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ASSESSING THE ROLE OF NON-EPISTEMIC FEMINIST VALUES IN SCIENTIFIC INQUIRY

William A. Rottschaefer
Lewis and Clark College

ABSTRACT: In this paper I examine the feminist claim that non-epistemic values ought to play a role in scientific inquiry. I examine four holist arguments that non-epistemic values ought to play a role not only in the external aspects of scientific inquiry such as problem selection and the ethics of experimentation but also in its internal aspects, those that have to do with epistemic justification. In supporting their conclusion, I argue that they establish that the traditional external/internal distinction has served as a marker for more fundamental distinctions between non-epistemic and epistemic values and between the means by which each are pursued. However, I also contend that these arguments do nothing to deny these distinctions between epistemic and non-epistemic values. Maintaining these distinctions, I argue for an epistemic holism suggesting ways in which both substantive claims about non-epistemic values and reliable processes/methods for the legitimization of non-epistemic values may also be truth-conducive, thereby serving the epistemic ends of scientific inquiry.
Key words: epistemic values, feminist epistemology, Helen Longino, non-epistemic values, Richmond Campbell, science and feminist values, values and scientific inquiry

Introduction

What legitimate role, if any, do non-epistemic values (e.g., social, political, or moral values) play in scientific inquiry? The traditional answer to this question is a nuanced one. There is agreement that non-epistemic values not only do but also ought to play a role in the so-called external aspects of scientific inquiry. These values legitimately influence such external aspects as the selection of problems to pursue, the uses to which scientific knowledge are put, and the kinds of methodologies ethically permitted in the study of humans and other animals.[1] The

AUTHOR'S NOTE: Please address all correspondence to William A. Rottschaefer, Department of Philosophy, Lewis and Clark College, Portland, OR 97219. Telephone: 503-768-7479; Fax: 503-768-7359; Email: rotts@lclark.edu. The author wishes to thank the Editor of this Journal and two anonymous referees for their suggestions for revising this paper. He also thanks John Fritzman for very helpful comments on earlier versions of this paper. One version of this paper was presented at a recent annual meeting of the Oregon Academy of Science.

[1] The external/internal distinction usually abstracts away from the even larger economic, social, cultural, and political factors, all laden with non-epistemic values, which influence scientific inquiry. It also prescinds from the professional organization of science and the multiple motivations of individual scientists. For an important recent discussion of the former, see Philip Kitcher, *Science, Truth and Democracy* (New York: Oxford, 2001). For a contemporary classic examining the latter in the field of evolutionary biology, especially the field of systematics, see David Hull, *Science as a*

controversy about the role of non-epistemic values in scientific inquiry concerns the so-called internal aspects of scientific inquiry such as its methods of justification, whose aim is to achieve such epistemic values as truth, prediction, and explanation. The traditional answer to this question is that non-epistemic values have no legitimate role at all to play in what constitutes the intrinsic parts of scientific investigation. Feminist epistemologists, social constructionists, and other social critics of science (e.g., Marxists) have challenged the traditional answer.[2] In this paper I focus on the feminist challenge to the traditional answer both because of the intrinsic merit of the feminist challenge and because of its potential for addressing the general issue of the role of non-epistemic values in scientific inquiry in fruitful ways.

Kathleen Okrulik (2000) distinguishes two sorts of feminist challenges. The first examines the general relationships between gender and science and the second studies the connections between gender and scientific results, methods, and epistemology. The former includes equity studies, research on science education, the study of women scientists, and findings concerning women and technology. The latter takes two forms, "first-order, discipline-specific research" demonstrating gender biases in both scientific methodology and findings, and "second-order, epistemological reflection" on the connections between feminist values and scientific methodology. The first-order studies derive from a number of disciplines including genetics, evolutionary biology, physiology, primatology, and psychology (e.g., Fausto-Sterling, 1985; Haraway, 1989; Hubbard, 1990; Keller, 1985; Longino, 1990). The second-order accounts draw lessons about the methodological and epistemological deficiencies revealed in the first-order studies and recommend remedies and alternatives that better promote feminist values (e.g., Fausto-Sterling, 1985; Harding, 1986, 1991, 1993; Longino, 1991, 1996). It is in these second-order critiques that the challenges and alternative proposals to the traditional answer about the role of feminist non-epistemic values in scientific inquiry take their sharpest form.

We can distinguish three major categories of feminist non-epistemic values (Longino, 1990, pp.164-179) that concern social equality for men and women, ideals of personhood that include women, and political ideals of liberty, autonomy, and responsibility that are inclusive of women. Scientific inquiry that supports such values is feminist. These feminist values are put in jeopardy by such anti-feminist attitudes as androcentricism, sexism, patriarchy, and heterosexism.[3] Thus,

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Process: An Evolutionary Account of the Social and Conceptual Development of Science (Chicago: University of Chicago Press, 1988).

[2] Social constructionists challenge the traditional answer by denying one of its suppositions that the goal of scientific inquiry is truth and that the means for attaining this goal are or ought to be truth-conducive.

[3] I follow Longino's helpful distinctions here: "'Androcentrism' is generally used to refer to perception of social life from a male point of view with a consequent failure to accurately perceive or describe the activity of women. 'Sexism' is generally used to refer to statements, attitudes, practices, behavior, or theories presupposing, or implying the inferiority of women, the legitimacy of their subordination, or the legitimacy of sex-based prescriptions of social roles and behaviors. . . . Patriarchal values [are] the assumption of a thoroughgoing dimorphism or sexual essentialism. In part

scientific inquiry in psychology that is especially crucial for feminists concerns studies concerning sex and gender differences, especially those that are alleged to affect temperament, cognitive capacities, and behavior. Feminists have attempted to make the case that such anti-feminist attitudes have appeared in biological and psychological studies concerning sex and gender differences in these areas (e.g., Harding & O'Barr, 1987). These and other cases have been the subject of careful second-order analyses by feminist epistemologists.

Reformist, Transformist, and Holist Feminist Epistemologies

Among feminist epistemologies concerned with scientific inquiry we can distinguish three tendencies: reformist, transformist, and holist (Campbell, 1998; Harding, 1986; Okruhlik, 2000).[4] I shall focus on the holist approach to the role of feminist values in scientific inquiry. Holists argue that non-epistemic values play a legitimate role in both the internal and external aspects of scientific inquiry.

Campbell (1998) identifies externalist empiricist feminist epistemologists as reformers (Campbell, 1998; Harding, 1986; Longino, 1990; Millman & Kanter, 1975; Okruhlik, 2000). They accept a standard empiricist account of the testing of scientific hypotheses—something that I will discuss in more detail in a moment—as an accurate account of how scientists justify and ought to justify their hypotheses. At the same time, they argue that external factors such as those that arise in the context of discovery distort some scientific findings with values that render them sexist and androcentric. Thus, a reform of these factors is required to overcome these distortions. Their goal is to make the internal aspects of science value-neutral with respect to non-epistemic values. The internal aspects of science should be governed by only epistemic values. Thus, externalist empiricist feminists advocate the reform of scientific inquiry.

Externalists make use of the classical logical empiricist distinction between the contexts of discovery and justification to show how non-epistemic values enter into scientific investigations and results. The intuitive basis for this distinction is that the way one gets an idea is not necessarily the way in which it ought to be justified.[5] The context of discovery contains roughly all those factors responsible for the origin of a scientific hypothesis while the context of justification embodies those factors that are involved in justification. Externalists contend that non-epistemic values supporting moral, economic, political, social, gender-based, and religious commitments play a role in the context of discovery. Non-epistemic values do so by determining such things as (1) how and why relevant hypotheses

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it is the idea that 'they' are made for and hence complementary to 'us.' As such it is a form not only of sexism but of heterosexism. The latter is generally identified as homophobia" (Longino, 1990, p. 129).

