Reconciling Objectivity and Accountability in Science: A Pragmatist Approach

Few debates in the philosophy of science can claim more relevance for humanism than that concerning the proper role of social, political, and ethical values in shaping scientific inquiry. Although humanism eludes a simple definition due to its complex history,[1] it is generally characterized by a combination of moral and epistemic concerns. Proponents of humanism take their central aims to include the enhancement of human well-being through the pursuit of moral values like human dignity, democratic organization, peaceful cooperation, political equality, and freedom.[2] But while humanism has moral values at its core, its proponents consistently emphasize the epistemic pursuits of science. The American Humanist Association, Humanists UK, and Humanists International all prominently feature the scientific method in public presentations of their views, and scientific humanists such as Steven Pinker, Alan Sokal, E. O. Wilson, and Richard Dawkins proclaim scientific knowledge to be a core aspect of their humanism (Pinker 2018; Dawkins 2017; Sokal 1996, 1997; Wilson 2005, 1998; Shermer 2019). For them, progress on a moral and social level is understood to result from the application of scientific methods to solving problems, "from engineering bridges and eradicating diseases to extending life spans and establishing rights" (Shermer 2019).

For many prominent humanists, however, the ability of scientific research to contribute to moral and social progress does not lie in its conscious adoption of progressive values, but rather in the exact opposite: in value-free epistemic methods oriented towards purely factual representations of the world. We find humanists asserting that science's value-free methods can "repress the fallacies and dogmas that so readily seduce us" and reveal the way the world really stands, providing humanity with the untainted, objective knowledge it requires to materially manifest its moral ends (Pinker 2018, 429). This value-free method of obtaining objective knowledge is favorably contrasted with sources of knowledge which *are* consciously directed by social, political, or ethical values, such as religious dogma, political authority, or cultural tradition. These latter, it is alleged, lead humanity

[1] See Davies 2001 for an account of humanism's complex, centuries-long history, and its consequent evasion of clear-cut definitions.

[2] Such definitions are found among organizations such as the American Humanist Association, Humanists UK, and Humanists International, as well as scholarly analyses such as Weldon 2020 and Davies 2001.

away from genuine knowledge towards "wishful thinking, superstition and demagoguery" (Sokal 1997). Science's capacity to enhance human wellbeing relies on its intentional and scrutinous *exclusion* of value-judgments and its exclusive focus on value-free factual representations of the world. Echoing the 'value-free ideal of science,' this view holds that, to retain its integrity and authority as a source of useful, objective knowledge, science's selection and assessment of theories should be governed by purely epistemic, truth-oriented considerations—or 'epistemic values' (Douglas 2009; Lacey 1999). These epistemic criteria are traditionally thought to include the empirical adequacy of a theory, its predictive accuracy, its internal (logical) consistency, its consistency with other well-supported scientific claims (external consistency), its breadth of explanatory scope or unifying power, its simplicity, and its likeliness, once posited, of leading to further avenues for inquiry (fruitfulness) (Kuhn 1977).

Unfortunately for this brand of humanism, the value-free ideal of science has been widely rejected by philosophers, historians, and sociologists of science. This popular view of science, they say, confronts an immediate and obvious problem. A variety of controversies over the pursuit and application of scientific knowledge has shown that science's reputation as a straightforward instrument towards moral progress is "not especially well grounded in science's actual track record or balance sheet" (Fuller 2010, 6). Research into the biological determinants of intelligence and behavior have been characterized as based in, and legitimizing, racist and sexist ideologies (Gould 1996; Longino 1987, 1990). Institutions of science have been criticized for directing their research towards military exploits (Kevles 1987), legitimizing capitalist ideology (Haraway 1991), and assisting in industry monopolization (Winner 1980). And the history of coercive interventions and discriminatory practices in medical science have raised questions about the universality of the 'human' well-being served by scientific knowledge (Washington 2006). We apparently cannot take for granted that science will provide opportunities for constructive improvement—cures for diseases, disaster prevention, transportation, and communication—rather than opportunities for moral regress and destruction—industrialized warfare, forced sterilization, environmental degradation, and political oppression. The recognition of this fact has led to calls for more careful appraisal and conscientious employment of ethical and political values when directing and conducting scientific research (Brown 2020; Kourany 2010; Douglas 2009; Longino 2002). Only then, it is claimed, can we be confident that science's epistemic goals will serve overall positive ends.

