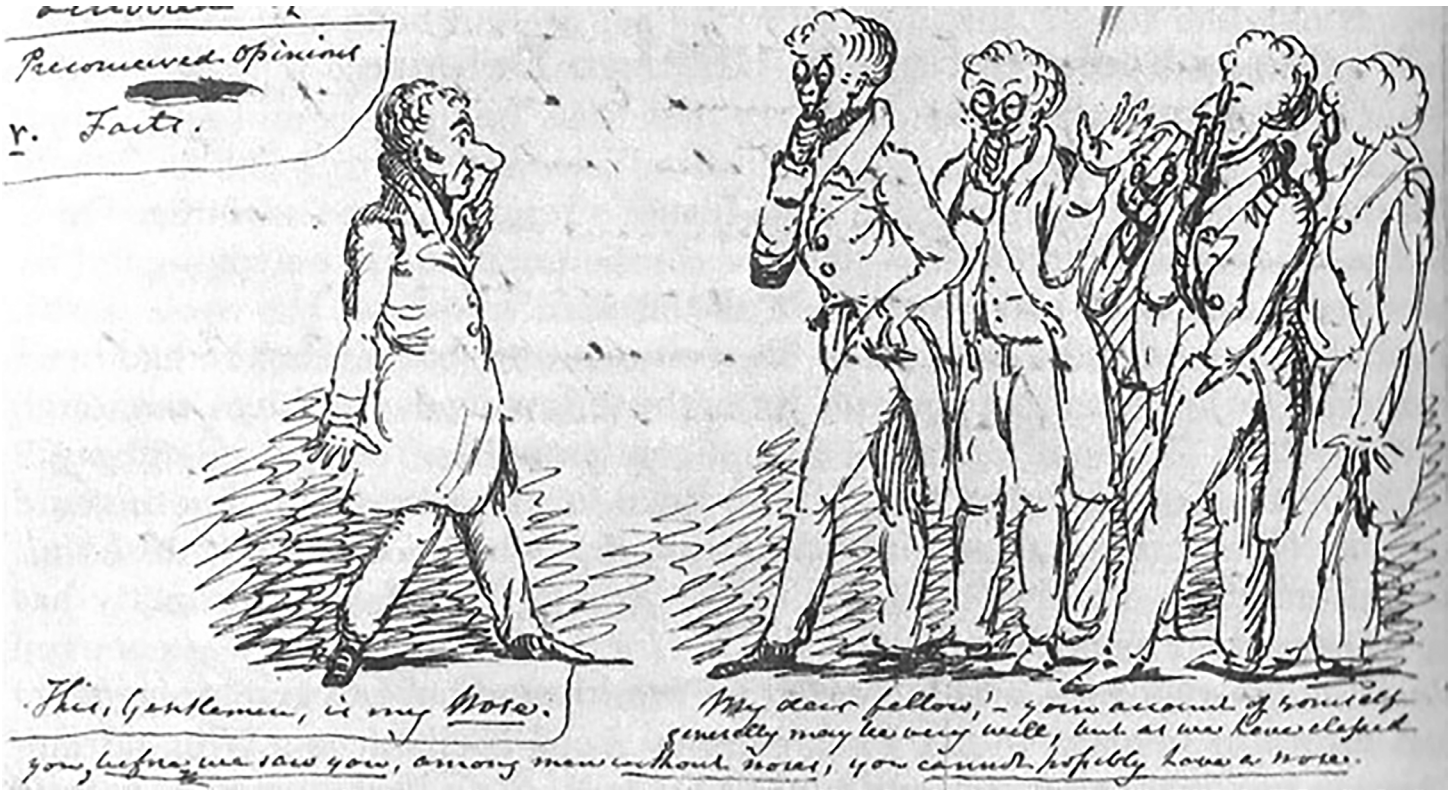


# When Experts Disagree

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## ABSTRACT

The *Fact-or-Faux* series addresses misinformation and science media literacy. Here, we consider how consumers may best manage cases of scientific disagreement and corresponding uncertainty, at least when any controversy is genuine and not merely a misleading impression generated by deceptive media messaging.


**Keywords:** Consensus; disagreement; scientific uncertainty; precautionary principle

*Respect the consensus of the relevant scientific experts*. That's the benchmark for reliable science in informing public policy or personal decision-making (Oreskes 2019). But what if the experts disagree? What if there is no genuine consensus? What then? If we cannot confidently sort fact from faux, what are we to do?

## First, check: is the controversy counterfeit?

In some cases, the appearance of disagreement is just that: *mere appearance*. Social media can amplify the views of dissenting experts, making them appear far more important than they really are. One study showed that contrarian claims about covid vaccines were 11 times more frequent than those of the corresponding consensus (Efstratiou et al. 2024).

