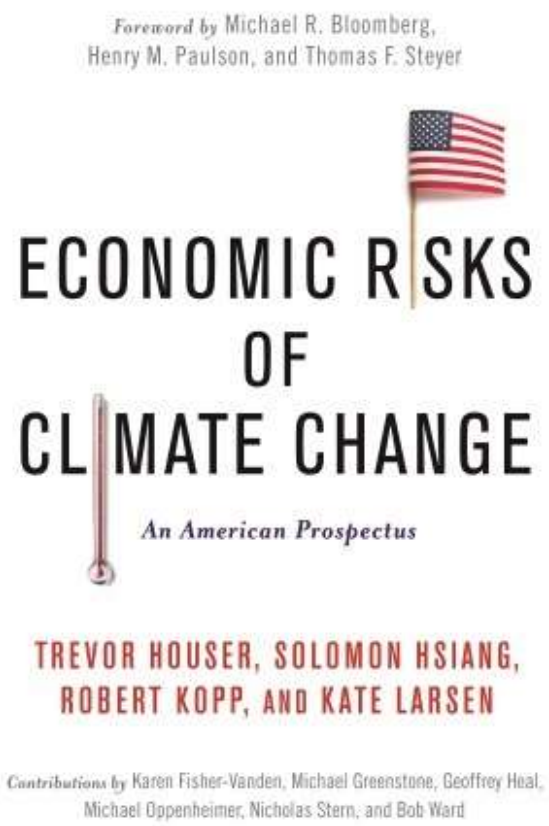
The uncertainties associated with mathematical models that assess the costs and benefits of climate change policy options are unknowable. Such models can be valuable guides to scientific inquiry, but they should not be used to guide climate policy decisions.

An audacious study:



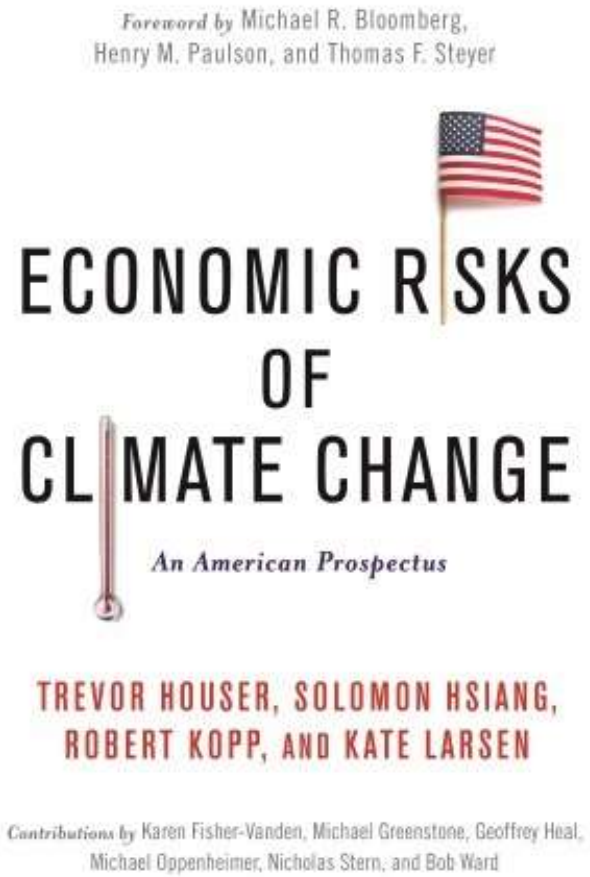
"[…] the report forecasts—at the level of individual counties in the U.S.—energy costs and demand, labor supply, mortality, violent crime rates, and real estate property prices up to the year 2100 […]"

Climate Models
as
Economic Guides
Scientific Challenge
or
Quixotic Quest?

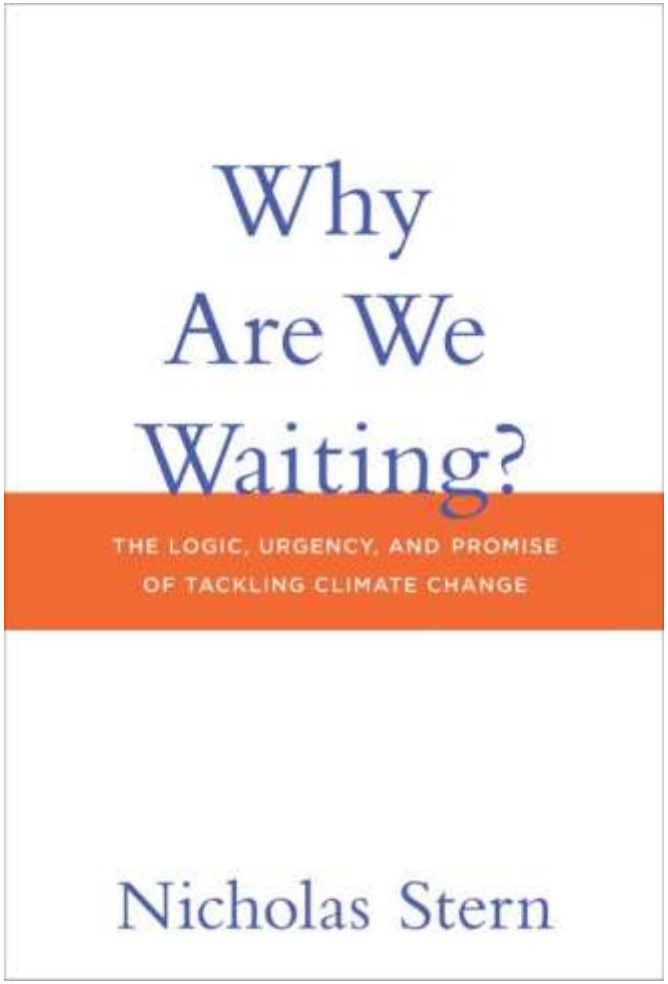


"The report presents the amount of computer power and data generated as evidence of the scientific legitimacy of the enterprise. The authors note, however, that out of an abundance of caution they did not model deterioration in cognitive performance as temperatures rise"

Climate Models
as
Economic Guides
Scientific Challenge
or
Quixotic Quest?



Next comes the latest (2015) book of Nicholas Stern …



… advocating for better integrated assessment models (IAM)

THE LOGIC, URGENCY, AND PROMISE OF TACKLING CLIMATE CHANGE

Excerpts

"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

THE LOGIC, URGENCY, AND PROMISE OF TACKLING CLIMATE CHANGE

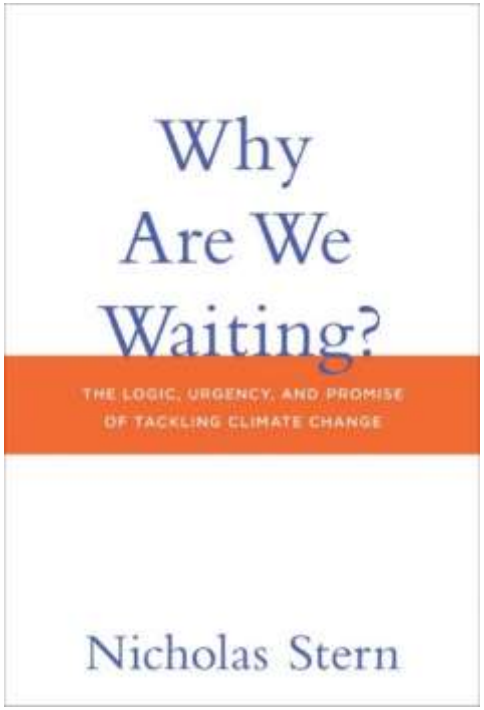
… After a list of criticism moved to the realism of Integrated Assessment Models:

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

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’?



