

SYMPOSIA PAPER

Minority Reports: Registering Dissent in Science

Haixin Dang^{1,2} 

¹University of Nebraska, Omaha, USA and ²Department of Philosophy, Case Western Reserve University, Cleveland, Ohio, USA
Email: haixin.dang@case.edu

(Received 21 April 2023; revised 05 October 2023; accepted 23 October 2023; first published online 01 December 2023)

Abstract

Consensus reporting is valuable for presenting unified scientific evidence to the public. When a consensus does not exist, I argue that scientists ought not to default to majority reporting in its place. Majority reporting has several epistemic drawbacks because it can obscure underlying justifications and lines of evidence, which may be in conflict or contested. I argue that minority reporting, in conjunction with majority reporting, is an epistemically superior mechanism for scientists to report on the full range of reasons and evidence available within a group. This article addresses several objections, including worries over group cohesion, fringe reporting, and elite capture.

1. Introduction

In large scientific groups, disagreements among members over how evidence ought to be gathered and interpreted are inevitable. In 2019, the Many Smiles Collaboration brought together twenty-one labs from more than nineteen countries to test the facial feedback hypothesis—a controversial theory that posits that people’s emotional experiences are influenced by their facial expressions. The collaboration aimed to include many researchers working in the area so to achieve a picture of the whole field, but this meant that the collaboration included proponents of the facial feedback hypothesis, critics of the hypothesis, and those who did not have strong beliefs either way. Over several years, the study collected data from just under 4,000 participants and aimed to test the hypothesis in novel ways. The resulting paper was published in *Nature Human Behavior* and concluded that “a facial mimicry and voluntary facial action task could both amplify and initiate feelings of happiness” (Coles et al. 2022, 1731). While the collaborative process behind this paper may appear routine at first glance, the Many Smiles Collaboration is unique in its organization. The group had been explicitly designed from the outset to allow for the possibility that group members would not come to a consensus over the course of the study. The final manuscript “reflect[s] the majority opinion of the collaboration” and if there are substantial dissenting opinions over the method, analysis, or results, those dissents

will be uploaded as supplements alongside the main results (see supplemental information in Coles et al. 2022 for details of the collaboration setup).¹

Collaborations like this challenge what is assumed about how a group ought to report on what it believes or knows.² Even when group members disagree internally, it seems reasonable to rely on consensus building or majority reporting to present a unified external facing front. The readership of collaborative scientific articles has come to rely on consensus reporting as the default. It is commonly held that consensus reporting is valuable because it allows scientists to speak with one voice. Consensus building helps the group discover the most robust scientific evidence and this is considered important especially when interfacing with policy makers. When no consensus exists, groups often reach for the next best thing—majority reporting—while omitting any dissenting views altogether.

Is consensus or majority reporting the best way to present the results of group inquiry? These issues are particularly salient given the rise of large-scale collaborations in all areas of science (Chawla 2019). While large collaborative groups had long been common in physics, many more fields have started to work in similarly large groups. For instance, the model of the Many Smiles Collaboration is part of a larger trend of large multilab international collaborations. The Many Primates Collaboration brings together a diverse group of scientists to study primate cognition (Many Primates et al. 2019). The Many Babies Collaboration is a global project on developmental psychology (Byers-Heinlein et al. 2020). Crucially, these collaborations are built with researchers with different and often conflicting theoretical and methodological commitments. The heterogeneity of these collaborations allows the group to directly address outstanding controversies and debates in their fields.³ But these large collaborations can also be rife with deep disagreements. What should a group do when a consensus does not emerge at the end of inquiry?

