Four Traditions in the History of Values in Science (1867-2000)

Matthew J. Brown*

Draft - July 1, 2024

Abstract

This chapter explores the history of discussions of values in science from the late nineteenth to the end of the twentieth century, focusing primarily on anglophone philosphy of science. The focus is on those who accept that science is inevitably and appropriately value-laden. The paper divides this history into four distinct philosophical traditions: pragmatism, Marxism, feminism, and an unnamed tradition dubbed "risk management." Attention to these traditions will help us better understand the dynamics of the contemporary discussion, as well as uncovering resources that might be revived.

1 Introduction

In philosophy of science today, discussions of values in science are increasingly central to the field. It was not always so. For several decades after the mid-twentieth century, there was near-consensus around the ideal of value-free science, according to which moral, political, and other "non-epistemic" values had no role to play in science proper. Proctor (1991) and Douglas (2009) have told histories of the rise and consolidation of the value-free ideal. Today, 30+ years after Longino's *Science as Social Knowledge* (1990) and 20+ years after Douglas's "Inductive Risk and Values in Science" (2000) it is time for

*Center for Dewey Studies, Southern Illinois University, matt.brown@siu.edu, http://matthewjbrown.net

a history of the counter-movement according to which non-epistemic values play a legitimate role in science.

I will focus on four traditions within mostly anglophone philosophy of science for thinking about values in science: the pragmatist and Marxist traditions of the late-nineteenth to mid-twentieth century, the feminist tradition arising in the 1970s, and a tradition focused on policy and risk assessment beginning from the 1990s. Each of these traditions begins from a different intellectual background or philosophical orientation, and each responds to different though overlapping concerns. These different traditions lead to different approaches to values in science that sometimes complement and sometimes conflict with one another. While there have been other moments within the history of philosophy that are relevant to the philosophy of science and values, these are arguably the most significant for contemporary thought on the topic.

Early thinkers on values in science from pragmatist and Marxist traditions were concerned with the influence of values on science in a secondary way; their primary concern was the potentially beneficial influence of science over the normative fields of ethics and politics, though even within this shared focus, their approaches differed. Both traditions tended to see the influence between science and values as mutual or dialectical, and so were more or less committed to a legitimate role of values in science.

These approaches differ as well from the two traditions that have had the greatest influence over contemporary discussions: the feminist tradition in science and science studies and a tradition focused on risk assessment and the uses of science in policymaking, culminating in the revival and improvement of the argument from inductive risk by Heather Douglas (2000). Those starting with the feminist approach have tended to focus on social-level norms for values in science, the critique of patriarchy and inegalitarian values in science, and the possibility of science becoming an ally of anti-sexist, anti-racist activism. Those who have come from the tradition concerned with risk and policy have tended to emphasize scientific integrity and threats to it, individual-level norms for scientific inquirers, the role and legitimation of scientific authority, and mechanisms for democratic consultation or deliberation about values.

There has, of course, been significant cross-fertilization between these four traditions, and some philosophers have integrated across two or more of these traditions. That said, there has been insufficient recognition of the role these different traditions and their disparate interests have played in influencing the contemporary lines of debate.

2 Pragmatism

The pragmatist tradition in philosophy, inaugurated by Charles S. Peirce and William James at the end of the nineteenth century, and taking various forms in the early- and mid-twentieth century, played an important founding role in the development of philosophy of science as a field. From the very beginning, this tradition had the seeds of an argument for values in science. The two core features of pragmatism that are relevant here are (1) the action-orientation that intrinsically links belief or judgment to action, which is reflected both in Peirce's *pragmatic maxim* and his *doubt-belief theory of inquiry*, and (2) the thesis of *inductive risk*, which first appears in William James's classic article, "The Will to Believe." The implications of these features for values in science were not drawn out explicitly be Peirce and James, but were made explicit by John Dewey in his writings on logic, by Jane Addams in her social scientific practice, and by the later "hard pragmatists" connected with Edgar A. Singer, Jr., in their writings on philosophy of science.

Charles Peirce first articulated the pragmatic maxim in "How to Make Our Ideas Clear" in the following way: "Consider what effects, which might conceivably have practical bearings, we conceive the object of our conception to have. Then, our conception of these effects is the whole of our conception of the object" (Peirce 1878). This analysis of concepts and ideas in terms of their practical effects, for Peirce, provided the ultimate degree of clarification of meaning. Peirce relatedly defines *belief* in line with this maxim in terms of its significance for action:

> Our beliefs guide our desires and shape our actions... The feeling of believing is a more or less sure indication of there being established in our nature some habit which will determine our actions... Belief does not make us act at once, but puts us into such a condition that we shall behave in some certain way, when the occasion arises. (Peirce 1877)

So the role of belief in our cognitive life is to give rise to a habit or disposition to act in certain ways, under certain circumstances. To believe that it is raining is to be prepared to bring an umbrella or wear a rain coat, if I plan to go out and wish to avoid getting wet. Peirce's definition of *doubt* and *inquiry* coordinate with this definition of belief. A doubt arises when I lack a clear, confident, habitual reaction to a situation: "Had they doubted... they

would not have acted as they did... Doubt is an uneasy and dissatisfied state from which we struggle to free ourselves and pass into the state of belief" (Peirce 1877). According to Peirce, "Most frequently doubts arise from some indecision, however momentary, in our action" (Peirce 1878). Even in the case of science, which response less to immediate needs and goes hunting for reason to doubt, the inquirer must adopt a "feigned hesitancy" that suspends our habit-belief for some specific reason.