The book of N. Stern suggests using different mathematical models, including dynamic stochastic general equilibrium models.

Philip Mirowski

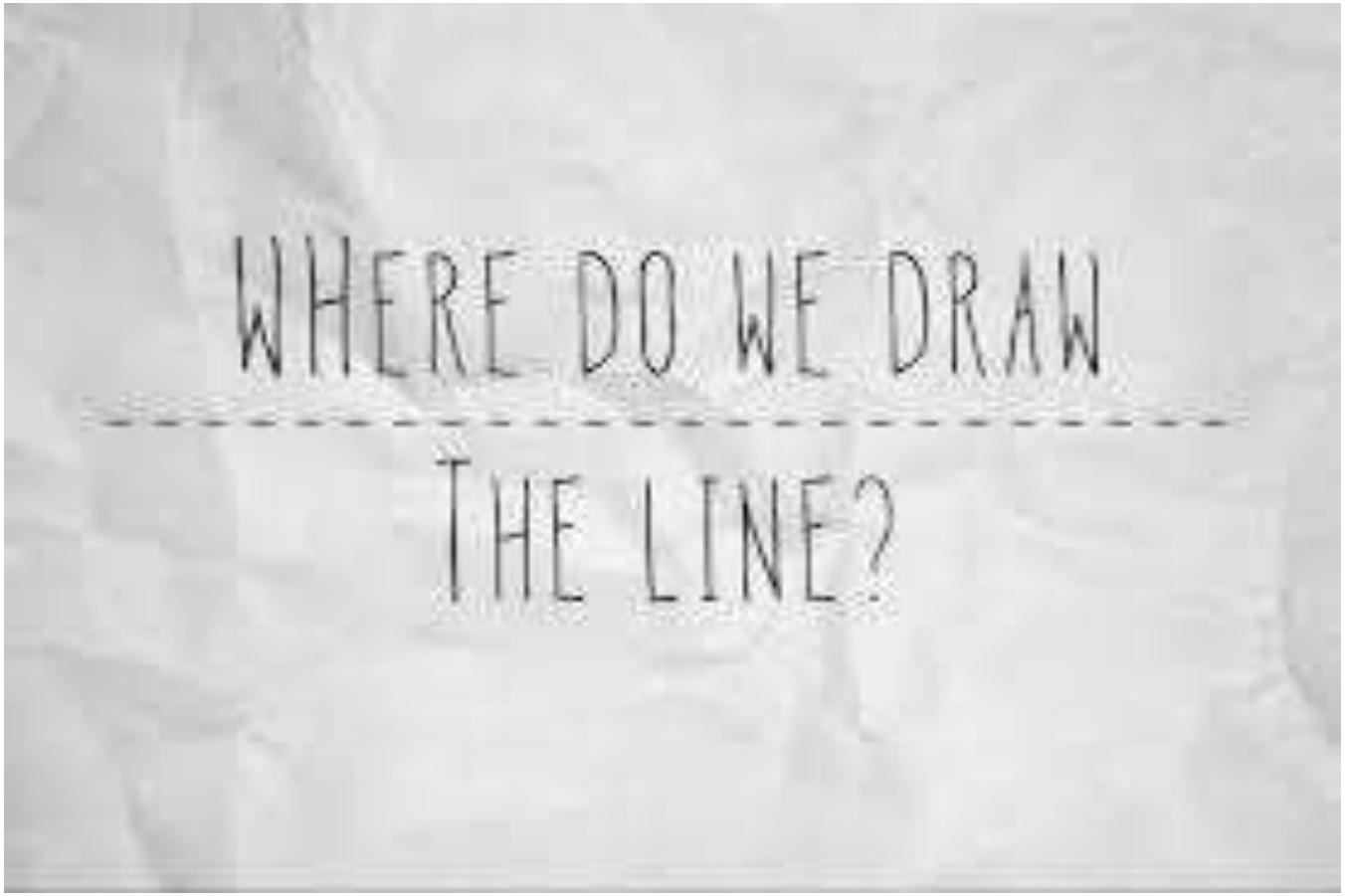
See Philip Mirowski's book for a damaging critique of DSGE as used in economics … inquiries by the US senate and the Queen of the England about their failure to predict the crisis …

Everybody in the profession knows that DSGE work under the economists' standard 'caeteris paribus' hypothesis (=all the rest being equal)

But

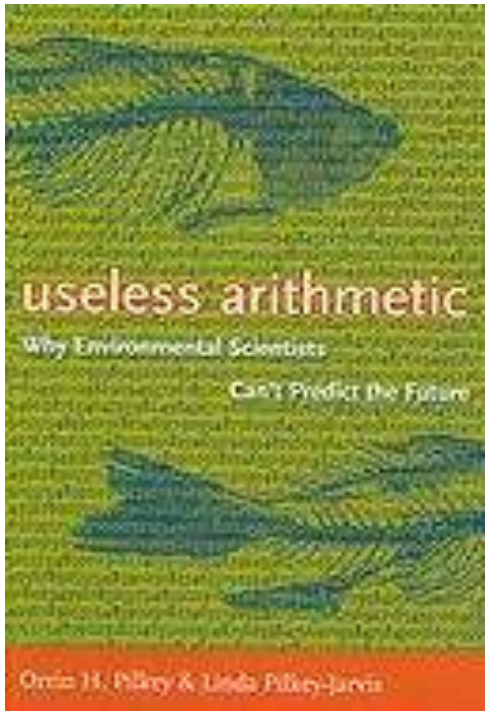
Caeteris are never paribus

Mathematical modelling of climatic change (terra infirma) and its cost to society (terra incognita):



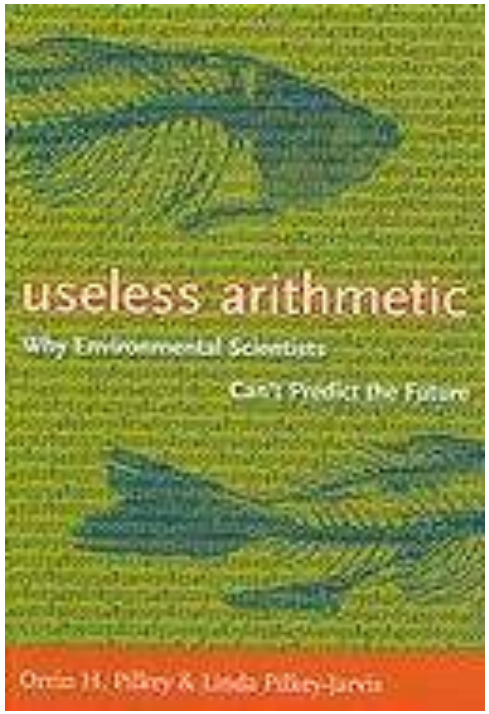
Pilkey and Pilkey-Jarvis (2007:86) climate-sceptics' work would be harder if:

"[…] the global change modeling community would firmly and publicly recognize that its efforts to truly quantify the future are an academic exercise and that existing field data on atmospheric temperatures, melting glaciers, […] and other evidence should be relied on to a much greater degree to convince politicians that we have a problem."



