Energy Ethics
An introduction

Andrea Saltelli

Course at JRC-Ispra, September 2023

upf. BARCELONA SCHOOL OF MANAGEMENT

CNR ISTC ISTITUTO DI SCIENZE E TECNOLOGIE DELLA COGNIZIONE

UNIVERSITAS BERGENSIS

Where to find this talk: www.andreasaltelli.eu

Andrea Saltelli

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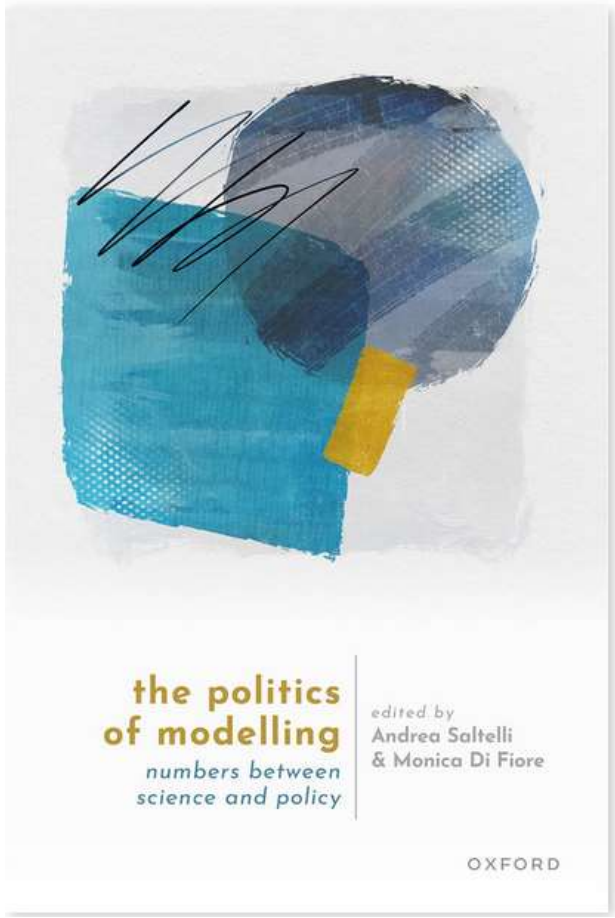
August 25 2023: The politics of modelling is out!



Praise for the volume

"A long awaited examination of the role —and obligation —of modeling."
Nassim Nicholas Taleb , Distinguished Professor of Risk Engineering, NYU Tandon School of Engineering. Author, of the 5 -volume series Incerto.

***

"A breath of fresh air and a much needed cautionary view of the ever-widening dependence on mathematical modeling."
Orrin H. Pilkey, Professor at Duke University's Nicholas School of the Environment, co-author with Linda Pilkey-Jarvis of Useless Arithmetic: Why Environmental Scientists Can't Predict the Future, Columbia University Press 2009.

***

"The methods by which power insinuates itself

Mastodon Toots by
@AndreaSaltelli

AndreaSaltelli
2023/8/28 11:24
August 26 Podcast (16m) - interview for ABC NET RADIO, AUS: Assumptions and consequences: the politics of modelling, Guests: Ehsan Nabavi and Andrea Saltelli, Producer - Chris Bullock.

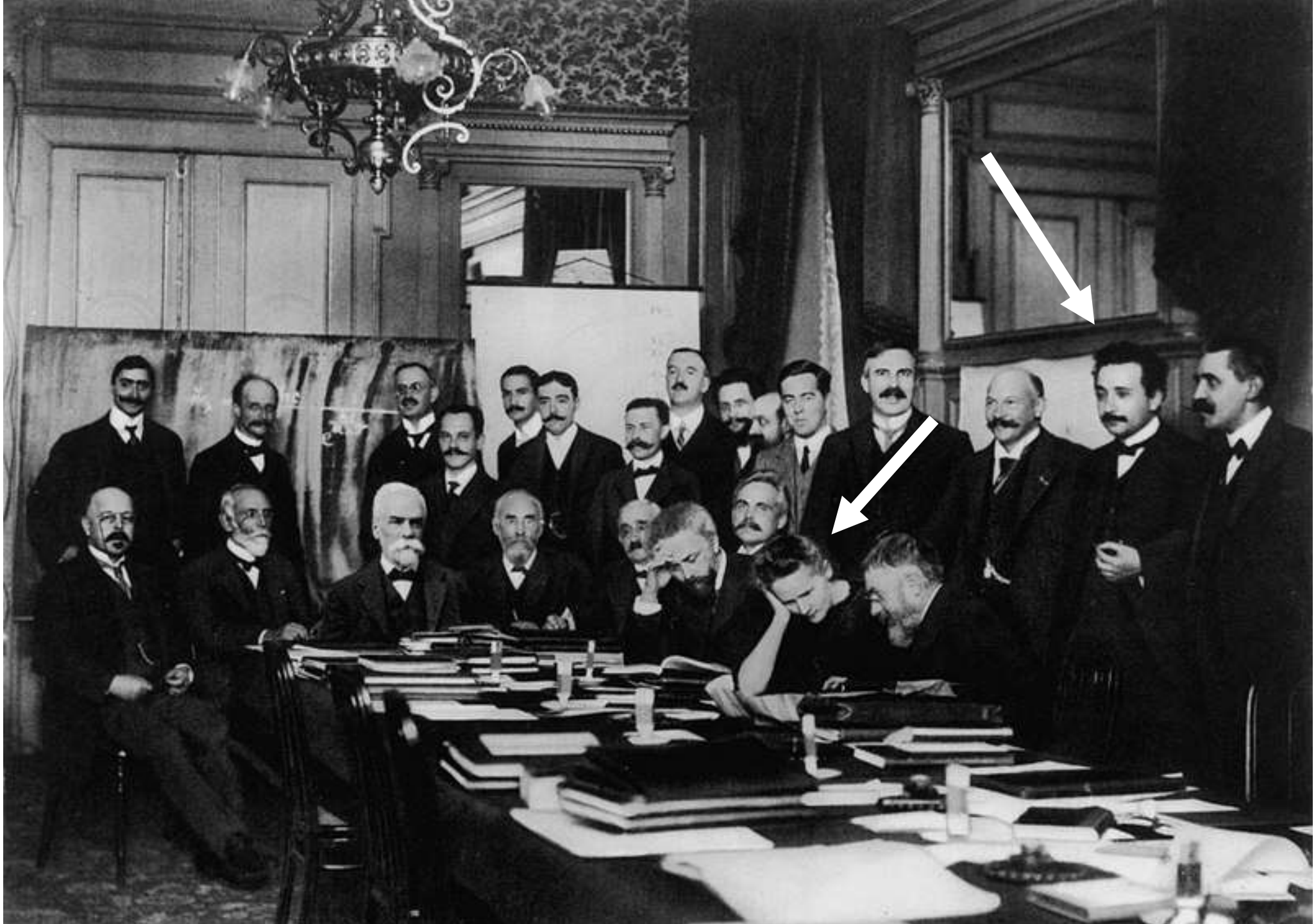
abc.net.au/listen/programs/sun

View on mstdn.social

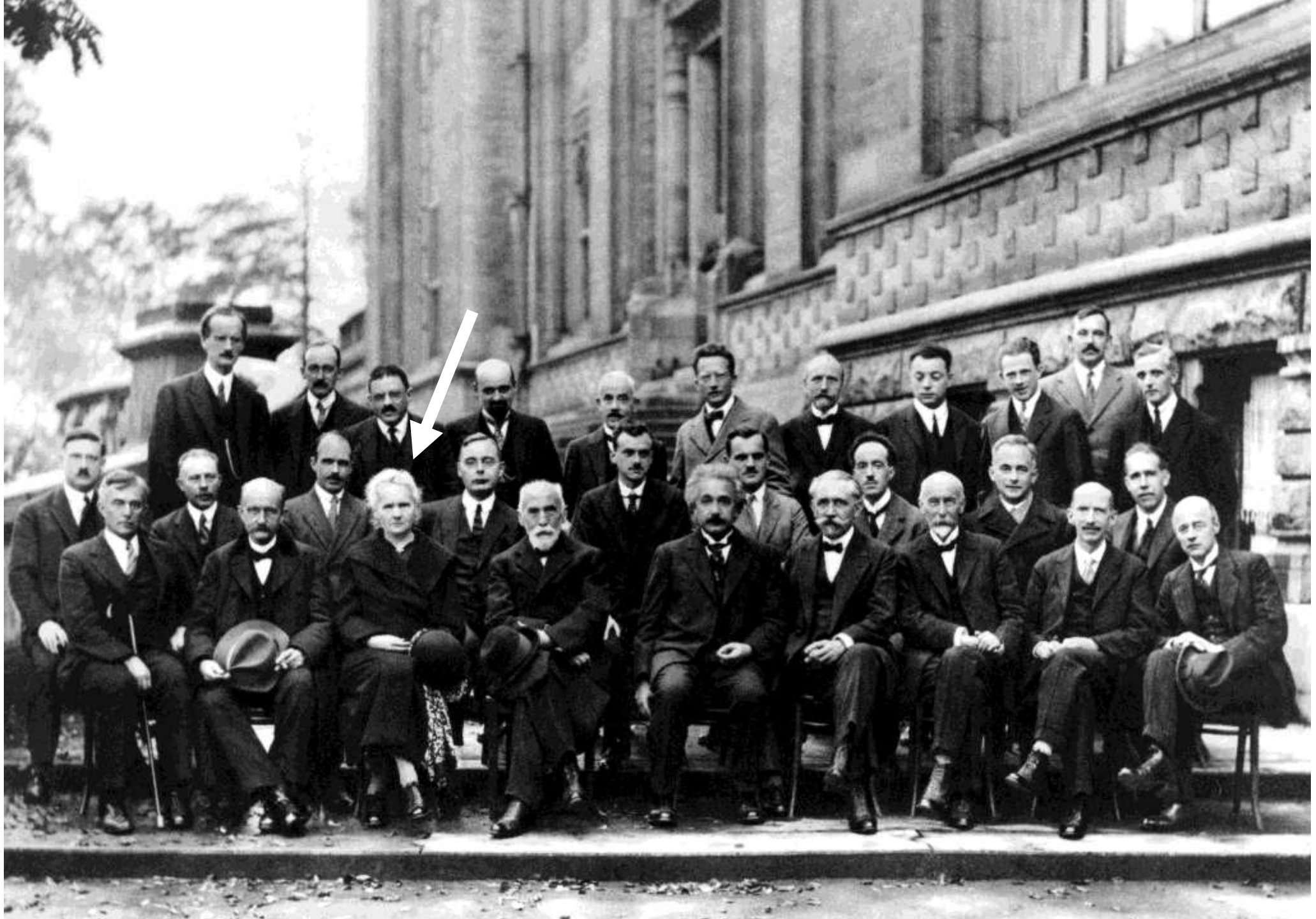
- Women
- Ethics in crumbs; golden rule, Nichomachean ethics, utilitarianism and little more;
- EEA
- Collingridge and its dilemma;
- History and Philosophy of Science
- How are we taught our science?
- Why Science and Ethics? The Vienna Circle, Popper, Kuhn, Lakatos, Feyerabend (based on Ravetz's "Ideological commitments in the philosophy of science");
- Michal Polanyi;
- Lyotard, Shapin and Schaffer, Latour, Toulmin;
- Roots of the Cartesian dream: From Bacon to Science the Endless Frontier;
- Critique of the dream;
- Merton, norms and counter-norms (Mitroff);
- Feynman Cargo Cult lecture.
- Who predicted the crisis: De Solla Price and Ravetz;
- Ravetz: Science from 'Gemeinschaft' to 'Gesellschaft';
- Bad science is fit; it is sticky; fixes backfire; a lost ethos;
- Not all disciplines are the same
- Who is a scientist?
- Two suicides

So many men, so few women

1911



1927



Lise Meitner

The first person to understand nuclear fission;

She did not win the Nobel prize 1944 for chemistry which went to her colleague Otto Hahn

Lise Meitner
1878- 1968

Rosalind Elsie Franklin

Her X-ray images led to the discovery of the DNA double helix structure;

Nobel in Medicine 1962 to J. Watson, F. Crick and M. Wilkins;

Franklin should have ideally been awarded a Nobel Prize in Chemistry (according to J. Watson)

Rosalind Elsie Franklin
1920-1958

Eunice Foot (1819–1888)

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CLIMATE HOME NEWS

Meet the woman who first identified the greenhouse effect

Published on 02/09/2016, 5:58pm

Eunice Foote demonstrated the heat-trapping properties of carbon dioxide at a scientific conference in 1856, newly digitised records show

By Megan Darby

Irish physicist John Tyndall is commonly credited with discovering the greenhouse effect, which underpins the science of climate change.

ART. XXXI.—*Circumstances affecting the Heat of the*
by EUNICE FOOTE.

(Read before the American Association, August 23d, 1

MY investigations have had for their object to
different circumstances that affect the thermal actio
of light that proceed from the sun.

Several results have been obtained.

First. The action increases with the density o
is diminished as it becomes more rarified.

The experiments were made with an air-pump a
drical receivers of the same size, about four inc
ter and thirty in length. In each were placed two t
and the air was exhausted from one and condensed
After both had acquired the same temperature they
in the sun, side by side, and while the action of t
rose to 110° in the condensed tube, it attained on
other. I had no means at hand of measuring the d
densation or rarefaction.

The observations taken once in two or three min
follows:

Exhausted Tube		Condensed Tu	
In shade.	In sun.	In shade.	
75	80	75	
76	82	78	
80	82	80	
83	86	82	
84	88	85	

This circumstance must affect the power of the
different places, and contribute to produce their fo
the summits of lofty mountains.

Secondly. The action of the sun's rays was found
in moist than in dry air.

In one of the receivers the air was saturated wit
in the other it was dried by the use of chlorid of ca
Both were placed in the sun as before and the
follows:

Dry Air.		Damp Air.	
In shade.	In sun.	In shade.	
75	75	75	
78	88	78	
82	102	82	
82	104	82	
82	105	82	
83	108	92	

CIRCUMSTANCES

Affecting the Heat of the Sun's Rays.

BY MRS. EUNICE FOOTE.

Tweet

Isabel Hilton
@isabelhilton

Who could have imagined that the scientist who first demonstrate the potential for global warming with an elegant experiment could be so completely forgotten. Oh, it was a woman? Now I get it.

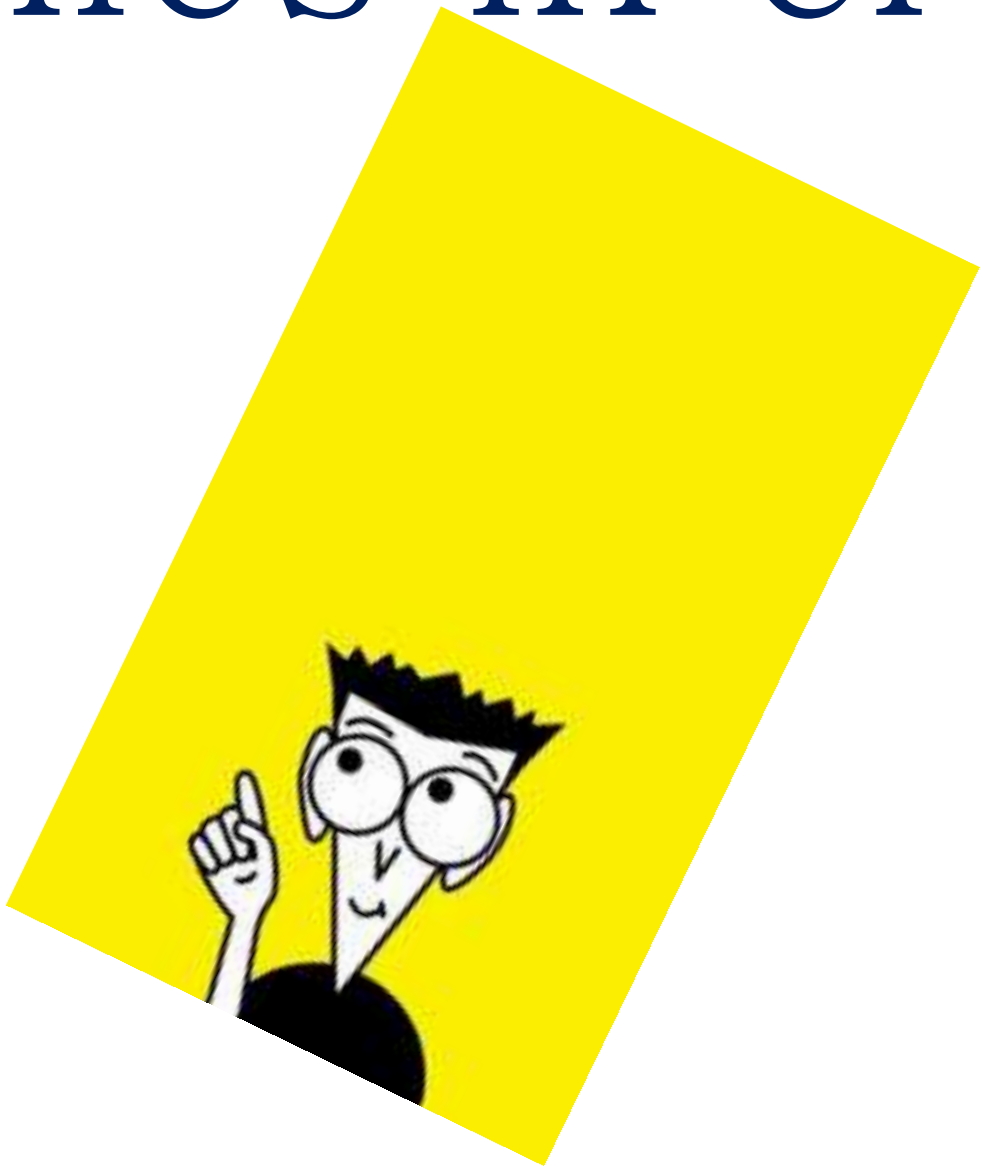
Overlooked No More: Eunice Foote, Climate Scientist Lost to History

Foote's ingenious experiment more than 150 years ago yielded a remarkable discovery that could have helped shape modern climate science had she not bee...

nytimes.com

https://www.nytimes.com/2020/04/21/obituaries/eunice-foote-overlooked.html

Ethics in crumbs



Philosophical quests:

Ontology: what is
Epistemology: how to know
Ethics: what to do

Question: which comes first?

Golden rule

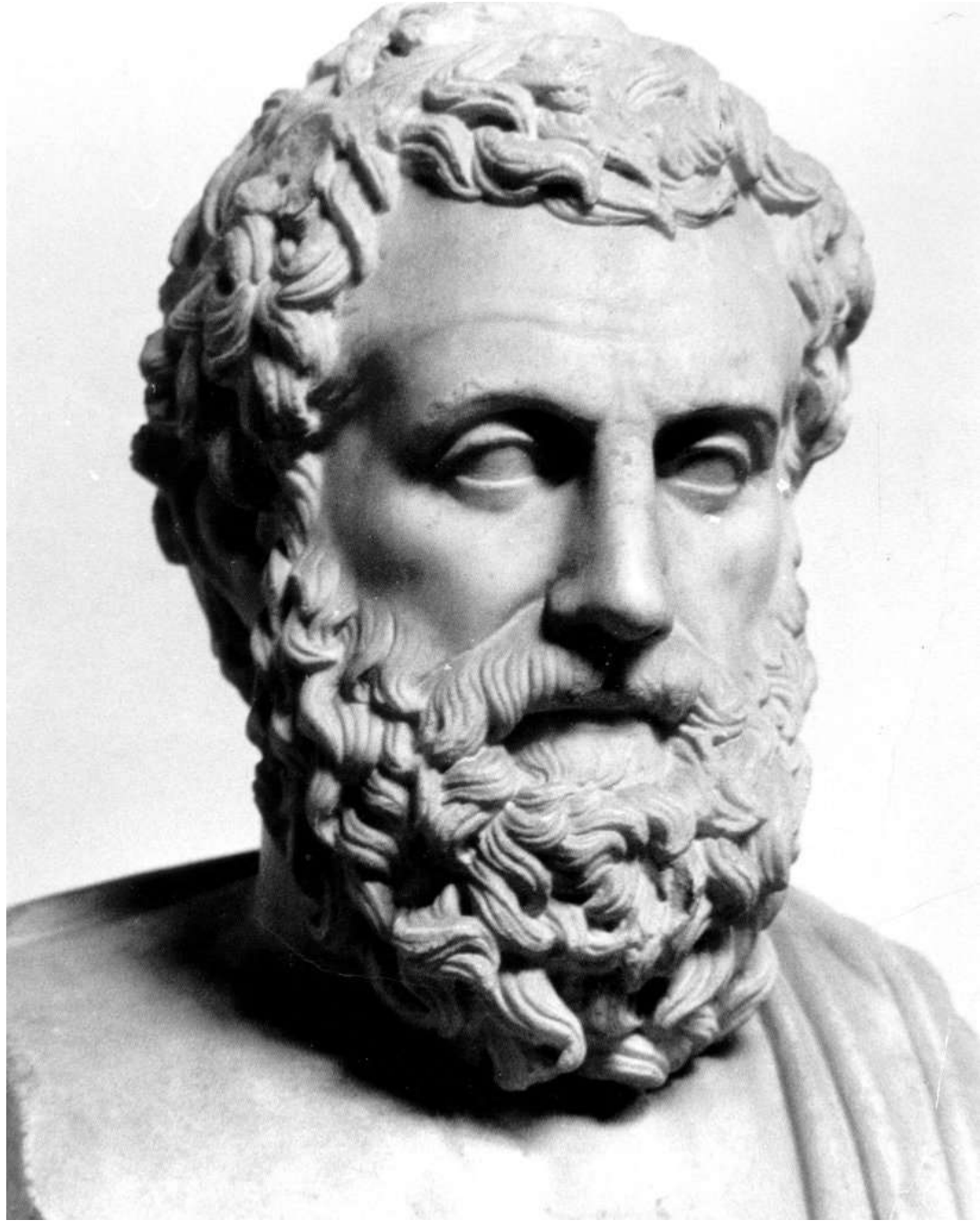
“treat others as you treat yourself” (Mahābhārata, ~IX-V century BCE)

“Avoid doing what you would blame others for doing” (Thales ~624 BC, ~546 BC)

“Treat your inferior as you would wish your superior to treat you” (Seneca, ~4 BC, 65 AD)

“Thou shalt love thy neighbour as thyself”, (Paul the apostle, ~5, ~64 AD)

Aristotle's Nicomachean Ethics



For Aristotle (384, 322 BC) strict relation between ethics and politics

Ethics: How to live a good life (myself)

Politics: How to promote a good life (in the polis)

“...though it is worth while to attain the end merely for one man, it is finer and more godlike to attain it for a nation or for city-states. These, then, are the ends at which our inquiry aims, since it is political science, in one sense of that term”, Book 1, Chapter 2

Ethics for educated citizens [Athenians], no children, no barbaroi, no slaves or craftsmen, no idiotes, no women, [but their happiness important]

Unlike in Plato, there is no universal good (no summum bonum)

As the function of man is intellectual activity, his 'good' must be plural and coincide with the exercise of virtues (aretes), among which justice is key

Question: which are the other three virtues?