[4] These theories contrast with postmodern feminist theories that hold that the sciences and their results are merely particular cultural products and have no special call on knowledge, truth, and reality. Postmodern feminist theories are often social constructionist.

[5] Giere (1999, pp. 217-236) discusses the nature and origin of the distinction as introduced into Anglo-American philosophy of science by Hans Reichenbach.

are identified, defined, and deemed worthy of testing, (2) the nature of untested background assumptions, and (3) the availability of alternative explanations and evidence. Bad science is due to these external sources. Thus, the reform of science requires that scientists not allow these distorting non-epistemic values to influence science's internal nature, the factors constituting the processes of justification. It also requires that scientists, to the extent that it is possible, remove distorting values from the external parts of science, in particular from the context of discovery. It does not require that scientists modify the processes of justification that constitute its internal nature.

Other feminist critics find more deep-seated distortions in science. They argue for the transformation of scientific inquiry. One such transformist is Sandra Harding (1986, 1991, 1993), who argues for *standpoint* feminist epistemology. Standpoint feminist epistemology maintains that externalist reforms of science are not sufficient. Indeed, standpoint theorists argue that it is the very non-epistemic value-neutrality, objectivity, and dispassionate apolitical characteristics of scientific methodology that promote its sexism and androcentrism.[6] Elimination of sexism and androcentrism requires that the findings of science be corrected and enriched by the epistemic and non-epistemic values of marginalized individuals and groups.

> Feminism and the women's movement provide the theory and motivation for inquiry and political struggle that can transform the perspective of women into a "standpoint"—a morally and scientifically preferable grounding for our interpretations and explanations of nature and social life. The feminist critiques of social and natural science, whether expressed by women or by men, are grounded in the universal features of women's experience as understood from the perspective of feminism. (Harding, 1986, p. 26)

Thus, while externalist empiricist feminists attempt to reform science without touching its methodology of testing, standpoint epistemologists maintain that the core itself in need of transformation.

Richmond Campbell (1994, 1998, 2001) argues for a holist version of feminist epistemology that advocates elements of both reform and transformation. He calls it internalist feminist empiricism.[7] Campbell argues that internalist feminist theory is preferable to its several competitors, in particular externalist and standpoint feminist theories. He aims to give science a feminist character by making feminist values a central feature of its methodology. He argues that the externalist empiricists are correct in retaining the epistemic value of the scientific enterprise but incorrect in thinking that its core pursuits are merely epistemic and not also non-epistemic. Campbell accepts the transformers' claims about the non-epistemic value-laden character of inquiry and, thus, argues that scientific inquiry

[6] In more recent papers Harding has argued for "strong objectivity," an objectivity that requires a systematic study of the wider context of beliefs and practices that influence the background assumptions of the sciences (e.g., Harding, 1993).

[7] In a later paper Campbell (2001) abandons the distinction between internal and external aspects of scientific inquiry.

is—and ought to be—intrinsically value-laden with non-epistemic moral values. Because some of these non-epistemic values are incorrect and distorting, he agrees with both transformers and reformers that science must, when necessary, rid itself of improper moral values and take on proper ones—specifically feminist values—if it is to attain the truth and objectivity to which it aspires. He contends that a feminist critique of science must reach into its internal core; however, he contends that standpoint theorists are incorrect in deeming that science's core empirical methodology is fundamentally flawed. That core, he maintains, must be retained because it provides the basis for the objectivity about moral values necessary for the pursuit of feminist values.

In this paper I explore four major arguments for the holist view. I conclude that the holists have demonstrated that non-epistemic values not only have played a role in the intrinsic elements of scientific inquiry but also that they do so legitimately. Thus, to that extent, they have shown that transformation is required and reform is insufficient. Nevertheless, I shall argue that even though non-epistemic values have a role in the core of scientific inquiry, epistemic values legitimately govern that core. This point emerges from the fact that holists' account of the legitimate use of non-epistemic values in scientific inquiry requires that claims about these values themselves be epistemically justified and that any methods and mechanisms for the generation of non-epistemic value claims must themselves be truth-conducive.[8] Thus, I present a revised version of holism that I call epistemic holism.

In the next section of this paper I examine Campbell's argument that the empirical methodology of hypothesis and theory testing is intrinsically and legitimately laden with moral values because of its necessary reliance on auxiliary hypotheses in scientific testing, and I conclude that that argument fails. I devote subsequent sections to a discussion of three other recent holist arguments that non-epistemic values play a legitimate role internal to scientific inquiry. In another section of the paper I conclude from an evaluation of these arguments that the use of the traditional distinction between the external and internal parts of scientific inquiry fails to do its job. It does not satisfactorily mark the boundary between the aspects of scientific inquiry where non-epistemic and epistemic values play legitimate roles. I show that non-epistemic values may play a legitimate role even in the so-called internal parts of scientific inquiry such as the empirical justification of hypotheses. In another section of this paper I examine the sources that legitimate a role for non-epistemic values in scientific inquiry. In developing the epistemic holistic account, I distinguish between two legitimate ways that non-epistemic values may play a role in scientific inquiry. They function either as embodied in justified claims about non-epistemic values that are truth-conducive by means of coherence criteria of truth or as non-epistemic processes and methods that both lead to non-epistemic values and are also truth-conducive. I maintain that non-epistemic values attain a legitimate epistemic role in the so-called internal

[8] Among the holists' views that I discuss, Richmond Campbell (2001) uses the criterion of truth-conduciveness explicitly. Arguably, the criterion is also implicit in the other views that I examine.

aspects of scientific inquiry only if they themselves are justified epistemically. I conclude by speculating about the existence and nature of non-epistemic processes and methods that are also truth-conducive.

Auxiliary Hypotheses as the Source of Non-Epistemic Value: Commitments in Scientific Inquiry

Non-epistemic values are, by definition, aimed at goals other than truth. Indeed, on some traditional views truth is a matter of objectivity and values a matter of subjectivity and preference. Thus, the introduction of non-epistemic values into the core of scientific inquiry seems to threaten the very objectivity that Campbell requires. To meet this problem Campbell contends that feminist value claims about the moral wrongs of sexism and androcentrism and the rightness of gender equality are best understood and supported when interpreted as substantively and methodologically objective. Thus he argues for moral realism, the view that moral propositions have truth-value.[9] Consequently, Campbell maintains that feminist epistemology, because of its explicit commitments to feminist social, political, and moral values, requires the epistemic values of truth and objectivity that are a mark of scientific inquiry.

Campbell claims both that the substantive claims of the sciences should be taken realistically and that the methodology of the sciences is objective.[10] In Campbell's view, the best means that we have for discovering the truth about objective realities are the empirical methods of the sciences. As a result, Campbell is committed to an empiricist account of the nature of scientific methodology and to a scientific realist account of its substantive results. For a feminist epistemology to achieve the sort of truth and objectivity it requires, feminist epistemology of science must be empirical. Thus, Campbell also seeks to naturalize feminist epistemology by making the methodology of the sciences an intrinsic part of feminist epistemology (p. 1).[11] So, in opposition to both externalist feminist empiricism and standpoint theory, Campbell proposes that a feminist epistemological account of science be an internal empiricist one. Science so understood is feminist science because it makes non-epistemic, feminist values part of science's methodological core. It is empiricist because it retains the empiricist methodology in its pursuit of epistemic and non-epistemic values. In sum, Campbell's proposal is twofold. He contends both that the sciences must embrace feminist values and that feminist epistemology, including feminist moral epistemology, must take up the epistemic values of science.

