Science Communication

Science communication gone wrong

Rui Mata, HS 2024

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Course structure

Session information

Sessions take place Thursdays, 8.15-9.45, Biozentrum, Hörsaal U1.131.

#	Date	Topic	Instructor(s)	Slides
1	19.09.2024	What is science communication?	Mata	pdf
2	03.10.2024	Models and elements of science communication	Mata	pdf
3	10.10.2024	Scientific uncertainty and trust in science	Mata	pdf
4	17.10.2024	Guidelines for science communication	Mata	pdf
5	24.10.2024	Science communication gone wrong	Mata	pdf
6	31.10.2024	Practical: Knowledge and Data Visualization	Hil/Lachenmeier	pdf
7	07.11.2024	Practical: Modular Information Design	Hil/Lachenmeier	pdf
8	14.11.2024	Practical: Modular Information Design	Hil/Lachenmeier	pdf
9	21.11.2024	Practical: Modular Information Design	Hil/Lachenmeier	pdf
10	28.11.2024	Practical: Modular Information Design	Hil/Lachenmeier	pdf
11	05.12.2024	Practical: Modular Information Design	Hil/Lachenmeier	pdf
12	12.12.2024	Practical: Modular Information Design	Hil/Lachenmeier	pdf
13	19.12.2024	Exam		

Recap of last session

- Discuss the steps involved in developing science communication initiatives
- Become familiar with some guidelines and recommendations for science communication
- Discuss science communication during crises


WHO'S GOT THE ANSWER?

When starting a science communication project one should …
[Select all the correct answers]

- A: conduct a scoping of gaps in knowledge and target audience
- B: first conduct user testing of different messages
- C: focus primarily on long-term outcomes
- D: select communication channels as a function of target audience

1.Scoping
Look at what people are saying and the underlying assumptions.

How is your research topic being talked about in the public domain? How well is information being used? What are the misconceptions? What context is missing? What are the key underlying assumptions?

2.Involving people
Work out the significance for different groups and how to involve them.

Which individuals and groups are most interested, concerned or involved in the issue? Who isn't but should be? Who is driving the public conversation? Who should be part of the project team? Who should you invite to user testing? Who can help you share your findings?

3.Planning
Propose content and formats that are relevant for the people accessing them.

What is the best format to communicate your research: website, graphics, video, events, publications? What is the key content and context you need to include? What language and style should you use?

4.User testing
Develop your material together.

How can you run user testing? Who should be involved? Which parts of your output should you user test? What questions can you ask?
Use the feedback from user testing to re-plan your science communication activity.

5.Dissemination
Continue to engage people and use feedback.

Who should know about your research findings? Who will talk about and publicise them? How can you share them with the media, with professionals, with the public?

Inputs	Participants & Activities	Short-term Outcomes	Medium-term Outcomes	Long-term Outcomes	Vision
▪ Research ▪ Evaluation ▪ Practitioners ▪ Leadership programs ▪ Support to scientists ▪ Communication & engagement training ▪ Institutional support for scientists and publics ▪ Funding (including Broader Impacts and other funding requirements) ▪ Strategy of communication	Participants ▪ Scientists ▪ Publics ▪ Practitioners Activities ▪ Public Dialogue Approaches ▪ Policy Deliberation Approaches ▪ Knowledge co-production approaches ▪ University-led, cooperative engagement approaches ▪ Everyday engagements ▪ Note: see typology for more details and examples	Scientists humanized/ publics individualized	Build trust between publics and scientists	Build trust between publics and scientists	Sound, evidence-informed public decision-making on science-related issues
		Positive affect	Longer-term positive affect about science	Long term positive affect	Dialogue on critical science-society issues embedded in public discourse
		Increased sense of public engagement identity	Shared appreciation of public engagement Do more & better engagement (more able and comfortable) Build relationships to continue public engagement with science	Engagement is part of work and life (proposals, plans) in strategic and reflective ways Institutional change	Influence individual and collective action and behavior Influence policy
		Intention to act or engage again Increase skills/ability to engage civically Increased self-efficacy	Act on something from engagement Be ready to advocate/amplify Increased preparation to engage between science and society	Share scientific or social content and understanding with networks	Influence research agendas Research that is responsive to societal needs and interests
		Increased interest and motivation around topic	Increased willingness to consider science-society intersections	Improve goals or focus of research Hear/understand others' views about science	Resilient STEM workforce Science embedded in daily life
		Increased understanding of the process of science and social institutions	Increased ability to discuss science-society intersections	Frame science to be relevant to publics Framing knowledge outcomes for use by scientists and decision-makers	

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According to the guidelines on science communication of the German Council for Public Relations…
[Select all the correct answers]

- A: methods can sometimes be simplified to improve understanding.
- B: the storytelling principle suggests that fictional narratives are central.
- C: science communication should allow for dialogue.
- D: preprints should never be communicated.