In this chapter, I consider the long-standing debates in philosophy of science concerning the proper role of values in scientific inquiry, with special consideration for its relevance to competing humanist requirements (a) to sustain science's objectivity as a source of knowledge and (b) to ensure its direction towards progressive moral and social outcomes. In the next section, I show how the widespread rejection of the ideal of value-free science has been largely due to the practical and logical impossibility of a 'rational core' of purely epistemic scientific methods that can insulate the production of scientific knowledge from the influence of human values. Despite these arguments, there remain anxieties that the intentional incorporation of political, social, and ethical values into scientific criteria will introduce human bias into scientific knowledge and will damage, if not destroy, the precious objectivity upon which scientific authority is based. In the following section, I consider the ways in which those promoting value-infused scientific methods have recognized the legitimacy of this concern and have sought ways to sustain a concept of scientific objectivity for value-conscious science. While recognizing the merits of these approaches, I argue that they do not directly confront an underlying assumption motivating the compulsion to retain an epistemic 'core' of value-free methods in the production of scientific knowledge. This is the assumption that objectivity consists in the representation of a world external to and independent of human perspective, valuations, and goals; a notion of objectivity which sustains a view of epistemic standards as functioning to remove the biases and idiosyncrasies of distorting human perspectives (including value-judgments) to reveal the way the world truly stands. Rejecting this concept of objectivity, in the subsequent section, I offer a pragmatist account of epistemic standards as specifically developed and adapted through their successful employment in seeking resolutions to human problems and intelligently guiding human interventions. In this account, epistemic standards do not derive their normative status from their capacity to produce perspective-independent representations, but from their intentional adaptation towards the manifestation of human goals. Methodological objectivity, therefore, is not only consistent with an explicit orientation towards value-laden purposes; it increases as methods continue to adapt to shifting purposes in human life. This theory of epistemic methods and their normativity can provide a basis for deeply value-infused scientific methods whose objectivity and authority consist precisely in their incorporation of value-laden concerns.

A "Rational Core" of Epistemic Methods

The tension between the points of view sketched above concerning the employment of value judgments in science may strike some as merely apparent. We employ values in scientific research all the time, in ways that need not interfere with the objectivity of the knowledge produced. Ethics committees limit science's research methods to those which will not cause harm to human subjects and the environment; Professional committees seek to remove discriminatory barriers to the employment of women and people of color in science; Government policies such as the Revitalization Act of 1993 ensure women and people of color are represented in biomedical research; and decisions as to which research to fund amidst limited financial and human resources are guided by value-judgments concerning the needs of society. Although they influence the choice of research topics and place limitations on methods, it may be said that these value-laden influences do not affect what has been called the "rational core" of scientific inquiry: "the core area of scientific inquiry that deals only with facts, or only with justification relationships between evidence, hypothesis, and theories" (Rooney 2017, 33). This is sometimes framed as the distinction between the *context of discovery*—which is influenced by contingent social factors such as who discovered a theory, when, and how—and the *context of justification*—in which scientists are purely concerned with assessing the logical and epistemic relations between evidence and hypothesis (Reichenbach 1938). Since this latter context of scientific justification permits only epistemic standards to play a role in theory assessment, there is no necessary problem of scientific objectivity caused by value-laden restrictions and selections in the context of discovery.

Unfortunately, the issue cannot be so easily resolved. This is because many philosophers (especially stemming from the tradition of feminist epistemology) have challenged the possibility of a rational core of science structured according to epistemic procedures alone, and the accompanying possibility of producing value-free facts. They show that values enter scientific reasoning even at these purportedly internal stages of theory justification. Prominent among these challenges are arguments from the necessity of unforced value-laden choices occurring throughout the process of scientific reasoning. According to these criticisms, in the course of their assessment of evidence and theory choice, scientists encounter choices which cannot be decided by epistemic criteria alone and therefore come under the influence of values. Additionally, such choices are argued to carry moral and political consequences. Two versions of choice-based arguments against the value-free ideal are

the argument from inductive risk (Douglas 2009; Rudner 1953) and the argument from underdetermination (Longino 2002, 1990).

The argument from inductive risk, recently championed by Heather Douglas (2009; see also Rudner 1953), stems from the fact that scientific inquiry involves inherent uncertainty in inferring a theoretical conclusion from evidence. The evidence is never sufficient to infer a conclusion with complete certainty, so a risk of error of varying degrees inevitably remains. A decision therefore arises as to whether the available evidence is sufficiently strong to justify the inference, where 'sufficiency' here requires a value-judgment concerning the ethical or moral significance of the consequences of error. For example, the hypothesis that a vaccine is safe for administration among humans ought to be tested to a higher degree of statistical significance than a hypothesis concerning the durability of belt buckles because the consequences of error are much graver (Rudner 1953). Since the inductive nature of scientific inference requires this sort of ethical judgment, the 'rational core' image of science is either false or requires significant qualification. The argument from the underdetermination of theory by evidence, most notably developed by Helen Longino (1990, 2002), points out that a set of background assumptions are structurally necessary for data to act as a source of relevant evidence for a theory. These background assumptions are not uniquely determined, and our choice of assumptions is influenced by, and pertinent to, social, political, and ethical values. In case studies of research into the biological determinations of gendered behavior, for example, Longino shows that background assumptions—such as how to categorize empirical observations, what kind of evidential phenomena can feature in explanations, and in what kind of relationship to the explicandum—are not forced by epistemic considerations, but are influenced by social, political, and ethical values (1990).[3] Expanding on Longino's research, Rooney argues that the permeability of influence between scientific methods and broader social values in the process of inferring theory from evidence throws into question not only the practical possibility of applying purely epistemic criteria, but the very coherence of the distinction between epistemic and non-epistemic influences (1992, 21). What we take to be 'simple' or 'fruitful' in a theory, she argues, is impacted by the culturally determined value of what features of the world that theory is, respectively, combining or opening up to future research. Rooney therefore suggests that we abandon the quest for a clear

[3] My account of these arguments is necessarily briefer than they deserve. For a more comprehensive account of the argument from inductive risk, see Douglas 2009; and for a more comprehensive account of the argument from underdetermination, see Longino 1987. For a discussion of the strengths and limitations of each, see Brown 2013.

distinction between epistemic and non-epistemic values, and consider them to be connected by a 'robust borderlands area' of methodological criteria that are not exclusively one or the other (2017).

