What Is the Harm in Gendered Citation Practices?

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Women are cited less frequently than men in a variety of scientific fields. Drawing theoretical resources from Fricker and Hookway, I argue that these gendered citation practices constitute a form of participatory epistemic injustice insofar as they prevent female scientists from fully engaging in the epistemic practices of science. Furthermore, Longino's notion of "uptake" gives us a way of understanding gendered citation practices as an epistemic harm accrued not simply by individuals but by scientific communities as a whole. Finally, I discuss the cumulative harms of this kind of participatory epistemic injustice for individuals and for marginalized groups.

1. Introduction. Starting in the early twentieth century, the field of Paleoindian studies—sometimes referred to as Early Man studies—was dominated by male archaeologists focusing on the lives of the first groups of people who came to the Americas from Asia roughly 15,000 years ago (Gero 2000, 307). These male archaeologists predominantly concentrated on the activity of the men in Paleoindian groups, specifically the hunting of megafauna such as mammoths and elk. In the latter half of the twentieth century, the vast majority of books and articles on this topic were written by men or pairs of men; 89% of articles in nine of the most important collected volumes from 1965 to 1990 had at least one male author, while 10% had only female authors. Paleoindian societies were identified by archaeologists by the types of tools that men used for hunting: the kinds of rocks shaped into tools by Paleoindians had a particular fluted shape, and "without the fluted point, there is no Paleoindian" (310). Paleoindian culture was identified with the hunting activity of men. The mostly male archaeologists did not consider what happened after the hunt, how the meat was prepared, or other alternatives for how Paleoindians ate.

During the same period, female archaeologists were concentrated in fields that focused on tools other than hunting tools, such as nutting stones and flake

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tools that were used for more 'domestic' purposes such as preparing food and cleaning animal skins, which were presumably done by the women in Paleoindian groups (Gero 2000, 313). Both male and female archaeologists were doing lithic analysis of artifacts, but few women were cited by the male archaeologists or included in the volumes on lithic analysis edited by men.

Furthermore, women are cited less frequently than their male counterparts in archaeology at large (Gero 2000, 314). Gero points to the case of Eileen Johnson, a woman who was working in the male-dominated areas of Paleoindian studies. She had two single-authored publications in 1978 and 1980 that were cited a total of three times; in contrast, two male authors writing about findings from the same archaeological sites were cited eight and nine times for their respective articles. When Johnson coauthored pieces with men, she was cited a similar number of times as single male authors but much more frequently than when she was a solo female author; her two coauthored publications received seven and 11 citations.

Many scientific fields have increased the representation of women in the last few decades; given the changing demographics of science, it may seem that gender bias in science is gone or at least rapidly disappearing. However, women continue to face challenges in science. In particular, women are cited less frequently than men in a number of disciplines, even after controlling for their relative frequency of publication and other potential confounding factors.[1] This occurs in a wide variety of disciplines, including some in which women make up a larger proportion of the field than men.

The fields in which women are cited less frequently than men include astronomy (Caplar, Tacchella, and Birrer 2017), archaeology (Hutson 2002), communication science (Knobloch-Westerwick and Glynn 2013), ecology and evolutionary biology (Kelly and Jennions 2006), epidemiology (Schisterman et al. 2017), gynecological oncology (Hill et al. 2015), international relations (Maliniak, Powers, and Walter 2013), neuroscience (González-Álvarez and Cervera-Crespo 2017), neurosurgery (Khan et al. 2014), pediatric neurosurgery (Klimo et al. 2014), and psychology (Geraci, Balsis, and Busch 2015). The methods vary across studies that document these disparities and focus primarily on the most prestigious journals in their fields, but almost all find a statistically significant difference in citation rates by gender. For example, Caplar et al. (2017) examine the papers published in five top astronomy journals since the 1950s and find that women received 4% fewer citations than men. Women receive an average of four fewer citations per paper than men for articles published in the top six journals in epidemiology (Schisterman et al. 2017). Citation measures such as the h-index, which reports the number

1. I will refer to this phenomenon as 'gendered citation practices'. I will also refer to 'science' or 'gendered citation practices in science' when I really am only referring to the fields in which there is evidence for said gendered citation practices.