Social epistemologists of science have studied how epistemic groups, in general, ought to report their results (Bright et al. 2018; Dang 2019) and similarly challenge the norm that scientific reports ought to represent a group consensus. In this article, I will argue that scientific groups ought to publish minority reports *alongside* majority reports, *in cases in which a consensus does not exist*. Allowing dissenting views to be published should not be seen as a failure of collaboration nor undermine trust in science. I will argue that minority reporting has several practical upshots in facilitating better science communication and in guiding the organization of large diverse collaborations. This article will also present a social epistemic argument for minority reporting as an important mechanism in group inquiry. Majority reporting alone often obscures the underlying justifications and lines of evidence within the group, which may be in conflict or contested. A group can better report on its justifications and reasons if it can publish both a majority and minority report. While I do not present what a minority reporting publication

¹ No dissents were produced at the conclusion of the collaboration. All disagreements were sufficiently addressed in the main text of the paper (see Coles et al. 2023).

² Social ontologists hotly debate the status of group beliefs and group knowledge. In this article, I will set these debates aside. If one is particularly averse to theorizing about group beliefs, one can make sense of this article by substituting in group views or group claims.

³ One core aim of these collaborations is to allow for results to be replicated within the collaboration through multiple labs.

model⁴ will look like in practice, I do address several possible objections at the end of this article, including worries over group cohesion, fringe reporting, and elite capture.

2. Scientific consensus and dissent

Scientific consensus plays a crucial role in public life. From the National Institute of Health (NIH) to the Intergovernmental Panel on Climate Change (IPCC), scientific groups are counted on to formulate consensus statements to provide authoritative answers to disputed questions. For example, the IPCC has proceeded on the assumption that a scientific consensus is an essential tool for successful climate governance. Climate scientists' ability to speak with one voice is viewed as an important defense against climate skeptics. Consensus is also considered essential to coauthorship in general. For instance, many authorship guidelines in scientific journals require that each author endorse all parts of a paper (e.g., ICMJE authorship guidelines, see ICMJE 2023) that essentially require that authors come to some consensus over the main claims reported in a paper.

Philosophers of science have been interested in studying the role of consensus in the production of scientific knowledge (de Melo-Martín and Intemann 2014; Miller 2021). Consensus among epistemic agents of a community may be valuable as a mark of knowledge (Miller 2013) or a sign of successful reasoning (Beatty and Moore 2010). It also has important social value as a resource for public policy making. In the face of increasing science denialism, scientists are under pressure to present themselves as a united front to combat misinformation. However, the drive for consensus also has negative epistemic consequences, such as masking expert disagreement and obscuring value judgments (Beatty 2006). There exists widespread agreement among philosophers that dissent plays an important epistemic role in scientific communities (de Melo-Martín and Intemann 2018; Longino 1990), but philosophers also argue that some forms of dissent are epistemically detrimental and carry no benefits (Biddle and Leuschner 2015). But in public discourse, dissensus among experts is often taken as a reason not to trust experts or science in general. Worryingly, there is evidence that even modest amounts of scientific dissent undermine public support for environmental policy (Aklin and Urpelainen 2014).

While scientific consensus may be a useful tool when interfacing with policy makers and the public, consensus reporting has several important *epistemic* drawbacks and so should not be taken as the *epistemic* ideal of scientific groups. Consensus building often leads to a minimum of what can be accepted by everyone or the “lowest common denominator” (Beck et al. 2014), which may not be truly representative of what total evidence the group holds as a collective. Settling for the lowest common denominator can be epistemically costly in the long run. It leads to an informational loss, by discounting heterodox views, and could increase the chances of error and close off the pursuit of certain lines of inquiry. According to Oppenheimer

⁴ One such minority reporting publication model can be seen in the Many Smiles project. Collaborators are given the option to write a minority report to be published as a supplement to the main paper if there is a substantial divergence in views. However, this model is not yet accepted by journals. What form a minority report will take may be dependent on the needs and contexts of each collaboration. Exploring these different publication models is beyond the scope of this article.

et al. (2007), consensus building may downplay or exclude more extreme findings, which could be of help in understanding the entire complexity of the climate system. For example, the projected sea-level rise in the Fourth Assessment Report (AR4) was well below the subsequent observations. This occurred because scientists compiling the report could not agree on how much would be added to sea-level rise by melting polar ice sheets, and so left out the data altogether to reach a “consensus.”

