

**FEMINIST STANDPOINT EPISTEMOLOGIES
WITH/IN THE NATURAL SCIENCES**

by

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B.Sc., University of Victoria, 1991

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ABSTRACT

In this thesis, I consider the strategic uses of feminist standpoint epistemologies to feminist struggles over authority, meaning and knowledge in the context of the natural sciences. While feminist goals with respect to the natural sciences are diverse, filled with contradictions, tensions, and moments of shared resonance, competing interests are most sharply articulated between efforts to increase women's participation in science and efforts to transform how concepts of science determine what and how we know.

Feminist standpoint epistemologies posit women's difference as a resource for producing more objective/less partial knowledge. I explore feminist standpoint theories through the work of Dorothy Smith, Evelyn Fox Keller and Patricia Hill Collins. Although these theories are potentially deeply conservative, in this thesis I evaluate standpoint epistemologies according to the uses, costs and benefits of the strategies they provide for justifying feminist claims in the context of debates over equality and difference. Evaluating standpoint epistemologies involves considering how essentialisms function; the value of such strategies is determined by who uses them and in what contexts.

I consider whether geneticist Barbara McClintock's practices provide a model for feminist science based on a standpoint approach and whether feminist standpoint theories are able to explain her alternative practices. In addition, I examine the public messages of feminist science critics and of women scientists to determine whether strategies arising from feminist standpoint epistemologies are useful to women struggling to achieve equity and to transform science.

I conclude that while there are currently many barriers to using standpoint strategies effectively with/in the natural sciences, multiple strategies are necessary because both feminisms and science are constructed through ongoing struggles for political resources. Feminist politics must serve competing interests and address not only who uses a strategy in a particular context, but how such decisions are made.

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CHAPTER ONE: Women, feminism and science: An Introduction

For feminists, the ultimate test of knowledge is not whether it is 'true' according to an abstract criterion, but whether or not it leads to progressive change. (Weiler, 1988, p. 63)

Science and technology initially resided at the periphery of the concerns identified by second wave feminist movements. Not until the late 1970s did disputes over technology and nature within reproductive politics cause feminists to acknowledge the central role science plays in western systems of domination. The feminist literature on gender, science and technology has since exploded into a major field of study with increasingly diverse research interests and goals.¹ This field encompasses equity projects for women scientists, textual interpretations of science writing, and critiques revealing androcentric and other biases within scientific epistemological assumptions, methodologies, theories, facts and interpretations. Some feminists call for alternatives, for efforts to transform masculine science and/or to create a feminist science (Benston, 1982; Bleier, 1986). The notion that women have privileged access to a new epistemology is intrinsic to most feminist successor science projects (Fee, 1986; Harding, 1986).

In part, this thesis is my attempt to bridge the gaps between feminist science projects and between the communities of women committed to them. It is a desire which springs from my identities as feminist and scientist, which place me on the margins of both communities. While feminist science projects are diverse, filled with contradictions, tensions and moments of

¹Although science and technology are not distinct, I use the term science throughout the thesis rather than 'science and technology' because I am primarily concerned with processes of knowledge-making. However, I do so with the understanding that science is increasingly technology-driven (Harding, 1986, 1991) and that it is difficult to distinguish between the production of scientific knowledge and its technological applications.

shared resonance, competing interests are most sharply articulated between efforts to increase women's participation in science and efforts to transform how our concepts of science determine what we know and how we know. These conflicts are mapped onto the relationships between women scientists working to achieve equity and feminist science critics working to transform science. The boundaries between these communities and projects are blurred by those women scientists who are feminists and/or are interested in feminist critiques of science. While the dichotomies I present are neither stable nor absolute, they provide a useful framework for understanding the tensions surrounding feminist science projects.

Throughout this thesis, I use the following terminology to identify and distinguish the communities of women involved in these projects. I use 'women scientists' to refer to women who currently practice science, including feminists and non-feminists. Although not all women scientists self-identify as feminists, many do and are involved in feminist political projects; at times I use 'feminist women scientists'. 'Feminist science critics' refers to academic feminists who work primarily from locations outside of science, in disciplines such as history, philosophy, sociology, or women's studies, and includes those women who have completed scientific training and formerly practiced science.² At times, I am more specific, referring to 'feminist epistemologists' who produce theories of knowledge and knowledge-making, or to 'feminist standpoint epistemologists.' On occasion, I use 'feminists outside science' to amorphously describe feminists who are

²Very few women have been able to continue to both practice science and produce feminist theory about it. While the transition from the practice of science to feminist theorizing is likely the result of a combination of factors including funding requirements, time, the traditional divide between the practice and philosophy of science, and increasing alienation from science as it is currently practiced, this migration of women deserves attention.

not practicing scientists or scientific workers.³ My focus throughout is on professional scientists, however I also draw attention to the role that technicians, tradespeople, clerical staff, and other workers play in scientific knowledge-making.⁴

Central to the conflicts among feminist science projects is *difference*. What is the role of identity and experience in knowledge making? Considering feminist epistemologies as strategic political interventions into the realm of knowledge construction, this thesis evaluates the usefulness of feminist standpoint epistemologies to particular communities in their struggles to achieve specific goals in particular contexts. Whether or not women produce more objective knowledge is not the crucial point here; rather, I suggest that in some instances it may be useful to argue that we do, in others it may be more useful to argue that we do not. In particular, I am concerned with the natural sciences. While standpoint theory was developed by and for social scientists (Longino, 1993b), I evaluate the possible usefulness of feminist standpoint analyses and strategies to practicing women scientists for their career survival and advancement; and to feminist science critics working to transform science. Key to this discussion is who gets to decide where and when a particular strategy will be used. Like all difference feminisms, standpoint epistemologies are hotly contested (Grant, 1987; Jackson, 1989; Kline, 1989; Longino & Hammonds, 1990; Spelman, 1988). The purpose of this thesis is not to replicate or contest well-established criticisms,

³While Nelson (1990) and Harding (1989) argue that *all* theorizing about science takes place *inside* science, for the purposes of this thesis I refer to practicing scientists and scientific workers as inside science and to others as outside science.

