FEMINISM, SCIENCE, AND THE PHILOSOPHY OF SCIENCE
SYNTHESE LIBRARY

STUDIES IN EPISTEMOLOGY,
LOGIC, METHODOLOGY, AND PHILOSOPHY OF SCIENCE

Managing Editor:

JAAKKO HINTIKKA, Boston University

Editors:

DIRK VAN DALEN, University of Utrecht, The Netherlands
DONALD DAVIDSON, University of California, Berkeley
THEO A. F. KUIPERS, University of Groningen, The Netherlands
PATRICK SUPPES, Stanford University, California
JAN WOLEŃSKI, Jagiellonian University, Kraków, Poland

VOLUME 256
FEMINISM, SCIENCE,
AND
THE PHILOSOPHY OF SCIENCE

Edited by

LYNN HANKINSON NELSON
Rowan College, Glassboro
and
JACK NELSON
Temple University, Philadelphia

KLUWER ACADEMIC PUBLISHERS
DORDRECHT / BOSTON / LONDON
# TABLE OF CONTENTS

LYNN HANKINSON NELSON and JACK NELSON / Introduction  ix

## PART I: HISTORICAL OVERVIEW: LOGICAL EMPIRICISM AND FEMINIST EMPIRICISM

RONALD N. GIERE / The Feminism Question in the Philosophy of Science  3

NANCY TUANA / Revaluing Science: Starting from the Practices of Women  17

## PART II: FEMINIST AND MAINSTREAM PHILOSOPHY OF SCIENCE: CONTINUITIES AND TENSIONS

HELEN E. LONGINO / Cognitive and Non-Cognitive Values in Science: Rethinking the Dichotomy  39

JACK NELSON / The Last Dogma of Empiricism?  59

SUSAN HAACK / Science as Social? – Yes and No  79

LYNN HANKINSON NELSON / Empiricism without Dogmas  95

ELIZABETH POTTER / Underdetermination Undeterred  121

ILKKA NIINILUOTO / The Relativism Question in Feminist Epistemology  139

## PART III: FEMINIST PHILOSOPHY OF SCIENCE AND THE SOCIOLOGY OF KNOWLEDGE, SOCIAL CONSTRUCTIVISM, AND THE DEBATE OVER SCIENCE STUDIES

KAREN BARAD / Meeting the Universe Halfway: Realism and Social Constructivism without Contradiction  161

JOSEPH ROUSE / Feminism and the Social Construction of Scientific Knowledge  195

ELISABETH A. LLOYD / Science and Anti-Science: Objectivity and its Real Enemies  217
PART IV: VIEWS FROM MULTICULTURAL AND GLOBAL FEMINISMS, AND FROM FEMINIST PHENOMENOLOGY

SANDRA HARDING / Multicultural and Global Feminist Philosophies of Science: Resources and Challenges 263

SARA HEINÄMAA / Woman – Nature, Product, Style? Rethinking the Foundations of Feminist Philosophy of Science 289

CONTRIBUTORS 309
ACKNOWLEDGMENTS

As editors of this volume, we have incurred many debts. We are grateful to those who read drafts of the initial prospectus and suggested contributors, and to the anonymous reviewer who commented on earlier versions of these essays. Annie Kuipers of Kluwer Academic Publishers displayed patience and continuing encouragement. We thank Jim Fetzer for suggesting the volume and the contributors for agreeing to be part of this project and for receiving, in good humor, our comments on successive drafts of their essays. Finally, we thank our families, particularly our daughter Rebecca Watson, and our parents, Virginia and Donald Hankinson, and Valnette and Lowell Nelson, who maintained good humor when we worked through family reunions.
INTRODUCTION

The essays in this volume address issues at the intersections of two loosely-delineated and rapidly-evolving areas of inquiry, “mainstream” philosophy of science and feminist philosophy of science. We hope this collection will facilitate and encourage dialogue among feminists and their colleagues about the nature of science and the philosophy of science. Some recent analyses in feminist and mainstream philosophy of science suggest an unbridgeable chasm between these traditions. We demur. We take philosophers of science and scientists, feminists and non-feminists alike, to share an interest in the nature of objectivity, truth, evidence, cognitive agency, scientific method, and the relationship between science and values. We also take there to be substantive issues that divide feminists and their mainstream colleagues, not including interest in the notions just listed. And we believe that encouraging greater dialogue between mainstream and feminist philosophy of science will further our understandings of these notions.

