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Feminist Critiques of Science

Science is defined as knowledge based on truth, which appears as fact obtained by systematic study and precise observation. To be scientific is to be unsentimental, straight thinking, correct, rational, rigorous, and exact. Yet scientists make statements about the social and political roles of women, claiming all the while to speak the scientific truth. Feminists as well have used scientific evidence to bolster their cause (Fausto-Sterling 9). As Ruth Bleier and Anne Fausto-Sterling (both of whom are scientists and feminists) have documented, research about sex differences frequently contains gross procedural errors. In fact, these errors are considered so prevalent, an article by a well-known psychologist cites “ten ubiquitous methodological problems” that plague such work (Jacklin). Bleier and Fausto-Sterling’s work highlight many problems within scientific theories. For example, early in the twentieth century, scientists argued that there might be more male geniuses than female geniuses because male intelligence varied to a greater extent than did female intelligence. This “fact” proved proof positive of the overall superiority of the male mind. Hypotheses in defense of this position still pop up from time to time, consisting of old ideas in modern dress that prove themselves unacceptable by mainstream psychologists. Also, the premise that women are by nature abnormal and inherently diseased dominates past research on menstruation and menopause. While approaching the male reproductive system as normal, this viewpoint calls abnormal any aspect of the female reproductive life cycle that deviates from the male’s. At the same time such an analytical framework places the essence of a woman’s existence in her reproductive system. “Caught in her hormonal windstorm, she strives to attain normality

but can only do so by rejecting her biological uniqueness, for that too is essentially deformed: a double bind, indeed" (Fausto-Sterling 121). The alarming paucity of research done regarding women over the age of forty is also striking to feminist scholars, as well as the wealth of study given possible links between testosterone and aggression (There is no strong evidence that violence is caused by testosterone as of this writing, but this does not seem to result from lack of research or funding.)

In her article, "Gender and the Biological Sciences," Kathleen Okruhlik discusses several examples of sexist bias in modern biology that have affected scientific judgment. For instance, she examines the progress of the hypothesis that spatial ability is X-linked and therefore exhibited more frequently in males than in females. Although there have been many refutations of this claim, many scientists continue to tweak and strain their hypotheses. Okruhlik writes,

> "None of these hypotheses is well-supported by evidence and most seem to be clearly refuted. What is interesting for our purposes is that for many researchers the one element of the theoretical network they are unwilling to surrender in the face of recalcitrant data is the assumption that there must be predominantly *biological* reasons for inferior intellectual achievement in women" (Okruhlik 196).

I believe that these examples and other like them make a persuasive case for sexism within the scientific enterprise. But if this assessment is correct, some important questions must be dealt with. Is the scientific process that produced these cases inherently sexist? Does the scientific process necessarily have a subjective bias that leads to sexism? Or are these cases simply the result of "bad science" in which the scientific norm of objectivity was violated? It is interesting to ask what we would expect if science were primarily studied and performed by women. Perhaps sex bias would continue to exist, but only in misandric ways. Or perhaps even physics and chemistry would work within very

different frameworks. Feminist positions vary as these questions are answered. Feminist empiricists argue that these cases of sexist bias are merely the result of sloppy scientific work, while thinkers who espouse standpoint epistemology and contextual analysis argue that science is open to subjective biases and must be altered in order to protect objectivity. In this paper, I will argue that Kathleen Okruhlik's modified contextualist approach to eliminating sexist bias from scientific research is superior to Sandra Harding's standpoint feminism. I will also illustrate why Helen Longino's feminist contextualism benefits from Okruhlik's modifications. I will begin by introducing the positions of feminist empiricism, feminist contextualism, and standpoint epistemology and move on to introducing Harding's arguments. Critiques of these arguments will be presented, followed by an explanation of Okruhlik's case for modified contextualism and the Bayesian critique of modified contextualism. Finally, I will present a rejoinder to Okruhlik's opponents.