[9] He bases that moral realism on a feminist contractarian account of moral values.

[10] As a realist, Campbell holds that reality is independent of the representations that we use to portray it. Consequently, he contends that the ability to misrepresent is a key feature of a realist position. Thus, Campbell holds that scientific theories are capable of truth or falsity and that some scientific theories are in fact true. However, in understanding the notion of truth, he argues against the correspondence theory of truth and for Giere's (1999) notion of models being more or less similar to the realities that they represent.

[11] Parenthetical page references will be to 1998.

The criticisms of science offered by feminist epistemologists presuppose some understanding of the scientific method. But, of course, the question of what the scientific method is—indeed, whether or not there is a single unique scientific method at all—is a matter of some controversy, so Campbell attempts to find something that would be agreed upon by all sides as a significant part of scientific methodology. He settles on what he calls the empiricist methodology for the testing of scientific hypotheses and theories, and he argues that this methodology is a widely accepted component of the justificatory part of scientific method.[12] He claims that the empiricist method for the testing of scientific hypotheses and theories has three elements (p. 21). These elements prescribe what a scientist ought to achieve if he or she is to claim empirical justification for her hypothesis or theory. They are (1) predictive success, (2) observation independence, and (3) explanatory power.[13] Predictive success is the attribute of a hypothesis or theory that enables the derivation of observable outcomes from it that are observed. Observation independence is the requirement that the test outcomes be observable without presupposing the theory or hypothesis under test. Finally, explanatory power requires that the proposed hypothesis or theory provides the only plausible explanation of the observed phenomenon.

Rendering scientific inquiry feminist, therefore, means making empiricist methodology feminist by bringing feminist values into this methodology. An appropriately feminist scientific inquiry will pursue epistemic values by means of the empirical methodology for testing scientific theories, and it will support feminist values by making sure that the non-epistemic values intrinsic to this methodology are properly feminist.

But what is the source of the non-epistemic value-dependence of the empirical methodology for the testing of scientific theories? According to Campbell, the key to answering this question is to be found in the non-epistemic value-dependence of auxiliary hypotheses—for instance, hypotheses about the experimental situation or about instrumentation and the role that these hypotheses play in this methodology. Auxiliary hypotheses play an essential role in ensuring the predictive success of hypotheses, the independence of predicted observation from the theory under test, and explanatory power. However, because auxiliary hypotheses are laden with non-epistemic values, these values enter into the very core of the empirical methodology for the justification of scientific theories and hypotheses.

Some feminist epistemologists of science, as well as many practitioners of science studies and some non-feminist philosophers of science, have argued that the phenomenon of underdetermination is a major source for the role of non-

[12] Besides this empirical marker of scientific justification, coherence with other well-justified hypotheses and theories, explanatory power, simplicity, and heuristic power also often serve as justifiers. As we shall see, Campbell considers explanatory power to be an element in the empirical testing of scientific theories.

[13] Campbell takes these three elements to constitute central, if not exclusive, norms of an empiricist methodology of justification. Although one may quarrel with some parts of their formulation, I will, for purposes of examining his argument, accept them as satisfactory.

epistemic values in the acceptance of scientific theories (Laudan, 1990; Laudan & Leplin, 1991). Roughly, underdetermination postulates that for any hypothesis there is an empirically equivalent one such that the empirical evidence used to support one hypothesis supports the other equally. Thus, no empirical results will enable one to decide between the two hypotheses. Because this is so, and because, nevertheless, scientific hypotheses and theories are accepted or rejected, it is argued that non-epistemic values play a role in the acceptance of a hypothesis. Thus, it is argued that it is incorrect to claim that non-epistemic values play no role in science.

One might think that Campbell would make use of this argument from underdetermination to support his position. He does not, however, and for reasons that are apparent when the implications of the argument from underdetermination are considered. Campbell does not base his account of the presence of non-epistemic values on the underdetermination account because it is externalist. Rather, he argues that non-epistemic values function in theory acceptance in an internal fashion. Moreover, it is often claimed that one consequence of the underdetermination account of theory acceptance is that claims about scientific truth and scientific realism have to be rejected or reinterpreted radically. On this view, truth is merely (and only) the consequence of social construction. Given his commitments to scientific and moral realism, and so to the truth of scientific and moral theories, there is good reason to believe that Campbell would reject this sort of social constructionist solution to the problem of underdetermination and theory acceptance.[14]

To exemplify Campbell's contention, consider a view that has been discussed widely by feminists as a plausible case of androcentrism.[15] It has often been held that though there are large overlaps, males by nature are better at mathematics than females. The bases for this conclusion are the results of standardized tests such as the M-SAT. A number of auxiliary hypotheses are needed to connect the hypothesis under test with the supporting data. Among them are (AH-1), that mathematical ability is evidenced on standardized tests such as the M-SAT; (AH-2), that the content of a problem does not affect the formal properties of the problem; (AH-3), that the content of the problem does not affect the individual's grasp of the formal properties of the problem; and (AH-4), equality in the level of mathematical education of males and females can be determined by parity in the number and type of mathematical courses taken by a person. It is clear that some of these auxiliaries may be held on the basis of androcentric values, for instance: (AH-4), that parity between males and females in the number and type of courses taken suffices to establish that mathematical training is the same for both.

[14] Although a holist and not a social constructionist, Longino (1990) argues that the underdetermination of theories by facts inevitably leaves a role for values in the internal parts of scientific inquiry.

[15] I adopt this discussion from Longino (1992, pp. 183-184) with some revisions.

Androcentrism may allow this assumption, prevent questioning it, and hinder the pursuit of an alternative to it.[16]

We can formulate Campbell's argument that non-epistemic values operate within the empirical methodology for hypothesis testing in the following fashion:

1. An essential feature of the empirical justification of scientific hypotheses and theories is the successful use of an empirical methodology for their testing.
2. An empirical methodology for the testing of scientific theories and hypotheses has the features of (a) predictive success, (b) the independence of observation from the theory/hypothesis under test, and (c) explanatory power.
3. Auxiliary hypotheses play an essential role in each of these features.

Auxiliary hypotheses are laden with non-epistemic values.

4. Therefore, the empirical justification of scientific theories and hypotheses involves non-epistemic values (pp. 25-27).

Premises 1, 2, and 3 are relatively noncontroversial claims about the empirical justification of scientific claims. We can formulate Campbell's argument in support of Premise 4 as follows:

4a. Auxiliary hypotheses are influenced by the processes of discovery.
4b. The processes of discovery are laden with non-epistemic values.
4. Auxiliary hypotheses are laden with non-epistemic values.

Campbell takes 4b to be generally accepted, arguing that Thomas Kuhn's findings on this score have become common wisdom, and I shall not quarrel with it.[17] Nevertheless, I contend that Premise 4a is problematic.

We need to distinguish three different situations in which non-epistemic values might play role with regard to auxiliary hypotheses. First, non-epistemic values can influence the origin of auxiliary hypotheses. Second, non-epistemic values can play a role in the acceptance of auxiliary hypotheses in the sense of a decision to entertain them for testing. Finally, non-epistemic values might contribute to the justification of auxiliary hypotheses. To make his case Campbell must show that, according to the empirical methodology of hypothesis testing, non-epistemic values influence the justification of auxiliary hypotheses legitimately. However, Campbell presents no argument for that claim. Rather, he merely notes that the auxiliary hypotheses necessary for the achievement of each

[16] This auxiliary hypothesis has been refuted by two sorts of findings. One shows that the different toys and play experiences provided to males and females influence the development of different skills. Other shows that the same teacher in the same classroom treats boys differently than girls (Buerck, 1985, as referred to in Longino, 1990). Longino also cites Fennema and Sherman (1977) for findings concerning the effects of early play experience and both Becker (1981) and Gore and Roumagoux (1983) concerning classroom experience.