⁴There are significant differences in women's participation both hierarchically and territorially across scientific disciplines. For example, the majority of technicians in the fields of medicine and health are women, while the majority in engineering fields are men (Statistics Canada, 1993, pp. 7-10). Because statistics on natural scientists vary according to which fields and which workers they include, I am as specific as my sources allow in identifying which groups are included.

but to examine the role of difference in standpoint theories as a particular example of a general paradox in feminist theorizing: difference as both strength and weakness.

The contradictions among feminist science projects teach us a great deal about science, and yet the politics of achieving feminist goals requires some cooperation between the overlapping communities of feminists and scientists. However, feminist science critics face many difficulties in maintaining a theory of science that is coherent with scientists' own visions. Many natural scientists are resistant to social theories about science (Gross & Levitt; Harding, 1989; Sokal, 1996). Most working scientists concern themselves very little with philosophical debates about the nature of knowledge or with critical examinations of scientific theories and assumptions (Crawford & Marecek, 1989). This thesis is an attempt to facilitate dialogue across feminist and scientific discourses. The contradictory perspectives of women scientists who are feminists may wedge open a space from the current impasse, a space from which to begin building better practice. As Bleier (1986) noted a decade ago, feminists have made little headway in the sciences relative to other disciplines: "the elephant has not even flicked its trunk or noticeably glanced in our direction, let alone rolled over and given up" (p. 1).

I believe that any feminist transformation of how science is practiced and by whom, will come from feminist political movements both inside and outside science. While feminist projects may differ according to location and audience, we must avoid a situation where "those women over there" are perceived as undermining the one truly feminist goal or set of truths. Rather, we need to acknowledge that change arises from multiple strategies chosen for particular contexts, and aim to consider feminist science projects on their

own terms. In this thesis, I focus on strategies, on public political interventions. I look to the public messages that feminist science critics transmit about science and scientists and the public messages that women scientists transmit about science and feminist critiques of science. Because these public messages include and are part of ongoing feminist struggles for political resources, they may not accurately represent the diversity of thought within communities. Strategies are necessarily public but do not necessarily represent the beliefs of those who invoke them. According to Enlightenment standards, truth and strategy are opposed.⁵ This thesis does not present a representative survey of the actual range of opinions held by the overlapping communities of women scientists and feminist science critics.

My approach to the literature involved taking into account who has access to which publications, asking questions such as: who is the intended audience? and, who gets published? From the materials available, I have pieced together public messages that are largely distinct to feminist communities and to scientific communities. I searched the newsletters of professional science organizations, organizations for women scientists, mainstream science publications, biographies and autobiographies, and published interviews for information from women scientists. I was interested in the messages they send out about science, their places in the profession, the kinds of obstacles they face, their priorities and goals, their visions of feminisms and their reactions to feminist critiques. Some of those same sources helped to determine the public messages that feminists outside science construct about scientists, particularly those biographies and interviews written or conducted by feminist science critics. Additional

⁵For example, "open strategizing about whether or not to claim that lesbianism and gayness are 'natural' would delegitimize any claims made about it" (Phelan, 1994, p. 47).

information was gathered from feminist journals and presses publishing feminist critiques of science and other pieces written about science and scientists by feminist science critics and other feminists outside science. Materials by feminist science critics who had formerly practiced science offered valuable insights.

People are forever asking me the question: How did you get from science to women's studies? While that journey is much shorter than most people imagine, implicating my identities and experiences in this process of knowledge-making lays bare some of the contradictions in feminist science projects and provides the impetus for the questions I ask in this thesis. At the same time, I want to avoid the self-indulgence of so-called "vanity ethnography" (Van Maanen, 1988, pp. 92-93), relaying stories that are "of interest even to myself only vaguely" (Lewis, 1993, p. 6). Experience is not linear. Particular moments transform the way we see what happens thereafter as well as reforming how we see what has gone before. Nor is experience the site of uncontested meaning. We must interrogate our experiences for how they delimit what is possible for us (Lewis, 1993). This thesis is an interrogation of sorts, of my inability to resolve the contradictions between my identities and experiences as scientist and feminist. My dual identities inform my understanding of feminist science projects and are reflected in my approach to this topic.

Like many individuals with a working class background, I entered post-secondary studies with pressures to do something 'practical' that would lead to professional employment. I completed an undergraduate degree in chemistry and worked on and off over a period of five years as a technician for a private analytic laboratory. Throughout this period, I became politically active and experienced increasing alienation from science, from other science

students, and from my co-workers. I left science, partly because I felt unable reconcile my politics with employment in an institution which I perceived to be bound up with environmental degradation, warfare, and corporate profits. And yet, in transgressing disciplinary boundaries at the undergraduate and graduate levels, I sometimes encounter stereotypes and other cultural mythologies about science and scientists from my non-scientist peers. And I have often had difficulties reconciling feminist critiques of science with my daily experiences in a laboratory.

This thesis is an attempt to address the gap between feminist theories of science and the daily experiences of women scientists, between politics and strategies informed by different views of the world (Keller, 1987). Mine is not the only story, only one of a multiplicity that could be told from the same set of experiences. Different tellings help us to learn the terms on which others make sense of their lives (Lewis, 1993). Achieving solidarity across difference, and across the different tellings by feminists and by scientists, is the challenge of feminist practice.

In using the term 'women' throughout this thesis, I do not mean to reduce differences to a monolithic category. Like Lewis (1993) I believe that

an understanding of the complexity of women's experiences in a phallogentric social cultural setting which is also marked by class differentiation, racism, ethnocentrism, ageism, and homophobia is essential to the understanding of the situation of women. (p. 73)

I am working from feminist critiques of science which focus almost exclusively on gender. Feminist equity struggles in science, like other forms of feminist careerism, carry race and class bias. They tend to focus on those women who attain the status of professional scientists, while ignoring that large numbers of scientific workers, whether technicians, support staff or

custodial staff, are white women and women and men of colour (Rose, 1986; Traweek, 1988). However as Fee (1986) notes, the features of feminist science critiques are similar to those arising from marxist/working class, African, First Nations, and Chinese perspectives. Each brings a partial perspective of dominant/dominated social relations. "Reflected within science is the particular moment of struggle of social classes, races and genders found in the real, natural, and human world" (p. 53).