To take the IPCC as a further example, consensus building obscures how members of the IPCC weigh risks and uncertainties. Climate models are complex and structural uncertainties are high. Scientists who express doubts are marginalized or defer to the majority view to preserve consensus. Individual differences, which may carry important information or evidence are washed out by consensus. By the very nature of the consensus-building process, the summary for policymakers is conservative (Anderson 2023). While skeptics argue that the consensus statements of the IPCC are alarmist, the IPCC is more likely to *underestimate* the effects of climate change (Biello 2007). However, given the IPCC’s consensus reporting process, it is difficult for nonmembers to assess how many scientists believe the effects of climate change to be much worse than what is reported.

Consensus reporting does not help us access the reasoning process of groups. Consensus obfuscates the underlying reasonings of group members, especially when these reasons are diverse or are in conflict with each other. Consensus by its nature oversimplifies and dilutes the complete range of reasons group members hold. Furthermore, consensus can also have other negative effects. Beck et al. (2014) have argued that by excluding a plurality of views and “focusing on consensus, the IPCC becomes vulnerable to criticism relating to issues where no consensus exists” (83). The denial or obfuscation of legitimate disagreement among experts then becomes fodder for climate denialists.

These epistemic drawbacks of consensus reporting are not isolated to large scientific groups that have been convened to interface with policy makers. These problems extend to epistemic groups in general. When a group is comprised of diverse members with differing commitments, the group will need to come to a “lowest common denominator” to satisfy all members when coauthoring together. The larger the collaboration, the more likely the collaboration will need to flatten diverse lines of evidence within the group to achieve a consensus view.

If our epistemic goal is to know what a group of scientists believes and their reasons and justifications for their beliefs, then we should not rely on consensus reporting. Disagreement is integral to the scientific process. Consensus reporting obfuscates the underlying reasonings of group members and the epistemically significant ways in which individuals within a group differ in how they interpret the evidence. If we want to evaluate the internal reasoning process of groups, we need to rely on a different type of reporting model, one that is sensitive to individual differences and diversity of attitudes within the group.

It is tempting to replace consensus reporting with majority reporting. Rather than requiring all members to come to a consensus on what should be in a group report, the group can report on what a majority of members believe. When no consensus exists, majority reporting seems to be a reasonable alternative. Majority reporting can alleviate the “lowest common denominator” effect somewhat to find a position that is acceptable to a subset of members instead of everyone. However, I argue that

majority reporting is only effective when combined with minority reporting because, without the corresponding minority report, the majority report alone can misrepresent the full range of opinions within a group.

3. Minority reporting

When a group cannot reach a consensus, instead of defaulting to a “lowest common denominator” consensus that obfuscates the underlying diversity of the group, groups should produce a majority report *alongside* a minority report. This type of reporting model may be especially suitable for large collaborations where members are diverse. It would also benefit projects that are focused on topics where there already exists deep disagreement within a field, such as the case of the Many Smiles Collaboration.

Such a publication model would have several *practical* upshots. Scientists can be credited on a paper even though they disagree with the majority results and their dissenting opinions can be included alongside the main results. Currently, if a scientist dissents from the majority view, the only recourse she has is to remove herself from the authorship list or leave the collaboration altogether. These departures are viewed as ruptures in the social cohesion of the group. Explicitly allowing for a minority report allows scientists to avoid such ruptures.

A common objection against allowing for the public airing of unresolved dissents is fear of loss of group cohesion. These fears are overblown. Minority reporting is a strategy for managing disagreements within a collaboration. In the experience of the Many Smiles Collaboration, “the dissenting opinion contingency plan helped collaborators to feel confident that their participation would be recognized and rewarded even if major disagreements could not be resolved” (Coles et al. 2023, 665). When disagreements become intractable, rather than leading to a rupture in the collaboration, the dissenters can write their own minority report and still be included in the project going forward. This process avoids bottlenecks in collective inquiry when disagreements among collaborators cannot be resolved.