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of papers, *h*, that have at least *h* citations, show similar gender disparities to raw publication counts. Women working in the top 100 departments in psychology have an average h-index of 17.17, while men working in similar departments have an average h-index of 21.64, a statistically significant difference (Geraci et al. 2015, 2027). Combined, these studies give strong evidence that gender has an impact on citation rates.[2]

In this article, I show that this failure of uptake in the form of fewer citations constitutes an epistemic injustice. Miranda Fricker coined the term in her 2007 book, although earlier philosophers discussed the same idea under other names (Code 1991; Collins 1991). An epistemic injustice occurs when "a wrong [is] done to someone specifically in their capacity as a knower" (Fricker 2007, 1). I will show that gendered citation practices constitute an epistemic injustice. In particular, these citation practices are a form of what Christopher Hookway (2010) calls a *participatory epistemic injustice* because they prevent female scientists from fully engaging in the epistemic practices of science.

Hookway's conception of participatory epistemic injustice is useful to help define the problem with gendered citation practices, but it does not fully capture the critical features of the epistemic harms, namely, the harm done to the epistemic status of the entire community's knowledge as well as the cumulative nature of these harms to individual and cohorts of women. I will use Helen Longino's notions of "uptake" and "objectivity" to demonstrate that gendered citation practices constitute an epistemic harm, not only to women in science but also to the community of knowers as a whole. Additionally, I will explicate the cumulative nature of these harms for individuals in science and for the community as a whole.[3]

2. Epistemic Injustice

2.1. Fricker's Testimonial and Hermeneutical Injustices. In this section, I discuss Fricker's conception of epistemic injustice and her definition of a negative identity prejudice, a necessary component of establishing that an epistemic injustice has occurred. Fricker defines an epistemic injustice, broadly, as "a

2. This is likely not an exhaustive list of all the communities in science where gender bias may exist. More analyses of citation data are being done by members of scientific communities, especially as more attention is paid to citation rates for important decisions in a scientist's career. While it is possible that additional studies will shift the balance of the evidence from supporting gender bias to disconfirming it, the effect of gender bias in citation rates accords with both the subjective experience of women and a large body of literature on the biases women face in a number of different arenas, both academic and not (Valian 1999).

3. In my analysis, I will focus on women, but it is likely that the same patterns of lowered citation counts apply to other marginalized groups in science.

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wrong done to someone specifically in their capacity as a knower" (2007, 1). She defines and contrasts two types of epistemic injustice: testimonial injustice and hermeneutical injustice.

In a testimonial injustice, a speaker is given less credibility for testimony because of a prejudicial stereotype about members of the speaker's group (Fricker 2007, 21). One such example that Fricker discusses is the in-court testimony of Tom Robinson in *To Kill a Mockingbird*. The all-white jury has lowered credibility in Tom's testimony, given the racial prejudices they have about black people, and as a result, they do not believe him when he says he did not harm Mayella Ewell (23–24).

Hermeneutical injustice occurs when members of marginalized groups are prevented from developing the epistemic resources to interpret their own experiences because of prejudices about their identities on the part of the dominant group (Fricker 2007, 155). Fricker's primary example of this is sexual harassment. Before the term 'sexual harassment' was coined by women in the 1970s, women were kept from the appropriate epistemic resources to make sense of this experience (151).

Both testimonial and hermeneutical injustice require negative identity prejudices in whoever is committing the injustice: the hearer in the case of testimonial injustice and the dominant group in the case of hermeneutical injustice. A negative identity prejudice is a negatively valenced judgment made about people on the basis of their membership in a social group (Fricker 2007, 27–28). Negative identity prejudices are closely related to prejudicial stereotypes; the negative stereotypes we hold about members of marginalized groups' sincerity or competency result in reduced credibility judgments when those people testify (30–32). These prejudices are also, importantly, resistant to counterevidence; if someone has a mistaken belief about a social group that is corrected when encountering contradictory evidence, it will fail to be an identity prejudice (35). Maintaining a prejudice in light of counterevidence requires an affective investment on the part of the prejudiced, and any negative identity prejudice that is maintained in light of such evidence necessarily involves "an ethically bad affective investment" (35).