Similarly, there are dozens of blogs and websites denying global warming and climate change. But they mostly repost information from just three sites (Sharman 2014). Alas, lies seem to spread on social media faster, farther, and more broadly than facts (Vosoughi, Roy, and Aral 2018). So, before concluding that science is in disarray, you need to ask: are the sources of dissent credible? Or might the debate be imaginary, occurring just in the public media and not among the relevant experts?

Impressions of controversy are easy to create. For a long while, two-thirds of the misinformation on covid on social media originated from just a dozen sources (CCDH 2020). Similarly, most reports denying climate change shared on Twitter were traced to just ten publishers (CCDH 2021). Another analysis of over 22,000 tweets critical of climate change revealed 60 sources funded by a "Big Oil" company (Collarossi 2023). Accordingly, consumers of science should not mistake a flood of sponsored messaging from a vocal few as "the wisdom of the crowd." The appearance of a controversy *in the media* is not the same as a real controversy *among professional scientists*.

Another way agents try to shape public opinion is to generate bogus "consensus statements," such as the 1995 Leipzig Declaration and the 1998 Oregon Protocol. Each tried to challenge the consensus on global warming, Yet most signers had no actual expertise in the field. Creating an *image* of a controversy (when there is none) is a standard ploy now in the disinformation playbook. Indeed, this tactic has been increasingly used to confound timely action on important socio-scientific issues (see Figure 1; Martini and Andreoletti 2021; Michaels 2020; Oreskes and Conway 2010).

Another tactic for counterfeiting controversy is for someone without genuine expert credentials to pretend that they are a legitimate voice of dissent. For example, Judy Mikovits, an outspoken vaccine critic (*Plandemic*, *Plague of Corruption*), has been called by supporters "among the most skilled scientists of her generation." They herald her as "a modern-day Rosalind Franklin." But no qualified immunologist regards her views as sound. Research she published in *Science* magazine linking chronic fatigue syndrome to a virus was later retracted (the spurious results were attributed to a contaminated reagent.) Lacking credibility, her "dissent" is empty and without merit.

All this imitation of expert consensus or faux controversy can usually be identified with the basic tools of quick fact-checking, such as lateral reading. As always, look for conflicts of interest: ways that the claimant might benefit in terms of power, profit or privilege. Namely, begin (as always) by checking the journalistic and/or institutional reliability of your source of information. Establish that any discord is genuine.

FIGURE 1

**Some bogus controversies. Despite a consensus among the relevant experts, impressions of scientific disagreement flooded public media.**

- Secondhand cigarette smoke
- Climate change
- Safety of vaccines
- Acid rain
- Environmental harms of pesticides
- Toxicity of hexavalent chromium
- Toxicity of formaldehyde
- Toxicity of vinyl chloride
- Toxicity of lead
- Ephedra
- Whether statins control cardiovascular disease
- Health effects of burning diesel fuel
- Severity of the 2020 covid pandemic
- Whether masks reduces viral transmission
- Origins of the Covid-19 virus

## Why experts disagree

Yes, sometimes experts disagree. (See the opening banner image: a cartoon of a debate in the Geological Society of London in the 1830s, by one of the scientists being criticized; Rudwick 1985.) Indeed, in the ongoing scientific research relevant to many contemporary issues, it is common. However, the mere presence of debate among scientists does not discount the science, as some contend. It is not a signal that some investigators are incompetent or wrong. Or that every scientist is opinionated and ignoring the role of empirical results. Instead, professional disagreement typically indicates active *science-in-the-making*. Science is doing exactly what it should be doing: trying to get things right. Resolve ambiguities. Clarify the interpretation of the evidence. Find more relevant data. Scientific investigations take


time and resources. And sometimes, for the rest of us, it takes patience, too.

For example, relevant data may be meager and insufficient. Or researchers may encounter different sets of evidence that do not align. Or they may not concur about which observations are most significant. Multiple theories may explain the same results. These are all reasons why experts may justifiably disagree.

This is one reason why studying the history of science can be so valuable: to understand and appreciate how disagreement can actually contribute to scientific progress. How did scientists stumble on conflicting results? How did they resolve debates? There are plenty of stories. The particle vs. wave approaches to light. Or the Neptunists vs. the Plutonists in explaining how geological strata formed. Or the Mendelians vs. the Biometricians in conceptualizing the patterns of inheritance. All provide insights into the *critical discourse* and *social practices* that are integral to the nature of science.

Sometimes, science is recognizably incomplete. Namely, we just don't know. Or we don't know *yet*.

