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# Improving Science – Insights from Feminist Standpoint and Coherence Theory

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## 1) Introduction

In the US today, the predominant cultural image of a scientist is a white man, in a white lab coat, in a white lab. The lab exudes sterility and remoteness, the man a detached and discerning perspective. More importantly, he exudes authority. He is the symbol of science, and so it is unsurprising that these qualities are perceived to belong to the scientific endeavor as a whole. Science today is represented as the engine of societal progress, the fundamental source of new technology and new knowledge of the world. Even in what might seem a distant discipline such as philosophy, naturalized accounts of various phenomena (such as morality) are being offered as solutions to complex problems. Science is not only informing what people think about the world, but what they think about their bodies and personal identities<sup>1</sup>. The increasing credibility attributed to scientific claims and the wide application of these claims in other intellectual disciplines warrants rigorous analysis of scientific practice through a critical lens.

In this paper, I hope to paint a realistic portrait of the scientific process. In this image, the lab is messy rather than sterile and the male scientist is deeply involved with his work rather than detached. The picture will show that scientific arguments are not necessarily always evidential or rational. Like a political debate, appeals to deeply engrained cultural ideas and models are common and have even obscured evidence that could have been used to form more objective theories. I thus aim to explore the strengths and weaknesses of the scientific endeavor by carefully exploring feminist epistemologists' critiques of science. Feminist epistemologists argue that gender exposes males and females to different experiences that shape the way we observe and form knowledge about the world, biasing theory formation by scientists and making theories less rigorously empirical. In this paper, I will defend this central tenet of feminist epistemology and relate it to the form of coherence theory advocated by Linda Martín Alcoff to

discuss several important implications for science. Because the type of knowledge claims scientists rely on are necessarily rooted in particular social locations, we cannot expect to produce reliable theories from the efforts of particular individuals. Instead, scientific discourse places great weight on communal deliberation using shared criteria, creating theories less rooted in individual perspectives. The concern is that a homogenous scientific community, such as one lacking women, will produce poor theories because there are some individual biases that are shared by the entire community. Thus, feminist standpoint theorists argue that as long as structural factors such as gender, race, and class have drastic effects on our experiences, scientific communities must include members of marginalized social locations or will produce flawed theories. I hope to show that if the scientific community were to respond to this critique, it would become more just, open, robust, and realistic.

I will begin with a brief exploration of what science is commonly thought to be, and provide a philosophical schema for choosing between scientific theories. This discussion will introduce the complex nature of scientific theory choice and show how individual beliefs and values can influence theory choice and research. Second, I will examine problematic scientific theories highlighted by feminist epistemologists, explain how the fundamental flaws of these theories were connected to the social locations of the scientists who created them, and articulate how diversity resulted in drastic improvement of these theories. Third, given that diversity is important to scientific communities, I will begin to explore the type of diversity we ought to be concerned with having. Fourth, I will discuss how sex and gender are constituted. I will begin by discussing some of the more obvious features of gender in our society before turning to how gender is “achieved” by individuals and exists as a self-perpetuating, hierarchical social institution. Fifth, I will defend the feminist standpoint epistemologist position on diversity,

appealing to the special features of social locations such as gender, race/ethnicity, and class. Sixth, I will discuss these insights in the context of Linda Martín Alcoff's coherence theory and the idea of knowledge-power as a mutually constituting dyad. In particular, I will show how Michel Foucault's normative and epistemic account of local and hegemonic knowledges can be used to support the claims of feminist standpoint theory. Lastly, I will discuss how science would benefit from the changes suggested by feminist standpoint critique.

## **2) The Scientific Method and Theory Choice**

Modern science revolves around "hypotheses," "experiments," "observations," and "theories." A scientific "hypothesis" is a putative, testable explanation for a phenomenon. A scientist interested in why students often choose to work on assignments at the last possible moment might propose that "students procrastinate because they enjoy delaying work." To test this hypothesis, the scientist would need to design an experiment that produces observations which could falsify this statement. One possible experiment would be to survey students who procrastinate on assignments immediately after they stop procrastinating and determine if they felt they enjoyed their procrastination. If it was the case that all of the students disliked procrastinating but did it anyway, this would falsify the hypothesis.

When a hypothesis has stood the test of many observations over many decades and particularly when its insights explain seemingly unconnected phenomena, it becomes an accepted "theory." Often, hypotheses are formed and tested within the framework of existing hypotheses and theories. For example, one biological theory is that the release of particular neurotransmitters produces an electrical excitation in particular parts of the brain that produces the sensation of pleasure.<sup>2</sup> Working within this theory, our hypothetical scientist above could

have designed an experiment where the brain activity of students was recorded as they procrastinated. Based on what parts of the brain were stimulated, the scientist would either falsify or find more support for her procrastination hypothesis.

In the past, even long-standing and very well-regarded scientific theories have been falsified by new observations. In physics, Newtonian mechanics were regarded as universally correct for centuries until Einstein hypothesized that these well-regarded physical “laws” only held true under a particular set of conditions (such as speeds much slower than the speed of light). Newtonian mechanics survived for so long because the conditions under which they break down are not a part of the “typical” human experience. In addition to regular, small revisions made to less “central” theories of science, this example shows that sometimes dramatic shifts in scientific theorizing occur.

It may seem relatively easy to look in hindsight at relativity theory, compare it to Newtonian mechanics, and declare relativity theory’s superiority. However, it is certainly much more difficult to discern which theory to support when a reasoned consensus has not already been established. Thomas Kuhn suggests that we choose theories based on how well they satisfy different scientific values. Kuhn lays out five different values generally accepted by other philosophers of science as relevant when evaluating the strength of a scientific theory:<sup>3</sup>

- i. Accuracy – a good theory is consistent with our observations of the world.
- ii. Consistency – a good theory is internally consistent and is also consistent with other theories accepted by the scientific community.
- iii. Scope – a good theory describes/uncovers fundamental mechanics of the universe. It is able to make correct predictions that extend beyond the observations it was originally designed to explain.

- iv. Simplicity – a good theory explains the connection between seemingly isolated observations. Without the theory, these observations could not be sensibly grouped together.
- v. Fruitfulness – a good theory is ground for further research and new discoveries.

While this is not an all-inclusive list, it is sufficient to explore why theory selection should not be based purely on any single value. Today, predictive power (the ability to make useful and accurate predictions) is often taken to be the single most important attribute of a scientific theory. We can understand predictive power roughly as a function of theory scope and theory accuracy. Theories with large scopes are able to make a wider range of predictions. But these predictions are not useful if the theory does not correspond well with observed data (theory accuracy). Thus, even when theory choice is largely predicated on the predictive power of a theory, multiple values are implicitly involved. However, excessive emphasis on predictive power can be detrimental to theory development, and scientific progress as a whole. When new, highly fruitful theories are developed, they often have small hitches or lack the framework to generate better/more useful predictions than older, established theories. If scientists always valued accuracy and scope above all else, there would be little drive to work on new theories which potentially offer greater simplicity, fruitfulness, or even consistency.