Guidelines and Recommendations

Key Points	Description
Factual accuracy	Science communication should be conducted without exaggerations and without concealing risks
Clarity	Science communication should be conducted without distorting facts, even when complex research content is simplified
Societal Storytelling	Science communication should filter the diversity of information according to societal needs
Relevance	Science communication should be used as a didactic method to clarify factual content
Transparency	Science communication should name sources, cooperation partners, or any potential dependencies
Peer-Review	Communicating preprints should only occur when they are of significant public interest
Uncertainties	Science communication should always make the limits of statements and methods visible
Respect	Science communication should allow for open dialogue and respect for the positions of all parties involved

Guidelines on Science Communication of the German Council for Public Relations 18

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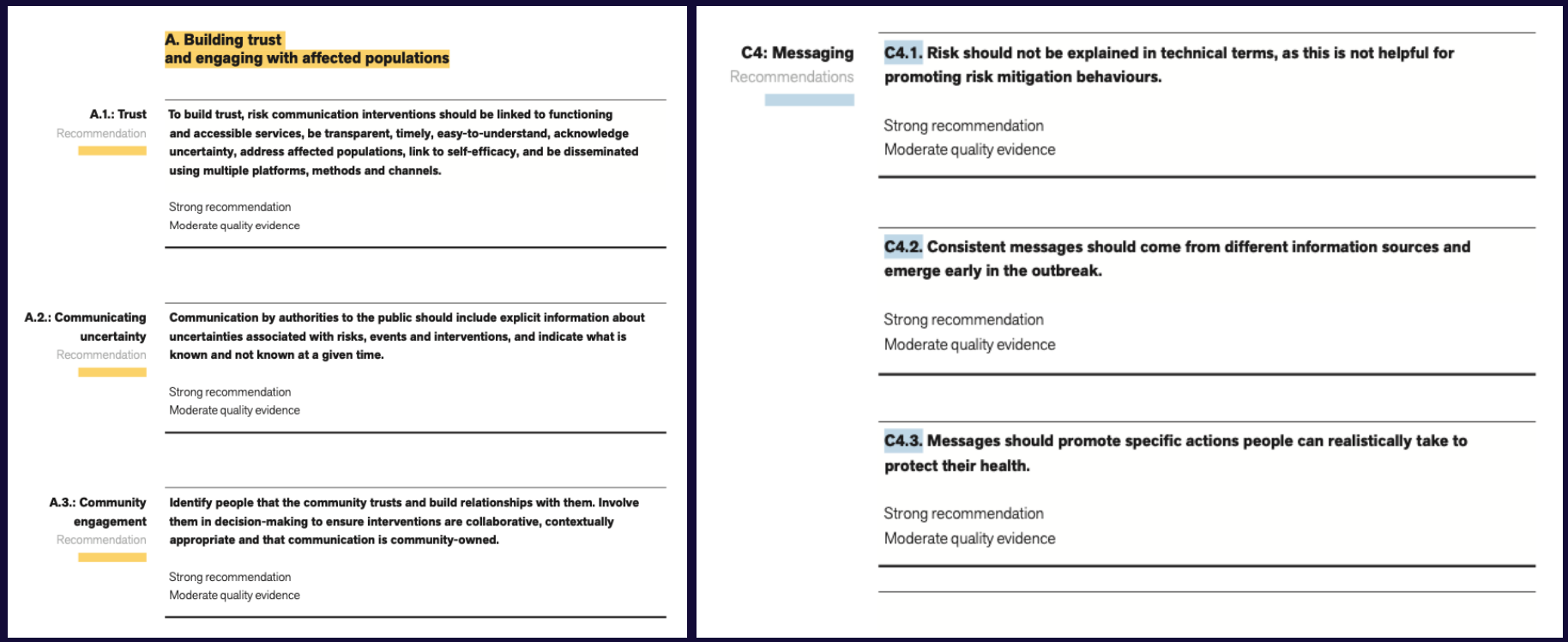
The World Health Organization's communication guidelines suggest that…
[Select all the correct answers]

- A: creating a sense of urgency is crucial to get the public to act.
- B: risk should be communicated in technical terms.
- C: there is little quality evidence to guide communication strategies.
- D: the speed of communication is more important than consistency.



A. Building trust and engaging with affected populations

A.1.: Trust Recommendation

To build trust, risk communication interventions should be linked to functioning and accessible services, be transparent, timely, easy-to-understand, acknowledge uncertainty, address affected populations, link to self-efficacy, and be disseminated using multiple platforms, methods and channels.

Strong recommendation
Moderate quality evidence

A.2.: Communicating uncertainty Recommendation

Communication by authorities to the public should include explicit information about uncertainties associated with risks, events and interventions, and indicate what is known and not known at a given time.

Strong recommendation
Moderate quality evidence

A.3.: Community engagement Recommendation

Identify people that the community trusts and build relationships with them. Involve them in decision-making to ensure interventions are collaborative, contextually appropriate and that communication is community-owned.

Strong recommendation
Moderate quality evidence

C4: Messaging Recommendations

C4.1. Risk should not be explained in technical terms, as this is not helpful for promoting risk mitigation behaviours.

Strong recommendation
Moderate quality evidence

C4.2. Consistent messages should come from different information sources and emerge early in the outbreak.

Strong recommendation
Moderate quality evidence

C4.3. Messages should promote specific actions people can realistically take to protect their health.

Strong recommendation
Moderate quality evidence

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When communicating scientific evidence in a crisis, communicators should…
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- B: reassure that experts are sure about the advice.
- C: use different channels to communicate different messages
- D: communicate specific and realistic protective actions.