With the pervasiveness of unforced value-laden choices and the difficulty of establishing clear distinctions between epistemic and non-epistemic criteria, it seems we lack a formal structure with which to insulate scientific methods of theory evaluation from the influence of values. Given this inevitable role for values in science, it makes better moral sense to navigate science's values intelligently and responsibly than to allow them to manifest arbitrarily. Careful value-based choices are more likely to make scientific research responsive to the ethical and political needs of society, to manifest its positive capacities, and to avoid its destructive potential from actualizing. It is on this basis that Longino has suggested incorporating intentional considerations of social, political, and ethical values into scientific criteria of theory assessment. She takes the traditionally recognized epistemic criteria—empirical adequacy, internal and external consistency, simplicity, breadth of scope, fruitfulness—and suggests alternative, feminist methodological criteria to direct science towards politically progressive and emancipatory outcomes. Instead of *consistency* with other presently accepted theories, scientists could evaluate a hypothesis according to a standard of *novelty*, whereby a hypothesis is desirable for "postulating different entities and processes, adopting different principles of explanation, incorporating alternative metaphors, or. . . attempting to describe and explain phenomena that have not previously been the subject of scientific investigation" (Longino 1996, 45). A criterion of novelty, Longino argues, would better avoid the assumptions of androcentrism and heterosexism plaguing mainstream theoretical frameworks. In place of *simplicity* and *breadth of scope*, science could adopt standards of *ontological heterogeneity* and *mutuality of interaction*. Rather than an ontological position in which "[d]ifference must be ordered, one type chosen as the standard, and all others seen as failed or incomplete versions," a science conducted according to a standard of ontological heterogeneity would build a natural ontology consistent with egalitarian politics, that "permits equal standing for different types" (1996, 47). Since "[a]symmetry of agency in the physiological context is used to naturalize asymmetry in the social," a science conducted according to the standard of mutuality of interaction would build a natural ontology in which multiple parties to an interaction would be active rather than passive, preventing justifications of sexism in the social realm emerging from scientific inquiry into nature (1996, 47).

This approach to scientific inquiry would help ensure that science's epistemic pursuits are oriented towards progressive social outcomes. However, suggestions to infuse progressive ethical

and political values into the selection criteria for scientific theories have struck many humanists as unacceptable, and there has been a significant backlash to them. Some are unprepared to recognize science's 'epistemic core' as inherently value-laden, pointing out the significant dangers of this philosophical account for the perceived objectivity of scientific knowledge. Scientific knowledge, they admit, is "liable at any moment to produce results that demolish one or another cherished preconception of ideology"—for example, it may be "unacceptable by feminist lights" (Gross and Levitt 1994, 146-7). But, they say, scientific methods following proper epistemic procedures are nevertheless protected from the perceptual errors and personal and political biases which distort the factual objectivity of knowledge claims. Incorporating specific social and political values into the criteria of scientific inquiry would, on the other hand, threaten the core of scientific objectivity and pave the way for the legitimization of politically motivated science. Some draw comparisons with research projects which downplayed the harmful effects of smoking or downplayed the evidence for human-induced climate change (Rooney 2017, 40; see also Oreskes and Conway 2010). In these cases, political values and economic interests corrupted science, misdirecting the public towards regressive or harmful beliefs and policies. The solution to such politicized science, they claim, is to insist on *more* rigorous restrictions of the influence of values on scientific methods, to prevent corruption of the knowledge produced and ensure we arrive at truthful theories of the world. Promoting an intentional role for values will only damage science's objectivity further.

This argument may strike one as odd—after all, permitting *select* values to play a role in scientific inquiry does not entail that we must permit *any and all* values, whether feminist or fascist (see Kourany 2008 for a discussion of this point). Such concerns, however, are not unfounded. The authority and objectivity of scientific knowledge are generally thought to derive from the integrity of scientific methods—an integrity usually interpreted to mean freedom from value-judgments and orientation towards facts. The significance of rejecting this interpretation is illustrated by instances in which the rejection of the 'rational core' has in fact been the basis for rejecting science's epistemic authority. As Longino herself points out, sociological and historical accounts which emphasize the influence of social and value-laden factors in science's epistemic criteria frequently conclude that scientific knowledge cannot therefore be rationally justified (Longino 2002, chap. 2). During the Science Wars of the 1990s, for example, it was not unusual to encounter claims there is "nothing distinctive to differentiate science from any other social activity," its knowledge claims being no more or less authoritative than knowledge arrived at by other, non-scientific methods (Ross 1996, 6).

In such a view, science's purportedly objective methods and facts are merely an ideological justification for the pursuit of science-affiliated political agendas; a smokescreen employed "to fend off social criticism" (Ross 1996, 13). Although opinions on this vary, some have even suggested that recent populist rejections of scientific knowledge, and the accompanying proliferation of "alternative facts," derive their credibility from academic arguments that scientific knowledge is inevitably perspectival and value-laden (Rosenfeld 2019, chap. 4).

