

A Better Foundation for Public Trust in Science

S. Andrew Schroeder
Claremont McKenna College/Princeton University
aschroeder@cmc.edu

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Abstract. There is a growing consensus among philosophers of science that core parts of the scientific process involve non-epistemic values. This undermines the traditional foundation for public trust in science. In this paper I consider two proposals for justifying public trust in value-laden science. According to the first, scientists can promote trust by being transparent about their value choices. On the second, trust requires that the values of a scientist align with the values of an individual member of the public. I argue that neither of these proposals work and suggest an alternative that does better: when scientists must appeal to values in the course of their research, they should appeal to *democratic values*, the values of the public or its representatives.

1. Introduction

The American public's trust in science is a complicated matter. Surveys reveal that trust in science has remained consistently high for decades, and scientists remain among the most highly-trusted professional groups (Funk 2017). However, within some segments of society (especially conservatives) trust has declined significantly (Gauchat 2012), and there are obviously serious gaps in trust on certain issues, such as climate change, vaccine safety, and GM foods (Funk 2017). The picture, then, is a complex one, but on balance it is clear that things would be better if the public placed greater trust in science and scientists, at least on certain issues.

As a philosopher, I am not in a position to determine what explains the lack of trust in science, nor to weigh on what will in fact increase trust. Instead, in this paper I will look at the question of what scientists can do to *merit* the public's trust — under what conditions the public *should* trust scientists. Indeed, it seems to me that we need to answer the normative question first: if we take steps to increase

public trust in science, our goal should not simply be to make scientists *trusted*, we should also want them to be *trustworthy*.

In what follows, I'll first explain how recent work in the philosophy of science undermines the traditional justification given to the public for trusting science. I'll then consider two proposals that have been offered to ground public trust in science: one calling for transparency about values, the second calling for an alignment of values. I'll argue that the first proposal backfires — it rationally should *decrease* trust in science — and the second is impractical. I'll then present an alternative that is imperfect, but better than the alternatives: when scientists must appeal to values in the course of their work, they should appeal to *democratic values* — roughly, the values of the public or its representatives.

2. Trust and the Value-Free Ideal

Why should the public trust scientists? The typical answer to that question points to the nature of science. Science, it is said, is about facts, and not values. It delivers us objective, verifiable truths about the world — truths not colored by political beliefs, personal values, or wishful thinking. Of course, there are scientists who inadvertently or intentionally allow ideology to influence their results. But these are instances of *bad* science. Just as we should not allow the existence of incompetent or corrupt carpenters to undermine our trust in carpentry, we should not allow the existence of incompetent or corrupt scientists to undermine our trust in science. So long as we have institutions in place to credential good scientists and root out corrupt ones, we should trust the conclusions of science.

There is, unfortunately, one problem with this story: science isn't actually like that. In the past few decades, philosophers of science have shown that even good science requires non-epistemic value judgments. Without wading into the nuanced differences between views, I think it is fair to say that there is a consensus among philosophers of science that non-epistemic values can appropriately play a role in at

least some of the following choices: selecting scientific models, evaluating evidence, structuring quantitative measures, defining concepts, and preparing information for presentation to non-experts.¹

These value choices can have a significant impact on the outcome of scientific studies. Consider, for example, the influential Global Burden of Disease Study (GBD). In its first major release it described itself as aiming to “decouple epidemiological assessment from advocacy” (Murray and Lopez 1996, 247). In the summary of their ten volume report, the authors describe their study as making “a number of startling individual observations” about global health, the first of which was that, “[t]he burdens of mental illnesses...have been seriously underestimated by traditional approaches... [P]sychiatric conditions are responsible...for almost 11 per cent of disease burden worldwide” (Murray and Lopez 1996, 3). Many others have cited and relied on the GBD’s conclusions concerning the magnitude of mental illness globally (Prince *et al.* 2007). And nearly two decades later, the same GBD authors, in commenting on the legacy of the 1996 study, proudly noted that it “brought global, regional, and local attention to the burden of mental health” (Murray *et al.* 2012, 3).