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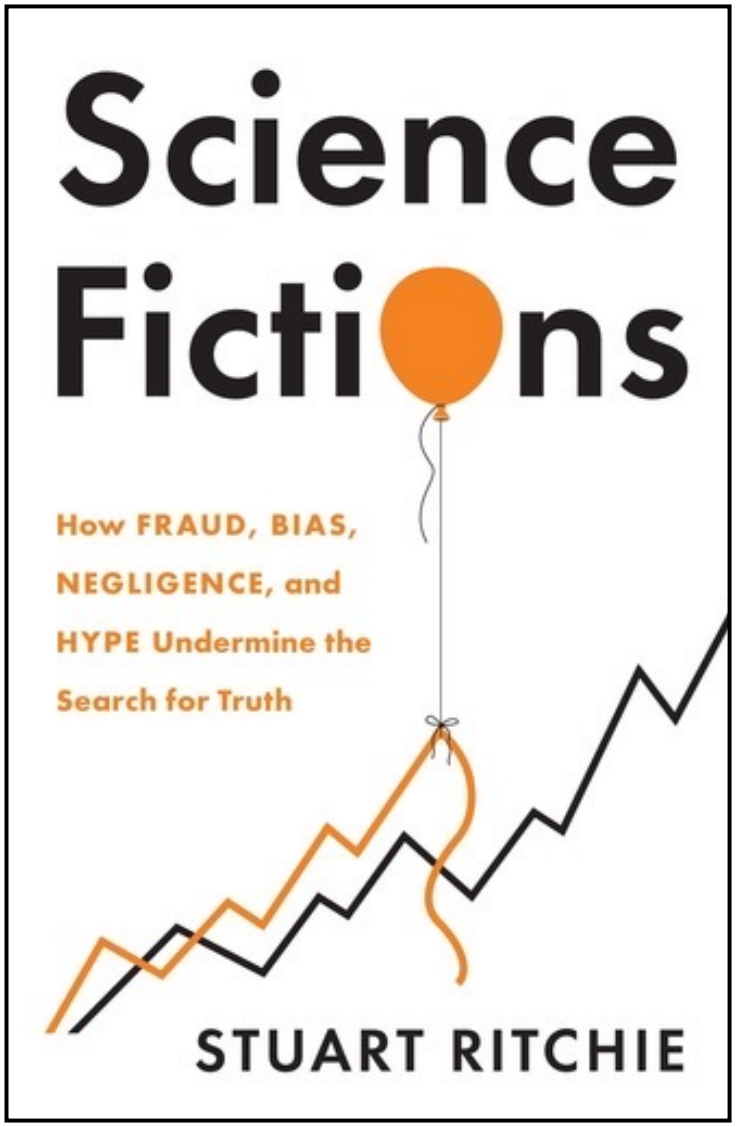
Goals for today

- Get to know some examples of science communication gone wrong to discuss problems of **hype**, lack of expressions of **uncertainty**, and **epistemic trespassing**



Hype: Exaggeration of scientific findings in press releases, media coverage, or even by researchers themselves to attract attention, funding, or prestige.

Hype or spin is observed in the publication record

"spin" refers to the intentional or unintentional presentation of study results in a more favorable or misleading way than what the data objectively support. This can involve selectively emphasizing positive aspects of the study while downplaying or omitting negative results, using language that exaggerates the treatment's benefits, or making claims of effectiveness without strong supporting evidence.