[17] It seems clear to me, and I surmise that Campbell would agree, that the processes of discovery do not always introduce non-epistemic values into auxiliary hypotheses, but this qualification does not affect Campbell's argument because he need establish only that in some cases auxiliary hypotheses are laden with non-epistemic values.

of the three elements of the empirical methodology for testing hypotheses originate in processes of discovery.[18]

One can concede to Campbell the trivially true claim that any hypothesis, whether auxiliary or not, can be traced back to some context of discovery. One can even concede to Campbell, for the sake of argument, the contrary-to-fact claim that all such auxiliaries were inspired by, and accepted because of, various non-epistemic values. Following empiricist norms for testing hypotheses, however, no such auxiliaries can play a legitimate role in attaining predictive success, theory independence, or explanatory power unless they are justified.[19] The logic of confirmation, so the empiricist would argue, has as its goal the attaining of a true hypothesis. Justification is the means for attaining it. Nothing else will do and everything else is irrelevant.[20]

Thus, I conclude that Campbell has failed to establish the claim that non-epistemic values play a normatively intrinsic role in the confirmation and falsification of hypotheses. However, there are several alternative holist suggestions current in the literature that might provide support for Campbell's contention. I turn now to an examination and evaluation of these suggestions.

Non-Epistemic Values, Available Hypotheses, and Systematic Bias

Ron Giere (1996) and Helen Longino (1996) have argued that non-epistemic values deriving from the context of discovery can play a role in the context of justification because justification is relative to available competing hypotheses and is comparative. In a recent paper Campbell (2001) presented a similar sort of argument for the role of non-epistemic values in the scientific methodology of hypothesis testing, one based on the notions of available hypotheses and systematic bias.

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[18] Campbell, 1998, pp. 25-26. Campbell seems to be contending that given that the context of discovery admits non-epistemic value commitments, these commitments find their way into the context of justification via auxiliary hypotheses. However, showing that non-epistemic values play a role in the context of discovery establishes only that non-epistemic values have played a role in the origin of a hypothesis, whether the hypothesis under test or auxiliary hypotheses. It does not establish that they have played a role in the acceptance of a hypothesis for purposes of testing it, let alone in its justification.

[19] Claims that tests have been successful are, of course, always fallible—nor is it likely that all the auxiliary hypotheses that play a role in the testing of a hypothesis can themselves be tested. Thus, no legitimate norm can require it.

[20] I set aside worries about the Gettier problem. Of course, scientific naturalists need not contend (as did the logical positivists and empiricists) that the logic of confirmation and falsification to which they appeal is understood and articulated by a priori means. Rather, on a scientific naturalist account of scientific methodology, the successful practices of scientists past and present serve as a key empirical source for determining the norms that embody in the so-called logic of confirmation and falsification. None of this is to say that scientists always get it right. They may mistakenly fail to apply the norms that they embrace. The norms of a certain period may be inadequate relative to later versions. Thus, unjustified auxiliaries may be used and the predictive success, theory independence, or explanatory power believed achieved may not be actually attained. However, these views about epistemic norms do not imply that non-epistemic values play a legitimate intrinsic role in the empirical methodology for the testing of scientific hypotheses and theories.

Campbell examines a testing situation in which a set of available competing hypotheses (e.g., H1, H2, and H3) are all, because of their sources in the context of discovery, sexist or androcentric. The currently available evidence, E, supports H1 over H2 and H3. He formulates the condition on explanatory power thusly ". . .a necessary condition for evidence E supporting a hypothesis H is that there is no credible alternative hypothesis H* that explains E as well as H" (Campbell, 2001, p. 203). He notes that that formulation has two interpretations. The weak interpretation requires that the set of competitors be only those hypotheses currently considered by the researchers or those that would be considered by them if brought to their notice. Under this constraint, a hypothesis, H, fulfills the criterion of explanatory power if the current evidence supports no other hypothesis in this set more than or as well as it supports H. The strong interpretation requires that the set of competitors be expanded further. The set contains not only those hypotheses currently being considered and those that would be considered if proposed but also a further group of hypotheses that would be available for consideration and be considered provided that there were certain changes in the research community's epistemic situation. These changes include ". . .appropriate experiences, imagination, and reasoning. . ." (Campbell, 2001, p. 204). Under the strong interpretation, H fulfills the explanatory power condition only if it is superior to any hypothesis in this expanded set (i.e., there is no hypothesis in the expanded set that the evidence supports at least as well as it does H).

To illustrate what Campbell has in mind, consider a speculative extension of the example I used earlier concerning mathematical abilities in males and females. The general alternative to the view that the significant differences that exist between males and females in mathematical abilities is due to innate abilities is, obviously, that they are due to a complex of learning history and testing situations. Suppose that one component of this alternative is the hypothesis (H*), that mathematical ability is evidenced in other ways than by performance on standardized tests (e.g., by mathematical learning and performance in group settings). It may be the case that such a hypothesis could explain the existing evidence of performance as well as H does and even account for any new findings concerning differences in performance. Campbell's contention is that androcentrism may play a role in the fact that H* is not considered while feminist values would allow its consideration. Androcentrism may prevent H* from being part of the relevant set of competing hypotheses. Feminist values would make it a part of the expanded set that ought to be considered if an adequate assessment of explanatory power is to be made.

Campbell himself offers several examples to illustrate his analysis. For instance, he analyzes the case of medical research on coronary heart disease. A working hypothesis, H, of that research in its early stage of development was that the nature and course of heart disease are the same in men and women. The similarity in mortality rates of men and women seemed to support that hypothesis. Under the weak interpretation of the explanatory power criterion, H fills the criterion. However, under the strong interpretation it does not. As was made clear

by subsequent research, there is an alternative hypothesis, H*. This alternative hypothesis, given the right sort of cognitive set among researchers, not only explains E as well as H but also explains further evidence, E*, concerning the differential course of heart disease in men and women. Under this strong interpretation of explanatory power, in order to achieve empirical support through the empirical methodology of hypothesis testing a hypothesis must be superior to all those within the expanded set of competitors, including H*. H fails to meet this criterion.

Because of this feature of empirical justification, Campbell argues that situations of systematic bias arise in scientific inquiry. These biases can be antithetic to feminist values or supportive of them. The former biases are bad and the latter good. He suggests as examples of bad systematic bias early studies of coronary heart disease, hypotheses in fertility research concerning the hypothesized active and passive roles of sperm and egg, and hypotheses in cognitive psychology about the superiority of male reasoning capacities. He argues that the locus of systematic bias is found in the theoretical background beliefs of the researchers. The weak interpretation of the set of competitors does not weed out this sort of bias. Thus, although a criterion of impartiality with respect to the fit of evidence and currently available hypotheses argues for the acceptance of H, it is not a satisfactory criterion precisely because it allows for and provides no way to protect against systematic bias. Consequently, he argues that to eliminate systematic bias, the strong criterion must be employed with respect to which competing hypotheses must be eliminated in order to establish explanatory power. However, the invocation of the strong criterion, because it involves background theoretical beliefs, will, of necessity, bring in non-epistemic values because those beliefs depend upon processes of discovery that all admit are open to non-epistemic values.

