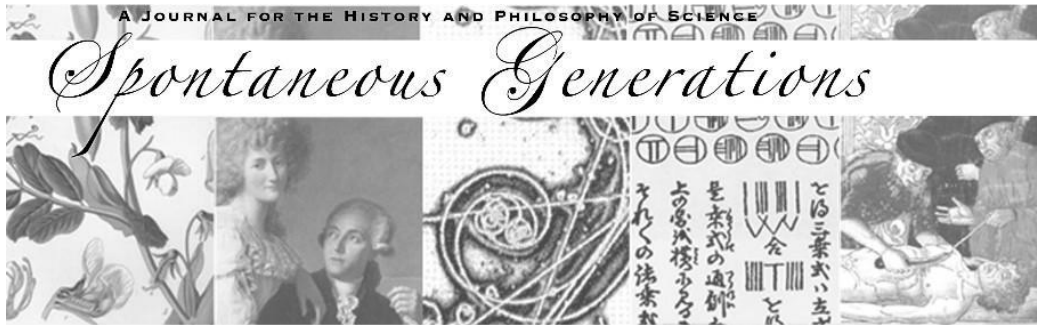




The Two Virtues of Science

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The Two Virtues of Science

Stephen D. John

Abstract During the COVID-19 pandemic, there was disagreement over whether the science supported facemask mandates. This paper interrogates debates over this question, paying particular attention to an ambiguity between two scientific virtues: epistemic caution and epistemic responsiveness. I suggest that there is an argument from each virtue to reasons to trust scientists' claims in policy debate. However, as the case of facemask debates illustrates, it is not clear that scientists can possess both virtues simultaneously: the two virtues are in tension. After showing how this general framework can help us better understand debate, I turn to consider some possible ways of resolving this tension, arguing that none of them is entirely satisfactory.

From the start of the COVID-19 pandemic, some experts argued that governments should implement facemask mandates to slow the spread of the virus, but other experts disagreed.¹ In April 2020, the UK Government's view was clear: "we do not recommend face masks for general wearing by the public."² In early-June, however, the Government changed direction, introducing legislation making facemasks compulsory on public transport, later extended to shops. Many commentators found this change confusing. According to Boris Johnson, the justification was simple, "the scientific evidence of face coverings, and the importance of stopping aerosol droplets... that's been growing"; the government was simply "following the science."³

You might worry that the UK government was too quick or too slow to introduce facemask regulations, or that its messaging was confusing. Still, the government's justification for their shift of policy seems sensible. In a fast-moving research environment, such as a pandemic, scientific understanding changes quickly, so, presumably, science-based policy should also be expected to change. Rapid shifts are only to be expected if policy is – as many of us believe it ought to be – "led" by the science. However, not everyone agrees.

First, many commentators seem to hold both that it is deeply problematic for policy to "flip-flop,"⁴ and yet, also seem to hold that policy should be guided by the science.

¹ G. Martin, Hanna, E. McCartney, M & Dingwall, R, "Science, Society, and Policy in the Face of Uncertainty: Reflections on the Debate Around Face Coverings for the Public Puring COVID-19," *Critical Public Health* 30 no. 5 (2020): 501-508; T. Greenhalgh, "Face Coverings for the Public: Laying Straw Men to Rest," *Journal of Evaluation in Clinical Practice* 26 no. 4 (2020): 1070-1077

² K. Schofield, "Wearing Face Masks Makes No Difference to the Spread of Covid-19," *Politics Home*, April 3, 2020, <https://www.politicshome.com/news/article/coronavirus-wearing-face-masks-makes-no-difference-to-spread-of-disease-insists-uk-medical-chief>.

³ C. Wilson, "What Are Face Covering Rules in England and Why Did the Policy Change?" *The New Scientist*, July 14, 2020, <https://www.newscientist.com/article/2248820-what-are-face-covering-rules-in-england-and-why-did-the-policy-change/>

⁴ R. Syal, "Boris Johnson's Covid Flip-Flops," *The Guardian*, December 20, 2020, <https://www.theguardian.com/world/2020/dec/20/boris-johnsons-covid-flip-flops-the-pledges->

Regardless of one's own political inclinations and views, this seems an odd combination of views: what should we make of the idea that science-based policy shouldn't flip-flop? Second, there is a tricky question about whether the science had changed at all. Plausibly, there was much more evidence for the efficacy of facemasks in June 2020 than in March. Still, the key concern of the anti-facemask scientists in March was that there were no RCTs showing facemask efficacy, and there were still no such studies by May.⁵ So, had the science changed or not?