While a value-free approach towards science is not appropriate for humanist philosophies for the reasons explored above, a wholesale rejection of scientific objectivity would pose major problems. The integrity of scientific methods, the trustworthiness of its facts, and the authority of its interventional directives are crucial for producing reliable information about the world and adequately directing public policy (Douglas 2009). If we reject the 'rational core' concept for its inadequate consideration of ethical and political values in scientific practices, we also need to consider how to sustain science's authoritative objectivity in its absence. In the next section, I explore attempts to reconcile these concerns, but conclude that an underlying assumption at the root of this tension has not been fully confronted. I then turn to an exposition of my account of epistemic standards, inspired by classical and contemporary pragmatisms, which has the potential to overcome the deep tension between scientific objectivity and valuative responsibility.

Accounts of Objectivity for a Value-Laden Science

In her influential approach to values in science, Douglas seeks to reconceptualize the terrain of scientific inquiry in such a way that "accepts a pervasive role for social and ethical values in scientific reasoning, but…still protects the integrity of science" (2009, 1). To achieve this, she does not so much reject the 'rational core' concept of scientific inquiry as reconstruct it. Taking on board the problems she and others have identified with the 'rational core' image of science, Douglas argues that many values traditionally understood as epistemic—such as simplicity, explanatory power, breadth of scope, external consistency, and predictive precision—have been miscategorized, since they are not, strictly speaking, truth-assuring (2013, 799). For example, "a simple theory, though elegant, may just be wishful thinking in a complex world. A theory with broad scope may not be a true one… A fruitful theory, leading to many new avenues of research, may prove itself false over

time" (2009, 107). Douglas classifies these standards not as epistemic, but as 'cognitive,' insofar as they aid scientists with their cognition during the research process. A theory meeting these standards "is easier to work with, to use, and to develop further" (2009, 107). While cognitive values enable scientists to discover the truth by making theories easier to navigate, they are similar to social, political, and ethical values, in that they too may misdirect scientific procedures away from objective, factual knowledge. The set of *genuinely* epistemic criteria is much smaller than often thought, including only internal consistency and empirical adequacy. Douglas suggests that we can therefore protect the integrity of value-laden science by limiting (but not excluding) the role of other criteria in the scientific research process.

This is achieved by drawing a distinction between an acceptable indirect role and an unacceptable direct role that all values—social, political, ethical, or cognitive—may play in the research process. In an unacceptable direct role, values would serve in the same way as evidence, determining the scientists' decisions by acting as reasons in and of themselves to accept or reject an interpretation or theory. For example, a scientist may ignore or minimize evidence which supports a theory because it conflicts with their cognitive preference for simple theories or with their political beliefs concerning appropriate gender roles. In an acceptable indirect role, values do not compete with evidential considerations, but are used when the evidence itself is incomplete, or when the uncertainty of the evidence must be navigated. For example, values may help a scientist determine appropriate standards of statistical significance in order to balance the tension between the risk of arriving at false positives and the risk of arriving at false negatives in their research. In Douglas' account, since "values in the indirect role operate at the margins of scientific decision-making rather than front and center as with the direct role," the presence of value-considerations is no threat to scientific objectivity (2009, 103). We can obtain objective *and* ethically responsible knowledge by adhering to a method which permits only an indirect role for values "in the heart of science" (2009, 108).

This approach has significant merits from the perspective of humanism. For one, it retains a strong sense of objectivity and authority for science in directing public projects while providing adequate avenues for holding scientific institutions, researchers, and programs accountable to a public pervasively affected by their decisions and processes. Additionally, it allows us to retain an intuitive notion of the foundation of scientific objectivity—a 'rational core' stage of scientific inquiry purely governed by epistemic criteria. There are, however, limitations to this approach which

prevent it from constituting a genuine resolution to the tension between scientific objectivity and value-responsibility. Most significantly, even the small set of minimal epistemic criteria that Douglas has delineated is vulnerable to influence from social or other non-epistemic values, jeopardizing the basis of her account of scientific integrity. Hugh Lacey, for example, argues that "since adopting a strategy is partly rationalized in view of its mutually-reinforcing interactions with certain social values, values contribute to some extent to the interpretation of *empirical adequacy* that one brings to bear on one's hypothesis" (1999, 221, emphasis added). Longino has also questioned the epistemic status of empirical adequacy, arguing that "even the apparently neutral criteria of accuracy or empirical adequacy can involve socio-political dimensions in the judgment of which data a theory or model must agree with" (1995, 396). Matthew Brown has raised this point even for logical consistency, arguing that "a logically consistent theory may just be wishful thinking if dialetheism is true" (2017, 70). It is not therefore clear that a rational core of epistemic methods, however pared down, can be defended. Another way of balancing the competing needs for values and objectivity in science must be found.

