HPSC 1001/1901/2101/2901

WHAT IS THIS THING CALLED SCIENCE?

Semester 2, 2020

Lecture 21: Consensus - 1

Consensus is agreement. A question is seen as settled. Sometimes a topic is no longer discussed, as the evidence is agreed to be overwhelming.

In a degree of belief framework: all the scientists have similar degrees of belief? They don't have to all fully accept a theory (?), but just have to have similar degrees of confidence in the different the options.

In the dinosaur case: there is consensus than an asteroid hit present-day Mexico about 65 mya, with global effects. Not complete consensus on whether this was the cause of the dinosaur extinction.

* See this popular article for the ongoing controversy:
https://www.theatlantic.com/magazine/archive/2018/09/dinosaur-extinction-debate/565769/ (Will put it on Canvas)
There seems to be a bit more debate than I realized.

Consensus seems compatible with some amount of disagreement. In a scientific community, to what extent will there be a tendency to try to bring people together, as opposed to allowing some diversity to continue?
Compare Kuhn on the functioning of normal science with other views that both expect and endorse ongoing diversity of opinion (Laudan, Longino).

Two kinds of consensus:

Spontaneous. Agreement is reached: everyone or nearly everyone reached the same view. If you did a survey, very few in the field would disagree. (This is a matter of degree.) And: no organized effort was needed to reach agreement.

Curated: Initially, some diversity of opinion. Due to a perceived need for closure to occur, the field is asked to *make its mind up*, or is asked if it has made its mind up.

Why? Usually because of a policy decision, in a situation where the government or bureaucrats can't just quietly ask for directions from a few scientists. The situation requires

public recognition of the scientific basis for the decision. So the scientific community is asked to formulate, or agree with, a statement that says an issue is settled. Action can now proceed as there is no reasonable doubt left.

"Policy" here can include educational policy (teaching evolution, eg.) as well as more obvious areas like health (vaccination) and energy (climate change).

Spontaneous consensus is a level 2 matter.
Curated consensus is a sort of interaction between 2 and 3.

That interaction seems to introduce the possibility of trouble. A decision on the scientific side is being affected by something other than internal discussion of the usual kind.

There is an external consumer or user of the scientific information (which is fine, and normal) but also a sort of feedback from them, affecting what the scientists decide or say.

This can look questionable, but it can also seem necessary in some cases.
On difficult issues, scientists can argue for a long time.
What is done when a practical decision has to be made?
You could wait, or hedge (do little that requires commitment), but sometimes the issue is urgent.
In some cases, a calculation of costs and benefits can be explicitly applied behind the scenes. But to do that calculation you need to know which hypotheses are the most likely to be right – you need some agreement.
And: it will often also be necessary to get an overall picture of things across to the wider community.

A trade-off: You don't want the mere existence of questioning to override a sensible use of knowledge. There will always be *some* uncertainty.

But you don't want to cut off debate too early. If you decide that an issue is settled, it will make no sense to fund work that continues to ask basic questions. "That is a waste of money, surely! We know the basics here." No one should get a grant today to investigate the atomic number of helium.

But if an issue is not really settled, it may be a bad mistake to end debate and start to put real pressure on those who are reluctant to go along.

So: a spontaneous consensus is the best situation for policy decisions and action. But in a pure form this may be rare.

Especially in a democratic system where information moves around a lot (and even more so in the internet age), there will be pressure to reach consensus on high-stakes issues, to end debate and move forward. Is this OK, or a problem?

How the idea of consensus is described by (for example) NASA.

https://climate.nasa.gov/scientific-consensus/

Site last updated: October 26, 2017.

> Multiple studies published in peer-reviewed scientific journals[1] show that 97 percent or more of actively publishing climate scientists agree*: Climate-warming trends over the past century are extremely likely due to human activities.

Footnote - *Technically, a "consensus" is a general agreement of opinion, but the scientific method steers us away from this to an objective framework. In science, facts or observations are explained by a hypothesis (a statement of a possible explanation for some natural phenomenon), which can then be tested and retested until it is refuted (or disproved).*

As scientists gather more observations, they will build off one explanation and add details to complete the picture. Eventually, a group of hypotheses might be integrated and generalized into a scientific theory, a scientifically acceptable general principle or body of principles offered to explain phenomena.

Unpack some of this:

In science, facts or observations are explained by a hypothesis (a statement of a possible explanation for some natural phenomenon), which can then be tested and retested until it is refuted (or disproved).

The idea of positive support seems absent so far. Seems very Popperian.

As scientists gather more observations, they will build off one explanation and add details to complete the picture.

Now seems too confident. This situation might be attained, but need not be.

Eventually, a group of hypotheses might be integrated and generalized into a scientific theory, a scientifically acceptable general principle or body of principles offered to explain phenomena.

This now seems to acknowledge positive support. (Must have been present before.)
Note the binary nature of much of this – refute/no refute, acceptable/not acceptable.
No role for degree of belief. No role for diverse opinions.