As consumers of science, can we learn to acknowledge that current research may be uncertain? Accepting such a status as "natural" is an important foundational epistemological belief (or element of "epistemic cognition").

## Uncertainty as a form of expert knowledge

When the experts disagree, you may easily be tempted to substitute your own judgment for the experts'. Yet non-experts must resist this powerful urge. If the experts cannot agree, who are we to trump their conclusions? We can easily miss something that the experts themselves know very well. We may well be reminded of the wisdom in respecting those who know more than we do.

One may desperately want to heed a personal hunch or an intuition. Yet this is not *knowledge*. Pretending to be an expert is just a dangerous excuse for succumbing to preconceptions. It is easy to unintentionally cherry-pick data to support your favored conclusion. But a patchwork of "positive" evidence is not necessarily complete. It fosters illusions, susceptible to blind spots. That's why we turn to experts to begin with. They know well how unwitting mistakes commonly happen. So, we must guard against accepting merely plausible arguments, and respect the view of experts.

It is equally dangerous to cherry-pick just the experts who agree with you. Non-experts are not equipped to second-guess the experts, even when they disagree. Our job is *not* to judge *which* scientific experts to trust—that is part of the inherent dilemma of expertise. Instead, we must see any major disagreement as the conclusion itself. That is, the justification is incomplete. The knowledge is still *uncertain*.

Yes, in practice, consumers often make their own judgments. But they are not scientifically justified. Psychologists have identified what cues we tend to rely on. We use indirect clues, such as "majority vote, replication, information quality, and experience" (Johnson, Mayorga, and Dieckmann 2024). We rely on our own knowledge (Barzilai, Thomm, and Shlomi-Elooz 2020). But, ideally, we should adopt a bird's-eye view of the relevant scientific community. Thus, if the experts *as a group* all acknowledge that they are uncertain, we should think likewise. Adopt an *agnostic* posture. Proceed as if the relevant information was simply not available. That is not abandoning science or reason. That is just prudently accepting the way it is.

As a result, we may need an alternative method for making decisions. How can we *accommodate* the uncertainty? For example, we may want to consider the entire spectrum of possible outcomes consistent with what science is already available. Perhaps we should hedge our bets against any undesirable outcome. Perhaps we should try to avoid the "worst case scenario." Or should we first protect the most vulnerable stakeholders? There are many versions of the Precautionary Principle for guiding decision making when the ideal information is unavailable (Fisher, Jones, and von Schomberg 2006; Steel 2015). But they all follow the principle that when there is genuine uncertainty, one should

FIGURE 2

**Variants of the precautionary principle.**

- Avoid irreversible harm.
- Pursue preventative actions.
- Ensure a fair distribution of risk.
- Prepare for multiple possibilities.
- Prepare for the worst-case scenario.
- Protect the most vulnerable stakeholders.
- Invest in more research to resolve uncertainties.
- Shift the burden of proof about potential harms.
- Preserve individual freedoms about accepting risks.

heed the familiar mottos, "better safe than sorry," or "first, do no harm" (Figure 2).

So, the absence of absolute scientific certainty does not justify not acting at all. The prudent alternative strategy is to assess what we do know scientifically about the risks, costs and possible consequences of making certain assumptions (or of disregarding them!). If there is a lack of overwhelming evidence, we may choose to forego a collective decision and let individuals make their own private choices. In other cases, the "most probable" outcome *may* be an appropriate benchmark (even if we know that other outcomes are possible). That is, we need to adopt a distinctive posture toward decision making under uncertainty.

Who knows? Maybe we elect to wait for better information and invest in more research? Other times, not: the potential risks are too urgent.

Ultimately, personal or social decision-making under (scientific) uncertainty follows *different principles and criteria than when definite information is available*. But it does not mean we should do nothing or fail to act.

That realization opens an opportunity for students to discuss how different criteria may fit different contexts. Socioscientific decisions-making is *informed by* science, but not determined wholly by it.

## Uncertain, but not clueless

It is easy to imagine the non-expert's frustration. They may conclude (unfairly), "if scientists are uncertain, then they know nothing at all." When the experts disagree, the disillusioned citizen-consumer may throw up their hands in despair and dismiss the science altogether. "Science is broken," they may cry.

But when experts disagree, they are not necessarily clueless. Accordingly, our task is to collect what information *is* available and contextualize it. Uncertain science may still critically *inform* our decision-making.

For comparison, we may reflect on how we respond to conflicting advice from acquaintances—about which cell phone service to use, or which college to attend. We do not discount their information entirely. We consider it all as a whole.

For example, there may be common ground on some basics. That may well be enough to guide us. Or the *range* of perspectives may be relevant. The extremes set informative boundaries. Those strategies can be applied to science, as well.