We have invited philosophers and practicing scientists to explore parallels and tensions between feminist approaches to science and other approaches in the philosophy of science and science studies more broadly. Contributors have more than met our expectations. Their essays explore the notions at the heart of both mainstream and feminist philosophies of science just listed, the categories that should and should not figure in the explanatory principles employed in the philosophy of science, and the question of what, if any, implications feminist science scholarship carries for our understanding of these notions. The contributors explore parallels and tensions between, on the one hand, feminist approaches to the philosophy of science, and, on the other, the rationalist and empiricist traditions in mainstream philosophy of science, the core tenets of logical empiricism, Quinean holism, varieties of realism, naturalized philosophy of science, sociology of knowledge, varieties of social constructivism, postcolonial science studies, multicultural and global feminisms, and the phenomenological tradition in Continental philosophy. Several contributors also explore recent arguments that science studies, including feminist philosophy of science, fail to meet and/or explicitly reject standards of rational inquiry.

Mainstream philosophy of science serves as one source of the issues on which contributors focus. It is now common to describe the philosophy of science of recent decades as sharply divided into two loosely-delineated research programs or schools of thought: one devoted to the refinement and articulation of the program spawned by logical empiricism and its immediate heir (the post-positivist tradition represented by Rudolf Carnap, Carl Hempel, and Ernst Nagel) whose goal is to reconstruct the logic of science (the logic of explanation, justification, and so on);
and the other constituted by reactions against the conceptualization of science as a body of theories and assumed primacy of the "logic of justification" in the philosophy of science. This latter school of thought is typically associated with the work of Paul Feyerabend and Thomas A. Kuhn, but it in fact includes a variety of approaches to understanding science in the philosophy of science, united by the emphasis on science as an activity rather than as a body of theories.

Indeed, it is common to describe post-positivist philosophy of science as characterized by three broad epistemological positions: contemporary versions of empiricism (constructive empiricism, for example), neo-Kantian social constructivism (a position typically attributed to Thomas A. Kuhn, for example), and scientific realism. While more detailed than the scheme outlined in the preceding paragraph, this classificatory scheme is also problematic. For one thing, it does not identify naturalized philosophy of science, a research tradition in which there is substantial interest and work. As importantly, the distinctions the scheme presupposes are by no means universally applicable. Among naturalized philosophers of science, for example, one finds advocates of scientific realism and of empiricism (Ronald Giere and W. V. Quine, respectively, have offered such arguments). So, too, "social constructivism" has been used both by its advocates and its critics in enough different ways – some vague and others quite specific, some generous and others quite limited – as to make the usefulness of the category without further explication dubious. Similarly, although "scientific realism" is understood by some to constitute the primary (or only) alternative to "social constructivism", "realism" is itself used in a variety of ways that are not obviously compatible (as attested to by its role as a component of "scientific realism", "naturalistic realism", and "perspectival realism"). And the relationship of some of the views associated with social constructivism to constructive empiricism or to the naturalistic realism advocated by Quine is itself hardly obvious. Finally, there seems to be no single thread running through the work of those who use "realism", "social constructivism", and/or "empiricism" to describe their positions.

Notwithstanding these complexities and ambiguities, the "isms", distinctions, and oppositions we have mentioned are assumed and appealed to in a good deal of recent work in the philosophy of science, including many of the essays in this volume. We suggest that readers look to see what content an individual author attributes to the notions in question, rather than superimpose such content or implications.