The critiques of science arising out of the radical social movements of the 1960s and early 1970s focused on the political economy of science and on the relationships between science and ideology (Feyerabend, 1975; Kuhn, 1970; Popper, 1969). In the history, philosophy and sociology of science, critics aim to show how interests fashion knowledge, yet fail to recognize gender as a category of possible significance in the production of scientific knowledge (Blaier, 1986). Feminist epistemologies and critiques of science are connected to intellectual movements spanning the disciplines, but both feminist and non-feminist scholars usually leave these connections unstated (Crawford & Marecek, 1989).

Modern western cultures are science-centred. As Harding (1986) notes, scientific rationality has permeated not only the modes of thinking and acting of our public institutions but even the ways we think about the most intimate details of our private lives. Widely read manuals and magazine articles on child rearing and sexual relations gain their authority and popularity by appealing to science. (p. 16)

Science and politics have a dialectical relationship: mutually reinforcing, constructing and re-constructing each other (Haraway, 1991, pp. 9-19). Because political claims are made on behalf of science, it is crucial that feminists pay attention to science, not simply to condemn science and technology as oppressive or irrelevant to women. Neither should feminists assume that

science and technology are neutral tools which we can unproblematically apply to our own purposes (Lorde, 1984). Rather, we need to engage with science because it is the privileged form of knowledge-making in our culture and reinforces dominant social relations.

It is inevitable that women will be victimized by the sciences and their technologies in a society such as ours where women have little power, where almost all scientific research is technology driven, and where political issues are posed as requiring merely technological 'solutions.' (Harding, 1989, p. 281)

"Science is a system of procedures for gathering, verifying, and systematizing information about reality" (Namenwirth, 1986, p. 19). The scientific method is a set of idealized practices that involves making observations, forming hypotheses or tentative explanations for the observations, and testing their validity by further observation or experiment. This method is intended to guarantee the objectivity and validity of scientific knowledge; in fact, objectivity and value neutrality is supposedly what distinguishes science from other forms of knowledge (Bleier, 1986). However, science critics argue that each step of the scientific method is affected by the values, opinions, biases, belief and interests of the scientist.

What is truly remarkable is that scientists and the public deny this. Scientists and the information they collect are treated as though they are culture-free, classless, apolitical; as though the scientist's attempts at objectivity were routinely successful. (Namenwirth, 1986, p. 34)

Social bias affects scientific observations and assumptions, and determines what kinds of questions get asked by influencing what gets defined as a problem in need of explaining (Bleier, 1986).

Traditional epistemologies are theories of knowledge *in general* that tell us how knowledge makers ought to reason in order to reach knowledge which is true or right. According to traditional understandings, knowledge

making is democratic, available to anyone who uses the right method. While knowledge makers are supposed to be interchangeable individuals, traditional epistemologies in practice support elites who exercise cognitive authority through knowledge-making institutions (Addelson, 1993).

Dominant and subordinate social, cultural, and economic groups do not agree on what counts as useful knowledge. This disagreement is not a function of the objective/subjective dichotomy, but rather of the unequal power to articulate the knowledge each group derives from its own experience. In other words, the dominant social, cultural, and economic groups are able to renege ownership of the knowledge they derive from their experience and instead call it universal and objective. This privilege speaks more about their power than about the 'truths' they claim to have uncovered. (Lewis, 1993, p. 190)

Feminist epistemologists challenge the premise that a general account of knowledge, which ignores the social context and status of knowers, is possible.

While internally heterogeneous and irreducible to any uniform set of theses, feminist epistemologies are based on a recognition that values, politics and knowledge are intrinsically connected (Alcoff & Potter, 1993). Who gets to make knowledge varies systematically with the politics of a situation: "*who* makes knowledge makes a difference. Making knowledge is a political act" (Addelson, 1993, p. 267). In particular, feminist standpoint epistemologists claim that members of groups on the margins of stratified societies produce better knowledge than those in the centre, if they possess the right political values.

Feminist epistemologies interact with one or more traditions in the history of epistemology. These relationships involve appropriation and respect as well as criticism and rejection. Nevertheless, the feminist reconstruction of epistemology promises to reconfigure the borders between

epistemology, political philosophy, ethics, and other areas of philosophy (Alcoff & Potter, 1993).

Feminist epistemologies ask questions such as: Who is the subject of knowledge? How does the social position of the subject affect the production of knowledge? How can objectivity be maximized if we recognize that perspective cannot be eliminated? Are the perspectives of the oppressed epistemically privileged? How do social categories such as gender affect scientists' theoretical decisions? What is the connection between knowledge and politics (Alcoff & Potter, 1993)? Feminist epistemologies potentially result in sciences which acknowledge subjectivities, assumptions and the partiality of truth claims.

According to "mainstream philosophers, feminist work in philosophy is scandalous primarily because it is unashamedly a political intervention" (Alcoff & Potter, 1993, p. 13). Feminists show

that to be *adequate*, an epistemology must attend to the complex ways in which social values influence knowledge, including the discernible social and political implications of its own analysis. . . For feminists, the purpose of epistemology is not only to satisfy intellectual curiosity, but also to contribute to an emancipatory goal: the expansion of democracy in the production of knowledge. (Alcoff & Potter, 1993, p. 13)

This requires that feminist epistemologies reveal how knowledge is authorized and whom it empowers. These theories must be self-reflective and able to reveal their own social grounds. Feminist knowledge makers who occupy elite positions must not assume that what is liberatory for them/us is liberatory for all women. Addelson (1993) argues that feminist epistemologies be tested by their effects on women's practical political struggles outside the academy.

This thesis attempts to test feminist standpoint epistemologies by their effects on feminist struggles in the context of the natural sciences, considering whom these strategies empower and whom they authorize to speak. Cognitive authority resides with feminists in some contexts and with scientists in others. I speak from a location which straddles both identities. Because communities or groups (not just individuals) have a role in the acquisition and development of knowledge (Kuhn, 1970; Nelson, 1990), I want to acknowledge the direct and indirect contributions of various communities to this thesis. I, however, retain responsibility for the weaknesses of this text, with the hope that it will be of some use in feminist struggles over scientific meaning and meaning-making.

CHAPTER TWO: Feminist Epistemologies

For years western feminists have debated the nature of women's oppression and the goals of feminist movements. Are women to strive for equality with men? Or, are women to value and preserve their differences from men? Within the scope of popular debates, the goals of achieving equality and preserving difference have often been construed as oppositional or mutually exclusive. But differences among women complicate the equality/difference binarism: with which groups of men are women to strive for equality? which differences are to be valued and preserved among which groups of women?