Inquiry, for Peirce, is simply the response to doubt, an attempt to remove its "irritation" and adopt a belief that will establish a new habit or rule of action. One significant feature of Peirce's view of inquiry is that it aims neither at truth nor certainty but simply at the removal of doubt:

> With the doubt, therefore, the struggle begins, and with the cessation of doubt it ends. Hence, the sole object of inquiry is the settlement of opinion. We may fancy that this is not enough for us, and that we seek, not merely an opinion, but a true opinion. But put this fancy to the test, and it proves groundless; for as soon as a firm belief is reached we are entirely satisfied, whether the belief be true or false... The most that can be maintained is, that we seek for a belief that we shall think to be true. (Peirce 1877)

For Peirce, "the settlement of opinion" means the return of confidence in how to act, that is, that one is satisfied *enough* with the results of inquiry in order to feel secure in how to proceed, and no further degree of certainty is relevant. This is not only an expression of Peirce's fallibilism, one of his most crucial legacies for contemporary philosophy; the way that he ties the settlement of belief to action also provides an opening for thinking that practical reasoning (value judgment) is relevant to any inquiry. As Peirce puts it in "The Fixation of Belief," "It is certainly best for us that our beliefs should be such as may truly guide our actions so as to satisfy our desires; and this reflection will make us reject any belief which does not seem to have been so formed as to insure this result" (Peirce 1877). The criteria for belief is confident action.

The second important legacy of pragmatism for values in science appears in William James's classic "The Will to Believe," where he argues, "Believe truth! Shun error!—these, we see, are two materially different laws; and by choosing between them we may end by coloring differently our whole intellectual life" (James 1896). These two separate rules of inference must be

balanced against one another. This is perhaps the earliest and most basic form of the inductive risk thesis, highlighting the trade-off between false positive and false negative errors (Magnus 2013). This trade-off cannot be entirely resolved by logical or epistemological considerations, what James called "intellectual grounds," but rather "our passional and volitional nature" must play a role. It is a reasonable extension of James's argument that, where non-epistemic consequences follow from following these two different laws of thought, non-epistemic values have a role to play.

John Dewey did the most, among the classical pragmatists, to make explicit the consequences of Peirce's and James's commitments for the role of values in science. For Dewey, inquiry is the resolution of a problematic situation in order to return to stable practice or intelligent action (Brown 2012). This is simply a re-statement of Peirce's doubt-belief theory of inquiry in less individualistic terms. It follows, for Dewey, that all inquiry is a form of practical reasoning:

> To say that something is to be learned, is to be found out, is to be ascertained or proved or believed, is to say that something is to be done. Every such proposition in the concrete is a practical proposition. Every such proposition of inquiry, discovery and testing will have then the traits assigned to the class of practical propositions. They imply an incomplete situation going forward to completion, and the proposition as a specific organ of carrying on the movement. (Dewey 1915, MW 8:64)

Similar claims are made throughout his major work of philosophy of science, *Logic: The Theory of Inquiry* (Dewey 1938, LW 12:162, 180). And he makes clear that this is especially true in the case of science:

> [A] slight degree of reflection shows that [the scientist] has to decide what researches to engage in and how to carry them on—a problem that involves the issue of what observations to undertake, what experiments to carry on, and what lines of reasoning and mathematical calculations to pursue. Moreover, he cannot settle these questions once and for all. He is continually having to judge what it is best to do next in order that his conclusion, no matter how abstract or theoretical it may be as a conclusion, shall be grounded when it is arrived at. (Dewey 1938, LW 12:163)

What's more, Dewey argues that value judgment is itself a form of empirical inquiry (Dewey 1903, 1939), and democracy itself is or involves a form of collaborative social inquiry in response to shared problems (Dewey 1927). As such, Dewey's philosophy of social science suggests that the aims of social sciences ought to be social problems and facilitating social planning and public policy (Dewey 1931a, 1931b, 1938; Bohman 1999).

If John Dewey was the preeminent theorist of democratic, value-laden science in the pragmatist tradition, Jane Addams was one of its most significant practitioners. Addams is more well known for her writings on ethics and political philosophy, as in her *Democracy and Social Ethics* (1902), as well as an activist, peace advocate, and Nobel Peace Prize laureate (Hamington 2022). She founded and led the Hull House social settlement in the poor immigrant neighborhood of Chicago's Nineteenth Ward in 1889, which was the center of much of her work from that time until her death in 1935. Through her work at Hull House, Addams pursued forms of democratic social knowledge and a kind of community-based participatory research through projects like the Working People's Social Science Club and the *Hull-House Maps and Papers* (Hull House 1895; Westhoff 2007; Brown forthcoming).

In "A Function of the Social Settlement" (1899), Addams writes,

> It is frequently stated that the most pressing problem of modern life is that of a reconstruction and a reorganization of the knowledge which we possess; that we are at last struggling to realize in terms of life all that has been discovered and absorbed, to make it over into healthy and direct expressions of free living. (324)

She then quotes James and Dewey discussing the connection between knowledge and action. The social settlements, she argues, act not as controlled "sociological laboratories" but as spaces for the experimental application and field-testing of knowledge in practice, as applied to real life. In social use, the value of knowledge is determined (see Gross 2009; Fischer 2019).

An important line of pragmatist influence in the philosophy of science traveled through the influence of Edgar A. Singer, Jr., a pragmatist who taught philosophy of science at the University of Pennsylvania from the 1890s. Singer was influential on a series of students who founded and edited the journal *Philosophy of Science* (A. W. Richardson 2008; A. Richardson 2013). Two of those students would give important defenses of the value-ladenness of science around the middle of the twentieth century: C. West Churchman and Richard Rudner.

