PH458

The Public Understanding of Science

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Introduction

The compartmentalisation of science

- The division of labour is one of the cornerstones of modern societies.
- Science offers perhaps the most paradigmatic case of this division.
- Its practitioners undergo lengthy specialised training and then devote whole lifetimes in niche areas of research.
- As a consequence, results in one area of science are not as easily discernible to practitioners in another.

The public and evidence

- If scientists from distinct fields have trouble understanding each other, what can we expect from the public?
- **More relevantly**: How much understanding of evidence and its testing powers can we reasonably expect from them?
- General education and popular science help instill some comprehension but there are limits to this approach.
- Why care? As you may recall, we want to improve policy design and implementation through evidence.

Science and democracy in tension

- The need to consider the public's understanding of science becomes all the more important given the power it has.

- In modern democratic societies, the public expresses its opinions through voting and even the threat of voting.

- That places democracy in a collision course with science.

  * Climate Change
  * Balanced Treatment of ID and evolution
  * Stem-cell research
  * GM products

NB: See https://ballotpedia.org/ for referenda.

Lecture aim and focus

- In this lecture:

  We consider whether it's a good idea to let democracy decide policies where science provides relevant evidence.

  NB: This may be made into a policy itself. A meta-policy that determines how (certain) other policies get selected.

  Focus area: Whether it's a good idea to let parents decide which topics enter the scientific curriculum.

A *Scientific* Controversy?

Evidence and alternative hypotheses

- There are various cases where it is claimed that evidence is either indeterminate or supports 'alternative' hypotheses.

  Examples:

  * cause of autism (the Wakefield hypothesis)

  * the safety of blood transfusions (Jehovah's witnesses)

  * origins of life (Intelligent Design)

- Is there really scientific controversy in such cases? Let us consider the first and third of these in turn.

The case of autism: The 'alternative' hypothesis

- In the mid-1990s Andrew Wakefield MD, co-authored a study linking measles vaccination with bowel disease.
- He then further speculated that MMR vaccination was linked with autism loosely based on some limited evidence.
- One of his recommendations was that MMR should be dropped in favour of single-antigen vaccination.
- As a consequence: "MMR vaccination rates dipped… Before that the UK was on track to achieve measles elimination".

http://www.bbc.co.uk/news/health-41399850 (27/09/17)

The case of autism: The review of studies

- "Twenty epidemiologic studies have shown that neither thimerosal nor MMR vaccine causes autism. These studies have been performed in several countries by many different investigators who have employed a multitude of epidemiologic and statistical methods. The large size of the studied populations has afforded a level of statistical power sufficient to detect even rare associations. These studies, in concert with the biological implausibility that vaccines overwhelm a child's immune system, have effectively dismissed the notion that vaccines cause autism. Further studies on the cause or causes of autism should focus on more-promising leads" (Plotkin et al 2009: 460).

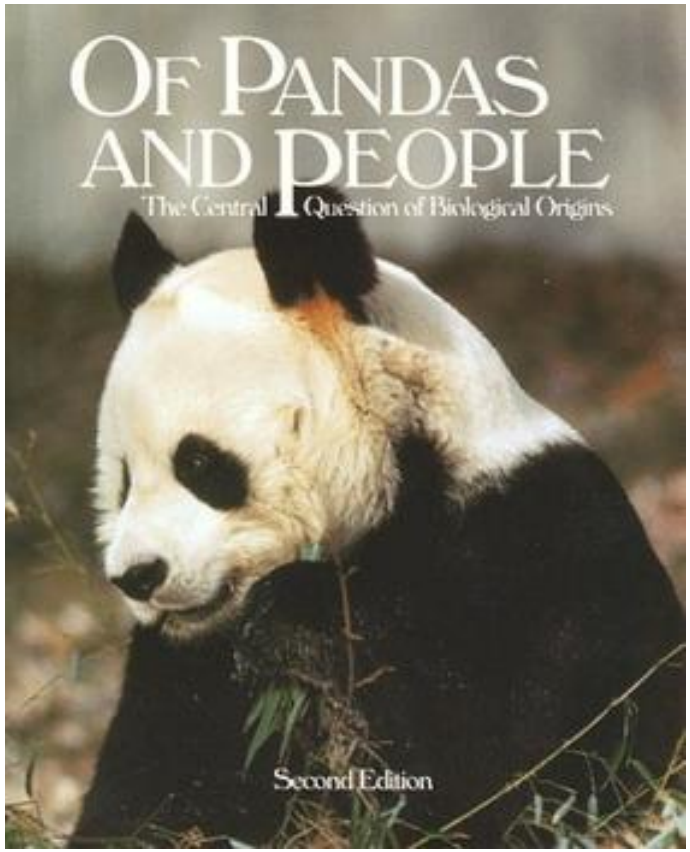
NB: See also Taylor et al. (2014).