The second source of the issues addressed by contributors to this volume is feminist science scholarship, an area of inquiry also marked by significant development in the last two decades. Feminists commonly describe this development in terms of an evolution, from an initial emphasis on the sociology of science (with the latter construed narrowly to include social arrangements within science communities, and particularly women's positions and relatively low numbers within them), to critiques of the methods, theories, and research projects of various sciences (e.g., of androcentric methods and theories), to more general questions about the social processes in which scientific knowledge is generated, and (event-
u ally) to critiques and analyses of theories about science, including theories developed by philosophers of science, and the development of alternative theories about science. While such descriptions are useful starting points, they are potentially misleading. The "levels" of analysis just outlined have been evolving apace, each informing the other, and the ability to maintain the boundaries traditionally assumed between "sociological" issues and "epistemological" issues is one issue about which feminist scientists and philosophers of science, and their colleagues, often deeply disagree – as the essays in this volume attest.

Feminist critiques of mainstream philosophical positions and feminist alternatives to these positions are commonly classified using the categories "feminist empiricism", "feminist standpoint theory", and "feminist postmodernism", with each category understood to locate a feminist methodological approach at the intersections of a specific philosophical tradition and feminist theory. Cautions paralleling those offered earlier in the discussion of mainstream philosophy of science are appropriate here. Specifically, while the terms "realism", "empiricism", and "social constructivism" figure in feminist analyses, authors do not always understand the terms in the same ways. Nor do feminists always see these epistemological positions as mutually exclusive. Further, there is more than one version of feminist empiricism, of feminist standpoint theory, and of feminist postmodernism; and there are feminists who advocate versions of realism, others who advocate phenomenological approaches to science, and varieties of feminism. Finally, feminist naturalized philosophy of science is a current research program, but as in "mainstream" naturalized philosophy of science, considerable disagreement remains in feminist philosophy of science about what "naturalized" means in this context. Attending to the details of the analyses undertaken in individual essays is appropriate.

The essays address overlapping themes, and the way in which they are presented is but one of several possible ways of organizing them. We have selected sections based on our sense of larger and significant topics. In some sections, there is significant disagreement among the authors about a specific issue and/or about the implications of feminist science scholarship for the traditional categories and emphases of the philosophy of science; in others, there are areas of substantive agreement.

The essays included in Part One together provide a historical overview of how opposing views of the relationship between, on the one hand, good science and, on the other hand, social and political values, developed within logical empiricism (Giere) and contemporary feminist empiricism (Tuana).

In "The Feminism Question in Science", Ronald N. Giere explores the grounds for the resistance among many philosophers of science to admitting any influence of gender within good science. He maintains that an important source of this resistance is to be found in the presuppositions of post-war logical empiricism, presuppositions shaped not by argument but by the specific circumstances within which logical empiricism developed, and the carry over of such presuppositions to post-positivist philosophy of science. Giere includes among such presuppositions
the alleged distinction between the contexts of discovery and justification and the insistence that cultural factors (like gender) could not play any role in establishing the legitimacy of scientific claims. Ironically, Giere argues, important developments within post-positivist philosophy of science itself, particularly the turn to the notion of “rational progress within a research tradition” that is associated with the work of Imre Lakatos and other historically-oriented philosophers of science, do establish the theoretical possibility that gender could influence good science. Hence, Giere maintains, the existence of such influence is an empirical question to be considered by examining particular cases. Giere concludes by offering “perspectival realism”, a view that builds on the semantic view of theories, as compatible with and promising for feminist empiricism.

In the second essay of this section, “Revaluing Science: Starting from the Practices of Women”, Nancy Tuana explores the relationship between views in feminist empiricism of the relationship between cultural values and science, and an evolving body of feminist science scholarship. Tuana analyzes specific critiques advanced by feminist scientists and uses these case studies to argue that feminist scientists draw both on the methodological norms of their disciplines and feminist values. Tuana maintains that one implication of her case studies is that cognitive agents, including scientists, are engaged members of epistemic communities whose values and affective interests can have positive epistemic value. Building on the epistemology she attributes to primary care providers in the medical profession, Tuana sketches a view of the relationship between “knowers” and “known” that she maintains will allow for a more complex notion of scientific objectivity than conceptions that privilege disinterestedness and value-neutrality allow.