A historical example demonstrating this dilemma is the evolution of astronomical theory in 15<sup>th</sup>-16<sup>th</sup> century Europe. Ptolemaic theory placed the Earth at the center of the universe. Ptolemaic theory was the working astronomical paradigm for over a millennium in Europe until its replacement by Copernican theory which posed that the Earth and other planets revolved around the sun. It was not until Kepler proposed several modifications to the mathematics of Copernican theory that it became more accurate than Ptolemaic theory. If Kepler had only valued accuracy or even valued accuracy above all else, there would have been little reason to

adopt Copernican theory. Moreover, Ptolemaic theory was already more consistent with other extant theories of physics which had been designed with the assumption of a geocentric universe. So why work within the Copernican paradigm at all? One driving force of Kepler's work was the simplicity of the Copernican model – it could explain the movement of celestial bodies as a single orbit around the sun, while Ptolemaic theory had to postulate two different orbits to explain the same phenomena.<sup>4</sup>

A good attitude in making theory choice thus considers all values, and recognizes that theories that have an advantage in a particular value, while perhaps lacking in other values, may still be worth investigating and developing. Theory choice becomes a matter of serious debate. Because these five values are imprecise, individual scientists might disagree about how well a theory meets a particular value. Even if there is consensus about the extent to which rival theories satisfies each value, there might not be consensus on theory choice should competing theories satisfy different criteria to different degrees, because the interests of different scientists might cause them to place greater weight on different values.<sup>5</sup>

The deliberative quality this Kuhnian framework provides to theory choice is posed by some as a serious if not altogether damning weakness. Some philosophers desire an algorithm to unambiguously decide between rival theories given a select list of criteria and appropriate weightings for each.<sup>6</sup> While such an algorithm might be ideal, it is hard to imagine how to apply it practically. In general, the relative weighting of different scientific criteria is determined by the interests of the particular scientist. A safety engineer investigating the force an air bag must deliver to prevent a passenger from being ejected when two cars collide can use relativity theory to determine more accurate velocity values than Newtonian theory. This in turn gives more accurate calculations of force. However, for the speeds and masses involved in the crash,

Newtonian theory involves far simpler calculations and ultimately results in answers so similar that there would be no functional change in airbag design. Should time-cost of calculations be included in the “ideal algorithm?” What about the degree of accuracy necessary to affect a change in design?

While it might be possible to assign a hypothetical superior theory, the choice can only be made after addressing relevant, non-scientific values as well as determining an appropriate weighting for factors involved, such as accuracy, time cost, etc. In practice, this means that the goals and interests of a scientist/scientific community, as well as practical considerations, can substantially influence theory choice. The primary criticism of Kuhnian theory is that it allows for non-rational considerations in theory choice. Do such factors play a role in science? One well-known story to help examine this issue was the theorization of the Polymerase Chain Reaction (PCR) by Kary Mullis, which won him the Nobel Prize in Chemistry. The PCR has revolutionized DNA/RNA research with applications in evolutionary biology, protein/drug synthesis, forensic sciences, and medical diagnostics.<sup>7</sup> Mullis credits the psychedelic drug LSD as the creative inspiration for conceiving of PCR,<sup>8</sup> Some philosophers of science accept that creativity and even irrationality may play an important role in the development of scientific theories, but argue that irrationality in theory development can be cleanly separated from irrationality in theory choice.<sup>9</sup>

In practice, this is not the case. Kepler was an early convert to heliocentric theory not just because of its simplicity but because of his interest in Neoplatonism; Darwinian evolutionary theory found an especially strong bastion in Britain because it gelled with British social ideas at the time about the struggle for existence.<sup>10</sup> Kuhn argues that this is also beneficial (theoretically) to the scientific process at the level of theory choice. We can understand the “objective”



scientific values such as accuracy and consistency as values shared by the community, and a small source of debate within the scientific community because different scientists may place different weights on different objective values. But the major sources of disagreement between rational individuals are subjective factors (as opposed to judgmental ones)<sup>11</sup>; the goals, interests, and beliefs of individual scientists allow room for greater disagreement which produces new theories and prevent scientific stasis.<sup>12</sup> Kuhn seems correct to assert that individual theory choices driven by subjective factors ultimately benefit the scientific community as a whole by generating theory diversity. But this is undesirable at the communal level where collective analysis and critique should ultimately strip theories of personal biases. Fortunately, because personal values influence individual scientists rather than the entire community, scientists with different perspectives can challenge the influence of personal concerns. Therefore, over time, objective values should pick winning scientific theories.

But there are two conditions under which this will not occur. The first is when there are criteria shared by all the scientists participating in the scientific community that are not “objective criteria.” In a relatively homogenous community, particularly one dominated by a particular race, class, gender, or sexual orientation, there can be many biases shared by the entire community which collectively influence all decision-making. Second, a scientific community could be diverse in membership but homogenous at positions of authority and influence. When the voices that are taken most seriously and given most weight are coming from one perspective, the community is little if at all better than under the first condition. In either condition, the community chooses theories on subjective criteria rather than the five shared/objective criteria above.

### **3) Examples of Shared Subjective Values – Male Dominance and Scientific Theory**

Descartes, Enlightenment thinkers, and their intellectual successors have posed the knower as a rational entity that observes objects from a neutral vantage point and passively receives information.<sup>13</sup> Through this disembodied perspective, the “knower” comes to learn the properties of particular objects and understand their relationship with other objects. To demonstrate, we can imagine a primatologist studying the mating habits of chimpanzees. This biologist notes that one male, the apparent alpha male, mates with the vast majority of the females while the other males have much fewer mates and produce less offspring. Under “the view from nowhere,”<sup>14</sup> this primatologist is a neutral surveyor of ape activity, and his or her observations can be used to form a concrete body of knowledge about how chimpanzees mate and how they structure their societies. In this “traditional” view, objectivity is a measure of how accurately the scientist’s observations and conclusions match reality.<sup>15</sup> This perspective of knowers, knowledge, and truth is not universally held by scientists but seems to dominate contemporary Western views of scientific practice. But this conception of the knower-knowledge relationship does not fit the actual history of scientific practice.

In the following examples of theories from male-dominated scientific communities, I will be providing examples to support a different view of knowers and knowledge within the context of science. Scientific knowledge claims depend on observations and analysis which are active processes. Both are influenced by past experiences, accepted theories, and cultural attitudes/values.<sup>16</sup> In societies where these are greatly shaped by social locations such as gender and race, social location invariably affects knowledge production. Because knowledge is inseparable from a perspective, the crucial question is what kind of perspective we ought to prefer. I argue that science has been successful as an intellectual endeavor because it largely

functions through shared decision-making criteria that allow interactions between multiple perspectives. Major scientific theories are usually very reliable because they are rooted in not just a communal perspective but communal *perspectives*, surviving criticism from generations of scientific communities. Diversity within the scientific community intensifies this criticism and exposes more flaws, producing theories which are more determined based on the shared, objective communal criteria discussed above.

The history of science yields many examples where lack of diversity negatively influenced scientific theory. For example, primatology was largely dominated by men prior to the 1970s. When these scientists observed a single male primate in a group mating with multiple females, they all came to the conclusion that dominant males had “harems of females”<sup>17</sup>; a description implying that the power and agency in chimpanzee sexual decision-making was almost entirely in the hands of alpha male chimpanzees. In the 1970s, many female primatologists entered the field. Using the same field methodologies, they observed the same phenomena as male scientists but inferred different conclusions. They suggested that females were coalescing around a single mate because of unfavorable environmental conditions; the females were using the male chimpanzee as a resource to ensure the survival of their offspring.<sup>18</sup> Testing this hypothesis, they found that females did in fact diverge towards other mating partners when environmental conditions were more generally favorable.

This example is not sufficient to show that all scientific knowledge is situated in a particular body and perspective. But it serves an explanatory purpose; it reveals precisely how knowledge *can* be situated in a particular body. Men who had grown up in a society where “proper women” did not speak “unless spoken to” took for granted that male apes were the driving force in the apparent asymmetry of male-female relationships and found little reason to

pursue alternative hypotheses. Female scientists were able to observe the exact same phenomena and envision that female apes could be playing a decisive role in mating. This example shows that the gender makeup of a scientific community can affect the theory choices that were available within the scientific community. But it also touches on the importance of discourse. The “harem” hypothesis is not dry scientific jargon; it asks us to envision exotic, luxurious palaces filled with beautiful women who serve the whims of a despotic Oriental sultan. The hypothesis appeals to deeply impressed cultural images, relating the biologically primitive alpha male ape to the culturally primitive sultan. The analogy is so apt because both images are so fundamentally flawed. Just as female primates played a crucial role in mate selection, women in harems were politically involved and the most successful were often king-makers.<sup>19</sup> It is reasonable to pose that the appeal to the concept of the harem, a fantasy land in the eyes of Western white men, functioned to ease the incorporation of the primatology hypothesis into the larger intellectual fabric of the time, helping it evade appropriate scientific critique and analysis.