Pilkey, O.H. and Pilkey-Jarvis, L., 2007. Useless Arithmetic. Why Environmental Scientists Can't Predict the Future, Columbia University Press, New York.

“[…] A serious societal debate about ‘solutions’ can never occur as long as modellers hold out the probability, just around the corner, of accurate projections of future climates and seal-level position.”



Discussion points

- Climate costing is useful because …

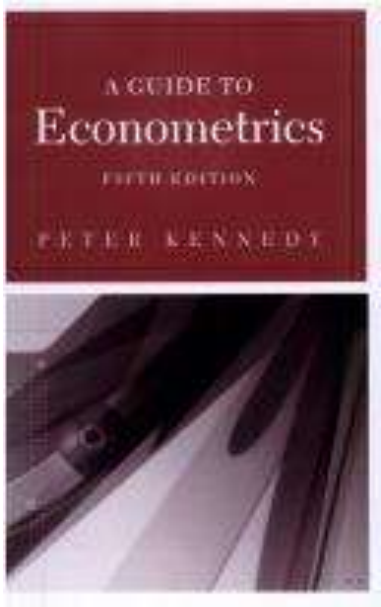
Discussion points

- Can I recall an instance where uncertainties have been either amplified or deflated instrumentally?

RULE FOUR: find sensitivities before sensitivities find you;

Peter Kennedy, A Guide to Econometrics. Anticipating criticism by applying sensitivity analysis. This is one of the ten commandments of applied econometrics:

<<Thou shall confess in the presence of sensitivity.
Corollary: Thou shall anticipate criticism >>



RULE FIVE: aim for transparency

Doubts raised over Europe's green energy plan

'Host of questions' from advisers

Economic model lacks transparency

By Mike Clark in London

A cooling plant in Germany: the credibility of plans to roll 60 nuclear reactors back into operation by experts

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

RULE FIVE: aim for transparency

"Experts have "raised a host of questions" about how the European Commission's use of a non-transparent model could affect the energy review, according to a leaked report by energy specialists chosen by Brussels to advise on the forthcoming "Energy Roadmap to 2050"

FT November 6, 2011

RULE FIVE: aim for transparency

"The credibility of a European energy review has been cast into doubt by experts who point out that long-term plans to cut carbon emissions are based on an economic model owned by a single Greek university that cannot be independently scrutinised."

Part IX

Office of Management and Budget

Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by Federal Agencies; Notice; Republication

The OMB about transparency

http://www.whitehouse.gov/omb/inforeg/

RULE FIVE: aim for transparency

[models should be made available to a third party so that it can] use the same data, computer model or statistical methods to replicate the analytic results reported in the original study.

[…] The more important benefit of transparency is that the public will be able to assess how much an agency's analytic result hinges on the specific analytic choices made by the agency.

Friday, February 22, 2002
Graphic - Federal Register, Part IX
Office of Management and Budget
Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by Federal Agencies; Notice; Republication
http://www.whitehouse.gov/omb/inforeg/

This was 2002

House Republicans Aim To Limit Power Of Environmental Protection Agency

The Huffington Post | by **Robin Wilkey (/robin-wilkey)**

Posted: 02/07/2014 6:18 pm EST | Updated: 02/08/2014 10:59 am EST

This is 2014

The bill, dubbed the Secret Science Reform Act would force the EPA to publicly release its research on a topic before issuing a policy recommendation, and require that the research be "reproducible."

Supporters claim the bill will increase transparency in public policy, while opponents have accused the bill's authors of trying to keep the EPA from doing its job.

"Secret Science Reform Act of 2014 [⋯] to prohibit the Environmental Protection Agency (EPA) from proposing, finalizing, or disseminating [a risk, exposure, or hazard assessment, criteria document, standard, limitation, regulation, regulatory impact analysis, or guidance] unless all scientific and technical information relied on to support such action is specifically identified and publicly available online in a manner sufficient for independent analysis and substantial reproduction of research results"

http://beta.congress.gov/bill/113th-congress/house-bill/4012
Accessed February 2017

The bill died in the Senate in 2015 after winning House approval.

But (February 2, 2017):

HOME ABOUT CONTACT WHISTLEBLOWERS AWARDS SUBSCRIBE DONATE JOBS

inside climate news

News Investigations Topics Today's Climate Clean Economy Documents Infographics Membership

A Pulitzer Prize-winning, non-profit, non-partisan news organization dedicated to covering climate change, energy and the environment.

HOME

Rep. Lamar Smith Launches New Assault on EPA's 'Secret Science'

Head of the House Science Committee calls a hearing to inquire into how the agency uses science in its decisions, part of his long battle against the agency's work.

BY DAVID HASEMYER Follow @DavidHasemyer

FEB 2, 2017

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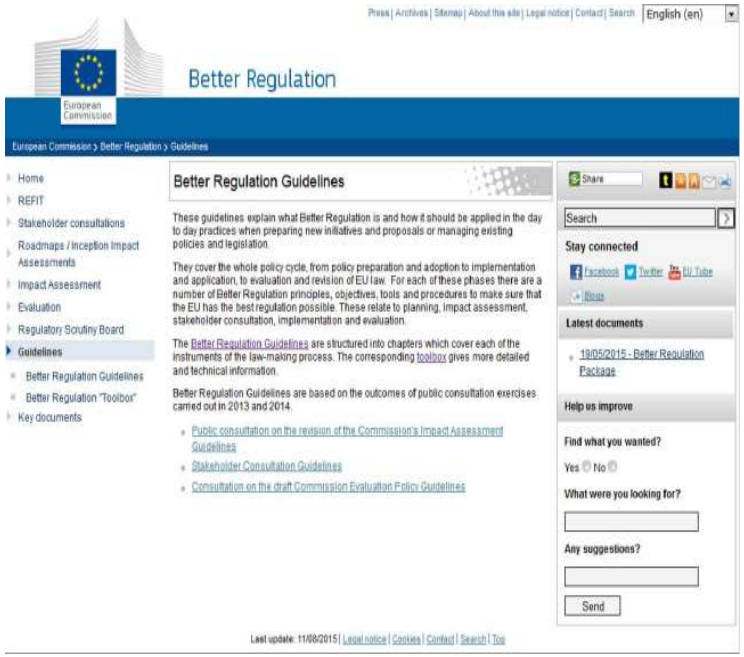
"Hearing titled 'Making the EPA Great Again' […] critics say it's just a launch pad to revive his science reform legislation [the secret science bill]"