Minority reporting also has important epistemic advantages. For an instructive *epistemic* model of how minority reports may improve the epistemic standing of a group, I turn to an analogy with the US Supreme Court. The court issues majority opinions, which are legally binding, and dissenting opinions when there exists significant divergence in views. Furthermore, justices may also write concurring opinions when they agree with the ruling but for different legal reasons (Sunstein 2014).⁵ The majority opinion alongside the dissenting opinion provides valuable insight into how the court has reached its decisions. The court reasonings are rendered more transparent by the existence of multiple opinions. It allows for the court to report on the full range of reasons the justices held in their judgments.

Justice Ruth Bader Ginsburg was well known for her cogent dissents in her twenty-seven years on the bench. In reflecting on the impact of her dissents, Ginsburg (2010) wrote: “My experience teaches that there is nothing better than an impressive dissent to lead the author of the majority opinion to refine and clarify her initial

⁵ For much of the American court’s history, unanimous decisions were the norm, until the 1940s. Today, the majority of opinions from the court are divided. Other legal systems have other conventions, for instance, the European Court of Human Rights requires consensus for its decisions.

circulation” (3). The minority report can help the author of the majority opinion be more attentive to the limits and uncertainty of evidence and more careful in considering the assumptions underlying their conclusions, therefore increasing the quality of reasoning of the court overall.

This epistemic model of the Supreme Court that allows for majority and minority reports can be extended to scientific groups.⁶ In fact, from 1977 to 2013, the NIH convened consensus panels that explicitly adopted a “court of law” model. The NIH’s Consensus Development Program brought together experts to produce consensus reports interpreting the available evidence on contentious medical issues and to identify research gaps to guide future research. Over the course of the program, the Consensus Development Program delivered more than 160 consensus reports on topics ranging from the prevention of Alzheimer’s disease to the management of Hepatitis B. Miriam Solomon (2015) notes that: “In a 1998 talk by John Ferguson (Director of OMAR [Office of Management Analysis and Reporting] during the 1990s), I also heard a specific comparison with the US Supreme Court, in which minority opinions are not ignored, but reported along with the majority statement” (32). Interestingly, over the life of the Consensus Development Program, a minority report has only been produced *three* times.

The NIH’s adoption of the majority/minority reporting model provides a suggestive case study for the potential benefits of this model in scientific groups. In light of the increasing reliance on expert panels and scientific committees to guide policy decisions, it becomes even more important to consider the value of such a model for reporting group results. Epistemic groups need a mechanism to register dissent on issues where there exists no strong consensus. While the majority report should be taken with the most weight, minority reports can shed light on underlying reasonings and value judgments that would otherwise be hidden in a majority or consensus report. Zeynep Pamuk (2021) argues that scientific committees ought to issue both majority and minority opinions because it would contribute to making scientific committees more epistemically careful and more accountable to democratic norms. The possibility that dissenting opinions may be made public could be “a disciplining force ensuring that committee reports are well supported, and refrain from overstating or understating the uncertainty of the evidence” (87).

Furthermore, minority reporting helps to establish a relevant contrast class, which helps to contextualize the majority report. Evaluators may stand a better chance of understanding the group’s majority view if they can interpret the group’s results in the context of a minority view. The minority report can clarify the limits of each view and present alternative conclusions to be drawn from the same evidence. If our goal is to design epistemic groups to report in the most informative and transparent way, then we should require minority reporting as a mechanism to gain a deeper understanding of the state of the underlying evidence.

⁶ Are the majority/minority opinions of a legal court an instructive case for thinking about scientific groups? Yes, because we depend on the expert judgment of epistemic groups. A group of justices is also an epistemic group: They consider the evidence and provide reasons for their judgments. The court may be described, as it were, as engaging in the production of legal knowledge.

4. Objections and replies

So far, I have argued that majority reporting in conjunction with minority reporting ought to be adopted as a model for epistemic group reporting. However, there are several disadvantages and potential negative consequences to this model that need to be addressed directly.