However, one objection might be that this example demonstrates the pitfalls of inferring social relationships in higher order animals. Primatology can be categorized into the “soft sciences” such as psychology, fields that are especially susceptible to epistemological mistakes because their subject matter has some inherent “unpredictability.” This clean demarcation between “soft sciences” and “hard sciences” (where entities act according to rational, predictable laws) is questionable. But regardless of whether such a division is legitimate or not, comparable examples can be gleaned from the history of the hard sciences.

In such fields, subjective values tend to assume more subtle forms. But we can clearly see ingrained modes of thinking rooted in male scientists’ gendered experiences affecting the language used in scientific discourse. This has tangibly resulted in the marginalization of

particular observations which changes the body of evidence used for choosing scientific theories. The Biology and Gender Study Group (BGS) suggests two elements of the Aristotelian “social ideal” pervade many texts describing reproduction and cell function: a contrast of “male activity” against “female passivity” and the notion of “the female as incomplete male.”<sup>20</sup> The following is a quote from a 1970s biology textbook:

“Conditions in the vagina are very inhospitable to sperm, and vast numbers are killed before they have a chance to pass into the cervix. Millions of others die or become infertile in the uterus or oviducts, and millions more go up the wrong oviduct or never find their way into an oviduct at all. . . . Only one of the millions of sperm cells released into the vagina actually penetrates the egg cell and fertilizes it. As soon as that one cell has fertilized the egg, the cell membrane becomes impenetrable to other sperm cells, which soon die.”<sup>21</sup>

This account represents the female reproductive tract as a biological war zone; the sperm’s unenviable task is to survive impending genocide. The BGS suggest this “spermatic hero” is easily comparable to Greek mythic hero: it survives a difficult journey, bests the rival sperm, and “marries” the princess.<sup>22</sup> Such language emphasizes the activity of the sperm which supposedly “penetrates” the egg and initiates new life.

However, this portrayal of sperm-egg interactions is inappropriate. In contrast to the portrayal of sperm as solely responsible for egg penetration, studies using scanning electron microscopy have visualized egg cells producing microvilli projections to bind sperm cells and direct them to the egg cell for fertilization. This results in a much more cooperative understanding of fertilization where both the male and female parts have an active and essential role. What is stunning is that biologists first observed these microvilli projections in 1895 but ignored them as a trivial.<sup>23</sup> This demonstrates again a poignant danger of homogeneous scientific communities – they are communities that can readily trivialize observations that fail to fit within with the prevailing view of a process or phenomena.<sup>24</sup> When such observations are

excluded from discussions as scientifically irrelevant, the scope of theories necessarily suffers resulting in less objective scientific theories.

These discussions of fertilization describe the process with metaphors to courtship and marriage. Such discourse is extended to the descendants of the fertilized cell, the trillions of cells that together constitute animals such as humans. The more-or-less contemporary “central dogma” of molecular biology suggests cells function through hierarchy: DNA encodes RNA, RNA is translated into the proteins, and proteins do the cell’s fundamental work. According to this dogma, the nucleus houses DNA and serves as the cell’s “seat of power.” This theorizing is rooted in the marital metaphors which were rife in early cell biology. For example, T. H. Morgan, an American geneticist and Nobel-prize winner, suggested that the nucleus and cytoplasm “conferred” like partners before the “nucleus told the cytoplasm what to do.” Morgan’s account mirrors his American ideal of marriage which he suggested was true of his own marriage.<sup>25</sup> These accounts trace back to gendered assumptions about fertilization – the sperm provides the cell’s nucleus and some of its DNA while the egg provides the cytoplasm. Thus, some scientists extended this line of thinking, and their own beliefs about the proper power structure of a male-female marriage into their account of cell function. This is ironic, because the egg also provides nuclear material and DNA to the cell. The theoretical emphasis on established dominance and hierarchy paints a one-sided picture of nuclear-cytoplasmic interactions. But in fact, the two cellular domains are co-regulators. While the nucleus sends signals and controls protein production in the cytoplasm, the cytoplasm also sends signals which can enable or repress the transcription of certain genes.<sup>26</sup>

The phrase “central dogma” in the context of a scientific hypothesis is ironic because it contradicts the supposedly critical nature of the scientific method. The phrase is attributed to

Francis Crick, one of three men given the Nobel Prize in Physiology or Medicine for work on the structure of DNA (a controversial bestowal because of the exclusion of Rosalind Franklin whose work was pivotal to the development of the prize-winning model). Crick chose the term because “this new assumption was more central and more powerful” than his “sequence hypothesis.”<sup>27</sup> The phrase served rhetorical purpose, stressing DNA as the key authority in cell activity. Because data collected at the time supported his claim, the dogma became lodged in biochemical theory and remains there today.<sup>28</sup> This is despite a significant and growing body of evidence suggesting that proteins regulate DNA shape, chemical modifications, and transcriptional activity. As such, the discourse used in its introduction to the scientific community has likely helped maintain the influence of Crick’s hypothesis which relies on the masculinization of the nucleus and feminization of the cytoplasm.

Further examples of gendered theory are available at even more fundamental “levels” of “hard science,” such as organic chemistry. Reactions are typically described as having an “active partner,” a nucleophile with attacking electrons, and a “passive partner,” an electrophile hoping to attract electrons. One mechanism for such two-molecule reactions,  $S_N2$ , is usually described through the metaphor of “backside attack.”<sup>29</sup> In this case, the nucleophile penetrates the vulnerable electron cloud of the passive electrophile from its backside, forcing a molecule attached to the front of the electrophile to detach. This sort of language applies phallic concepts to molecules which are very remote from anything resembling human sexuality. A more accurate scientific account of this reaction could use Coulomb’s law, which asserts that there is an attractive force between oppositely charged particles. In a  $S_N2$  reaction, the nucleophile has a partial negative charge which is attracted towards a partial positive charge on the electrophile. Rather than one molecule forcing the reaction, an attractive force arising from physical

properties inherent in both molecules brings them together. Unlike previous examples of patriarchal preconceptions, this approach to the  $S_N2$  reaction has not necessarily had an adverse impact on scientific development. But the language used is deeply troubling because it is still extremely common today unlike the “sperm tales” account of fertilization. This metaphor is frequently employed pedagogically in organic chemistry courses to introduce college students (and future scientists) to the  $S_N2$  reaction. The use of such metaphors in teaching is only possible if the gendered templates they depend on are intuitive to students and it further reinforces the notion of male aggression-female passivity by suggesting parallels to molecule-molecule interactions. The end result is that young scientists today are still being trained to actively theorize in gendered terms and gendered models.

But do these examples really demonstrate that knowledge is necessarily embodied? An apologist for science can object that these examples are all just examples of bad science. Under this view, the old primatology community made unwarranted assumptions about male-female chimpanzee relationships; they allowed their personal biases to influence their theorizing about primate social structure without considering alternative possibilities. At the end of the day, the scientific method worked because new observations demonstrated the untenability of the old characterization of primate social structure, and a more comprehensive and accurate theory was formed. This response can be generalized to many examples of bias in scientific theories that have been raised by feminist epistemologists – feminist epistemologists are only pointing out examples of bad science while simultaneously demonstrating that the scientific method is self-correcting and eventually bad theories die out and as better alternatives are constructed.

While it is true that scientists eventually gave up these inadequate theories, this objection fails to consider the underlying mechanism for scientific advancement. Homogenous scientific



communities can, have, and do reach consensus on theories that are objectively inferior to other theories due to personal values and assumptions that are shared by all or most members. In primatology, cell biology, and molecular biology, important new observations and corrections to prevailing scientific theories were only made after a significant influx of female scientists into the field. These female scientists changed the pool of ideas, values, and experiences within the community. As a result, they could expose assumptions that were taken as truths and made possible shifts towards better theories. These are clear examples of diversity within the scientific community advancing scientific theory, and it lends credence to feminist demands for a more inclusive scientific community (along lines of gender, race, class, etc.).