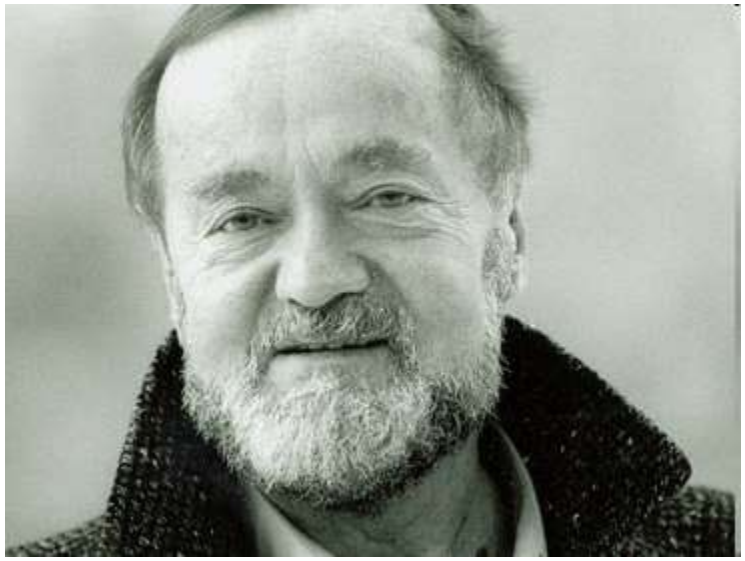
https://insideclimatenews.org/news/02022017/lamar-smith-epa-house-science-committee

“Modellers could usefully consider the following principles:

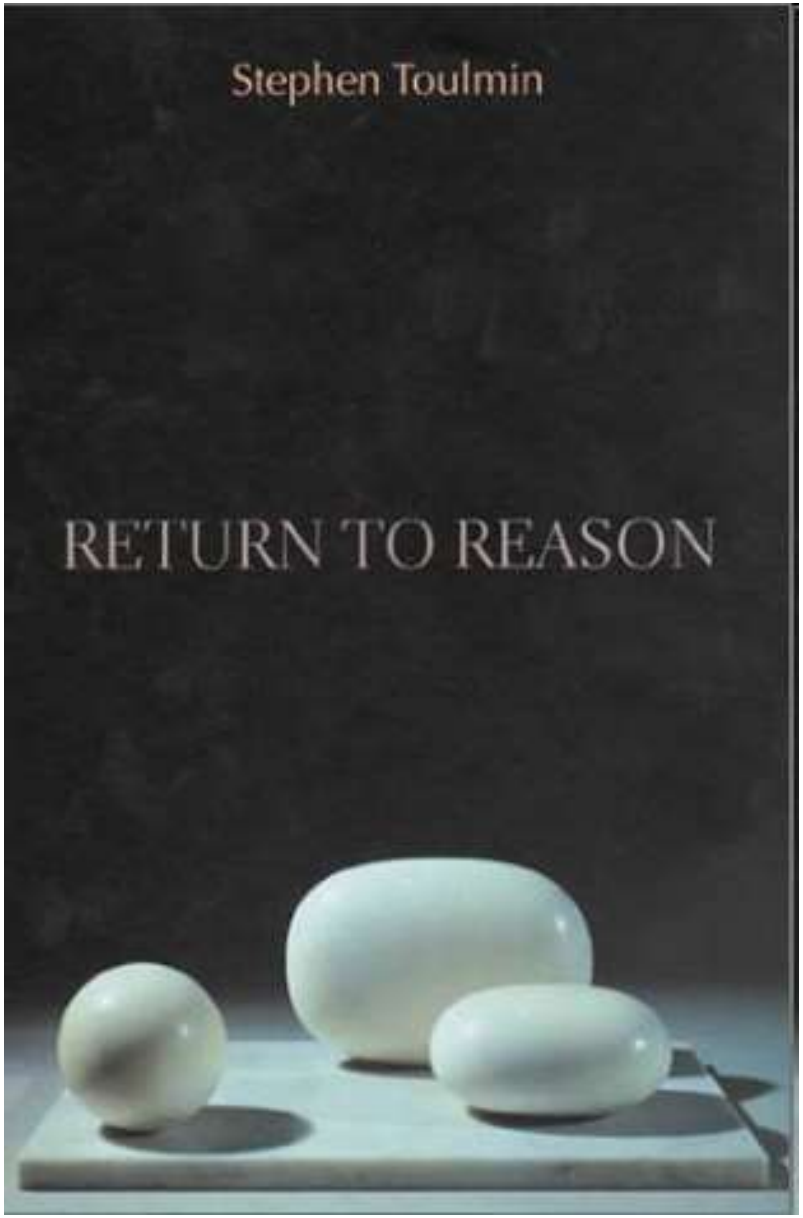
4. Aim for transparency – when relevant and possible the model calculations should be checked by third parties.



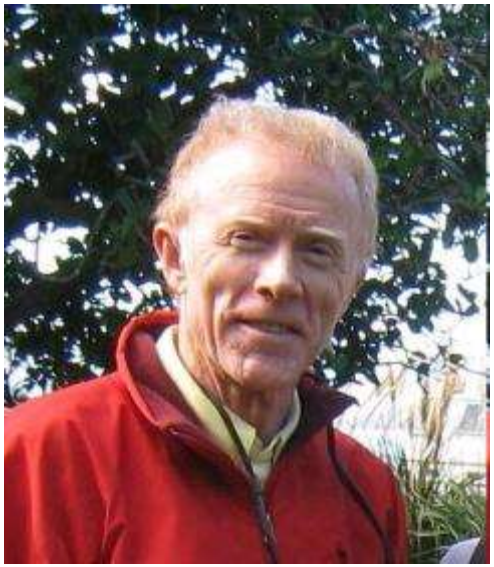
RULE SIX: Do the right sums



Do the sum right
Versus
Do the right sums
(Stephen Toulmin)
A plea for reasonableness
versus rationality



RULE SIX: Do the right sums



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

Expertise and responsibility
Rule 6

- Most analyses offered as input to policy are framed as cost benefit analysis (monetization, the occupational psychosis of economists) or risk analyses

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.

Discussion points

- Can I recall an example of a framing which did not sound right to me?