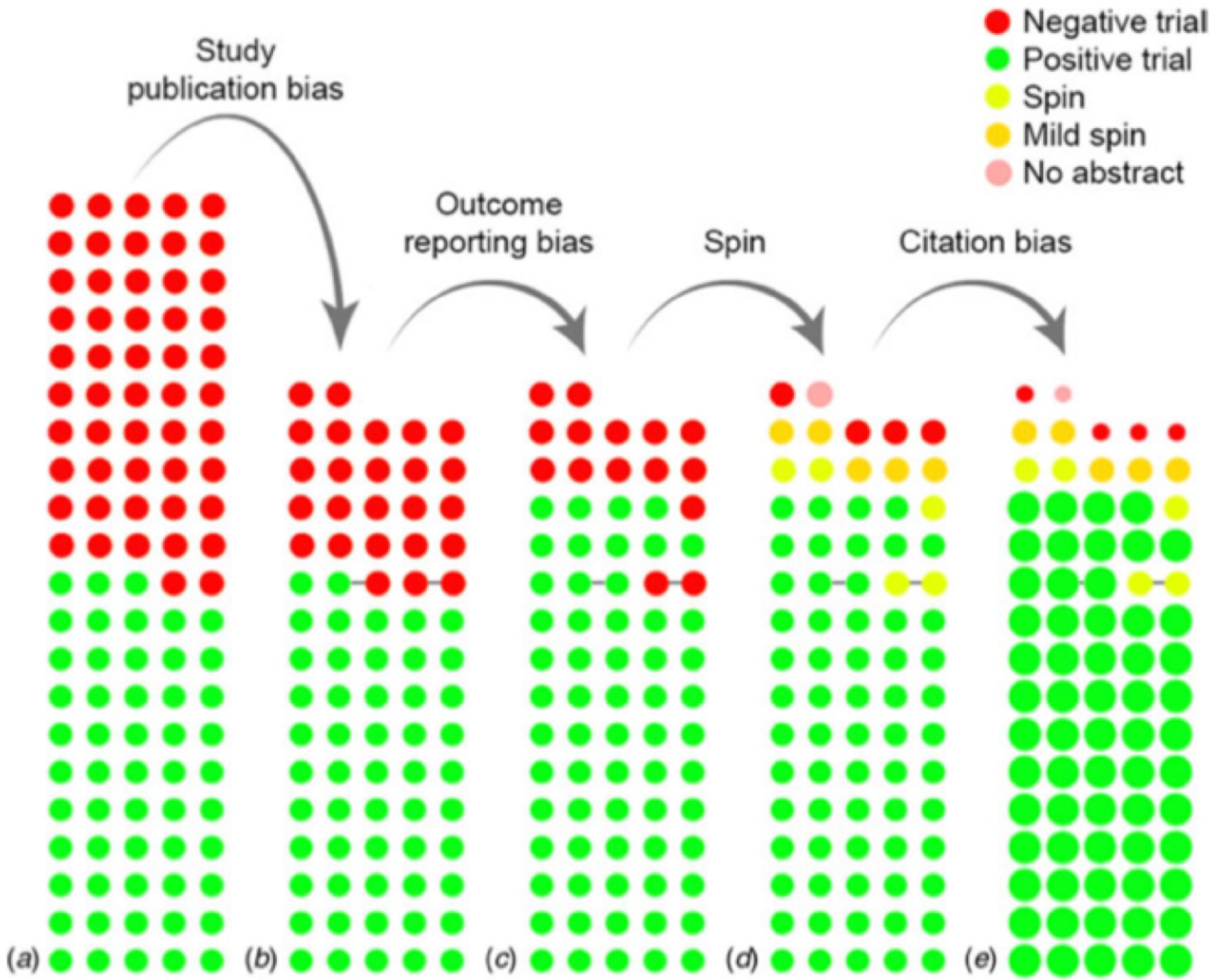
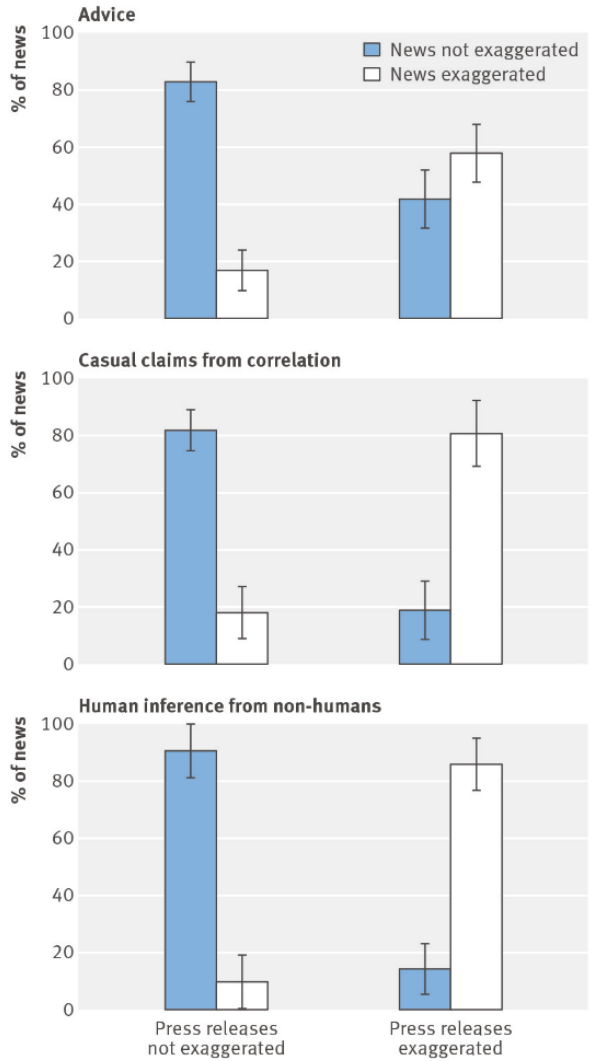


Fig. 1. The cumulative impact of reporting and citation biases on the evidence base for antidepressants. (*a*) displays the initial, complete cohort of trials, while (*b*) through (*e*) show the cumulative effect of biases. Each circle indicates a trial, while the color indicates the results or the presence of spin. Circles connected by a grey line indicate trials that were published together in a pooled publication. In (*e*), the size of the circle indicates the (relative) number of citations received by that category of studies.

De Vries, Y. A., Roest, A. M., De Jonge, P., Cuijpers, P., Munafò, M. R., & Bastiaansen, J. A. (2018). The cumulative effect of reporting and citation biases on the apparent efficacy of treatments: The case of depression. *Psychological Medicine, 48*(15), 2453–2455. http://doi.org/10.1017/S0033291718001873

Framing of results impacts news content

This study investigates the relationship between exaggeration in academic press releases and the subsequent coverage in news articles, particularly regarding health-related science. The researchers analyzed a sample of press releases and news stories to determine if exaggerated claims, causal statements, or human inferences were made when not supported by the original research. They found that exaggerations in press releases significantly increased the likelihood of exaggerated claims in news articles. In particular, when press releases included overstatements about causality or relevance to humans, the news coverage often mirrored these exaggerations, indicating that the framing of results in press releases has a substantial impact on news content. This study highlights the need for accurate communication in science to avoid misinformation in public discourse.