A more radical approach to reconciling value-influenced science with scientific objectivity is to challenge the widespread view that values are an irrational or corrupting influence on objectivity. For one, certain non-epistemic values have been shown to aid science's epistemic objectivity rather than detract from it; and determining which values aid or hinder epistemic goals "is an empirical question to be settled by a close examination of scientific practice rather than by an a priori pronouncement" (Kourany 2008, 96-7). For example, egalitarian social values "have seemed to yield better rather than worse science, more objective rather than contaminated science" by correcting for the biases already present in existing scientific procedures (Kourany 2008, 96-7; See also Anderson 2004). Additionally, we find theoretical accounts as to why and how values can be rationally employed throughout science without interfering with its objectivity. Longino's account of science as social knowledge details the way in which social discussions and mutual checks ensure that the values influencing scientific inquiry are not idiosyncratic biases, but are deemed acceptable and unproblematic from a diversity of perspectives (1990; 2002). If scientific communities are structured according to norms of open, critical debate amidst intellectual equality, and are composed of members with diverse backgrounds, we can be reasonably sure that the values influencing science will not unduly bias the production of knowledge. Matthew Brown's account of values in science goes further in claiming that, even when value judgments conflict with evidence and traditional

epistemic criteria, a scientist may be warranted (and objective) in prioritizing the value judgments (2020, Chap. 3). He gives the example of a psychologist who discovers that their data support the claim that race is a factor in intelligence. The psychologist has not set out specifically to investigate race and intelligence, and has applied stricter than usual standards to their analysis in light of the damaging effects this theory would have on society. But nevertheless, these were the results of the study. According to the standard view, which Brown calls *the epistemic priority thesis*, the psychologist should accept and publish the results, since "you must prioritize evidence, or epistemic standards, over considerations of values" (2017, 64-65). But, Brown argues, our excessive weighting of epistemic over non-epistemic values in producing objective, reliable knowledge derives from a problematic view of values and value-judgments as systematically less reasonable than epistemic standards (2020, 96). Developing a sophisticated theory of values as fallible, empirically revisable, non-absolute, and responsive to reasons, Brown argues that, "[i]f we had a proper theory of values and value judgments, we would have no need for the epistemic priority thesis" (2020, 97).

Amidst the failed attempts to preserve a rational core of epistemic methods as a means of preserving objectivity, a revised theory of values as having a rational (and potentially objective) basis would appear to be necessary for any successful reconciliation of the tensions between science's moral and epistemic concerns. Accounts like Brown's therefore constitute an indispensable step in making progress on this problem. This is as true for humanism as for any other philosophical tradition. Human well-being and self-determination are at the heart of humanist philosophy, and so humanists should prefer to avoid situations in which one is compelled to sacrifice moral values because of their perceived threat to science's epistemic goals. Accounts like Brown's provide a rationale for rejecting this compulsion, since the cognitive nature of values allows us to legitimately question whether it is rationally necessary to sacrifice our deeply held values for the sake of following a set of epistemic criteria. However, such accounts sidestep a significant underlying problem. A major source of dissatisfaction with calls to integrate value-judgments into scientific methods is that such an integration would violate a deeply rooted epistemological (and likely at heart metaphysical) distinction between facts and values. Facts, it is thought, are out in the world, while values are not genuine aspects of the objects in nature that we subject to scientific study, but are in the human perspective. Correspondingly, epistemic standards are thought to guide us toward factual representations of the world, while values relate to distinct concerns about how we believe the world *ought* to be, and what kinds of actions we ought to take to push it in that direction. Elizabeth

Anderson has characterized this as the intuition that the scientific project "can only succeed if we set aside our own anthropocentric classifications and read the book of nature in the language of nature itself'—a language that would presumable not include human values (1995, 44). For that reason, even were we to accept Brown's theory of values as rational, revisable, and held for good reasons, those values are not therefore qualities of the world; they may still be imported by human perspectives. We may still conceive of values as interfering with our epistemic understanding of what the world is really like.

This intuition runs very deep, and its importance should not be underestimated. From the Age of Enlightenment, it has formed the basis for narratives of science's methodological capacity to extract the true nature of the world from the error-prone perspectives of human beings. Francis Bacon compared the mind to "a false mirror, which, receiving rays irregularly, distorts and discolours the nature of things by mingling its own nature with it" (Bacon 1861, 54). Descartes, too, employed a foundational distinction between human perspective and the genuine qualities of nature, to the point that "there might be very little correspondence between [a person's] understanding of the objects they studied and the natures of the objects" (Sorell 1991, 30). For these thinkers, certain procedures (different for each) were able to circumvent the distorting influence of human perspective in order to reveal what nature is really like. Consistent with this historical framework, for many humanists today, scientific methods (or other purportedly purely epistemic methods like mathematics or logic) are understood as functioning to remove relativities of perception—including valuation—in order to adequately reveal the world, its objects, and their qualities as they truly stand. The job of rigorous epistemic methods is precisely to circumvent human perspectives and arrive at factual representations. This is where the urge to retain a "rational core" of epistemic, value-free methods finds its motivation. We see this in Douglas' minimal epistemic criteria intended to insulate the heart of scientific knowledge-construction from the direct influence of human values; and we see its more subtle expression in Longino's account of mutual checks between scientists rationalizing scientific knowledge via the removal of idiosyncratic values. Human perspectives distort representations of reality, and epistemic procedures remove or limit this distorting influence. If we are going to accept value-infused scientific methods (and I think a humanist philosophy must), we will have to confront this intuition and, if possible, construct an adequate alternative to the notion that science's epistemic methods exist to correct the distortions of human perspective and provide more accurate accounts of what the world is really like.