Happiness descends from the living of a good life; eudaimonia corresponds to being good to the polis (ethics and politics together here)

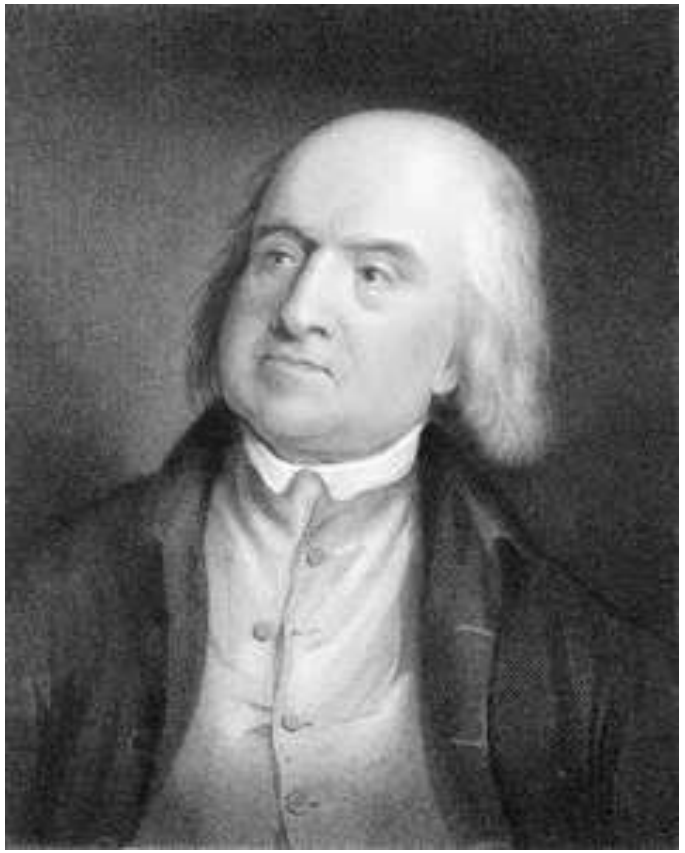
The concept of eudaimonia has lost little of its appeal; see e.g. Jeffrey Sachs and the World Happiness Report…

εὐδαιμονία

Fast forward some 22 centuries

Jeremy Bentham's fundamental axiom

"it is the greatest happiness of the greatest number that is the measure of right and wrong"



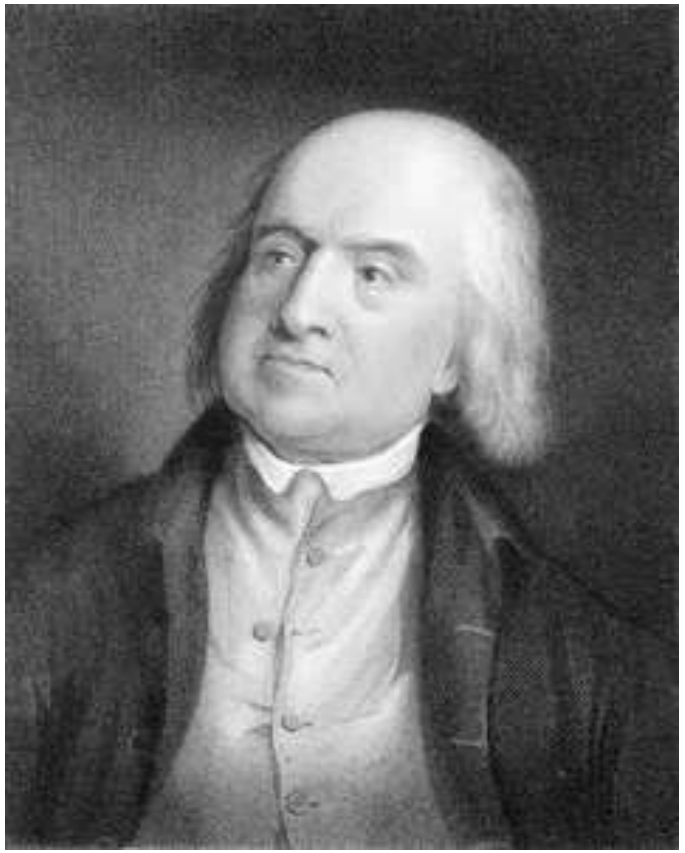
Jeremy Bentham
(1748, 1832)

The long lasting influence of utilitarianism, e.g. today in economics;

Implies computing the greatest happiness for the greatest numbers

From Condorcet's mathématique sociale to today's cost benefit analyses

(decisionism, procedural utopia,…)



Jeremy Bentham
(1748, 1832)

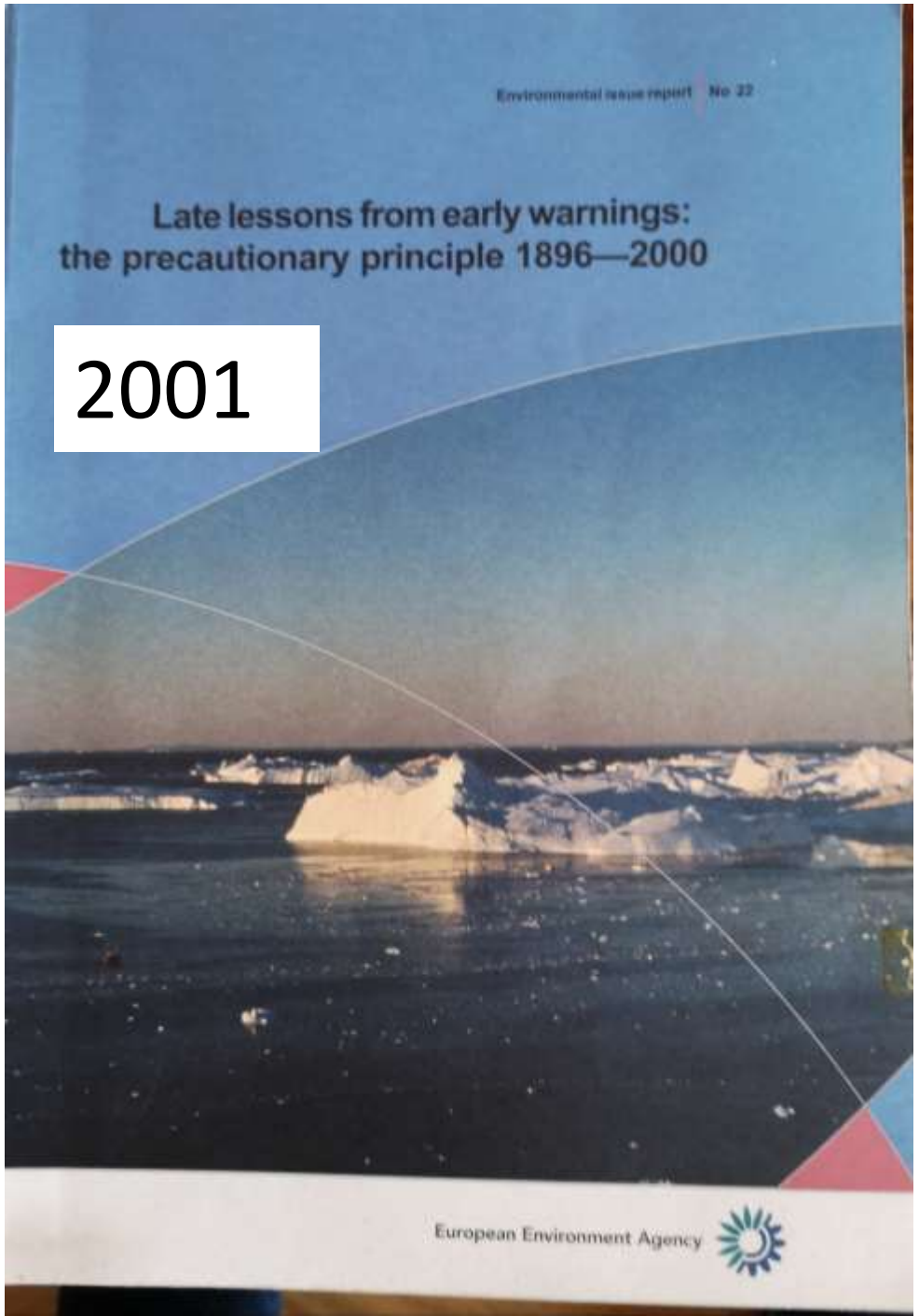
The Collingridge Dilemma:

Can we control the development of a technology?

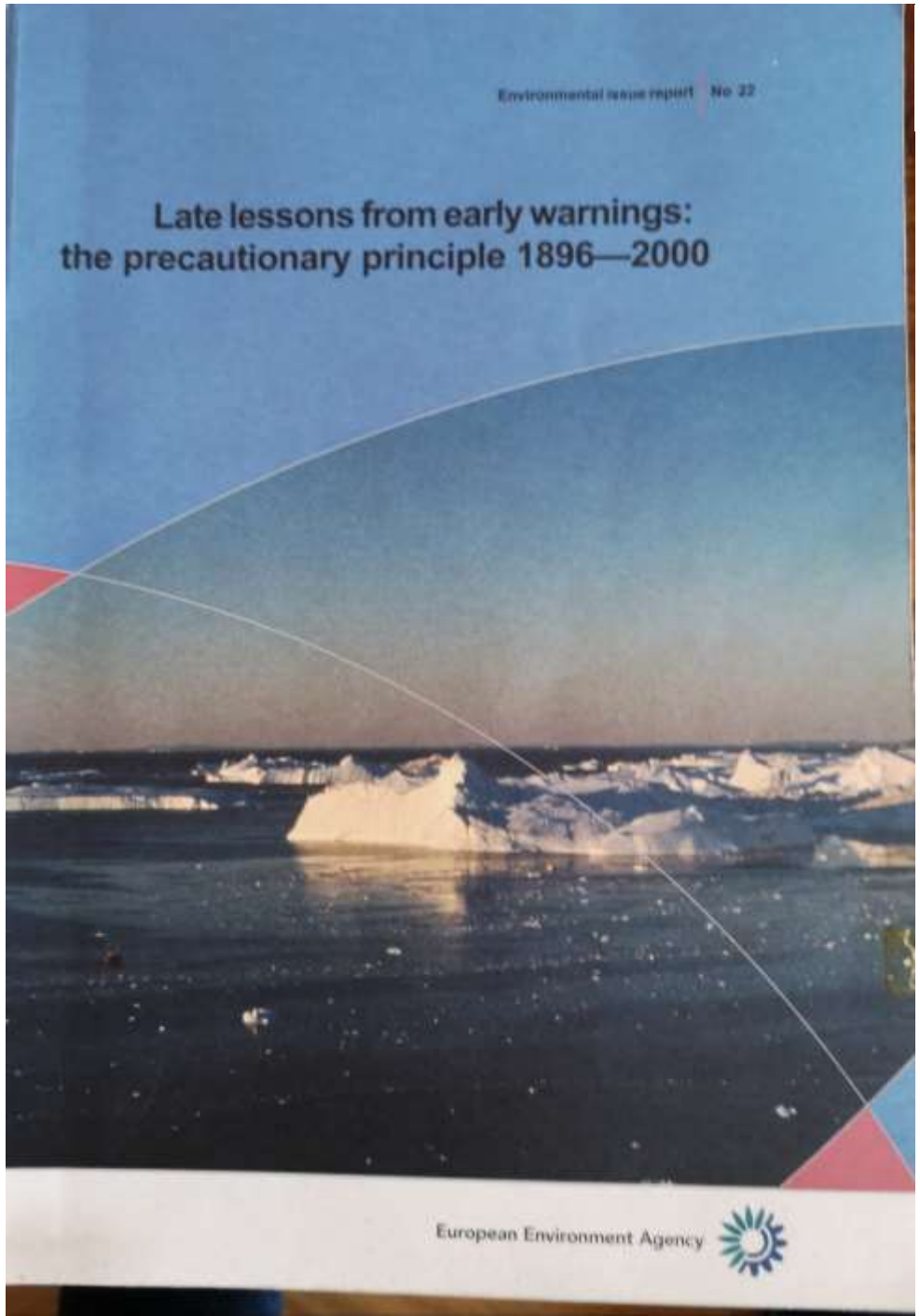
Impacts cannot be easily predicted until the technology is developed and taken up…

… But change is difficult when the technology has become entrenched.

Collingridge, D. 1980, The Social Control of Technology (New York: St. Martin's Press; London: Pinter)


Environmental issue report No 22
Late lessons from early warnings:
the precautionary principle 1896—2000
2001
European Environment Agency


Late lessons from early warnings:
science, precaution, innovation
Summary
ISSN 1725-9177
2013
European Environment Agency



2001

https://www.eea.europa.eu/publications/environmental_issue_report_2001_22/Issue_Report_No_22.pdf/view

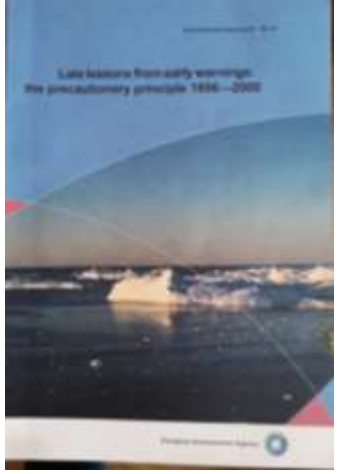
European Environment Agency (EEA, 2001):
Late Lessons from Early Warnings. The Precautionary Principle 1896-2000

14 case studies of how not heeding early warnings led to catastrophe

Asbestos, chlorofluorocarbons, non-ionizing radiation, ‘mad cow disease’, sulphur dioxide, methyl tert-butyl ether (MTBE) in petrol, and others, leading to

➔ 12 “late lessons”

1. Acknowledge and respond to ignorance, uncertainty and risk in technology appraisal.



2. Provide long-term environmental and health monitoring and research into early warnings.

3. Identify and work to reduce scientific ‘blind spots’ and knowledge gaps.

4. Identify and reduce interdisciplinary obstacles to learning.

11. Identify and reduce institutional obstacles to learning and action.

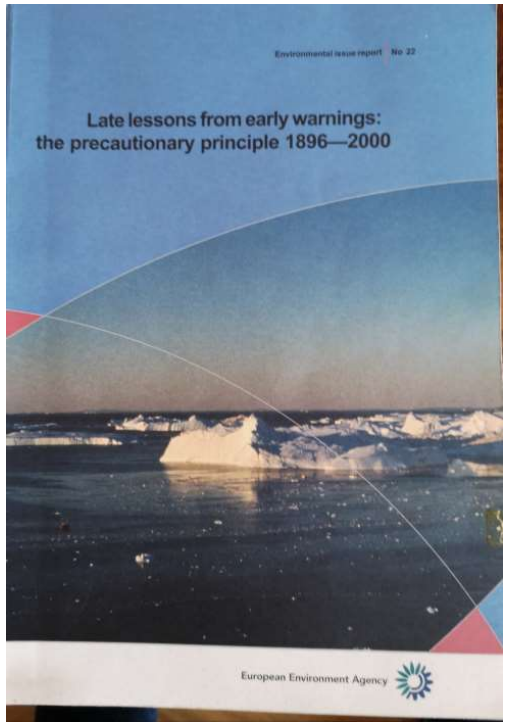
5. Account for real-world conditions in regulatory appraisal.

8. Ensure use of ‘lay’ knowledge, as well as specialist expertise.

6. Systematically scrutinize claimed benefits and risks.

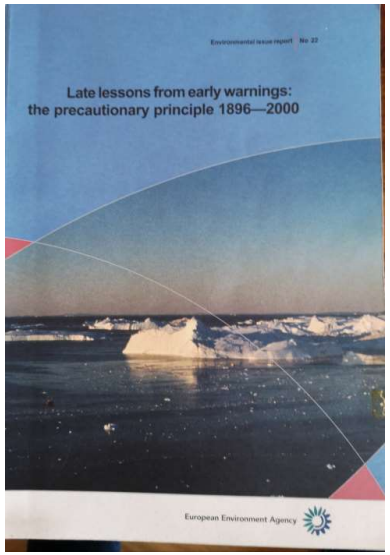
9. Account fully for the assumptions and values of different social groups.

7. Evaluate alternative options for meeting needs, and promote robust, diverse and adaptable technologies.



➔ Not because it can be done it should be done

10. Maintain regulatory independence of interested parties while retaining an inclusive approach to information and opinion gathering.



12. Avoid ‘paralysis by analysis’ by acting to reduce potential harm when there are reasonable grounds for concern.

2013

https://www.eea.europa.eu/publications/late-lessons-2

Cases on lead in petrol, lead in petrol

➔ Be alert of regulatory capture; exaggerating uncertainty can be used to deflect regulation

(Mad cow disease: disgust of public opinion to learn of cows fed on offal and bodily waste)

EEA conclusions: doing enough?

The question seems not to be whether we have learnt the lessons, but whether we are applying them effectively enough to prevent nanotechnology being one more future case study on how not to introduce a new technology

Despite a good start, it seems that we have become distracted

Some elements from history and philosophy of science

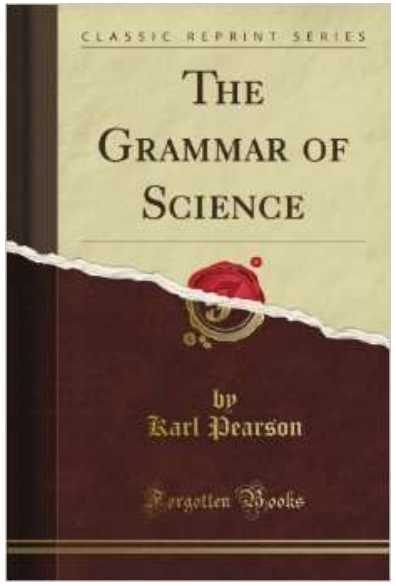
How are we taught our science; the good and the truth; from the Vienna circle to …

How are we taught our science?