Some possible interactions between scientific communities and the wider community:

Scenario 1.

- Some degree of spontaneous consensus.
- Pressure from outside (govt. bodies, business) to firm up a view, as policy decision is needed. Scientists do this. The firming up might be premature?

Scenario 2

- Some degree of spontaneous consensus.

• Powerful business or other interests seek to emphasize uncertainty (climate change, cigarettes and cancer - see Oreskes and Conway, *Merchants of Doubt*).

• Scientists seek to convey the original consensus, or try to actively curate a consensus, or do some of both.
The result might be polarized, exaggerated statements: "There is no consensus," versus "There is no doubt."

All these are interactions between level 2 and level 3, in my framework.

** Regarding the two main risks – reaching consensus too early (and abandoning the search for a better theory), versus reaching it too late – I don't think either risk is more acute than the other. It will depend on the case.

Some cases to think about:
1. HIV as cause of AIDS -- 1980s to around 2000,
2. Human-caused climate change -- 1980s to present,
3. Dietary advice: low fat, low cholesterol diets. 1970s to present,
4. Safety of standard vaccines (esp 'MMR' vaccine),
5. Covid-19 pandemic.

HIV and AIDS

Early 1980s - start of AIDS epidemic as visible issue (not with that name).
Gay men, hemophiliacs, IV drug users especially.

1983 - Gallo (US) and Montagnier (Fr) labs announce a retrovirus may be associated with the disease. (Priority dispute later.)

Through 80s: steady increase in evidence that HIV was cause.

Dissenters (first parts of this via Wikipedia - some good articles there).

Peter Duesberg - UC Berkeley oncologist who worked on retroviruses.
1987 article in *Cancer Research*, "Retroviruses as Carcinogens and Pathogens: Expectations and Reality."

Proposed that AIDS is immunological decline caused by use of recreational drugs and/or other drugs, including (once it was used) AZT, the early anti-AIDS drug.
HIV exists but it is harmless, a "passenger."

1988, statement by US National Academy of Sciences (NAS): "the evidence that HIV causes AIDS is scientifically conclusive."

HIV INFECTION AND ITS EPIDEMIOLOGY

New information about HIV infection and its epidemiology has emerged either to confirm or alter earlier impressions of the disease. One question that has been resolved is the causative agent of AIDS. HIV and AIDS have been so thoroughly linked in time, place, and population group as to eliminate doubt that the virus produces the disease. **The committee believes** that the evidence that HIV causes AIDS is scientifically conclusive.

https://www.nap.edu/read/771/chapter/2
Confronting AIDS: Update 1988. Executive Summary

Was this a bit quick, in 1988?
Evidence, as cited above, was wholly association-based ("thoroughly linked in time, place...").
Very strong associations. But no lab work or experiments that show that adding the virus to a healthy person/cells leads to the disease.

And as Duesberg emphasized: *no mechanism* by which a retrovirus (of that kind?) could do so much damage. Another form of toxicity must be involved?

I was in California then. Much discussion of this question. Duesberg was a qualified and respected guy. I knew an

oncologist graduate student at UCSD who was very concerned about his arguments.

A few other qualified dissenters, but not many.
Main one: Kary Mullis.
Nobel Prize in chemisty for inventing/developing PCR methods (a genetic photocopier – famous now for its use in SARS-Cov 2 testing worldwide). Says he was initially cautious, from 1988, and then impressed by Duesberg.

> I like and respect Peter Duesberg. I don't think he knows necessarily what causes AIDS; we have disagreements about that. But we're both certain about what doesn't cause AIDS.

> We have not been able to discover any good reasons why most of the people on earth believe that AIDS is a disease caused by a virus called HIV. There is simply no scientific evidence demonstrating that this is true.
>
> From Mullis' introduction to Duesberg's book. *Inventing the AIDS Virus*, 1996.

Mullis - a self-identified rebel and gadfly. Dislikes institutionalized science.

See also his website:

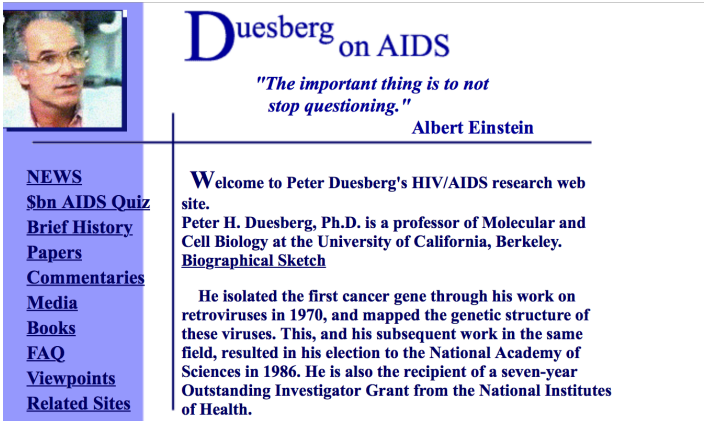
https://www.karymullis.com/pdf/On_AIDS_and_Global_Warming.pdf

Mullis said(/said) he does think viruses are involved (see end of slides).