A critic can accept the notion of systematic bias and the existence of cases of systematic bias. However, one need not concede that this shows that non-epistemic values play a legitimate role in the process of the empirical testing of hypotheses.[21] The central issue concerns the epistemic standing of the background beliefs. Under the strong interpretation of the explanatory power condition, systematic bias involves a situation in which some hypotheses are not considered, even though they ought to be and, given a different cognitive set, would be. It is the failure to consider all of the hypotheses in the expanded set that leads to the apparent confirmation of one of the systematically biased hypotheses. At this point one might ask what is the source of the standing of the hypothesis H*, which, if

[21] Instead of focusing on auxiliary hypotheses as a source of non-epistemic value infiltration into the process of empirical justification, Campbell's new argument focuses on background theoretical beliefs including auxiliary hypotheses. Because these can systematically influence the composition of the set of hypotheses that are actively considered, they can bring it about that all of the actively considered hypotheses are systematically biased with respect to non-epistemic values, for good or ill. A critic can grant this. However, one will also note that this sort of situation is not confined to cases in which non-epistemic values are involved. It is quite general. Biases that tend to lead away from adequate justification, and truth can come from epistemic and non-epistemic sources.

considered, would be found to support the given evidence E at least as well as H, and which, in some circumstances, explains new evidence, E*, evidence not explained by H.[22]

For Campbell's argument to go through, the source of the superior or equal standing of H* cannot be merely that it is equally or better supported by E, for that sort of support is merely epistemic. It is not dependent upon any substantive or methodologically distinct non-epistemic values, so the source of its independent preferability must derive from its status as a background belief. As a background belief, H* either has epistemic support or it does not. If it does, that support might derive from other empirical sources or from the other criteria of justification that scientists often invoke, such as coherence with other justified scientific hypotheses or theories, heuristic power, and simplicity. In either case, however, non-epistemic values do not play a role in providing H* with an independent preferability that warrants its inclusion in the set of hypotheses that ought to be compared evidentially.

On the other hand, suppose that H*'s place in the expanded set of competitors is due to non-epistemic values. How could this occur? First, suppose H* is present because of some discovery source deriving from non-epistemic values. This is insufficient to give H* any epistemic justification superior to the other alternatives in the set unless we have some way of distinguishing between the justificatory preferability of various discovery sources. However, Campbell provides us with no independent way to distinguish the relative preferability of discovery sources.[23] Second, we might assume that H* itself is either a substantive claim about non-epistemic values or a factual claim that could be used in an inference in support of such a substantive claim. If so, either H* itself is justified epistemically or it is not. If it is justified epistemically, then its epistemic superiority in the expanded set is, in the final analysis, due to epistemic values rather than non-epistemic values.

[22] A second question also comes to mind: what are the sources of the failure of the research community to entertain the expanded set of hypotheses? In answering the second question Campbell gives charitable readings to the cases he investigates and urges this mode of interpretation as a default position unless there is empirical evidence to the contrary. On my understanding, the charitable reading restricts the sources of failure to cognitive, though not necessarily cognitively conscious failures, that is, failures that are immediately open to conscious access. Scientists do not follow the norms of proper scientific inquiry, norms that include the consideration of the expanded set of alternative hypotheses, because of the kinds of factors mentioned in the text, lack of certain experiences and failures to imagine and reason in certain ways. The first question is about appropriate norms and the second about what is required to act according to those norms. Because answering the first question is central to the issue of the role of non-epistemic values in scientific inquiry, I focus on Campbell's answer to that question.

[23] We can assume that those discovery sources connected with good biases are preferable to those associated with bad ones. However, this assumption merely moves the problem to another location, the epistemic standing of claims about non-epistemic values and the reliability, in the truth-conducive sense of the term, of the processes and methods used to establish claims about non-epistemic values. Of course, the second half of Campbell's research program is to provide answers for these issues. See Campbell (1998). I have also attempted to address these issues in my 1998, though in a different way than Campbell.

Finally, perhaps H* is present in the set because of some non-epistemic value source.

We can assume that non-epistemic values may influence auxiliary hypotheses either substantively, by affecting their content, or methodologically, by playing a role in the mode of their acceptance. A substantive claim can invoke non-epistemic feminist values directly or indirectly. A substantive claim directly invokes non-epistemic values if it is an assertion of feminist values or norms. For instance, the claim that gender equality is morally valuable is directly substantively value-laden with feminist values. On the other hand, a substantive claim is indirectly laden with non-epistemic values, if, though factual in character, it is used in an inference that supports a directly substantive value claim. For example, the claim that men and women, in most cases, have about equal reasoning capacities is indirectly substantively value-laden with feminist values insofar as it might be used in a morally normative argument, along with premises stating moral values, to draw a normative conclusion. As far as methodological influence goes, non-epistemic values can affect the acceptance of auxiliary hypotheses methodologically if scientists employ in their acceptance methodologies or cognitive mechanisms that are reliable in ascertaining non-epistemic values. Campbell, however, does not indicate what such a source might be.

Assume that certain cognitive stances provide justificatorily preferable avenues insofar as they are superior with respect to truth conduciveness. We might, then, hypothesize that some of these stances invoke or are based on non-epistemic values. Indeed, Campbell distinguishes between two sorts of objectivity, value-free objectivity and truth-conducive objectivity. To be objective in a value-free way is "to be uninfluenced by any concerns or values beyond those of reaching true conclusions and perhaps following the canons of good scientific practice" (Campbell, 2001, p. 198). To be objective in a truth-conducive fashion "is just to pursue an inquiry in a way that is conducive to finding out the truth about the subject of the inquiry" (Campbell, 2001, p. 198). We can interpret Campbell as arguing that a systematically good bias is epistemically preferable to systematically bad one precisely because the former is better epistemically—it possesses more truth-conducive objectivity. On the other hand, because it involves non-epistemic values it does not manifest value-free objectivity. The fact that H* is, then, the result of a cognitive stance that, if practiced in the right way, would produce systematically good bias would provide H* with an independent justificatory status and, consequently, the preferability we have been seeking. That status derives from its truth-conduciveness.

Both accounts of objectivity are dispositional, describing it in terms of the tendency of practices of inquiry to arrive at true claims. Value-free objectivity excludes non-epistemic means from these practices and tentatively includes practices that abide by acceptable scientific methods. Truth-conducive objectivity, on the other hand, allows for any inquiry that aids in finding the truth, which

would include the cognitive stances based on non-epistemic values.[24] One effect of this distinction is that whatever the role of non-epistemic values in inquiry, that role is governed by epistemic values because truth is quintessentially an epistemic value.[25] Non-epistemic values are in the service of epistemic values. But that, of course, does not conflict with Campbell's contention that non-epistemic values, if they of the right sort, do—and ought to—play a role in scientific inquiry. Non-epistemic values are of two sorts: substantive and methodological. Substantive value claims can play a role in epistemic inquiry insofar as they themselves have some justification. If the justification is due to purely epistemic means, then the discovery that substantive values have played a role in providing support for a hypothesis H* does not support Campbell's contention. What seems to be required in support of Campbell's contention is that these substantive non-epistemic value claims themselves be supported epistemically by cognitive mechanisms or methods that have a dual function, that of discovering both sorts of values. The cases of systematic bias to which Campbell appeals do not, as analyzed, reveal the presence and operation of such mechanisms or methods.[26] Thus, I contend that Campbell's argument from available hypotheses and systematic bias fails.