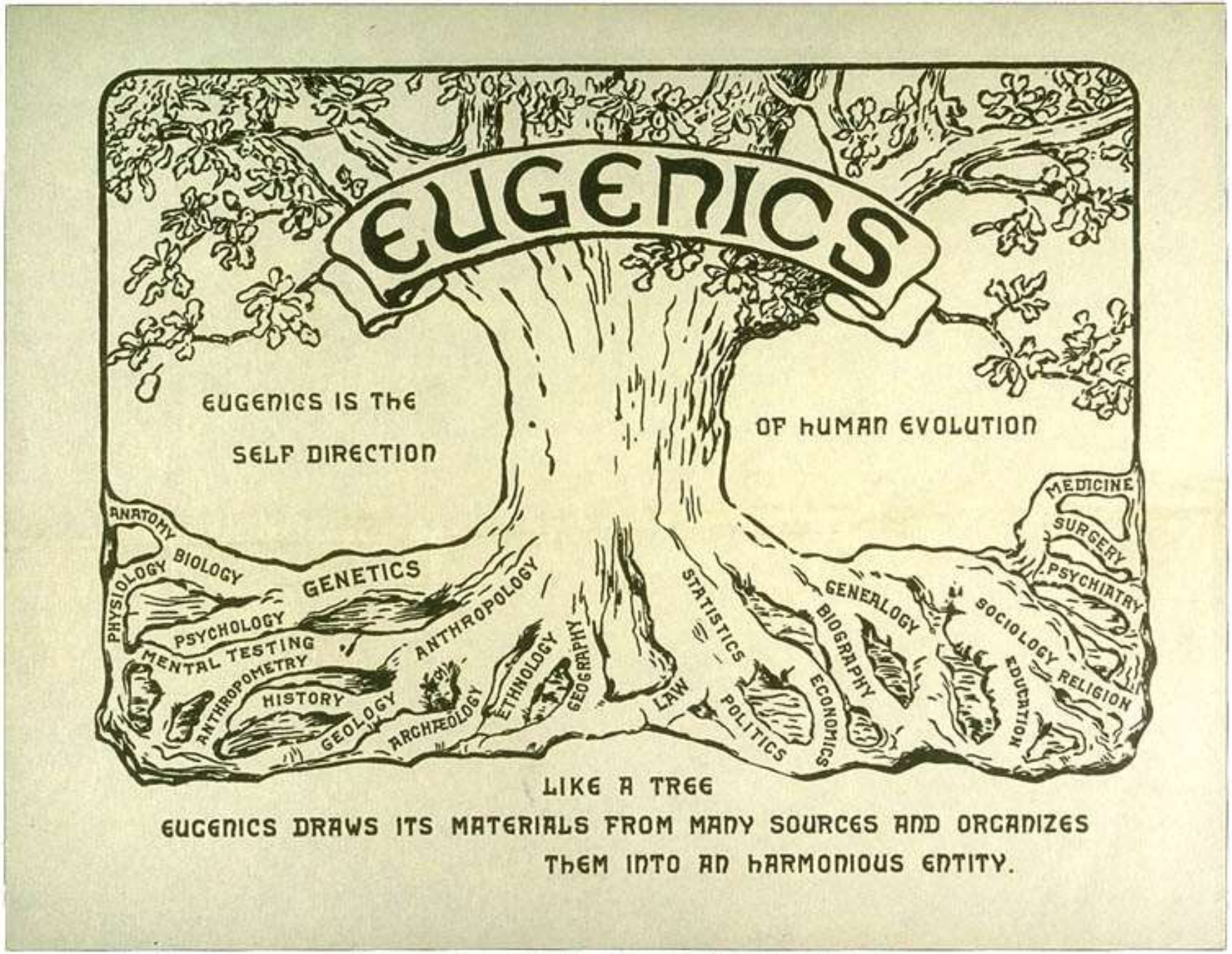
Karl Pearson (a social Darwinist) suggests not wasting resources on social programs as:

"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

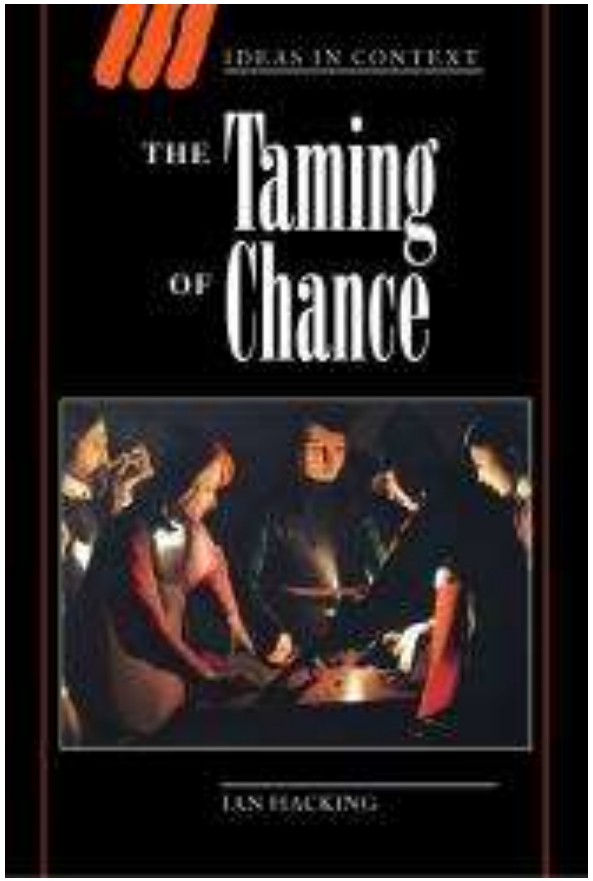


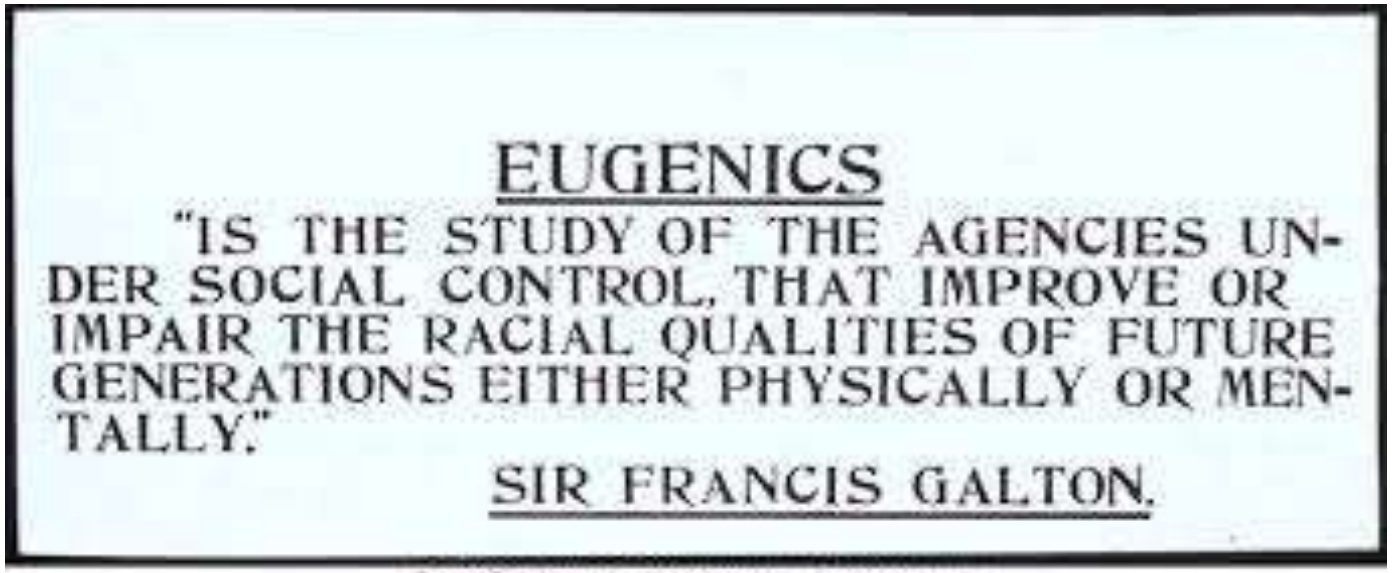
Pearson, K., 1892, The Grammar of Science, Walter Scott Publisher, London, p.32.



LIKE A TREE
EUGENICS DRAWS ITS MATERIALS FROM MANY SOURCES AND ORGANIZES
THEM INTO AN HARMONIOUS ENTITY.

Francis Galton and Karl Pearson (the one of chi-squared); laboratory of biometrics; distinguishing army officers from private soldiers from criminals convicted of murder from non-violent felons from Jews …





The Jewish type …

EUGENICS

C. P. IVES, Jr. Managing Editor CHARLES McALPIN PYLE, Business Manager

"Eugenics is the study of all of the agencies under social control which may improve or impair the inborn qualities of future generations of men, either physically or mentally."

—Francis Galton

VOLUME II AUGUST 1929 NUMBER 8

The first R&D Statistics ever, by Francis Galton (1822-1911)

Measuring the numbers of sons and daughters of ‘great men of science’ will tell us whether a society degenerates toward stupidity (Benoît Godin, 2010)

Godin, B., From Science to Innovation, INRS, Montreal, Canada, Communication presented to the Government-University-Industry Research Roundtable (GUIRR) US National Academy of Sciences, Washington, May 21, 2010.

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

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

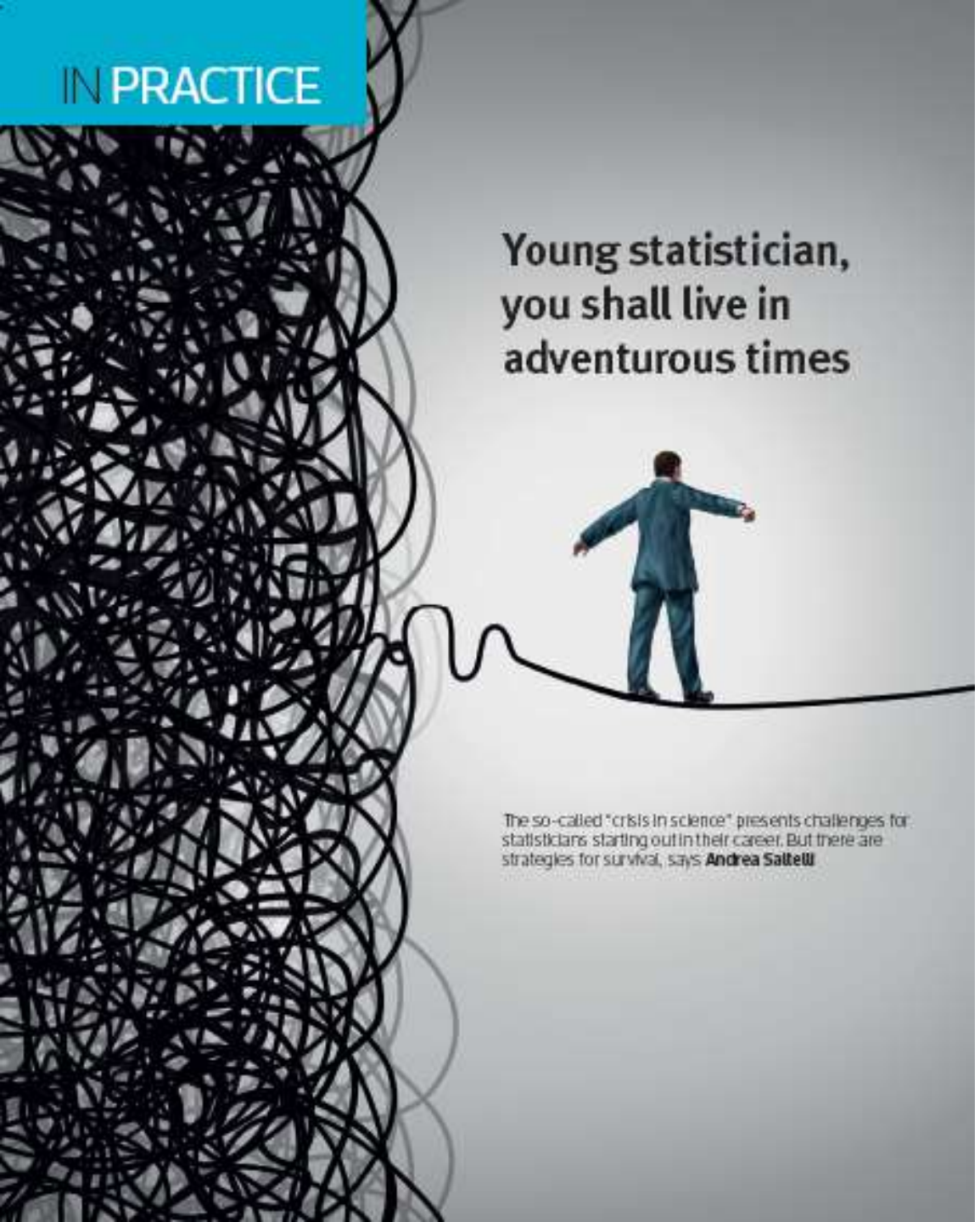
Thomas Kuhn, The structure of scientific revolution, 192, Chapters I and XIII

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

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

Thus disciplinary advancements are presented in textbooks as the “perception of the obvious” made by one-eyed men in the kingdom of the blinds (Ravetz, 1971).

Can statisticians ignore their role in Eugenics, can chemists ignore what is phlogiston, or geologists how Alfred Lothar Wegener 1915 theory of Continental Drift was met with skepticism …



SIGNIFICANCE
ROYAL STATISTICAL SOCIETY
ASA AMERICAN STATISTICAL ASSOCIATION

More here

https://rss.onlinelibrary.wiley.com/doi/10.1111/j.1740-9713.2016.00983.x

Why ethics and science cannot be separated?

See a clean version here:
http://www.andreasaltelli.eu/file/repository/Ideological_committment.pdf

How science is conceived has important political implications

The **Vienna Circle** and the fight against the 'metaphysical and theologizing' associated with fascism and national socialism (1929). Modern empiricism as a scientific world conception

Verification or falsification?

Karl Popper

A radical departure from the principle of 'verification' that was at the heart of the Vienna Circle positivism (inductivism)

Verification or falsification?

Karl Popper

Truth cannot be verified: it can only be falsified

Socratic ethos

Is Socrates saying that he knows the truth?

And what kind of man am I? One of those who would gladly be refuted if anything I say is not true, and would gladly refute another who says what is not true, but would be no less happy to be refuted myself than to refute, for I consider that a greater benefit … I believe there is no worse evil for man than a false opinion about the subject of our present discussion

Courtesy of Kjetil Rommetveit

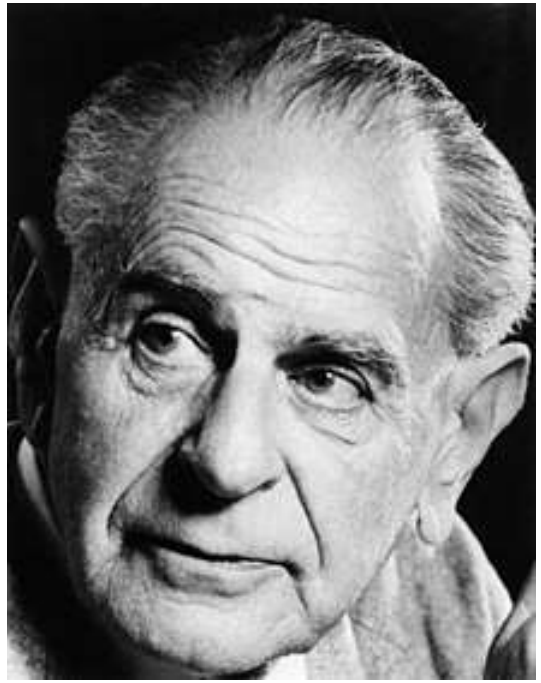
Verification or falsification?

Karl Popper

Demarcation science/non-science ➔ Marxist historiography and psychoanalysis are not science

Verification or falsification?

A champion of liberal democracy at times of cold war; open society as an alternative to totalitarianism



Karl R. Popper
1902–1994

A critical member of the Mont Pelerin society, with Friedrich Hayek, Milton Friedman, Ludwig von Mises and others,

Paradigm shifts

Thomas Kuhn: a disenchanted vision of science as alternating between ‘normal’ and ‘revolutionary’

Puzzle solving, dogmatic science, then a paradigm shift … then the same over again

Lost a direction a progress

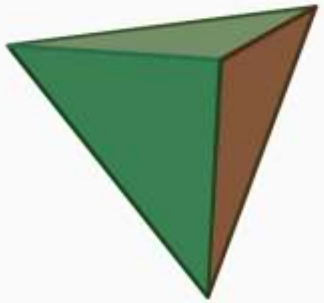
Imre Lakatos: defending science from its enemies. Remedying the weaknesses in Popper's program

"Proofs and Refutations" revealing the ambiguities of proof even in mathematics, on 'Euler Polyhedron Theorem'; If even mathematics can be ambiguous how can science be dogmatic?

Who remembers the theorem?

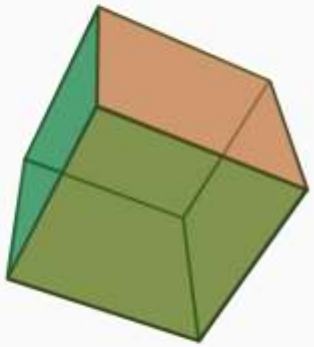
Euler's Polyhedron Formula

Vertices - **E**dges + **F**aces = 2



V = 4 E = 6 F = 4

4 - 6 + 4 = 2

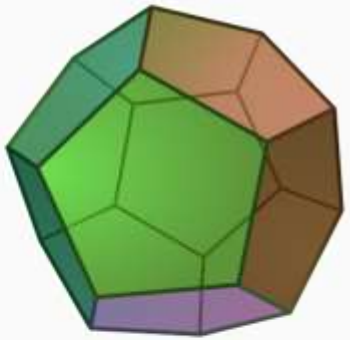


V = 8 E = 12 F = 6

8 - 12 + 6 = 2

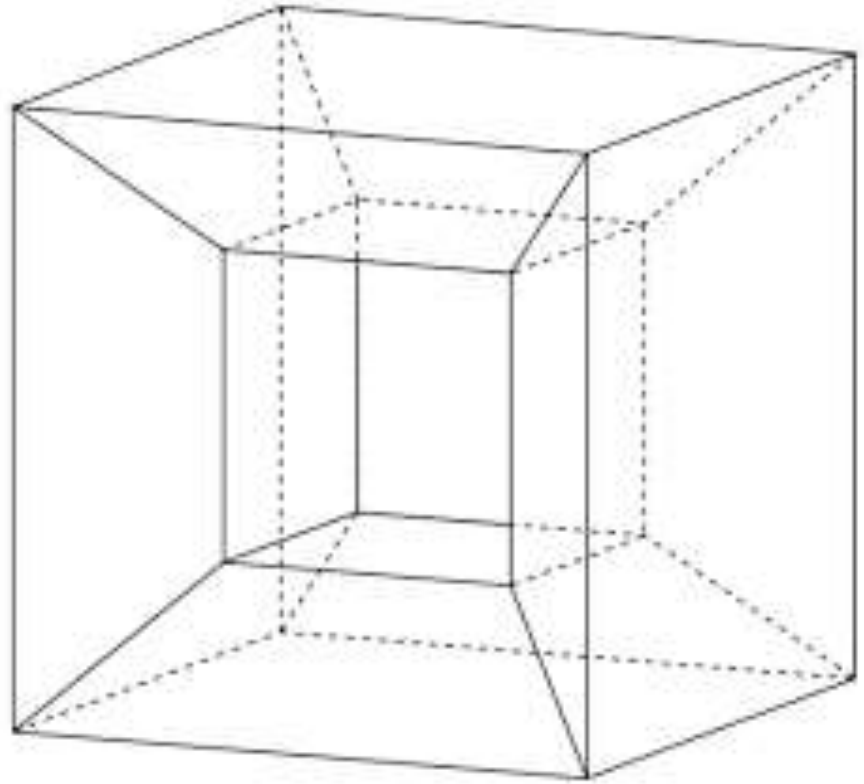
V = 6 E = 12 F = 8

6 - 12 + 8 = 2



V = 20 E = 30 F = 12

20 - 30 + 12 = 2



A monster example?

Imre Lakatos: The idea of ‘decadal’ research programmes to save Popper’s falsificationism from Kuhn’s critique by combining the two visions, abandoning ‘naïve falsificationism’

Paul Feyerabend

Perhaps the most erudite and most philosopher among the four; and the most destructive of any theory of scientific method

In “Against Method” he shows how the best among scientists (e.g. Galileo Galilei) violated any ‘rule’

A court jest, a fascist,
a Zen master? Asks Ravetz

Paul Feyerabend

Human imperfections of Galileo can 'blow the mind' of a student for whom the authority of science is as absolute

After such a shock the student may be ready to awaken to the truth that there is no truth to awaken to (Feyerabend as a Zen master?)

Paul Feyerabend

For Ravetz, Feyerabend shows to the lay public science's sacred images being sprayed by a philosophical machine gun (Feyerabend as a fascist?)

Killing science as we know it or showing the hypocrisy of this image?

Ravetz's conclusions

The edifice built by Popper and Lakatos was vulnerable to the critique of Kuhn and Feyerabend, perhaps because of its ideological aspirations

Yet the Enlightenment battle against the church cultural and political hegemony is over, so is a simplistic image of science upholding the Good and the True

Is this true?