#### **4) But What Kind of Diversity?**

Feminist epistemologists' views have tended to converge over the last few decades, but important disputes remain. In general, feminist epistemologists agree that knowledge is "socially situated"; individuals occupy a "social location" based on power relations and structural hierarchies that influence and limit what that individual experiences and understands.<sup>30</sup> Gender is one such social location. Most schools of thought are "contextualist," asserting that scientific research occurs under a multitude of potential aims which causes the criteria for theory choice and methodology to change (depending on research context).<sup>31</sup> An easy way to understand this claim is to review the case of the engineer who must choose between working with relativity or Newtonian theory. Likewise, most hold that normative considerations should and do take a part in theory choice. Feminist epistemologists argue that social and political values shape the assumptions and aims of research projects. With all else being equal, we ought to choose theories and research projects that promote "human flourishing."<sup>32</sup> As a result, many reject the idea that science is "value-neutral" and only deals with "facts."<sup>33</sup> Finally, there is broad

agreement that maximizing or achieving objectivity happens at the level of the scientific community, rather than at the individual level.<sup>34</sup>

The major source for divergence is how communal diversity should be achieved. Feminist empiricists emphasize that values biasing scientific theories are easier to identify and challenge when the scientific community is composed of individuals with diverse values and interests.<sup>35</sup> Empiricists maintain that this diverse scientific community is more likely to produce rational theories, whereas a more homogenous community is much more susceptible to accepting theories which are actually products of widely shared values and biases.<sup>36</sup> For empiricists, the content of one's values is unimportant. By creating a community with a broad set of values and interests, individual partiality is neutralized by the community's expanded perspective.<sup>37</sup> But this approach towards diversity is problematic. If white supremacists such as Ku Klux Klan members are underrepresented in the scientific community, do they have the right to demand greater inclusion and tolerance for their ideals? A strong commitment to the position that the content of one's values is irrelevant seems to entail that we must honor their demands. At the surface, this may not be troubling because KKK members are a small minority and would be unlikely to seriously bias the scientific community. But the values of white supremacists are not a desirable form of diversity. To understand why certain marginalized groups such as women and ethnic minorities deserve a voice at the table but others such as white supremacists do not, I will present a theoretical framework for discussing sex and gender in section 5. Based upon this understanding, I will show why the marginalized position of women in our society yields a superior epistemic position to that of white supremacists using feminist standpoint theory.

## 5) Sex and Gender

Gender can be thought of as the “social meaning of sex.”<sup>38</sup> I refer to sex as a biological classification of persons as either male or female depending on their reproductive anatomy, secondary sexual characteristics such as facial hair, and genetics (XX or XY).<sup>1</sup> One way to examine the social meaning of gender is through Sandra Bem’s “lenses of gender.” She argues that our society perceives the world through three “gender lenses”: biological essentialism, androcentrism, and gender polarization. These lenses are deep assumptions which maintain male power and female subordination, but are unnoticed and widespread in our practices and institutions.<sup>39</sup> They are mutually reinforcing, reproducing the societal beliefs that the biological differences between males and females make males superior.<sup>40</sup> Bem argues that discussing the nature and particular effects of the lenses allows us to see the lenses rather than seeing the world through them.<sup>41</sup>

“Biological essentialism” serves as the linchpin of the other two lenses, presenting our society’s gender practices as an inevitable product of human biology.<sup>42</sup> This lens demonstrates the considerable cross-talk between scientific theory and gender norms/conventions. One theory formerly used to argue against the education of women was the “First Law of Thermodynamics,” a physics principle suggesting that the total amount of energy in a system remains constant because energy can neither be created nor destroyed. In the 1870s, Edward Clarke, a Professor at Harvard Medical School, used the idea to argue that the human body had a fixed amount of energy; thus growth in women’s brains came at the expense of atrophy of their wombs.

Observing that college-educated women tended to give birth to fewer children, Clarke argued

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<sup>1</sup> Sex is not as clear-cut a classificatory system as commonly thought. For example, individuals with the condition androgen insensitivity have an X and Y chromosome (considered biologically male), but lack androgen receptors for the hormone testosterone. As a result, they typically have the physical characteristics of females. Cases with moderate insensitivity can result in ambiguous reproductive anatomy.

that education was harmful to women's reproductive health.<sup>43</sup> The flaws in such reasoning are quite apparent. If the First Law of Thermodynamics were to apply to female bodies in this way, it should also be applicable to male bodies, and suggests that education is detrimental to any organism's reproductive health. There are numerous other flaws with the argument, but even today scientific theories are advanced to defend gender norms.

Biologists determined in the late 1940s that human embryos, whether they possessed XX or XY chromosomes, could generate both male and female reproductive organs. In the late 1950s, scientists noted that prenatal exposure to particular hormones could affect male/female differentiation. Bio-psychologists seized this observation and argued that prenatal hormones not only determine male and female bodies but irreversibly organize brains with a male or female pattern.<sup>44</sup> While this hormone-dependent brain patterning has a major effect in animals such as fruit flies, other factors are more important in species more closely related to humans. Even in rats which are not highly social mammals, brain development and behavior tendencies are more strongly influenced by social interactions with adults.<sup>45</sup> The alternative explanation is that many human societies divided labor based on sex and institutionalized male political power. Socially constructed differences are then perpetuated by the lenses of gender.<sup>46</sup> And even should there be significant physical differences based on sex, there is no compelling reason why societies should be constructed around them as they have been.<sup>47</sup>

Androcentrism is both an ideological and political lens. In androcentric societies, men are general stand-ins for humans, the movers and doers, while women are their assistants.<sup>48</sup> As such, a woman might occupy a high or important position in society, but it is usually in relation to a man, she is "Sydney's sister" or "Pembroke's mother" but not Sydney or Pembroke.<sup>49</sup> Simone de Beauvoir notes that in such societies, men represent both the positive and the neutral,

as indicated by the use of “man” to designate human beings in general. In contrast, women are solely negative, imprisoned and restricted by their ovaries and uterus. While men are subjects with agency, women are objects, the Other.<sup>50</sup> Androcentric thought ignores that men also have reproductive organs and hormones and sees male anatomy as natural or even liberating rather than restrictive. This lens is deeply rooted in Western society. In the Bible, God creates “man”/Adam in his image and Eve as only a helper for Adam. Greek philosophy, which underpins some of the rationalist ideals of science, possesses comparable undercurrents. Aristotle claimed that the world was fundamentally hierarchized. He argued that females were “mutilated” males lacking the cognitive faculties of men, justifying their position as subservient caretakers.<sup>51</sup> In science, we can see androcentrism at work in medical anatomy textbooks which depict almost exclusively male anatomy.<sup>52</sup> In such textbooks, the most stark male-female differences, reproductive anatomy, are either completely ignored or oversimplified such as by removing the clitoris from the diagram or treating the entire female reproductive anatomy as a primer for heterosexual sex.<sup>53</sup> Androcentrism serves to justify male privilege/power and female subordination.<sup>54</sup>

Androcentrism and biological essentialism together reinforce gender polarization. In a gender polarized society, there are “exclusive scripts” for males and females.<sup>55</sup> This evident in how occupations are still largely distributed along gendered lines, with females being required to do the vast majority of unpaid housework.<sup>56</sup> This analysis can be extended into cultural phenomena such as posture: males typically adopt wide, space-consuming postures while “proper female posture” requires minimizing use of space and timid behavior.

This account is useful in understanding how gender affects the lives of individuals in a gendered society as well as how the assumptions underpinning gendered societies can be

unwittingly extended into flawed scientific theories. But it fails to emphasize one crucial aspect of gender. Gender cannot be taken off or taken on at will like a pair of glasses. Gender is performative; the status of being a “man” or “woman” is achieved psychologically, culturally, and socially. And while it is individuals that “do” gender, it is a “situated doing,” an emergent property of social situations. This means that gender is both an outcome and a justification for the social arrangements of a society.<sup>57</sup> How gender functions in this regard can be elucidated through the story of Agnes.

