

Biases in the Knowledge System – from Academia to the Public and Back

Yonatan Dubi

Department of Chemistry

jdubi@bgu.ac.il



Ben-Gurion University
of the Negev



A Quick update on the situation in Israel

- On the 7/10/23, Hamas carried out a brutal attack against civilians, with well documented crimes against humanity, with atrocities only seen before on the eastern front during WW2, taking hostage more than 200 people, among them documented 40 children and infants (their status unknown to date).
- Israel has no option but to eliminate Hamas in a de-Nazification campaign. The war will end only when Hamas is no more, and its leaders and commanders either dead or brought to trial.
- The IDF has the world's best and documented record in preventing civilian casualties, as inspected by NATO. We will continue this policy.
- Yet, as US president Biden acknowledged – there are casualties in war. The best way to avoid unnecessary casualties is demand that Hamas lay down their arms and surrender.

Biases in the Knowledge System – from Academia to the Public and Back

Yonatan Dubi
Department of Chemistry

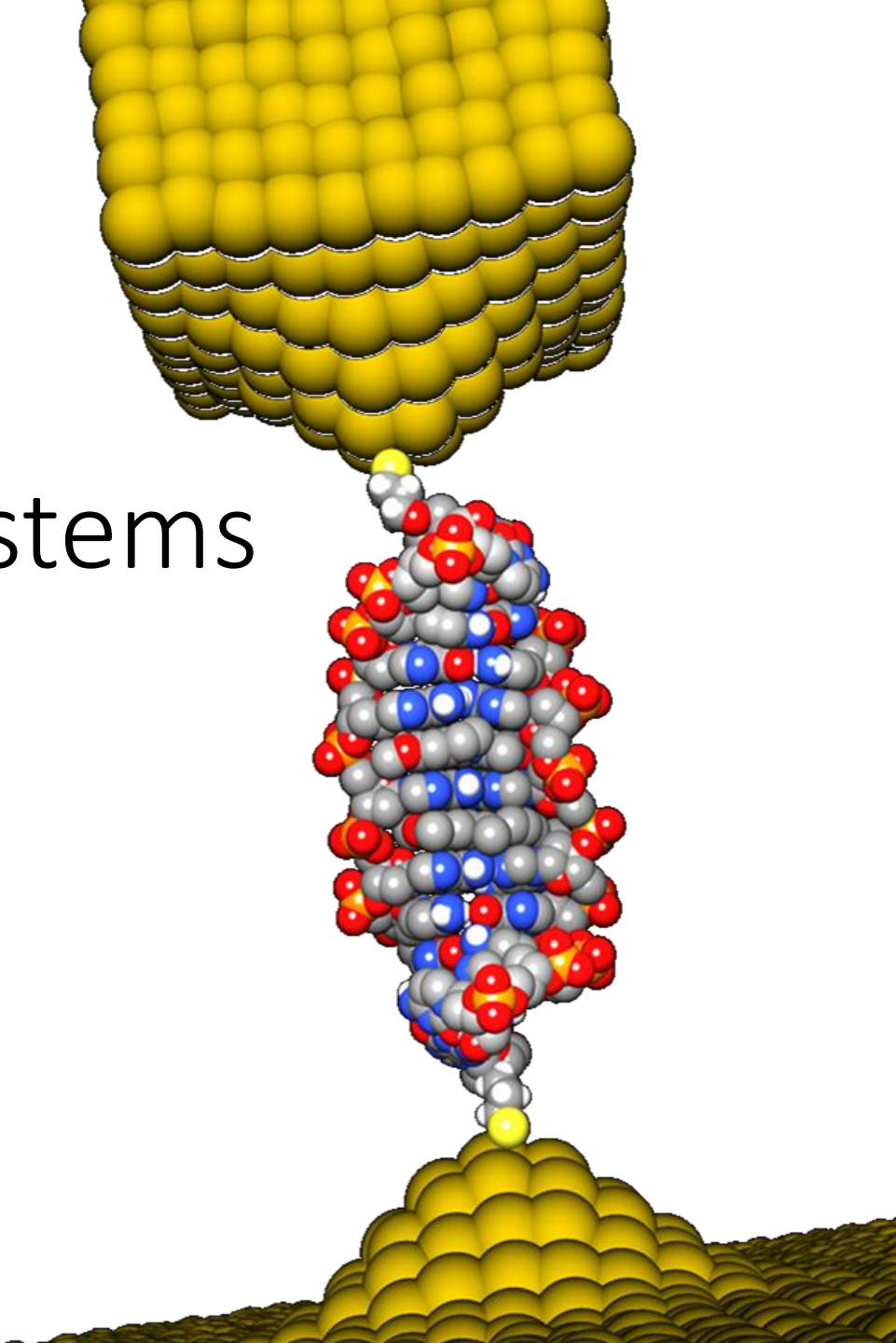
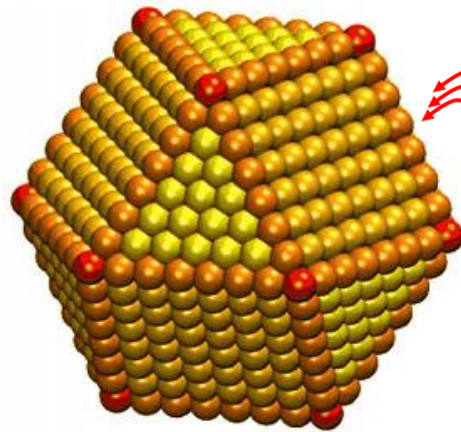
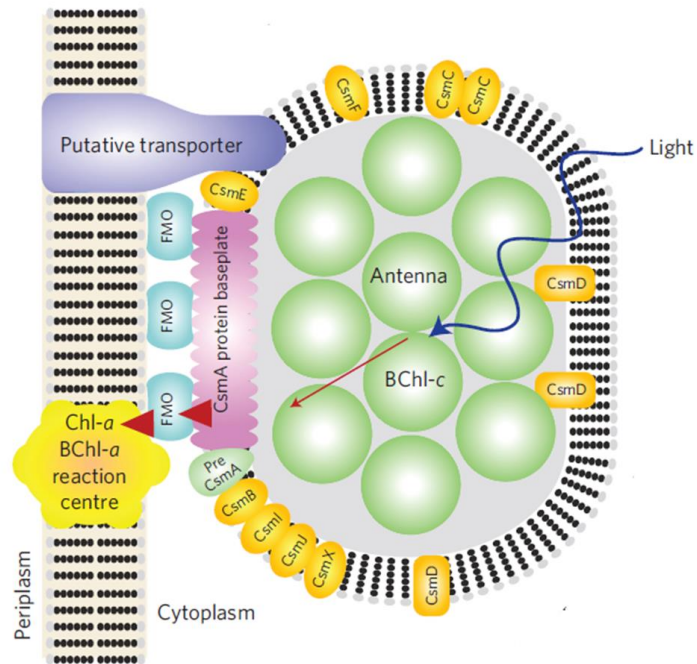


Ben-Gurion University
of the Negev



Research thrust –

Nonequilibrium Nanoscale Systems



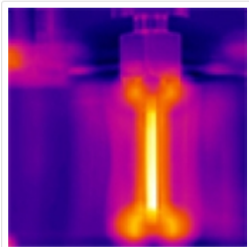
ARTICLE

Open Access

“Hot” electrons in metallic nanostructures—non-thermal carriers or heating?

Yonatan Dubi¹ and Yonatan Sivan²

OSA Continuum Vol. 3, Issue 3, pp. 483-497 (2020) • <https://doi.org/10.1364/OSAC.376809>



Experimental practices required to isolate thermal effects in plasmonic photo-catalysis: lessons from recent experiments

Yonatan Sivan, Joshua H. Baraban, and Yonatan Dubi

[Author Information](#) ▾ [Find other works by these authors](#) ▾

SCIENCE ADVANCES | RESEARCH ARTICLE

BIOPHYSICS

Do photosynthetic complexes use quantum coherence to increase their efficiency? Probably not

Elinor Zerah Harush^{1,2} and Yonatan Dubi^{1,2*}

EDGE ARTICLE

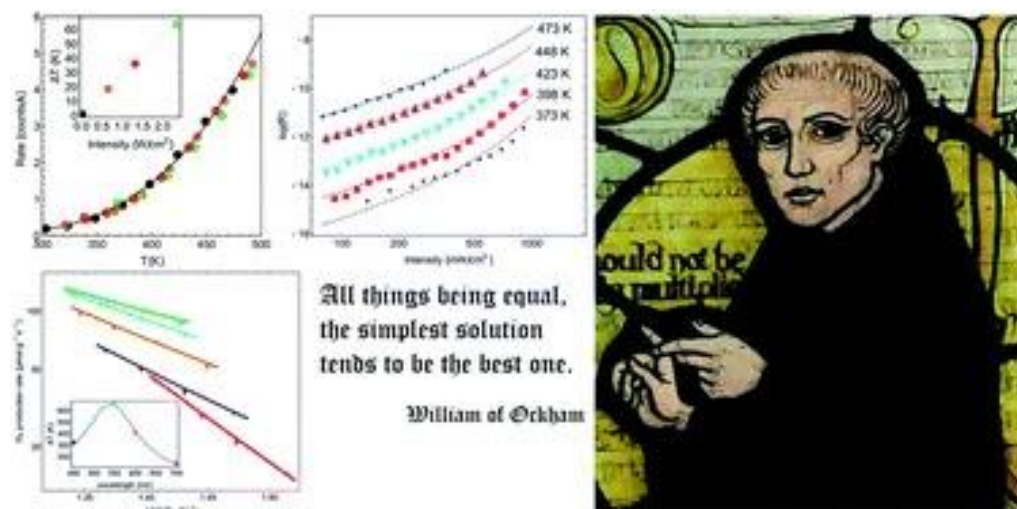
[View Article Online](#)
[View Journal](#) | [View Issue](#)