Sumner, P., Vivian-Griffiths, S., Boivin, J., Williams, A., Venetis, C. A., Davies, A., Ogden, J., Whelan, L., Hughes, B., Dalton, B., Boy, F., & Chambers, C. D. (2014). The association between exaggeration in health related science news and academic press releases: Retrospective observational study. *BMJ*, *349*(dec09 7), g7015–g7015. https://doi.org/10.1136/bmj.g7015

Uncertainty vs. ~~certainty~~

NEWS IN FOCUS

SPACE What makes landing on a comet so hard **p.172**

MEDICAL ETHICS Rules on clinical trials stir debate **p.174**

NEUROSCIENCE Evidence mounts for gut–brain link **p.178**

DEPRESSION The condition that causes a staggering burden of disability **p.179**

FILIPPO MONTEFORTE/AFP/GETTY

More than 300 people perished in the earthquake that struck the medieval centre of L'Aquila.

RISK ASSESSMENT

Scientists cleared of quake deaths

Italian appeals court says six seismologists were not guilty of manslaughter following the 2009 L'Aquila disaster.

BY ALISON ABBOTT & NICOLA NOSENGO

Six seismologists accused of misleading the public about the risk of an earthquake in Italy were cleared of manslaughter on 10 November. An appeals court overturned their six-year prison sentences and reduced to two years the sentence for a government official who had been convicted with them.

The magnitude-6.3 earthquake struck the historic town of L'Aquila in the early hours of 6 April 2009, killing more than 300 people.

The finding by a three-judge appeals court prompted many L'Aquila citizens to react with rage, shouting "shame" and saying that the Italian state had just acquitted itself, local media reported. But it comes as a relief to scientists around the world who had been following the unprecedented case with alarm.

"We don't want to have to be worried about the possibility of being prosecuted if we give advice on earthquakes," says seismologist Ian Main of the University of Edinburgh, UK. "That would discourage giving honest opinion."

The defendants themselves have mixed feelings. Giulio Selvaggi, former director of the National Earthquake Centre in Rome, says that although he is happy to be acquitted, "there is nothing to celebrate — because the pain of the people of L'Aquila remains".

In the months before the major earthquake struck, the region around L'Aquila had been subject to frequent, mostly low-magnitude tremors known as seismic swarms. Residents were alarmed by a local amateur earthquake predictor's claims that he had evidence of an impending quake, although geologists dismissed his methods as unsound.

A commission of experts met on 31 March 2009 to advise the government. According to the prosecution, a press conference after that meeting — attended by the acting president of the commission, volcanologist Franco Barberi of the University of Rome 'Roma Tre', and by Bernardo De Bernardinis, then deputy director of the Italian Civil Protection Department — conveyed a reassuring message that a major earthquake was not on the cards. Moreover, in a television interview recorded shortly before the meeting but aired after it, De Bernardinis said that "the scientific community tells me there is no danger because there is an ongoing discharge of energy" during the seismic swarms.

As a consequence, according to the prosecution, when the earthquake struck on 6 April, 29 people chose to stay indoors and died as their homes collapsed. All members of the expert commission were found guilty of manslaughter in October 2012, after a 13-month trial that transfixed the international scientific community.

In addition to De Bernardinis, Selvaggi and Barberi, the other defendants were Enzo Boschi, former president of the National Institute of Geophysics and Volcanology in Rome; Claudio Eva, an Earth physicist at the University of Genoa; Mauro Dolce, head of the seismic-risk office of the Civil Protection Department in Rome; and Gian Michele Calvi, director of the European Centre for Training and Research in Earthquake Engineering in Pavia.

Over the course of six hearings before the appellate court in L'Aquila, the defence argued that there was no proof of a causal link between the meeting and the behaviour of the people of L'Aquila citizens. The lawyers also argued that the scientists could not be held accountable for De Bernardinis's reassuring statements, and that their scientific opinions were ultimately correct.

De Bernardinis was acquitted of the manslaughter charges in 16 cases, but not for the other 13. The judges can take up to three months to publish the reasoning behind their verdict. Lawyers for the families of the deceased have announced that they will challenge the ruling in the Supreme Court of Cassation in Rome, which could call for a retrial. ■