Feminist critiques of science and knowledge, like most feminist theorizing, are shaped by the broad outlines of the equality and difference¹ debates. At stake are questions of women, nature and culture--not only how we understand these concepts and their relations to each other, but also the political strategies and possibilities which result.

Equality and Difference

Second wave western feminists made significant gains in achieving social legitimacy and power by focusing on women's rights to the same possibilities and prerogatives as (white) men. This brand of equality feminism is typified by Simone de Beauvoir's *The Second Sex* (1970) and Betty Friedan's *The Feminine Mystique* (1963). While the roots of each work are different, lying in existentialism and liberalism respectively, both authors accept the position and experiences of the white middle-class male as the

¹Difference has more than one set of meanings within feminisms. Unless otherwise specified, I use the term 'difference feminisms' to refer to feminist analyses which emphasize women's differences from men.

norm. To de Beauvoir and Friedan, women fall short of this norm not because of inherent or essential inferiority, but as a result of social relations and conditioning. Hence, "One is not born, but rather becomes a woman" (de Beauvoir, 1970, p. 249). Aiming to eliminate systemic sexist discrimination, equality feminists encourage women to enter male dominated arenas to prove that women can perform equally well within the given structures.

However, as women enter existing institutions of social power, the weaknesses of equality feminisms become apparent. While some women gain access to social power, social relations remain primarily unaltered; systemic discrimination remains entrenched and women face double and even triple workloads in productive and reproductive labour. Challenges to equality feminisms arise from women who do not want to 'be' like men to achieve equality and dignity and from working-class women and women of colour who see that equality feminisms serve only to make white middle-class women equal to men of the same race and class.

Refusing to play by the accepted rules of the game, many feminists began to search for that which makes women uniquely different from men and to identify and develop a language and culture of women. Associated with French feminists such as Luce Irigaray, and with psychoanalytic feminists such as Nancy Chodorow (1978), Carol Gilligan (1982) and Mary Belenky *et al.* (1986), difference feminisms result from feminist efforts to redefine traditionally devalued feminine characteristics and activities as strengths, sources of power and as vital contributions to society. Claiming women's difference from men means redefining oneself and the world according to women's own perspectives, challenging not only social relations but the structures of representation, meaning, and knowledge (Grosz, 1994).

Yet too often women's differences from men are boiled down to something all women share across cultures, history, class and sexuality. Difference feminisms are challenged for perpetrating a falsely universal essentialism based on the experiences of white, heterosexual, middle-class women, and for reinscribing binary oppositions such as male/female and reason/emotion through attempts to invert the cultural value assigned to each term of the binary pair.

The equality and difference debates rest on contested ground: the relations between the natural and the social (Fuss, 1989, p. 3) and how these determine our understanding of women: are women (and men) the product of nature or culture, or both? Equality feminisms argue that any differences between women and men are socially constructed through gender identities and/or through social relations of power, and are therefore subject to change. Difference feminisms map sex onto gender, assuming either that socialization processes necessarily result in differences between women and men, or that women and men exist prior to culture and to the assignment of social values to the differences between them. The terms of this debate are easily problematized: given the diversity of women (and men) whom do we mean by 'women'? do sexed bodies exist as real and directly accessible through the senses, or as networks of effects continually subject to sociopolitical determination (Fuss, 1989, p. 5; Laqueur, 1990)? Are the concepts of the social and the natural unproblematic?

While I return to some of these questions below, two key points arise out of this discussion which I want to emphasize here. First, equality and difference beg the questions: equal to whom? different from whom? These questions are played out both between women and men in debates about the sources of sexist oppression and among communities of women in debates

about feminism, racism and other forms of oppression. Neither equality nor difference can satisfy women's varying concerns and needs. We need to ask different questions: not simply whether individuals are the same or different within a particular structure, but how are they similar or different and what are the implications (Phelan, 1994, p. 12)? not simply whether similarities and differences arise from nature or culture (or both), but what are the relations between the social and the natural? The political notion of equality in fact depends on an acknowledgment of difference, for there would be no need to strive for equality among individuals or groups who are considered identical or the same (Scott, 1990).

Second, when feminists choose one approach over the other they do so not simply on the basis that it offers a better understanding of social relations but because it is judged to be more effective in achieving feminist goals. Aligning oneself with equality or with difference feminisms is as much a question of political strategy as it is of explanatory power or internal theoretical coherence. For example, the continued oppression and domination of women has been justified on the grounds of unchanging and innate differences between women and men. Does asserting women's autonomy based on those same differences prove an effective strategy? Over the last century, western feminists have increasingly turned away from efforts to bring typically feminine values into the public sphere, arguing that despite limited success in particular contexts, such strategies ultimately result in women's ghettoization. Regardless of the 'evidence' for or against the natural or cultural origins of women's oppression, many western feminists currently condemn difference feminisms as essentialist in favor of theories of the social. In the context of feminisms, gender essentialism consists of the belief that

woman can be specified by one or a number of inborn attributes which define across cultures and throughout history her unchanging being and in the absence of which she ceases to be categorized as a woman. (Schor, 1994b, p. 42)

Believed to be complicitous in reproducing patriarchy, essentialisms are also

. . . the prime idiom of intellectual terrorism and the privileged instrument of political orthodoxy . . . the word essentialism has been endowed within the context of feminism with the power to reduce to silence, to excommunicate, to consign to oblivion. Essentialism in modern-day feminism is anathema. (Schor, 1994b, p. 42)

According to Schor, anti-essentialism originates from the conflicts between existentialist equality feminists and French difference feminists and secures feminism's place within the dominant male theory of this era, deconstruction. For feminism, "Anti-essentialism is the wages of academic legitimation" (Schor, 1994a, p. xii).

Feminist Epistemologies: Empiricist, Standpoint, Postmodern

Feminist epistemologies resonate with the tensions produced by the equality and difference debates. The three major streams identified by Harding (1986, 1991), feminist empiricisms, feminist standpoint epistemologies, and feminist postmodernisms, represent alternative ways of understanding the relations between women, nature and culture and result in varied strategies for feminist knowledge-seeking.