The Enlightenment battle against the church cultural and political hegemony is over, so is a simplistic image of science upholding the Good and the True

The Republic of Science: Its Political and Economic Theory
Michael Polanyi

Science as a market which feeds society's thirst for self improvement

Science as a community of practice capable of self-governance

Michal Polanyi

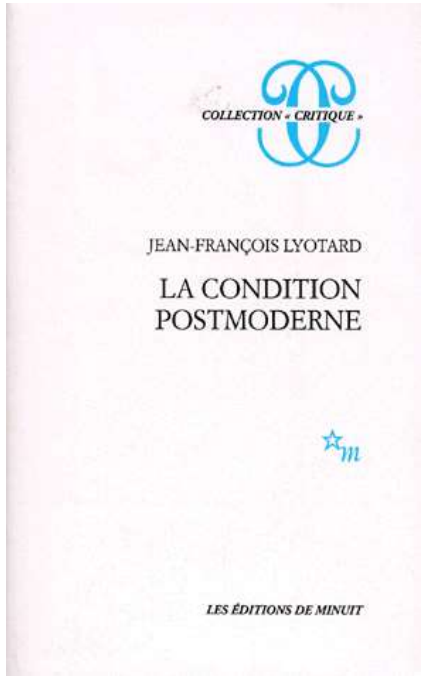
Minerva, I, 1 (Autumn, 1962) , pp. 54- 73, https://mitpress-request.mit.edu/sites/default/files/titles/content/9780262690201_sch_0001.pdf

For Lyotard the grand narrative of the relation between knowledge/science and power has come to an end

Jean-François Lyotard

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

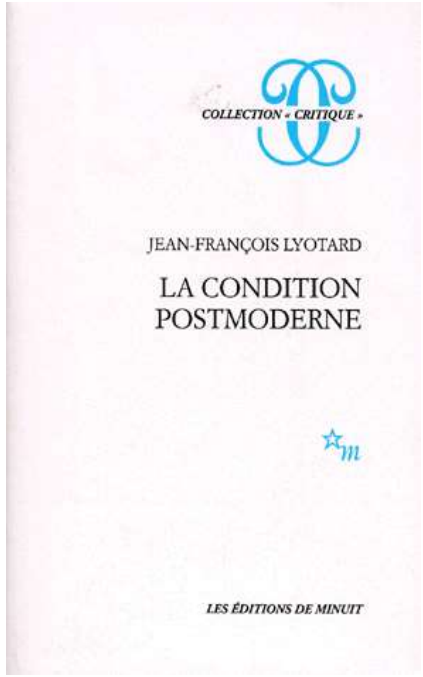
“The question of the legitimacy of science has been indissociably linked to that of the legitimation of the legislator since the time of Plato.”



Jean-François Lyotard

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

“…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 …”



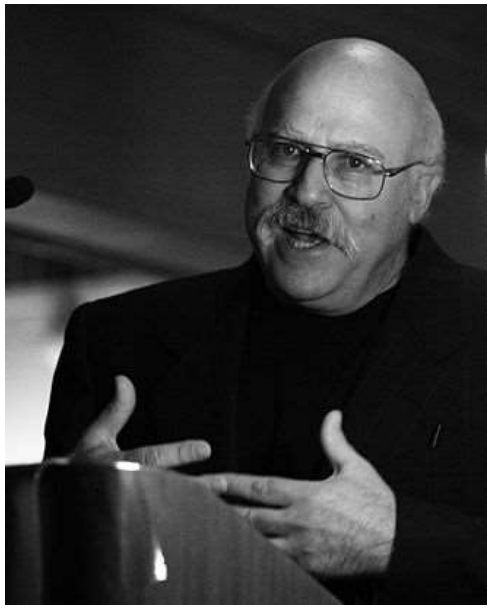
Jean-François Lyotard

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

“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.”

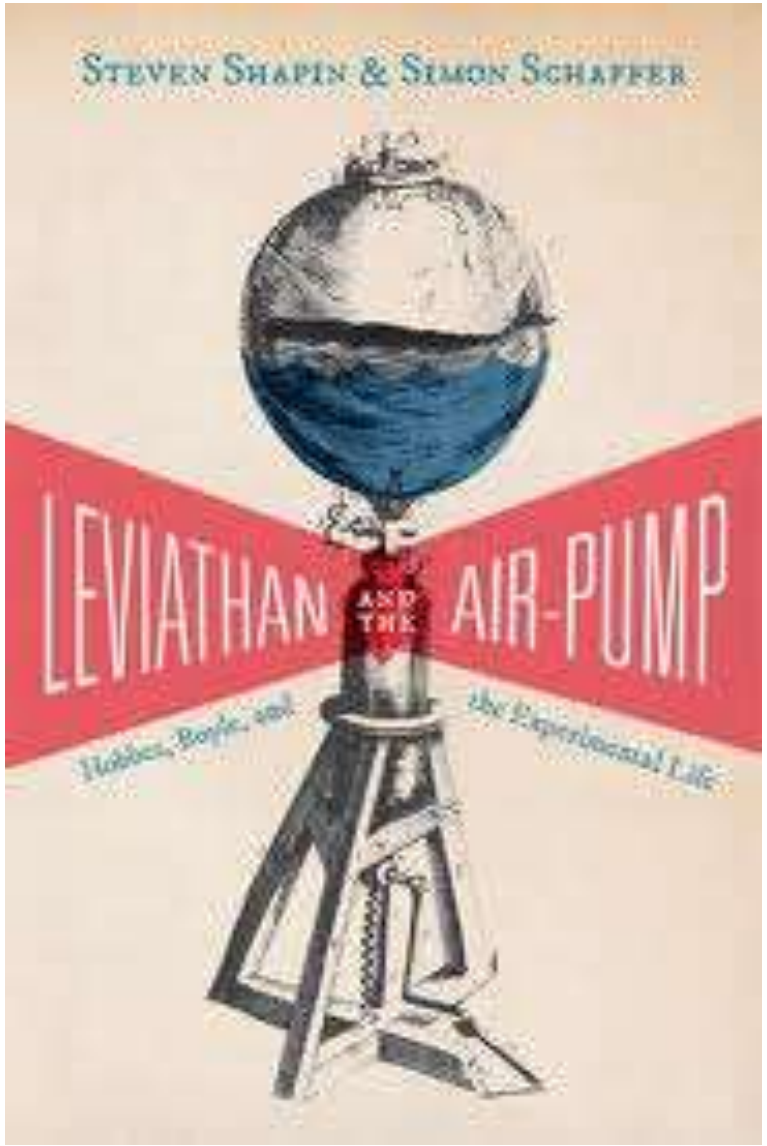
Simon Schaffer



Steven Shapin

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

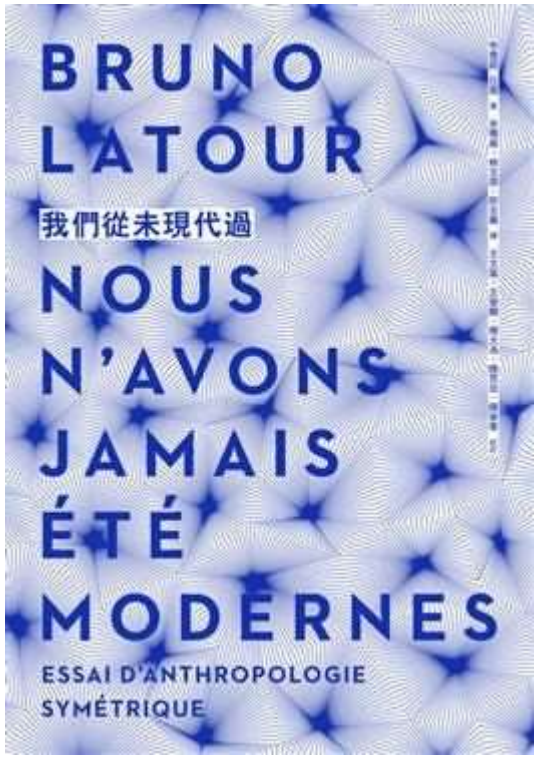
Establishing ‘matter of facts’ under controlled ‘laboratory’ experiments before witnesses as a way to subtract the discourse about knowledge from religious squabbles …



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'.

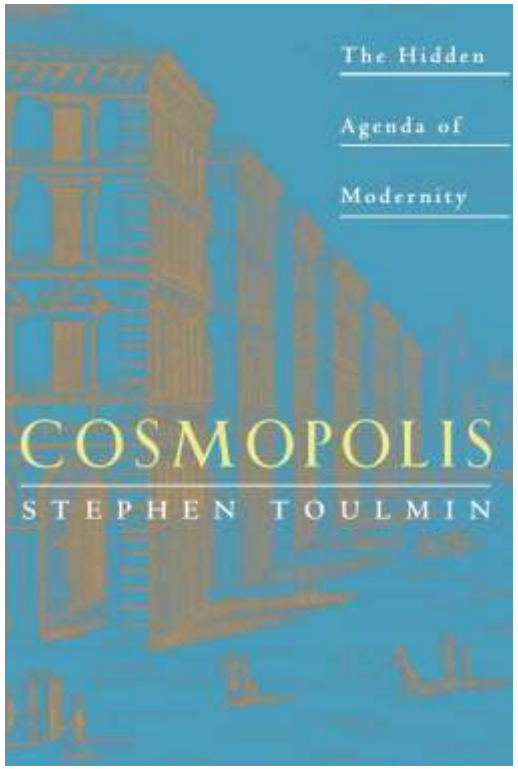
Bruno Latour



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

Stephen Toulmin: Modernity as a counter-Renaissance; Descartes versus Montaigne; the delusion of a Newtonian view of society

Stephen Toulmin



Stephen Toulmin, 1990, Cosmopolis: The Hidden Agenda of Modernity, The University of Chicago Press.

The roots of the Cartesian dream

Francis Bacon
(1561-1626)
Magnalia Naturae, in the New Atlantis (1627), '*Wonders of nature, in particular with respect to human use*'

We call Cartesian dream the idea of man as master and possessor of nature, of prediction and control, of Bacon's wonders of science and of 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'

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.

Magnalia Naturae, in the New Atlantis (1627),

'Wonders of nature, in particular with respect to human use'

Francis Bacon (1561-1626)

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;
[…]
Drawing of new foods out of substances not now in use; Making new threads for apparel; and new stuffs, such as paper, glass, etc.; 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.”

http://www.bartleby.com/34/1/6.html

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’

http://oll.libertyfund.org/titles/1669

Overpopulation? War due to scarcity of resources? Will 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’

http://oll.libertyfund.org/titles/1669

‘Mathématique sociale’: We still use today terms such as ‘Condorcet method’, ‘Condorcet winner’, ‘Condorcet-ranking procedure’

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

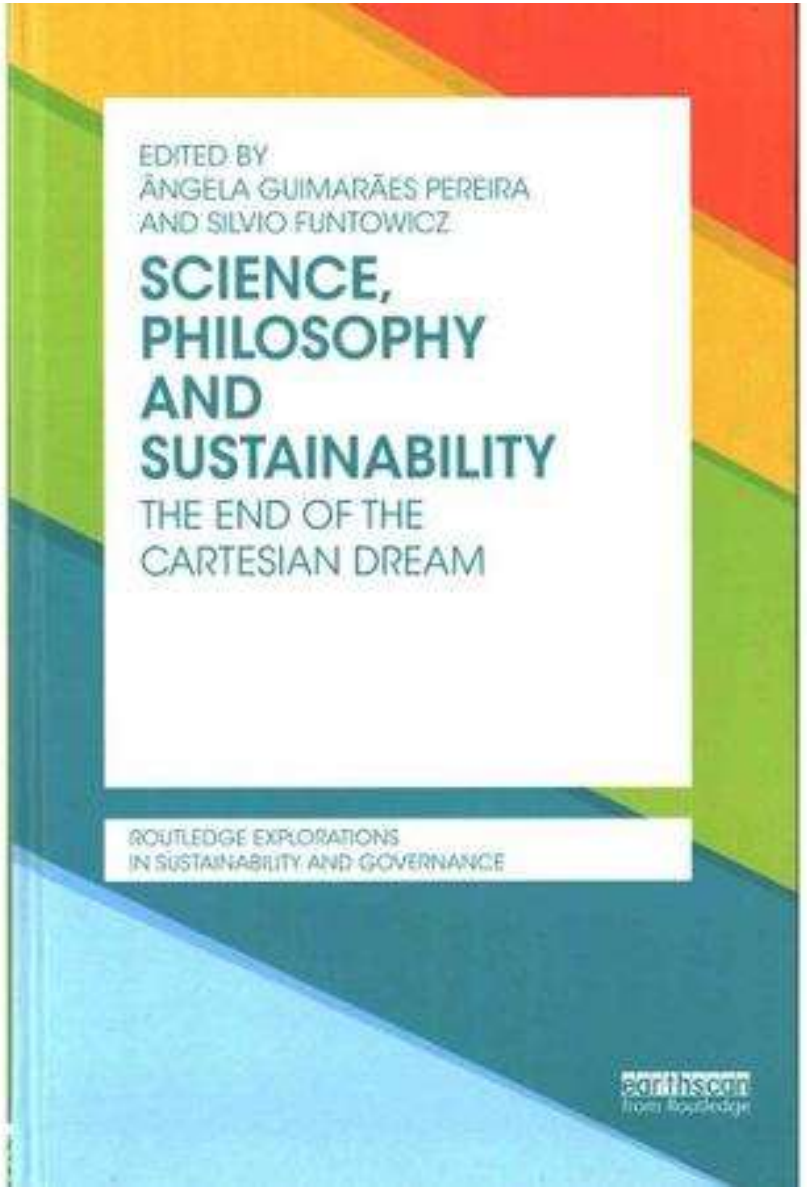
‘

Feldman, J., 2005, Condorcet et la mathematique 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

Condorcet's algorithms and Descartes' Geometry: the dream always had a quantification agenda

Some reading on the Cartesian Dream



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.

Closer to our times the dream was couched in the ‘Endless Frontier’ metaphor by Vannevar Bush, 1945:

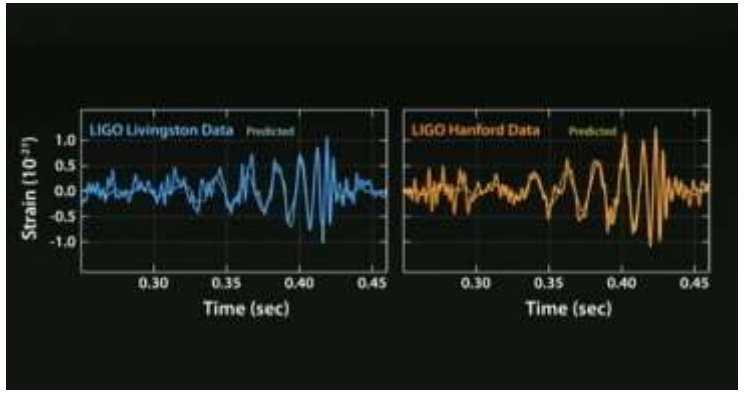
Vannevar Bush
(1890–1974)

“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.”

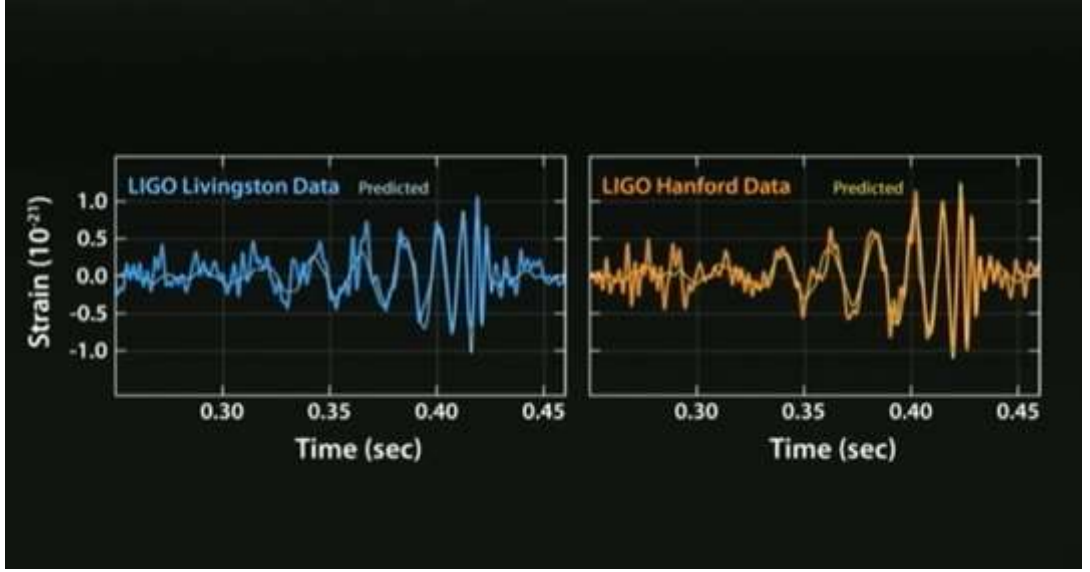
Bush, V. (1945) Science: the endless frontier, United States Office of Scientific Research and Development, U.S. Govt. print office.

The success of the Cartesian dream

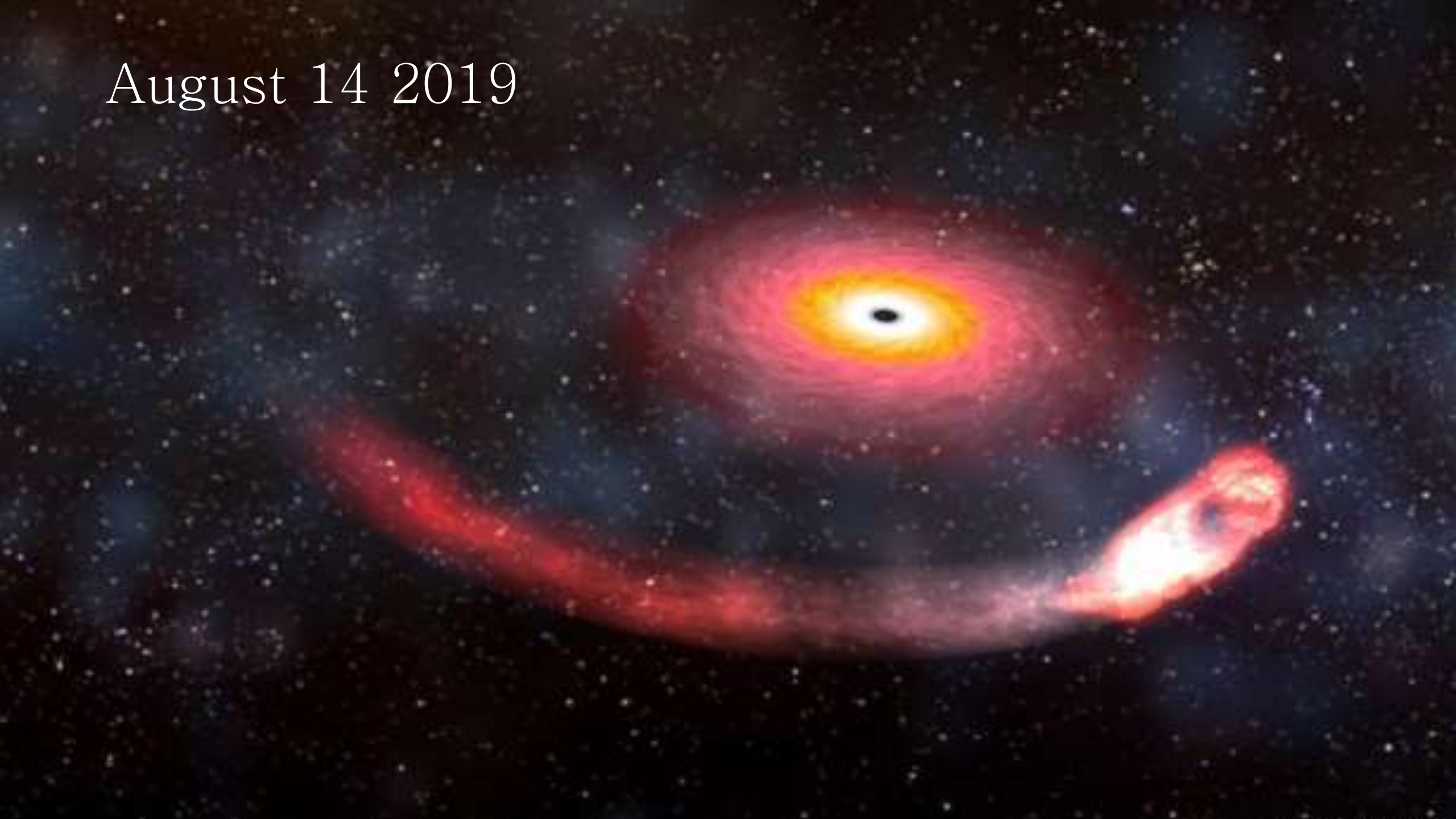
The keeping of the promise: Gravitational waves, from J. Weber's cylinder to LIGO



A Madman Dreams of Tuning Machines: The Story of Joseph Weber, the Tragic Hero of Science Who Followed Einstein's Vision and Pioneered the Sound of Space-Time, By Maria Popova, https://www.brainpickings.org/2016/04/25/black-hole-blues-janna-levin-joseph-weber/



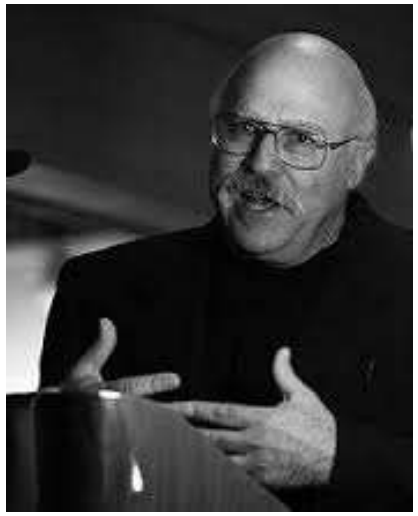
https://www.brainpickings.org/2016/04/25/black-hole-blues-janna-levin-joseph-weber/


August 14 2019

If you are a natural scientists you were nourished and trained in the Cartesian dream (S. Toulmin: ‘The hidden agenda of modernity’)

Stephen Toulmin

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



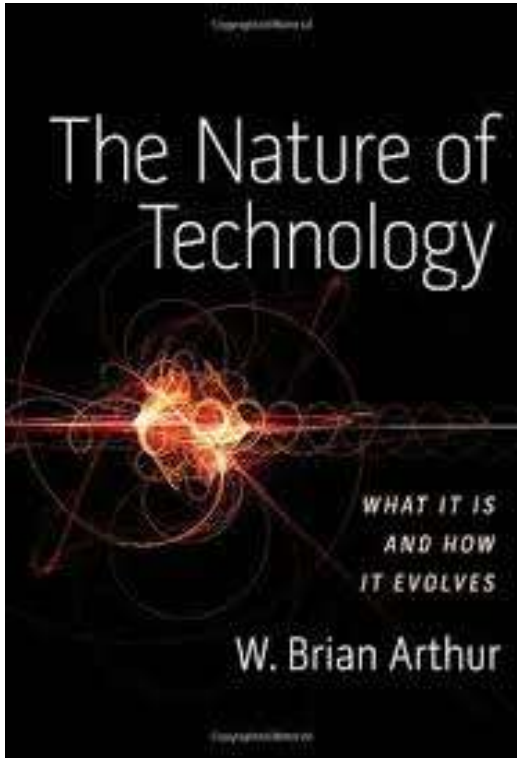
Steven Shapin

Steven Shapin, 2016, Invisible Science, The Hedgehog Review: Vol. 18 No. 3 (Fall 2016)
W.B. Arthur, The nature of technology, Free Press, New York, 2009.