In the following section, I suggest that pragmatist philosophy can help us with this task, by giving us an alternative way of understanding the genesis and function of epistemic guidelines—where they come from and what they are intended to achieve. Drawing on classical and contemporary pragmatisms, in particular John Dewey's philosophy of science, I show that epistemic norms can be viewed as continuous with and adaptively responsive to teleological human values, whilst carrying objectivity and authority in guiding inquiry. Rather than placing epistemic objectivity and value-relativity in tension, this account takes epistemic objectivity to emerge from its fine-tuned suitability to producing knowledge that serves human needs.

A Teleological Account of Epistemic Standards

The pragmatist basis for a reconciliation of values and objectivity in science lies in its challenge to the standard epistemological framework, according to which knowledge consists in putting together a 'transcript' of the natural world which is external to and independent of the mind. In this epistemological framework, which Dewey called 'the spectator view of knowledge,' the natural world (the phenomenon to be known) is understood as discontinuous with the knower, who is "viewing from outside" (Dewey 1972, 42). The mind of the inquirer from which knowledge is constructed has "the power of changing 'reality' into appearance, of introducing 'relativities' into things as they are in themselves" (Dewey 1972, 25). The problem then arises as to whether the inquirer is transcribing the world accurately, where accuracy becomes a matter of removing human beings, their perspectives, and their values from the picture. Our very notion of objectivity becomes bound up in this understanding of mind-externality and human-independence.

Starting in the mid- to late nineteenth century, philosophers in the American pragmatist tradition challenged this approach to nature, the mind, and objectivity. John Dewey, in particular, argued that understanding objective knowledge to consist in the separation of the qualities of an external world from the distortions of the human mind was inconsistent with the evolutionary theory of human life. In an evolutionary framework, the human mind and its functions are evolved from, and continuous with, the rest of the natural world. Like other living creatures, human beings actively participate in nature to sustain and further their own existence. They respond to their environmental conditions in such a way as to adapt those conditions to their needs, or adapt their

behavior according to those conditions. Knowledge-construction and other functions of the mind are highly sophisticated forms of such evolved, active responsiveness to environmental conditions. Inquiry—including highly precise and systematized inquiry like science—must therefore be understood as "a special mode of organic behavior"; an evolved function of human life-activity amid an environment (Dewey 1985, 39).

Characterized this way, the function of inquiry consists not in composing a transcript of qualities of a detached and external world, with maximal independence from human perspectives, but in constructing reliable frameworks for interacting with the world which have some bearing on broader human activity (Anderson 1995; Kitcher 2001, 65). Inquiry consists in analyzing a complex human environment, by selecting and ordering the component aspects that are useful and relevant to a desired outcome, to attain a reliable basis on which to orient activities towards the satisfaction of human needs. In cartography, different maps of the same region select different elements of the terrain for representation according to whether the map will be used for driving, hiking, or riding the bus. In the sciences, too, we find different aspects of the world selected according to the relevance such knowledge has for intended uses. In an example from Philip Kitcher, a biomedical study of malaria transmission by mosquitos utilized the biological species concept rather than precise morphological criteria because it enabled scientists to distinguish morphologically identical "sibling populations" which played different roles in spreading the disease. The biomedical study of Lyme disease, however, typically identifies the bacterium through precise molecular criteria to study the structures and mechanisms by which the disease attacks the human body. It would be folly to suggest one classification were more objective while the other fell short.[4] In inquiry, "the partitioning of nature accords with our interests" which, in turn, align with our desired activities and outcomes (Kitcher 2001, 49).[5]

The functional genesis of inquiry in broader life-activity has contextualizing implications not only for the *content* of knowledge, but also for the *methods* of acquiring it. Standardized, institutionalized, and highly curated methods of inquiry (like the sciences) are, at any given time, the present culmination of past applications of the same or similar methods, and self-correcting

[4] Kitcher provides a helpful extrapolation of this argument by moving between the distinct purposeful and classificatory contexts of biomedicine, horticulture, and cuisine (pp. 49-50).

[5] In some branches of inquiry, the questions pursued are relatively removed from practical applications and are motivated more by curiosity. Even in such cases, our "natural curiosity" into certain phenomena and the questions we take to be live and significant will co-evolve with practical projects situated in broader social and individual activities (cf. Kitcher 2001, chap. 6).

adaptations of those methods according to their successes or failures. For example, "primitive astronomy and primitive methods of keeping track of time (closely connected with astronomical observations) grew out of the practical necessities of groups with herds in care of animals with respect to mating and reproduction, and of agricultural groups with reference to sowing, tilling and reaping" (Dewey 1985, 77). The development of instruments and techniques for measuring precise angles facilitated the acquisition of the needed information on which to base human activity. Even the development of mathematical techniques for solving quadratic equations and ascertaining geometric truths was a theoretical outgrowth of meeting a practical need (Kitcher 2011, 91-92). The honing of scientific methods is therefore not fundamentally dissimilar to the development of the methods of a craft. Just as a craftsperson learns through the operation of certain procedures that they will achieve certain results, "we discover that if we draw our inferences in a certain way, we shall, other things being equal, get dependable conclusions" (Dewey 1985, 20). Correspondingly, the evaluation of scientific methods as successful, normative, or superior to others is similar to the evaluation of certain methods of farming, surgery, time-keeping, or navigation—not due to minimal intrusion from human perspectives, but according to the accumulated successes and failures of sequences of applications of them in past situations, which have been oriented to resolving determinate problems in contexts of human life. Having been developed *in situ* according to the demands of meeting human needs, scientific methods are not independent of the broader life and goals of human beings and communities. Presently accepted scientific methods are those which "experience up to the present time shows to be the best methods available for achieving certain results" (Dewey 1985, 108).