It turns out, however, that the reported burden of mental health was driven largely by two value choices: the choice to “discount” and to “age-weight” the health losses measured by the study. Discounting is the standard economic practice of counting benefits farther in the future as being of lesser value compared to otherwise similar benefits in the present, and age-weighting involves giving health losses in the middle years of life greater weight than otherwise similar health losses among infants or the elderly. Further details about discounting and age-weighting aren’t relevant to this paper; all we need to note is that the study authors acknowledged that each reflects value judgments, and that a reasonable case could be made to omit them (Murray 1996; Murray *et al.* 2012).² Given other methodological choices made by the authors, these two weighting functions combine to give relatively more weight to health

¹ On these points see e.g. Reiss (2017) and Elliott (2011).

² Indeed, in 2012 the GBD ceased age-weighting and discounting. There was also a third value choice that drove the large burden attributed to mental health: the choice to attribute all suicides to depression (Murray and Lopez 1996, 250). Because I do not know precisely how this affected the results, I set it aside here. For much more on discounting, age-weighting, and other value choices in the GBD, see Schroeder (2017).

conditions which (1) commonly affect adults or older children (rather than the elderly or young children), (2) have disability (rather than death) as their primary impact, and (3) have their negative effects relatively close to the onset or diagnosis of the condition (rather than far in the future). It should not be surprising, then, that when the GBD authors ran a sensitivity analysis to see how the decision to discount and age-weight affected the results, they discovered that the conditions most affected by these choices — unipolar major depression, anaemia, alcohol use, bipolar disorder, obsessive-compulsive disorder, chlamydia, drug use, panic disorder, post-traumatic stress disorder — were largely composed of mental health conditions (Murray and Lopez 1996, 282). Overall, the global burden of disease attributable to psychiatric conditions drops from 10.5% to 5.6%, when the results are not age-weighted or discounted (Murray and Lopez 1996, 261, 281).

I don't want to comment here on the wisdom of the GBD scientists' decision to discount and age-weight.³ They offer clear arguments in favor of doing so and many other studies have done the same, so at minimum I think their choices were defensible. The point is that what was arguably the top-billed result of a major study — a result which was picked up on by many others, and which was still being proudly touted by the study authors years later — was not directly implied by the underlying facts. It was driven by a pair of value judgments. Had the GBD scientists had different views on the values connected to discounting and age-weighting, they would have reported very different conclusions concerning the global impact of mental illness.⁴

This case is not unique. The dramatically different assessments given by Stern and Nordhaus on the urgency of acting to address climate change can largely be traced to the way each valued the present versus the future (Weisbach and Sunstein 2009). Similar conclusions are plausible concerning the value choices involved in classifying instances of sexual misbehavior in research on sexual assault, the value

³ I do so in Schroeder (unpublished-a).

⁴ Although the sensitivity analysis was conducted by the original study authors, they do not draw any connection to their prominent claims concerning the global extent of mental illness. To my knowledge, this paper is the first to do so.

choices impacting the modeling of low-level exposures to toxins (Elliott 2011), and the value choices involved in constructing price indices (Reiss 2008).

A natural — and not implausible — response to these cases is to suggest they are outliers. Although some scientific conclusions are sensitive to value choices, the vast majority are not. The Earth really is getting warmer and sea levels really are rising, due to human activity. Vaccines really do prevent measles and really don't cause autism. These conclusions are not sensitive in any reasonable way to non-epistemic value judgments made by scientists in the course of their research. The problem, however, is that there is no clear way for a non-expert to verify this — to tell which cases are the outliers and which are not. This, I think, justifies a certain amount of skepticism. “Although some of our conclusions do depend on value judgments, trust us that *this* one doesn't,” isn't nearly as confidence-inspiring as, “Our conclusions depend only on facts, not values.”

I conclude, then, that rejecting the view of science as value-free, combined with high-profile examples of scientific conclusions that do crucially depend on value judgments, undermines the claim of science to public trust in a significant way. In other words, it explains why it may be rational for the public to place less trust in the conclusions of science on a broad range of issues — including in areas, such as climate change and vaccine safety, where major conclusions are not in fact sensitive to different value judgments.⁵

3. Grounding Trust in Transparency

Good science is not value-free, which undermines the standard justification given for trust in science. What, then, can scientists do to merit the public's trust? The standard response has been to appeal to transparency. If values cannot or should not be eliminated from the scientific process, scientists

⁵ For similar conclusions see Douglas (2017); Wilholt (2013); Irzik and Kurtulmus (*forthcoming*); and Elliott and Resnik (2014).

should be “as transparent as possible about the ways in which interests and values may influence their work” (Elliott and Resnik 2014, 649; *cf.* Ashford 1998; Douglas 2008; McKaughan and Elliott 2018). Obviously, in order for this proposal to work, scientists would need to be aware — much more aware than most are today — of the ways in which value judgments influence their work. But, since we have independent reason to want such awareness, let us assume that calls for transparency are accompanied by a mechanism for increasing such awareness by scientists.