Both Churchman and Rudner gave arguments from the inductive risk thesis for a necessary role for values in science. Many philosophers of science today are familiar with the argument of Rudner (1953) that "The Scientist Qua Scientist Makes Value Judgments," thanks to the credit given to it by Heather Douglas in her recent work (Douglas 2000, 2009). Rudner sharpens the argument into such a clear, concise argument, that it is often cited to the exclusion of more detailed and more compelling versions of the argument (see Havstad 2022). Rudner's argument probably owes much to a somewhat earlier argument but much denser argument from Churchman (1948). According to Churchman, "No fact or law of science can be determined without presupposing ethical principles" (Churchman 1948; see Staley 2017). Churchman also pursued a distinctively Deweyan vision of social science as he worked to forge the field of management science as the application of ethics in action. Rudner also argues, in a point that Dewey would have appreciated but many present-day philosophers have missed, that the objectivity of science requires a "science of ethics."

Another key stage in the pragmatist tradition are attempts to use the neopragmatism of W.V.O. Quine to argue against the fact-value or science-values dichotomies. Morton White (1981) and Lynn Hankinson Nelson (1990) explicitly use Quine's epistemic holism and "web of belief" metaphor to argue that science and values interpenetrate whenever mixed inferences (involving both normative and descriptive premises) take place. This may be the origin of underdetermination-based arguments for values in science that became central to the feminist tradition (see below), and may be an alternate route to the kind of value-ladenness of science analyzed by Anna Alexandrova (2018).

Pragmatists emphasize both the inevitable and sometimes beneficial influence of values in science, as well as the influence of science over values, action, and politics. Ultimately, they see these as contextual or functional distinctions made for specific and limited purposes, in such a way that could not ground broad, universal pronouncements like the ideal of value-free science. Some pragmatists, like Peirce and Addams, emphasize the communal nature of inquiry, while others, like James and Rudner, have a more individualistic take. Dewey among others attempts to synthesize both in his accounts of democratic inquiry and the continuum of inquiry. Largely missing from current

discussions, the pragmatist notion of the influence of science on values or the "science of ethics" may have much to offer the literature on values in science.[1]

3 Marxism

Another important philosophical tradition in the founding of professional philosophy of science is the Marxist tradition. Among the two most important figures in this respect are Otto Neurath, a founding member of the Vienna Circle, and William Malisoff, the founding editor of *Philosophy of Science*. Malisoff was also a colleague of Singer's at Penn, an important connection between the pragmatist and Marxist traditions in the period. Though Viennese, Neurath had a significant influence on Anglophone philosophy of science in several ways but especially through his leadership of the International Unity of Science movement and the International Encyclopedia of Unified Science. These two figures are examples of a broader stream of Marxist work in philosophy of science in the 1930's-1950's, a stream that shrank to a trickle due to the influence of anti-communism (Howard 2003; Reisch 2005).

Neurath's views on values in science have been ably explored by Don Howard (2006). Neurath articulated an early version of what is known as the underdetermination argument for values in science. Although Neurath was a kind of non-cognitivist about values and preferred to use the term "auxiliary motive" to avoid the whiff of metaphysics associated with "values," his argument is strikingly similar to later arguments by White, Helen Longino, and Hankinson Nelson.

Neurath also defended an account of science, especially social science, that was to serve social (or socialist) ends. Neurath did not believe that social science could be a value-free source of political ends; he regarded this as a form of "pseudo-rationalism." Rather, Neurath thought that social science itself needed social and political ends to guide it, so that it might serve those ends. As Howard argues, for Neurath, "theory choice is driven by the need for practical action" (both everyday and political) (Howard 2006, 11). That is, due to empirical underdetermination and uncertainty, we must choose theories in science that are most fit for our practical purposes. Indeed, even Neurath's philosophy of science served social and political ends. He specifically imagined

[1] Clough (2003, 2013) and Anderson (2004) are exceptions, synthesizing this pragmatist insight that values are science-laden with other insights from the feminist tradition. I have also argued that this insight needs to be recovered (Brown 2020).

the adoption of physicalist language, a central aspect of his version of logical empiricism and the unity of science, as an antidote to philosophical obstacles to social and political progress (ibid., 12).

William Malisoff, the founding editor of *Philosophy of Science*, colleague of Edgar Singer, was a Marxist and an alleged spy for the Soviets (Reisch 2005, 105–7). He was a bit of a polymath, teaching both chemistry and philosophy, as well as doing industrial work and advising the government. His contributions to the journal included essays like "Virtue and the Scientist" (1939) and "A Science of the People, by the People and for the People" (1946). The former is a particularly interesting piece from the point of view of the history of values in science, as well as for those interested in the history of philosophy of science in practice. Among the claims made in this ten-page article, Malisoff argues that scientific knowledge is inherently social, and it cannot be understood apart from its social context. He argues that science is a practice, and philosophers of science cannot understand it if they focus only on its finished results. They have to understand scientific as inherently linked with action and application. As a result, social responsibility is of crucial importance to the scientist, and science is not neutral or value-free. What's more, he sees scientific practice as a model of ethical behavior, and claims that we should model our general ethics on the ethics of research and the virtues displayed by the scientist.

Under Malisoff's leadership and that of his immediate Singer-trained successors Churchman and Rudner, science and values, science and policy, and the sociology of knowledge were common topics in *Philosophy of Science* (Howard 2003, 66–70). What's more, a number of explicitly Marxist publications graced the pages of those the early issues, such as:

- A. Emery, "Dialectics versus Mechanics: A Communist Debate on Scientific Method" (1935)
- John Somerville, "Soviet Science and Dialectical Materialism," (1945)
- Lewis S. Feuer, "Dialectical Materialism and Soviet Science," (1949)
- Hans Freistadt, "Dialectical Materialism: A Friendly Interpretation" (1956) (see Howard 2003, 68)

Science and political ideology were a central topic that disappeared from the journal in the early 1960s.