Non-Epistemic Values and Inductive Risk

Other holists have approached the issue of the role of non-epistemic values in empirical justification from a different direction. A more fine-grained examination of the process of empirical testing itself gives us another, perhaps more persuasive, reason to argue that non-epistemic values enter into the context of empirical justification. Empirical testing involves non-epistemic values in cases of inductive risk in which there is significant chance of error (Douglas, 2001; Hempel, 1965; Rudner, 1953). Inductive risk occurs in any testing situation in which there is a significant chance for false-positives or false-negatives. A false-positive occurs when one takes something to be the case that is not and a false-negative when one concludes that something is not the case when it is. Such situations are an intrinsic part of empirical hypothesis testing. In situations of inductive risk, in which there is also significant likelihood of practical action on the basis of scientific claims, the consequences of such action must be taken into consideration and evaluated. The evaluation of such consequences legitimately involves the consideration of non-epistemic values. Heather Douglas (2001) has illustrated this point with admirable clarity in the case of studies determining the toxicity of dioxins. Scientists must balance the non-epistemic costs and benefits of reducing or increasing the number of false-positives or false-negatives. Increasing false-positives and, thereby

[24] Thus, though, Campbell in places seems to think otherwise, both accounts of objectivity provide for the possibility of error. Failure can derive not only from the non-epistemic side but also from the epistemic. Consequently, bad systematic bias may derive from inquiry that is lacking with respect to merely epistemic values (e.g., the failure to use a double-blind procedure).

[25] This applies to Campbell because he is both a scientific and moral realist.

[26] This is not to say that there are no such mechanisms or methods. Indeed, as we shall see below, I think that there may be some.

decreasing false-negatives, favors public health at the expense of increased economic costs. Decreasing false-positives and, thereby, increasing false-negatives, favors the reduction of economic costs at the expense of public health.

Douglas's argument applies at a number of points in scientific inquiry in which inductive risk plays a role. Non-epistemic values can enter into scientific inquiry whenever inductive risk is involved, as it is when a scientist chooses a methodology, gathers and interprets data, or when he or she accepts a hypothesis as justified. In addition, different sorts of non-epistemic values, including gender-related ones, can enter into the empirical testing of hypotheses in any study in which there is inductive risk. Consequently, in situations of inductive risk in which there is significant likelihood of actions dependent upon the results of the empirical testing, non-epistemic values are and ought to be given explicit consideration. Scientists, therefore, do (and ought to) make assessments on the basis of the various epistemic and non-epistemic value priorities of the parties affected, scientists and non-scientists alike. Thus, a closer look at the actual practice of empirical hypothesis testing supports the contention that non-epistemic values play an internal role in science, in its empirical methodology of hypotheses testing, at least in all cases of inductive risk where the likelihood of practical application is high. Such cases, it seems, constitute a significant portion of scientific work.

One response to the argument from inductive risk is to argue that it applies to only practical, not theoretical, science (Hempel, 1965; McMullin, 1983). Indeed, Douglas herself concedes that there are cases in which inductive risk is non-existent or insignificant or when, even if there is inductive risk, the likelihood of practical application is low. In such cases the role of non-epistemic values disappears or is negligible. Thus, on this view theoretical science ought to pursue epistemic values. Practical science must also consider non-epistemic values. Consequently, externalist feminist reformers can continue to maintain that to the extent that non-epistemic values play a role in the empirical methodology of hypothesis testing within science proper (i.e., theoretical science), it is bad science.

Supporters of the argument from inductive risk can reply that this defense of the epistemic purity of the internal aspects of scientific inquiry trivializes the notion of epistemic purity because such cases of theoretical science seem to be few, given the current practice of science. The practical–external/theoretical–internal distinction enables its supporters to retain the epistemic purity of the empirical methodology of hypothesis testing by restricting its range severely while it relegates most of scientific inquiry to its external aspects. Thus, most of science and most of its aspects are properly subject to evaluation in terms of non-epistemic values. As a result, supporters of the argument from inductive risk might contend that it would be much better to eliminate the distinction between external and internal aspects of scientific inquiry. Instead, they would commend the diligent adherence to both non-epistemic and epistemic norms wherever non-epistemic and epistemic goals are being pursued in the practice of science, be that in the so-called external parts of scientific practice or its so-called internal parts.

However, in reply, critics of the argument from inductive risk can offer a more radical critique of that argument. They might contend that a distinction must

be made between, on the one hand, setting the statistical standards that will be operative in determining the amount of inductive risk, the relative portion of false-positives and false-negatives that will be considered significant and, on the other hand, the determination of the actual error present. The normative judgment about the relative amount of error that will be allowed is partially determined by the non-epistemic values that govern the consequences of actions based on the affirmation of the hypothesis under test or its denial. However, once the standards are set, epistemic ends and standards govern the determination of the actual amount of error present (Lacey, 1999a, 1999b). The advocate of the argument from inductive risk can concede this point but nevertheless argue that one of the necessary premises in the reasoning process leading to acceptance or rejection of the hypothesis in question is partially supported by non-epistemic values. This is the premise that enunciates the error rate allowable in the predicted phenomena, so the reasoning process as a whole cannot be completed without the use of non-epistemic values.

In reply, the radical critic of the argument from inductive risk can contend that whether or not there is inductive risk, the scientist always has a primary obligation to consider the practical application of his work. Indeed he might argue that in cases of practical application in which there is little or no inductive risk, the likelihood of action on the claim that p (or the claim not p) is even greater. Action in these situations is more likely because there is more assurance about the scientific results to be employed. Thus, the radical critic of the argument from inductive risk might argue as follows: A scientist's duty qua scientist is to seek the truth, and his or her duty qua moral agent is to do the morally right thing. He or she has both duties in all cases, whether or not they involve inductive risk. Whether in situations of inductive risk or in situations of its absence, the scientist first ought to fulfill his or her obligation as a moral agent by considering the non-epistemic moral consequences of actions based on her claim that p (or that not p). Thus, the presence of inductive risk does not show that non-epistemic values are a part of the internal process of the empirical testing of hypotheses. Rather, it shows how, in the work of most scientists most of the time, internal epistemic and external non-epistemic considerations are woven together with non-epistemic moral values, rightly taking precedence over epistemic ones.

The radical critique of the argument from inductive risk depends crucially on the distinction between epistemic and non-epistemic values. Whether a pursuit belongs to the extrinsic or intrinsic part of scientific inquiry depends on whether that pursuit is epistemic or not. But how coherent is that distinction?

The Coherence of the Distinction Between Epistemic and Non-Epistemic Values

Feminist philosophers of science, for instance, Longino (1996) and Rooney (1992) have challenged the coherence of the distinction between epistemic and non-epistemic values. They have argued that the boundary between epistemic and non-epistemic values is fuzzy and that there is no in-principle distinction between

the two. At best, the distinction is contextual. In attempting to determine the truth of scientific claims, philosophers of science often appeal to empirical adequacy, internal and external coherence, explanatory and heuristic power, and simplicity as criteria of truth. As such, these criteria are themselves epistemic virtues or means to the epistemic virtue of truth. Feminist philosophers of science have provided a somewhat different list (Longino, 1996). Besides empirical adequacy, we find novelty, ontological heterogeneity, mutuality of interaction, applicability to human needs, and diffusion of power. The latter list clearly contains what seem to be non-epistemic values (e.g., applicability to human needs and diffusion of power). Feminist philosophers of science can contend that even if these values have not played a role in past scientific practice, they ought to do so. What makes for "good" science in this account is that the particular set of values that are pursued, whether epistemic or non-epistemic, are supported in the proper manner. For instance, Longino (1992, pp. 112-113) argues that the pursuit be carried out according to four criteria for transformative critical discourse.[27]

The no significant distinction argument, however, is open to an obvious objection. As already noted, some of the values on the feminist philosophers of science are clearly non-epistemic in character (e.g., applicability to human needs). A critic will argue that such values do not belong on the list of epistemic virtues, no matter how valuable they might be in themselves as moral virtues or indicators of the achievement of the moral good. Only epistemic values belong on that list. Though non-epistemic moral values, such as feminist values, may rightly trump epistemic values in cases of conflict, the two sets of values remain distinct.