Check for updates

Cite this: *Chem. Sci.*, 2022, 13, 10878

All publication charges for this article covered by the Royal Society of Chemistry. Yonatan Dubi *ab

Spinterface chirality-induced spin selectivity effect in bio-molecules†





Alon Tal

December 18, 2022 at 5:57 PM · 🌐

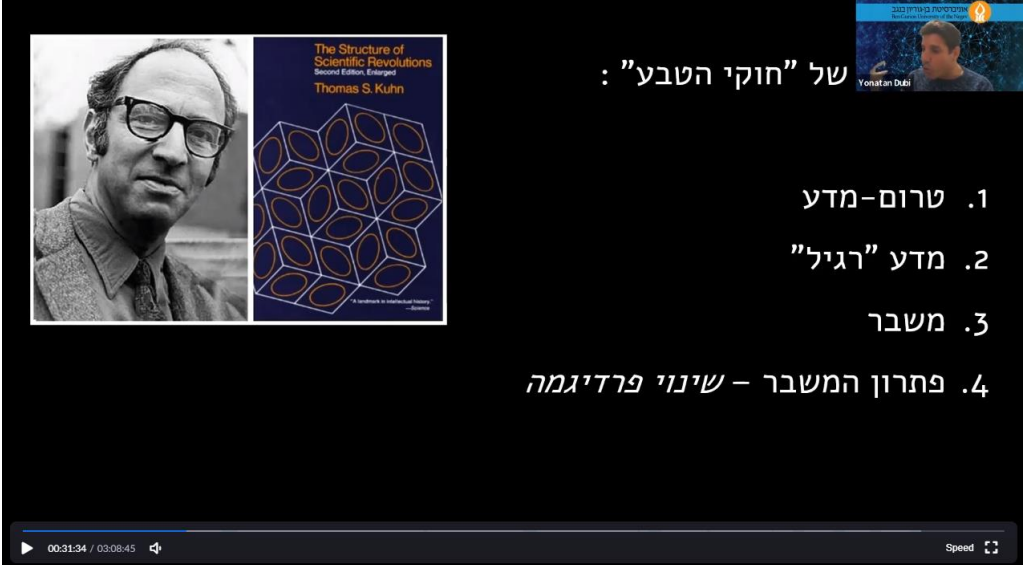
A conference about Climate Change's Impact on Nature, at Tel Hai college on Thursday -- that I'm keynoting -- has invited a climate denier to be among the speakers. Given the state of the planet, today I find this to be absolutely unacceptable: analogous to having a Holocaust denier to a conference on European Jewry during World War II. This article confirms just how marginal climate deniers are in the scientific world at present. I have suggested that to the conference organizers to "uninvite" Yonatan Dubi to the gathering. But if not, I am calling those attending to simply express their indignation and disappointment by walking out of his presentation.

Critical scientific thinking – lessons from a practitioner

Main Theme:

Scientific progress, in any discipline – from physics to psychology – is built on two seemingly contradicting elements: trust and doubt. Trust, that the knowledge gained thus far is indeed well established, and doubt – well, that new knowledge is not so well established. But where does the line cross? The tension between these two elements is constant and complicated, but the common ground is always the facts, the available data and the need for observation.

In this course we explore the tension between the two, revolving around the question of what constitutes “scientific truth”, how do we strive to gain it, and when should we be careful in claiming that the truth has been found.



של "חוקי הטבע":

1. טרום-מדע
2. מדע "רגיל"
3. משבר
4. פתרון המשבר - שינוי פרדיגמה

00:31:34 / 03:08:45 Speed



From BGU's Ethics Code:

- 1. The fundamental aim of the University is to seek, investigate and teach the truth, to promote all fields of knowledge and scholarship, to develop cultural, intellectual, creative and critical activity within the University and in the wider society that it serves.**

· seek, investigate and teach the truth

What is “the truth”?

Mathematical truth – a statement that come out of the axioms

Physical truth – a statement reflecting *observations of the world*
(Spinoza’s *Facie Naturae*)

Knowledge

How do we “know”?

1. Knowledge from the divine



2. Knowledge from authority

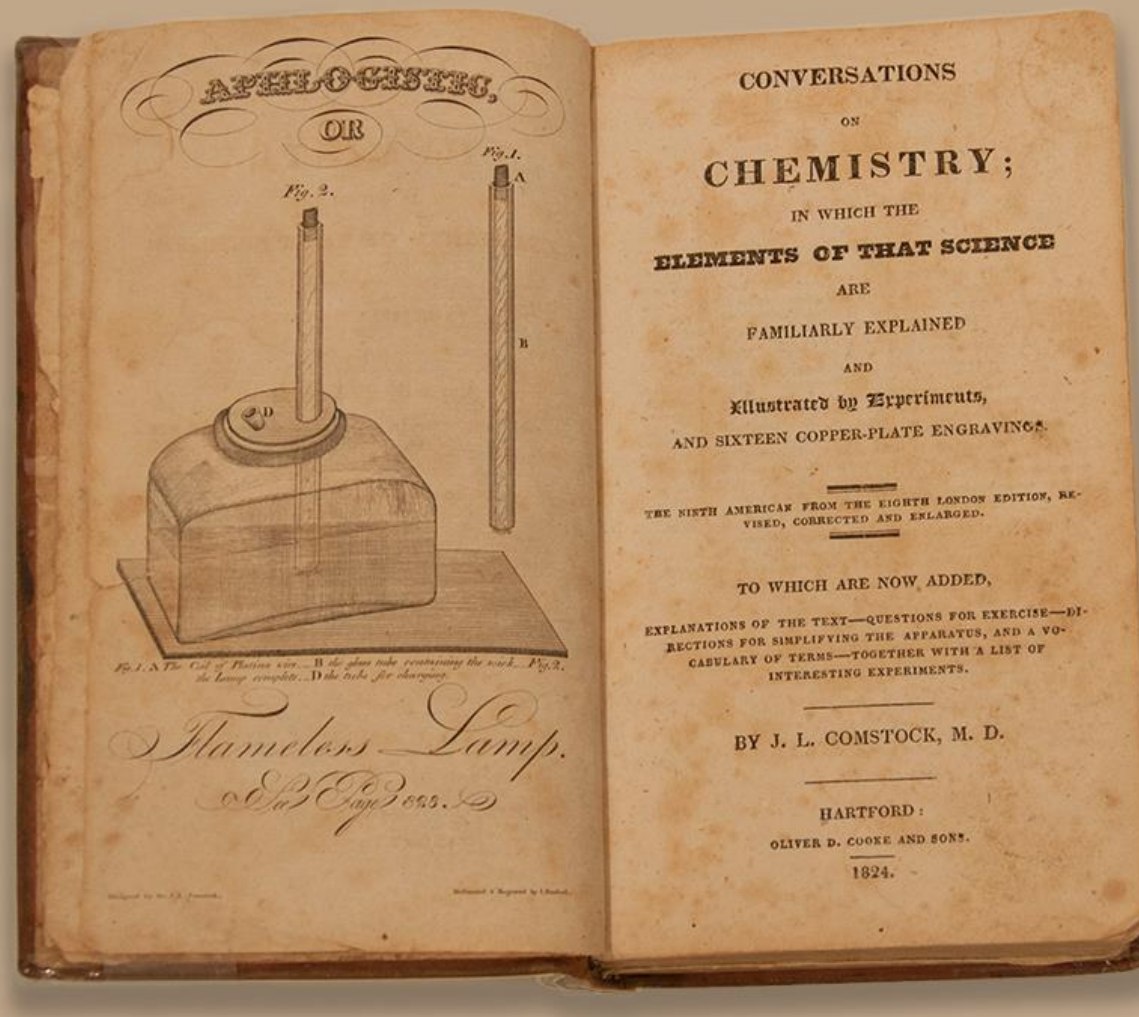


3. Knowledge from *observation*



Do not suppose that I was a very deep thinker, or was marked as a precocious person.