But Marxist and adjacent approaches continued to play a role in the work of leftist scientists from the late 1960s through the end of the twentieth

century, especially through the work of Scientists and Engineers for Social and Political Action (SESPA), which became Science for the People (SftP), and through the Boston Sociobiology Study Group and one of its most strongly Marxist members, Richard Lewontin, whose books laid out an explicitly value-laden, Marxist account of biology (Lewontin 1982, 1992; Lewontin, Rose, and Kamin 1984; Levins and Lewontin 1985).

Marxists emphasize, at least as strongly as the pragmatists, the influence of science over values and politics. Scientific theory, in the form of historical or dialectical materialism and critical political economy, not only helps uncover biasing ideology but can also contribute to politics and social improvement. What's more, thinkers like Neurath and Malisoff fully acknowledge the value-ladenness of science and the social responsibility of scientists. Marxist scientists and philosophers of science have, especially in the latter twentieth century, attempted to combine science and social activism in ways that deserve further analysis by contemporary philosophers of science.

4 Feminism

It is a daunting task to provide a history of feminist philosophy of science, given that many of the key figures are still living and working in the field, and that many good overviews have been written by authors better situated to do so (S. S. Richardson 2010; Anderson 2020; Crasnow 2024; Crasnow and Intemann 2021; Bueter 2024; Yap this volume). I will limit myself here to broad themes in the work of feminist philosophers and feminist science studies scholars concerning science and values, without attempting a comprehensive account.

Early work in feminist science studies typically begins with cases where widespread, comprehensive, deleterious value systems (namely, patriarchy) leads to bad science. It proceeds either in a purely critical mode, or in a comparative mode that cites more recent work where the entry of women into a field helped uncover and correct bad (patriarchal) science (whether or not they were explicitly feminist). For example, Donna Haraway (1986) discusses sexist bias in primatology and the positive role of women in the field in uncovering and overcoming such biases. The Biology and Gender Study Group (1988) points out the role of sexist metaphors in cell biology, describing sperm and egg according to gender roles of "Prince Charming" and "Sleeping Beauty," and the way that this metaphor has stifled understanding

of the fertilization process. There are many such examples, and because partiarchy and sexism are still with us, there are bound to be more discovered by scientists and science studies scholars.

What to do about such bias has been a source of debates within philosophy of science. One early perspective, referred to as "spontaneous feminist empiricism" by Sandra Harding (1986) and "the *methodological* approach" by Janet Kourany (2010), takes patriarchal and sexist values as simply leading to bad (because biased) science, and the role of feminist critique is to identify such values and remove them, to return to good (value-free, objective) science (see Bueter 2024, 23). But many feminist philosophers of science have rejected this approach, arguing that the ideal of value-free science is part of the *problem*, not the solution. The value-free ideal is generally an ideological mask for hiding such biases, which can only be handled by making values an explicit part of scientists' reflection and discussion. Arguments from the underdetermination fo theories by evidence have often been central in these arguments (see Nelson 1990; Longino 1990), purporting to show that values are among the background assumptions that are necessary to bridge the gap between theory and evidence. Lynn Hankinson Nelson and Helen Longino also recommend a *social* response to the problem that emphasizes that the community, not the individual, is the relevant knower, and recommend norms of critical discourse and diversity to combat bias (see Bueter 2024, 24; Kourany 2010).

Other feminist philosophers of science take a more directly *political* approach, emphasizing not merely a diversity of perspectives, but the interaction of one's epistemic standpoint with one's place in social power hierarchies (see Bueter 2024, 24; Kourany 2010). Feminist standpoint theories argue that women occupy a social location that is a potential resource for generating better knowledge about gender, which men in a patriarchal society typically do not have access to (Hartsock 1983; Wylie 1992; Harding 1995). Standpoint theory does not define standpoints directly in terms of values; however, standpoint theorists typically regard group interests, political convictions, and other values as part of what constitutes a standpoint. A form of consciousness is also necessary for getting the full benefit of a privileged standpoint, e.g., class consciousness for a proletarian standpoint, feminist consciousness for women's standpoint, etc.

Another crucial move in the literature on values in science that has its origin in the feminist literature is the idea that there is no sharp distinction, but rather a vague and porous border, between so-called "epistemic" and "non-epistemic" values. Since at least Thomas Kuhn (1977), defenders of the value-

free ideal have pointed to a subset of values that are the ordinary values of scientific practice (for Kuhn, accuracy, internal and external consistency, broad scope, simplicity, fruitfulness for further research). Where anything like a value judgment must be made in science, these values are the only appropriate ones to use (Kuhn acknowledges that his list may not be exhaustive). Science ought to be kept pure of other sorts of values, so-called "non-epistemic" values, including all social, ethical, and political values. Phyllis Rooney (1992) and Helen Longino (1996) have argued, persuasively, that there is no sharp border between such values, nor any unequivocal list or weighting of epistemic values independent of the non-epistemic values of the inquirers. In their views, there is no divide between these types of values, but rather a spectrum or deep interconnections.

Feminist philosophy of science has been influential on many philosophers of science whose work on values in science does not have an explicitly "feminist" flavor. The primary insights of the feminist tradition, all of which remain influential today, are that values in science can have both negative and beneficial effects, that the adoption of the value-free ideal tends to mask rather than eliminate biasing values, and social and political approaches to managing values in science that emphasize community norms structure rather than individual reasoning.