13 NOVEMBER 2014 | VOL 515 | NATURE | 171

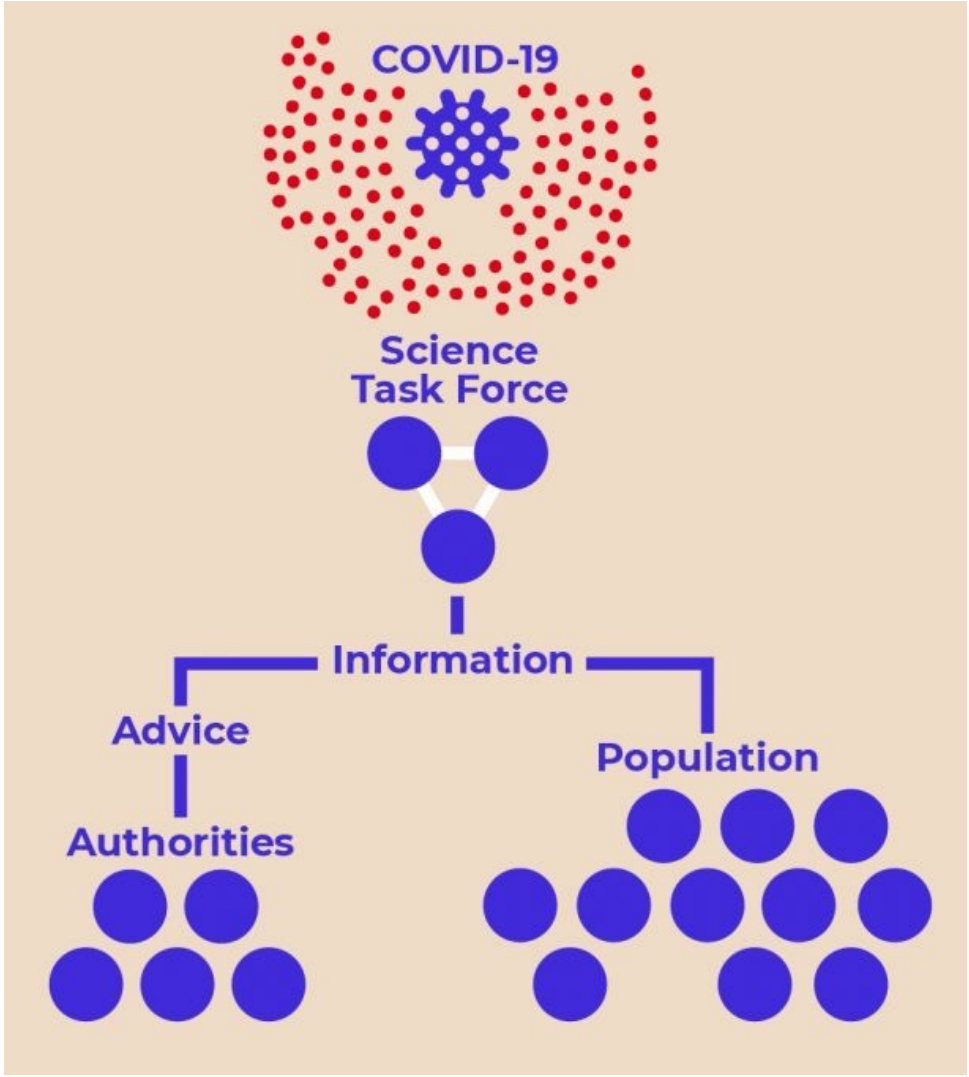
https://www.bbc.co.uk/programmes/m002305h

Abbott, A., & Nosengo, N. (2014). Scientists cleared of quake deaths. Nature, 515, 171.

Uncertainty vs. ~~certainty~~

https://www.swissinfo.ch/eng/politics/cover-up-how-shifting-policies-affect-swiss-attitudes-toward-masks/45978462

Uncertainty vs. ~~certainty~~



«There is a limited evidence base to support the use of masks in healthcare or community settings. However, three of the six meta-analyses identified a significant decrease of respiratory viral infection risk while the other three reported a positive but non-significant trend towards the benefit of masking. No study reported that wearing a mask significantly or non-significantly increased the risk for infection by a respiratory virus. This situation is similar to hand hygiene, which demonstrated a decrease in the risk of respiratory infection, but with the caveat that the difference with the control group was not always significant.»

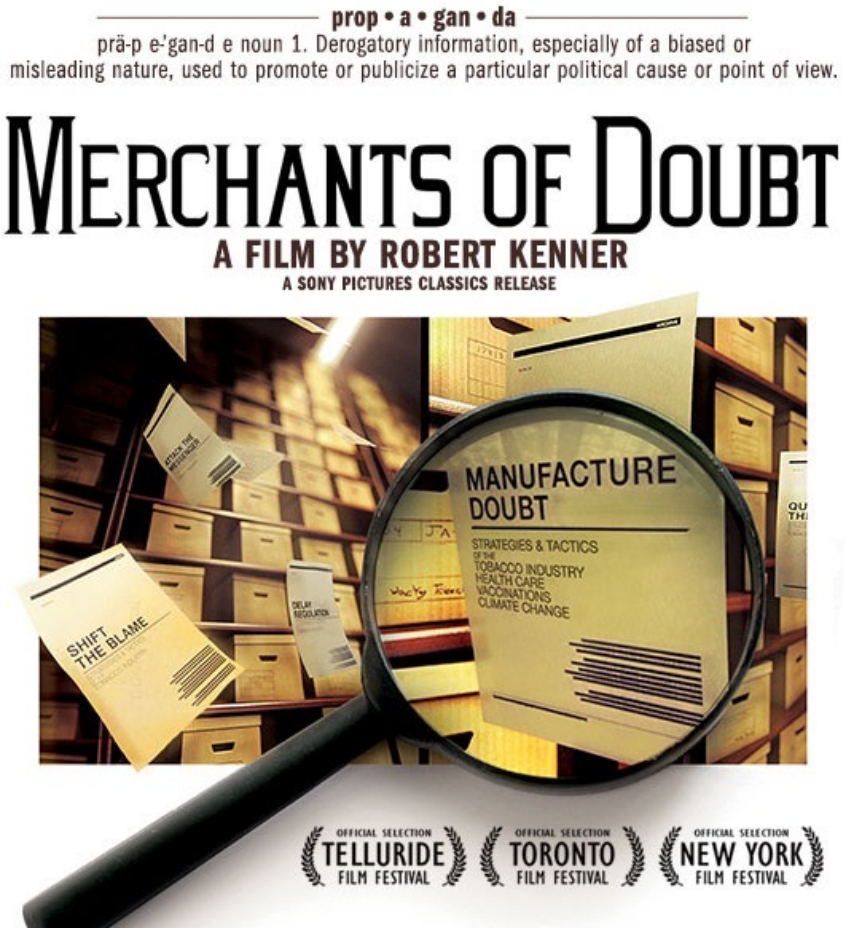
https://sciencetaskforce.ch/wp-content/uploads/2020/10/Role-of-masks-20April20-English.pdf