Agnes, a transsexual raised as a boy, adopted a female identity at 17 and later received sex reassignment surgery. Despite being assigned male sex at birth and having a penis (until the operation), Agnes was able to pass as female based on the clothing she wore, the shape of her body, her hair, etc.<sup>58</sup> Candace West and Don Zimmerman argue that this is because everyday sexual categorization relies on an “if-can” test: if people can be seen as members of a relevant category, then categorize them that way except in the presence of discrepancies.<sup>59</sup> Agnes not only had to maintain her status as female (which was primarily threatened by discovery of her genitalia or later knowledge of the operation) but her femininity. Agnes learned to perform gender through her fiancé’s criticism of other women. He insisted that she should not offer her opinions or claim equality with men. In learning to do gender, Agnes was learning feminine behavioral patterns as well as the location of power.<sup>60</sup> The fact that Agnes learned how to perform femininity from critiques of other women reveals that men and women are accountable for their gender performances, a person’s activities and interactions are constantly judged in daily life to be in accordance or disagreement with one’s gender.<sup>61</sup> Social accountability drives gender’s omnirelevance; for example, a female doctor is never just a doctor and must navigate two different roles which sometimes make opposite demands. The female physician will be

judged for her skill in medicine but is also under pressure to maintain her femininity such as through being a good wife and active mother.<sup>62</sup>

These enacted gendered differences are then reinforced by the “essentialness” of gender. Gender pervades all aspects of daily life: it determines which restroom we enter, whether we can attend particular events or join certain organizations, how much we are expected to speak in conversations, etc.<sup>63</sup> As such, gender performances naturalize the artificial social divisions they are based upon. So is it this “unnaturalness,” that makes gender concerning? Most superficially, we need to be concerned about gender because gender polarization has long kept women out of scientific communities, resulting in serious flaws in scientific theories. Even when women have been allowed into the workforce, it is expected to be in their nature to raise children and do housework, maintaining significant elements of gender polarization.<sup>64</sup> But more fundamentally, androcentric societies are unjust. One obvious injustice is that privileges are arbitrarily awarded to males and denied of females. Additionally, gendered societies categorize males and females that challenge the exclusive scripts laid out for their sex as biologically or psychologically abnormal.<sup>65</sup> For example, one demand of gender in our society is “obligatory heterosexuality,” we are expected to monitor our sexual feelings, to make sure that the person is properly sexed and gendered before we allow ourselves to fall in love.<sup>66</sup> Those that enact masculinity/femininity successfully but are homosexual are generally considered to deviate from the natural (and societal) order.<sup>67</sup> Why does this occur? Gender as a social institution depends on its constant enactment by individuals within the society. For gender to survive, the character and motives of individuals that fail to perform it properly must be called into question rather than the justness of the social institution itself.<sup>68</sup>

## **6) Evaluating Social Locations with Feminist Standpoint Epistemology**

The discussion of gender in section 5 was prompted by the potential worry raised in section 4 that advocating for diversity within scientific communities could allow underrepresented groups such as white supremacists to argue that they deserve special considerations/access to the scientific community. In this section, I will join the previous discussion of gender with feminist standpoint theory to explain why the scientific community has a special interest in including women and members of certain other marginalized social locations, but not white supremacists.

The initial worry was that feminist empiricists would have to concede that white supremacy would be a relevant form of diversity within the scientific community. This is because feminist empiricists are primarily concerned with identifying and removing biases from the scientific community, which is achieved by increasing the overall diversity of values and interests within a scientific community. As such, feminist empiricists are primarily concerned with androcentrism because it produces biased/bad science. While feminist standpoint theorists share this concern, they also strongly object to androcentrism because it is a hierarchy that penalizes women for no justifiable reason. Moreover, feminist standpoint theorists are concerned with inclusion of marginalized social locations, rather than overall diversity. This puts feminist standpoint theorists in a position to reject the demands of the white supremacist on normative and epistemological grounds.

The normative argument is that the actual content of the values present in a scientific community matters; the community should make an effort to include individuals who have an interest in undermining unjust, extant social structures.<sup>69</sup> White supremacists are problematic because even though their beliefs are marginalized by society, they desire to construct a



community that privileges whiteness. From the perspective of a standpoint theorist, race is a social construction and giving benefits to certain individuals while oppressing others makes the society desired by white supremacists unjust. In order to prevent the actualization of the fundamental goal of white supremacists, exclusion is justified. In contrast, women as a collective do not aim for dominance. Women share experiences due to the social institution of gender, but they do not consciously share goals, particularly the goal of dominating men. It could perhaps be argued that women have a subconscious interest in subverting androcentric gender institutions, but this is not problematic to standpoint theory because the destabilization of unjust systems is a desirable goal.

The epistemic argument is that certain social locations, such as that of women, can possess “epistemic advantage” while others such as that of the white supremacist cannot. Standpoint theorists argue that this epistemic advantage emerges from marginalized social locations where individuals regularly experience the effects/operations of particular hierarchies.<sup>70</sup> As discussed in section 5, gender is attained as a sort of performance. Individuals are constantly held accountable by others for our gender performance, and societal penalties are imposed for failing to act the part. Gender as a social institution thus operates on almost all human experiences making it both omnipresent and omnirelevant.

Several other social locations are similarly omnipresent, though to varying degrees and with effects on experience and demands that differ widely from those of gender. Race is one of the most obvious omnipresent social institutions. While some individuals confound racial categorization (as some confound gender categorization), most people readily meet a racial “if can” test based on skin color and physical features. Members of particular races are also stereotyped into excelling or failing at particular activities, having certain temperaments and

dispositions, or even occupying certain economic roles. The performative aspects of race are not as pervasive as with gender, but questions such as “is Obama black enough?” are only meaningful if race is achieved in ways that parallel gender. Interestingly, whiteness has many features similar to androcentrism. Whiteness establishes the dominant racial group, it functions as a neutral location, and its members are not so readily stereotyped for possessing particular traits or affinities (until the category is broken down into constitutive ethnic groups such as Jews, Italians, Germans, etc.).

A third social location which might be omnipresent is socioeconomic class.

Socioeconomic locations are more fluid than gender and race because primary determinants such as wealth and education can be attained (but not easily for those starting from the bottom of the hierarchy). Nonetheless, socioeconomic locations are partly delineated by how well individuals “act the part.” The concepts of “old money” and “new money” are rooted in the idea that how a person speaks, dresses, and relates to possessions, among other factors, can be used to determine whether a person was raised in their current socioeconomic location.

At this point, a white supremacist could object that they are also marginalized and oppressed by society and deserve the same sorts of considerations given to women. This supremacist could argue that their location is achieved by doings such as political activism, listening to particular artists, having a certain hairstyle and dress, etc. However, white supremacy is neither omnipresent nor omnirelevant. In contrast to the location of women, white supremacists are not judged by most other members of society for failing to adopt ritualized postures, use segregated bathrooms, or display submissiveness to non-(white supremacists). Although local social structures such as family might strongly influence a person’s choice to become a supremacist, this choice is fluid in ways that gender, race, and socioeconomics are not.

Epistemologically relevant social locations are ultimately defined by social institutions that induce perpetual evaluation, causing individuals to constantly experience the effects/power of the institution.

Some critics have too hastily dismissed standpoint epistemology by mischaracterizing epistemic advantage. The claim is not that people from oppressed social locations are automatically privileged with superior epistemic ground in all cases. If a wealthy factory owner and good businessperson moved her/his factory from West Virginia to Thailand, an economist would best be able to explain the decision, probably in part by appealing to the reduced expenses from cheaper labor and the relatively small cost of shipping from Asia to the US. An economically marginalized worker at the Thailand factory will have been denied access to the formal education needed to theorize about why the factory opened up in his/her city.<sup>71</sup> In explaining the economic and profit motives involved, the factory worker is probably at an epistemic disadvantage. However, if instead we want to know precisely how the factory in Thailand extracts maximum profit from its laborers, the same factory worker is the best possible theorist.