5 Risk Management

The final tradition of work on values in science in the twentieth century is what I will call the "risk management" approach.[2] This is the least-well-recognized tradition in the field, one that does not even have a widely recognized names. Some of the most important names in this tradition include Bryan Norton (1991; 1996), Carl Cranor (1993), Kristin Shrader-Frechette (Shrader-Frechette 1991) (and her student Kevin Elliott (2000b, 2000a)), and Sheldon Krimsky (2000). The most influential philosopher within the tradition, from a contemporary point of view, is Heather Douglas. Work in this tradition is influenced by controversies in regulatory and environmental science, an emphasis on the role of science in policymaking, and a close relationship to the science of risk management. Work in this tradition tends to focus either on norms (or norm-violations) for individual researchers or on the larger policy embedding of scientific results. The most influential

[2]It could also be called the "regulatory policy" tradition with equal justice.

innovation within this tradition, from the point of view of contemporary philosophy of science, is Douglas's revival and improvement of the inductive risk argument that first appeared in the pragmatist tradition.

The explanation for why this approach is not well-recognized or named in the literature is unclear. It may be that it is simply too recent to have received a clear account. It may be that earlier work in this field has been relegated to the literatures on environmental ethics and philosophy of technology that are little-read by mainstream philosophers of science. Meanwhile, more recent work in the field has sometimes been conflated with the feminist and pragmatist traditions with which it has generated fruitful recent dialogues.

Key to my explanation of this lack of recognition is the project of situating Heather Douglas's *argument from inductive risk*, clearly the most influential argument in the literature today, and for good reason.[3] It is common to see this argument assimilated to the earlier pragmatist arguments of Churchman and (especially) Rudner, as well as to the underdetermination argument from the feminist tradition.[4] Rather than treat the question conceptually, I will look at the question historically, by looking at Douglas's earliest version of the argument, her (1998) dissertation, *The Use of Science in Policy-making: A Study of Values in Dioxin Science* (Pittsburgh HPS).

Douglas's dissertation has no references to the pragmatist tradition or the work of Churchman and Rudner. In general, the citations to philosophers of science are thin in the dissertation (see table).

Category of source	Number of Citations
Science (primary literature)	199
Journalism/policy reports	31
Regulatory policy research	9
Misc philosophers of science	3
Feminists	2
Pragmatists	0

The best argument for connecting Douglas to the pragmatist tradition on values in science is a somewhat lengthy (about 8 pages) discussion of

[3]The argument is almost certainly valid and sound; see Havstad (2022); Brown and Stegenga (2023).

[4]For criticism of the former conflation, see Havstad (2022). Biddle (2013) treats the argument from inductive risk as a special case of the underdetermination argument, while Elliott (2011) and Brown (2013) treat them as distinct types of argument.

Hempel's essay, "Science and Human Values" (1965). This essay is strange, in that it contains no citations and no hints of the sources of his ideas, though it does include a tepid version of Rudner's argument. It is likely that Hempel was familiar with the work by Rudner and Churchman to which his own argument bears striking resemblance.[5] However, according to Douglas, Hempel's essay was not formative over her ideas about values in science, which largely came from analyzing the dioxin case study (the work of scientists and policymakers).[6] The discussion of his work was added on the recommendation of Eric Angner to add support to the argument that had arisen organically from looking at the argument of regulatory scientists (Douglas 1998, 139n64). So it may be fairer to say that Douglas independently discovered (a better version of) the argument from inductive risk, rather than that she revived and improved it.

Feminist philosophy of science, by contrast, did have a formative influence on Douglas's philosophical education (via classes with Sandra Harding, Tamara Horowitz, and Nina Gregg), and she had read Longino's work as early as 1993 or 1994. Indeed, while working on her dissertation, Douglas began to see how the arguments by scientists and policymakers in the dioxin case "connected the dots" for her, leading her to understand Longino's claim that empirical assumptions encode values. But Douglas did not conceive of her work as contribution to this tradition.[7] And this matches the relatively brief discussion of feminist philosophy in the dissertation: only Longino (1990) and Rooney (1992) are cited, and only Longino gets much detail (about five pages). But while Douglas accepts Longino's and Rooney's arguments undermining the distinction between epistemic and non-epistemic values, she still accepts the distinction as useful if permeable (pp. 146-147). Douglas also reviews Longino's underdetermination argument (pp. 148-149) but finds Longino's account of value-laden science "not clear" and not "carefully developed" enough (p. 150). She specifically argues for Hempel's inductive risk approach over Longino's (pp. 150-152). While Longino, and the feminist science studies tradition that she represented, helped present Douglas with a puzzle to solve (how can empirical claims encode values?), Douglas seems to have rejected her approach to the problem, and not to have taken up any alternatives from the feminist tradition. What's more, Douglas has explicitly said that she did

[5]See, e.g., Frank (1956), based on presentations at the 1953 meeting of the American Association for the Advancement of Science, to which all three contributed.

[6]Personal communication, 6/17/2022

[7]Personal communication, 6/17/2022

not conceive of herself, in the late 1990s, as doing feminist work, not through an antipathy to feminism, but due to her view that feminist philosophy of science at that time was explicitly work on gender.[8]

It thus seems clear to me that Douglas's approach to values in science is better situated in relation to the work in regulatory science and policy from which it draws, and the larger tradition of risk management, which is heavily engaged with that work. While there seem few direct connections between Douglas's work and major philosophers in the risk management tradition (Cranor and Norton only receive very brief citations in the dissertation), she shares the distinctive concern with regulatory science and policy and with risk management. However we situate Douglas's work, the publication of her argument from inductive risk in 2000 (now with references to Churchman and Rudner) had a paradigm-shifting influence over the discussions of values in science in the twenty-first century, and forms a good end-point to my narrative.

6 Conclusion

This brief survey of the history of values in science has focused on the four traditions that have explored these issues from the late nineteenth century to the close of the twentieth. How has this history impacted the present discussion in the field and the rising interest in values in science? One important feature of the field in the twenty-first century is that it is difficult to discern distinct traditions, as there have been fruitful interactions, conversations, and mergers, especially between the feminist and risk management traditions. As already mentioned, it would be difficult to overestimate the importance of Douglas's arguments in the contemporary discussion. At the beginning of the twenty-first century, feminist philosophy was also moving from the periphery to gain mainstream recognition. The merger of the feminist and risk management traditions has thus led to the robust discuss we see today.