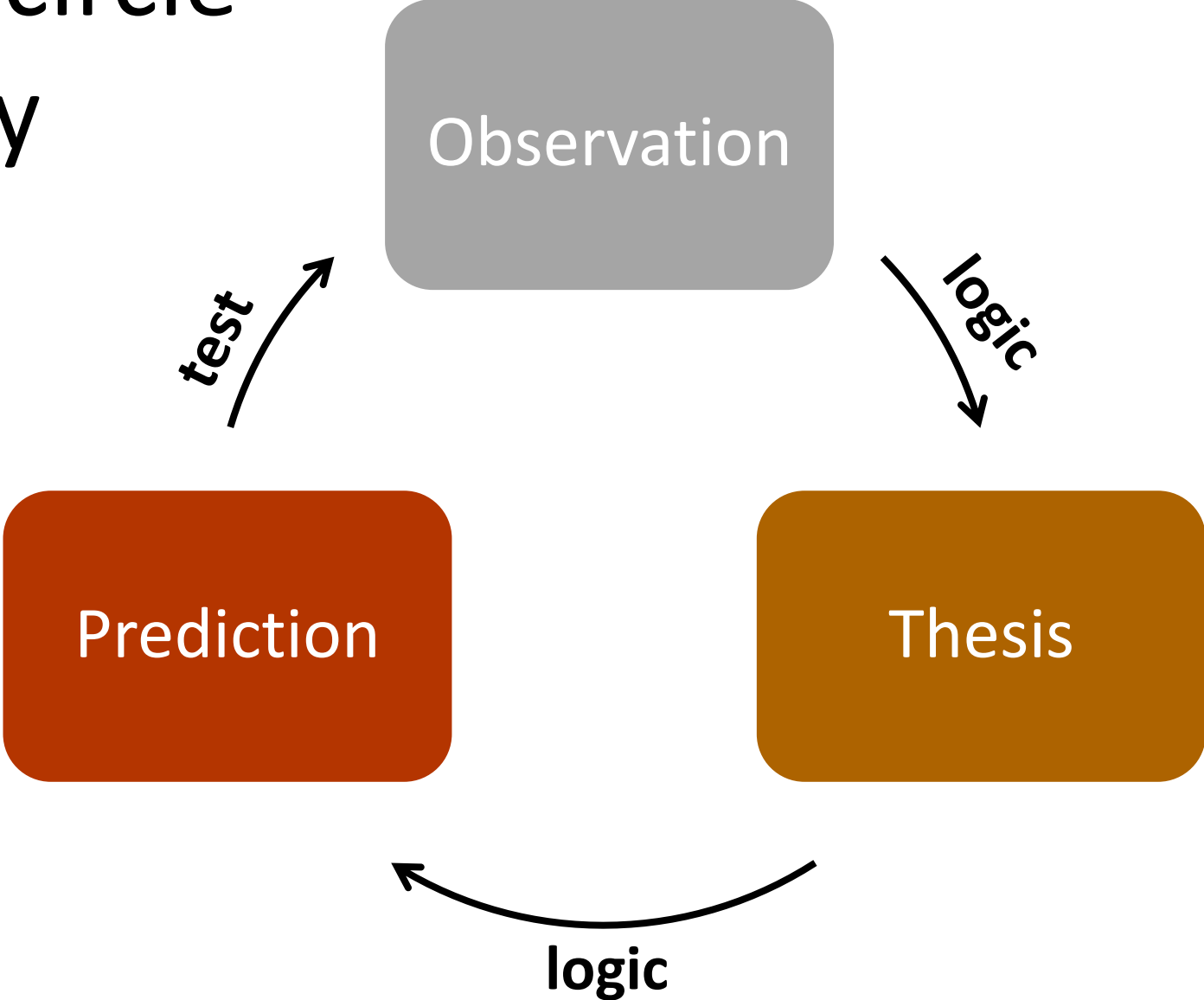
I was a very lively imaginative person, and could believe in the *Arabian Nights* as easily as in the *Encyclopaedia*. But facts were important to me, and saved me. I could trust a fact, and always cross-examined an assertion. So when I questioned Mrs. Marcet's book by such little experiments as I could find means to perform, and found it true to the facts as I could understand them, I felt that I had got hold of an anchor in chemical knowledge, and clung fast to it.



4. Knowledge from *Logic*



The never-ending circle of scientific inquiry





The Knowledge system

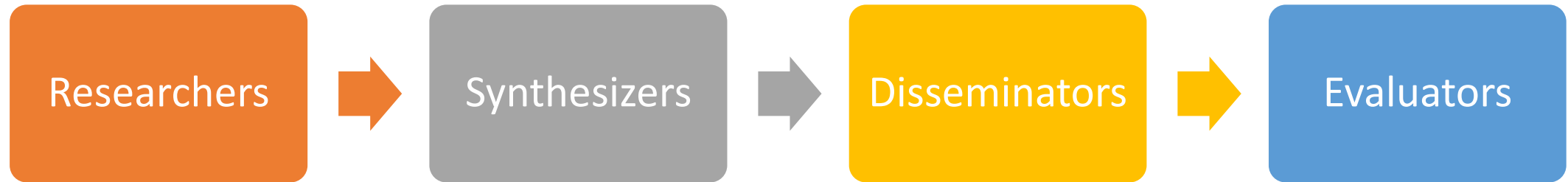


Alex Epstein

The Knowledge system (following Epstein)

- Researchers
- Synthesizers - what's important? what's valid?
- Disseminators (News outlets, Media)
- Evaluators – What to *do*?

The Knowledge system (following Epstein)



Incentives in the **Knowledge system**



Researchers

- Academic pressures (publication, promotion)
- Peer pressure (everyone wants to fit in)
- Political biases (selection bias)
- Funding
- Status

Incentives in the **Knowledge system**



Synthesizers - what's important? What's valid? (IPCC – on climate)

- Limited by the knowledge accumulated by researchers...
- Political bias
- Public attention
- Self-preservation

Incentives in the **Knowledge system**



Disseminators (News outlets, Media)

- Politics & Agenda
- Financial incentives

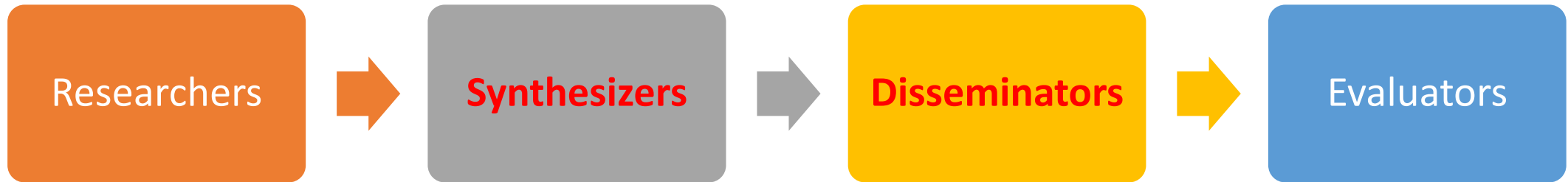
Incentives in the **Knowledge system**



Evaluators – What to do?