The discussion heretofore captures too wide a range of groups, from the IPCC and groups of justices to multi-site collaborations, which have different aims and therefore not suitable for the same treatment. The IPCC may be a particularly unique case as it is a group that includes nonscientists and explicitly considers political decisions around climate governance. We can instead narrow our attention to Working Group I of the IPCC, which is the group directly responsible for assessing and reporting on the state of the physical science. The problem of how an epistemic group ought to report on its reasons and results is a general problem for all epistemic groups of all different shapes and sizes. Epistemic groups are special because they engage in collective inquiry and respond to reasons and evidence. How an epistemic group reports on its results is essential for interfacing with and learning from them. The minority reporting model proposed here can be applied to all epistemic groups if we are interested in learning about the range of reasons within a group, in cases in which a consensus does not easily emerge.

Scientific groups can report on dissenting views in the discussion sections of their papers without issuing a separate minority report. Many disagreements within a group can be reported on to the satisfaction of the dissenters by addressing them directly in the text of the main paper and this may, in fact, be preferable. In the Many Smiles Collaboration, no dissenting opinion was necessary “because the disagreements were minor enough to be described in the main text” (Coles et al. 2023). Nonetheless, when a group is large and diverse, and when there already exists deep disagreements in the field, it is less likely that all disagreements can be resolved in the main paper. When a group runs into a bottleneck because members are engaged in a deep disagreement, rather than ending the collaboration or rupturing the collaboration, the group needs to have the option to write a minority report. This helps to ensure cohesion and confidence within a large and diverse epistemic group. Minority reporting should be used only when disagreements cannot be resolved in the main text.

Minority reporting will result in fringe reporting. Minority reporting will not legitimate or highlight fringe issues. If a group is comprised of members who espouse fringe beliefs, then the group is liable to report on those fringe beliefs. As long as a group has members who are reason responsive and share a commitment to the truth, then the group will be less likely to produce fringe reports. Rather, minority reports can help scientific groups differentiate between epistemically responsible dissenting opinions and those that are epistemically inappropriate. Identifying normatively appropriate dissent is a notoriously difficult problem (de Melo-Martín and Intemann 2014; Miller 2021). The process of finding a minority position is a social epistemic solution to allow a group to distinguish legitimate dissent from fringe concerns. The group through collective inquiry can determine which concerns are legitimate dissents to the majority view and find the most cogent criticism or alternative to the majority view. Ultimately, this article’s goal is not to solve the problem of misinformation or convince science skeptics. Rather this proposal is to appeal to a reasonable interlocutor. The goal is to provide the best group reporting to those who are epistemically responsible.

There would be a proliferation of minority reports if groups were given the option. So far in the cases in which minority reports were allowed, proliferation has not occurred. NIH's Consensus Development Program, which allowed for the production of a minority report, only produced three. The Many Smiles Collaboration did not need to resort to writing a separate minority report. Scientific norms still strongly encourage a group to come to a consensus. If minority reporting does turn out to be rare, it would tell us something interesting about the state of the scientific community. However, there is the possibility that we may end up like the modern Supreme Court, where minority opinions are now routine. Whether or not minority reporting will proliferate is ultimately an empirical question.

Minority reporting can be captured by special interests to skew scientific results. Perhaps the most pressing objection to minority reporting may be that minority reporting can be particularly sensitive to capture by elites or special interests that seek to undermine public action and trust in science. Elite capture is a concept that originated from global development. It explains how people with more power and resources can take control of financial benefits meant for everyone, like foreign aid. The concept of elite capture has since been extended to describe how the powerful can take over political projects and control public resources like knowledge and attention (see Táíwò 2022). One can reasonably fear that minority reporting in science can be captured by elites to serve particular economic and political agendas. Minority reports may serve as the perfect vehicle for special interests to cast doubt on the majority report and thereby delay policy changes and collective action. Biased reporting of science has already been well documented for industry-supported research on hazardous materials, such as tobacco smoke (Oreskes and Conway 2011). This is a serious problem.