It may be helpful to clarify some background ideas that are prevalent within philosophy of science and feminist theory. Some scholars, in particular feminist empiricists, find their foundation in classical empiricism. This is the position that experience provides the only, or at least the primary, justification for all knowledge, which is of contingent fact. From the classical empiricists to some early twentieth-century theorists, empiricists held that the content of experience could be described in fixed, basic, theory-neutral terms — for example, in terms of sense-data (Anderson). In this tradition, feminist empiricists espouse the value-neutrality thesis and deny that contextual values should play any role in science. The value-neutrality thesis is, according to *Philosophy of Science: The Central Issues*, "The thesis that scientific

decisions about theories should be governed exclusively by cognitive values. Cognitive (or epistemic) values are those values that are linked, directly or indirectly, to the aims of science as a knowledge-seeking enterprise, especially the goal of discovering interesting truths and rejecting error. Cognitive values include predictive power, explanatory scope, and (some would argue) simplicity" (Cover 1310). On the other hand, contextual values play a core role in feminist contextualiam. According to this position, all observations are formed in complex concepts that cannot be immediately given in experience, all of which are tentative and subject to revision in light of further experience (Logical, Quine). Earlier contextualists hold that epistemology is simply another project within science, in which we empirically investigate our own practices of inquiry (Relativity, Quine). However, some contextualists accept a sharp division between facts and values that feminist contextualists argue cannot be sustained within a thoroughly naturalized empiricism. Feminist contextualists are deeply engaged in considering how feminist values can legitimately inform empirical inquiry, and how scientific methods can be improved in light of feminist demonstrations of sex bias in currently accepted methods. Their version of naturalized epistemology therefore does not follow contextualists like W.V. Quine in reducing epistemology to nonnormative psychological investigations, but rather upholds the roles of value judgments in rigorous empirical inquiry.

Feminist Empiricism

Feminist empiricists believe that science is essentially objective due to its method. That is, if the scientific method were always carried out appropriately, feminist empiricists believe that the aforementioned cases of "bad science" would not have

occurred. The whole point of scientific methodology, they would argue, is to make the gender, race, and personality of the individual scientist irrelevant. The name "feminist empiricism" was given to this stance by a philosopher who wished "to contrast feminist standpoint theory with the insistence of empiricism's proponents that sexism and androcentrism could be eliminated from the results of research if scientists would just follow more rigorously and carefully the existing methods and norms of research—which, for practicing scientists, are fundamentally empiricist ones" (Rethinking, Harding). A feminist empiricist would see no reason to give a name to her philosophy of science, but for the purposes of contrast and organization, I will accept this classification.

Feminist empiricists, far from believing that science does not benefit from a feminist perspective, believe that feminists can produce (objective and sound) scientific work that studies areas that have been systematically ignored by previous generations of scientists. A few examples include female sexuality, medical issues, and childhood. Rather than considering males the "subject," or norm for personhood, these scientists seek to use the scientific method consistently. Also, these scientists work critically, helping to root out misogynistic assumptions in addition to more benign forms of bias. Close and precise scrutiny of analytic frameworks in particular allows these scholars to identify possible contextual bias that previous scholars did not recognize or ignored. By expanding the scientific scope beyond androcentric interests of study and by critically evaluating scientific work, feminist empiricists believe that science can be made more objective and thus less sexist.

Feminist Contextualism

It is clear that the feminist contextualist position is thoroughly incompatible with feminist empiricism, as the former disallows contextual values and the other embraces them. Helen Longino rejects the value-neutrality thesis in her paper, "Values and Objectivity." Empiricists, she states, divide scientific activity into two phases: the context of discovery and the context of justification. As described above, empiricists believe that background assumptions and beliefs that are a part of the context of discovery are eliminated once they are put through the sieve of justification, i.e. the scientific method. However, Longino argues that background beliefs and assumptions are crucial in determining which hypotheses we accept as being confirmed by which evidence, and calls this position the "contextualist analysis of evidence." Longino asks us to imagine a scenario in which a child develops a rash on her stomach. Why, exactly, would her parents consider the rash as evidence for the hypothesis that the child has measles rather than as evidence for some other hypothesis, say, "that the moon is blue"? The ordinary answer would be that they think that the rash is caused by measles and there is no other likely cause of this rash. Given this background belief, the rash strongly confirms their diagnosis of measles. But it is possible that they could have had different background beliefs. They might have believed that this kind of rash was caused by a gastric ailment. In that case, they would have inferred a different hypothesis from the same evidence. Furthermore, what is considered the evidence can be described a number of ways: an itchy tummy, red spots on stomach, spots, and a rash. Which hypothesis the parents consider to be confirmed by the evidence also depends on how that evidence is described.