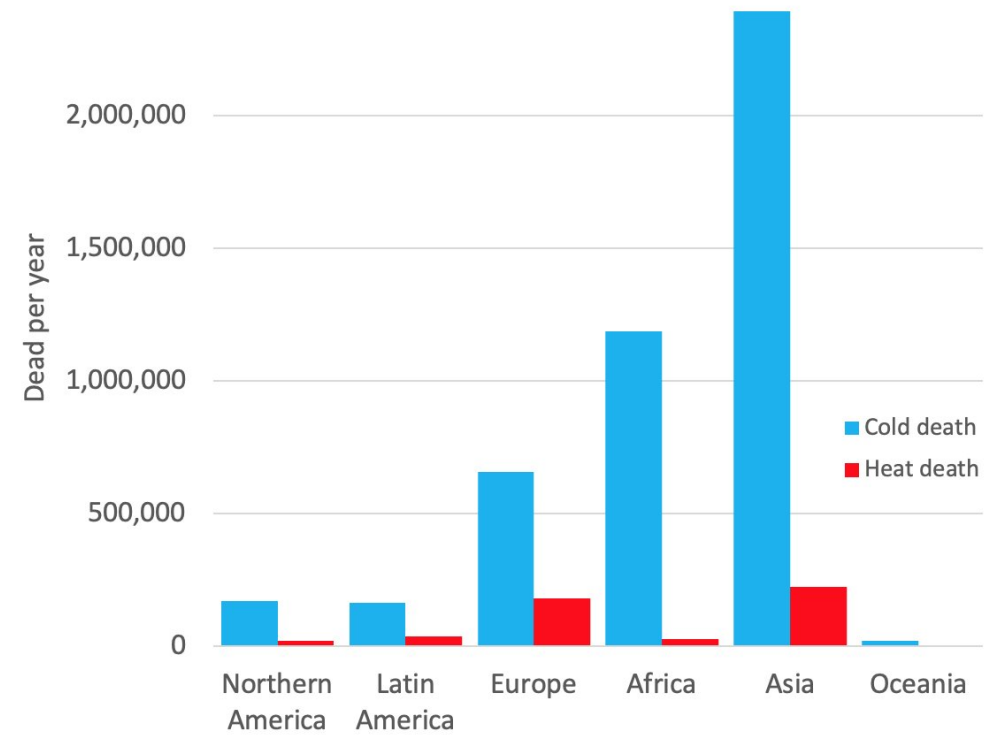
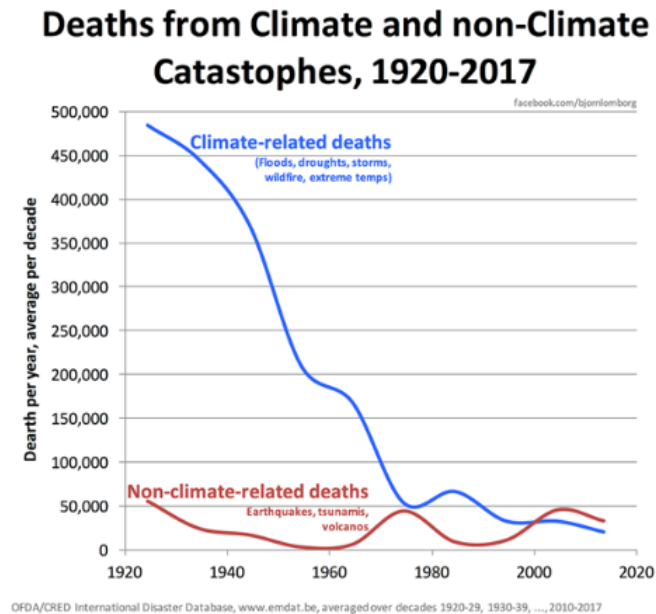
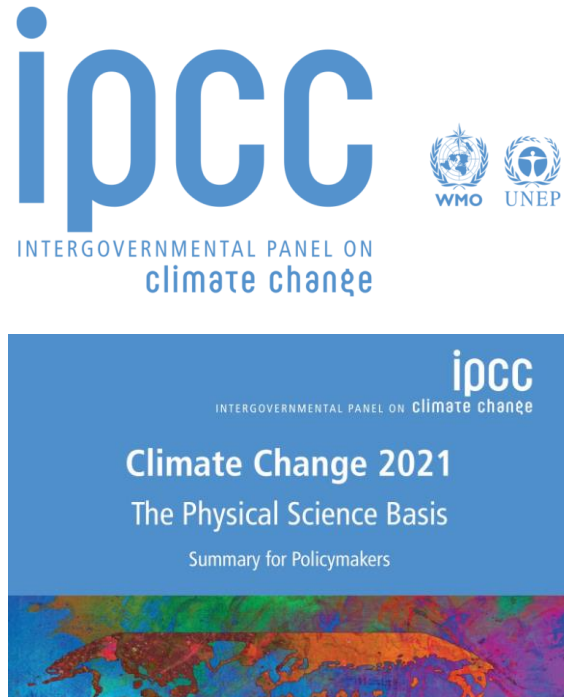
- Politics & Agenda
- Populism

The Knowledge system (following Epstein)



The Knowledge system (following Epstein)

Synthesizers - what's important? What's valid? (IPCC – on climate)



Zhao et al., The Lancet 2021

The Knowledge system (following Epstein)

- **Disseminators** (News outlets, Media)

The Knowledge system (following Epstein)

- **Disseminators** (News outlets, Media)

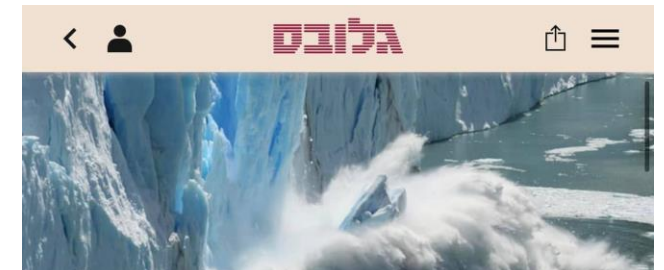


The intensification of winter mid-latitude storm tracks in the Southern Hemisphere

Rei Chemke¹, Yi Ming² and Janni Yuval³

Over the 1980–2012 period, Southern Hemisphere winter cyclones were also found to intensify in one reanalysis¹⁶. However,

Thus, not a single model is able to capture the intensification of the EKE in reanalyses (not even when including the uncertainty in the mean reanalyses trend²⁴; black bar). Not only is this models–reanalyses discrepancy evident over the entire 1979–2018 period, but also reanalyses show larger 10, 20 and 30 yr trends over the 1979–2018 period (Extended Data Fig. 1).



cation of the storms. Interestingly, the recent weakening of summer storms in the Northern Hemisphere in reanalyses was also found to occur in climate models only by the end of the twenty-first century²¹.

climate models only by the late twenty-first century. The inability of climate models to adequately capture the storm-track intensification, which delays the detection of the intensification in models by several decades, questions the skill of climate models to accurately assess the future changes in the Southern Hemisphere extra-tropics; mid-latitude storm tracks affect the distribution of heat, precipitation and weather events (including extreme events) from low subtropical regions to the high polar regions. We reveal

צ'מקה, עורך המחקר: "מקבלי החלטות צריכים להתאים את המדיניות לשינויים המהירים בהקדם"

OPINION
GUEST ESSAY

What Is Owed to Pakistan, Now One-Third Underwater

Sept. 3, 2022



My Europe World Business Sport Green Next Travel Culture Video Programmes

News > World > Pakistan

Pakistan floods: One third of country is underwater after record-breaking monsoon



Video Ad Feedback

Never-before-seen flooding leaves one-third of Pakistan underwater

Erin Burnett Out Front



The never-before-seen, deadly flooding in Pakistan has affected 33 million people and left one-third of the country underwater. CNN's Anna Coren reports.

NEWS

Home | Israel-Gaza war | War in Ukraine | Climate | Video | World | UK | Business | Tech | Science

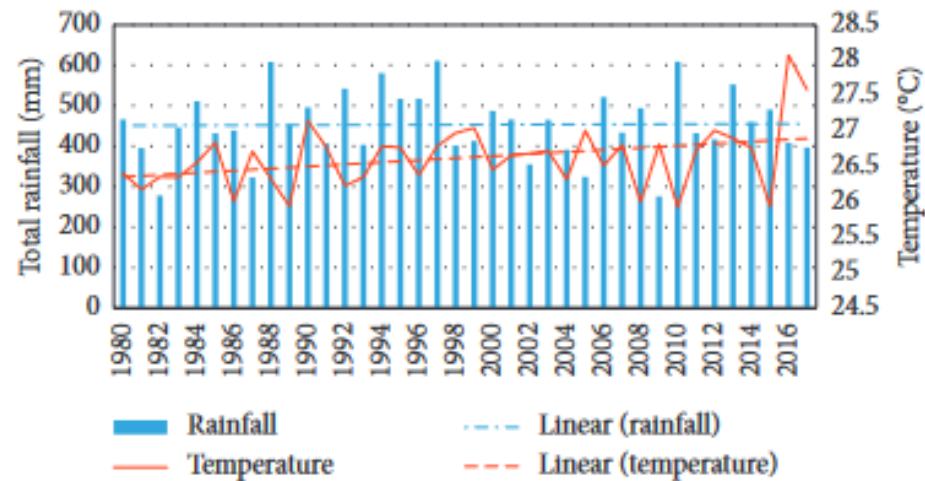
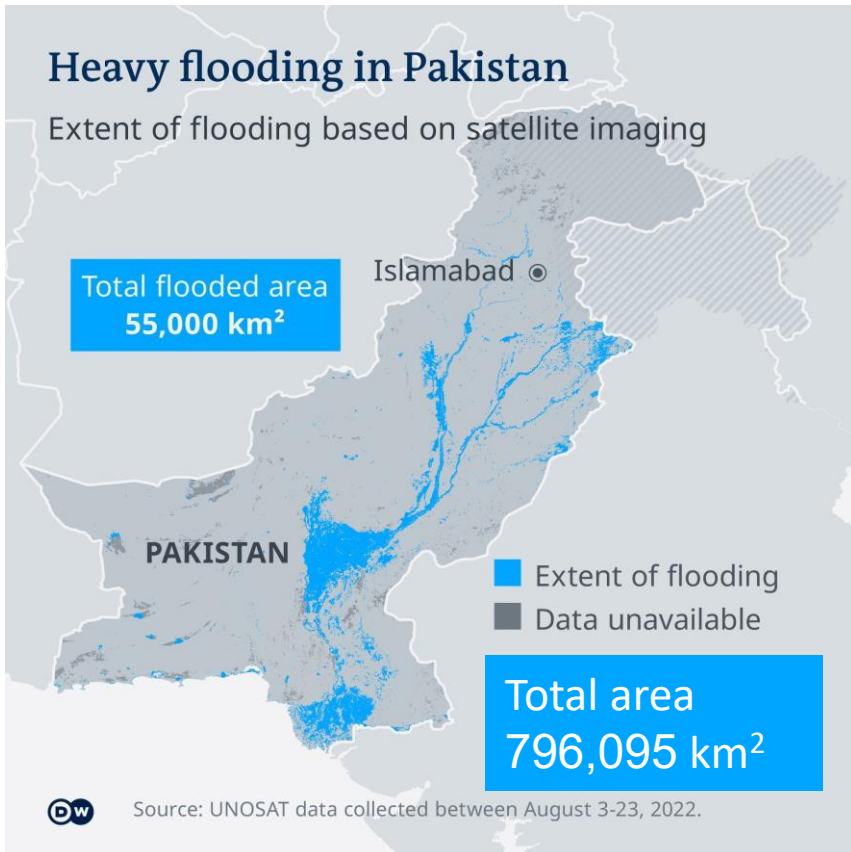
Asia | China | India