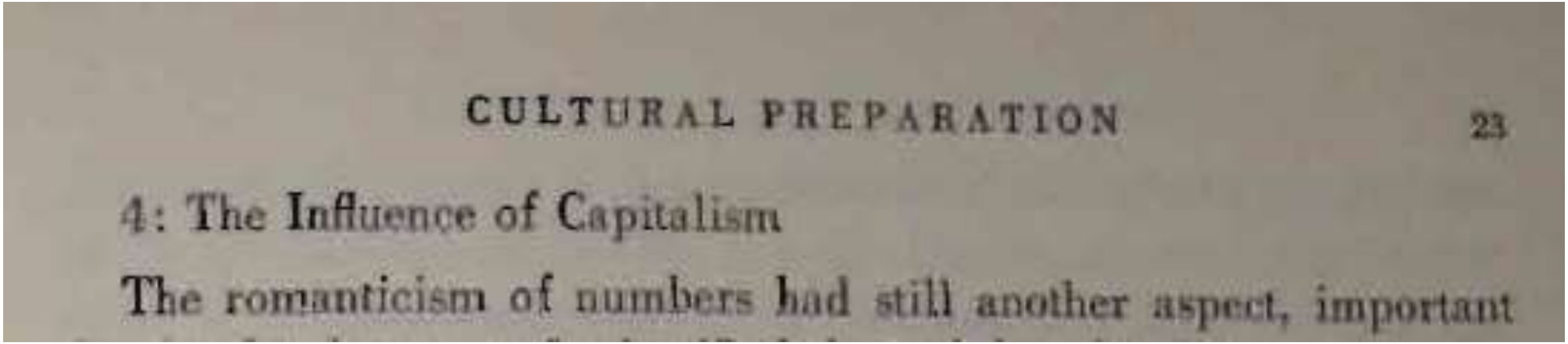
The critique of the Cartesian dream

What do Lyotard, Toulmin, Dewey, Bakunin, and (Fritz) Schumacher have in common?

From post-modern thinkers to pragmatists to anarchists to the fathers of the ecological movement, a common concern about mastering science and technology and its uses, about the dangers of modernity



Lewis Mumford explained in 1934 how well the ‘machine’ integrates with capitalism



CULTURAL PREPARATION 23

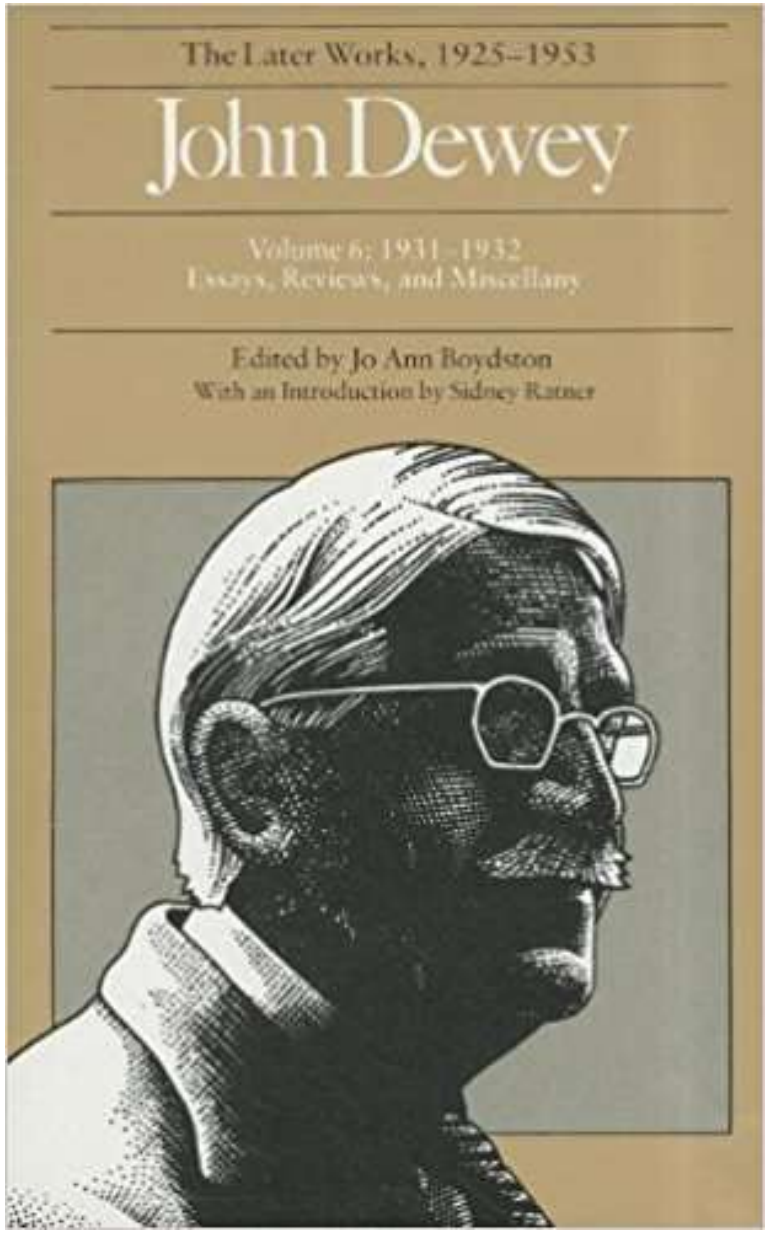
4: The Influence of Capitalism

The romanticism of numbers had still another aspect, important

Lewis Mumford, **1934**, Techniques and Civilization, ROUTLEDGE & KEGAN PAUL LTD, p. 23-31 of the 1955 edition.

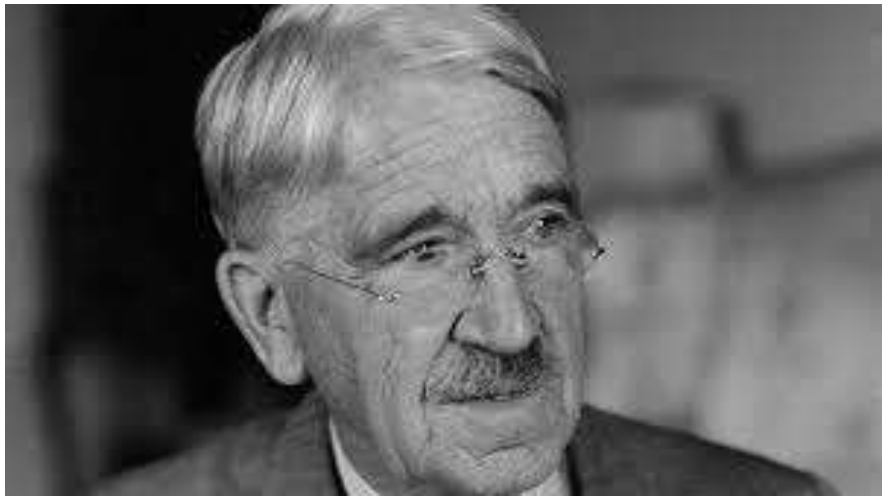
Here lies the heart of our present social problem. Science has hardly been used to modify men's fundamental acts and attitudes in social matters. It has been used to extend enormously the scope and power of interests and values which anteceded its rise. Here is the contradiction in our civilization. The potentiality of science as the most powerful instrument of control which has ever existed puts to mankind its one outstanding present challenge.

From J. Dewey 'Science and Society' in John Dewey: The Later Works, 1925-1953: 1931-1932, Vol. 6-ExLibrary



John Dewey 1859-1952

“Here lies the contradiction of our civilization. The potentiality of science as the most powerful instrument of control which has ever existed puts to mankind its one outstanding present challenge”



John Dewey

J. Dewey, Science and society, in ‘John Dewey: The Later work , 1931-1932 Vol. 6

“Science, which should have been the wind of truth to clear the air, has polluted the air, helped to brainwash, and provided weapons for war.”

Paul Goodman

Do we live after COVID a similar dissatisfaction with science?

Paul Goodman, 1970, New Reformation, Notes of a Neolithic Conservative, PM press (2010 Edition).

Doubts about the scientific quantification of the impact of new technologies

Fritz Schumacher

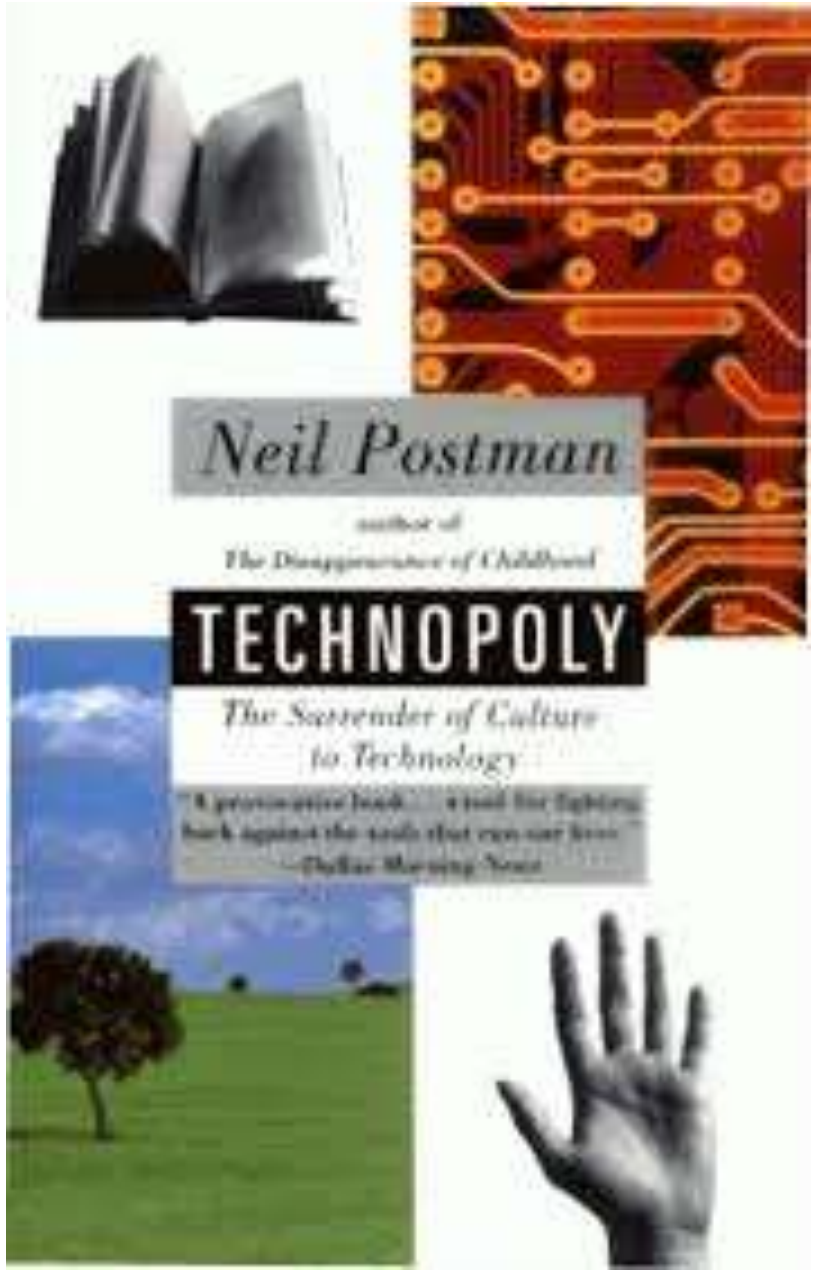
Langdon Winner

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

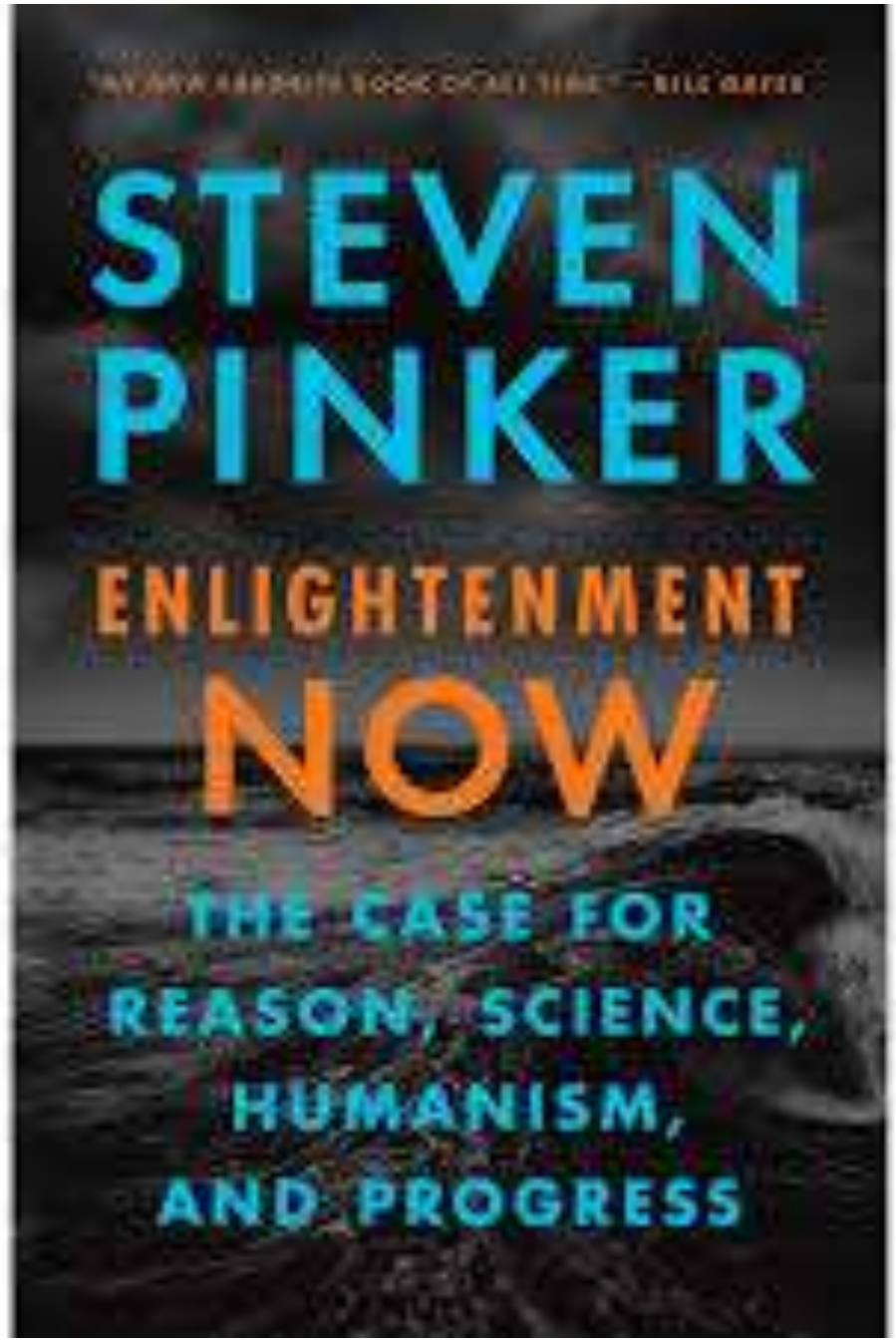
Winner, L., 1986. The Whale and the Reactor: a Search for Limits in an Age of High Technology. The University of Chicago Press, 1989 edition.

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.

“… it is inescapable that every culture must negotiate with technology, whether it does so intelligently or not"
(N. Postman, Technopoly)

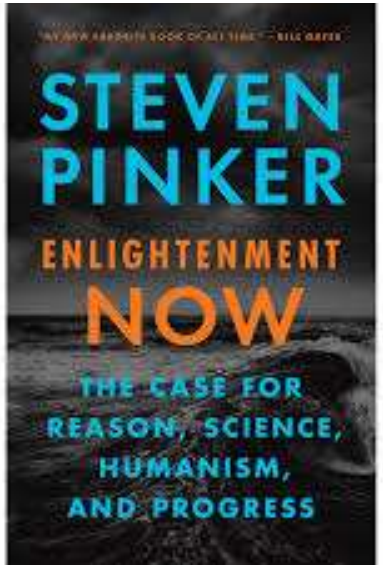


The discussion on the legacy of Enlightenment goes on



Steven Pinker

Jeremy Lent



"A future perfect. Steven Pinker's case for optimism; "Enlightenment Now" explains why the doom-mongers are wrong", The Economist

"Steven Pinker Wants You to Know Humanity Is Doing Fine. Just Don't Ask About Individual Humans" (Jennifer Szalai, The New York Times)

"a monumental apologia for a currently fashionable version of Enlightenment thinking" ((John Gray, New Stateman)

The history of western history's two powerful metaphors: "man as master and possessor of nature" and "nature as a machine"

From the dualism of Greek and Christian philosophies to our days

Contrasted with alternative metaphors, such as nature as a system of systems

The ethos of science

Robert K. Merton, sociologist of science, considered the father of Science and Technology Studies, 1910-2003

CUDOS

Communalism – the common ownership of scientific discoveries, according to which scientists give up intellectual property rights in exchange for recognition and esteem …

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

CUDOS

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

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

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Practicum here

- Split in ~five groups
- Debate among yourselves the pros and cons of **one** norm & elect **two** advocated, one pro the norm and the other against (30m)
- The two advocates for each group report in class