If we view knowledge as socially located, we see epistemologies as historical justificatory strategies rather than as models for determining abstract and universal truths (Harding, 1986, p. 141). Theories of knowledge justify claims to specific knowledges, thereby producing and legitimating power. Epistemologies can be understood as political strategies.

What comes to the fore, then, is not truth but strategy. If we ask why certain metanarratives function at certain times and places, we find that the answer has to do not with simple progress of a unitary knowledge but rather with shifting structures of meaning, power, and action. (Phelan, 1994, p. 42)

Each stream of feminist epistemologies challenges the authority of objectivity and scientific method to determine what counts as real in a manner which reflects specific allegiances to equality and difference feminisms, conceptions of the relations between the natural and the social, as well as considerations of audience and sites of possible change.

Feminist empiricists acknowledge that social biases such as sexism enter research by influencing how scientists choose research topics, design experiments to test hypotheses, and collect and interpret evidence. At the same time they argue that bias can be eliminated from research by stricter adherence to the existing norms of scientific methodology.² According to feminist empiricists, feminist movements encourage women to enter scientific careers on an equal footing with men, broaden the scope of research and alert scientists to sexism in research, which can then be refuted on the basis of evidence (Harding, 1986, pp. 102-110). Thus, feminist empiricists acknowledge that social values enter science in the context of discovery but defend the value-neutrality of the context of justification and the universality of the knowledge produced by good science. Although the social influences which direction we choose to look in, good science simply uncovers nature for our viewing.

²Longino (1993b) questions whether any feminist scholars totally conform to the profile of feminist empiricism identified by Harding (1986), but acknowledges that "certain moments in the analyses offered by practicing scientists who are feminists do fit this model" (p. 105). Harding (1986) treats Longino and Doell's (1983) essay "Body, Bias and Behaviour" as an exemplar of feminist empiricism. Because the essay does not claim that masculine bias can be corrected by application of current methodologies in the sciences, Longino (1993b, p. 119) finds Harding's discussion a "puzzlingly perverse misreading."

Harding (1991, p. 116) argues that feminist empiricisms carry the seeds of a more radical approach. They undermine three key assumptions of the empiricism they rely on: that the social identity of the observer is unimportant, that science is necessarily separate from politics, and that the scientific method is able to eliminate all biases and is itself free of bias. These contradictions form the basis of feminist standpoint epistemologies.

Feminist standpoint epistemologists claim that no perspective in a stratified society can be disinterested, impartial, value-free, or detached from the particular, historical and social relations in which everyone participates.³ Hence, all knowledge is socially situated, including scientific representations of the natural world. While the view available to each individual is both partial and distorted by the relations of ruling, it is less partial and distorted for the dominated than for those in a position to dominate. Feminist standpoint theorists argue that women's distinct situation in a gender stratified society provides special resources which enable feminism to produce empirically more accurate descriptions of the world and more complex theoretical explanations than conventional research, which does not make use of these resources (Harding, 1991, p. 119).

In contrast to feminist standpoint epistemologists and empiricists, feminist postmodernists reject the aims and assumptions of Enlightenment projects, including scientific aims to tell universal truths about the natural world.⁴ Such theorists argue that there is no archimedean point from which to evaluate knowledge claims and no category 'woman' to whose social

³The origins of standpoint epistemologies lie in Hegel's parable of the master-servant relation, which served as a model for Marx's analysis of the relation between the ruling and working classes. Human activity structures and sets limits on human understanding such that what we do shapes and limits what we can know (Harding, 1991, p. 120).

⁴I use the term postmodern here as a shorthand reference for some of the major ideas offered by postmodernisms, poststructuralism, and deconstruction. Delineating amongst these conceptual practices is beyond the scope of this work.

experience feminists can appeal. Rather, women inhabit multiple, constantly shifting subject positions which provide the resources for knowledge claims.⁵ Feminist postmodern theorists reject a politics of unity based on naturalized and essentialized identities in favor of a politics of solidarity in opposition to dominant constructions of truth. For many postmodernists, rejecting empiricism means that the stories science tells about nature reflect the social (not the natural) worlds.

The boundaries between feminist empiricist, standpoint and postmodern epistemologies are not discrete; these approaches contain shared elements, internal tensions and contradictions. This set of relationships resembles a dialogue and suggests that choosing one strategy over the others is currently premature. Harding (1986) proposes

that we think of feminist epistemologies as still transitional meditations upon the substance of feminist claims and practices. In short, we should expect, and perhaps even cherish, such ambivalences and contradictions. (p. 141)

In addition, the differences among feminist epistemologies may be as much political or tactical as philosophical, given the diversity of strategies which result. Different justificatory strategies are successful in different contexts and for different audiences, and are chosen to argue feminist claims accordingly.

By challenging sexism through appeals to evidence rather than politics, feminist empiricist strategies are persuasive to conventional scientists and philosophers, gain access to powerful scientific discourses with less resistance than other feminist justificatory strategies, and are able to open up research options for feminists without placing their funding, publishing opportunities, and teaching and laboratory appointments in serious jeopardy (Harding, 1991, 112-5). By contrast, many feminists view postmodern

⁵Although, what parts of our identities count as resources for knowledge claims is not obvious.

approaches as relativistic, leaving them little ground on which to justify a politics of transformation.⁶ In addition to being politically unsatisfactory to many feminists, postmodernism is unpalatable to empiricists, including natural and social scientists, committed to discovering reality.

Feminist standpoint epistemologies are more convincing to most social scientists than strictly empirical arguments, are more palatable than postmodernism to scientists and mainstream philosophers of science, and are able to draw on a diversity of feminist research in the social sciences to defend their claims to more objective knowledge (Harding 1991, p. 134). Because they occupy a middle ground between the perceived realism of empiricism and the perceived relativism of postmodernism, providing an analysis of social construction bounded by empirical constraints, standpoint epistemologies are appealing to many feminists. For example, Harding (1986, p. 195; 1991) views this middle ground as the most likely route to a political transformation which will transfer social power from the 'haves' to the 'have-nots.' While noting that middle grounds have a bad name in philosophy, Code (1991) argues that "a well-mapped middle ground offers a place to take up positions of strength and maximum productivity from which exclusionary theories can be tapped critically and creatively for criticism and reconstruction" (p. 318).