There are intriguing parallels between Giere’s and Tuana’s treatments of the relationship between the cultural values philosophers of science espouse and the theories of science they advocate, in their arguments for a relationship between such values and a then current state of science and science scholarship, and in their insistence that the question of what role cultural factors have in science is an empirical question. Giere’s analysis of the values informing logical empiricist arguments and Tuana’s of the values informing feminist empiricism suggest more continuities between the two research programs than is usually assumed. But their analyses also suggest that a fundamental difference between these traditions is that the relationship between cultural values and philosophical positions was downplayed in the first and is emphasized in the second, and that this difference is important for understanding the formulation of a discovery/justification context distinction in logical empiricism and its rejection in feminist empiricism. Finally, differing views about the relationship between relativism and cultural values in science and in the philosophy of science emerge as relevant to the differences between logical and feminist empiricism just mentioned, as both Giere and Tuana address.

Relativism is also a central concern in the essays included in Part Two. It is perhaps not surprising that some of the strongest disagreements among contributors are to be found in this section, in which mainstream philosophers of science (Haack, J. Nelson, and Niiniluoto) and feminist philosophers of science (Longino,
L. H. Nelson, and Potter) consider the relationships between values and science, the nature of evidence, the loci of scientific knowledge, the viability and implications of Quine’s underdetermination thesis, realism, and the implications or lack thereof of feminist science scholarship for each.

In “Cognitive and Non-Cognitive Values in Science: Rethinking the Dichotomy”, Helen E. Longino questions whether values long construed as cognitive really are cognitive (or at least “purely cognitive”), where “cognitive” is taken to mean something like conducive to the discovery of truth. On the basis of a juxtaposition of traditional cognitive virtues (simplicity, external consistency, breadth of scope...) with virtues she finds implicit in the practice of feminist scientists (ontological heterogeneity, novelty, mutuality of interaction...), Longino argues that the former are at least not purely cognitive and, like those that inform the practice of feminist scientists, presently carry political valence. Assuming a view of evidential relations that emphasizes the role of social processes, Longino concludes that the epistemic weight attributed to a particular theoretical virtue in the choice between methods, theories, or research programs, is determined by local, negotiated, and ideally pluralistic, considerations, and that it is time to rethink the distinction between the “cognitive” and “political” salience of these virtues.

In “The Last Dogma of Empiricism?”, Jack Nelson addresses the broader issue of whether the science/values distinction can be maintained given a reasonably holistic view of evidence. Nelson argues that there are strong Quinean grounds for rejecting the distinction and that it is far from clear that doing so would vitiate the objectivity of science. Nelson concludes that whether or not the distinction is abandoned, the failure to take value issues seriously works against the doing of good science.

We find interesting contrasts between Longino’s and J. Nelson’s approaches to and conclusions about the science/values dichotomy. While both question the viability of the traditional understandings of and arguments for the dichotomy, Nelson argues for holism “with distinctions” and does not assume it is impossible or unimportant to distinguish between value theory and empirical theory. Longino’s analysis seems, for the reasons earlier outlined, to question the kinds of distinction Nelson’s analysis suggests can and should be maintained.

In “Science as Social? – Yes and No”, Susan Haack also addresses the relationship of values to science, as well as the nature of cognitive agency and the relationship between these issues. Haack acknowledges that the doing of science is in many ways a social or communal activity; indeed, she maintains, intersubjectivity and cooperative engagement of many researchers across generations are important contributors to science’s notable success. But recognizing the social character of science in these terms, Haack argues, does not entail the thesis that non-constitutive values either inevitably do, or should be allowed to, influence science. There is an important distinction, Haack maintains, between the evidential warrant for a hypothesis or theory and its acceptance by individual scientists. Further, Haack argues, “science is social” is either a genuine insight, but not a feminist one, or not a genuine insight. On the basis of these arguments, Haack concludes that feminist
science scholarship carries no new or significant implications for a theory of science.

In “Empiricism without Dogmas”, Lynn Hankinson Nelson advocates the adoption within naturalized philosophy of science of methodological principles that incorporate a modest and inclusive holistic account of evidence, and that take science communities as the primary loci of philosophical explanations of scientific practice. Building on developments in naturalized and feminist philosophies of science, Nelson maintains that “explanations” of good science that do not recognize more kinds of social factors to be constitutive of science than are allowed for by traditional methodologies are empirically inadequate, and that there are cases of good science that cannot be adequately explained without including a substantive role for social beliefs and values. She advocates a social empiricism, the key epistemic notion of which is evidential warrant. Nelson concludes with an argument from the perspective of social empiricism to the effect that there are normative questions about the social processes characterizing science that should be pursued in naturalized philosophy of science: precisely those questions that are simultaneously questions about the bodies of evidence that support scientific theories and research programs.