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

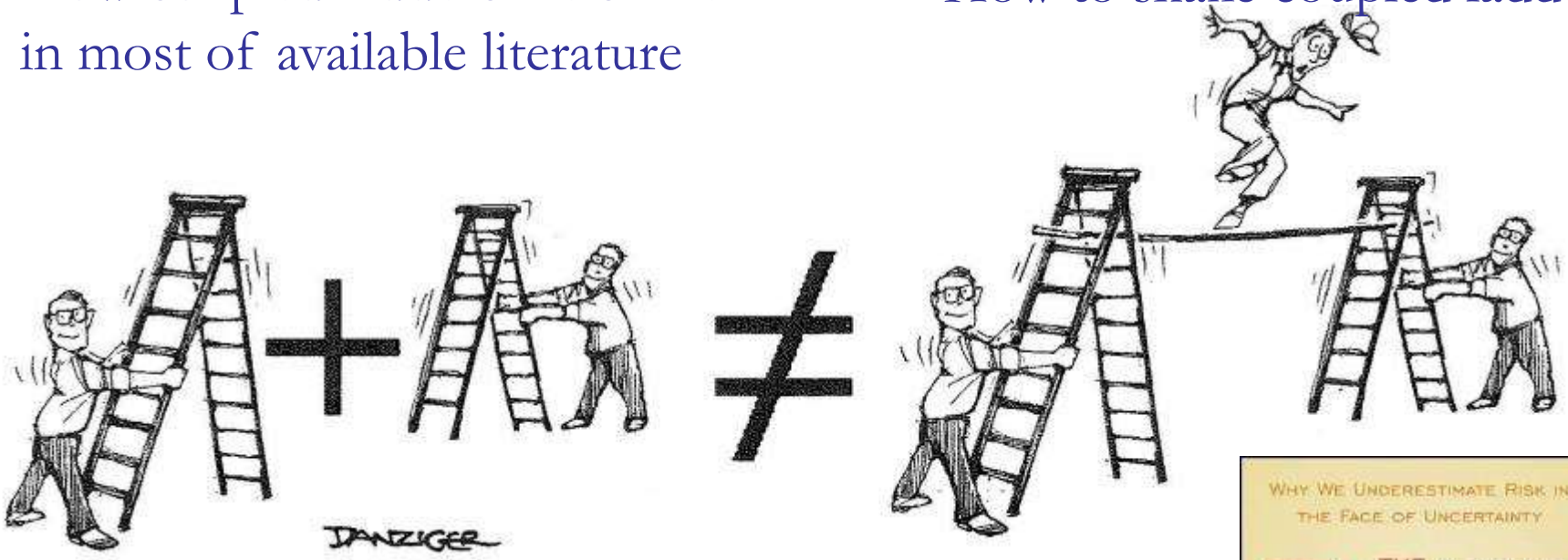
Andrea Saltelli*, Paola Annoni

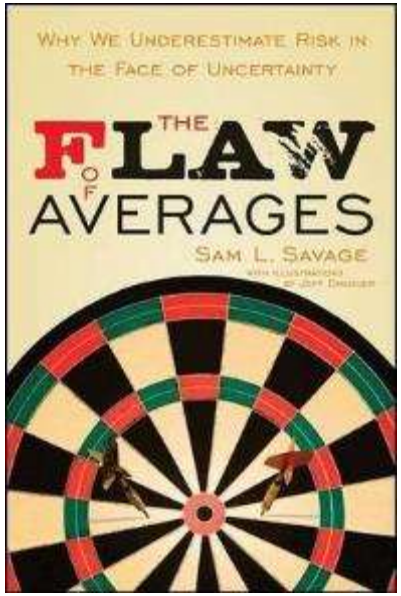
Joint Research Center, Institute for the Protection and Security of the Citizen, via E.Fermi, 2749, Ispra VA 21027, Italy

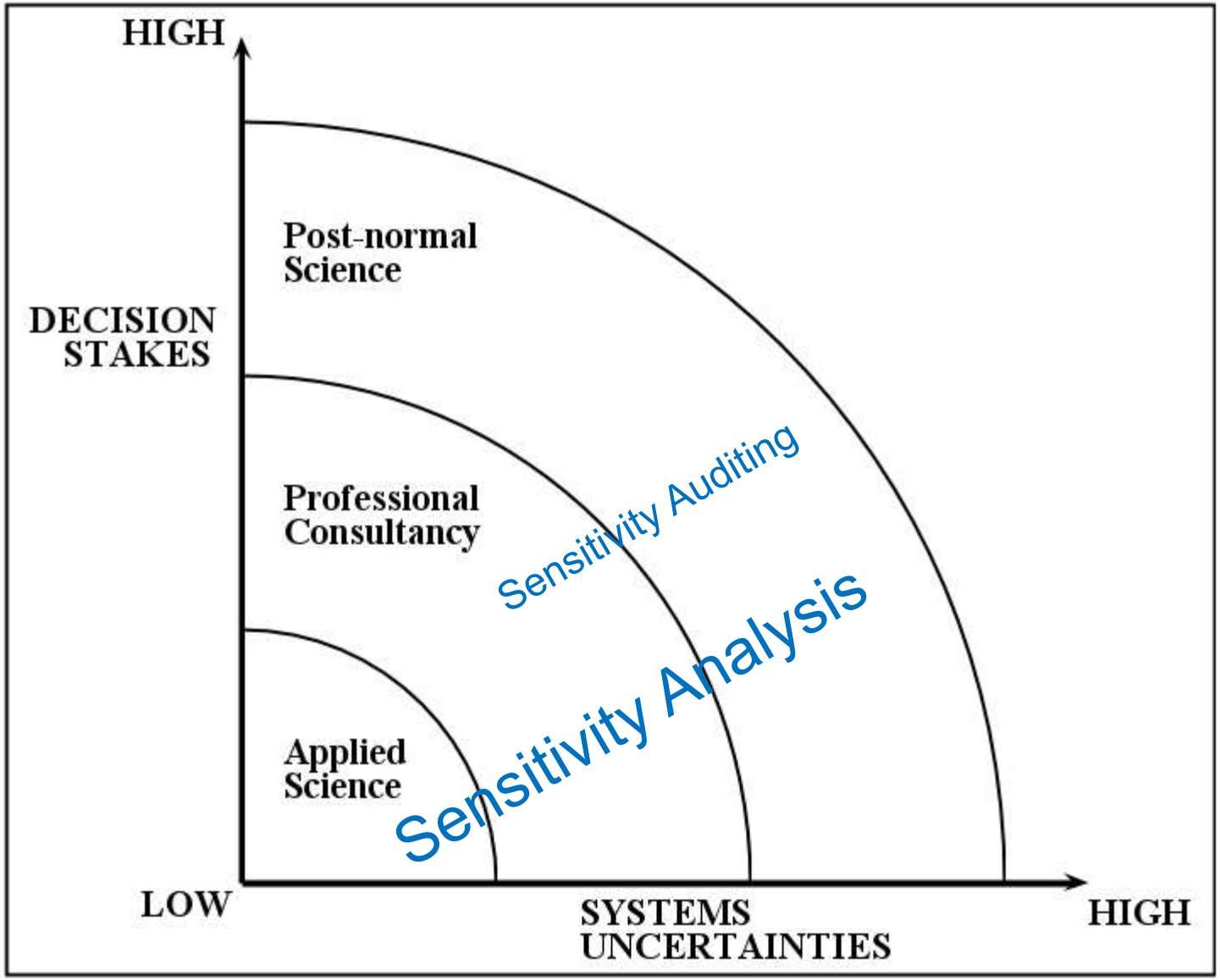
RULE SEVEN: Explore diligently the space of the assumptions

How coupled ladders are shaken in most of available literature

How to shake coupled ladders






HIGH
DECISION STAKES
Post-normal Science
Professional Consultancy
Applied Science
Sensitivity Auditing
Sensitivity Analysis
LOW
SYSTEMS UNCERTAINTIES
HIGH

Quantitative story-telling and responsible quantification

What is quantitative story telling?