It may seem that objectivity and science must part ways if Longino's arguments are correct, but she would not agree. Science, Longino argues, is a social activity and can be objective through transformative criticism, i.e. criticism with the power to change contextual values should they prove ill founded. Longino specifies four criteria necessary for transformative criticism to flourish: (1) there must be recognized avenues for criticism. Conferences and the peer review journal are essential to scientific objectivity; thus scientists should get appropriate credit for their critical activities, just as they do for original research. (2) There should be shared standards that critics can invoke within these avenues. (3) The community should be responsive to fair criticism. This does not mean that a scientist should concede to every criticism. After all, science often benefits from scientists rationally defending their theories. However, a "defense" should not come from pure dogmatism; criticism, in the long run, should be capable of changing beliefs. (4) Intellectual authority must be shared equally among qualified practioners. This will help prevent the domination of society by one group of interests, as when Medellian genetics was suppressed by the Soviet Union in the 1930s, or when American legislators demand equal teaching time in public schools for Creationism. Excluding women and minorities from science also violates this criterion. "The long-standing devaluation of women's voices and those of members of racial minorities means that such [sexist and racist] assumptions have been protected from critical scrutiny" (Longino 183).

Feminist Standpoint Theory

Standpoint epistemologists rely on contextual arguments for their basis, but argue for a more radical position. "Standpoint theories in general claim to represent the world

from a particular socially situated perspective that can lay a claim to epistemic privilege or authority." A complete standpoint theory must specify the *social location* of the privileged perspective, the *scope* of its privilege, aspect of the social location that generates superior knowledge; the *ground* of its privilege; the *type* of epistemic superiority it claims; and the *other perspectives* relative to which it claims epistemic superiority and modes of access to that perspective. Harstock writes, "There are some perspectives on society from which, however well-intentioned one may be, the real relations of human with each other and with the natural world are not visible" (Harding159). Many claims to epistemic privilege are commonplace and uncontroversial. Medical doctors are generally in a better position than their patients to know what is wrong with their bodies. Practical experience in fulfilling the social role of the doctor grounds the doctor's epistemic privilege, which lays a claim to greater reliability than the judgments of their patients. However, feminist standpoint epistemology is more controversial. Women, they argue, possess a unique perspective with which to understand social dynamics. W.E.B. DuBois, called this "bifurcated consciousness": the ability to see things both from the perspective of the dominant and from the perspective of the oppressed, and therefore to comparatively evaluate both perspectives. According to standpoint epistemologists, feminist empiricism is too weak a position to identify bias within science, since "the methods and norms in [scientific] disciplines are too weak to permit researchers *systematically* to identify and eliminate from the results of research those social values, interests, and agendas that are shared by the entire scientific community or virtually all of it" (Harding 238). With the insights of the women's movement, standpoint theorists can retroactively examine sexist or androcentric practices

in scientific disciplines. In this way, standpoint theorists assume the contextualist position of science as a social process, but argue that women possess an epistemological authority that is superior to men's.

Harding's Arguments

Sandra Harding argues that standpoint theory projects should critically engage with the natural sciences in two ways: addressing systemic biases within fields and analyzing the inadequacy of sciences's standards for achieving objectivity or good method. (Socially Relevant 26). She points out how critical standpoint work done in primatology and in biology "delineate how particular sciences…constituted their hypotheses and methods to meet the sexist and androcentric (and often racist and ethnocentric) needs of dominant social groups, thereby providing distorted and partial accounts of nature's regularities and underlying causal tendencies and revealing otherwise hidden features of dominant ways of thinking" (Socially Relevant 26). Harding criticizes what Donna Haraway called the "God trick" of science: the pretension that science and scientists are capable of speaking authoritatively about anything in the world from no particular social location or human perspective at all. Early feminists decimated this idea, and with good cause. A medical society that stigmatizes menstruation, pregnancy, and menopause as illnesses is clearly a society with a distorted perspective. (It is easy to guess how parents of a thirteen year old boy would react to a doctor's comments that their son's vocal changes and muscle development are an unfortunate burden).

