

Science and Truth

Quote of the day:

“Science is a way of thinking much more than it is a body of knowledge.”

-- astronomer and science communicator Carl Sagan

Readings for next time

Today's class and the next one will have more of a Smith imprint than most of the others

Both modernists and postmodernists challenge authority, albeit in different ways. The “argument from authority” is a well-known fallacy.

How can someone take an appropriately skeptical attitude toward authority without become a nihilist, flat earth believer, or QAnon advocate? One way is to shift the conversation from authority to expertise.

expert: a person who has comprehensive knowledge of or skill in a particular area. Expertise is a kind of acquired authority.

However, this doesn't really solve our problem, because experts can get things wrong. How can you figure out whether to believe what an expert is saying?

Let's consider five possible means by which you could assess an expert's claims.



1. Evaluate the expert's evidence and reasoning for yourself?

- **This is easier if you have general knowledge, expertise in a related field, and the ability to invest substantial time investigating the matter.**
- **Increasing specialization and technical sophistication makes this strategy difficult if not impossible in many fields.**

2. Consider the expert's interests and biases?

- **Everyone has interests and biases, which may or may not influence their judgments. It is hard to know for sure how much difference their interests and biases make.**

3. Examine the expert's track record?

- **Works better for service providers (doctors, therapists, accountants, mechanics, plumbers, etc.) than for scientific experts.**

4. Consider the expert's credentials?



- Weak credentials are a red flag.

However, there are card-carrying experts with good credentials who hold beliefs that the vast majority of their colleagues reject. The mere fact that you can find a credentialed expert for a position proves nothing.

Which brings us to what might be the best strategy the average person can take to evaluate an expert's claims:

5. Put your stock in a community of experts—i.e., look for an expert consensus (if it exists) rather than the opinion of a single expert.

Expert consensus is no guarantee of correctness, but a rational non-expert will usually be better served by accepting than rejecting an expert consensus.

Note that an expert consensus is merely provisional. It could be overturned.

For the purposes of this class, scientists are the most important kind of experts. The expert consensus of accountants or mechanics rarely becomes a political controversy that people routinely reject. Scientific matters, however, sometimes do lead to widespread denial.

It will thus be worthwhile for us to investigate how science works as an enterprise, how to learn about a scientific consensus, and why people often refuse to accept a scientific consensus.

Lee McIntyre, Naomi Oreskes, and others: what makes science distinctive as a way of knowing?



- 1. Not the “scientific method,” which is better described as “scientific methods.”**
- 2. Instead, it’s the scientific attitude—putting your claims into the form of hypotheses that can be tested against evidence, and then revising your beliefs accordingly.**
- 3. Also, the scientific community. Individual scientists are fallible human beings. Through a rigorous process of evaluating hypotheses, the community can arrive at provisional truth even though each scientist is flawed as a truth seeker.**

The consensus on a given matter arises through this process of dialogue among scientists based on formal rules, accepted methods, sharing of data, multiple investigations of the same question, etc.

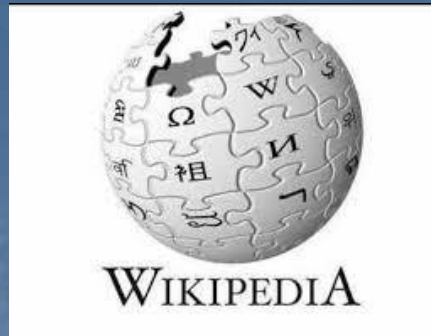
**How can we find out the current scientific consensus on a particular subject?
Beware of Google, which will often take you to the sites of interest groups, ideological news sources, and other non-experts—all of whom claim that the science is “on their side.”**





The best ways to learn about a scientific consensus (if it exists):

- 1. Systematic reviews of the published, peer-reviewed scientific literature. Textbooks serve a similar purpose. Information making it into a textbook usually has a strong consensus behind it.**
- 2. The statements of scientific associations**
- 3. Wikipedia**



Communication researcher Danah Boyd: Many students are taught to avoid Wikipedia and to instead use Google to “do your own research.”