Understanding the different philosophical traditions that contribute to the contemporary scene can also help us better understand the dynamics of that debate and identify potential tensions and miscommunications. Perhaps the most significant different between the risk and feminist traditions in this respect is their relative individual versus social focus when it comes to ameliorating the role of values in science. Researchers most influenced by the risk

[8]Personal communication, 6/17/2022

tradition tend to focus on specific inquiries and the way values appropriately guide those inquiries, while feminist philosophers tend to emphasize the larger social structures of the scientific community and their role in guaranteeing the social objectivity of science. There are exceptions, however; for example, Janet Kourany's (2008, 2010), while firmly situated within the feminist tradition, tends to have a more individualized or local focus, while Torsten Wilholt (2009), while most closely inspired by Douglas and the risk management tradition, tends to emphasize social norms or community structures.

Another important lesson from this history is that there needs to be greater attention to distinctive contribution of pragmatism and Marxism to the discussion of values in science. The science-ladenness of values deserves as much attention as the value-ladenness of science, and may help us address some of our contemporary problems. This is especially true as it is increasingly recognized that philosophy of science needs greater engagement with metaethics in order to adequately address values in science (Franco forthcoming). Finally, both the Marxist and pragmatist traditions provide valuable insights for recent work suggesting that the values in science literature needs to engage more closely with political philosophy (Schroeder 2021; Lusk 2021).

References

Addams, Jane. 1899. "A Function of the Social Settlement." *The Annals of the American Academy of Political and Social Science* 13 (3): 33–55.

———. 1902. *Democracy and Social Ethics*. Edited by Charlene Haddock Seigfried. Urbana: University of Illinois Press (2002).

Alexandrova, Anna. 2018. "Can the Science of Well-Being Be Objective?" *The British Journal for the Philosophy of Science* 69 (2): 421–45. https://doi.org/10.1093/bjps/axw027.

Anderson, Elizabeth. 2004. "Uses of Value Judgments in Science: A General Argument, with Lessons from a Case Study of Feminist Research on Divorce." *Hypatia* 19 (1): 1–24.

———. 2020. "Feminist Epistemology and Philosophy of Science." In *The Stanford Encyclopedia of Philosophy*, edited by Edward N. Zalta, Spring 2020. https://plato.stanford.edu/archives/spr2020/entries/feminism-epistemology/; Metaphysics Research Lab, Stanford University.

Biddle, Justin B. 2013. "State of the Field: Transient Underdetermination and Values in Science." *Studies in History and Philosophy of Science* 44 (1): 124–33. http://dx.doi.org/10.1016/j.shpsa.2012.09.003.

Bohman, James. 1999. "Democracy as Inquiry, Inquiry as Democratic: Pragmatism, Social Science, and the Cognitive Division of Labor." *American Journal of Political Science* 43 (2): 590–607.

Brown, Matthew J. forthcoming. "Trust, Expertise, and Scientific Authority in a Democracy: A Pragmatist Approach." In *Pragmatism and Philosophy of Science: Historical and Contemporary Perspectives*, edited by Roberto Gronda, Marianne Janack, and Giancarlo Marchetti. Routledge Studies in the Philosophy of Science. Routledge.

———. 2012. "John Dewey's Logic of Science." *HOPOS: The Journal of the International Society for the History of Philosophy of Science* 2 (2): 258–306.

———. 2013. "Values in Science Beyond Underdetermination and Inductive Risk." *Philosophy of Science* 80 (5): 829–39.

———. 2020. *Science and Moral Imagination: A New Ideal for Values in Science*. Pittsburgh: University of Pittsburgh Press.

Brown, Matthew J., and Jacob Stegenga. 2023. "The Validity of the Argument from Inductive Risk." *Canadian Journal of Philosophy* 53 (2): 187–90. https://doi.org/10.1017/can.2023.37.

Bueter, Anke. 2024. *Feminist Philosophy of Science*. Elements in the Philosophy of Science. Cambridge University Press.

Churchman, C. West. 1948. "Statistics, Pragmatics, Induction." *Philosophy of Science* 15 (3): 249–68.

Clough, Sharyn. 2003. *Beyond Epistemology: A Pragmatist Approach to Feminist Science Studies*. Lanham, Md.: Rowman & Littlefield Publishers.

———. 2013. "Feminist Theories of Evidence and Biomedical Research Communities: A Reply to Goldenberg." *Social Epistemology Review and Reply Collective* 2 (12): 72–76.

Cranor, Carl F. 1993. *Regulating Toxic Substances: A Philosophy of Science and the Law*. Oxford University Press, USA.

Crasnow, Sharon L. 2024. "Feminist Perspectives on Science." In *The Stanford Encyclopedia of Philosophy*, edited by Edward N. Zalta and Uri Nodelman, Spring 2024. https://plato.stanford.edu/archives/spr2024/entries/feminist-science/; Metaphysics Research Lab, Stanford University.

Crasnow, Sharon L., and Kristen Intemann, eds. 2021. *The Routledge Handbook of Feminist Philosophy of Science*. Routledge Handbooks in Philosophy. Routledge.

Dewey, John. 1903. "Logical Conditions of a Scientific Treatment of Morality." In *The Middle Works, 1899–1924*, edited by J. A. Boydston, 3:3–39. Carbondale: Southern Illinois University Press, 1977/2008.

———. 1915. "The Logic of Judgments of Practice." In *The Middle Works, 1899–1924*, edited by J. A. Boydston, 8:14–82. Carbondale: Southern Illinois University Press.