Harding believes that political struggle is necessary to advancing the goal of analyzing and exposing systemic biases and inadequate standards. Political theory and activism, she argues, helps women form collective group consciousness that "...enable[s] women in their different class, race, sexuality, and cultural locations to identify, value, and engage in the kinds of research that could enable them to see how to end their cultural-distinctive forms of sexist oppression" (Socially Relevant 30). Political struggle is also necessary in order to gain access to the means to do such research. Harding argues that research training, funding, employment in institutions, and publication are essential to the research process. Much more controversially, Harding also conceptualizes politics itself as part of the research method. "We need not—indeed, must not—choose between 'good politics' and 'good science,' standpoint theorists have argued, for the former can at least sometimes produce the latter, and the latter, at least in some cases, requires the former" (Socially Relevant 30). Harding believes that it is better to ask questions regarding which politics advance the growth of knowledge and for whom. This is one of standpoint theory's definitive features, in that it attempts to "map the practices of power, the ways dominant institutions and their conceptual frameworks create and maintain oppressive social relations" (Socially Relevant 31). The way that this theory plans to achieve this goal (and another distinct feature of this theory) is found in its attempts at "locating, in a material and political disadvantage or form of oppression, a distinct insight about how a hierarchal social structure works" (Socially Relevant 31). Harding argues that an essential feature of this theory is the belief that recording what members of oppressed groups say or believe is not sufficient for establishing that a group has a privileged ability for the articulation of reliable claims. After all, it is possible that

members of groups believe stereotypes and other distorted images that refer to their group. There must be critical analysis and reflection on daily life sufficient for eliminating this kind of unthinking acceptance of a dominant culture's labeling. Harding delineates another characteristic in the overarching emphasis of the perspective: "...standpoint theory is more about the creation of group's consciousness than about shifts in the consciousness of individuals. An oppressed group has to come to understand that each member is oppressed because she or he is a member of that group...not because he or she individually deserves to be oppressed" (Socially Relevant 32).

Harding singles out Dorothy Smith and Hartsock as persons who exemplify standpoint researchers. In their sociological research these scientists began by pointing out the different ways that women are assigned responsibility for daily life. These activities, such as childcare and domestic labor, they demonstrate, have been labeled by sociologists and political theorists as "natural," thereby "exalting men's activities alone as distinctively human achievements." Smith's method of inquiry in particular is born out of political struggle and rejects standard sociological methods of work because, she argues, that these methods cause researchers to "inadvertently realign the issues that concern us with those of the relations of ruling" (96). Instead, Smith's method of inquiry is characterized by attention to situational actualities and group consciousness, and emphasis on the importance of texts as bridges between the actual and the discursive. However, Smith is quick to point out that "If I could think of a term other than 'standpoint,' I'd gladly shift, especially now that I've been caged in Harding's creation of the category of 'standpoint theorists'…My notion of standpoint doesn't privilege a knower" (91). Still, her work is an example of what Harding believes is necessary for

progress and Smith herself does not shy from the political implications of this work. Smith argues that work produced from this approach has been relevant and helpful in a variety of contexts including "collective bargaining, issues of racial inequality in Canada, pay and employment equity, environmental activism, social policy, and gay activism" (97). Harding, therefore, has reason to believe that standpoint theory can produce the methods of research she claims are necessary.

Some Objections to Harding's Arguments

I find it troublesome that Harding is quick to lump sciences like sociology and physics together, despite her precision and specificity in other contexts (i.e. groups that require collective group consciousness). Longino writes, "The main problem with [Harding's arguments] is the attempt to subsume the natural sciences under the social sciences without sufficiently attending to the goals, content, and methodologies of natural science inquiry. Harding consequently represents both feminists and philosophers as having thought only in the shallowest terms about the questions of objectivity, values, realism, and truth that are raised by the critiques of science" (Review 573). Also, as Cassandra Pinnick points out, Harding's claim that standpoint research programs provide better, more objective results is "a good empirical claim, open to evaluation based on empirical data. One expects that Harding will turn her efforts to show that marginalized feminists have either a record of obtaining better results than nonfeminists and other nonmarginalized types, or that a small but remarkable body of data (inconclusive as it may be at present) suggests that marginalized feminists could more successfully achieve scientific ends" (653). However, Harding seems content to highlight particular scientific

research projects that incorporate methods inspired by standpoint theory. She does not gather any empirical data that demonstrates why these projects are superior to others, although this would clearly strengthen her arguments.