Would such a proposal work? Transparency about values can help ground trust in some situations, but I see no reason to think that it should broadly support public trust in science. Transparency is only useful in supporting — as opposed to eroding — trust if it enables the recipient of that information to determine how it has affected the author’s conclusions. (Knowing I have a conflict of interest will typically reduce your trust in what I tell you, unless you can determine how that conflict influenced my conclusions.) Transparency, then, will only promote trust in a robust way if the public understands how value choice influenced the results, and understands what alternative value choices could have been made and how they would have influenced the results. These criteria may be satisfiable when the effect of a value choice is relatively simple. Suppose, for example, that a scientist classifies non-consensual kissing as “sexual assault”, rather than “sexual misconduct”, on the grounds that she believes it has more in common with rape (a clear instance of sexual assault) than it does with contributing to a sexualized workplace (a clear instance of sexual misconduct). The value judgment here is relatively simple to explain, an alternative classification is obvious, and (if the statistics involved are simple) the effect of alternative classification on the study may be relatively straightforward. So transparency could work here.

Many value choices, however, are much more complex. Think about choices embedded in complex statistical calculations — for example, those involved in aggregating climate models (Winsberg 2012) or in calculating price indices (Reiss 2008). In cases like these, it will be very hard to clearly explain the importance of any individual value choice and harder still to explain what alternative choices

could have been made. Further, many studies involve a large number of value judgments. Schroeder (2017), for example, identifies more than ten value choices which non-trivially influenced the Global Burden of Disease Study's results. Even if each of those value choices could be explained individually, it would be virtually impossible for a non-expert to figure out the interaction effects between them.

What these cases show is that even if scientists make a serious effort at transparency — not simply listing their value judgments, but attempting to explain how those judgments have influenced their results — in many cases it simply won't be possible to communicate to the public how those values have impacted their work.⁶ And, if the public can't trace the impact of those values, transparency doesn't amount to much more than a warning — a reason to *distrust*, rather than to trust. A parallel realization can be seen in the way many medical schools and journals have handled researchers' conflicts of interest. Whereas in the past disclosures of conflicts of interest — essentially, transparency — were often regarded as sufficient; many have now realized that merely knowing about such conflicts does not appreciably help a reader to interpret a study. There is thus a growing move towards banning all significant conflicts of interest.⁷

4. Grounding Trust in an Alignment of Values

The previous section argued that transparency about values is not typically a solution to the problem of public trust in science. That problem, we can now see, was not caused by the fact that values were *hidden*; it was caused by the fact that the values of scientists may *diverge* from the values of any

⁶ McKaughan and Elliott (2018, and in other works) suggest that scientists, through a particular sort of transparency, seek to promote “backtracking” — that is, to enable non-experts to understand how values have influenced scientists' results and to see how those results might have looked given alternative values. They seem to suggest that, at least in the cases they consider, this will frequently be possible. I am claiming that this will not generally be feasible. See Schroeder (unpublished-a) for a more detailed discussion of a particular case.

⁷ See e.g. <<https://ari.hms.harvard.edu/interim-policy-statement-conflicts-interest-and-commitment>>

individual member of the public.⁸ To promote public trust in science, then, it seems that we need to eliminate that divergence. This is the insight that motivates Irzik and Kurtulmus (*forthcoming*; cf. Douglas 2017; Wilholt 2013), who argue that what they call “enhanced” trust requires that a member of the public knows that a scientist has worked from value choices that are in line with her own.