Moreover, to actually possess epistemic advantage, an individual must gain a “critical consciousness” of how an oppressive social institution actually functions. One group of individuals capable of achieving such consciousness is that of “insider-outsiders.” An insider-outsider comes from a disadvantaged social location, but engages the world of the privileged. Alison Wylie discusses the fictional example of Blanche (from *Blanche on the Lam*), a black female housecleaner who fills in at a rich white family’s home after a mysterious murder. Due to the Southern tradition of viewing servants as intellectually inferior, members of the house discuss matters of deep significance in front of Blanche. To keep her job and to survive, Blanche

must judge and evaluate the persons in the house, understand the power dynamics within the household, and draw on the knowledge of others within the black community, such as housecleaners from other households. Her unique social position allows her to act as the story's detective and uncover who was responsible for the murder.<sup>72</sup>

“Epistemic advantage” is thus not an automatic or necessary impartiality possessed by those that are disadvantaged, but a highly contingent advantage accessible to those who can see the world from multiple perspectives. The insider-outsider's experience of societal power relations (such as being impoverished or being a female) allows them to dissociate from the world view of the empowered and keeps them from having a vested interest in maintaining the assumptions of that world view.<sup>73</sup> For this contingent benefit, standpoint epistemologists claim that a person must develop a critical consciousness of how knowledge is produced and how it shaped by social location.<sup>74</sup> This consciousness is produced at the community-level through the discussions and interactions between members of disadvantaged groups;<sup>75</sup> standpoint epistemology becomes a form of activism that aims to understand and disrupt systems of power.<sup>76</sup> Thus, in a society where oppressed social locations exist, feminist standpoint theorists would generally assert that having a diverse community of scientists (particularly those from disadvantaged positions) is not sufficient to maximize objectivity. The key is not just diversity of social locations, but also the fostering of a critical consciousness among the scientists who occupy those locations.

## **7) Power and Knowledge, Coherence Theory**

In section 6, I discussed how standpoint theorists can offer both normative and epistemological arguments against the values of white supremacy as a valid form of diversity.

Standpoint theory argues that a scientific community benefits from being open to members of marginalized social locations who can best see its biases and the operation of power structures. These social locations are capable of yielding epistemic advantage, but it must be actualized through raising critical consciousness. In this section, I will consider one final objection from hypothetical white supremacists.

The white supremacists argue that while their social location might not yield the sorts of experiences and encounters with societal power structures that gender does, they are still capable of realizing a more limited epistemic advantage through critical consciousness. Additionally, they argue that if standpoint theory truly desires to break down power structures, it must accept moral relativism because morality is just another social institution that exerts power to control the behavior of individuals. As such, standpoint theorists have no grounds to reject their moral claims. Therefore, white supremacists occupy a social location that warrants consideration for inclusion in the scientific community.

It would be weird to actually hear this from a white supremacist. But this objection facilitates discussion of a very important point: standpoint theory does not “devolve” into moral relativism because its normative claims can be fundamentally linked to its epistemic claims. To understand precisely how this relationship works, we must turn to a coherence theory account of knowledge. This poses a practical problem for feminist standpoint epistemology because the primary alternative, foundationalism, tends to be the intuitive view of many scientists.

Foundationalism attempts to provide a reliable core belief upon which all truth claims can be justified.<sup>77</sup> In science today, researchers implicitly take observations and inductive reasoning to be firm foundations for establishing scientific truths. Moreover, a sort of transcendentalist foundationalism underlies the cultural image of science I began this paper with: the white man in

a white coat in a white lab. In the transcendentalist account, whether a knowledge claim is true depends on whether it accurately corresponds to a genuine reality beyond experience.<sup>78</sup> These intuitive foundationalists thus believe that scientific reasoning can bridge the gap between sensory experience and the fundamental, underlying nature of reality.

Coherence theory instead posits knowledge and truth to be “immanent,” phenomena that are a part of our lived/experienced world.<sup>79</sup> Willard V.O. Quine advocated a form of coherence theory when he argued for verification holism, where the entire body of scientific knowledge is the empirically relevant unit rather than individual theories.<sup>80</sup> In “Two Dogmas of Empiricism,” Quine suggests that all knowledge/belief is a human-made fabric (a web of beliefs) connected to experience at the periphery. For Quine, the physical objects studied by scientists and the gods posited by the Greeks are all cultural objects. However, he argues that these physical objects are epistemologically superior, more “primal,” because they are more useful for predicting fluxes in our experiences. When experience contradicts with our body of knowledge, it is pragmatic to adjust our scientific beliefs to better fit our actual experiences.<sup>81</sup> For Quine, even beliefs close to the center of this body of knowledge can be revised if necessary to fit experience, strongly contrasting Quine’s account from foundationalism.

In practice, scientists who observe events that contradict standing theory will modify auxiliary hypotheses rather than questioning major scientific theories. It allows thinkers/scientists to work within a paradigm defined by core beliefs while modifying theoretical details to better fit our experience of the world. The benefit of such an approach is the utility it provides. When college physics students attempting to measure the acceleration caused by Earth’s gravitational field calculate values that vary greatly from the accepted value of  $9.81 \text{ m/s}^2$ , their instructors tell them to look for the most “probable” sources of error. Instead of throwing

out Newton's gravitational equations, the students will consider the inaccuracy of measurements caused by using yardsticks and manual timers. This approach allows scientists to improve theories through incremental modifications when observations do not fit expectations. But core beliefs are not immune to revision. While they are insulated from challenges by the modification of auxiliary beliefs, the appearance of contradiction after contradiction makes scientists more willing to question theories that they have long assume to be true.

To fully understand how knowledge claims work, we must also examine the effects of power on our web of beliefs. I will do so by turning to Linda Martín Alcoff's reading of Michel Foucault as a coherentist. Alcoff establishes this reading by highlighting the similarities of Foucauldian "discursive formations" to webs of belief. Discursive formations are composed of discursive entities (words, propositions, theories) whose meanings are determined by internal relations with other entities within the discourse.<sup>82</sup> The interrelationships between entities determine the rules of the formation, what counts as a legitimate object of inquiry, the conditions for discursive change, and what statements are meaningful or not.<sup>83</sup>

For a statement or "knowledge claim" to be justified within a particular discursive formation, it must meet three conditions: it must be meaningful within the discourse, it must be about an object whose existence is recognized within the discourse, and the agent advancing the claim must have a "legitimate perspective."<sup>84</sup> The first two conditions are closely related. A statement is meaningful if it can be "statable" within a discourse. Alcoff uses the example of "homosexuality" in ancient Greece to explain this concept. From our own discursive formation, it appears that some Greeks were homosexuals so it seems that Greeks should be in a position to agree or disagree with the claim that "homosexuality is sexual malfunction." However, the discursive concept of homosexual identity did not exist for the Greeks, so the statement would be

“puzzling” or meaningless.<sup>85</sup> The condition of existence is clearly interrelated. Foucault stipulates that discourses are “practices that systematically form the objects of which they speak.”<sup>86</sup> While this claim may seem radical, it is similar in nature to Quine’s arguments about cultural posits.

The condition of legitimacy is where Foucault’s account diverges. He argues that discursive formations also determine the procedures and perspectives through which knowledge claims can be formed; what counts as evidence or a legitimate practice is internal to the discourse.<sup>87</sup> The significance of this third condition within the scientific community is highly visible. To have one’s hypotheses taken seriously, a scientist must have particular educational qualifications (such as a Ph. D). The authority of this degree is somewhat proportional to the prestige of the granting institution. Moreover, claims gain greater credibility if the scientist has a notable position in a major research institution and has many well-known publications. “Legitimate procedures” are also determined within particular research fields; for claims to be seriously considered they must be backed by the right type of experiment. In a field like biochemistry, what counts as a legitimate experiment is a product of current theories about how particular molecules are expected to interact.