The addition of 'epistemic injustice' to the philosophical vocabulary has generated a great deal of discussion among epistemologists and ethicists about other types of wrongs that are distinctly epistemic. While Fricker's concepts of testimonial and hermeneutical injustice cannot fully capture the wrong done by gendered citation practices, her definition of 'negative identity prejudice' will be necessary in showing why gendered citation practices constitute an epistemic injustice.

If gendered citation practices are an epistemic injustice, they must be due to an identity prejudice based on gender. While there might be explicit sexists in academia who refuse to cite women on principle, these bad actors are almost certainly in the minority because of the liberal values held by most scholars

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across academia (Prentice 2012). These explicitly sexist scientists are therefore unlikely to substantially contribute to the robust gendered citation practices seen in some sciences. While explicit sexism might explain some small part of gendered citation practices, it seems much more likely that implicit biases are what causes less uptake for papers authored by women. Implicit biases are "typically thought to involve associations between social groups and concepts or roles" (Saul and Brownstein 2016, 1–2). Implicit association tests have shown that most people have stronger associations between men and science than they do between women and science (Nosek et al. 2009). In a sample of over 500,000 implicit association test results from around the world, about 70% showed at least somewhat stronger association between men and science than women and science (10594). If scientists are implicitly biased toward perceiving men as belonging in science, then they may be more likely to treat the scientific work done by men favorably and are therefore more likely to cite it in their own work, whether favorably or negatively.

Implicit bias against women in science constitutes a negative identity prejudice in Fricker's sense, because the implicit bias is resistant to counterevidence. The number of women participating in science has consistently increased over the past 50 years, creating a great deal of counterstereotypical evidence that may have reduced implicit biases against women in science. Yet, most people still hold these biases. Fricker's conception of negative identity prejudice is difficult to definitively establish in every individual in a population, but the work on implicit biases suggests that a prejudice against women is persistent and pervasive.

Implicit biases against women in science constitute a negative identity prejudice in the way that Fricker describes. However, gendered citation practices do not seem to fit into her categories of epistemic injustice. They do not prevent women from making sense of their experience in science; women often explicitly identify the ways in which they receive lowered credibility in science through gender bias in citations. Thus, gendered citation practices cannot be a hermeneutical injustice. While citations have some similarities to testimony—there is a writer and a reader, and the writer's choice to cite or not is related to whether the reader gives the appropriate amount of credibility to the writer—gendered citation practices do not seem to be a form of testimonial injustice, either. In a testimonial injustice, the hearer gives a lower credibility judgment to a speaker on the basis of a negative prejudice the hearer holds about people like the speaker. The hearer can disbelieve some particular statement made by the speaker, or doubt everything the speaker says, but it is not clear that failing to cite is because of a reader assigning a credibility deficit to the writer of a particular paper. Citations are often to a paper as a whole, not specific pieces of testimony, and have a public-facing component in a way that testimony does not; citations are used to indicate agreement but can also be used in the service of criticism. Failing to cite someone is not the same

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kind of judgment as not believing him or her; a failure to cite is closer to failing to recognize that someone has contributed to a conversation at all. Gendered citation practices are not testimonial or hermeneutical injustices, but the harm is epistemic in nature.

2.2. Hookway's Participatory Epistemic Injustice. Many other philosophers have expanded on Fricker's concept of epistemic injustice to accommodate a wider variety of epistemic harms. Christopher Hookway defines a category of epistemic injustices that he calls participatory epistemic injustices. This category includes testimonial injustice, but the uniting feature is that these injustices prevent a knower from fully participating in an epistemic practice, which can include more than just testimony (Hookway 2010, 155). Hookway argues that Fricker views epistemic injustice from an informational perspective (in which only exchanges of information are important) and that a participatory perspective (in which the ability of a knower to engage with epistemic practices is at the forefront) can capture a wider variety of injustices that are specifically epistemic (157). Testimony is one epistemic practice, but we also participate in others such as discussion and questioning. A participatory epistemic injustice occurs whenever a participant in any epistemic practice is prevented from fully engaging with the practice because of a prejudicial stereotype held by the other member in the exchange.