- A truism: always listen more than one story
- An exhortation from philosophers
- A development from sensitivity analysis and sensitivity auditing
- A concept implicit in post-normal science's concept of "extended peer communities"

“There is only a perspective seeing, only a perspective “knowing”; and the more affects we allow to speak about one thing, the more eyes, different eyes, we can use to observe one thing, the more complete will our “concept” of this thing, our “objectivity”, be.”

Friedrich Nietzsche, Genealogy of Morals, Third Essay.

Stories, frames / framings, narratives

Some examples

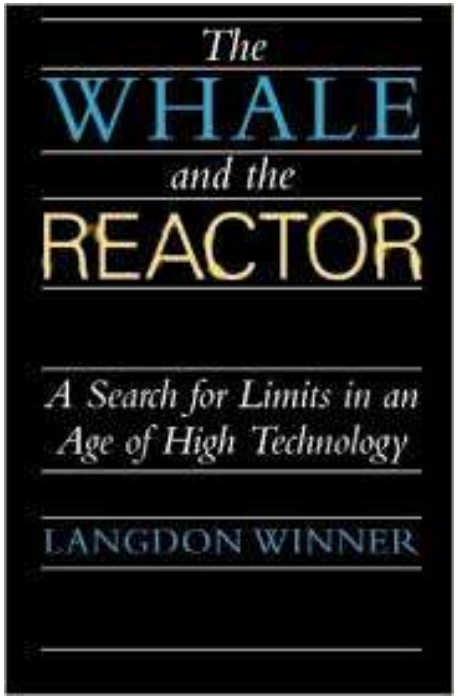
Frames

Most analyses offered as input to policy are framed as cost benefit analysis or risk analyses.

8

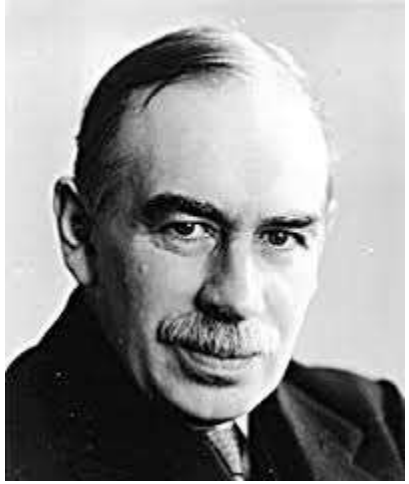
ON NOT HITTING THE TAR-BABY

Langdon Winner

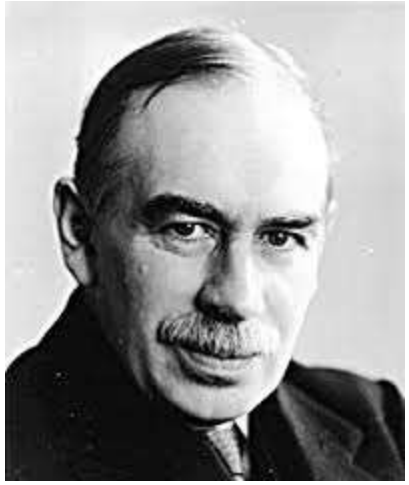


Winner, L., 1986. The Whale and the Reactor: a Search for Limits in an Age of High Technology. The University of Chicago Press, 1989 edition.

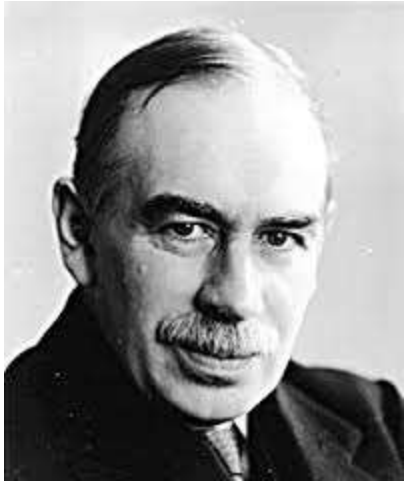
What does John Maynard Keynes say of cost benefit analysis in his 1936 work 'The General Theory of Employment, Interest, and Money'?



"If we speak frankly, we have to admit that our basis of knowledge for estimating the yield ten years hence of a railway, a copper mine, a textile factory, the goodwill of a patent medicine, an Atlantic liner, a building in the City of London amounts to little and sometimes to nothing; or even five years hence…"

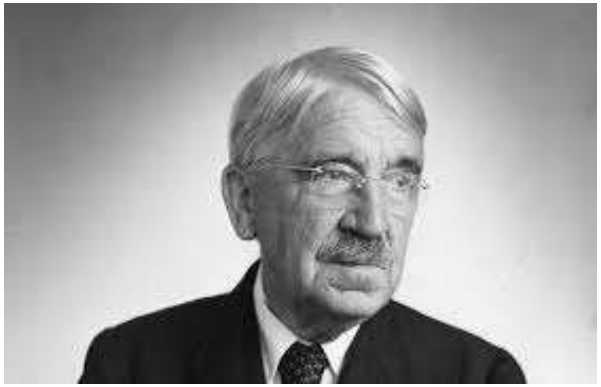


"... In fact, those who seriously attempt to make any such estimate are often so much in the minority that their behaviour does not govern the market."



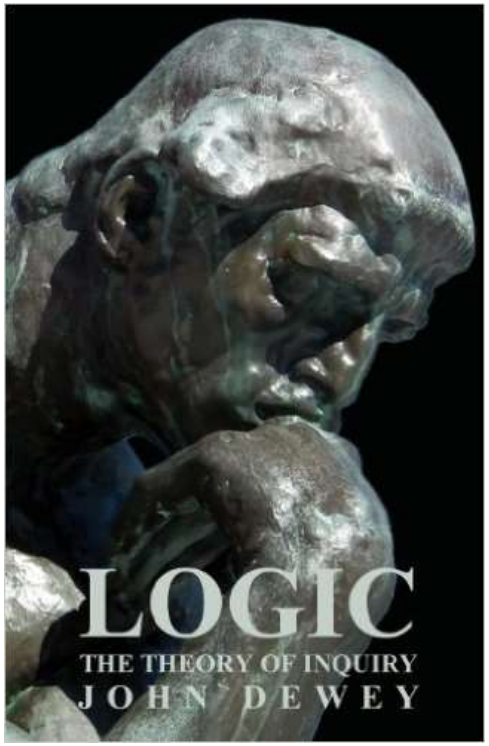
Frames

John Dewey suggested the concept of 'occupational psychosis'



John Dewey
1859-1952

- Thus CBA = professional psychosis of economists
- Funtowicz and Ravetz's Extended Peer Community because experts have 'lenses'
- Feyerabend's intuition that citizens mature by learning about experts' fallibility …

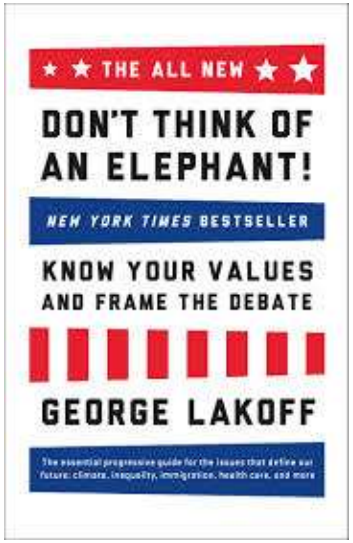


John Dewey, Logic: The Theory of Inquiry (1938), Saerchinger Press (2007)

Frames

The expression ‘tax relief’ is apparently innocuous but it suggests that tax is a burden, as opposed to what pays for road, hospitals, education and other infrastructures of modern life (Lakoff, 2004).