For Foucault and Alcott, this is one place where power influences the web of beliefs because power structures determine authority, in addition to the creation of objects of discourse.<sup>88</sup> A common objection is that this theory reduces all knowledge to power, resulting in epistemological relativism.<sup>89</sup> Alcott does not share this worry and emphasizes that Foucault’s truth and power operate as a dyad, together defining new knowledges, practices of knowing, and objects of knowledges.<sup>90</sup> To understand this dyad, a useful example is Foucault’s discussion of the Panopticon, a jail with a central watch tower surrounded by floors of cells on all sides.<sup>91</sup> The



Panopticon relies on the threat of physical violence and punishment to separate and enclose individual prisoners.<sup>92</sup> This makes individual prisoners objects of knowledge for those in the guard tower.<sup>93</sup> The tower is designed so that prisoners cannot tell if they are being watched, so the most prudent course of action is to always obey the rules of the prison. Knowledge asymmetry between guards and prisoners yields the disciplinary power that facilitates the prison's attempts to mold the behavior and character of its inmates.<sup>94</sup> This structural exercise of power is analogous in important ways to social institutions such as gender. With gender, there is no looming Panopticon, but instead the perpetual threat of observation and judgment. The exercise of diffuse, societal disciplinary power creates and maintains gender.

If we accept this inseparability of knowledge and power, what becomes of epistemology? Alcoff and Foucault argue that there are two fundamentally different types of discursive formations: hegemonic and subjugated knowledges.<sup>95</sup> We should undermine hegemonic and engage local, subjugated discourses not because doing so dissolves the power-knowledge dyad, but because of the different relationships the discourses have with power.<sup>96</sup> To explain this difference, Alcoff uses two possible claims about homosexuality. The hegemonic claim is "homosexuality has determinate characteristics, effects, and physiological manifestations in all its instances" and the local claim is that "homosexual practices have a certain set of effects in one particular context."<sup>97</sup> The hegemonic claim is totalizing. It intends to perfectly specify and fix the concept of homosexuality,<sup>98</sup> while the local claim is open to discussion and to variance due to context. Totalitarian discourses are problematic because they enact political and epistemic violence against subjugated ones, producing stable ground for research at the expense of rich, complex, alternative theories and explanations. Thus, we should prefer local, subjugated

knowledges because they can provide sufficient grounds for theorizing and evaluating knowledge claims while maintaining flexibility that allows for richer theories.<sup>99</sup>

With this in mind, we ought to reject the call of white supremacists for inclusion. The discourse of white supremacists may currently be a minor, localized discourse, but it is not a true subjugated knowledge because it aims to replace the current hegemonic discourse.<sup>100</sup> In contrast, the subjugated knowledges promoted by critically conscious members of marginalized communities would be local knowledges that aim to subvert current power structures and totalitarian discourses, creating a more open scientific community. These individuals can do so because their experiences of omnipresent/omnirelevant social locations allow them to recognize and elucidate how power is involved in the production of current scientific knowledge claims. This facilitates the contest of that power on epistemic grounds, allowing for the more rapid creation of new discourses and new theories.

## **8) Conclusion**

In this paper, I first explored Kuhnian scientific theory choice, explaining how individual scientists might choose a theory based on personal values as well as considerations generally valued by the scientific community. When theory choice is determined at the communal level, personal values/idiosyncrasies no longer hold much sway. However, in homogenous scientific communities it is still possible for communally shared biases to distort theory selection. In section 3, I provided specific examples from the history of science to demonstrate how male dominance affected scientific theory formation. As I showed, this could occur through short-sighted interpretations of observations, through discourse that shaped what sorts of observations could be considered relevant, and by shaping how scientists are taught to theorize about the

phenomena they study. In the fourth section, I laid out a general argument for diversity in the scientific community and suggested that such an approach would be problematic. Certain kinds of diversity, such as proportional inclusion of white supremacists, are not only unimportant but harmful to science.

In order to explain why this is the case, I discussed the nature and effects of gender in our society in section 5 before explaining in section 6 how a social location such as gender has important differences from the social location of a white supremacist. In section 6, I advanced the claims of feminist standpoint epistemologists who would object to the values of white supremacists and deny that such a social location is epistemologically privileged. In contrast, the omnipresence and omnirelevance of gender constantly exposes women to the effects of power. Thus, if a woman or someone from another marginalized social location gains critical consciousness of how power structures influence their lives, they can realize an epistemic advantage that allows them to call into question dominant assumptions and power structures. Section 7 starts as a final defense against a white supremacist's demand for preferential access to the scientific community, but also synthesizes the claims of standpoint theory with a coherence theory of truth that takes into account the effects of power on knowledge. In examining the power-knowledge dyad, I echoed Alcoff's and Foucault's call to give preference to local, subjugated knowledges over totalizing, hegemonic knowledges. Although white supremacy is a minority discourse today, it is an aspiring hegemonic knowledge due to its desire for dominance. By rejecting hegemonic discourses, we can have theories that are more flexible and can better cohere with the rich complexities of experience.

In sum, I argue that the scientific community would benefit epistemologically from the inclusion of individuals from marginalized social positions that correspond to local/subjugated

knowledges. To actualize this suggestion is a tremendous challenge on three separate levels. First, it is in the personal interest of some of those who hold positions of authority within the scientific community to exclude the marginalized. From a purely economic perspective, there are a finite number of positions and only a finite amount of grant money, so greatly increasing access to the scientific community would be economically disadvantageous. Moreover, opening up their established theories/hypotheses to a greater torrent of criticism may seem personally unappealing. Second, even if we could imagine a world where scientific resistance to this proposal was minimal, it would be difficult for members of marginalized communities to achieve admittance into positions of authority within the scientific community precisely because of the structural disadvantages from which they might derive epistemic advantage. Third, because the privilege scientists have long had and the way in which power functions in hegemonic knowledge systems, the claims of new scientists with epistemic advantage might be taken with great suspicion. Scientists of the old guard would see these critiques as coming from a “biased” or particular perspective, unaware of the situatedness of their own knowledge claims. We could easily imagine that such criticism would be derogatively labeled “women’s science” and fall on deaf ears.

These practical worries are extremely important. But I will set them aside to crystallize the potential benefits to a scientific community modeled on feminist standpoint theory. A scientific community that has substantial participation from critically conscious members of marginalized social locations and which is responsive to their theories would be more just, open, robust, and realistic. Because systems of oppression create an unjustified hierarchy, increasing marginalized peoples’ access to the scientific community directly advances societal justice, albeit in a small way. It would indirectly destabilize systems such as gender and race by rendering

more visible the mechanisms by which they are formed and operate on individuals as well as the assumptions that are necessary for them to be maintained. Because science influences how we fundamentally think about ourselves and our bodies, it is quite possible that such theorizing would spill over into other disciplines.

This scientific community would be more open in two ways. First, the legitimacy/authority requirement within scientific discourse would be more flexible. No longer would claims from scientists who come from marginalized social locations face extra suspicion and criticism; asymmetries in agent authority based on arbitrary criteria such as gender and race would end. New ways of experimenting and evaluating knowledge claims would also likely develop. Second, the preference for local knowledges would allow scientists more freedom to generate new hypotheses and to articulate theories with more limited scopes that can excel at explaining the complexities of particular phenomena, and even to challenge or suggest new values upon which to judge theories.

This last effect in particular makes such a scientific community more robust. Theories would still be evaluated based on shared, communal criteria. However, the increased openness of scientific discourse could result in new criteria for theory evaluation or abandonment of old criteria. For example, one value that might fall into disuse is external consistency because it could be argued that consistency only serves to maintain the hegemony of existing scientific discourses. Whether or not this would occur is contingent on the actual discussion within the scientific community and this conversation turns largely on the particular insights and arguments from hypothetical, critically conscious scientists. Regardless, the inclination against grand, unitary theories will trade a solid, static ground for generating theories for the ability to more

rapidly generate new theories, particularly local theories that can explain complex and puzzling phenomena.