Additionally, just as scientific inquiry is (and has been) a self-corrective process with regard to the content of its claims, it has also been self-corrective with regard to its methods. Rather than discovering and applying fixed, predetermined methods, science consists in an evolution of methods through the honing, adaptation, and systematization of a set of reliably successful procedures. It does not follow that "the 'better' methods are ideally perfect, or that they are regulative or 'normative' because of conformity to some absolute form" (Dewey 1985, 108). Rather, scientific methods acquire their normative compulsion precisely through being (and having been) highly responsive and adaptive to the need for change. This means that, while existing methodological principles "supply a (relative) norm or standard for further undertaking" (Dewey 1985, 108), they are apt to be continually renegotiated on the basis of their success or failure in ongoing contexts of

inquiry. This responsiveness to change is especially significant in circumstances where the pertinent features of contexts of inquiry and the desired outcomes of inquiry are shifting.

Scientific methods have their evolution and genesis in purposeful features of human life, but they also have distinctive characteristics that distinguish them from other activities and inquiries. While methods found in some forms of craft are highly relative to the specific outcomes of those crafts—you wouldn't, for example, use farming methods to navigate the seas—science's epistemic methods have been adapted towards a deliberate indifference to *specific* contexts and outcomes. Rather than knowledge enabling action towards the resolution of specific problems, scientific methods have been adapted to provide the kinds of knowledge that can be relied upon for action taken across an increasingly broad range of contexts. This adaptive pressure leads generally to the widely recognized epistemic criterion of *breadth of scope*. Similarly, a preference for communicability, transferability, and manageability across contexts has led to the substitution of qualitative variety, detail, and specificity with quantitative measurement and formal relations, corresponding with the epistemic criterion of *simplicity*. And, as opposed to the vagueness which serves everyday purposes in ordinary language, scientific methods have developed in the direction of producing systematic relations of coherence and *consistency* to enable more precise interventional capacities. Scientific epistemic standards of breadth of scope, simplicity, and consistency therefore have a basis in the need for broadly applicable and reliable interventional activity. The epistemological principles we see in science today have been continually adapted and consistently successful means for acquiring knowledge that can be applied in many situations, by many types of people, for many ends, with high degrees of precision. The wide-ranging efficacy of traditionally recognized epistemic standards of science in guiding precise investigations and powerful interventions across a wide range of problem-based contexts constitutes their epistemic authority. But the increasing abstraction, breadth, and usability of results obtained by scientific methods have not removed the human being or value-considerations from the scientific process—they themselves consist in certain valuations oriented toward certain kinds of activity. They therefore have a relatively stable form of epistemic normativity, but are neither fixed nor absolute.

This picture of epistemic methods as evolving from broader problematic contexts of human activity reframes the relationship between scientific methods and moral, political, and social values, and has significant implications for legitimate interactions between them. According to the pragmatist picture presented above, scientific methods are not aiming for a less distorted

representation of remote and detached objects in the world, but are instrumental appendages to human efforts to successfully pursue their projects in and among that world. Providing objective or authoritative accounts of the material environment does not here depend on constructing representations undistorted by human values and perspectives. It is rather based on the accumulated trial and testing of interventions through human activities in their environment—successful and unsuccessful—and the suitability of methods of representation for achieving them. Instead of being situated on either side of a categorical divide, teleological values concerning the way the world ought to be and epistemic standards concerning how best to acquire representations of that world are dynamically integrated parts of a continuous terrain of normativity in intelligently and effectively acting in the world to effect desired change.

As a consequence of this view, the objectivity and authority of epistemic methods are not threatened by the use of values to select and evaluate those methods. Because it does not derive from a notion of objectivity as human-independent representation, the epistemic normativity of these standards would not be reduced, but potentially increased, by their being responsive and adaptive to ethical and political concerns. It is scientific methods' high degree of adaptability in light of pertinent consequences that has resulted in their capacity and authority. With the emergence of different political, economic, or social circumstances, new problems may arise which did not previously exist and old consequences may become pertinent and problematic which were not previously considered. This would make the current context relevantly different to the one in which our current methods were adapted and developed, justifying ongoing scrutiny of those methods' suitability for the present circumstances and adequacy in meeting present needs. The responsive shift in epistemic methods would constitute an incorporation of further relevant features of desired outcomes, increasing the capacity and procedural authority of those methods.

To clarify these points, let's return to the controversial suggestion by Helen Longino of selecting or adapting epistemic standards in science according to their tendencies towards feminist political outcomes. As we've seen, Longino claims that our current epistemic standards do not tend towards progressive social and political needs, and in some ways work against their realization. For example, the standard of external consistency reproduces and reinforces the existing androcentricity, homophobia, sexism, or racism in our established knowledge; and the scientific standards of simplicity and breadth of scope contribute to the naturalization of social and political hierarchy. These criteria, she suggests, might be replaced with alternative criteria tending towards more

felicitous political outcomes, such as novelty to find alternatives to biased established knowledge, or ontological heterogeneity and mutuality of interaction to cultivate an appreciation of diversity and equality across the natural and social worlds.