Feminist standpoint epistemologies have been subject to extensive criticism for essentializing and universalizing gender differences at the expense of articulating differences in race/ethnicity, culture, class and sexuality among women and among men (Kline, 1989; Grant, 1987).

Standpoint epistemologies carry several additional weaknesses. First, their

⁶In response to the notion that every story is equally true: "What does it mean to say all interpretations are equal in a Euro-American culture where inequality is institutionalized; where some versions are printed in every newspaper and other versions disappear" (Kiss & Tell, 1994, p. 72)?

internal logic suggests that oppressions can be quantified and ranked so that the experiences of the 'most oppressed' group of women will ground the least distorted knowledge. Second, feminist standpoint theories encourage researchers to begin inquiry from the lives of marginalized women yet leave few clues as to how, for example, a "white middle-class Scottish woman might act on the recommendation to start thought from the life of a Myanmar peasant woman" (Longino, 1993a, p. 211). In addition, having philosophers seek out 'less privileged' women replicates the social-scientific observer/observed hierarchy and attests to a belief that the privileged themselves are located nowhere or in positions that are not contestable (Code, 1991, p. 308). Third, feminist standpoint epistemologies imply an epistemological chasm between feminists and non-feminists (or between women and men) which assumes that feminists can know things that non-feminists cannot know (Nelson, 1990, p. 273). However, feminists have neither the evidence nor motivation to claim that no one else can come to know what feminists know; after all, most feminists were at one time non-feminists.

Feminist Standpoint Epistemologies

For the remainder of this chapter I focus on feminist standpoint epistemologies, with their attendant strengths and weaknesses, uses and dangers. Like all feminisms of difference, feminist standpoint epistemologies ascribe a special resource to women--a seductive notion, particularly within a context of identity politics where much attention is paid to where you speak from, who you are. I do not want to ignore or dismiss as unimportant those aspects of standpoint epistemologies which contribute to continued oppression, exploitation and domination, but neither do I wish to curtail

discussion at this point simply by labeling feminist standpoints essentialist. I examine standpoint epistemologies with questions about how essentialism functions within particular contexts. Diana Fuss (1989) argues that “in and of itself, essentialism is neither good nor bad” (p. xi). Instead of asking whether or not feminist theories are essentialist (and therefore bad), feminists might ask where, how and why essentialism is invoked, and what are the political consequences? Fuss asserts that the tension produced by the essentialist/constructionist debate is responsible for some of feminist theory’s greatest insights. However it has also “created the current impasse in feminism, an impasse predicated on the difficulty of theorizing the social in relation to the natural” (1989, p. 1). This is particularly pertinent to feminist investigations of the natural sciences. Feminist standpoint epistemologies are good examples of recent explorations of strategies around essentialism intended to overcome this impasse. Can essentialisms work to our benefit? If so, in what contexts? Who is ‘we’, when used by whom? These are questions which I return to later in this chapter. I hope this thesis will contribute to the reopening of debate, to new conversations about what essentialism means, and yet I am highly conscious of motive. I pose these questions as a feminist of relative privilege: the questions I choose, how I ask and answer them, depend on where I (and my audience) stand. I assume that they would look different from different locations.

Works by Dorothy Smith, Evelyn Fox Keller, and Patricia Hill Collins provide the detailed ground for examining feminist standpoint epistemologies. Their work provides strong examples of the diversity of feminist standpoint approaches, including alternate constructions of difference, but is not entirely representative of that body of theory.⁷ I have

⁷For other examples, see Nancy Hartsock (1983) and Hilary Rose (1983).

chosen to focus on Smith because her work in sociology is a benchmark of standpoint theory grounded in a materialist analysis; on Collins, also a sociologist, because she expands Smith's work to include race as well as gender difference; and on Keller because she is a natural scientist and because she grounds difference in psychodynamic development.

Dorothy Smith

The essays collected in *The Everyday World as Problematic* (1987) chart the development of Smith's critiques of sociology and her proposal for a feminist alternative. Smith argues that established sociology has systematically developed a consciousness of society and social relations from the standpoint of men located in the "relations of ruling." According to Smith, this sociology claims objectivity not on its capacity to speak the truth, but on its capacity to exclude the presence and experience of particular subjectivities--those particular local places in the everyday in which we live our lives. Smith (1987) uses the term "relations of ruling" as a way to draw attention to the "intersection of the institutions organizing and regulating society with their gender subtext and their basis in a gender division of labour" (p. 3). The term "ruling" refers to a complex of organized practices, for example government, law, and educational institutions, and to the textual discourses which partially occupy and connect multiple sites of power. Smith terms this mode of ruling "extralocal," in that our everyday activities and experiences are transcribed into abstract and general forms which become part of the relations of ruling. Ideology supports existing social relations and shapes the way we think about the world around us, such that our local, particular, and direct experiences and knowledge are organized into forms of knowledge consistent with the interests, aims and perspectives of the ruling

class, and become part of the practice and relations of ruling (1987, p. 56). According to Smith, women's exclusion from the making of ideology, knowledge and culture by the ordinary social processes of socialization, education, work and communication means that women's experiences, interests, and ways of knowing the world are not represented in the ruling organization or its knowledge/texts. As a result, the perspectives of those men in the ruling class are presented as general and universal, when in fact they are partial, limited, located in a particular position and permeated by special interests and concerns (1987, p. 20).

Smith (1987, p. 80) concludes that "the actual practices, the labour, and the organization of labour, which makes the existence of a ruling class and their ruling possible, are invisible" from the standpoint of ruling. These relations are visible only from a standpoint outside the ruling class and in a class whose labour produces both a ruling class and the relations of ruling. Smith (1987, p. 83) argues that within capitalist relations women do the work of caring for concrete bodily needs, liberating men to abstraction both in the home and the workplace. Because women's work is located outside the relations of ruling but is essential to sustaining them, social relations are visible from the standpoint of women.

Patricia Hill Collins

In "Learning from the Outsider Within: The Sociological Significance of Black Feminist Thought" (1986) and "The Social Construction of Black Feminist Thought" (1989), Patricia Hill Collins articulates a standpoint and epistemology distinctive to Black women. According to Collins, African-American women's political and economic status provides them with a distinctive set of experiences and a different view of material reality than that

available to those who are not Black and female, which results in a distinctive consciousness. A Black women's standpoint and epistemology stem from Black women's experiences of race and gender oppression, but do not result simply from combining Afrocentric and feminist values; Black women occupy the margins of both communities. Collins (1986, p. 59) argues that Black feminist scholars who occupy an "outsider within" status in the academy "are in a better position to bring a special perspective, not only to the study of Black women, but also to some of the fundamental issues facing sociology itself."