Humility vs. ~~Epistemic Trespassing~~

“Epistemic trespassers are thinkers who have competence or expertise to make good judgments in one field, but move to another field where they lack competence—and pass judgment nevertheless. We should doubt that trespassers are reliable judges in fields where they are outsiders.“

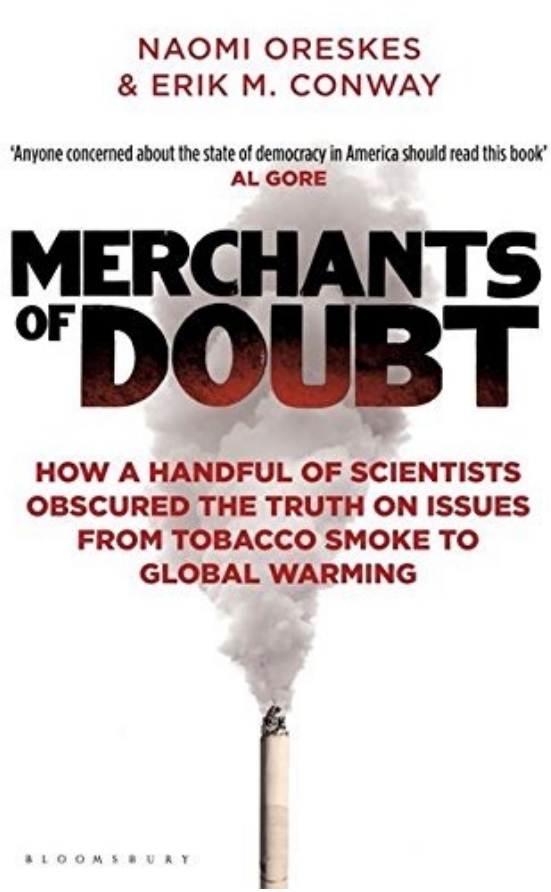
Ballantyne, N. (2019). Epistemic Trespassing. *Mind*, *128*(510), 367–395. https://doi.org/10.1093/mind/fzx042

Humility vs. ~~Epistemic Trespassing~~



https://www.youtube.com/watch?v=j8ii9zGFDtc

Humility vs. ~~Epistemic Trespassing~~



The book documents how a small group of influential scientists worked with industries to create public doubt on issues like tobacco, acid rain, and climate change. These scientists, often driven by free-market ideologies, used their credibility (in physics!) to challenge established scientific consensus, delaying regulation and protecting industry interests. Their strategy was not to disprove the science but to create uncertainty, which shaped public opinion and stalled policy action. The book highlights how manufactured doubt has been a powerful tool to undermine science for ideological as well as financial gain.

The techniques of false scientific communication

Cook, J., Supran, G., Lewandowsky, S., Oreskes, N., & Maibach, E., (2019). America Misled: How the fossil fuel industry deliberately misled Americans about climate change. George Mason Univ. Center for Climate Change Communication.

Falsely argues that because we don't know everything, we know nothing.

False: In the 1990s, scientists had already formed a consensus that humans were causing global warming.

Just because climate has changed naturally in the past does not mean it's natural now.

Unsettled Science

Cast doubt on the scientific consensus on climate change.

Knowing that weather forecasts are reliable for a few days at best, we should recognize the enormous challenge facing scientists seeking to predict climate change and its impact over the next century In spite of everyone's desire for clear answers it is not surprising that fundamental gaps in knowledge leave scientists unable to make reliable predictions about future changes

A recent report from the National Research Council (NRC) raises important issues, including these still-unanswered questions (1) Has human activity already begun to change temperature and the climate, and (2) How significant will future change be?