From within the pragmatist framework outlined above, we can now see that Longino's suggestion is not a threat to the objectivity of scientific knowledge. This is not because, as Douglas claims, the 'epistemic' standards she replaces are not genuinely epistemic, leaving the truth- and objectivity-assuring criteria untouched. Neither is it simply because, as Longino suggests, human values are rationalized through social (or other cognitive) processes to remove biases and idiosyncrasies (though the argument presented here is not intended to displace such accounts of the rationality of values). Rather, it is because there is no inherent tension between moral imperatives to influence the world in line with human values and epistemic imperatives to objectively represent the world. The quest for a value-free representation of the world's qualities independent of human perspective is a misunderstanding of the proper function of epistemic inquiry and its corresponding notion of objectivity. Knowledge of the world is a functional component of undertaking action towards a desired end and epistemic normativity is therefore not even ideally independent of human perspectives and values. Any 'rational core' of epistemic methods has itself evolved due to its suitability to aid in certain desired interventional outcomes and the objectivity bestowed by those methods is not negated by reframing the interventional outcomes more broadly (or differently) to include the progressive political values of the 21st century.

This does not mean that current epistemic standards carry no normative weight since, as we've seen, normative weight is not absolute but shifting. It only means that this normative weight is relative to and responsive to desired outcomes. One desired outcome may be broadly applicable interventional power, while another may be the production of an egalitarian knowledge base. Any change of scientific methods in the interest of accounting for newly recognized problematic situations would not simply create new forms of representing, understanding, and talking about the world; it would enable (or disable) various kinds of actions towards achieving certain kinds of outcomes. For example, as Longino has suggested, breadth of scope, simplicity, and consistency may have ontological implications in accordance with socio-political values of domination. But swapping out these methodological criteria would likely mean that our methods would not produce theories that are as powerful, broadly applicable, and conducive to large-scale technological interventions.

Now, there is no principled reason that these large-scale technological considerations should trump the ethical considerations. While the values of consistency, simplicity, and breadth of scope are genuinely broadly applicable epistemic means of predicting and controlling elements of the environment, the high esteem that has been placed on material control relative to alternative methods which may have brought about broader social benefits has been, and continues to be, a decision dependent on politically-inflected interpretive tools for what constitutes our society's most pressing problems and what constitutes our science's success in overcoming them. Our present cultural circumstances (perhaps very unlike those in which such scientific methods have so far been adapted) might judge current methodological criteria to be failing to produce 'successful' resolutions to encountered 'problems,' perhaps because they are deemed to cause more social problems than they solve, or because they do not contribute to the higher shared goal of improving life for the majority of people. This judgment could be made with no less legitimacy than one made on the basis of a failure to predict a material outcome, since the adaptation of scientific methods is a process of trial and error according to the success- and failure-criteria of an inquiring community or individual.

Since decisions as to a society's 'more favorable' conditions are well-known to be politically inflected, the inherent purposefulness of scientific inquiry compels us to reflect on the desired purposes of science, and how significantly the overall effects of science as currently practiced accord with a society's purported values. As the conditions and specificities of cultures alter and we seek more democratically structured societies, it makes sense to continually re-evaluate the extent to which established epistemic methods are creating the kinds of representational frameworks which fulfill our ever-changing world-building purposes. Scientific inquiry is a goal-oriented practice for bringing about more favorable conditions in human interactions with their environments. The adequacy of epistemic methods therefore change, and should continue to change, according to adapting purposes, values, desires, ends, and the shifting abilities of former methods to these new criteria of success.

Conclusion

This chapter set out to explore the debates concerning the proper role of value-judgments in scientific reasoning. As we've seen, there exists a long-standing and intuitive tension between

scientific objectivity and scientific moral accountability. On the one hand, there are fears that the value-free pursuit of knowledge will allow scientific knowledge to be directed towards destructive outcomes and to disguise dubious ethical values. At the same time, there are fears that thoroughly incorporating ethical and moral values into the pursuit of scientific knowledge will contradict the basic principles of scientific objectivity and factual representation. Inventive and sophisticated resolutions to this tension have multiplied in recent decades, as philosophers (among others) have sought to persuade scientists, policy-makers, and the public to practice value-conscious science in the interest of society. Amidst these proposals, I have argued that we must confront the assumed concepts of objectivity and epistemic normativity motivating calls for a value-free science. By rejecting the concept of objectivity as representation of the world in a manner independent of human perspective, we can consequently reject the concept of normativity of epistemic standards as emerging from the removal or limitation of human perspective (including values). The pragmatist theory of epistemic standards as emerging through their repeated adaptation to desired uses and outcomes allows values to play a central role in determining the practice and reasoning criteria of science. The question of what we want the goals and outcomes of our science to be becomes inseparable from the question of what epistemic criteria we ought to apply, drawing the supposedly opposed needs of objectivity and moral accountability into a dynamically interconnected normative terrain.

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