Pakistan floods: One third of country is under water - minister

30 August 2022



- Only ~6% of Pakistan was flooded (still tough)
- Monsoon rains in Pakistan has been *diminishing* in strength and flow since the 90s, well documented and studied (yet, not understood)



<https://doi.org/10.1155/2019/8281201>

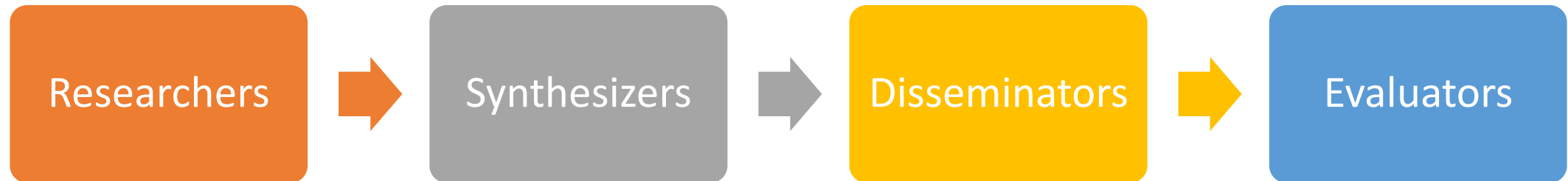
<https://agris.fao.org/agris-search/search.do?recordID=PK201600063>
 7

<https://doi.org/10.1371/journal.pone.0271626>

Two inherent flaws in the **Knowledge system**

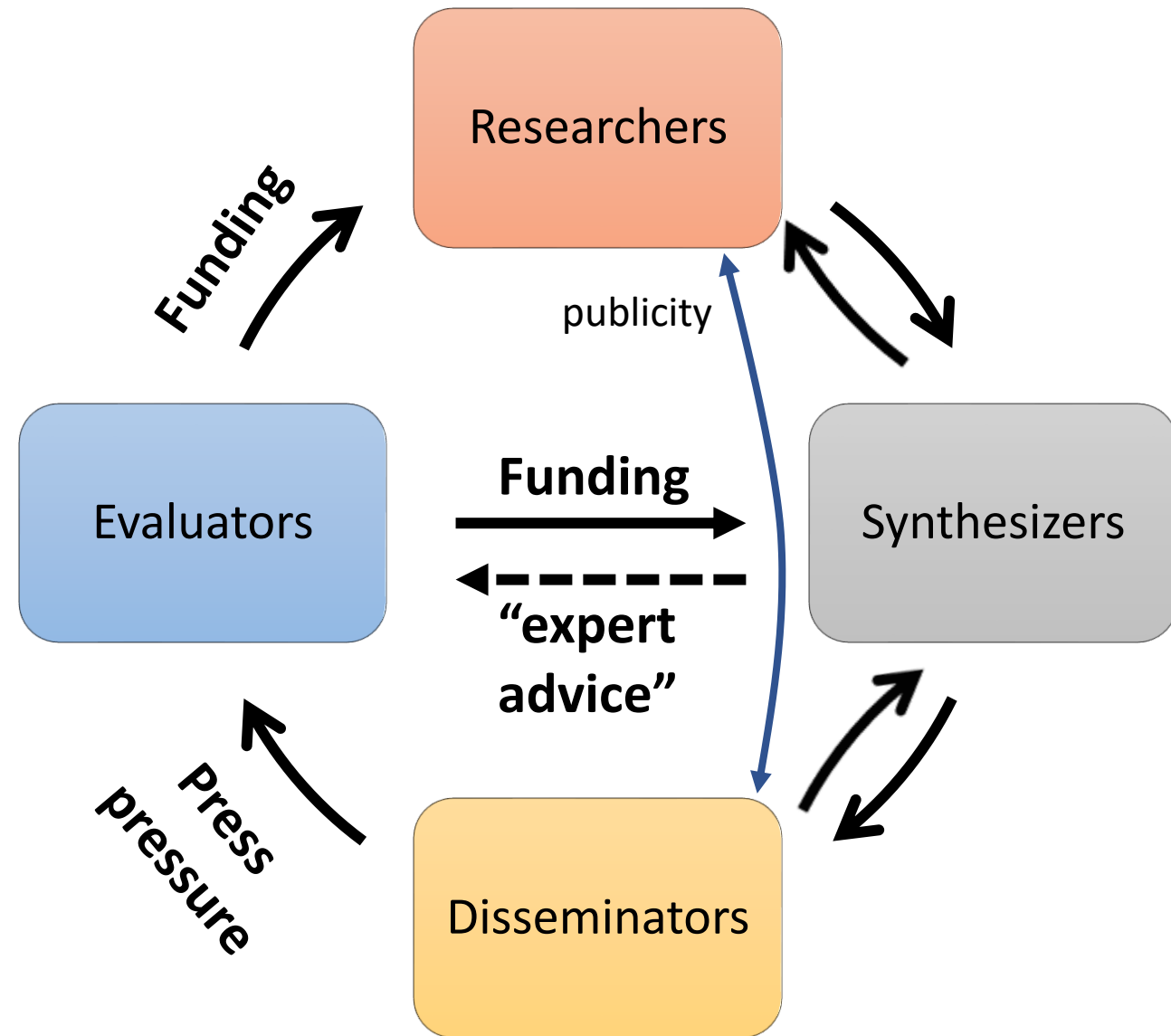
Two inherent flaws in the **Knowledge system**