Harding may reply that the conventional standards that would allow for the accumulation of empirical data are the standards of the oppressors, and any data that would support standpoint theory would have to use standpoint methods. However, how can Harding be sure that the standpoints employed would not be suffering from the aforementioned "false consciousness"? Furthermore, there is a serious tension between Harding's desires to involve a multiplicity of standpoints and her desire for standpoint theory to develop normative judgments. Since Harding will not grant authority to any particular standpoint within marginalized groups, each group's standpoint must have equal authority. Thus, there is no clear way to resolve conflicts between different standpoints, and standpoint theory's decent into postmodernism seems inevitable. Postmodernism is an entirely untenable position for Harding, due to the fact that if every statement is just as valued as others, then misogynistic claims hold just as much weight as feminist claims and the results of scientific work are as important as the results of reading tea leaves (Cover; Pinnick). Harding must either address these problems within her theory or consider more promising feminist philosophies of science.

Okruhlik's Arguments

Kathleen Okruhlik's arguments show the most potential, as she both avoids the pitfalls of standpoint theory and improves on Longino's concepts. Okruhlik argues that contextual values influencing a generation of theories in the context of discovery will

inevitably affect the content of science in the context of justification. Since the context of justification involves choosing among available theories, if all of the available theories are sexist, then gender bias will continue to pervade the theory that is chosen. Okruhlik believes that the scientific method cannot, by itself, remove gender bias. Even if a decision is perfectly rational, the product may be defective because social factors have influenced the context of discovery. Okruhlik argues that philosophers must acknowledge that the context of discovery has an epistemic significance and should not focus only on the context of justification. "Any adequate philosophy of science will have to take this into account" (Okruhlik 205).

Like Longino, Okruhlik proposes that a change of social organization is needed to encourage criticism from a variety of viewpoints. Okruhlik's proposal falls somewhere between feminist empiricism and standpoint epistemology. For example, women must be encouraged to pursue careers in science, must be given rightful credit for their work, and should be taken seriously when they criticize their colleagues. Furthermore, discriminative hiring and promotional practices must be eliminated. However, unlike Longino, Okruhlik does not believe that including more women in the sciences is a necessary or sufficient condition for the improvement of objectivity. Okruhlik thinks that a male dominated scientific community could produce work that does not exhibit sexism. In other words, the scientific process is not inevitably biased simply due to the patriarchal social structures of our society. She believes that science should continue to strive for objectivity and that the scientific method is useful for that purpose. Yet, she also believes that contextual values influence the scientific process (and the contents of science) and that the social arrangements of science must be addressed in order to check this influence.

She believes that there are "some standard philosophical tools that can partially illuminate the origins and diversity of ideological biases in science. These tools, however, are inadequate to the task at hand so long as they are embedded within an outmoded and indefensible conception of the scientific process that limits the influence of social factors to the context of discovery" (Okruhlik 207). Okruhlik does not see value in beginning a kind of feminist science that uses only feminist standpoints, and instead advocates the inclusion of this standpoint, along with others. "There is no 'feminist paradigm' that can be imposed from above and no reason to believe…that gender bias in physics, for example, will be of the same kind and degree as in biology. Real change in science will occur only when specific rival theories are developed by scientists who both have a thorough grounding in their own disciplines and a commitment to questioning biases introduced by social arrangements of science" (Okruhlik 206).