<https://points.datasociety.net/did-media-literacy-backfire-7418c084d88d>

Smith: Why we should trust Wikipedia more than whatever sites someone finds through Google

- **Google can be a vehicle for confirmation bias and motivated reasoning.**
- **Meanwhile, Wikipedia is a decentralized system of knowledge compilation (tens of thousands of contributors), without the opportunity for cherry picking by users because each subject has one article.**
- **Wikipedia has rules to avoid “anything goes” in writing and editing.**
- **“Neutral point of view” standard. Must cite authoritative sources. No original research in the Wikipedia article itself. Goal is to describe disputes (where they exist), not engage in them.**

- **Wikipedia is open and transparent (can check history of every edit).**
- **Wikipedia indicates whether there is an expert or scientific consensus on a topic, or whether there are conflicting views. No false equivalence.**
- **Wikipedia changes as we gain new knowledge.**

Some caveats:

- **Wikipedia contains only basic information. It's not a substitute for detailed study of a subject.**
- **Articles on obscure topics might have lower accuracy (fewer participants in writing and editing the articles).**
- **Articles on breaking news might have lower accuracy (it takes time for the back-and-forth that makes Wikipedia work).**
- **Wikipedia reflects the knowledge available in the wider society. It can only be as good as the knowledge that feeds into it.**



Two important implications follow from the reliability—and limitations—of Wikipedia as an information source:



Implication 1A: If a Wikipedia article challenges your deeply held values, you shouldn't immediately jump to the conclusion, "Wikipedia is biased." You should instead consider the possibility that *you're* biased and that you hold a false belief.

Implication 1B: Some of the information on Wikipedia is wrong (just like textbooks, or our best expert or scientific understandings of a subject). If you think Wikipedia is wrong on a particular matter, you could be right. But beware of our endless capacity for self-delusion.

Let's examine areas of scientific consensus that many people reject, starting with those lacking a strong overlap with partisan and ideological orientations.

homeopathy: "a system of treating diseases using very small amounts of the substance that causes the disease or condition"

**Can involve dilution to one part per billion or less.
Homeopathy violates the known laws of chemistry,
where the dose makes the poison or treatment.**

How do we know that homeopathic treatments do not work beyond placebo? A good source of information is Cochrane Library, which publishes systematic reviews and meta-analyses of the research on various medical treatments.

<https://www.cochranelibrary.com/>

We can also turn to Wikipedia for a quick summary of scientific knowledge about homeopathy.

<https://en.wikipedia.org/wiki/Homeopathy>

Some other areas of science denial that don't have a strong association with any political ideology:

alien abduction https://en.wikipedia.org/wiki/Alien_abduction

flat earth https://en.wikipedia.org/wiki/Flat_Earth

bigfoot <https://en.wikipedia.org/wiki/Bigfoot>

ESP https://en.wikipedia.org/wiki/Extrasensory_perception

astrology <https://en.wikipedia.org/wiki/Astrology>

AIDS not caused by HIV

https://en.wikipedia.org/wiki/HIV/AIDS_denialism

vaccines cause autism, and antivax views more generally

https://en.wikipedia.org/wiki/Vaccines_and_autism

For most of the above areas, you can find a small number of experts who reject the consensus.

More areas of science denial that don't have a strong association with any political ideology:

mediumship <https://en.wikipedia.org/wiki/Mediumship>

psychics <https://en.wikipedia.org/wiki/Psychic>

ghosts <https://en.wikipedia.org/wiki/Ghost>

clairvoyance <https://en.wikipedia.org/wiki/Clairvoyance>

remote viewing

https://en.wikipedia.org/wiki/Remote_viewing

telekinesis

<https://en.wikipedia.org/wiki/Psychokinesis#Etymology>

certain types of alternative medicine

https://en.wikipedia.org/wiki/Alternative_medicine