If this proposal were feasible, I think it would provide a good foundation for trust. And, in certain limited cases, it may be feasible. When science is conducted by explicitly ideological organizations, members of the public may be able to make quick and generally accurate judgments about what values scientists hold, and accordingly may be able to seek out research done by scientists who share their values. (A pragmatic environmentalist, for example, might be confident that scientists employed by the Environmental Defense Fund are likely to share her values.)

Most science, however, is not conducted by explicitly ideological organizations. In these cases, it will typically be very hard for members of the public to confidently determine whether a given study relied on value judgments similar to her own. Even when this can be done (perhaps as a result of admirable transparency and clarity on the part of a scientist), it will require sustained and detailed engagement from the public, who will have to pay close attention not just to the conclusions of scientific studies, but also to their methodology. Although such close attention to the details of science would be beneficial for a great many reasons, it unfortunately is not realistic on a broad scale. There are simply too many scientific studies out there that are potentially relevant to an individual’s decisions for even attentive members of the public to keep up. If our model for trust in science requires an alignment of values between the scientist and individual members of the public, trust in science can’t be a broad phenomenon. Further, I don’t think we want our foundation for trust in science to make that trust accessible only to those with the education and time to invest in exploring the details of individual scientific studies.

⁸ It seems relevant to note here that distrust in science is greatest among those who identify as politically conservative, while studies show that university scientists in the U.S. overwhelming support liberal candidates for political office. Whether or not this in fact explains the distrust conservatives have in science, the argument thus far shows why such distrust could have a rational foundation.

I also — somewhat speculatively — worry that adopting this proposal would exacerbate another problem. Suppose the proposal works and, at least on some issues, members of the public are able to identify and rely upon science conducted in accordance with their own values. This, I think, might lead to a further “politicization” of science, as each side on some issue seeks scientists who share their values. Of course, once we allow a role for values in science, value-based scientific disagreement isn’t necessarily a problem. Faced, for example, with one experimental design that is more prone to false positives and another that is more prone to false negatives, either choice may be scientifically legitimate. It may therefore be appropriate for more environmentally-minded citizens to rely on different studies than citizens more concerned about economic development. I worry, though, that in a culture where the public specifically seeks science done by those who share their values, it will be too easy to write off any differences in conclusions as due to value judgments — too easy for environmentalists to assume that any time pro-environment and pro-industry scientists reach different conclusions, it must be due to different underlying, legitimate value judgments. In reality, though, most such disagreements are the result of *bad* science. The worry, then, is that if we grow too comfortable with each side of an issue having its own science, it will be harder to distinguish scientific disagreements that can be traced to legitimate value judgments, from disagreements that are based on illegitimate value judgments or simple scientific error. This would be a major loss.

5. Grounding Trust in Democratic Values

I’ve argued that neither transparency about values nor an alignment of values can provide a broad foundation for public trust in science. Let me, then, suggest a proposal that, though imperfect, can do better. From what’s been said so far, we can note a few features that a better solution should have. First, both the transparency and aligned values proposals ran into trouble because they require a great deal of attention and sophistication from the public. Most individuals simply don’t have the training to

understand more technical value choices, or value choices embedded within complex calculations. And, even when such understanding is possible, it will often require a level of attention that will in practice be accessible only to the well-off. We should therefore look for a foundation for public trust which doesn't require such detailed understanding of or close attention to individual scientific studies. Second, I suggested that the aligned values proposal, in telling individuals to seek out studies conducted in accordance with their own values, could reinforce a kind of politicization that may have bad consequences. It would be better to find a proposal that wouldn't so easily divide scientists and the public along ideological lines. Third, the problem with the transparency proposal (which the aligned values proposal tried, impractically, to address) was that values, even if transparent, can be alien. In order for an individual to truly trust science, that science must be built on values that have some kind of legitimacy for her.

I think scientists can satisfy two-and-a-half of these three criteria by appealing to *democratic values* — the values of the public and its representatives — when value judgments are called for in the scientific process. The details of this proposal go beyond what I can say here.⁹ But, briefly, the idea is that we look to political philosophy to tell us how to determine the (legitimate) values representative of some population. In some cases, those values might be the output of a procedure, such as a deliberative democracy exercise, a citizen science initiative, or a public referendum.¹⁰ In other cases, it might be more appropriate to equate a population's values with the views, suitably "filtered" and "laundered", currently held by its members. ("Filtering" may be necessary to remove politically illegitimate values, e.g. racist values, and "laundering" to clean up values that are unrefined or based on false empirical beliefs.) In cases where there is a broad social consensus, that might count as the relevant democratic value; in cases where there is a bimodal distribution of values, we might say that there are two democratic values; etc.