Attempts by some feminists to incorporate racial and other differences into existing feminist standpoint epistemologies are perceived by Collins as typically prioritizing one form of oppression and characterizing "remaining oppressions as variables within the most important system" (1986, p. 47). In constructing a Black feminist standpoint, Collins assumes that systems of domination are linked and aims to develop new theoretical interpretations of the interaction among oppressions.⁸ Collins identifies four characteristics of a Black feminist standpoint epistemology which she argues are common to both Afrocentric and feminist standpoint epistemologies. First, concrete experiences are used as criteria to determine meaning such that wisdom rather than knowledge typifies Black feminist thought and is the key to the survival of subordinates (1989, p. 759). Second, knowledge is developed through dialogue with other members of a community rather than assessed in isolation (1989, p. 763). Third, an ethic of care which values individual expressions, emotions and the capacity for empathy is fundamental to alternative epistemologies (1989, p. 765-6). And fourth, alternative

⁸Collins' efforts here may not be entirely successful, as she later argues that the material conditions of gender oppression are universally shared by all women (1989, p. 756).

epistemologies incorporate an ethic of personal accountability such that “knowledge claims made by individuals respected for their moral and ethical values will carry more weight than those offered by less respected figures” (1989, p. 769).

Collins chooses to present Black women’s experiences as a point of contact between Afrocentric and feminist analyses, as a way to challenge “analyses claiming that Black women have a more accurate view of oppression than do other groups. Such approaches suggest that oppression can be quantified and compared and that adding layers of oppression produces a potentially clearer standpoint”(1989, p. 757; Grant, 1987).⁹ Collins maintains that “because such approaches rely on quantifying and ranking human oppressions . . . they are rejected by Blacks and feminists alike” (1989, p. 758).¹⁰

Evelyn Fox Keller

Although in *Reflections on Gender and Science* (1985) Keller stops short of fully developing a feminist standpoint, I have chosen to consider her work within this category because her arguments imply and can be used to develop a feminist standpoint, as I demonstrate below.¹¹ Keller may choose to avoid developing a standpoint because her intended audience is made up of scientists and because she believes that any transformation of science will occur at least partly from within.

⁹As I discuss below, Collins leans toward a postmodern analysis in claiming that oppressed groups do not necessarily have a more accurate view of oppression than do dominant social groups.

¹⁰This position is a reversal of her earlier stance: “the thesis that those affected by multiple systems of domination will develop a sharper view of the interlocking nature of oppression is illustrated by the prominence of Black lesbian feminists among Black feminist thinkers” (Collins, 1986, p. 62). In addition, Marlee Kline (1989), bell hooks (1984), Judith Grant (1987) and Sandra Harding (1991) each suggest that the lived experiences of women of colour should form the grounds of a liberatory standpoint.

¹¹Harding (1991) locates Keller’s work in a middle ground between feminist empiricist and standpoint projects, along with that of Sara Ruddick (1989) and Carol Gilligan (1982).

Keller grounds gender difference in psychodynamics rather than materialism. In *Reflections*, Keller argues that cultural associations between science and masculinity can be explained by the interactions between emotional, cognitive and gender development. By rooting her analysis in object-relations theory, and proposing that alternatives to traditional masculinist science can be based on a shift in developmental norms, Keller places the notion of gender differences at the centre of her work. According to Keller, both the scientific mind and the process of acquiring knowledge are characterized as masculine, in their focus on autonomy, separation, and distance. Drawing on the work of Chodorow (1978) and Gilligan (1982), Keller argues that adherence to a dichotomous self/other conception of objectivity can be seen as a defense against ongoing anxiety about autonomy, involving both the excessive delineation typical of boys and the inadequate delineation typical of girls. Rather than involving "static" autonomy and objectivity, which Keller links with power and domination, Keller's vision of non-masculinist science is grounded in "dynamic" objectivity, which relies on subjective experience to create a relationship with the world somewhat akin to empathy.

Keller intends dynamic objectivity to transcend the dualisms of gendered emotional and cognitive development. Her vision of "non-masculinist" science is gender neutral rather than feminine, allowing individual scientists to make use of the full range of human capacity. However I argue that Keller's dynamic objectivity may be possible only from the standpoint of women. According to the logic of feminist standpoint epistemologies, women, because of their subordinate social position, are forced to know both sides of the autonomy/relatedness or hate/love dualisms, while most men are not. Since only women know both, only

women may be able to undertake the integration of autonomy and relatedness necessary for dynamic objectivity. Or, women may be in a better position than men to do so. Keller indirectly proposes that a theory of science based on a women's standpoint will offer the most objective knowledge. Further, while intending dynamic objectivity to transcend gender, Keller constructs an oppositional dualism between static and dynamic objectivity and symbolizes them as masculine and non-masculine. The resulting ambiguity allows the non-masculine to be associated or interpreted as feminine, especially as Keller repeatedly stresses the importance of empathy, love and relatedness to dynamic objectivity, concepts traditionally associated with the feminine. So that while Keller does not specifically advocate a feminine or feminist science, her work is often perceived as linking a science based on dynamic objectivity to the symbolic feminine, and by extension, to women. The consequences of these interpretations will be discussed in later chapters.

In *Secrets of Life, Secrets of Death* (1992), Keller shifts away from standpoint and psychodynamic approaches, toward an analysis of the "constitutive role of language in scientific thought and action in the practice of working scientists" (p. 4). In the Introduction to *Secrets*, Keller notes that in the context of recent trends in science studies focusing on institutions, politics, culture and language, her prior work has come to be seen as naive or foundationalist and that psychodynamic explorations have become strategically impossible. However, she continues to stand behind her earlier work and attempts to articulate a middle position which attends to logical and empirical constraints.

The Problems of Unity and Essence

However they account for the difference, all standpoint theorists posit the knower as distinct rather than abstract. Who knows matters. Feminist standpoint theorists argue that women's distinct social location provides the ground for a potentially more accurate view of social relations. While Keller grounds women's difference in psychodynamic development, Smith and Collins locate difference in the sexual (and racial) division of labour. In all cases, being able to constitute difference as the grounds for an epistemic privilege requires essence and unity (Houle, 1996). Essence and unity significantly problematize standpoint epistemologies, including feminist standpoints.