———. 1927. *The Public and Its Problems*. Edited by Jo Ann Boydston. Vol. 2. The Later Works of John Dewey. Southern Illinois UP, 1986/2008.

———. 1931a. "Science and Society." In *The Later Works, 1925–1953*, edited by J. A. Boydston, 6:49–52. Carbondale: Southern Illinois University Press, 1985/2008.

———. 1931b. "Social Science and Social Control." In *The Later Works, 1925–1953*, edited by J. A. Boydston, 6:64–68. Carbondale: Southern Illinois University Press, 1985/2008.

———. 1938. *Logic: The Theory of Inquiry*. Edited by Jo Ann Boydston. Vol. 12. The Later Works of John Dewey. Southern Illinois UP, 1991.

———. 1939. "*Theory of Valuation*." In *The Later Works, 1925–1953*, edited by J. A. Boydston. Vol. 13. Carbondale: Southern Illinois University Press.

Douglas, Heather. 1998. "The Use of Science in Policy-Making: A Study of Values in Dioxin Science." PhD thesis, University of Pittsburgh HPS Program.

———. 2000. "Inductive Risk and Values in Science." *Philosophy of Science* 67 (4): 559–79.

———. 2009. *Science, Policy, and the Value-Free Ideal*. Pittsburgh: University of Pittsburgh Press.

Elliott, Kevin C. 2000a. "A Case for Caution: An Evaluation of Calabrese and Baldwin's Studies of Chemical Hormesis." *Risk: Health, Safety, and Environment* 11: 177–96.

———. 2000b. "Conceptual Clarification and Policy-Related Science: The Case of Chemical Hormesis." *Perspectives on Science* 8: 346–66.

———. 2011. *Is a Little Pollution Good for You?: Incorporating Societal Values in Environmental Research*. Environmental Ethics and Science Policy Series. New York: Oxford University Press.

Fischer, Marilyn. 2019. "Science and the Social Settlement." In *Jane Addams's Evolutionary Theorizing: Constructing "Democracy and Social Ethics"*. Chicago: University of Chicago Press.

Franco, Paul L. forthcoming. "Metaethics and Values in Science." In *Values, Pluralism, and Pragmatism*, edited by Jonathan Tsou, Jamie Shaw, and Carla Fehr.

Frank, Philipp G., ed. 1956. *The Validation of Scientific Theories*. Beacon Press.

Gross, Matthias. 2009. "Collaborative Experiments: Jane Addams, Hull House and Experimental Social Work." *Social Science Information* 48 (1): 81–95. https://doi.org/10.1177/0539018408099638.

Hamington, Maurice. 2022. "Jane Addams." In *The Stanford Encyclopedia of Philosophy*, edited by Edward N. Zalta, Summer 2018. Metaphysics Research Lab, Stanford University. https://plato.stanford.edu/archives/sum2018/entries/addams-jane/.

Haraway, Donna Jeanne. 1986. "Primatology Is Politics by Other Means," In *Feminist Approaches to Science*, edited by Ruth Bleier, 77–118. New York: Pergamon Press.

Harding, Sandra. 1986. *The Science Question in Feminism*. Ithaca: Cornell University Press.

———. 1995. "'Strong Objectivity': A Response to the New Objectivity Question." *Synthese* 104 (3): 331–49.

Hartsock, Nancy C. M. 1983. "The Feminist Standpoint: Developing the Ground for a Specifically Feminist Historical Materialism." In *Discovering Reality: Feminist Perspectives on Epistemology, Metaphysics, Methodology, and Philosophy of Science*, edited by Sandra Harding and Merrill B. Hintikka, 283–310. Dordrecht: Springer.

Havstad, Joyce C. 2022. "Sensational Science, Archaic Hominin Genetics, and Amplified Inductive Risk." *Canadian Journal of Philosophy* 52 (3): 295–320. https://doi.org/10.1017/can.2021.15.

Hempel, Carl G. 1965. "Science and Human Values." In *Aspects of Scientific Explanation and Other Essays in the Philosophy of Science*, 81–96. New York: The Free Press.

Howard, Don A. 2003. "Two Left Turns Make a Right: On the Curious Political Career of North American Philosophy of Science at Midcentury." In *Logical Empiricism in North America*. University of Minnesota Press.

———. 2006. "Lost Wanderers in the Forest of Knowledge: Some Thoughts on the Discovery-Justification Distinction." In *Revisiting Discovery and*

Justification: Historical and Philosophical Perspectives on the Context Distinction, edited by Jutta Schickore and Friedrich Steinle, 3–22. Dordrecht: Springer.

Hull House, Residents of, ed. 1895. *Hull-House Maps and Papers: A Presentation of Nationalities and Wages in a Congested District of Chicago, Together with Commends and Essays on Problems Growning Out of the Social Conditions*. New York: Thomas Y. Crowell & Co.

James, William. 1896. "The Will to Believe." *The New World* 5: 327–47.

Kourany, Janet A. 2008. "Replacing the Ideal of Value-Free Science." In *The Challenge of the Social and the Pressure of Practice: Science and Values Revisited*, edited by Martin Carrier, Don Howard, and Janet A Kourany, 87–111. Pittsburgh, PA: University of Pittsburgh Press.

———. 2010. *Philosophy of Science After Feminism*. Oxford University Press.

Krimsky, Sheldon. 2000. *Hormonal Chaos: The Scientific and Social Origins of the Environmental Endocrine Hypothesis*. Baltimore, Md.: Johns Hopkins University Press. http://www.loc.gov/catdir/bios/jhu051/99026066.html.