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

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

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

IAN I. MITROFF

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

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

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

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

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

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

Instead of Communalism

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

Instead of Universalism

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

Instead of Disinterestedness

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

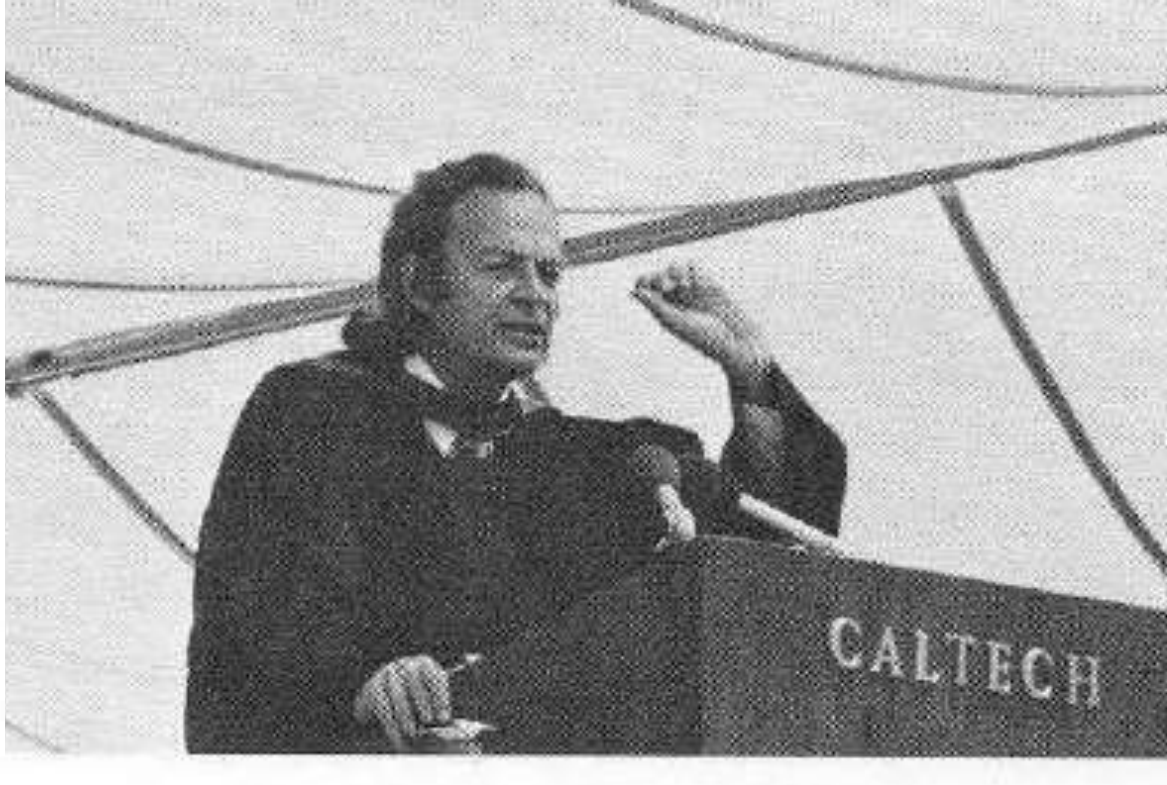
Instead of Organized Skepticism

A lesson from a recent past

Cargo Cult Science

by RICHARD P. FEYNMAN

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



http://calteches.library.caltech.edu/3043/1/CargoCult.pdf

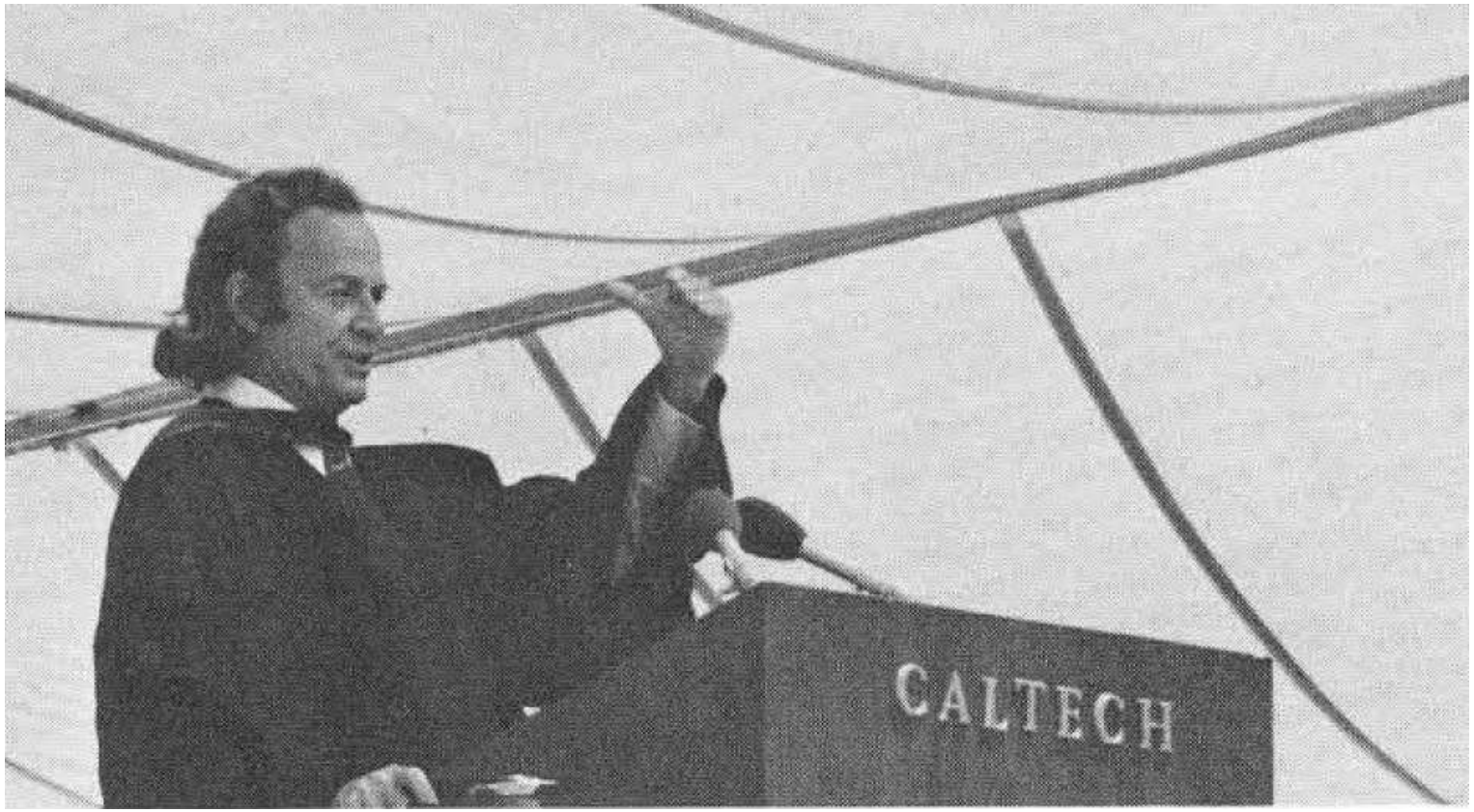
“In the South Seas there is a cargo cult of people. During the war they saw airplanes land with lots of good materials, and they want the same thing to happen now.

So they've arranged to imitate things like runways, to put fires along the sides of the runways, to make a wooden hut for a man to sit in, with two wooden pieces on his head like headphones and bars of bamboo sticking out like antennas—he's the controller—and they wait for the airplanes to land”

“They're doing everything right. The form is perfect. It looks exactly the way it looked before. But it doesn't work. No airplanes land. So I call these things cargo cult science, because they follow all the apparent precepts and forms of scientific investigation, but they're missing something essential, because the planes don't land”

“[…] there is one feature I notice that is generally missing in cargo cult science. That is the idea that we all hope you have learned in studying science in school […] .

It's a kind of scientific integrity, a principle of scientific thought that corresponds to a kind of utter honesty--a kind of leaning over backwards.



“Details that could throw doubt on your interpretation must be given, if you know them. […] give all of the information to help others to judge the value of your contribution.”

The topic

An overall crisis of scientific practice and ethos, the role of technology, the impact on society.

Crisis in science?

There have recently been alarms as to the scientific quality arrangement is several disciplines. The most visible symptom of this possible dysfunction is the so-called reproducibility crisis

Futures
Volume 91, August 2017, Pages 5-11

What is science's crisis really about?

Andrea Saltelli [a, b] ✉, Silvio Funtowicz [a]

Futures
Volume 104, December 2018, Pages 85-90

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

Andrea, Saltelli ✉

On the radar: October 2013

The Economist

HOW SCIENCE GOEs WRONG.

Essay

Why Most Published Research Findings Are False

John P. A. Ioannidis

2005

John P. A. Ioannides

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

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

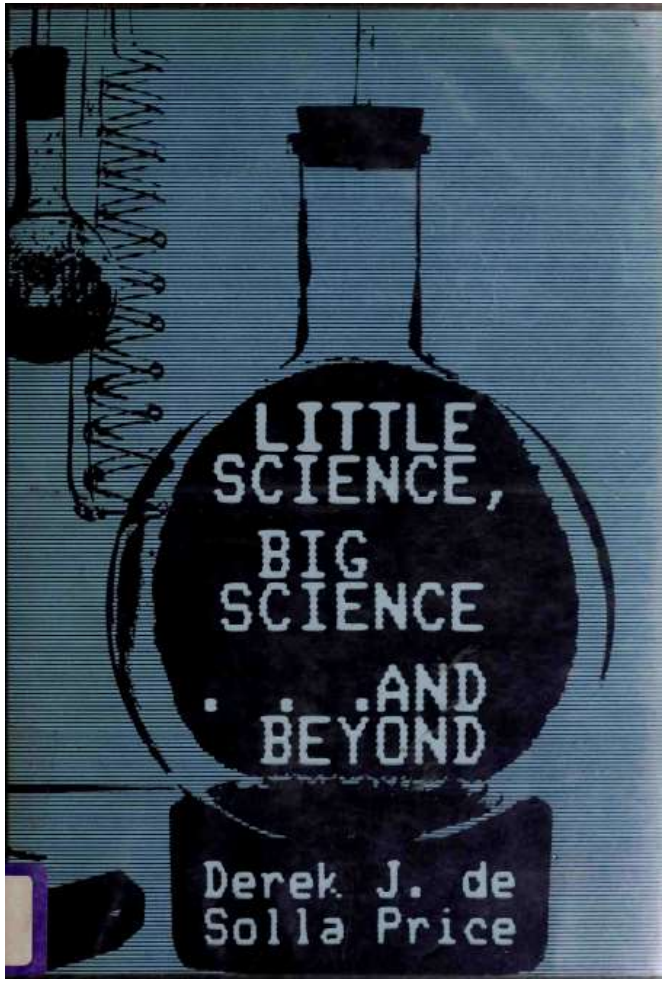
… misleading science advice, institutions on denial, a new breed of science wars

The crisis is methodological, epistemological, ethical and metaphysical

Scholars who saw it coming …

and how they were vindicated

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)



Derek J. de Solla Price

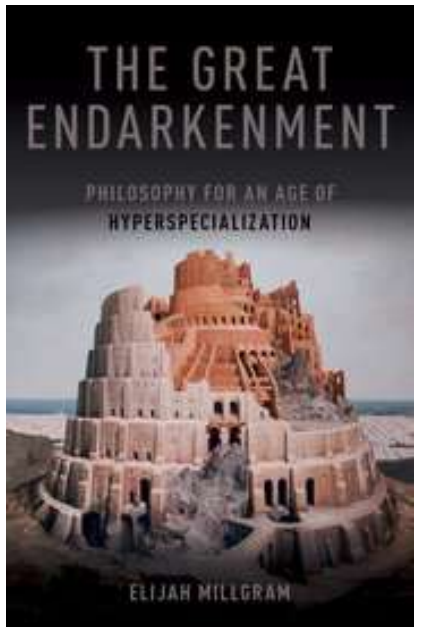
de Solla Price, D.J., 1963, Little science big science, Columbia University Press.

~2.2 million articles a year (2016) over ~30,000 journals

https://www.aje.com/en/arc/scholarly-publishing-trends-2016/

http://blogs.nature.com/news/2014/05/global-scientific-output-doubles-every-nine-years.html

Derek de Solla Price ←→ Elijah Millgram



The Great Endarkenment.
Philosophy for an Age of Hyperspecialization
By Elijah Millgram

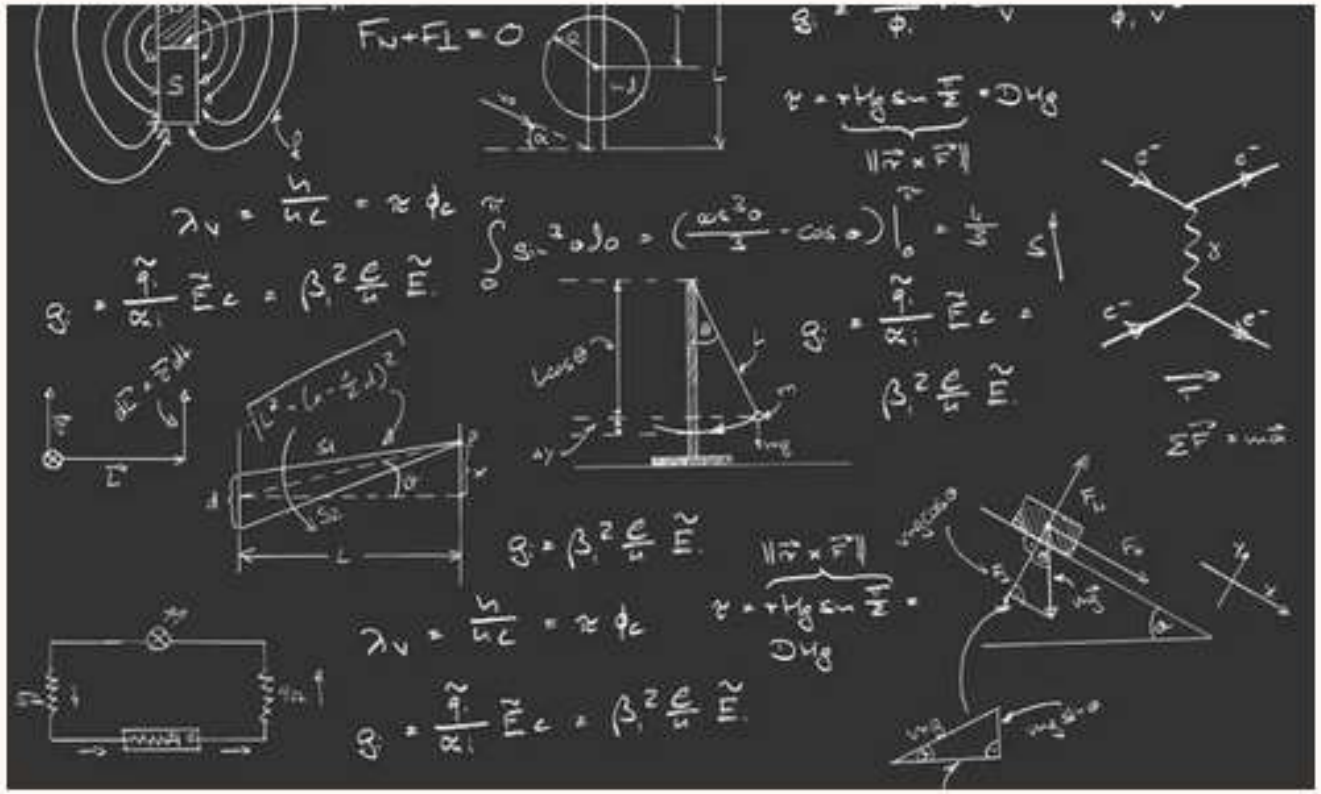
Describes a world in which all knowledge and products are the result of some form of extremely specialized expertise, and in which expertise is itself highly circumscribed, since experts depend in turn on other experts whose knowledge claims and styles of argumentation cannot be exported from one discipline to the next. ➔ “serial hyperspecializers” (p. 26)
Experts thus become “logical aliens” (p. 32)

Science from ‘Gemeinschaft’ to ‘Gesellschaft’, for Jerome R. Ravetz

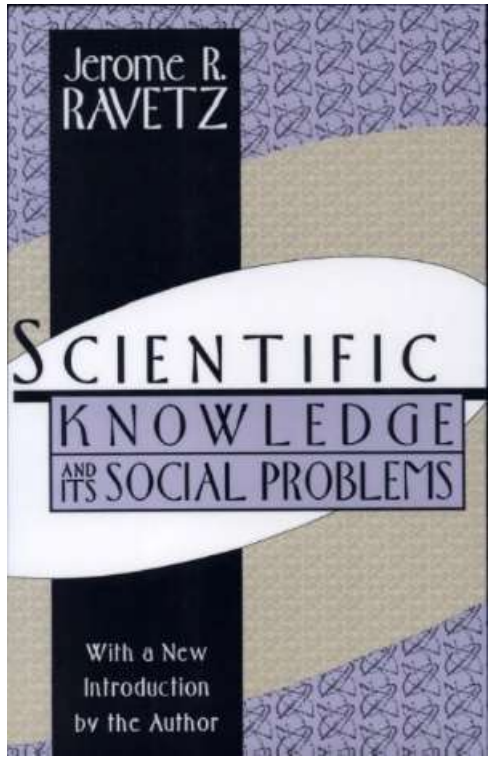
https://www.theguardian.com/science/political-science/2016/jun/08/how-should-we-treat-sciences-growing-pains

How should we treat science's growing pains?

Jerome Ravetz has been one of the UK's foremost philosophers of science for more than 50 years. Here, he reflects on the troubles facing contemporary science. He argues that the roots of science's crisis have been ignored for too long. Quality control has failed to keep pace with the growth of science.



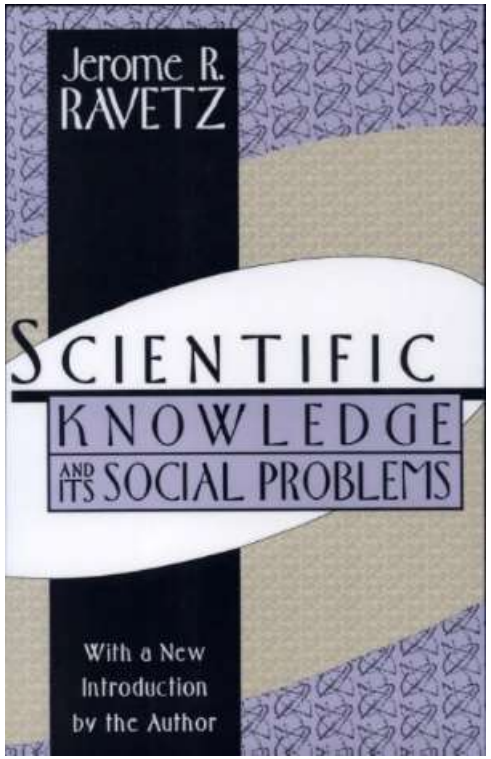
Two separate factors are necessary for the achievement of worthwhile scientific results: a community of scholars with a shared knowledge of the standards of quality appropriate for their work and a shared commitment to enforce those standards by the informal sanctions the community possesses; and individuals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



Jerome R. Ravetz

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

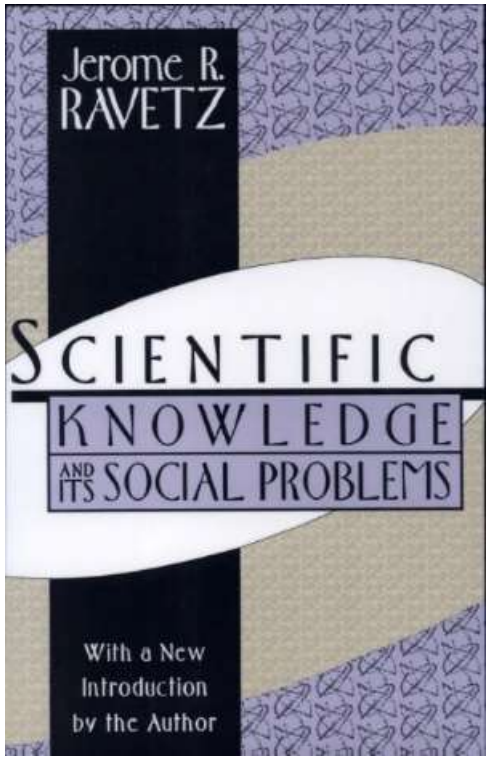
p.22: [...] The problem of quality control in science is at the centre of the social problems of the industrialized science of the present period."



Jerome R. Ravetz

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

“If [science] 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”



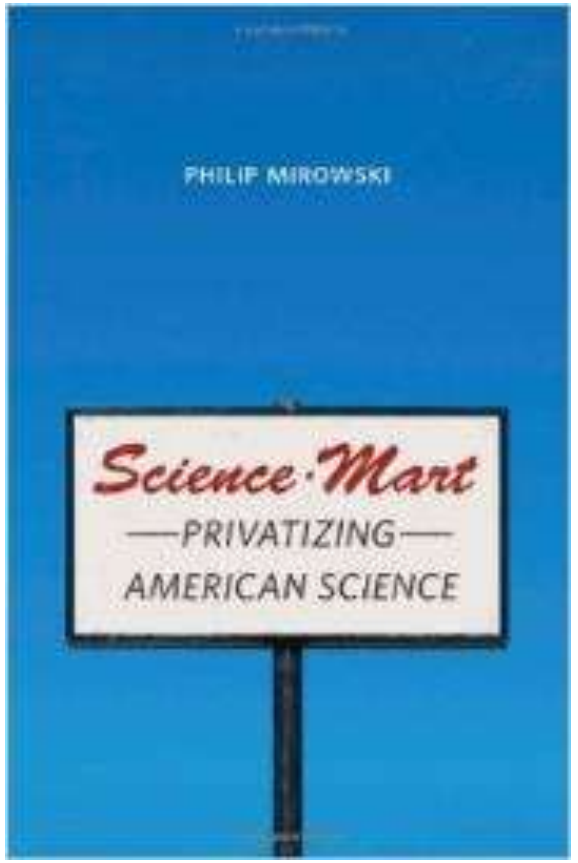
Jerome R. Ravetz

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

… neoliberal ideologies lead to decreasing state funding of science, which becomes privatized … knowledge as a monetized commodity replaces knowledge as a public good ➔ collapse of quality

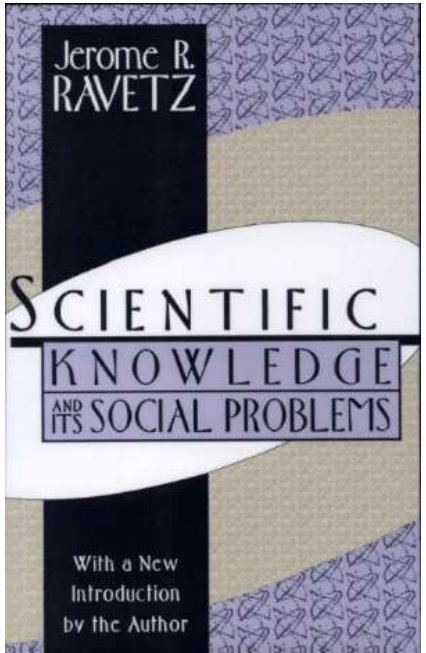
Philip Mirowski

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



p. 179. For it is possible for a field to be diseased [...] reforming a diseased field is a task of great delicacy [...] not even an apparatus of institutional structures can do anything to maintain or restore the health of a field **in the absence of an essential ethical element operating through the interpersonal channel of communication.**

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



Jerome R. Ravetz

PLOS | MEDICINE

Brow

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ESSAY

June 21, 2017

Why Most Clinical Research Is Not Useful

John P. A. Ioannidis

Published: June 21, 2016 • https://doi.org/10.1371/journal.pmed.1002049

THE ECONOMIC JOURNAL

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

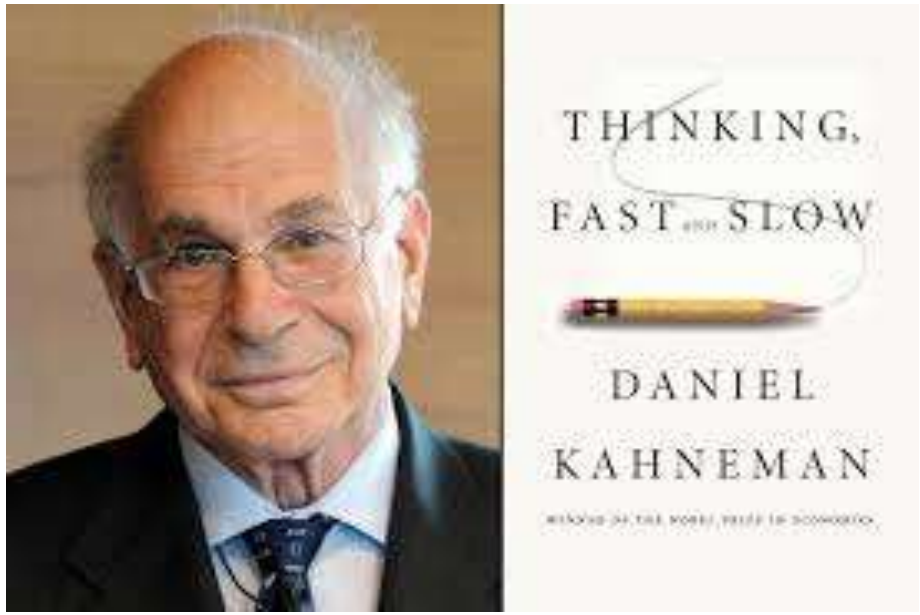
THE POWER OF BIAS IN ECONOMICS RESEARCH*

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

October 27, 2017

Rather than isolated instances of corruption now entire fields of research are found diseased

Reconstruction of a Train Wreck: How Priming Research Went off the Rails



"[…]questions have been raised about the robustness of priming results … your field is now the poster child for doubts about the integrity of psychological research…"

https://replicationindex.wordpress.com/2017/02/02/reconstruction-of-a-train-wreck-how-priming-research-went-of-the-rails/comment-page-1/

An existential crisis?