Or there may be differing levels of uncertainty. Even if there is not a solid "consensus," there may be a clear majority view. Sometimes, that is all we need. We would certainly not want to give "equal weight" or "balance" to a minority view, as though it would surely triumph eventually.

In other cases, it is helpful to know what the leading experts think—the ones that fellow experts regard as most knowledgeable and experienced. In a sense, that peer recognition may be reason to consider their judgment "more expert." That work of appraisal is often done by professional science journalists in reporting the status of the ongoing science in the news. Indeed, such media "gatekeepers" are important interfaces between non-expert consumers and the community of expert scientists. We may need to keep in mind *their* particular

expertise: "translating" the experts' knowledge for us, including when the experts disagree. Their mediating role is part of the social architecture of trust.

## Recap

Yes, scientists sometimes disagree. Nothing extraordinary about that. However, when they do, we are not wholly disabled. We may apply a series of queries (a sort of decision-tree) to help guide us:

- First, check whether the disagreement is genuine, or manufactured artificially in the media by interests hoping to confound the science for their own sake.
- If experts do disagree, exhibit epistemic humility. Do not try to trump the expert uncertainty.
- Probe the nature of the disagreement. What is the degree of uncertainty, the range of debated alternatives, and the views of the leading experts—relying on veteran science journalists and scientific institutions.
- Be ready to accept the scientific uncertainty and follow alternative decision-making methods, such as using the Precautionary Principle.

A prepared presentation to help guide students through this reflection inquiry mode is available (in both PPT and PDF formats) at http://shipseducation.net/misinfo/disagreement.htm

**DISCLOSURE STATEMENT**

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**REFERENCES**

Barzilai, S., E. Thomm, and T. Shlomi-Elooz. 2020. "Dealing with Disagreement: The Roles of Topic Familiarity and Disagreement Explanation in Evaluation of Conflicting Expert Claims and Sources." *Learning and Instruction* 69: 101367. https://doi.org/10.1016/j.learninstruc.2020.101367.

CCDH (Center for Countering Digital Hate). 2020. "The Disinformation Dozen." CCDH (Center for Countering Digital Hate). https://counterhate.com/research/the-disinformation-dozen/.

CCDH (Center for Countering Digital Hate). 2021. "The Toxic Ten." CCDH (Center for Countering Digital Hate). https://counterhate.com/research/the-toxic-ten/.

Collarossi, J. 2023. "Tweets, Ads, and Lies: Researchers Are Fighting Against Climate Misinformation." Boston University. https://www.bu.edu/articles/2023/tweets-ads-and-lies-researchers-are-fighting-against-climate-misinformation/.

Efstratiou, A., M. Efstratiou, S. Yudhoatmojo, J. Blackburn, and E. De Cristofaro. 2024. "Here's Your Evidence": False Consensus in Public Twitter Discussions of COVID-19 Science." *Proceedings of the ACM on Human-Computer Interaction* 8 (CSCW2): 1–33. https://doi.org/10.1145/3687010.

Fisher, E. C., J. S. Jones, and R. von Schomberg. 2006. *Implementing the Precautionary Principle: Perspectives and Prospects*. Cheltenham, UK: Edward Elgar Publishing.

Johnson, B. B., M. Mayorga, and N. F. Dieckmann. 2024. "How People Decide Who Is Correct When Groups of Scientists Disagree." *Risk Analysis* 44 (4): 918–938. https://doi.org/10.1111/risa.14204.

Martini, C., and M. Andreoletti. 2021. "Genuine versus Bogus Scientific Controversies: The Case of Statins." *History and Philosophy of the Life Sciences* 43 (4): 110. https://doi.org/10.1007/s40656-021-00456-w.

Michaels, D. 2020. *The Triumph of Doubt*. New York: Oxford University Press.

Oreskes, N. 2019. *Why Trust Science?* Princeton: Princeton University Press.

Oreskes, N., and E. M. Conway. 2010. *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming*. New York: Bloomsbury Press.

Rudwick, M. 1985. *The Great Devonian Controversy*. Chicago: University of Chicago Press.

Sharman, A. 2014. "Mapping the Climate Sceptical Blogosphere." *Global Environmental Change* 26: 159–170. https://doi.org/10.1016/j.gloenvcha.2014.03.003.

Steel, D. 2015. *Philosophy and the Precautionary Principle*. Cambridge, UK: Cambridge University Press.

Vosoughi, S., D. Roy, and S. Aral. 2018. "The Spread of True and False News Online." *Science* 359 (6380): 1146–1151. https://doi.org/10.1126/science.aap9559.

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