While elite capture cannot be prevented altogether, elite capture can be deterred when there is increased transparency of the process and people involved. Minority reporting, designed the right way, can increase transparency. It will be crucial that majority and minority positions are signed and not given anonymously. Minority reporting is a mechanism for a group to share more information about their commitments and disagreements with the public. However, minority reporting may not be suitable for *all* groups. Minority reporting allows a community to present what is within the range of reasonable disagreement, but this requires that the community has not already been captured by special interests. On topics that are sensitive to elite capture, perhaps we need to design better group mechanisms to ensure that the resulting minority report is not a vehicle of doubt but accurately presents normatively appropriate dissent. We would need to ensure that epistemic communities themselves are robust against capture.

Finally, I have not addressed the exact form a minority report will take. Rather, I have explored several examples which demonstrate some important features of minority reporting. As collaborations proliferate, more groups will need to present their results beyond traditional consensus reporting. This article has argued that minority reporting, in conjunction with majority reporting, should be the model for group reporting because it confers important epistemic benefits that can outweigh possible negative consequences. Scientific dissent is an integral part of collective inquiry, and scientific groups ought to be organized to recognize and manage epistemically productive disagreement.

Acknowledgments. Thanks to Nicholas A. Coles, Mikkel Gerken, Miriam Solomon, and Robbie Williams for invaluable comments on earlier versions of this paper. Research leading to these results has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation program (Grant Agreement No. 818633).

References

- Aklin, Michaël, and Johannes Urpelainen. 2014. "Perceptions of Scientific Dissent Undermine Public Support for Environmental Policy." *Environmental Science & Policy* 38 (2014):173–77. <https://doi.org/10.1016/j.envsci.2013.10.006>
- Anderson, Kevin. 2023, March 27. "IPCC's Conservative Nature Masks True Scale of Action Needed to Avert Catastrophic Climate Change." *The Conversation*. <https://theconversation.com/ipccs-conservative-nature-masks-true-scale-of-action-needed-to-avert-catastrophic-climate-change-202287> (accessed 1 April 2023).
- Beatty, John. 2006. "Masking Disagreement among Experts." *Episteme* 3 (1–2):52–67. <https://doi.org/10.3366/epi.2006.3.1-2.52>
- Beatty, John, and Alfred Moore. 2010. "Should We Aim for Consensus?" *Episteme* 7 (3):198–214. <https://doi.org/10.3366/epi.2010.0203>
- Beck, Silke, Maud Borie, Jason Chilvers, Alejandro Esguerra, Katja Heubach, Mike Hulme, Rolf Lidskog, et al. 2014. "Towards a Reflexive Turn in the Governance of Global Environmental Expertise. The Cases of the IPCC and the IPBES." *GAIA—Ecological Perspectives for Science and Society* 23 (2):80–87. <https://doi.org/10.14512/gaia.23.2.4>
- Biddle, Justin B., and Anna Leuschner. 2015. "Climate Skepticism and the Manufacture of Doubt: Can Dissent in Science Be Epistemically Detrimental?" *European Journal for Philosophy of Science* 5:261–278. <https://doi.org/10.1007/s13194-014-0101-x>
- Biello, David. 2007. "Conservative Climate." *Scientific American* 296 (4):16–19. <https://doi.org/10.1038/scientificamerican0407-16>
- Bright, Liam K., Haixin Dang, and Remco Heesen. 2018. "A Role for Judgment Aggregation in Coauthoring Scientific Papers." *Erkenntnis* 83:231–52. <https://doi.org/10.1007/s10670-017-9887-1>
- Byers-Heinlein, Krista, Christina Bergmann, Catherine Davies, Michael C. Frank, J. Kiley Hamlin, Melissa Kline, Jonathan F. Kominsky, et al. 2020. "Building a Collaborative Psychological Science: Lessons Learned from ManyBabies 1." *Canadian Psychology/Psychologie Canadienne* 61 (4):349–63. <https://psycnet.apa.org/doi/10.1037/cap0000216>
- Chawla, Dalmeeth Singh. 2019. "Hyperauthorship: Global Projects Spark Surge in Thousand-Author Papers." *Nature*. <https://doi.org/10.1038/d41586-019-03862-0>
- Coles, Nicholas A., Lisa M. DeBruine, Flavio Azevedo, Heidi A. Baumgartner, and Michael C. Frank. 2023. "Big Team' Science Challenges Us to Reconsider Authorship." *Nature Human Behaviour* 7 (5):665–67. <https://doi.org/10.1038/s41562-023-01572-2>
- Coles, Nicholas A., David S. March, Fernando Marmolejo-Ramos, Jeff T. Larsen, Nwadiogo C. Arinze, Izuchukwu L. G. Ndukaihe, Megan L. Willis et al. 2022. "A Multi-lab Test of the Facial Feedback Hypothesis by the Many Smiles Collaboration." *Nature Human Behaviour* 6 (12):1731–42. <https://doi.org/10.1038/s41562-022-01458-9>
- Dang, Haixin. 2019. "Do Collaborators in Science Need to Agree?" *Philosophy of Science* 86 (5):1029–40. <https://doi.org/10.1086/705444>
- de Melo-Martín, Inmaculada, and Kristen Intemann. 2014. "Who's Afraid of Dissent? Addressing Concerns about Undermining Scientific Consensus in Public Policy Developments." *Perspectives on Science* 22 (4):593–615. https://doi.org/10.1162/POSC_a_00151
- de Melo-Martín, Inmaculada, and Kristen Intemann. 2018. *The Fight against Doubt: How to Bridge the Gap between Scientists and the Public*. New York: Oxford University Press. <https://doi.org/10.1093/oso/9780190869229.001.0001>
- Ginsburg, Ruth Bader. 2010. "The Role of Dissenting Opinions." *Minnesota Law Review* 95:1–9.
- International Committee of Medical Journal Editors (ICMJE). 2023. "Recommendations for Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals." <http://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html> (accessed 15 April 2023).