1. Accumulated bias

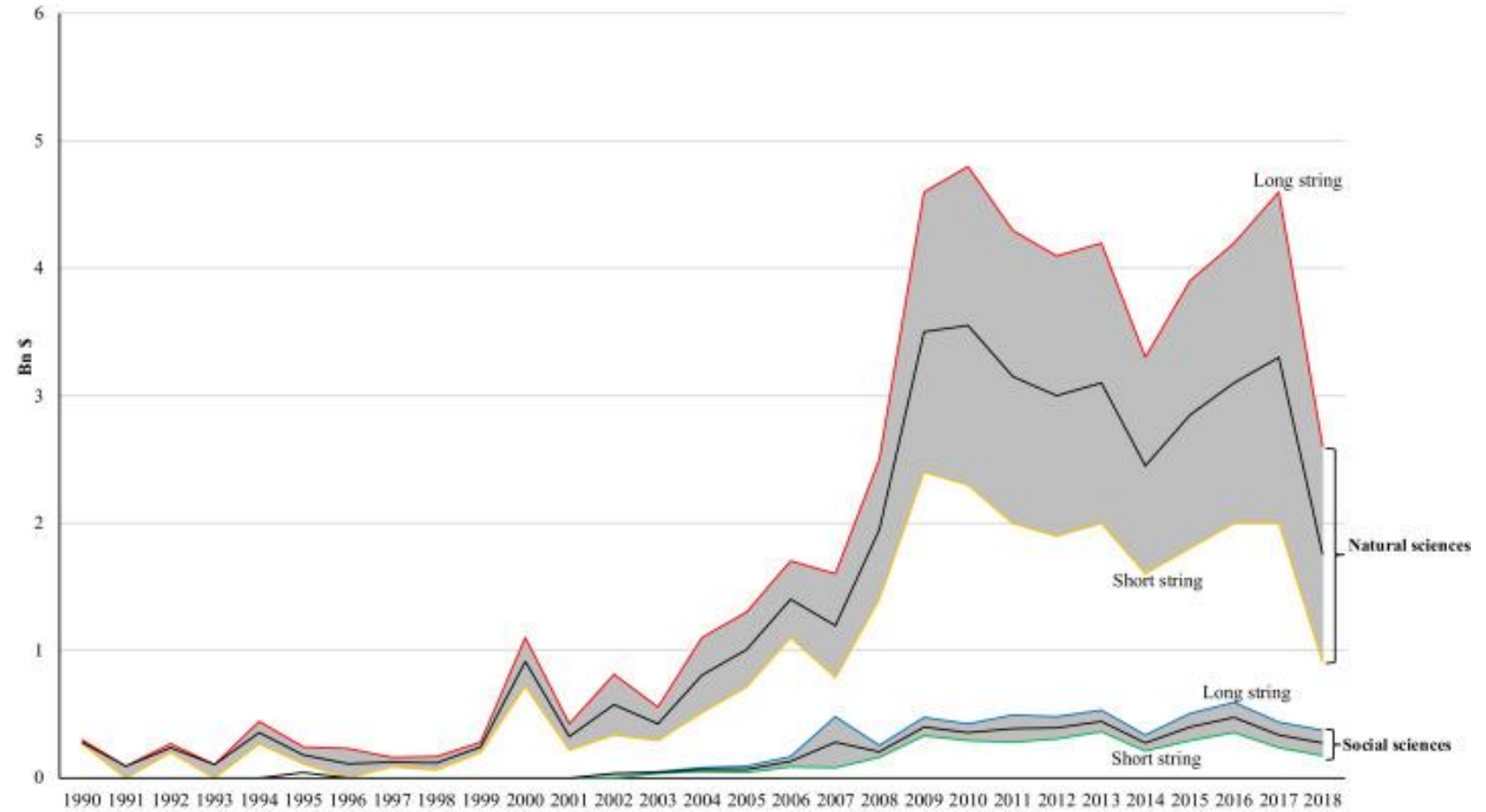


Two inherent flaws in the Knowledge system

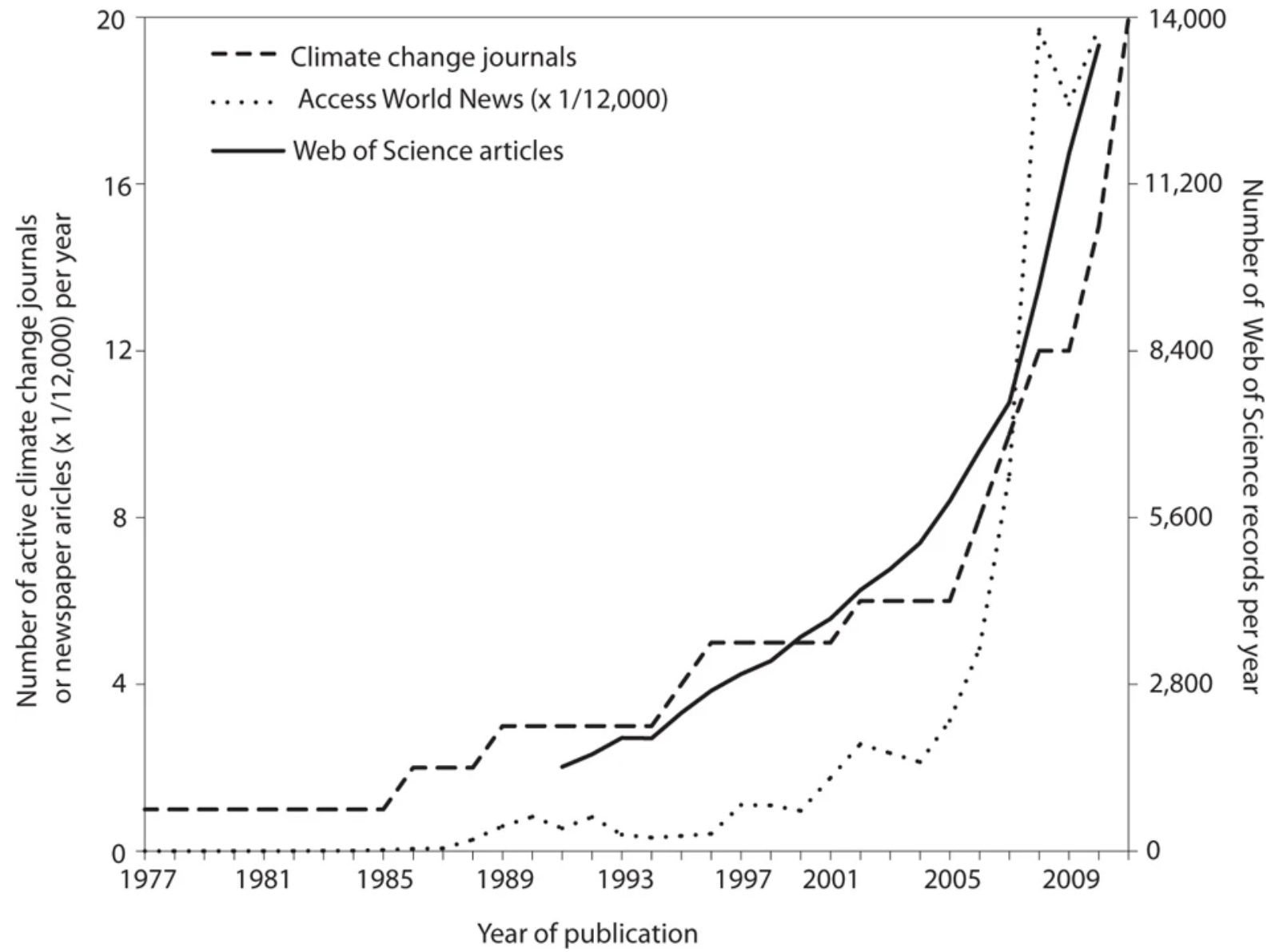
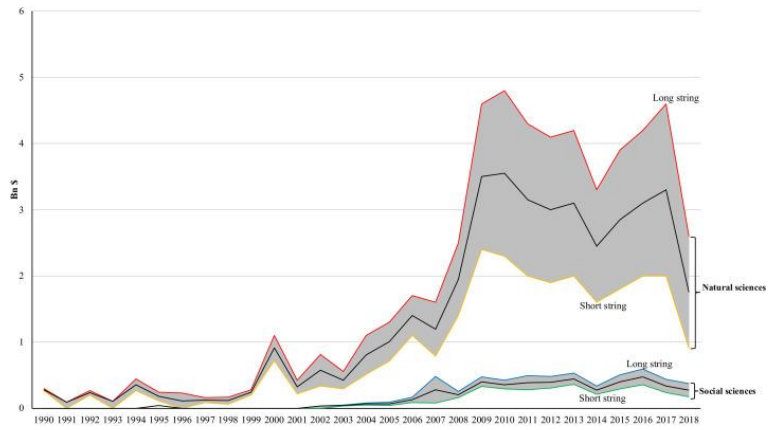
2. Knowledge system feedbacks



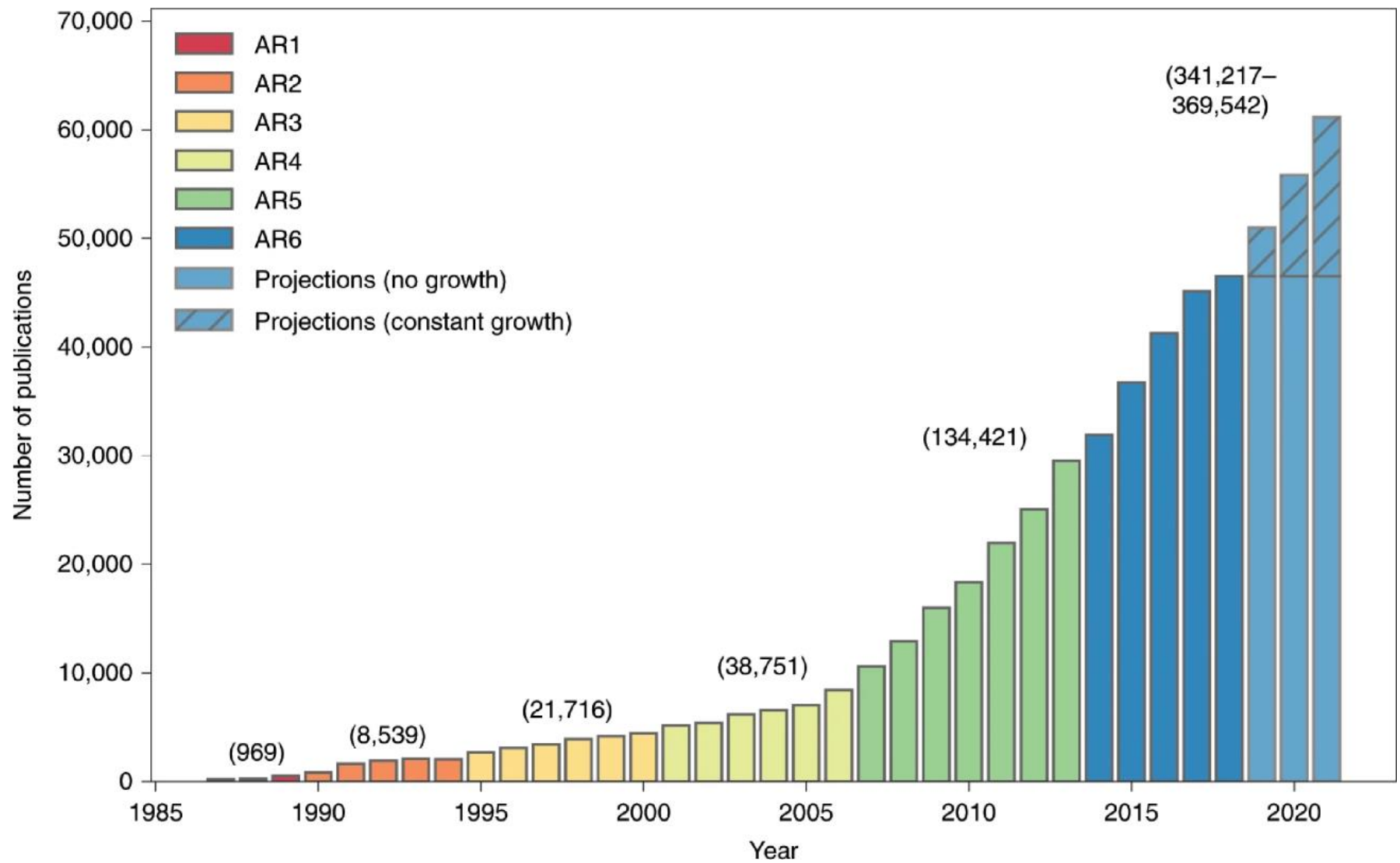
From evaluators to researchers : Funding for climate research