The case of evolution: The 'alternative' hypothesis

- First published in 1989. The Dover Area School Board endorsed it in 2004 and introduced ID into the curriculum

- "*Of Pandas and People* presents evidences, found in the data of biology, for intelligent cause" (ix).

- "[It] is not intended to be a balanced treatment by itself. We have given a favorable case for intelligent design and raised reasonable doubt about natural descent" (p. ix).



The case of evolution: The review of studies

- But the evidence, once again, clearly favours Darwinian evolutionary theory.

  Gilchrist (1997): “This search of several hundred thousand scientific reports published over several years failed to discover a single instance of biological research using intelligent design theory to explain life’s diversity” (14-15).

  NB: See also Rennie (2002) and Krauss (2006).

Scientific consensus: Big picture vs. details

- One argument that is sometimes latched on by intelligent design proponents is the dissent among evolutionists.

- A counter to this argument is that the disagreement concerns details, not the big picture.

Example: Whether ancestors of whales evolved hair-like teeth ('baleen') as an optimisation for filter-feeding.

Enter Democracy

Education and commitment to democracy

- Suppose the evidence does indeed tell against these alternative hypotheses.
- We can still ask whether adherence to democracy is reason enough to give such hypotheses an educational podium.
- Kitcher (2007) is interested in precisely this question.

  "I begin by stepping back from the heated conflict about evolution and religion, and ask what a commitment to democratic values requires of us" (p. 6).

Pursuing one's own good in one's own way

- It's certainly not enough, he claims, to say that we are required to vote in elections.
- What we need, in addition, are spaces where:

  "people can undertake their own projects, guided by their own values and aspirations, so long as they do not impinge upon the like spaces of their fellow-citizens" (p.6).
- The constitution, he elaborates, ensures such spaces can be created.

Freedom in education (but up to a point)

- On the subject of educating the young, this means:

  "[the young] come to appreciate a wider range of thoughts and possibilities, so that, as they grow, their vision of what is worthwhile, what is central to the lives they want to lead, is autonomously developed from consideration of diverse perspectives. Where there are genuine options, they should see them clearly." (p. 7).

- Having said this, he goes on to stress that:

  "where matters have been settled, we owe it to them not to pretend, but to show them how an informed consensus has been achieved" (p. 7).

Beyond reasonable doubt

- Kitcher admits that science is fallible. There is no presumption of certainty here.

- Even so, he argues that science, more than any other institution, settles disputes beyond reasonable doubt.

  "... in the science curriculum, it is appropriate to make judgments about what has been established and what remains open – to tell students that there's overwhelming evidence for the atomic theory of chemistry, for the contemporary theory of molecular genetics, and for Darwin's theory of evolution by natural selection" (p. 7).

Responsible education

- We must not shy away from the facts:

  "It would be irresponsible, however, to [suggest] that there are two 'equally valid' stories in any of these instances, for that would be phony, deceptive, a blatant distortion of the evidential situation." (p. 7).

- Education does not mean anything goes:

  "… it's important not to deceive young people, precisely because the point of education is to help them shape their future lives; to do that, they need to know just what the facts are, insofar as collective human [especially scientific] inquiry has established them" (p. 7).

Hybrid epistemologies

- What muddles the waters, claims Kitcher, is those religious groups who insist on so-called ***hybrid epistemologies***.
- The kind that seek to mix-and-match scientific (naturalistic) and non-scientific (supernatural-istic) judgment.
- Conflict is bound to occur as the latter posits causes that the former denounces.
- What happens in such cases?
- Needless to say, those who advocate hybrid epistemologies let their own brand of supernaturalism win.

Public reason

- This is dangerous, according to Kitcher, as it poses a serious problem in democratic decision-making.

  "If there are issues that arise for this society in which each group makes its decision according to what it takes as the facts, and if the differing epistemic standards yield incompatible factual determinations, how will the policy dispute be resolved?" (p. 12).

- Instead, Kitcher argues for "a shared conception of public reason, [which] can only be secular" (p. 5).

- That is, a rough agreement on what counts as evidence; this can only come by endorsing scientific standards.

Replies and Counter-Replies

Impartiality and freedom

- Kitcher's approach seems to conflict with various well-motivated views about the relation between citizen & state.