I suggest that thinking through these questions reveals a far more general tension between two different arguments for giving scientists an important role in policymaking: by appeal to the virtue of *epistemic caution* and by appeal to the virtue of *epistemic responsiveness*. I will try to describe this problem, then note some ways we might try to solve it. However, as so often in philosophy, this is a case where I am far more confident there is a problem than that there is a solution.

The Problem

There are some obvious candidate answers to both of my questions: why think science-based policy doesn't flip-flop? Had the science changed or not? We can find a way in which the two questions are linked, though, if we step back and think about a more general question: why should policymakers place epistemic trust in scientists at all?

Consider the physicists at CERN who refuse to declare a discovery until they have 5-sigma certainty. In adopting such high evidential standards, in refusing to stick their neck out and affirm claims until they are almost certain those claims are true, the physicists display an epistemic virtue of "epistemic caution". In van Fraassen's memorable phrase, "it is not an epistemological principle that one might as well hang for a sheep as for a lamb."⁶ I suggest that we often assume both that scientists do, and ought to, possess this virtue (or, strictly, that institutions are arranged such that they are incentivised to act as if they do). In turn, there is a clear argument from the claim that scientists *are* epistemically cautious to the claim that we *ought* to trust them: in extending trust, we are gaining true beliefs without running a significant risk of coming to believe false beliefs.

These comments are very sketchy. Still, they help us to understand why policy flip-flops might *seem* so problematic: if we think that good scientists are characterised by "epistemic caution", then science-based policy – or, at least, policy based on good science – should rarely change, because the underlying scientific claims will rarely change. If some policy is constantly shifting and changing, then we have excellent evidence that it wasn't "science-based" in the first place. Of course, you might worry that even if some people *do* think about science this way, they *ought* not to; I will return to these issues shortly. Before doing so, consider the second question raised by the facemask policy shift: did the science change?

In an insightful series of contributions, Jonathan Fuller has suggested that many debates around COVID-19 policy can be understood as involving a debate between two different epistemological camps: one approach, associated with public health epidemiology, "is methodologically liberal and pragmatic", stressing the importance of using multiple sources of evidence, the other, associated with clinical epidemiology, is

upended-by-reality.

⁵ Wilson, *What Are Face Covering Rules*.

⁶ Bas van Fraassen, *The Scientific Image* (Oxford: Oxford University Press, 1980): 73.

“more methodologically conservative and skeptical,” guided by maxims of Evidence Based Medicine (EBM).⁷ In turn, broadly, members of the first camp were proponents of facemask use, whereas proponents of the latter were opponents.

Fuller is clearly correct that much of the debate over topics such as facemasks turns on questions about the *admissibility* and *strength* of different types of evidence. However, a second, slightly different concern also runs through these debates. Many opponents of facemasks were willing to admit that there was *some* evidence that they were effective; what they doubted was that there was *sufficiently good* evidence to say they were. Combined with a commitment to the evidence hierarchy of EBM, they held that we should say facemasks are effective *only* when we have RCT evidence. Strictly, their views on different kinds of evidence were separate from their general commitment that scientists should commit to claims *only* when they have the “best possible” evidence. Indeed, it is notable that many proponents of facemask mandates were happy to cede the epistemological claim that RCT evidence is epistemologically superior to – indeed, the strongest form of – epidemiological evidence.⁸ The disagreement between the two sides was not so much about what counts as *better* or *worse* evidence, but over how much evidence was *enough* evidence to make a claim.

Note that, lying behind this disagreement is a further set of broadly ethical concerns, where opponents of facemasks seemed keen to stress the potential *harms* of acting on uncertain evidence, whereas proponents stressed the potential *opportunity costs* of failing to adopt this measure.⁹ I won’t enter into this even more complicated issue here (it is a fascinating case for anyone with an interest in how broadly ethical concerns might intersect with epistemological debates – but one it would take a book to unpack!). My key concern here is that, regardless of precisely *why* they disagreed on the need for certainty, the distinctive feature of the clinical epidemiology camp was less their account of evidence and more their strong commitment to epistemic caution: unlike their opponents, who were willing to commit on “weaker” evidence, they refused to commit to claims without the “best” evidence. In turn, then, from this perspective, although the evidence might have shifted in various ways, “the science” wouldn’t change until an RCT had been performed. Quite simply, for members of this camp, it would be inappropriate to claim *any* policy on facemasks was “led” by the science, because no epistemically cautious science should advance a view on facemasks at all.