George Lakoff



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.

Frames

Published road accident statistics record the conditions of the driver as to alcohol or drug use but not the make and year of the car or its safety features (Gusfield, 1981).

Gusfield, J. (1981). The Culture of Public Problems. Drinking-Driving and the Symbolic Order. The University of Chicago Press.

Frames

"[…] 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

Which were the real concerns?

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?

Claire Marris, Brian Wynne, Peter Simmons and Sue Weldon, 2001, Final Report of the PABE research project, funded by the Commission of European Communities, Contract number: FAIR CT98-3844 (DG12 - SSMI), December 2001

Frames

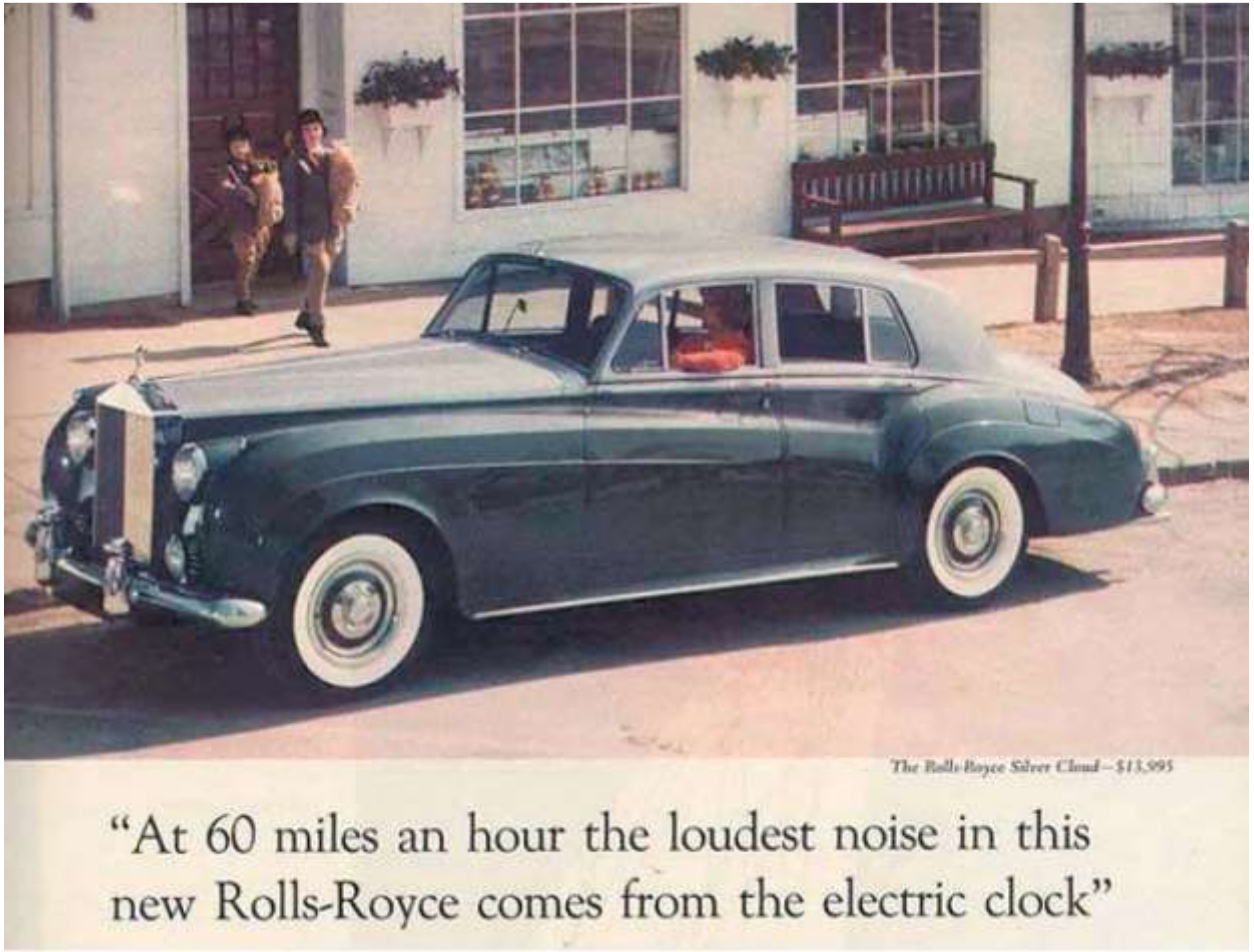
The New York Review of Books

Why Free Markets Make Fools of Us

Cass R. Sunstein

OCTOBER 22, 2015 ISSUE

Phishing for Phools: The Economics of Manipulation and Deception
by George A. Akerlof and Robert J. Shiller
Princeton University Press, 272 pp., $24.95



An advertisement for Rolls-Royce from the late 1950s

Frames

For Akerlof and Shiller - against what the 'invisible hand' would contend - economic actors have no choice but to exploit frames to 'phish' people into practices which benefit the actors not the subject phished.

George Akerlof

Robert R. Shiller

Frames as hypocognition & Socially constructed ignorance

For Rayner (2012) "Sense-making is possible only through processes of exclusion. Storytelling is possible only because of the mass of detail that we leave out. Knowledge is possible only through the systematic 'social construction of ignorance' (Ravetz, 1986)"

Steve Rayner

Jerry Ravetz

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

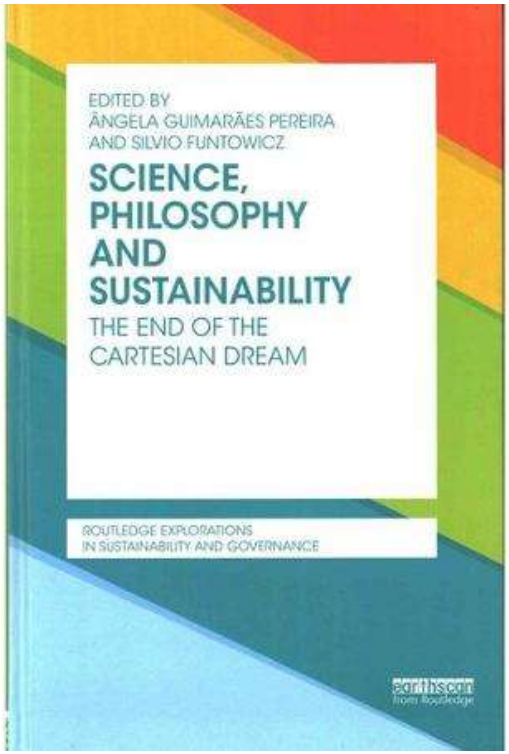
Rayner, S., 2012, Uncomfortable knowledge: the social construction of ignorance in science and environmental policy discourses, Economy and Society, 41:1, 107-125.

Rayner's (2012) strategies societies may use to deal with "uncomfortable knowledge".