In their competing arguments for epistemological individualism and social empiricism, Haack and L. H. Nelson appeal to views about the nature and scope of the evidence that supports theories in the sciences and in the philosophy of science. We suspect that broad differences in their accounts of evidential warrant (differences not limited to those concerning the role of social beliefs and values) are one source of their incompatible conclusions about the relationship between social processes and evidential warrant, the appropriate loci of philosophical explanations of science, and the implications of feminist science scholarship for a theory of science.

W. V. Quine’s underdetermination thesis is a presupposition of Longino’s analysis of the role of theoretical virtues in determining theory choice and is rejected by Haack who also rejects arguments that she takes to be based on that thesis to the effect that social and political values inevitably will (and should) influence such choice. The viability of the underdetermination thesis and its role in feminist science scholarship are the focus of the next essay in this section.

In “Underdetermination Undeterred”, Elizabeth Potter explores the issues separating proponents and critics of the underdetermination thesis and the recent arguments against the thesis advanced by Larry Laudan and Jarrett Leplin. Maintaining that Laudan’s and Leplin’s arguments against the thesis are not successful, Potter also argues that one issue at stake in the debate over underdetermination is a broader disagreement between those subscribing to rationalist approaches to science, and those (some empiricists, for example, and some pragmatists) who reject such approaches as well as the thesis that all science that is influenced by political factors and/or nonconstitutive values is ipso facto bad science. In rejecting the narrow definitions of rationality advocated by rationalist philosophers of science and recognizing that social or political considerations sometimes constrain good scientific decisions, Potter maintains, feminist science
scholars do not thereby reject scientific rationality. They are presumed to do so by rationalists, Potter argues, because the latter mistakenly assume that the rationality and cognitive authority possessed by science depend upon the rationalist project.

In “The Relativism Question in Feminist Epistemology”, Ilkka Niiniluoto considers the questions of whether and how feminist epistemology can avoid relativism, and maintains that realism is necessary to doing so. After surveying varieties of relativism, Niiniluoto asserts that feminist epistemologies have not, to date, sufficiently engaged the issue of realism. As feminist epistemologies also seem to presuppose gender relativism, Niiniluoto argues, they have not yet, in their empiricist, standpoint, or postmodernist formulations, precluded relativism. The issue is important, Niiniluoto argues, because embracing relativism would undermine the feminist project of criticizing “‘male bias’ in science” and the emancipatory potential of feminism. Accordingly, he advocates that feminist philosophers of science adopt “critical fallibilist scientific realism”, according to which “all factual beliefs in science are fallible, liable to error”, and classifiable as “uncertain, probable, or truthlike”. Niiniluoto also suggests that a feminist epistemology informed by a commitment to realism of this sort and tied to the applied social sciences represents an appropriate incorporation of feminist values in epistemology and science, and that political issues important to women would be served by feminist applied research.

There are other significant contrasts among the essays included in this section. We find a contrast in the approaches Haack and J. Nelson take to the science/values distinction, and in what these authors perceive as the consequences of its abandonment. Haack’s analysis suggests that maintaining the dichotomy as an ideal is necessary to the future of good science and to the critiques feminist scientists have leveled against androcentric and sexist science. J. Nelson’s analysis suggests that from the perspective of holism, abandoning the dichotomy might allow for the kind of attention to values that would contribute to better science. Several distinguishable philosophical traditions are drawn upon and appealed to in these essays. Haack’s analysis reflects the core research questions and emphases of traditional epistemology, J. Nelson and L. H. Nelson locate their analyses in naturalized philosophy of science, and L. H. Nelson maintains this is a distinguishable discipline from traditional epistemology. Longino’s “contextual empiricism” presumes a semantic view of theories in keeping with the view outlined by Giere as the basis for “perspectival realism”; the analyses undertaken by Haack, J. Nelson, L. H. Nelson, Niiniluoto, and Potter, on the other hand, presuppose a syntactic view of theories. Finally, as the foregoing suggests, several distinguishable versions of realism are advocated in these essays.