Most observers have noted that the crisis has technical as well as ethical and behavioural elements which interact with one another – e.g. the 'publish or perish' obsession has an impact on selection bias – the tendency to favour positive over negative results

Bad science reproduces better than the good sort

ROYAL SOCIETY OPEN SCIENCE

rsos.royalsocietypublishing.org

Research

Cite this article: Smaldino PE, McElreath R. 2016 The natural selection of bad science. *R. Soc. open sci.* **3**: 160384.
http://dx.doi.org/10.1098/rsos.160384

Received: 1 June 2016
Accepted: 17 August 2016

The natural selection of bad science

Paul E. Smaldino[1] and Richard McElreath[2]

[1]Cognitive and Information Sciences, University of California, Merced, CA 95343, USA
[2]Department of Human Behavior, Ecology, and Culture, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany

PES, 0000-0002-7133-5620; RME, 0000-0002-0387-5377

Poor research design and data analysis encourage false-positive findings. Such poor methods persist despite perennial calls for improvement, suggesting that they result from something more than just misunderstanding. The persistence of poor methods results partly from incentives that favour them, leading to the natural selection of bad science. This dynamic requires no conscious strategizing—no deliberate cheating nor loafing—by scientists, only that publication is a principal factor for

As in the real world, successful labs produce more 'progeny,' such that their methods are more often copied and their students are more likely to start labs of their own. Selection for high output leads to poorer methods and increasingly high false discovery rates. Improving the quality of research requires change at the institutional level.

Smaldino PE, McElreath R., 2016 The natural selection of bad science. R. Soc. open sci. 3: 160384. http://dx.doi.org/10.1098/rsos.160384

Bad science is ‘sticky’

ECOSPHERE
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Article | Open Access

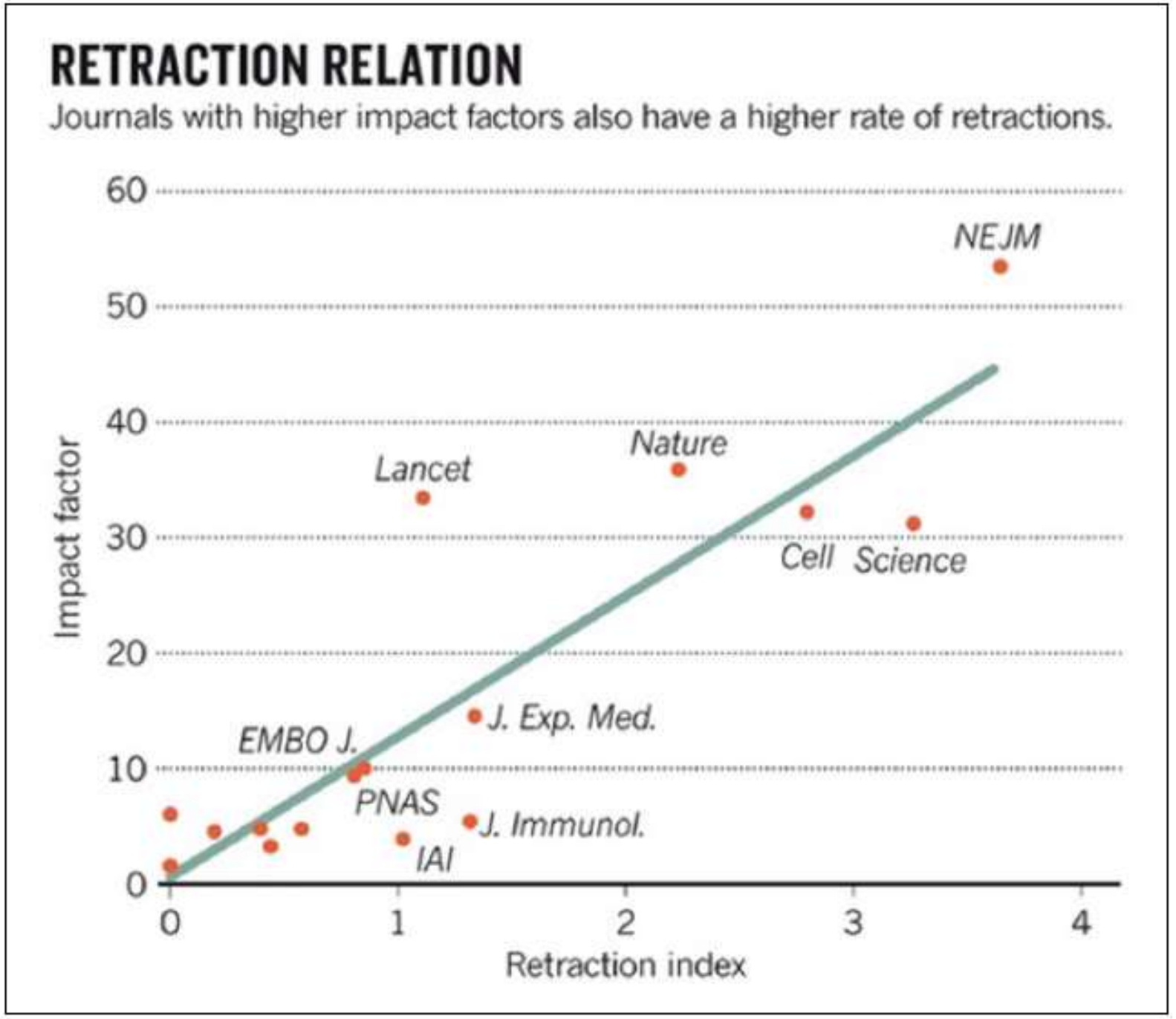
Do rebuttals affect future science?

Jeannette A. Banobi, Trevor A. Branch, Ray Hilborn

First published: 30 March 2011 | https://doi.org/10.1890/ES10-00142.1 | Cited by: 13

"We examined seven high-profile original articles and their rebuttals, finding that original articles were cited 17 times more than rebuttals, and that annual citation numbers were unaffected by rebuttals"

Bad science in bad journals?



Fang FC, Casadevall A and Morrison R (2011) Retracted science and the retraction index. *Infection and Immunity* 79(10): 3855–3859

Retraction Watch

April 20, 2017

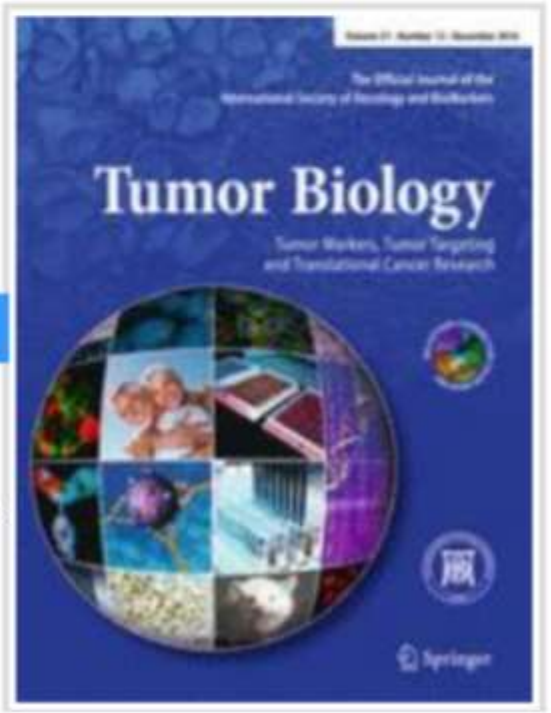
Tracking retractions as a

A new record: Major publisher retracting more than 100 studies from cancer journal over fake peer reviews

with 11 comments

Springer is retracting 107 papers from one journal after discovering they had been accepted with fake peer reviews. Yes, 107.

To submit a fake review, someone (often the author of a paper) either makes up an outside expert to review the paper, or suggests a real researcher — and in both cases, provides a fake email address that comes back to someone who will invariably give the paper a glowing review. In this case, Springer, the publisher of *Tumor Biology* through 2016, told us that an investigation produced "clear evidence" the reviews were submitted under the names of real researchers with faked emails. Some of the authors may have used a third-party editing service, which may have supplied the reviews. The journal is now published by SAGE.



Unintended effects of reforms

Good intentions going bad

TABLE 1. GROWING PERVERSE INCENTIVES IN ACADEMIA

Incentive	*Intended effect*	*Actual effect*
"Researchers rewarded for increased number of publications."	"Improve research productivity," provide a means of evaluating performance.	"Avalanche of" substandard, "incremental papers"; poor methods and increase in false discovery rates leading to a "natural selection of bad science" (Smaldino and Mcelreath, 2016); reduced quality of peer review
"Researchers rewarded for increased number of citations."	Reward quality work that influences others.	Extended reference lists to inflate citations; reviewers request citation of their work through peer review
"Researchers rewarded for increased grant funding."	"Ensure that research programs are funded, promote growth, generate overhead."	Increased time writing proposals and less time gathering and thinking about data. Overselling positive results and downplay of negative results.
Increase PhD student productivity	Higher school ranking and more prestige of program.	Lower standards and create oversupply of PhDs. Postdocs often required for entry-level academic positions, and PhDs hired for work MS students used to do.
Reduced teaching load for research-active faculty	Necessary to pursue additional competitive grants.	Increased demand for untenured, adjunct faculty to teach classes.
"Teachers rewarded for increased student evaluation scores."	"Improved accountability; ensure customer satisfaction."	Reduced course work, grade inflation.
"Teachers rewarded for increased student test scores."	"Improve teacher effectiveness."	"Teaching to the tests; emphasis on short-term learning."
"Departments rewarded for increasing U.S. News ranking."	"Stronger departments."	Extensive efforts to reverse engineer, game, and cheat rankings.
"Departments rewarded for increasing numbers of BS, MS, and PhD degrees granted."	"Promote efficiency; stop students from being trapped in degree programs; impress the state legislature."	"Class sizes increase; entrance requirements" decrease; reduce graduation requirements.
"Departments rewarded for increasing student credit/contact hours (SCH)."	"The university's teaching mission is fulfilled."	"SCH-maximization games are played": duplication of classes, competition for service courses.

Modified from Reseh (pers. comm., 2015) with permission

Academic Research in the 21st Century: Maintaining Scientific Integrity in a Climate of Perverse Incentives and Hyper-competition, Marc A. Edwards and Siddhartha Roy, ENVIRONMENTAL ENGINEERING SCIENCE, 34(1), 2017

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Academic Research in the 21st Century: Maintaining Scientific Integrity in a Climate of Perverse Incentives and Hyper-competition, Marc A. Edwards and Siddhartha Roy, ENVIRONMENTAL ENGINEERING SCIENCE, 34(1), 2017

Incentive	
"Researchers rewarded for increased number of citations."	*Actual effect*
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Reward quality work that influences others.	

Academic Research in the 21st Century: Maintaining Scientific Integrity in a Climate of Perverse Incentives and Hyper-competition, Marc A. Edwards and Siddhartha Roy, ENVIRONMENTAL ENGINEERING SCIENCE, 34(1), 2017

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Intended effect	
"Ensure that research programs are funded, promote growth, generate overhead."	

Academic Research in the 21st Century: Maintaining Scientific Integrity in a Climate of Perverse Incentives and Hyper-competition, Marc A. Edwards and Siddhartha Roy, ENVIRONMENTAL ENGINEERING SCIENCE, 34(1), 2017

Incentive	*Intended effect*	*Actual effect*
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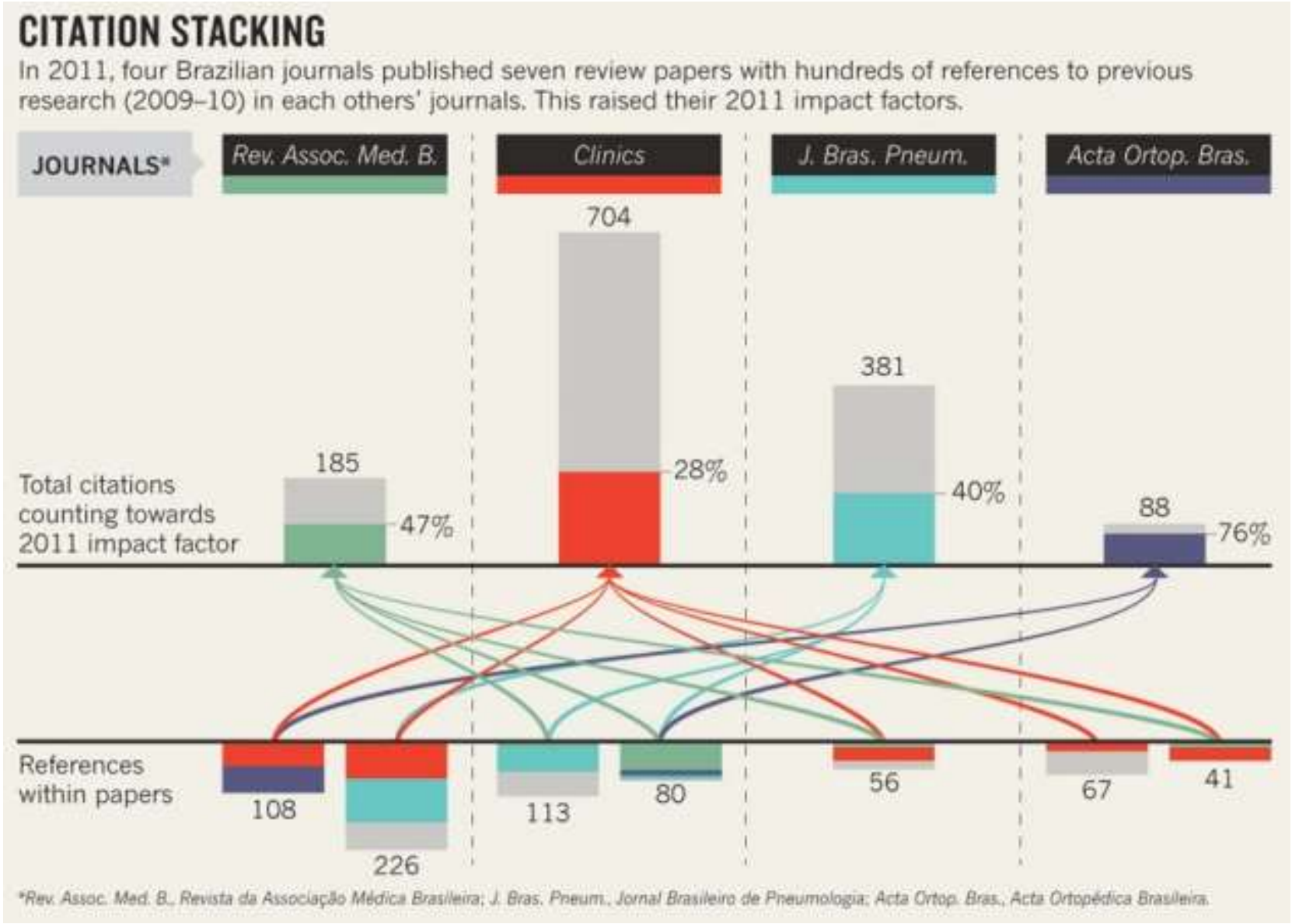
Academic Research in the 21st Century: Maintaining Scientific Integrity in a Climate of Perverse Incentives and Hyper-competition, Marc A. Edwards and Siddhartha Roy, ENVIRONMENTAL ENGINEERING SCIENCE, 34(1), 2017

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

Academic Research in the 21st Century: Maintaining Scientific Integrity in a Climate of Perverse Incentives and Hyper-competition, Marc A. Edwards and Siddhartha Roy, ENVIRONMENTAL ENGINEERING SCIENCE, 34(1), 2017

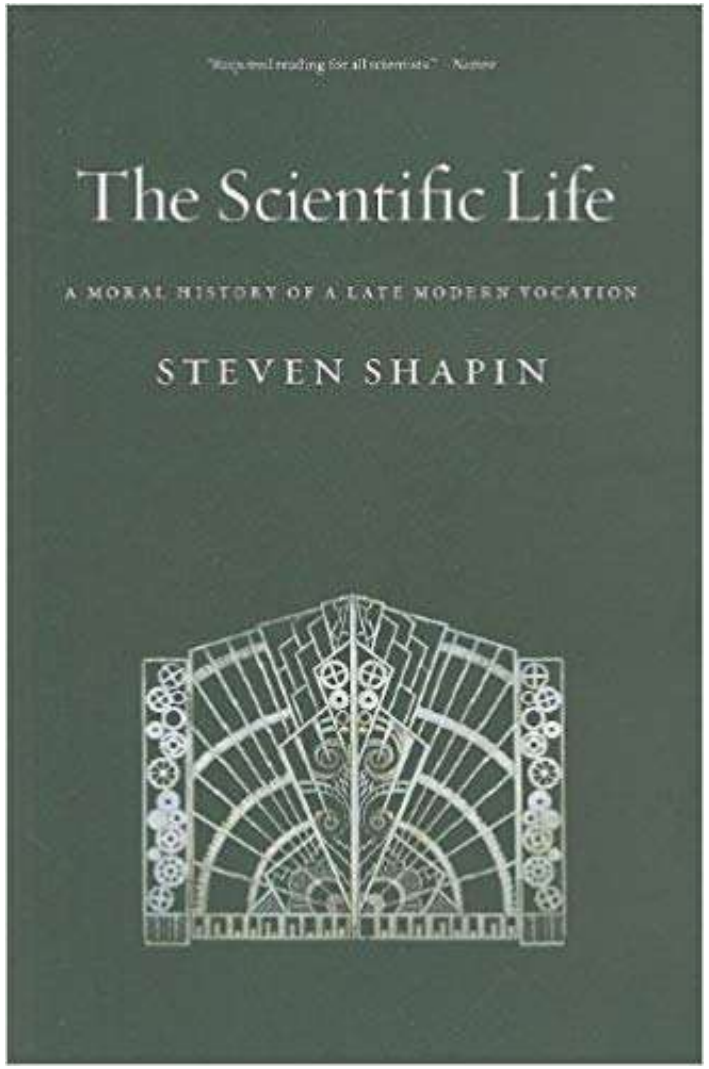
Gaming the system

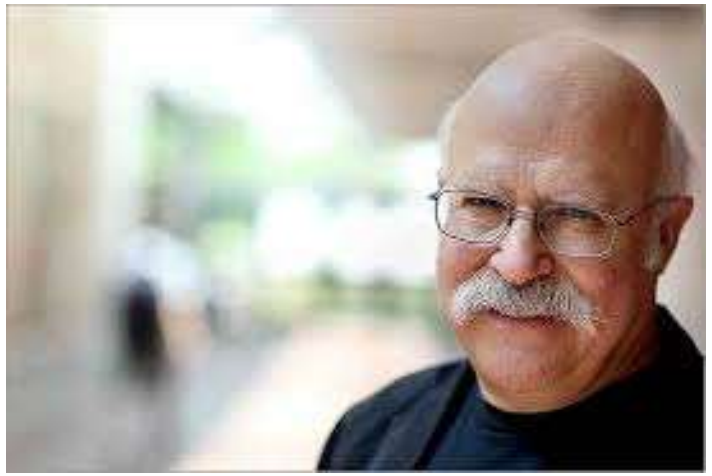
Use and abuse of metrics: from self-citation to citation cartels to citation stacking



Richard Van Noorden, 2017, Brazilian citation scheme outed. Thomson Reuters suspends journals from its rankings for 'citation stacking'. Nature, 27 August 2013

Lost ethos?