In the next two sections I shall argue in agreement with the obvious objection that the distinction between epistemic and non-epistemic values stands. However, I shall also argue in agreement with the holist arguments that I have examined that non-epistemic values do—and, in the proper circumstances, can—legitimately influence both the so-called external and internal factors of scientific inquiry. In particular, I shall examine the legitimate role of non-epistemic values in the pursuit of epistemic values.

Vindicating a Legitimate Role for Non-Epistemic Values in Scientific Inquiry

We started with a traditional distinction between external and internal aspects of scientific inquiry. The external aspects included (1) problem selection, (2) the

[27] Paraphrasing, these require (1) publicly recognized fora for the criticism of evidence, methods, assumptions, and reasoning, (2) a community tolerant of dissent and showing changes in beliefs and theories over time because of critical discourse within it, (3) publicly recognized standards of evaluation including, though not necessarily, the sets of epistemic and non-epistemic virtues discussed in the text, and (4) a community characterized by equality of intellectual authority that leads to consensus on the basis of critical dialogue in which all relevant perspectives are represented. (Longino, 1992, pp. 112-113). In her recent book (Longino, 2002), which only came to my notice after writing this paper, Longino argues in some detail that social inquiry of the sort characterized above can achieve epistemic ends.

uses to which scientific knowledge are put, (3) the kinds of methodologies that are employed ethically in the study of humans and other animals, and (4) processes of discovery.[28] Internal aspects refer to the various processes of justification of scientific claims (e.g., empirical methodologies for testing hypotheses and theories) demonstrating the explanatory power of a theory or hypothesis, establishing coherence between a hypothesis under test and already-justified hypotheses and theories. Traditionalists argue that, though in cases of conflict non-epistemic moral values rightly have priority, epistemic values legitimately govern the internal aspects of scientific inquiry while non-epistemic values are determinative in the external aspects of scientific inquiry, and legitimately so. Thus, the traditional divide between the role of epistemic and non-epistemic values in scientific inquiry has been made at the boundary between the external and the internal aspects of science.

However, as we have seen, this boundary has been challenged. The holist feminist epistemologists that we have examined argue that internal processes of scientific inquiry are also rightly governed by non-epistemic values. Some have claimed that non-epistemic values enter the process of empirical justification by influencing, via the discovery process or background theoretical beliefs, the set of alternative hypotheses to be compared for empirical confirmation and/or explanatory power. Others have argued that legitimate acceptance of a hypothesis often requires a consideration of non-epistemic values, as in the cases of inductive risk. Still others have challenged the distinction between epistemic and non-epistemic values. Defenders of the traditional view have responded by placing processes in which non-epistemic values play a legitimate role outside the intrinsic core of scientific inquiry. As a consequence, they seem to risk placing almost all of scientific inquiry in its extrinsic surrounds and emptying its core.

I conclude from this dialogue that the external/internal distinction has played the role of a marker for the more fundamental distinction between epistemic and non-epistemic endeavors. That distinction is between the methods of epistemic justification that serve only epistemic ends (e.g., truth) and methods of non-epistemic legitimization that serve non-epistemic ends, such as moral values, including feminist values. Transformist, reformist, and holist feminist epistemologists have generally accepted the presupposition of this fundamental distinction, namely that the epistemic value of truth is distinct from the non-epistemic value of moral goodness, including the moral goods achieved by feminism.[29] The distinction rests on the claim that what is the case is not necessarily what morally ought to be the case. Nor is finding out what is the case

[28] Discovery processes have internal and external features. They have an internal feature because they seem to involve epistemic values insofar as they are aimed at producing credible hypotheses and theories. Yet, because they are, in many instances at least, distinct from justification processes, they seem to belong to the external aspects of scientific inquiry. Because of the distinction between discovery and justification, discovery processes have been classified as external. However, there is some reason to challenge the necessity of the distinction between processes of discovery and justification, that is, between ways of coming to a hypothesis and ways of justifying it. An obvious case from ordinary knowledge is perception.

[29] That is not to say that they all hold the same account of truth.

necessarily identical with determining what ought to be the case or whether something that is, was, or will be the case ought to be the case. Thus, abstractly considered, truth-seeking and good-seeking are different enterprises because their goals are distinct.

Given the above dialogue between holists and their traditionalist respondents, what sort of holist position should we formulate? I shall formulate a revised holist position, one that I shall call epistemic holism. Epistemic holism is *holistic* because, in agreement with transformists and holists like Campbell and Longino, it contends that both epistemic and non-epistemic values have a role to play in all parts of scientific inquiry, both external and internal. Epistemic holism is *epistemic* in two senses. First, it is epistemic in the goal-directed sense that it makes the search for epistemically significant truth the central goal of scientific inquiry. Besides the goal-directed sense of epistemic, epistemic holism is epistemic because it contends that non-epistemic values play a role in scientific inquiry precisely because of their truth-conducive features. These features are either substantive or methodological. The holistic feature distinguishes epistemic holism from the reformers who argue that the intrinsic features of scientific inquiry ought to be non-epistemically value-neutral. The first sense of its epistemic character marks off epistemic holism from such holists as Longino who make the pursuit of non-epistemic values an inescapable aspect of scientific inquiry. The second sense of epistemic sets off epistemic holism from Campbell's holism insofar as the latter does not include the notion of methodological truth conduciveness that I shall describe below.

Let us take as established the correctness of the general feminist contention about the moral value of gender-equality and the moral evil of sexism and androcentrism.[30] Feminist and like-minded non-feminist philosophers of science can conclude that those non-epistemic values that are anti-feminist ought to be eliminated from any aspect of scientific inquiry, both the so-called external and intrinsic aspects of scientific methodology. In addition, they can agree that pro-feminist values ought to be incorporated into both the external and intrinsic scientific methodology, no matter how the distinction between external and internal is drawn, whenever, as in the cases of inductive risk and systematic bias, non-epistemic values come play a role.[31] However, this conclusion does not imply that the pursuit of scientific truths is made hostage to the pursuit of non-epistemic values. Rather, it means that scientists, as moral agents, have a duty to take their moral responsibilities, including gender-related ones, into account in the pursuit of their scientific goals in all aspects of their inquiry, whether external or internal. In cases of conflict the former should, as a general rule, take precedence.

[30] I have not argued for this contention, nor does Campbell. I take it to be philosophically uncontroversial. There are disagreements, of course, even among feminists, about what count as feminist values and how to justify claims about feminist values. My claim does not settle these disagreements.

[31] Of course, this would also be the case with any properly established set of moral values, whether feminist or not.

According to this holist feminist understanding, scientists ought to pursue both epistemic and non-epistemic virtues in all aspects of their work. The traditional distinction between external and internal parts of this activity does not reflect this reality adequately; indeed, it seems to hide it. In addition, maintaining the distinction as a marker of the aspects of scientific inquiry that are concerned with non-epistemic and epistemic values, respectively, could be harmful. Maintaining the marker function might help promote the belief that science itself is concerned with only epistemic values and that pure scientists do not have a responsibility to concern themselves with non-epistemic values. Rather than attempting to refine the external/internal distinction in an effort to find an internal core that involves only the pursuit of truth, a more fruitful strategy is available. It is better to describe and evaluate the actual contours of scientific practice and to discern in each the role of values, whether epistemic, non-epistemic, or both. The assessment of both epistemic and non-epistemic values should be considered to be part of scientific inquiry. This prescription does not threaten the rationality and objectivity of science as long as we endorse a cognitive account of moral values endorsed.[32] Under a cognitive account of values, the quality of the pursuit of both epistemic and non-epistemic ends is open to objective consideration and assessment (Machamer & Douglas, 1999). A traditionalist critic might find it problematic that that kind of assessment is really possible in the case of non-epistemic values. Moreover, if that sort of assessment is not possible, then the attempt to establish the truth-conducivity of non-epistemic values fails. So, in conclusion, let us briefly examine the question of whether and how non-epistemic values are open to objective consideration and assessment.