A (self-)image of the scientist, as committed to “epistemic caution” helps explain both the idea that science-based policy doesn’t flip-flop and the idea that, despite the mounting evidence, there was no change in the science of facemasks. These remarks seem, though, simply to open a new question: what did the government mean when it said that the science *had* shifted?

In some sense, the answer to this question is obvious: they gained some new evidence, or started to think of old evidence in new ways; for example, moving away from a focus on surface transmission. Still, why say “the science”, not just “some evidence”? Underlying such claims is, I suggest, a rather different image of the scientist, associated with a different argument for epistemic trust in science. On this model, the key virtue of the scientist is not that she is *epistemically cautious*, but, rather, that she is *epistemically responsive*, she constantly seeks out new evidence and updates her credence accordingly – unlike the religious or political zealot, the scientist is anti-dogmatic, or, more aptly, she is the perfect Bayesian agent. Rather than the scientists

⁷ J. Fuller, “Models v Evidence,” *The Boston Review*, May 1, 2020, <https://bostonreview.net/articles/jonathan-fuller-models-v-evidence/>.

⁸ Greenhalgh, *Face Coverings for the Public*.

⁹ See the responses to Fuller from Lipsitch and Ionnadis.

at CERN, the key model are authors for the Intergovernmental Panel on Climate Change, who carefully collect and synthesise evidence, qualifying their claims in terms of how likely they are. In terms of the philosophy of science, it is taken to an extreme in Popper's image of the scientist as someone who actively seeks new evidence to overthrow her past beliefs.¹⁰ While no-one is a card-carrying Popperian anymore, the surprising popularity of Popper's work is, I suggest, testament to the power of the image of the scientist as the great mind-changer.

In turn, there is also an important link between this image and arguments for epistemic trust in science. Plausibly, we all have an interest in basing policies on claims which reflect the best available evidence; as epistemically responsive agents, scientists have a strong commitment to calculating how likely claims are based on the best available evidence; therefore, as long as they are competent and sincere, we should listen to what the scientists have to say. Of course, as decision-makers we will still then have to make a choice as to whether claims are "likely enough" that we should act on them – but, arguably, expecting scientists to make this decision for us would threaten both our autonomy and democratic norms.¹¹

This model of the scientist as *epistemically responsive* underlies the government's claim that its policy changes simply reflected a change in scientific understanding. As the pandemic progressed and we gained more evidence and information, scientists updated their credences about the likely effectiveness of facemasks. Even if the evidence never met a "gold standard" level, there was a clear shift in scientific understanding, based on shifts in the underlying evidence, and, at some point, the understanding shifted significantly enough to warrant a change in government policy. Note an important corollary of this view is that it is entirely possible that yet more evidence might be collected, leading to a collective lowering of scientists' credence in the effectiveness of facemasks, justifying a move away from facemask mandates. On the "epistemic caution" approach, such a shift would be evidence policy is not science-based; on the "epistemic responsiveness" approach, it would be evidence that scientists and policymakers are doing their jobs well!

I have, then, provided an analysis of debates around the UK government's policy shifts around facemasks as involving and reflecting two different images of the core epistemic virtues of scientists. In turn, I think that we see a similar tension arise in very many related debates. For example, as many readers will already know, a huge amount of recent literature in philosophy of science argues that, because scientists must solve problems of underdetermination, non-epistemic values do and should play a role in scientific justification.¹² Broadly, there are two responses to this literature: one stresses the idea that scientists simply provide probabilities conditional on the evidence, hence avoiding concerns about underdetermination,¹³ whereas another argues that, even if scientists do solve underdetermination problems, they can still generate claims which are value-free, as long as they adopt conventional standards, which limit the inferences they can make.¹⁴ The first response pulls on the idea of *epistemic responsiveness*, whereas the latter pulls on the idea of *epistemic caution*. Problems arise, then, when

¹⁰ K. Popper, *Conjectures and Refutations* (London: Routledge and Kegan Paul, 1963).

¹¹ G. Betz, "In Defence of the Value Free Ideal," *European Journal for Philosophy of Science*, 3 no. 2 (2013): 207-220.

¹² S. John, *Objectivity in Science* (Cambridge University Press, 2021).

