Class Sessions #8  
24 October 2019  
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# Talking about the final paper assignment and the first draft

## Causal question

## Anything about climate change

## Research, not just opinion – reflect credible sources

## Questions?

# Some thinking on the subject

## {Boykoff, 2004 #5539} How do we learn about the science?

### Bias defined as “the divergence of prestige-press global-warming coverage from the general consensus of the scientific community” {Boykoff, 2004 #5539, 127}.

### “In the end, adherence to the norm of balanced reporting leads to informationally biased coverage of global warming. This bias, hidden behind the veil of journalistic balance, creates both discursive and real political space for the US government to shirk responsibility and delay action regarding global warming” {Boykoff, 2004 #5539, 134}.

## {Oreskes, 2007 #5545} Why should we believe the science #1?

## {Anderegg, 2010 #6527} Why should we believe the science #2?

### “This indicates that the bulk of UE researchers on the most prominent multisignatory statements about climate change have not published extensively in the peer-reviewed climate literature” {Anderegg, 2010 #6527, 2}.

## {Oppenheimer, 2007 #6528} Why should we believe the science #3?

### Scientists critiquing the process for papering over uncertainties.

## {Leiserowitz, 2009 #6526} Who believes the science?

# Faith/opinion/knowledge discussion

## Episcopal church votes to divest from fossil fuels: This is a moral issue, July 3, 2015 <http://www.theguardian.com/world/2015/jul/03/episcopal-church-fossil-fuel-divestment>

## During first class, all of you put yourself in one of the 6 categories and that is based on some set of BELIEFS about the world. All of you laid out something you KNOW and something you don’t know about climate change.

## So, for starters:

### How do you know what you know about climate change? How did you learn it?

### Why do you feel unsure about other things?

### Sources of information? Why do you believe some sources?

### What sources of information do you use? How many of you consciously use sources that run contrary to your existing thinking?

### In short, WHY do we believe what we believe?

Why Should we Believe the “Science” and Which Science Should we Believe?

# Credibility

## Expertise

### In looking at the two URLs you sent, those don't seem to fit my thoughts on this. Michael Crichton was a novelist with a medical degree -- why would he be an expert on climate science? Philip Stott is (according to Wikipedia) a biogeographer, not a climate scientist, and hasn't published in the peer-reviewed literature. Lindzen does have credentials that require he be taken seriously. With respect to him, the question is simply that a huge number of others with similar credentials disagree about the same evidence and theories. The same can be said for the single Russian person dealing with Mars.

### “97–98% of the climate researchers most actively publishing in the field support the tenets of ACC outlined by the Intergovernmental Panel on Climate Change, and (ii) the relative climate expertise and scientific prominence of the researchers unconvinced of ACC are substantially below that of the convinced researchers” {Anderegg, 2010 #6527, }.

## Trustworthiness

## Since we can't know who is correct on our own, we need to look at other factors in any complex, complicated field to figure out who to believe. Credibility is usually determined/assessed by two proxies: expertise and trustworthiness. Expertise is "do they have the training to know the truth (or as close to it as we as humans can come)" and trustworthiness is "if they knew the truth, would they tell it to me." So, we don't think people with only high school diplomas have as much expertise as those with PhDs and we don't think those with PhDs from lesser universities have as much expertise as those from more prestigious ones. We also don't trust people who work for Exxon as much as for private universities.

# Evidence that they followed scientific method and “analysts” vs. “advocates”

## Oreskes says there is no scientific method, in the sense of a given set of rules to follow {Oreskes, 2007 #5545, 80} -- true, but there is a principle underlying the multiple methods and that is that one is as engaged in the effort to prove ONE’s SELF wrong as to prove others wrong.

## General: those who seek to prove selves right vs. those who seek to prove selves wrong and fail

## Specific:

### Scientific method is an accepted method, when followed, for designing research to try to prove self wrong that also identifies how to interpret failure

### Null hypotheses

### Statistical significance and confidence intervals

### Addressing alternative hypotheses

# Peer-review: If aren’t critical of own work, others will be

## In line with this, better theories are those that are *falsifiable*

## Critical peer-review by those with equal expertise in a given field

# Theories that make predictions that prove right are convincing because they demonstrate that we understand the logic of the process

## We develop models based on existing data but the key is to apply them to “unlooked at” data and if they are consistent with that, then it's far more convincing

## Stock market example -- all stock market models can predict past fluctuations because the models can be developed to do so but almost no models can predict the market (despite the strong incentives to do so), since, if they could, there wouldn’t be money to be made

# Multiple independent sources of same piece of information

# Multiple indicators of same trend or phenomenon and multiple independently-arrived-at conclusions pointing in same direction

## The "signal" of climate warming due to humans is coming in from every different direction (glaciers, sea level rise, changes in animal lifecycles and numerous other indicators that almost all point in the same direction). Are there some glaciers that are getting longer sure - but the vast bulk of them are getting shorter -- look at : <http://www.gletscherarchiv.de/fotovergleiche/gletscher_liste>

## If a given theory is true, then should see A, B, C, D, and E, e.g., if warming is occuring, should see glacial melting, sea level rise, coral bleaching, phenological changes, etc.

## E.g., trust Galileo and Copernicus because their theory fit with the evidence better than prior theories.

## The reason to trust the IPCC over the alternatives is because the conclusions the IPCC is cautiously drawing are more consistent with far more of the theories and far more of the facts than are those who are contesting their conclusions.

## If warming is due to humans, should see increases after 1850, should see increases in gases that wouldn’t see if just sunspots (note that increases in gases will NECESSARILY lead to warming -- so only have to show they are increasing)

## Triangulation or “Consilience: the process by which sets of data—independently derived— coincided and came to be understood as explicable by the same theoretical account (Gillispie 1981; Wilson 1998). The idea is not so different from what happens in a legal case. To prove a defendant guilty beyond a reasonable doubt, a prosecutor must present a variety of evidence that holds together in a consistent story. The defense, in contrast, might need to show only that some element of the story is at odds with another to sow reasonable doubt in the minds of the jurors. In other words, scientists are more like lawyers than they might like to admit. They look for independent lines of evidence that hold together” {Oreskes, 2007 #5545, 90}.

# Must be *best* explanation, not just a possible explanation

## Must be the most consistent with the most facts and the most theories that have already been supported by other evidence

# Ability to account for all data, not just selected data

## Starts by addressing changes in the mean -- current temperature

## Addresses major trends in data -- trends over time

## Addresses correlation needed as 1st step in causal argument -- trends correlated with human activity

## Then also addresses why outliers exist

### Most careful work can (and indeed tries very hard to) explain outliers such as those glaciers that are growing, those reefs that are not bleaching, etc.

# “Consistent with other known laws of nature and other bodies of accepted evidence” {Oreskes, 2007 #5545, 92}.

# Other thoughts

## Because information accords with other KNOWLEDGE we already have (former student’s example: “This argument is convincing because it relies on an assumption that most people already believe to be true: that in general, news networks attempt to cover all sides of an issue and profit over showing public dispute.” More likely to trust a conclusion if agree with the underlying premise.

## Because information is consistent with our BELIEFS -- e.g., hard to disabuse ourselves of prejudices

## NOT because they reflect a consensus of scientists

## Notion that contrarians may be right appeals to sense of overthrowing the hierarchy, etc.