Overland & Sovacool, Energy Research & Social Science,
Volume 62, 101349 (2020)



Grieneisen & Zhang
 Nature Climate Change volume 1, 72–73 (2011)



Callaghan, Minx & Forster
 Nature Climate Change 10, 118–123 (2020)

The grand consensus

The grand consensus

ENVIRONMENTAL RESEARCH LETTERS

LETTER • OPEN ACCESS

Quantifying the consensus on anthropogenic global warming in the scientific literature

John Cook^{1,2,3}, Dana Nuccitelli^{2,4}, Sarah A Green⁵, Mark Richardson⁶, Bärbel Winkler², Rob Painting², Robert Way⁷, Peter Jacobs⁸ and Andrew Skuce^{2,9}

Published 15 May 2013 • © 2013 IOP Publishing Ltd


[Environmental Research Letters, Volume 8, Number 2](#)

Citation John Cook et al 2013 *Environ. Res. Lett.* **8** 024024

DOI 10.1088/1748-9326/8/2/024024

← Post



Barack Obama  
@BarackObama

"The debate is settled. Climate change is a fact." —President Obama
[#SOTU #ScienceSaysSo](#)

4:36 AM · Jan 29, 2014

 [Print subscriptions](#) [Sign in](#) [Search jobs](#) [Search](#) [International edition](#) 

The Guardian

[Home](#) [World](#) [US](#) [UK](#) [Sport](#) [Culture](#) [Lifestyle](#) [More](#) 

[Home](#) [Environment](#) [Science](#) [Global development](#) [Football](#) [Tech](#) [Business](#) [Obituaries](#)

This article is more than 2 years old

'Case closed': 99.9% of scientists agree climate emergency caused by humans

Trawl of 90,000 studies finds consensus, leading to call for Facebook and Twitter to curb disinformation

Most viewed



Live Israel-Hamas war liv
Israeli military encircles
Gaza City



Israel launches major
strikes on Gaza as violenc
flares up on Lebanon

ENVIRONMENTAL RESEARCH LETTERS

LETTER • OPEN ACCESS

Greater than 99% consensus on human caused climate change in the peer-reviewed scientific literature

Mark Lynas^{4,1}, Benjamin Z Houlton² and Simon Perry³

Published 19 October 2021 • © 2021 The Author(s). Published by IOP Publishing Ltd

[Environmental Research Letters, Volume 16, Number 11](#)

Citation Mark Lynas et al 2021 *Environ. Res. Lett.* **16** 114005

DOI 10.1088/1748-9326/ac2966

Submit to this Journal

Review for this Journal

Propose a Special Issue

Article Menu

Academic Editor



Nir Y. Krakauer

IK

Order Article Reprints



Open Access

Article

Ninety-Nine Percent? Re-Examining the Consensus on the Anthropogenic Contribution to Climate Change

by  David Dentelski ¹  ,  Ran Damari ²,  Yanir Marmor ³,  Avner Niv ⁴,  Mor Roses ¹  and  Yonatan Dubi ^{5,*} 

¹ Department of Physics, Bar-Ilan University, Ramat Gan 5290002, Israel

² Department of Chemistry, Tel-Aviv University, Tel-Aviv 6997801, Israel

³ Department of Computer Science, Weizmann Institute of Science, Rehovot 7610001, Israel

⁴ Faculty of Exact Science, Tel-Aviv University, Tel-Aviv 6997801, Israel

⁵ Department of Chemistry, School for Sustainability and Climate Change, Ben-Gurion University, Beer Sheva 8410501, Israel

Climate **2023**, *11*(11), 215; <https://doi.org/10.3390/cli11110215>

LETTER • OPEN ACCESS

Greater than 99% consensus on human caused climate change in the peer-reviewed scientific literature

Mark Lynas^{4,1}, Benjamin Z Houlton² and Simon Perry³

Published 19 October 2021 • © 2021 The Author(s). Published by IOP Publishing Ltd

[Environmental Research Letters](#), [Volume 16](#), [Number 11](#)

Citation Mark Lynas *et al* 2021 *Environ. Res. Lett.* **16** 114005

DOI 10.1088/1748-9326/ac2966

1) What is the consensus about? (Blurriness of the hypothesis)

2) What happened to Neutral papers?

LETTER • OPEN ACCESS

Greater than 99% consensus on human caused climate change in the peer-reviewed scientific literature

Mark Lynas^{4,1}, Benjamin Z Houlton² and Simon Perry³

Published 19 October 2021 • © 2021 The Author(s). Published by IOP Publishing Ltd

[Environmental Research Letters, Volume 16, Number 11](#)

Citation Mark Lynas et al 2021 *Environ. Res. Lett.* 16 114005

DOI 10.1088/1748-9326/ac2966

Table 1. Rating results from [2]. #—number of papers out of the 3000 papers examined.

Rating	1	2	3	4	5	6	7
#/3000	19	413	460	2104	2	1	1

- (1) explicit quantitative support of the AGW hypothesis,
- (2) explicit non-quantitative support,
- (3) implicit support,
- (4) no position or uncertainty,
- (5) an implicit rejection of the AGW hypothesis,
- (6) explicit rejection without quantification,
- (7) an explicit quantitative rejection

LETTER • OPEN ACCESS

Greater than 99% consensus on human caused climate change in the peer-reviewed scientific literature

Mark Lynas^{4,1}, Benjamin Z Houlton² and Simon Perry³

Published 19 October 2021 • © 2021 The Author(s). Published by IOP Publishing Ltd

[Environmental Research Letters, Volume 16, Number 11](#)

Citation Mark Lynas et al 2021 *Environ. Res. Lett.* 16 114005

DOI 10.1088/1748-9326/ac2966

Abstract

Anthropogenic activity is considered a central driver of current climate change. A recent paper, studying the consensus regarding the hypothesis that the recent increase in global temperature is predominantly human-made via the emission of greenhouse gasses (see text for reference), argued that the scientific consensus in the peer-reviewed scientific literature pertaining to this hypothesis exceeds 99%. This conclusion was reached after the authors scanned the abstracts and titles of some 3000 papers and mapped them according to their (abstract) statements regarding the above hypothesis. Here, we point out some major flaws in the methodology, analysis, and conclusions of the study. Using the data provided in the study, we show that the 99% consensus, as defined by the authors, is actually an upper limit evaluation because of the large number of “neutral” papers which were counted as pro-consensus in the paper and probably does not reflect the true situation. We further analyze these results by evaluating how so-called “skeptical” papers fit the consensus and find that biases in the literature, which were not accounted for in the aforementioned study, may place the consensus on the low side. Finally, we show that the rating method used in the study suffers from a subjective bias which is reflected in large variations between ratings of the same paper by different raters. All these lead to the conclusion that the conclusions of the study does not follow from the data.

Keywords: climate change; anthropogenic climate change; climate consensus

3) The “mellow abstract bias”

(out of 50 skeptic papers: ~50% would endorse the consensus defined by Lynas et al...)

Will this lead to restrictions?

The (fictional) story of the bare-feet committee



From evaluators to researchers (2): The UNESCO-SDG document

UNESCO and Sustainable Development Goals





United Nations
Educational, Scientific and
Cultural Organization



Sustainable
Development
Goals

UNESCO moving forward

the 2030 Agenda
for Sustainable Development

<https://en.unesco.org/sustainabledevelopmentgoals>

<https://unesdoc.unesco.org/ark:/48223/pf0000380519>

Executive summary

Universities and, more broadly, higher education institutions (HEIs), need to use the knowledge they produce and their education of new professionals, to help solve some of the world's greatest problems, as addressed by the Sustainable Development Goals (SDGs) set out by the United Nations (UN). Humanity is facing unprecedented challenges, most strikingly so in relation to climate change and loss of nature and



It is also time for HEIs to make sustainability and SDG literacy core requisites for all faculty members and students. Sustainability education should bring students into contact with real-world problems and



The **call** this report makes is for universities and HEIs to play an active part in an agenda

Recommendations for research

HEIs should not cease to protect and expand academic freedom for the promotion of systemic change. Basic and curiosity-driven research should also be maintained as a core principle where relevant. However,



The following three specific recommendations for HEIs merit inclusion in this summary:

- To anchor and monitor sustainability activities in HEI governance structures, HEIs should consider establishing the post of **Chief Sustainability or SDG Officer and/or a sustainability committee at the top level.**
- HEIs must **refuse to engage in research that supports non-sustainable practices** (for example, the fossil fuel industry) or invest their endowment funds in support of the fossil fuel industry.