- Longino, Helen E. 1990. *Science as Social Knowledge: Values and Objectivity in Scientific Inquiry*. Princeton: Princeton University Press. <https://doi.org/10.2307/j.ctvx5wbfbz>
- Many Primates, Drew M. Altschul, Michael J. Beran, Manuel Bohn, Josep Call, Sarah DeTroy, Shona J. Duguid, et al. 2019. “Establishing an Infrastructure for Collaboration in Primate Cognition Research.” *PLoS One* 14 (10):e0223675. <https://doi.org/10.1371/journal.pone.0223675>
- Miller, Boaz. 2013. “When Is Consensus Knowledge Based? Distinguishing Shared Knowledge from Mere Agreement.” *Synthese* 190 (7):1293–1316. <https://doi.org/10.1007/s11229-012-0225-5>
- Miller, Boaz. 2021. “When Is Scientific Dissent Epistemically Inappropriate?” *Philosophy of Science* 88 (5): 918–28. <https://doi.org/10.1086/714854>
- Oppenheimer, Michael, Brian C. O’Neill, Mort Webster, and Shardul Agrawala. 2007. “Climate Change: The Limits of Consensus.” *Science* 317 (5844):1505–6. <https://doi.org/10.1126/science.1144831>
- Oreskes, Naomi, and Erik M. Conway. 2011. *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming*. New York: Bloomsbury Publishing.
- Pamuk, Zeynep. 2021. *Politics and Expertise: How to Use Science in a Democratic Society*. Princeton: Princeton University Press. <https://doi.org/10.1515/9780691218946>
- Solomon, Miriam. 2015. *Making Medical Knowledge*. Oxford: Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780198732617.001.0001>
- Sunstein, Cass R. 2014. “Unanimity and Disagreement on the Supreme Court.” *Cornell Law Review* 100: 769–823. <https://doi.org/10.2139/ssrn.2466057>
- Táíwò, Olúfẹ́mi O. 2022. *Elite Capture: How the Powerful Took over Identity Politics (and Everything Else)*. Chicago: Haymarket Books. <https://doi.org/10.2307/j.ctv2g591sq>