The disagreements we have noted notwithstanding, we find the rejection of relativism and the assumption that the philosophy of science is a normative enterprise common to all of the essays in Parts One and Two. These issues are also addressed in the essays included in Part Three, in which the discussion is broadened to include parallels and discontinuities between feminist approaches to science, and sociology of science and varieties of social constructivism, and recent charges by
critics of science studies that feminist scientists and philosophers reject both the actuality and possibility of objectivity in the sense traditionally attributed to science.

In "Meeting the Universe Halfway", theoretical physicist Karen Barad builds on the epistemology she attributes to Niels Bohr to develop “agential realism”: a view she describes as “a social constructivist view” that constitutes a new form of realism, makes room for a robust notion of objectivity, and is compatible with feminist insights into science. Taking the rejection of relativism to be a common theme in feminist science studies, the first three sections of Barad’s essay are devoted to explicating Bohr’s views and agential realism. Bohr’s philosophy of physics, Barad argues, constitutes an alternative to the dualisms of subject-object, culture-nature, and word-world that are criticized by feminist science scholars, for it conceptualizes “objects” and “agencies of observation” as forming “a non-dualistic whole”. This view, Barad argues, also serves as an alternative to versions of social constructivism that reduce knowledge to power plays or to language. After explicating agential realism, Barad relates it to arguments in feminist science studies that knowledge is situated and that objectivity requires critical reflexivity, rather than the separation of an observer from the objects observed.

An argument common to Barad’s and Niiniluoto’s essays is that realism is important to feminist science critiques and to feminist epistemology. We find intriguing contrasts in the views of realism these authors advocate and in what they take to be necessary if relativism is to be avoided. Barad maintains that the form of social constructivism she advocates, according to which the objects of science are inseparable from the theories and theorizers that posit them, is sufficient to avoid relativism. In contrast, Niiniluoto’s analysis suggests that realism of a traditional kind, in which the objects of science are assumed to exist independently of the scientists who posit them and truth is defined as “correspondence between a statement and reality”, are required. Another intriguing contrast concerns the appropriate scope of feminist theorizing within and about science. Niiniluoto’s analysis suggests that this scope may be limited to the social sciences. Barad argues that “agential realism” is an appropriate epistemology for the natural sciences, e.g., physics, and commensurate with the practices of feminist scientists in a variety of sciences.

In “Feminism and the Social Construction of Scientific Knowledge”, Joseph Rouse compares the conceptions of science presupposed by and being developed in feminist science studies with those informing the sociology of science. While Rouse sees both research programs as representing explicit challenges to the epistemological individualism that has dominated the philosophy of science, he maintains that the differences between feminist philosophy of science and sociology of science are at least as significant. Specifically, Rouse argues that the supposedly sharp differences between normative, mainstream philosophy of science and descriptive sociology of science actually presuppose a shared conception of knowledge according to which “‘knowledge’ demarcates a coherent, surveyable domain of inquiry”. In contrast, according to Rouse, feminist science studies emphasize science and the philosophy of science as practices rather than bodies of
theory, and construe knowing as concretely situated and more interactive than representational. In addition, Rouse argues, the rejection of methodological relativism, the willingness to retain and employ revised conceptions of evidence and objectivity, and the insistence on engaging in normative evaluations of scientific practice further distinguish feminist science studies from the sociology of science.