Barcelona students to take mandatory climate crisis module from 2024

The
Guardian

Stephen Burgen
in Barcelona

Sat 12 Nov 2022 08.00
GMT

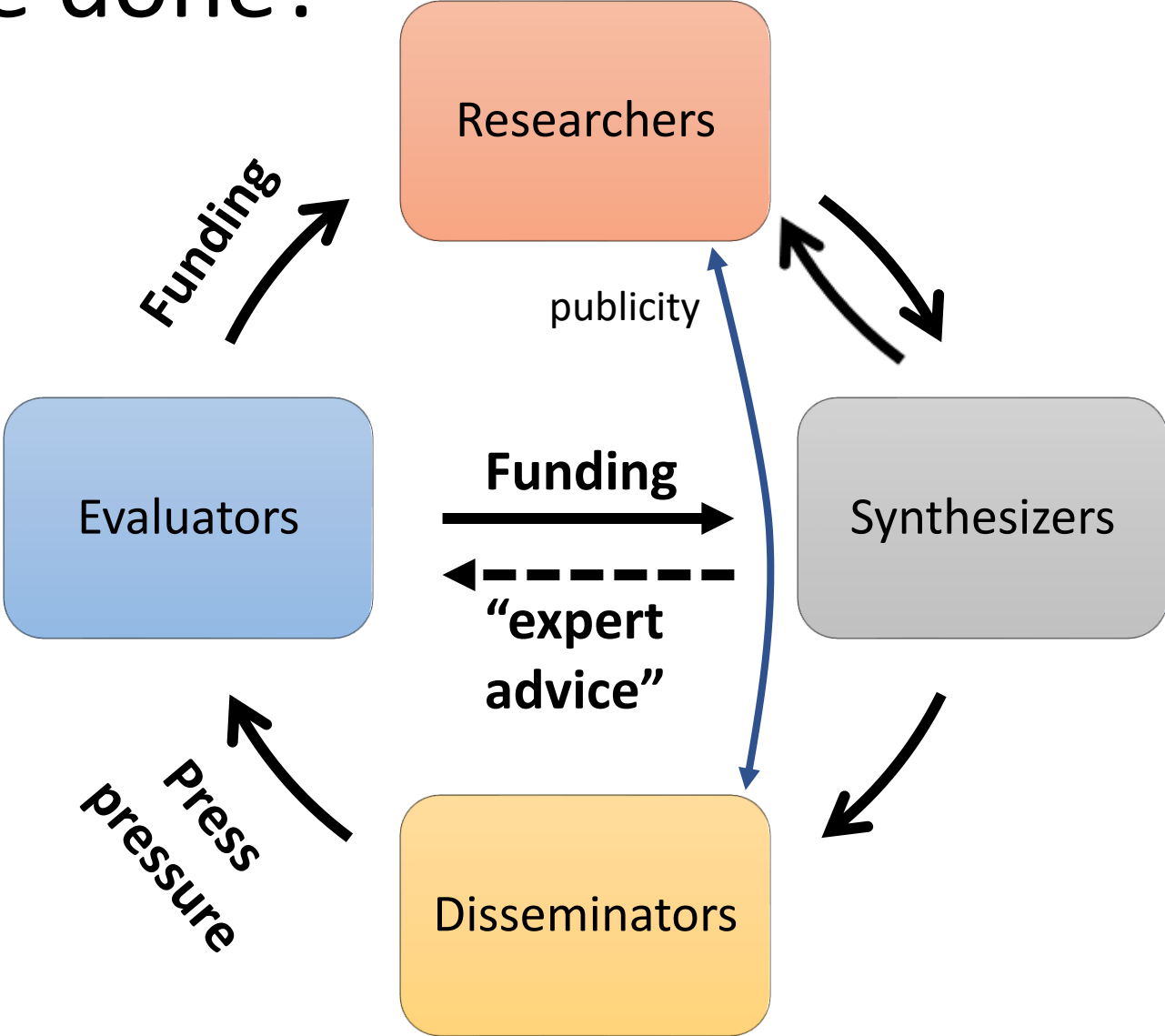
Course thought to be world first agreed after university bowed to pressure from seven-day End Fossil protest

All students at the University of [Barcelona](#) will have to take a mandatory course on the climate crisis after the establishment agreed to meet the demands of activists conducting a sit-in occupation.

In a move thought to be a world first, all 14,000 undergraduate and postgraduate students will have to take the course from the 2024 academic year. It will also devise a training programme on climate issues for its 6,000 academic staff.

The announcement came after a seven-day occupation by a group from the anti-fossil fuel organisation End Fossil Barcelona.

What can be done?



What can be done?

- Be aware of the flaws in the knowledge system
- Actively pursue correcting these flaws!
- Science literacy is a *must* – at all levels of education

What can be done?

Personal level:

- Study philosophy of science
- Discuss it
- Be aware of your own biases!

What can be done?

Institution level:

- Organize resistance! (like this conference...)
- Debate & Participate
- Object (vocally)

What can be done?

National/Global level (very hard!):

- Participate in funding discussions & politics (yes, I know...)
- Engage in global discussions (media/journals/outreach)
- Object (vocally)



In this [technological] revolution, research has become central; it also becomes more formalized, complex, and costly. A steadily increasing share is conducted for, by, or at the direction of, the Federal government.



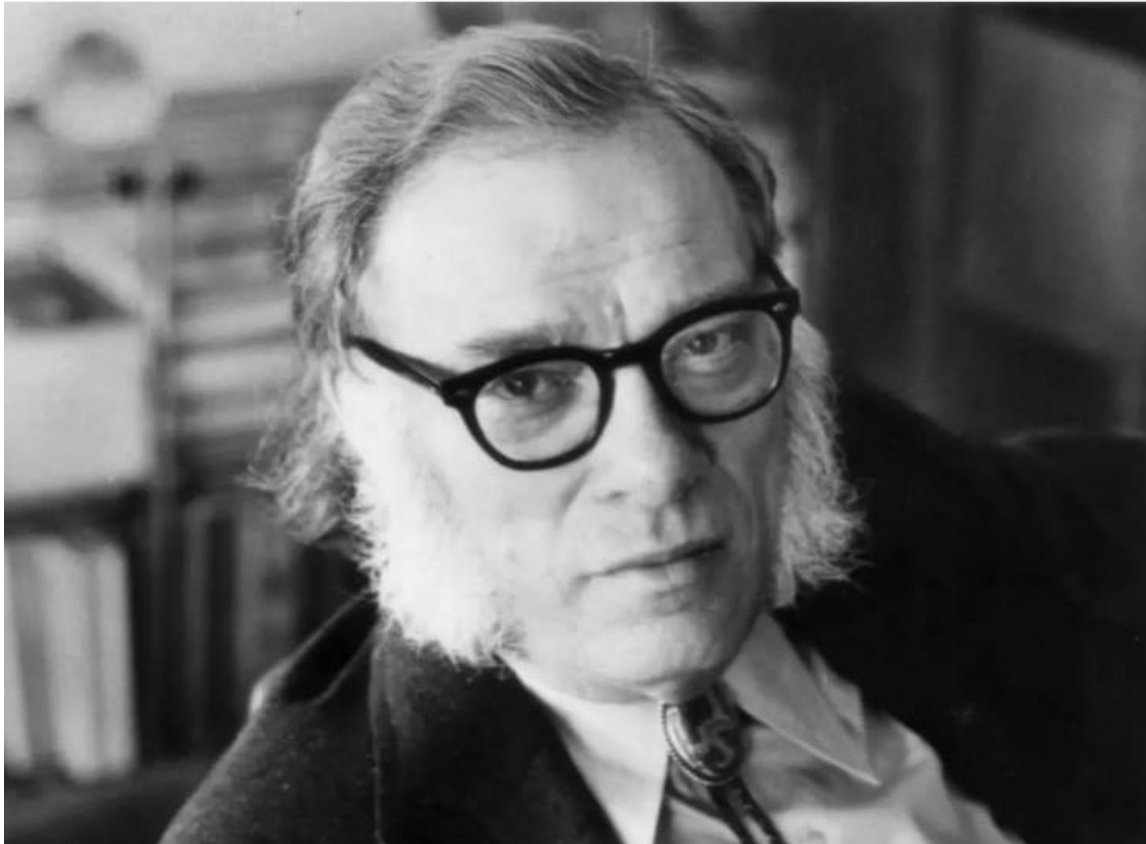
Today, the solitary inventor, tinkering in his shop, has been over shadowed by task forces of scientists in laboratories and testing fields. In the same fashion, the free university, historically the fountainhead of free ideas and scientific discovery, has experienced a revolution in the conduct of research. Partly because of the huge costs involved, **a government contract becomes virtually a substitute for intellectual curiosity.** For every old blackboard there are now hundreds of new electronic computers.

The prospect of domination of the nation's scholars by Federal employment, project allocations, and the power of money is ever present and is gravely to be regarded.

Yet, in holding scientific research and discovery in respect, as we should, we must also be alert to the equal and opposite **danger that public policy could itself become the captive of a scientific-technological elite.**

"The saddest aspect of life right now is that science gathers knowledge faster than society gathers wisdom"

Isaac Asimov



Thank you for your attention!