  Examples:
  Rawls: In a pluralistic society, a legitimate government must be impartial with respect to matters of conviction.

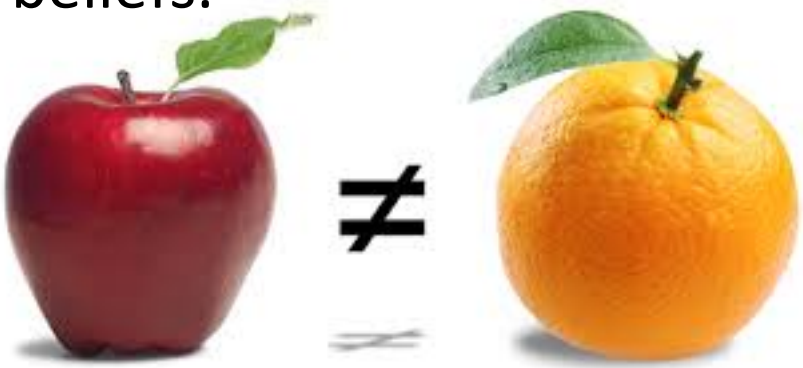
  Mill: In a free society, citizens must be able to make up their own minds about what to believe.

- Forcing people to learn one set of beliefs, it can then be argued, is tantamount to turning science into dogma.

Comparing apples and oranges

- One reply to these critiques is that the analogy is unfair as it fails to take into account important differences.

- Nobody in this debate, including Kitcher, wants to impose dogmatic and unsubstantiated beliefs.



- We can't compare these with the fallible beliefs produced by the open-ended evidence-based process of science.

NB: This process is arguably built into all of us and helps as much in everyday as in scientific life – Gopnik (1996).

Two kinds of secularism

- Suppose a genuine difference does indeed exist between those beliefs.

- There is still the further question of which kind of secularism is *best* for society?

- **Active Secularism**
  The state is justified in taking a stand on matters of conscience so long as it is based on strong evidence.

- **Passive Secularism**
  The state should remain neutral on matters of conscience but no religion should be given special preference.

Education's epistemic goals

- Another related issue is what exactly we want education to achieve?

- More precisely, what should its epistemic goals be and how should these interact with its moral goals?

Epistemic goals:
* true belief?
* coherence?
* understanding?
…

Moral goals:
* honesty?
* civil obedience?
* philanthropy?
…

- Depending on the precise nature of these goals, different approaches to the above debate *may* arise.

Rights and Responsibilities

Banishing religion from the classroom

- The psychologist Nicholas Humphrey is another fierce advocate of the naturalistic perspective.
- He urges the removal of religion, not just from science education but from education altogether.
- The following comes from 'What Shall We Tell the Children?', - 1997 Oxford Amnesty Lecture.

https://www.youtube.com/watch?v=yfr6SkaBuq0

https://www.edge.org/conversation/nicholas_humphrey-what-shall-we-tell-the-children

Children's rights

- The right to not be subjected to dogmatic and unsubstantiated ideas:

  "Children, I'll argue, have a human right not to have their minds crippled by exposure to other people's bad ideas—no matter who these other people are. Parents, correspondingly, have no god-given licence to enculturate their children in whatever ways they personally choose: no right to limit the horizons of their children's knowledge, to bring them up in an atmosphere of dogma and superstition, or to insist they follow the straight and narrow paths of their own faith… That's the negative side of what I want to say.".

Children's rights (2)

- The right to be exposed to truths:

  "But there will be a positive side as well. If children have a right to be protected from false ideas, they have too a right to be succoured by the truth. And we as a society have a duty to provide it. Therefore we should feel as much obliged to pass on to our children the best scientific and philosophical understanding of the natural world—to teach, for example, the truths of evolution and cosmology, or the methods of rational analysis—as we already feel obliged to feed and shelter them".

- See also Dawkins (2002), who even goes as far as to call religious indoctrination 'child abuse'.

Parental rights

- Arguably, parents also have rights (vis-a-vis their children).

  Examples:
  * The right to pass on their beliefs to their children?

  * The right to exempt their children from classrooms that undermine those beliefs?

- But these seem to conflict with the aforesaid children's rights, e.g. the right to be protected from false ideas.

- Moreover, they may conflict w/the responsibilities of science teachers to impart, e.g. knowledge, to all students.

Getting to the bottom of this issue

- How do weigh all of those rights? And can there be rights without co-relative responsibilities?

Reading

- Kitcher, P. (2008) ‘Science, Religion and Democracy’, *Episteme*, vol. 5(1): 5-18.

The End