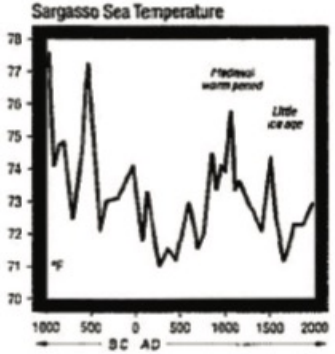
The NRC report confirms that Earth's surface temperature has risen by about 1 degree Fahrenheit over the past 150 years Some use this result to claim that humans are causing global warming, and they point to storms or floods to say that dangerous impacts are already under way Yet scientists remain unable to confirm either contention

Geological evidence indicates that climate and greenhouse gas levels experience significant natural variability for reasons having nothing to do with human activity Historical records and current scientific evidence show that Europe and North America experienced a *medieval warm period* one thousand years ago, followed centuries later by a *little ice age* The geological record shows even larger changes throughout Earth's history Against this backdrop of large poorly understood natural variability, it is impossible for scientists to attribute the recent small surface temperature increase to human causes

Moreover, computer models relied upon by climate scientists predict that lower atmospheric temperatures will rise as fast as or faster than temperatures at the surface However, only within the last 20 years have reliable global measurements of temperatures in the lower atmosphere been available through the use of satellite technology These measurements show little if any warming

Even less is known about the potential positive or negative impacts of climate change In fact, many academic studies and field experiments have demonstrated that increased levels of carbon dioxide can promote crop and forest growth

Contradicts themselves: they already talk about 1 degree warming.



So, while some argue that the science debate is settled and governments should focus only on near-term policies—that is empty rhetoric Inevitably, future scientific research will help us understand how human actions and natural climate change may affect the world and will help determine what actions may be desirable to address the long-term

Science has given us enough information to know that climate changes may pose long-term risks Natural variability and human activity may lead to climate change that could be significant and perhaps both positive and negative Consequently, people, companies and governments should take responsible actions now to address the issue

One essential step is to encourage development of lower-emission technologies to meet our future needs for energy We'll next look at the promise of technology and what is being done today

Uses the same delay argument as the tobacco industry: "Let's wait before we act".

ExxonMobil

Figure 4: ExxonMobil 2000 advertorial in The New York Times.
The fossil fuel industry implemented their plans to promote climate denial in the 1990s-2010s.

Jahrzehntelange wissenschaftliche Forschung zeigt, dass der Grossteil der schädlichen chemischen Bestandteile, die in Zigarettenrauch nachgewiesen wurden, bei der Verbrennung des Tabaks entsteht. Deshalb ist es unser Ziel, rauchfreie Alternativen anzubieten, die das Potenzial haben, das Risiko von Erkrankungen in Folge regelmässigen Zigarettenkonsums zu reduzieren.

Die neuesten wissenschaftlichen Fortschritte haben zur Entwicklung bahnbrechender Technologien geführt. Jetzt haben erwachsene Raucherinnen und Raucher bessere Alternativen zu Zigaretten. Zum Beispiel Tabakerhitzer. Der Tabak wird erhitzt statt verbrannt, und es entsteht ein nikotinhaltiger Tabakdampf, jedoch kein Rauch.

Und genau so funktionieren die rauchfreien Produkte, in die wir die Forschungsarbeit investiert haben. Sowohl unsere eigene umfangreiche Forschung als auch unabhängige Studien belegen, dass IQOS, wenn auch nicht risikofrei, deutlich weniger schädliche Bestandteile erzeugt als Zigaretten. Dies dank Eliminierung des Verbrennungsprozesses.

Erfahren Sie mehr über Wissenschaft auf
www.philipmorris.ch

Summary

We considered several cases of suboptimal science communication to discuss problems related to…

- **Hype:** Exaggeration of scientific findings in press releases can lead to distorted media coverage, leading to misleading or overstated conclusions that can have consequences for public understanding of science.
- **Uncertainty**: Failure to communicate scientific uncertainty appropriately can have consequences for protective behaviors in crisis situations; acknowledgment of uncertainty is key for increasing long-term trust and reduce confusion in the face of changing information.
- **Epistemic trespassing:** Scientists may sometimes make authoritative claims outside their area of expertise, potentially resulting in flawed or misinformed judgments; misuse of scientific reputations has been used to manufacture doubt by stakeholders that profit from delaying action or regulation – making it important to identify these cases.

Course grading

The final grade for the course will be based on two components:

Exam (40%)

At the end of the semester, a multiple-choice exam will test your understanding of core concepts covered in lectures and readings. You can find information about the location and time of the exam in the course directory.

Exercises (60%)

Practical exercises will make up the majority of your grade. These exercises will apply the principles learned in class to hands-on tasks. Both the timely submission and the quality of your work will be critical in determining a pass/fail for each exercise. Exercises should be submitted via ADAM.

https://matarui.github.io/SCICOM_HS24/

Exercise A (11%)

This exercise involves a brief reflection task. You will be asked to critically assess an example of science communication of your choice (e.g., a news article, blog post, video, podcast, etc.) based on what you learned in the course. Your reflection, which should not exceed 300 words, should address the following: What is the main message of the communication? Who is the target audience? What are the strengths and weaknesses? How could it be improved? Submit your reflection including a link to the example of your choice through ADAM by **31. Oct 2024**, 11:00.

Exercises B-H (7 exercises, 7% each)

During each session, you will complete a task involving manual drawing (materials will be provided), followed by a brief homework assignment. The goal is to develop an understanding of visualization principles through active creation and to learn how to critically evaluate visualizations. "Drawing by hand is thinking" is an approach that combines creative and analytical thinking: By drawing manually, you can develop a deeper understanding that is independent of digital tools and applicable in studies, research, and practice. For each session, you will have 12 hours to upload the in-class task (in case you have to miss the session and cannot do it in class) and 6 days to submit the homework assignment. Submit your drawings as a JPEG or PNG file.

https://matarui.github.io/SCICOM_HS24/