- Denial: "There isn't a problem"
- Dismissal: "It's a minor problem"
- Diversion: "Yes I am working on it" (In fact I am working on something that is only apparently related to the problem)
- Displacement: "Yes and the model we have developed tells us that real progress is being achieved" (The focus in now the model not the problem).

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

- A plea for a rediscovery of ignorance – especially ignorance generated by science itself;

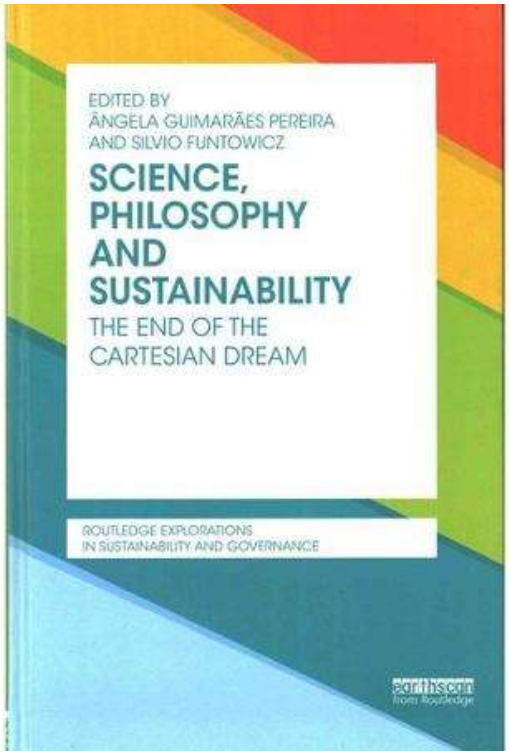


Ravetz, J., R., 2015, Descartes and the rediscovery of ignorance, in Guimarães Pereira, Â., and Funtowicz, S., Eds., 2015, The end of the Cartesian dream, Routledge's series: Explorations in Sustainability and Governance.

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

- Dichotomy between knowledge and ignorance as problematic as that between facts and value;

- Ignorance useful: work can be done on its boundaries (finding where these can be penetrated, spotting signals of troubles ahead).



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

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

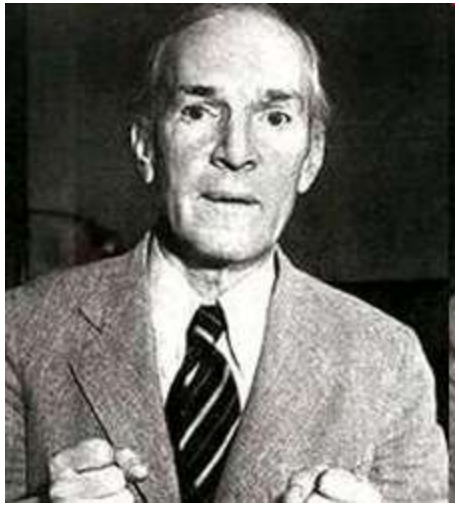
“Uncomfortable knowledge” can be used as a gauge of an institution’s health.

The larger the “uncomfortable knowledge” an institution needs to maintain, the closer it is to its ancient régime stage (Funtowicz and Ravetz, 1994).

Funtowicz, S.O. and Jerome R. Ravetz, 1994, Emergent complex systems, Futures, 26(6), 568-582.

Why frames 'stick'

"If is difficult to get a man to understand something when his salary depends upon his not understanding it."



Upton Sinclair

Discussion point

- Can I recall an example of uncomfortable knowledge?

So what does quantitative story telling propose?

Instead of detailed quantification on a single[/few] frame[s] a rough quantitative appraise of a richer set of frames.

Mario Giampietro

Andrea Saltelli and Mario Giampietro, 2017, What is wrong with evidence based policy, and how can it be improved? Forthcoming on FUTURES, http://www.andreasaltelli.eu/file/repository/FUTURES_Saltelli_Giampietro_6.pdf

Instead of Evidence-based policy: robust policy.

Test for:

- feasibility (compatibility with processes outside human control);
- viability (compatibility with processes under human control, in relation to both the economic and technical dimensions); and
- desirability (compatibility with a multitude of normative considerations relevant to a plurality of actors).

Techno-science is at the heart of contemporary narratives supporting ways to:

- innovate our way out of the economic crisis;
- overcome our planetary boundaries;
- achieve a dematerialized / circular / decarbonized economy;

Quantitative story telling is used in the project Magic-Nexus to test the quality of these and others narratives.

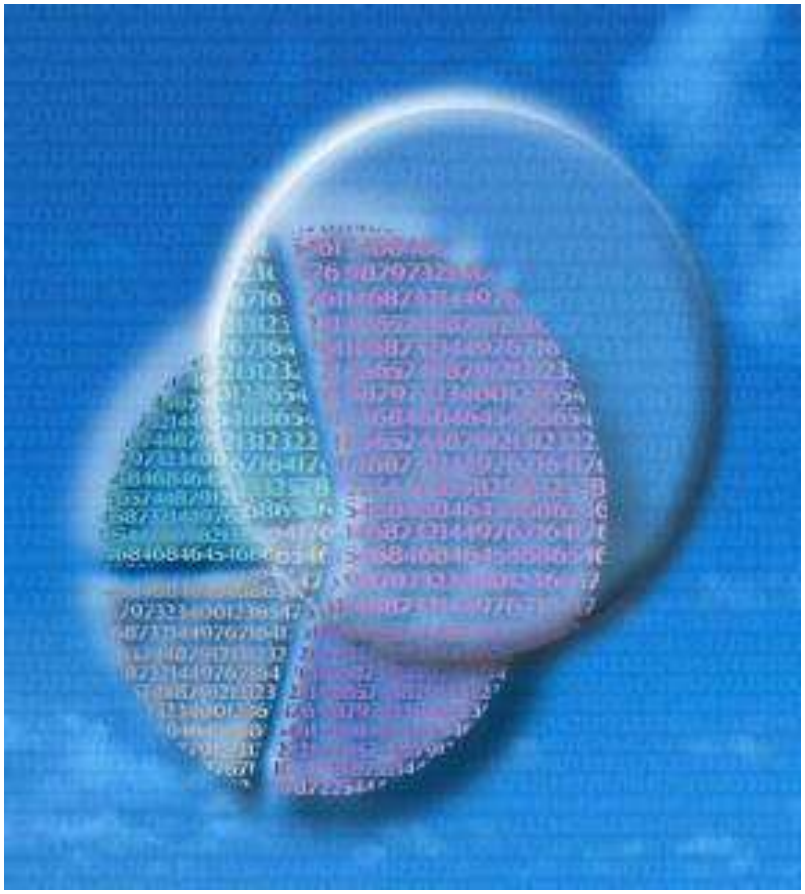
MAGIC
NEXUS

Saltelli, A., Giampietro, M., Ravetz, J.R., 2016, Decalogue of the diligent quantifier. A Pledge.

Excerpts:

- Don't quantify at gun point
- My license to quantify is also a license not to quantify
- Mind frames; mind motivations and power relations

http://www.andreasaltelli.eu/file/repository/Decalogue_of_the_diligent_quantifier_online_Version_2.pdf



END

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