In “Science and Anti-Science: Objectivity and Its Real Enemies”, Elisabeth A. Lloyd explores recent charges that feminist scientists and feminist analyses of science are “anti-scientific”. Surveying specific charges made in several books and articles, Lloyd identifies what she takes to be central assumptions and concerns motivating these charges. Among the more important, she argues, are assumptions that counterpose scientific and scholarly objectivity with overtly political goals; and that presume a dichotomy between, on the one hand, social investigations and explanations of scientific processes and products, and, on the other hand, investigations and explanations presented in terms of standards of evidence, theories, testing, and the like – categories figuring in “internal” scientific evaluations of knowledge. Lloyd maintains that neither the first nor the second assumption stands up to scrutiny, and she uses specific analyses offered by feminist scientists to argue that critics of feminist science studies often distort the arguments made by feminist scientists and philosophers of science so that they appear to be “anti-science”, downplay or ignore the substantive contributions feminist scientists have made to research in their disciplines, and/or attempt to exclude feminist scientists from those in a position to engage science by ignoring the scientific credentials of these scientists.

Substantive areas of agreement among the essays in this section have emerged. Perhaps most obviously, Barad, Rouse, and Lloyd reject the claims that feminist scientists and science scholars advocate relativism, reject standards of rational inquiry, and/or are aptly described as “anti-science”. Relatedly, each author seems to reject the assumption that explanatory principles that incorporate social factors and processes are necessarily incompatible with principles that incorporate the traditional categories of evidence and objectivity. These issues link the essays of this section to essays in earlier sections, with the question of what kind of explanatory principles are appropriately employed in the philosophy of science and/or science studies more broadly emerging as one of the most pervasive and contested issues in the volume as a whole.

There is a difference worth noting among the essays in this section. While Rouse argues that a significant difference between feminist science studies and sociology of science is that the former rejects methodological relativism, and Barad distinguishes the kind of social constructivism she advocates from at least some versions advocated in the sociology of science also by reference to her rejection of relativism, Lloyd’s analysis suggests that the charge of relativism made against sociology of science is itself misplaced.

The essays in Part Four further broaden the discussion by bringing traditions outside British and American philosophy of science to bear on feminist and mainstream philosophy of science.
In "Multicultural and Global Feminist Philosophies of Science: Resources and Challenges", Sandra Harding argues that significant philosophical issues concerning science emerge when themes in multicultural and global feminisms, and in postcolonial science studies, are brought to bear on Northern philosophy of science, including Northern feminist philosophy of science. Among the issues Harding identifies and considers are relationships between androcentrism and Eurocentrism in Northern philosophies of science, the expansion of Northern sciences and technologies to developing countries, and gender relations within global political economies. Viewed from the perspective of postcolonial science studies and multicultural and global feminisms, Harding maintains, Northern sciences can be seen to constitute "local", rather than universally applicable, knowledge systems. Attention to the distinctive philosophical issues raised by multicultural and global feminisms, she concludes, can expand the concerns of postcolonial and Northern feminist philosophies of science in ways that support the development of epistemologies and ontologies capable of detecting the androcentrism and Eurocentrism of dominant frameworks in the sciences and in the philosophy of science.

In "Woman – Nature, Product, Style?" Sara Heinämäa brings the phenomenological tradition in Continental philosophy to bear on conceptions of the sex/gender distinction that she takes to be functioning in feminist science critiques. Understanding phenomenology as critically attending to the basic concepts at work in the natural and human sciences, Heinämäa describes feminist phenomenology as attending to the meanings of the basic concepts and terms presumed in feminist philosophy of science. Focusing on the role of the sex/gender distinction in feminist science critique, Heinämäa argues that the phenomenology of the body provides the resources for a more fundamental challenge to the dichotomies of biological/cultural, corporeal/intentional, and object/subject presupposed in the "(bio)scientific conception of the body" and criticized by feminist scientists and science scholars. Indeed, Heinämäa maintains, as it has functioned in feminist theorizing within and about the sciences, the sex/gender distinction has served to reinforce these dichotomies and contributed to inadequate conceptions of gender and of women.

A common theme in the essays by Harding and Heinämäa is that while feminist philosophies of science have challenged important features of the philosophical traditions that serve as part of their origins, they have retained other features that can and should be challenged. Another common theme is that gender has been inadequately conceptualized, not only in the sciences, but in British and American feminist theory; both authors offer substantive suggestions for how feminist philosophy of science might proceed so as to overcome these limitations.