⁹ See Schroeder (unpublished-b) for a bit more. Many other philosophers have argued that there should be an important place for democratic values in science. See, for example, Kitcher (2011), Intemann (2015), and Douglas (2005).

¹⁰ The extensive literature on "mini-publics" offers a promising starting point. See e.g. Escobar and Elstub (2017).

Suppose, then, that political philosophers, informed by empirical research, can give us a way of determining democratic values. I suggest that when value judgments are called for within the scientific process,¹¹ scientists should use democratic values when arriving at their primary or top-line results — the sort of results reported in an abstract, executive summary, or in the initial portions of the analysis. Scientists could then offer a clearly-designated alternative analysis based on another set of values, e.g. their own. I think this proposal can address two of the concerns with which I began this section, and can make some progress towards answering the third.

Let us first consider the too-much-attention and politicization problems. On the democratic values proposal, if an individual can trust that a study was competently carried out — a matter I’ll return to below — then she can know, without digging into the methodological details, that its conclusions are based on objective facts plus democratic values.¹² This means that, in most cases, the public need not pay detailed attention to the methodological details of individual studies — thus solving the too-much-attention problem. Further, if scientific conclusions are based on objective facts plus democratic values, any two scientists investigating the same problem in the same social and political context should reach roughly the same conclusion. This recovers a kind of objectivity for science — not objectivity as freedom from values, but objectivity as freedom from personal biases. On this picture, the individual characteristics of a scientist should have no impact on her conclusions — a conception of objectivity that has been defended on independent grounds (Reiss and Sprenger 2014; *cf.* Daston and Galison 2007 on “mechanical objectivity”). If they are both doing good science, the environmentalist and the industrialist should reach the same top-line conclusions. And if the environmentalist and industrialist reach different

¹¹ This proposal is restricted to value judgments that arise within the scientific process. In particular, I do not mean for it to apply to problem selection. Scientists should be free to choose research projects that are not the projects that would be chosen by the general public. (The public, however, is under no obligation to fund such projects.) I treat the choice of research topics differently than choices that arise within the course of research because I think that scientists have different rights at stake in each case. For some related ideas, see Schroeder (2017b).

¹² There may also, of course, be methodological choices not based on non-epistemic values (including choices based on epistemic values). I set these aside here, since the problems of trust I’m concerned with don’t arise in the same way from them.

top-line conclusions, it means that one or the other has made some sort of error. This, I think, provides a solution to the politicization problem: on the democratic values proposal, good science (at least in its primary analyses) will speak with a single voice.

The democratic values proposal therefore solves two of the three problems we noted above. Of course, it only does so if the public can be confident that scientists really are making use of democratic values. Why should the public assume that? Right now, I think the answer is: they shouldn't! For the democratic values proposal to work, it must be accepted by a significant portion of the scientific community, or by an easily-identifiable subset of the scientific community. If that were to happen, though, then the problem here becomes the more general one of how the public can trust scientists to enforce their own norms. The procedures and policies now in place work reasonably well, I think, to expose unethical treatment of research subjects, falsification of data, and certain other types of misconduct. I am therefore optimistic that, given a greater awareness of the role value judgments play in scientific research, a system could be devised to identify scientists who depart from a professional norm requiring the use of democratic values.

6. Science, Values, and Democracy

I've argued that the democratic values proposal can address two of the problems that faced the alternative views. But what about the third? On the transparency proposal, the values of scientists can truly be alien. If a scientist conducts research based on her own values, then, unless I happen to share those values, I have no meaningful relationship to those values. If, however, a scientist appeals to democratic values, then there is a relationship, even if I don't share those values. If democratic procedures or methods were carried out properly, then my values were an input into the process which yielded democratic values. My values are, in a sense, represented in the output of that process. This, in turn, means that those values should have a kind of legitimacy for me. In a democracy, we regularly

impose non-preferred outcomes on people when they are out-voted. So long as democratic procedures are carried out properly, this seems to be legitimate — not ideal, perhaps, but better than any available alternative. On the democratic values proposal, then, when a particular scientific conclusion is uncontested, the public can trust that that conclusion is one drawn solely from the facts, plus perhaps the values that *we* share. For most of us, who don't have the time, inclination, or ability to dig into the details of each scientific study we rely on, or who have a strong commitment to democracy, that will be enough.