¹³ Betz, "In Defence of the Value Free Ideal."

¹⁴ T. Wilholt, "Epistemic Trust in Science," *The British Journal for the Philosophy of Science*, 64 no. 2 (2013): 233-253.

we think that there is anything like *the* argument for or against the “Value Free Ideal”, because, plausibly, different arguments are relevant depending on which epistemic virtues we stress.

Solutions

So, I think we have a problem: there are two distinct epistemic virtues which scientists *might* have, each of which *could* ground an argument for trust in science; however, it's not clear that we can coherently argue that we ought to trust scientists because they possess *both* of those virtues. Unfortunately, we often tend to overlook these important ambiguities in both everyday debates and philosophical debates, leading to confusion. Having set out this problem, we now face a series of normative questions. Crudely, these questions come in two categories: do actual scientists actually possess either of these virtues (or both in some combination)? Ought they possess either of these virtues (or both, in some combination)? Clearly, answering these questions is important for any attempt at figuring out precisely which roles “scientists” should and should not play in policy: if, for example, we are convinced by some arguments in social epistemology that a certain degree of epistemic dogmatism is helpful for the growth of knowledge, then we might be suspicious of claims that scientists *ought* to be responsive.

Unfortunately, I am not entirely certain how to proceed here. On the one hand, I am tempted by the notion that good scientific work displays the virtue of epistemic caution, and that there are good reasons why this ought to be so. Roughly, I think that it is only if scientists' assertions are guided by “high epistemic standards” that scientific advice can act as a kind of “epistemic common ground” for political and practical debate. So, to take a concrete example, we can understand epidemiological research into vaccine safety as guided by a virtue of epistemic caution, and that this is important because it means that members of the public can accept epidemiological claims that vaccines are safe regardless of their own potentially idiosyncratic ways of trading-off false positives and false negatives. By contrast, were vaccine researchers to adopt lower standards, increasing the chance of falsely claiming the vaccines are safe when they are not, then some members of the public might have reasons to reject their claims, as not reflecting their own values.¹⁵ (And, of course, we might interpret some worries about the speed of development of Covid-19 vaccines in precisely these terms, where there seemed to be a trade-off between the evidence we demanded for efficacy and concerns about safety).

That seems like a nice, neat argument. Unfortunately, the case study above suggests that it seems deeply problematic to think that experts should always be guided by high epistemic standards. Assume, for the sake of argument that, in the absence of RCTs it is impossible to make any claims about effectiveness with anything approaching certainty. As such, an epistemically cautious agent would simply refuse to say anything on this topic, preferring silence to sticking her neck out. Such silence may be epistemically virtuous. Unfortunately, it's also potentially disastrous; clearly, sometimes it is reasonable to make the decision to act on a given claim, even when that claim is extremely uncertain. Plausibly, the facemask case is like that. Given the relatively low costs of implementing a facemask mandate, it might well be reasonable for policymakers to implement such a mandate based on evidence that it *might* be

¹⁵ G. Irzik and F. Kurtulmus, “What is Epistemic Public Trust in Science?” *The British Journal for the Philosophy of Science*, 70 no. 4 (2019): 1145-1166.

effective, even if they are from certain that it is *effective*. However, given that such a mandate has *some* costs, it might not be reasonable to go ahead if there is *no* or *very weak* evidence that it is effective. (Note you might disagree with my analysis of this case, but I assume the general principle here is clear and uncontroversial). Clearly, then, policymakers also need people to inform them about the state of the evidence, who, insofar as possible, display the virtue of epistemic responsiveness, providing up-to-date assessments of likelihoods.

So, it seems that policymaking really requires two kinds of experts: those who are *epistemically responsive* and those who are *epistemically cautious*, and to treat their claims in very different ways: the latter can provide the shared common ground for debate, whereas the former provide claims which we might or might not choose to accept and act upon depending on non-epistemic values. There is, in principle, an elegant way of solving the problem of the two virtues of science. Unfortunately, in practice, we often expect the very same people to display the different virtues, and we use the same term to describe people with different virtues. What we can do about that, I don't know. In the meantime, though, we should not be at all surprised that "following the science" should turn out to be so complicated and contested.¹⁶

¹⁶ Thanks to Jon Fuller for very helpful feedback on an earlier draft of this paper. I could not include all of his insightful comments in the space allocated, but suggest interested readers chase up his fascinating work on the facemask case.

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