Bayesian Rebuttal to Okruhlik's Arguments

However, some scientists believe that we already have tools that make it possible to meet Okruhlik's goals, namely the Bayesian approach to confirmation. This approach relies on the mathematical theory of probability known as Bayes's Theorem. Instead of treating confirmation as a qualitative notion that might be made quantitative later on, Bayesians assume that confirmation is quantitative from the outset. Even such qualitative notions as evidence confirming a hypothesis and evidence confirming one hypothesis more strongly than another are analyzed in terms of probabilities with numerical values that lie between 0 and 1. Bayes's Theorem can be expressed as the following:

(Let Pr=probability of, h=hypothesis, e=evidence, k=background knowledge).

$$\mathbf{Pr\ (h/e\&k) \;=\; \frac{Pr\ (e/\ h\&k)\ x\ Pr\ (h/k)}{Pr\ (e/k)}}$$

Thus, Pr (h/e&k), the *posterior probability of the hypothesis,* equals the probability of the hypothesis, given background knowledge and the evidence. This is the probability of the hypothesis after the evidence is introduced. Pr (e/ h&k), the *predictive power of the hypothesis,* equals the probability of the evidence, given the hypothesis and background knowledge. This is how much you would expect the evidence to obtain, given the hypothesis. Pr (h/k), the *prior probability of the hypothesis,* equals the probability of the hypothesis, given background knowledge alone. This is the probability of the hypothesis before the evidence is introduced. Pr (e/k), the *prior probability of the evidence,* equals the probability of the evidence, given the background knowledge alone (Hutcheson).

Viewed simply as a theorem of the probability calculus, Bayes's equation is completely uncontroversial. It is a deductive consequence of the axioms of probability, together with a definition of conditional probability. But in order to apply that equation to scientific reasoning, some connection has to be forged between probability and confirmation. The relevance criterion is such a connection. Bayesians define relevant evidence in terms of posterior probability. If the posterior probability of the hypothesis is greater than the prior probability of the hypothesis, then the evidence is favorable to the hypothesis. If the posterior probability of the hypothesis is less than the prior probability of the hypothesis, then the evidence is unfavorable to the hypothesis. If the posterior probability of the hypothesis is equal to the prior probability of the hypothesis, then the evidence is irrelevant, or neutral to the hypothesis (Hutcheson).

The four quantities in Bayes's Theorem are, according to Bayesians, subjective degrees of belief. That is, they are the actual degrees of belief of real people as measured,

for example, by their willingness to bet at well-defined odds on various propositions (Curd and Cover 667). The appearance of subjectivism is mitigated to a degree by the stipulation that the people in question have to be rational and that rationality requires that their degrees of belief satisfy the probability axioms. The requirement of conformity to the probability axioms is called the *condition of coherence,* and Bayesians offer a Dutch book argument to justify it.

Professional gamblers say that a Dutch book has been made against someone if that person accepts a series of bets such that, no matter what the outcome, the person is guaranteed to lose money. Since no rational person would knowingly gamble in this way, the Dutch book argument proves that a necessary and sufficient condition for avoiding a book being made against you is that your degrees of belief satisfy the axioms of probability theory. When this condition is satisfied, your degrees of belief are said to be coherent. Thus, when subjective Bayesians interpret probabilities as degrees of belief, a certain amount of idealization is involved. The degrees of belief are not necessarily the actual degrees of conviction that a particular person has, but rather the degrees of belief that she would have if she were ideally rational and her degrees of belief were coherent (Cover 635).

The other constraint imposed by Bayesians is *conditionalization*: whatever a person's prior degree of belief in *h*, when new evidence, *e*, is acquired, that person should replace the old prior probability of *h* with the posterior probability of *h* given *e*, calculated using Bayes's Theorem. Posterior probabilities replace old prior probabilities. Again, Bayesians have appealed to Dutch book arguments in defense of this requirement, this time with the argument constructed as explicitly diachronic, rather than the using the

earlier synchronic structure. This type of argument goes as follows. If Jones makes a series of bets, some of which depend on what Jones's degrees of belief will be in the future, and if Jones follows a rule other than the Bayesian conditionalization rule and this alternative rule is known to the one with whom Jones is betting, then the person with whom Jones is betting can always construct a Dutch book against her. A necessary and sufficient condition for avoiding a Dutch book under the conditions stated is that one uses nothing but the Bayesian conditionalization rule for changing one's degrees of belief. Just as the synchronic Dutch book argument is used to derive the coherence condition from the presumption of rationality, the diachronic Dutch book argument is supposed to show how rationality mandates the Bayesian rule for revising one's degrees of belief over time (Cover 637).