I think that the foregoing provides a reasonable answer to the alien values concern. It is of course not a perfect answer. It would be better, at least from the perspective of trust, to get each member of the public access to “personalized” science conducted in accordance with her values. This, however, is impractical, as we saw when discussing the aligned values proposal. So long as that is the case, there is no way to accommodate everyone. Democratic values seem like a reasonable compromise in such a situation.

All of that said, it would be nice if we could say a bit more to those ill-served by democratic values. What should we say, for example, to an individual who knows that her values lie outside the political mainstream on some issue and is therefore distrustful of science done with democratic values on that issue? The first thing to note is that, in such cases, the democratic values proposal fares no worse (or at least not much worse) than the transparency or aligned values proposals. The democratic values proposal is fully consistent with transparency - something we have independent reason to want. So, in cases where the transparency proposal works (e.g. cases where the value choices are few, easy to understand, and computationally simple), the same advantages can be had with the democratic values proposal. Individuals who disagree with a particular value judgment and have the time and expertise to do so can determine how results would have looked under a different set of value judgments. Also, recall that I am proposing only that primary or top-line results be based on democratic values. In cases where value judgments can make a big difference — as in the Global Burden of Disease Study case discussed earlier — we might hope that scientists who hold contrary values will note the dependence of those

results on values by offering secondary, alternative analyses that begin from different value judgments. Those who have the time and expertise to dig into the methodology of scientific reports can do so, seeking out results based on values they share, as the aligned values proposal would recommend.

If the foregoing is correct, the democratic values proposal does better than the alternatives in most cases, and no worse in others. That should be sufficient reason to prefer it. But I think we can say a bit more. In what cases is the complaint from minority values most compelling? It is not, I think, when it comes from people whose values lie outside the mainstream on some issues, but within the mainstream on many other issues. The much more compelling complaint comes from people whose values consistently lie outside the mainstream — people who are consistently out-voted. Oftentimes (though of course not always) when this happens, it involves individuals who are members of groups that are or have been marginalized by mainstream society. Think, for example, of cultural or (dis)ability-based groups whose values and ways of life have been consistently treated as being less valuable and worthy of respect than the values and ways of life of the majority.

I think the democratic values proposal has two important features that can partially address such complaints. First, remember that the democratic values proposal launders and filters the actual values held by the public. Certain values — e.g. racist or sexist ones — conflict with basic democratic principles of equal worth, and so cannot be candidate democratic values. Thus, even in a racist society, telling scientists to work from democratic values will not tell them to work from racist values.¹³ Second, in what I regard as its most plausible forms, democracy is not a form of government based on one person-one vote. It is a form of government based on the idea that all citizens are of equal worth and have a right to equal consideration. This suggests that, in cases where minority values are held by a group that is or has been the subject of exclusion or discrimination, democratic principles may sometimes require giving those values extra weight, or a voice disproportionate to their statistical representation in the population, as a way of accounting or compensating for past unjust treatment. Thus, democratic principles may in

¹³ See Schroeder (unpublished-b) for more on this.

some cases require treating the values held by an excluded minority as democratically on a par with the conflicting values held by the majority.¹⁴

These considerations, I think, lessen the force of the complaint from minority values, especially in its most serious incarnation. But I don't think they eliminate it. There will still be people whose values will consistently be marginalized by the democratic view. In such cases, the main recourse available is an appeal to alternate results. If individuals with minority views can count on there being scientists who share those views, they can expect that the kind of alternative analysis they would prefer will be out there, at least in cases where it makes a difference. Of course, scientists are currently a rather homogeneous bunch along many dimensions. So this suggests that the call to work from democratic values provides (yet further) support for the importance of increasing diversity within the scientific community.¹⁵

¹⁴ See Kelman (2000) for an example of this sort of argument in the context of disability.

¹⁵ ACKNOWLEDGEMENTS TO BE ADDED

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