Hookway provides a number of examples that are not testimonial injustices but in which an epistemic injustice still takes place. In the first, a teacher does not recognize her student as a potential partner in inquiry because of a prejudicial stereotype she holds about the student (Hookway 2010, 156). The teacher answers the student's questions when he asks for clarification or additional information; when the student asks a noninformational question meant to engage with a deeper issue, the teacher ignores the question or assumes the question is irrelevant to discussion. She does not see the student as being able to contribute because of her stereotype about members of his group. This example fails to be a testimonial injustice because the student is not testifying to any particular fact that the teacher disbelieves; instead, he is participating in a different epistemic practice: questioning.

Another example Hookway gives focuses on participants in philosophical discussions in which hypotheticals and counterexamples are offered and refuted; the content of the discussion contains assertions but not exclusively (2010, 158). If a participant in the discussion is perceived as being a poor philosopher because his or her contributions are judged in light of some group membership, a participatory epistemic injustice is committed—although, once again, a testimonial injustice does not necessarily occur.

Hookway's notion of participatory epistemic injustice is useful because it substantially broadens the domain of epistemic injustice: it can include all varieties of epistemic practices, including those that occur in science and are

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relevant to citation. Gendered citation practices prevent women from fully engaging with the epistemic practices of science. In particular, failing to cite women in science prevents them from receiving uptake for their work.

3. Uptake and Gendered Citation Practices. Hookway's concept of participatory epistemic injustice is useful in broadening the epistemic practices from which knowers can be excluded; however, it does not capture how this is connected to the epistemic status of the knowledge community as a whole. Helen Longino's account of science can elucidate the importance of citations to science and help show why gendered citation practices can constitute an epistemic harm, not only to women in science but also to the entire scientific community. By Longino's account, only through the uptake of its content can original work be conferred the status of knowledge by the community. If women are suffering participatory epistemic injustice in the form of gendered citation practices, the knowledge produced by the community is less objective or even fails to become knowledge.

For Longino, criticism is what ensures the objectivity of the knowledge created by a community; any background beliefs held by the members of the community that influence their work will be appropriately scrutinized and can be rejected by the community. The four criteria she proposes to ensure adequate criticism are public venues, shared standards, uptake, and tempered intellectual authority (Longino 2002, 129–31). The criterion of most interest here is uptake. Uptake requires that members of the community hear the criticisms made by others and respond appropriately; not every criticism will need a response, but the community members must show that they are willing to modify their background beliefs in light of criticisms.

While Longino's account applies specifically to criticism, uptake is necessary for original work as well. If some members who contribute original work to a community are not being subject to criticism—or if some members who provide criticism are not being taken up—then the knowledge produced by the community is not objective. Citations represent one such form of uptake; they show that an original work has been read by other scientists, and the use of a citation requires some kind of comment on, or integration with, the content of the work.

For gendered citation practices to constitute a participatory epistemic injustice, participants must be denied from fully participating in an epistemic practice because of an identity prejudice on the part of their partners in the practice. Longino's concept of uptake is helpful to understanding from what epistemic practice women are excluded. Uptake is an epistemic practice; it is a necessary step in the process of transforming hypotheses and data into objective scientific knowledge, and citations are an important part of that codification into knowledge (Longino 1990, 69). If particular groups are being excluded from uptake, either by not having their original work appropriately

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criticized or by failing to have their criticisms of others' work heard by other members of the community, then a participatory epistemic injustice is done. Thus, given the evidence about gendered citations practices and the implicit biases against women in science, we should conclude that women are being excluded from the epistemic practice of uptake and are subject to an epistemic participatory injustice.