Finally, this would result in a scientific discourse that is more realistic because it fits how we actually think and theorize; it rightly holds truth as a “thing of this world.”<sup>101</sup> By recognizing that our beliefs and knowledge claims are inseparable from lived experience, scientists would no longer have to respond to the demand that theories describe the “fundamental laws of the universe.” This allows objects and topics that have been considered unworthy of scientific inquiry to enter the fold of scientific discourse while giving scientists freedom to theorize for better reasons such as the creation of accurate, useful models.

## Notes

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- <sup>6</sup> Kuhn, "Objectivity, Value Judgment, and Theory Choice," 326.
- <sup>7</sup> F.T. Ishmael and C. Stellato, "Principles and applications of polymerase chain reaction: basic science for the practicing physician," *Ann Allergy Asthma Immunol* 101.4 (2008): 60323-60327.
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- <sup>10</sup> Kuhn, "Objectivity, Value Judgment, and Theory Choice," 325.
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- <sup>12</sup> Kuhn, "Objectivity, Value Judgment, and Theory Choice," 332-3.
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- <sup>20</sup> The Biology and Gender Study Group (Beldecos et al.). "The Importance of Feminist Critique for Contemporary Cell Biology," *Hypatia* 3.1 (1988): 61.
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- <sup>23</sup> The Biology and Gender Study Group, "The Importance of Feminist Critique for Contemporary Cell Biology," 66.
- <sup>24</sup> The Biology and Gender Study Group, "The Importance of Feminist Critique for Contemporary Cell Biology," 70.
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- <sup>33</sup> Intemann, "25 Years of Feminist Empiricism and Standpoint Theory," 781.

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- <sup>34</sup> Intemann, “25 Years of Feminist Empiricism and Standpoint Theory,” 781-2.
- <sup>35</sup> Intemann, “25 Years of Feminist Empiricism and Standpoint Theory,” 790.
- <sup>36</sup> Intemann, “25 Years of Feminist Empiricism and Standpoint Theory,” 790.
- <sup>37</sup> Intemann, “25 Years of Feminist Empiricism and Standpoint Theory,” 792-3.
- <sup>38</sup> Sally Haslangar, “Gender and Race: (What) Are They? (What) Do We Want Them To Be?” *Noûs* 31.1 (2000): 37.
- <sup>39</sup> Bem, *The Lenses of Gender* (Yale University Press, 1993) 2-3.
- <sup>40</sup> Bem, *The Lenses of Gender*, 1.
- <sup>41</sup> Bem, *The Lenses of Gender*, 2.
- <sup>42</sup> Bem, *The Lenses of Gender*, 2.
- <sup>43</sup> Bem, *The Lenses of Gender*, 9-11.
- <sup>44</sup> Bem, *The Lenses of Gender*, 23.
- <sup>45</sup> Bem, *The Lenses of Gender*, 24.
- <sup>46</sup> Bem, *The Lenses of Gender*, 31-2.
- <sup>47</sup> Bem, *The Lenses of Gender*, 38.
- <sup>48</sup> Bem, *The Lenses of Gender*, 41.
- <sup>49</sup> Bem, *The Lenses of Gender*, 41.
- <sup>50</sup> Bem, *The Lenses of Gender*, 41-2.
- <sup>51</sup> Bem, *The Lenses of Gender*, 54.
- <sup>52</sup> Birke, *Feminism and the Biological Body*, 68.
- <sup>53</sup> Birke, *Feminism and the Biological Body*, 70-1.
- <sup>54</sup> Bem, *The Lenses of Gender*, 79.
- <sup>55</sup> Bem, *The Lenses of Gender*, 80-1.
- <sup>56</sup> Susan Okin, *Justice, Gender, and the Family* (Basic Books, 2008), 149.
- <sup>57</sup> Candace West and Don Zimmerman, “Doing Gender,” *Gender & Society* 1.2 (1987): 125-6.
- <sup>58</sup> West and Zimmerman, “Doing Gender,” 131-133.
- <sup>59</sup> West and Zimmerman, “Doing Gender,” 133.
- <sup>60</sup> West and Zimmerman, “Doing Gender,” 133-5.
- <sup>61</sup> West and Zimmerman, “Doing Gender,” 135-6.
- <sup>62</sup> West and Zimmerman, “Doing Gender,” 139-140.
- <sup>63</sup> West and Zimmerman, “Doing Gender,” 137.
- <sup>64</sup> West and Zimmerman, “Doing Gender,” 143-4.
- <sup>65</sup> Bem, *The Lenses of Gender*, 81.
- <sup>66</sup> West and Zimmerman, “Doing Gender,” 144-5.
- <sup>67</sup> Bem, *The Lenses of Gender*, 96.
- <sup>68</sup> West and Zimmerman, “Doing Gender,” 146.
- <sup>69</sup> Intemann, “25 Years of Feminist Empiricism and Standpoint Theory,” 793.
- <sup>70</sup> Wylie, “Why Standpoint Matters,” 31-4.
- <sup>71</sup> Wylie, “Why Standpoint Matters,” 37.
- <sup>72</sup> Wylie, “Why Standpoint Matters,” 35-6.
- <sup>73</sup> Wylie, “Why Standpoint Matters,” 37-8.
- <sup>74</sup> Wyle, “Why Standpoint Matters,” 31.
- <sup>75</sup> Intemann, “25 Years of Feminist Empiricism and Standpoint Theory,” 786.
- <sup>76</sup> Intemann, “25 Years of Feminist Empiricism and Standpoint Theory,” 786-7.
- <sup>77</sup> Linda Martín Alcoff, *Real Knowing: New Versions of the Coherence Theory* (Ithaca and London: Cornell University Press, 1996), 117.
- <sup>78</sup> Alcoff, *Real Knowing*, 117.
- <sup>79</sup> Alcoff, *Real Knowing*, 117.
- <sup>80</sup> Willard Van Orman Quine, “Main Trends in Recent Philosophy: Two Dogmas of Empiricism,” *The Philosophical Review* 60.1 (1951) 39-43.
- <sup>81</sup> Willard Van Orman Quine, “Main Trends in Recent Philosophy: Two Dogmas of Empiricism,” 39-43.
- <sup>82</sup> Alcoff, *Real Knowing*, 121-3.
- <sup>83</sup> Alcoff, *Real Knowing*, 121.
- <sup>84</sup> Alcoff, *Real Knowing*, 130-2.
- <sup>85</sup> Alcoff, *Real Knowing*, 125.



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- <sup>86</sup> Alcoff, *Real Knowing*, 131.
- <sup>87</sup> Alcoff, *Real Knowing*, 132.
- <sup>88</sup> Alcoff, *Real Knowing*, 138.
- <sup>89</sup> Alcoff, *Real Knowing*, 153.
- <sup>90</sup> Alcoff, *Real Knowing*, 153.
- <sup>91</sup> Michel Foucault, *Discipline and Punish*, trans. A. Sheridan (New York: Vintage-Random House, 1995), 200.
- <sup>92</sup> Foucault, *Discipline and Punish*, 141-3.
- <sup>93</sup> Foucault, *Discipline and Punish*, 170-2.
- <sup>94</sup> Foucault, *Discipline and Punish*, 201-4.
- <sup>95</sup> Alcoff, *Real Knowing*, 154.
- <sup>96</sup> Alcoff, *Real Knowing*, 156.
- <sup>97</sup> Alcoff, *Real Knowing*, 156.
- <sup>98</sup> Alcoff, *Real Knowing*, 154-5.
- <sup>99</sup> Alcoff, *Real Knowing*, 155.
- <sup>100</sup> Alcoff, *Real Knowing*, 156.
- <sup>101</sup> Linda Martín Alcoff, "Becoming an Epistemologist," in *Becomings: Explorations in Time, Memory, and Becomings*, ed. by Elizabeth Grosz (Ithaca: Cornell University Press, 1999), 61.

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