Duesberg: other stresses on immune system, many due to lifestyle. HIV a passenger.

Problem for Duesberg view: hemophiliacs had very high rates of AIDS, and had HIV, before blood screening. They were not risk-takers. (Duesberg's website even now is very unsatisfactory on this.)

* Duesberg's website (duesberg.com) accessed 2020:



Duesberg on AIDS

"The important thing is to not stop questioning."
Albert Einstein

NEWS
$bn AIDS Quiz
Brief History
Papers
Commentaries
Media
Books
FAQ
Viewpoints
Related Sites

Welcome to Peter Duesberg's HIV/AIDS research web site.
Peter H. Duesberg, Ph.D. is a professor of Molecular and Cell Biology at the University of California, Berkeley.
Biographical Sketch

He isolated the first cancer gene through his work on retroviruses in 1970, and mapped the genetic structure of these viruses. This, and his subsequent work in the same field, resulted in his election to the National Academy of Sciences in 1986. He is also the recipient of a seven-year Outstanding Investigator Grant from the National Institutes of Health.

"The important thing is to not stop questioning."
Albert Einstein

Makes sense on some views. Popper certainly. Perhaps others. (Longino and Laudan)

But: there is a practical side. This was very acute in early years, as the first anti-AIDS drug, AZT, was very toxic.

Was it right to prescribe and endorse it?
A hard decision at that time – see *Dallas Buyers Club*.
There was lots of incentive to distrust mainstream views, which were also sometimes seen as associated with an establishment that blamed gay people for the disease. Lots of money involved, too. Should money be invested in

developing anti-viral drugs, or in some more mixed approach?

Many gay activists initially liked Duesberg, until his comments about lifestyle got out.

Influence of the dissenters on South African policies 2000-2003.
AIDS spread quickly in Africa. Thabo Mbeki's SA governent (1999-2008) was initially skeptical that HIV was cause of AIDS.

Duesberg served on an advisory panel to Mbeki, convened in 2000. With other denialists. Govt decided not to provide anti-retroviral drugs. Health minister Manto Tshabalala-Msimang advised dietary approach and respect for traditional medicines.

For the history, see Nattrass, "AIDS and the Scientific Governance of Medicine in Post-Apartheid South Africa" *African Affairs*, 2008.

Switch of policy by Mbeki government in 2003.

Nattrass estimates that over 300,000 deaths would have been prevented by using anti-retroviral drugs (esp. as they cut down transmission). Number was reached by comparing one part of SA that followed a different policy.

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Since the initial debates: The mechanistic holes have been largely filled in – how HIV causes harm.

Update of the evidence: No longer purely association-based. In the 1990s, several cases where HIV infection resulted from a lab or dental procedure, with no other risk factors, resulting in AIDS.

....tragic incidents involving three laboratory workers with no other risk factors who have developed AIDS or severe immunosuppression after accidental exposure to concentrated, cloned HIV in the laboratory. In all three cases, HIV was isolated from the infected individual, sequenced and shown to be the infecting strain of virus. In another tragic incident, transmission of HIV from a Florida dentist to six patients has been documented by genetic analyses of virus isolated from both the dentist and the patients. The dentist and three of the patients developed AIDS and died, and at least one of the other patients has developed AIDS. Five of the patients had no HIV risk factors other than multiple visits to the dentist for invasive procedures....

National Institute of Allergy and Infectious Diseases, 2009 website.

Summary:

The CDC in the US tried, in late 1980s, to establish and assert a consensus. This looks early, given the gaps in the evidence? Perhaps, though the gaps were closed within 10 years or so.

There was not a shutting down of discussion. Duesberg was able to publish, including in *PNAS* (as a member of National

Academy of Sciences, he can have some work published there without refereeing).

This is a case where it seems that.... "The important thing is to not stop questioning." Albert Einstein
.... is not very helpful?

Or: you *can* keep questioning, but you *also have to act.*

In some contexts, especially in a democractic society, action that is expensive and has costs will require a clear consensus.

If there is a consensus of the spontaneous kind (no one wants to ask more questions), then there is no problem. In the HIV case, the situation was close to that, but not quite there.

Scope also existed for a *circumventing* of the usual effects of the near-consensus (of spontaneous kind) that existed. The SA govt distrusted Euro-American medicine and especially the drug companies. They were motivated to listen to the few qualified dissenters.

Even before this, in the US, there was enough dissent and enough disruption for the CDC to attempt to "curate" a

consensus. (See their 1988 statement.) This sometimes aroused suspicion.

See also R. Shilts' book *And the Band Plays On*.

It would fine to keep questioning, if you could let policy be guided by the weight of expert opinion (the 'center of gravity' in the community, a spontaneous consensus or an approximation to one) without being circumvented. This seems to be becoming more and more difficult.