The Truth-Conduciveness of Non-Epistemic Values

The epistemic holist maintains the distinction between epistemic and non-epistemic values, even when the latter are understood to be subject to rational assessment and the tools with which they are assessed overlap with those used to evaluate the pursuit of epistemic values. Nevertheless, the epistemic holist might argue that the recognition and pursuit of non-epistemic values have, in the long-run, a better truth-tracking record than will the lack of such recognition. For instance, male-dominated science eventually eliminated the errors of Aristotelian biology along with its androcentrism and sexism. However, a feminist biology might have gotten rid of both more quickly. The pursuit of such non-epistemic virtues ought to be incorporated into decisions about epistemic justification.

The truth-conduciveness of the pursuit of non-epistemic values might occur substantively or methodologically. Substantive truth-conducivity, if established,

[32] Indeed, the other half of Campbell's project is intended to support the rationality and objectivity of the pursuit of non-epistemic values, including feminist values, by arguing for the naturalization of feminist epistemology by means of a contractarian and moral realist account of ethics. Though I am an advocate of both naturalized epistemology and moral realism (Rottschaefer, 1998, 1999), I am not persuaded that the bases provided by Campbell for the second part of his project to naturalize feminist epistemology are adequate.

would show that the justified claims about non-epistemic values or justified claims about factual matters concerning gender issues, for instance, may themselves be truth-conducive and so serve epistemic ends. Substantive claims about non-epistemic values—or claims about factual issues related to these values—can play a legitimate role in the justification of claims about matters of fact, including scientific claims by means of a coherence criterion. The criterion of coherence plays a role here. The coherence of hypotheses or theories under test with established substantive claims about non-epistemic values would serve as a source of justification for these hypotheses or theories.

What about the truth-conduciveness of the methods and processes that provide legitimization for non-epistemic values? Are there processes and methods of non-epistemic value legitimization that are also processes and methods of achieving epistemic values? We have seen that there is some overlap in this area in terms of the employment of consistency, coherence, and explanatory power as methods of legitimization of non-epistemic values and justification of epistemic values. An interesting feature of this set of overlapping justifying processes is that they are cognitively mediational or inferential. They are neither input nor output processes or methods. Do we have evidence that any such input/output mechanisms of non-epistemic value legitimization are also truth-conducive? Are there processes or mechanisms that reliably produce true moral beliefs and that in conjunction with other cognitive mechanisms—or independently of such mechanisms—lead to right moral actions reliably?

Campbell appeals to several sources for feminist value legitimization, among them experientially generated processes and feminist contractarian moral reasoning.[33] Let us consider some version of these processes that might be reliable methods/processes of both non-epistemic and epistemic value origination. Such processes might play a role in the empirical methodology of theory testing by supporting certain sorts of auxiliary hypotheses or background theoretical beliefs needed for predictive success, theory-independent observations, or explanatory power. They might also provide epistemic justification for the hypothesis under test, for required auxiliaries or for background theories. They might serve not only to generate the hypothesis under test but also to provide epistemic justification for that hypothesis. They would be causes that are usually also good reasons, as is the case with perceptual processes, in which our senses are not only the sources of many claims but also provide good, prima facie reasons to think the claim true. This seems to be particularly plausible given what we know about emotional knowledge, such as is derived from empathy, and contractarian reasoning, in which

[33] Although I here take my cue from Campbell's suggestions, my proposed epistemic holism differs from his holism. Campbell argues for an ideal observer theory of moral truth. Unlike his understanding of scientific truth, moral truth is what an ideal ethical observer would judge to be morally valuable or normative in ideal circumstances. I, however, interpret the truth of moral claims in the same way as the truth of the factual claims of science, in a correspondence sense. Thus, his sources for moral truth are truth-conducive in a difference sense than are the ones I propose. This difference leads me to suspect that his account of the nature of the sources for the justification, and thus for the truth of moral claims, would differ significantly from mine. See Zagzebski (1996) for another form of epistemic holism that combines epistemic and moral virtues.

the exchange of perspectives and critical reasons about what is fair generates fair practices. Thus, in theory at least we can suppose that feminist mechanisms that reliably achieve feminist values can play a role in the epistemic justification of scientific hypotheses precisely because, ex hypothesi, they are mechanisms that generate both truth and moral value reliably.

Such dual function mechanisms or methods—ones that are both truth- and value-conducive—may in fact exist. The capacity for empathic distress may be an example. Developmental psychologists are making a good empirical case that the developing infant and toddler acquires a reliable capacity both for discerning that another is in distress and being motivated effectively to help. They are also showing that empathy is a reliable mechanism for discerning another's distress and acting on it. Inductive moral instruction, in which the caregiver points out to the toddler that someone is in distress and that the toddler should not do things to cause that distress or help others when in distress, links with the toddler's capacity for empathic distress. This sort of moral instruction has been shown to be more effective in the acquisition of conscience than either love withdrawal or assertions of power by the caregiver (see, for example, Eisenberg, 1992; Hoffman, 2000). Thus, there is reason to think that such dual function mechanisms may be more than theoretical possibilities.

My goal in this section has been the limited one of suggesting ways in which a holist feminist epistemology might be made plausible while maintaining the primacy of epistemic values in the justification of scientific inquiry. To do so I have offered a version of holism that I have called epistemic holism. It finds a role for non-epistemic values in the pursuit of truth. Some epistemically justified claims about non-epistemic values might be truth-conducive in the way that other justified claims are because of coherence. They lend support to hypotheses and theories under test that cohere with them. In addition, non-epistemic values may be truth-conducive because of hypothetically postulated mechanism and methods that are productive of both epistemic and non-epistemic values, which, if shown to exist, could play a legitimate role in scientific inquiry precisely because they would be truth-conducive. I have not attempted to demonstrate the existence of the truth-conducive roles that are postulated by epistemic holism. However, I have tried to make a case for the plausibility of such truth-conducive roles for feminist non-epistemic values.

Conclusion

I have laid out a line of argument that supports a modified version of holist feminist epistemology of science, epistemic holism. In agreement with holists, I have argued that the history and current practice of science reveals that scientists in fact—and, in theory, ought—to consider and evaluate the non-epistemic values, including feminist values, that occur within the various parts of their work. These parts are not only the so-called extrinsic aspects of scientific inquiry traditionally recognized as those in which non-epistemic values have (and ought to) play a role; they are also the so-called intrinsic processes of discovery and of justification,

including empirical justification. The extent to which non-epistemic values do or ought to play a role is not to be determined a priori but empirically. Non-epistemic values have this legitimate role to the extent that non-epistemic values ought always to be considered when they come into play, even in our epistemic pursuits, but they may also have a role in so far as they are embodied substantively or methodologically as truth-conducive. Non-epistemic values function in scientific inquiry not only because scientific inquiry is often legitimately subordinated to the pursuit of these values but also because sometimes non-epistemic values themselves promote the pursuit of epistemic values.

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