Philosophers like Wesley Salmon reject the unfettered subjectivism of many Bayesians, as they believe that prior probabilities should be guided by experience, and should not reflect mere prejudice or subjective whim. However, these philosophers are often satisfied due to the fact that, in the long run, the initial choice of probabilities becomes irrelevant. For as evidence accumulates, the values of the posterior probability of a hypothesis converge, thus the "washing out" of individual differences in the priors. One important condition for this sort of convergence is that we never assign to any hypothesis the extreme values of 0 or 1. Another condition is that we agree about the values of likelihoods (Cover 668).

This "washing out" of individual differences in the priors would derail Okruhlik's argument that even if a decision is rational, the product may be defective because social factors have influenced the context of discovery. Bayesians do not shun social factors as

they do not, in the long run, have any effects on which hypotheses are confirmed and which are not. Okruhlik believes that contextual values influence the scientific process (and the contents of science) and that the social arrangements of science must be addressed in order to check this influence, but Bayesians would not agree. Bayesians could agree with Okruhlik that it is right that women should be treated fairly and that the social arrangements within science must change in order for this to occur. However, they would maintain that, at least regarding theory choice, subjective biases such as androcentrism and sexism are rendered inconsequential by using the Bayesian approach.

A Rejoinder to the Bayesian Rebuttal

However, Okruhlik could respond to Bayesians by appealing to a conceptual possibility. That is, it is conceptually possible all evidence considered as supporting a hypothesis could be distorted by androcentric or sexist bias. It is also possible that every individual's degrees of belief regarding the prior probability of a theory could also be intrinsically androcentric or sexist. Consider an example from biology: the general belief that females are passive and males are active may have prevented the recognition of evidence that the ovum plays an active role in fertilization. As Longino has stressed, the issue is not whether a particular observation was made—microvilli extending from the ovum was observed and photographed as early as 1895—but how the observation is described and, as a consequence, what evidential significance it is deemed to have. For example, it makes a difference whether what is seen under the microscope is described merely as "projections around the ovum *accompanying* the penetration of a sperm cell," or as the ovum "*clasping* the sperm and *drawing* it in." This description would affect

how one would describe her degree of belief regarding the ovum's role in fertilization. If the only known description of events is the "passive ovum" description, it is likely that every person's degrees of belief in the prior probability of the "passive ovum" hypothesis will be reasonably strong. It is possible that all evidence acquired regarding the "passive ovum" hypothesis will be described in biased terms. Thus, Bayes's Theorem will be incapable of "washing out" these subjective factors in the long run.

While this may seem like a hyper-skeptical response, one can look to Fausto-Sterling and Bleier's work to find examples of theories that were grounded in sexist assumptions, relied on gendered observations, and were so thoroughly entrenched in sexist frameworks that concessions to valid and strong criticisms were few. Regarding gendered observations, one may notice that both ovum descriptions are very anthropomorphic. This is not to imply that good scientists would actually record data in this way. Rather, a scientist would attempt to record her observations in the most neutral terms possible; for instance, a mathematical or chemical representation. However, individual scientists employ ordinary language in their private understanding of their work, which can color the way they perceive objects and relationships. Also, ordinary language must be employed at some point if scientific observations are to enter the public consciousness. As Okruhlik proposes, it seems that systems must be in place to protect objectivity from descriptive "stories."

All things considered, Bayes's Theorem and Okruhlik's arguments are not totally incompatible. One of the attractions of the Bayesian approach to confirmation is that it provides a formal framework within which background beliefs can play an important role. That is, even if background beliefs play a role in confirmation, confirmation may

still be an objective relation between statements that include those background beliefs as an element. Bayes's Theorem, therefore, could be a promising vehicle for incorporating the subjective factors that Okruhlik considers, i.e. contextual values. However, this is a topic for another essay.

In closing, I believe that I have shown that Kathleen Okruhlik's modified contextualist approach to eliminating sexist bias from scientific research is superior to Sandra Harding's standpoint feminism. I demonstrated that Harding's position has drawbacks that outweigh her theory's advantages, and I also argued that, while Helen Longino's feminist contextualism is a very strong position, it benefits from Okruhlik's modifications. Finally, it has been shown that Okruhlik's arguments are not vulnerable to a Bayesian objection, and that the two positions may even be compatible.

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