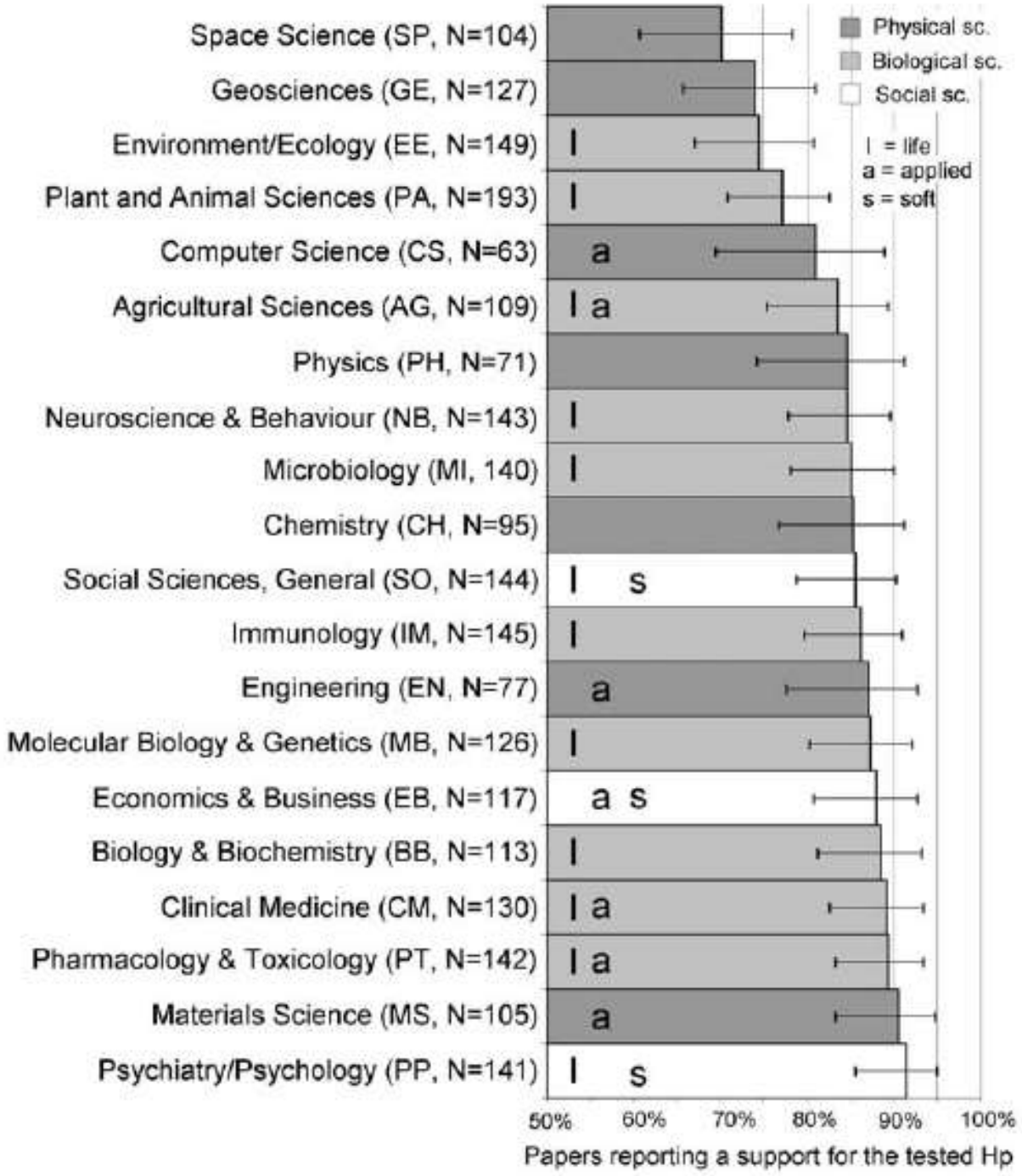


Steven Shapin

Is scientists' civility to each other what holds the venture together?

But someone disagrees: J.R. Ravetz, Morals and manners in modern science, Nature, 457(5), 662-663.

Not all disciplines the same



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PLoS one

"Positive" Results Increase Down the Hierarchy of the Sciences

Daniele Fanelli*

INNOGEN and ISSTI-Institute for the Study of Science, Technology & Innovation, The University of Edinburgh, Edinburgh, United Kingdom

"odds of reporting a positive result ~5 times higher among papers in the disciplines of Psychology and Psychiatry and Economics and Business than Space Science"

April 7, 2010

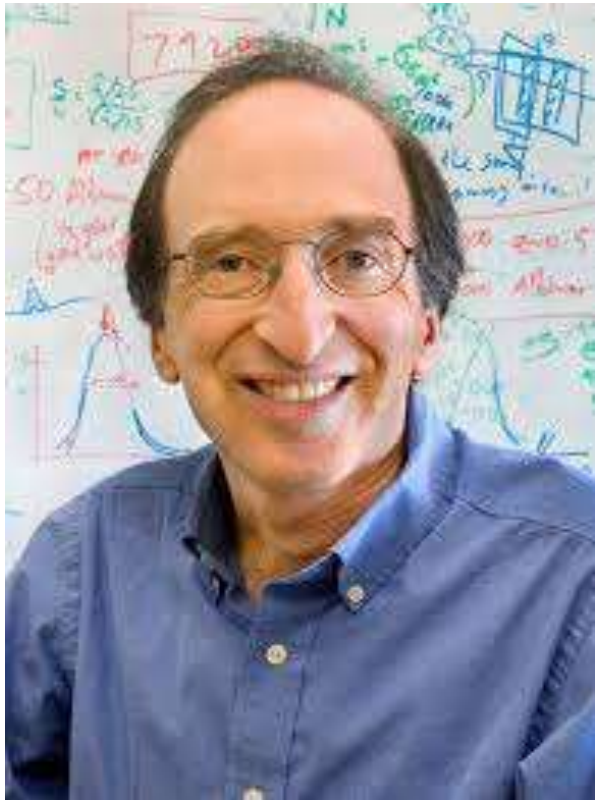
Physics as a model:

Following several high-profile errors, the particle physics community now invests great effort into intensive checking and re-checking of data prior to publication. By filtering results through independent working groups, physicists are encouraged to criticise.

R. Horton, “Offline: What is medicine’s 5 sigma?,” **Lancet**, vol. 385, p. 1380, 2015.

Saul Perlmutter, an astrophysicist at the University of California, Berkeley.

"Science is an ongoing race between our inventing ways to fool ourselves, and our inventing ways to avoid fooling ourselves.

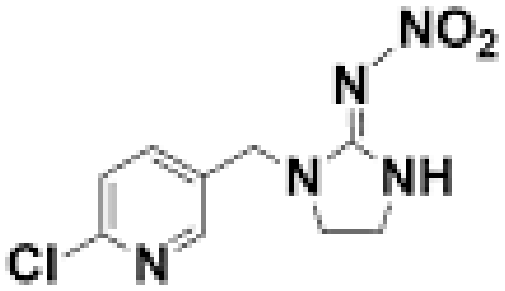


Saul Perlmutter

R. Nuzzo, "How scientists fool themselves – and how they can stop," Nature, vol. 526, no. 7572, pp. 182–185, Oct. 2015.

More ethical doubts: what is science? who is a scientist?

Can science be shoddy, entrepreneurial, reckless, or dirty?



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

Rogie scientists?

Cambridge Analytica and Facebook: The Scandal and the Fallout So Far

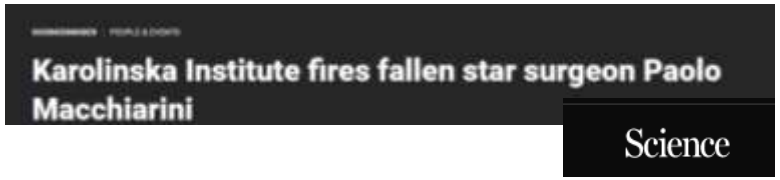
By Nicholas Confessore

April 4, 2018

The New York Times

Aleksandr Kogan

Paolo Macchiarini, Rick Mishkin



https://www.youtube.com/watch?v=8lHvTKzfu8Q

Clip from Inside Job, the movie

Does history repeat itself?

(Love canal, Flint…)

Lois Gibbs

Marc Edwards

http://www.andreasaltelli.eu/file/repository/LOVE_CANAL.pdf
https://en.wikipedia.org/wiki/Flint_water_crisis; http://flintwaterstudy.org/;
http://www.nytimes.com/2016/08/21/magazine/flints-water-crisis-and-the-troublemaker-scientist.html

Different cultures, different reactions

Yoshiki Sasai 1962 – 2014

http://www.nature.com/news/stem-cell-pioneer-blamed-media-bashing-in-suicide-note-1.15715

Different cultures, different reactions

Aaron Swartz, 1986 - 2013

https://www.rollingstone.com/culture/news/the-brilliant-life-and-tragic-death-of-aaron-swartz-20130215

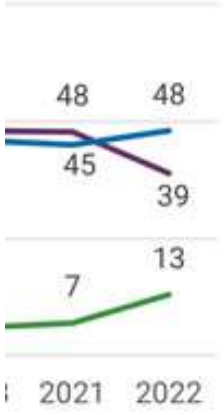
Where are we now?

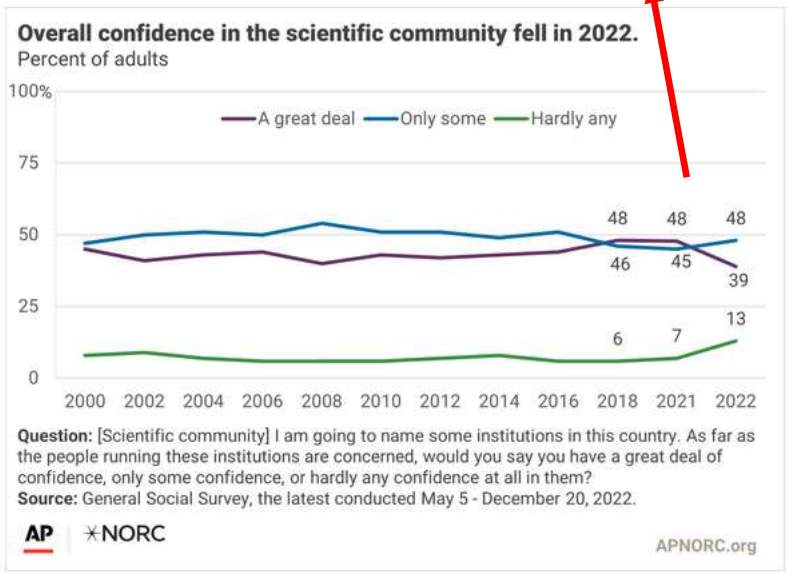
"Science, which should have been the wind of truth to clear the air, has polluted the air, helped to bra[illegible] provided wea[illegible]

Paul Goodman

Do we live after COVID a similar dissatisfaction with science?

Paul Goodman, 1970, New Reformation, Notes of a Neolithic Conservative, PM press (2010 Edition)





AP | NORC at the University of Chicago

SCIENCE AND TECHNOLOGY

Major declines in the public's confidence in science in the wake of the pandemic.

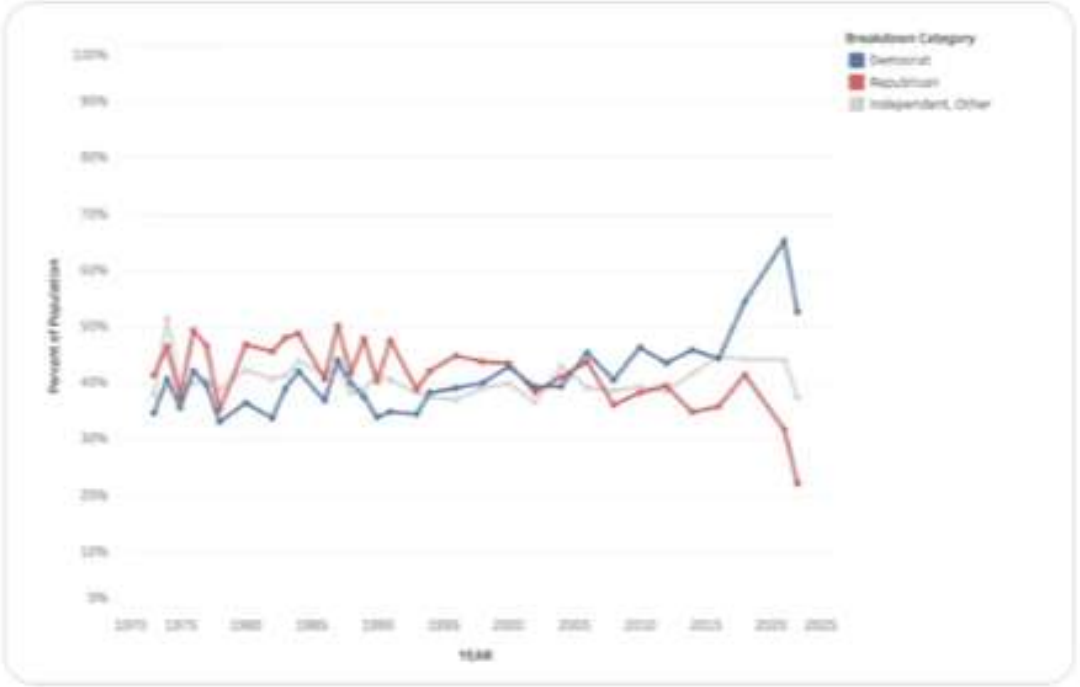
Half as many Republicans were confident in the scientific community compared to pre-pandemic levels. And bolstered support from Democrats during the pandemic eroded to pre-pandemic levels, based on an analysis of GSS data. Confidence in other institutions like education, business, journalism, and religion also slipped.

une 15, 2023

← Post

Paul Krugman
@paulkrugman

Utility tweet: polarization in trust in scientific community, from GSS



12:54 pm · 7 Aug 2023 · **126.4K** Views

73 Reposts **9** Quotes **324** Likes **9** Bookmarks

In the US this is seen through the lenses of the democrats – republicans divide … but is this the main story?

“Radically different responses to the disease from nation to nation—from draconian lockdowns across all sectors, to relatively permissive and flexible pandemic regimes—made obvious to all that the value of scientific evidence was to support what was politically desirable and possible in different contexts.

Rather than politics following the science, science was enlisted to follow the politics”

COMMENTARY | Open Access

What did COVID-19 really teach us about science, evidence and society?

Andrea Saltelli, Joachim P. Sturmberg, Daniel Sarewitz, John P. A. Ioannidis

First published: 06 June 2023 | https://doi.org/10.1111/jep.13876

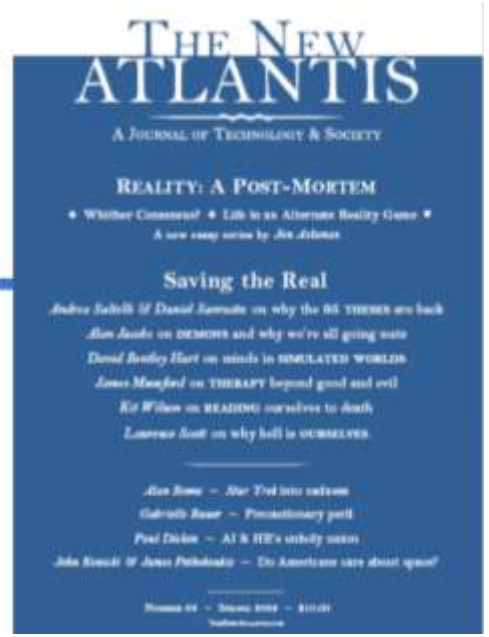
We live an acceleration in the transition from a regime of epistemic monopoly away from science…

Reformation in the Church of Science

Andrea Saltelli
JRC Science Summit, Ispra, June 13, 2022

BARCELONA SCHOOL OF MANAGEMENT

From: Reformation in the Church of Science. How the truth monopoly was broken up



… as it was away from church during Reformation

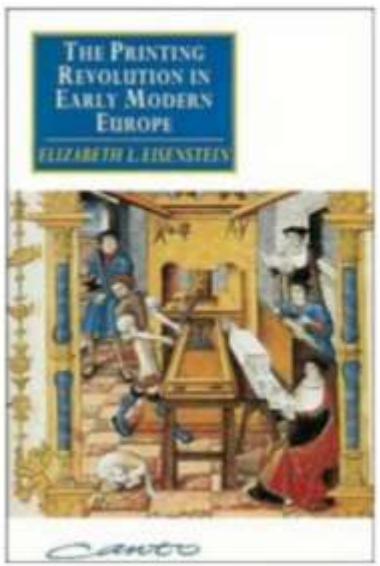
We know from history that what seemed to be stable regimes of truth may collapse, and be replaced

The Last Judgment (Fra Angelico, c. 1425-1430, San Marco, Florence)

XV-XVI century: the beginning of fake news?

The public hanging of witches in Scotland. Coloured engraving, 1678. Illustration: The Granger Collection/Alamy

More witches were killed in this period than in any other in history

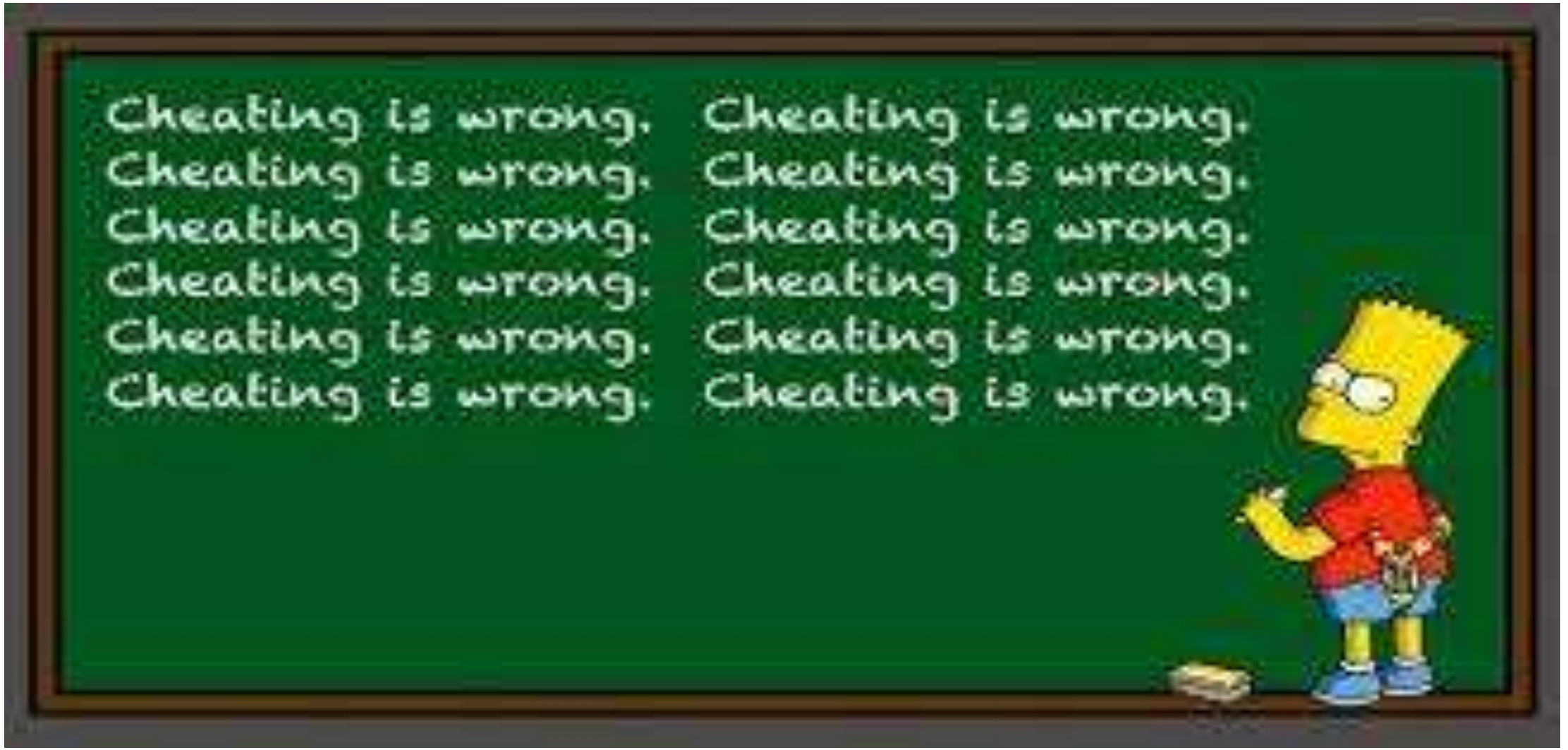


The printing revolution (initiated c. 1439):

- Millions of books are printed in a few years, from treatises of demonology to translations of bibles.

- The printing press permits religion, music and pornography to roam free

The path is open to Luther's theses (1517), to reformation, religious wars, eventually to the birth of the nation state



Source: The Simpsons, Twentieth Century Fox Film Corporation

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