We note additional contrasts and parallels among the essays in the volume. We suspect that the understandings of "social constructivism" at work in Barad’s and Rouse’s essays are different in significant ways, and that each is different from the understandings of that notion at work in the essays by Haack and Lloyd, which also stand in sharp contrast to one another. We find interesting parallels between the rejection of the epistemology/metaphysics distinction that Barad attributes to Bohr,
the perspectival realism Giere advocates, and the naturalistic realism J. Nelson and L. H. Nelson attribute to Quine and advocate. And the emphasis on knowing as an interactive relationship between scientists and nature is common to the essays by Barad, Rouse, and Tuana.

We suspect there are substantive differences in the content of “epistemic” at work in Longino’s and Haack’s approaches to the “social nature of science”, in Potter’s exploration of the issues dividing rationalist and anti-rationalist philosophies of science, and in Rouse’s view of the contrasts between feminist philosophies of science and both mainstream philosophy and sociology of science. And we find Giere’s, Longino’s, J. Nelson’s, L. H. Nelson’s, Potter’s, and Tuana’s understandings of empiricism to be significantly different from the view of empiricism at work in Harding’s essay as well, in some cases, as from one another.

Concerns about gender essentialism are common to the essays by Haack, Harding, Heinamaa, Niiniluoto, and Tuana, and the relationships between feminist philosophy of science and relativism that concern Niiniluoto are addressed in virtually all of the other essays. In addition, we find interesting parallels in Heinamaa’s explication of Merleau-Ponty’s phenomenology of the body, Tuana’s exploration of the epistemological significance of species-specific embodiment, and the view of knowing as embodied and situated that is an important feature of Barad’s account of agential realism.

We have noted that questions concerning the explanatory principles that should figure in the philosophy of science are among the more pervasive and contested issues in the volume. We conclude by noting broad continuities. Many contributors advance arguments that presuppose both the empirical success of science and science’s central role in our broader social and world communities. Additionally, the arguments we have summarized concerning the explanatory principles appropriate to the philosophy of science presuppose a shared view of the philosophy of science as a normative enterprise that can contribute substantive insights into the nature of science. We view these continuities as indicating that further dialogue among feminists and their colleagues about the nature of science and the philosophy of science is both possible and desirable.

Lynn Hankinson Nelson
Jack Nelson

NOTES

1 This is the schema laid out, for example, in the introduction to Richard Boyd, Philip Gasper, and J. D. Trout (eds): *The Philosophy of Science* (Cambridge, MA and London: MIT Press, 1991).
PART I

HISTORICAL OVERVIEW: LOGICAL EMPIRICISM
AND FEMINIST EMPIRICISM
My title is a reflection of Sandra Harding's *The Science Question in Feminism* (1986). Her science question in feminism is this: Feminist claims of masculine bias in science are often themselves based on scientific studies, particularly the findings of various social sciences. But if the claims or methods of science are in general as suspect as many feminists claim, then appeals to scientific findings to support charges of bias are undercut. In short, is it possible simultaneously to appeal to the authority of science while issuing general challenges to that same authority?

My feminism question in the philosophy of science is this: To what extent is it possible to incorporate feminist claims about science within the philosophy of science? Are feminist claims about science compatible with a philosophy of science that rejects relativism? Are they compatible with a philosophy of science that embraces realism? In short, how seriously should philosophers of science, in general, take the claims of feminists that the philosophy of science should incorporate feminist claims about science? The answer to my question, of course, depends both on what feminist claims one considers and on one's conception of the philosophy of science.

From the standpoint of the philosophy of science, the most significant claim of feminist scholars is that the very content of accepted theory in many areas of science reveals the gender bias of the mostly male scientists who created it. Moreover, the theories in question came to be accepted through the application of accepted methodological practices. So the sciences and scientists involved cannot be written off as obviously biased or otherwise marginal. Thus, gender bias in the content of accepted science is both possible and, in some cases, actual.

**CASE STUDIES**

An appropriate starting point for an examination of feminist critiques of science is with the many case studies of actual scientific research purporting to demonstrate masculine bias in the results of what had been regarded as clear cases of acceptable scientific practice. Investigating such cases, however, is much more difficult than one might think. Before explaining why, I will provide a rough taxonomy of cases and mention a few examples.