Kuhn, Thomas S. 1977. "Objectivity, Value Judgment, and Theory Choice." In *The Essential Tension: Selected Studies in Scientific Tradition and Change*, 320–39. Chicago: University of Chicago Press.

Levins, Richard, and Richard C. Lewontin. 1985. *The Dialectical Biologist*. Cambridge, Mass.: Harvard University Press.

Lewontin, Richard C. 1982. *Human Diversity*. New York: Scientific American Library.

———. 1992. *Biology as Ideology: The Doctrine of DNA*. 1st U.S. ed. New York, NY: HarperPerennial. http://www.loc.gov/catdir/description/hc044/92054487.html.

Lewontin, Richard C., Steven P. R Rose, and Leon J Kamin. 1984. *Not in Our Genes: Biology, Ideology, and Human Nature*. 1st ed. New York: Pantheon Books.

Longino, Helen E. 1990. *Science as Social Knowledge: Values and Objectivity in Scientific Inquiry*. Princeton, N.J.: Princeton University Press.

———. 1996. "Cognitive and Non-Cognitive Values in Science: Rethinking the Dichotomy." In *Feminism, Science, and the Philosophy of Science*, edited by Lynn Hankinson Nelson and Jack Nelson, 39–58. Dordrecht: Kluwer Academic Publishers.

Lusk, Greg. 2021. "Does Democracy Require Value-Neutral Science? Analyzing the Legitimacy of Scientific Information in the Political Sphere." *Studies in History and Philosophy of Science Part A* 90: 102–10. https://doi.org/https://doi.org/10.1016/j.shpsa.2021.08.009.

Magnus, P. D. 2013. "What Scientists Know Is Not a Function of What Scientists Know." *Philosophy of Science* 80 (5): 840–49.

Nelson, Lynn Hankinson. 1990. *Who Knows: From Quine to a Feminist Empiricism*. Philadelphia: Temple University Press.

Norton, Bryan G. 1991. *Toward Unity Among Environmentalists*. New York: Oxford University Press. http://www.loc.gov/catdir/enhancements/fy0636/91016719-d.html.

Norton, Bryan G. 1996. "Integration or Reduction: Two Approaches to Environmental Values." In *Environmental Pragmatism*, edited by Andrew Light and Eric Katz, 105–38. Routledge.

Peirce, Charles Sanders. 1877. "The Fixation of Belief." *Popular Science Monthly* 12 (1): 1–15.

———. 1878. "How to Make Our Ideas Clear." *Popular Science Monthly* 12: 286–302.

Proctor, Robert. 1991. *Value-Free Science?: Purity and Power in Modern Knowledge*. Cambridge, Mass.: Harvard University Press.

Reisch, George A. 2005. *How the Cold War Transformed Philosophy of Science: To the Icy Slopes of Logic*. Cambridge: Cambridge University Press.

Richardson, Alan. 2013. "What Good Is a (Indeed, This) History of Pragmatism?" *Transactions of the Charles S. Peirce Society* 49 (3): 405–12. http://www.jstor.org/stable/10.2979/trancharpeirsoc.49.3.405.

Richardson, Alan W. 2008. "Philosophy of Science in America." In *The Oxford Handbook of American Philosophy*, edited by Cheryl Misak, 339–74. Oxford: Oxford University Press.

Richardson, Sarah S. 2010. "Feminist Philosophy of Science: History, Contributions, and Challenges." *Synthese* 177 (3): 337–62.

Rooney, Phyllis. 1992. "On Values in Science: Is the Epistemic/Non-Epistemic Distinction Useful?" In *PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Association*, 1:13–22. 1. Philosophy of Science Association. https://doi.org/10.1086/psaprocbienmeetp.1992.1.192740.

Rudner, Richard. 1953. "The Scientist Qua Scientist Makes Value Judgments." *Philosophy of Science* 20 (1): 1–6.

Schroeder, S. Andrew. 2021. "Democratic Values: A Better Foundation for Public Trust in Science." *The British Journal for the Philosophy of Science* 72 (2): 545–62. https://doi.org/10.1093/bjps/axz023.

Shrader-Frechette, Kristin Sharon. 1991. *Risk and Rationality: Philosophical Foundations for Populist Reforms*. Univ of California Press.

Staley, Kent W. 2017. "Decisions, Decisions: Inductive Risk and the Higgs Boson." In *Exporing Inductive Risk*, edited by Kevin C Elliott and Ted Richards, 37–55. New York: Oxford University Press.

The Biology and Gender Study Group, Athena Beldecos, Sarah Bailey, Scott Gilbert, Karen Hicks, Lori Kenschaft, Nancy Niemczyk, Rebecca Rosenberg, Stephanie Schaertel, and Andrew Wedel. 1988. "The Importance of Feminist Critique for Contemporary Cell Biology." *Hypatia* 3 (1): 61–76. http://www.jstor.org/stable/3810051.

Westhoff, Laura M. 2007. ""To Add the Social Function to Democracy:" Jane Addams, Hull House, and Democratic Social Knowledge." In *A Fatal Drifting Apart: Democratic Social Knowledge and Chicago Reform*, 86–132. The Ohio State University Press.

White, Morton Gabriel. 1981. *What Is and What Ought to Be Done: An Essay on Ethics and Epistemology*. New York: Oxford University Press.

Wilholt, Torsten. 2009. "Bias and Values in Scientific Research." *Studies In History and Philosophy of Science Part A* 40 (1): 92–101.

Wylie, Alison. 1992. "The Interplay of Evidential Constraints and Political Interests: Recent Archaeological Research on Gender." *American Antiquity* 57 (1): 15–35. http://www.jstor.org/stable/2694833.

Yap, Audrey. this volume. "Feminist Philosophy of Science." In *Routledge Handbook of the History of Philosophy of Science*. Routledge.