4. Cumulative Harms. Citations and other measures of publication impact are becoming increasingly important in institutional decisions affecting scientists' careers, such as employment, tenure, and grant applications (Abbott et al. 2010). Journal impact factor, a frequently used indicator of research quality, has fallen out of favor in light of criticisms that a high journal impact factor does not always correspond to a high impact for a paper published in a given journal (Seglen 1997; Casadevall and Fang 2015; Larivière and Sugimoto 2018; "San Francisco Declaration on Research Assessment," https://sfdora.org/). There has been a shift toward using article- and individual-level citation counts and related measures as the important metrics of impact instead, because such measures focus on the particular work, as opposed to the venue of the work. Given the importance of citations to the individual careers of scientists, it is clear that a participatory epistemic injustice in the form of gendered citation practices will have a substantial impact on women in science.

However, Hookway's concept fails to capture the harm done by repeated participatory epistemic injustices, both diachronically for an individual and synchronically for a marginalized group in a community. This is because the harm of gendered citation practices is not fully captured by summing up each instance of injustice. First, I will consider the larger harms done to an individual across her career. I will then discuss the harms done to women as a group in scientific communities.

Suppose that two scientists, one male and one female, are both assistant professors working at similar types of institutions on projects of similar quality and importance in the same field, with the same number of publications of similar quality. If the female scientist suffers from one participatory epistemic injustice in the form of her work not being cited in a publication by a colleague because of the colleague's identity prejudice about women, she has been harmed by being denied access to full participation in science. The harm, however, may not have a substantial effect on her career path. She may still be able to secure grants for her future projects, continue to publish, and receive tenure. However, if she is subjected to the repeated harms of gendered citation practices, this may affect her career.

For example, if the female academic from the previous paragraph is working in epidemiology, each of her papers will receive roughly four fewer citations

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than those of her similarly situated male colleague (Schisterman et al. 2017, 163). If she and her male colleague both have five papers as assistant professors, this means she is already behind her colleague by 20 citations. If citation counts are used as a measure of quality in grant applications, as has been suggested by Ioannidis and Khoury (2014), she may fail to secure at least one grant she applies for because of her lower citation count. She not only loses the prestige attached to earning the grant but may be less able to fund her research and ultimately publish fewer papers, which further decreases her odds of obtaining tenure.

Now, consider the effects if such a scenario repeatedly plays out for all the women in a discipline. Many fields in science are still dominated by men at the top. For example, in epidemiology, women have gone from representing a third of the field in 1984 to over half by 2006 (Schisterman et al. 2017, 159), while much of the leadership of epidemiology has remained male; 59% of full professors in the discipline are men, compared to 30% of the associate professors and 27% of the graduate students (162). While there are more women entering science than ever before, small differences in the way that men and women are evaluated can lead to fewer women at the top of a field, even when starting from equal pools of men and women (Martell, Lane, and Emrich 1996).

For example, consider a group of 100 assistant professors, 50 male and 50 female, at comparable universities doing work of similar quality. Let us assume that this group starts with an average of five publications each, and the women of the group receive four fewer citations on average. If they all apply for the same set of grants, and citation counts are used to decide who is awarded a grant, a disproportionate number of women will fall below the cutoff. The effects of these differences will be further amplified through subsequent application cycles as the entire cohort progresses through their careers.

5. Conclusion. In this article, I have shown that the gendered citation practices in science constitute a participatory epistemic injustice against women and that the harms caused in aggregate are greater than the sum of their individual impacts. The cumulative harms of multiple participatory epistemic injustices can damage women's careers, keep them out of leadership positions in their disciplines, and force them out of the field altogether. These epistemic injustices cause serious harm to the state of scientific knowledge, reducing the objectivity of that knowledge and potentially preventing some scientific works from being recognized as knowledge. While gendered citation practices are not the only problem women face in science, such poor citation practices are on their own a substantial problem for science. Understanding why gendered citation practices constitute an epistemic injustice, and attending to the cumulative harms they bring, can help shape a response to the problem.

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