Standpoint theories admit a multiplicity of oppressions and identities but assume that one axis of difference is primary. For example, even while recognizing the cultural variability of the meaning attached to sexual differences Keller (1989, p. 313) claims "a core of observational experience" that "defies modulation and is universal" as evidence that the social construction of gender is constrained by biology. Despite grounding her work in the assumption that women's lives are differentially affected by racial oppression, Collins (1989) argues that the shared material conditions of gender oppression transcend divisions among women created by race, class, religion, sexual orientation and ethnicity, forming the basis of a women's standpoint with a corresponding feminist consciousness and epistemology.¹² Smith (1987, p. 49) argues that a sociology which begins inquiry from the standpoint of women is predicated on the discovery of a point of rupture

¹²Interestingly, Collins (1989, p. 755) posits women's culture as socially constructed within the constraints of patriarchy but argues the existence of an independent and historic Afrocentric value system common to all Black societies which "existed prior to and independently of racial oppression" and which comprises the fundamental elements of an Afrocentric standpoint.

between our experience as women within culture as constructed by ideology and the world as it is directly experienced. However, women's experience of rupture is not unique: the struggles of colonized peoples against the ideology of colonizers might also provide models of rupture and resources (Fee 1986: Longino 1993a, p. 205).

Standpoint theories rely on and essentialize the socially constituted practices of the dispossessed. Smith and Collins point to the sexual division of labour and in particular the caring labour typically performed by women as the grounds for knowing. Smith (1987, p. 107) maintains that "the standpoint of women is distinctive and has distinctive implications" (p. 107) because women in the home and workplace "have been assigned and confined predominantly to work roles mediating the relation of the impersonal and objectified forms of action to the concrete local and particular worlds in which all of us necessarily exist" (p. 108). Collins argues that many ordinary African-American women have grasped the connection between what one does and how one thinks, pointing out how divisions of labour shape differences in perspectives between men and women and between Black and white women. She cites Hannah Nelson, an elderly Black domestic worker: "Since I have to work, I don't really have to worry about most of the things that most of the white women I have worked for are worrying about. And if these women did their own work, they would think just like I do--about this anyway" (quoted in Collins, 1989, p.748).

Rather than challenging feminine/masculine binaries as constraining to women (and men), feminist standpoint theories can be used to reinforce, valorize and privilege sexist and heterosexist western stereotypes of feminine roles which emphasize caring labour, reproductive labour and labours of love. Keller bases her vision of a non-masculinist science on dynamic

objectivity, which she describes as a perception in the service of love permitting a fuller, more global understanding of an object in its own right (1985, p. 119). Arguing that an individual's developed sense of a separate self and other is a necessary precondition for both science and love, but not sufficient for either, Keller links science to love through the feminine. Keller relies on object relations theory to explain the production of caring and women's relational orientation. While failing to account for the development of a capacity to dominate in women and for the hierarchies of difference which place some women in a position to dominate some men and other women (Spelman, 1988, p. 88), object relations theories legitimate gender differences, providing

an explanation . . . that supports the status quo of heterosexual marriage and the nuclear family while also supporting the notion that the female contribution to these institutions has been important and valuable. It [object relations] validates our experience of gender, but in stereotypical ways, with the important difference that the gender stereotypes are now viewed more favourably. Clearly, a theory revaluing the feminine without radically altering our social arrangements is attractive on many levels. However, it is not a revolutionary theory, nor is it fundamentally a theory that liberates women. This is, unfortunately, precisely part of its appeal. (Hockmeyer, 1988, p. 27)

Using female experience, especially experiences of mothering or reproduction, as the basis for a feminist epistemology perpetuates stereotypes which romanticize women's labour and feminine attributes. Grant (1987) asks how such a theory is different from misogynist theories, except in that it reaches opposite conclusions.

In response to these kinds of appeals to female experience, Harding (1991, pp. 123-127) claims that feminist standpoint epistemologies are distinct from individual women's perspectives and experiences in two ways. First,

individual women's actual experiences are not sufficient to ground feminist knowledge claims because experiences themselves are mediated by social relations and second, a standpoint must be achieved through struggle, not simply claimed. Only through political activism on behalf of oppressed, exploited and dominated groups are we able to see how the social relations of power are organized. A standpoint is considered distinct from a perspective, which is available to anyone who claims it. Yet, the requirement of essence causes standpoint epistemologies to collapse onto individuals. What we do and who we are becomes the legitimate ground for knowing and for transformation. For example, Keller (1985, pp. 89-91) argues that the self-selection of individuals with personalities consistent with the stereotype of scientists as masculine, non-sexual, and emotionally distant perpetuates the masculinization of science and is one cause of the inscription of gender ideology on science, collapsing gender as a system of beliefs into individual gender identity.¹³ Keller's conclusion implies that women who choose science suffer abnormal development and confuses discriminatory barriers with individual motivation. By advocating a shift in developmental norms as the way to change science, Keller focuses on the psychological to the exclusion of the social, political, and economic factors which contribute to and function to maintain associations between masculinity, objectivity, power, and science. According to Hockmeyer (1988, p. 20), using psychology alone as a basis for feminist theorizing suggests a regressive return to personal solutions for political problems.

A reliance on essence causes standpoint epistemologies to be potentially conservative: knowing becomes being, identity legitimates

¹³Harding (1986, p. 53) conceptualizes gender as an asymmetric set of relationships between gender symbolism, the division of labour by gender, and individual gender identity and behaviour.

knowledge, and positions on the margins are valorized (Houle, 1996). Unity, the second requirement for constituting difference as the grounds for epistemic privilege, results in an overlapping set of problems.

Standpoint epistemologies assume there is a universal, shared experience to being a woman, for example. Smith develops "a method of working in sociology that will make it possible to begin from where women in general are, doing the type of work with which we as a sex are identified" (1987, p. 86). While Collins notes the assignment of work according to race and gender, most feminist standpoint theories which are rooted in materialist analyses do not recognize divisions in labour among women (and among men) along the lines of class, race, ethnicity, and sexual orientation. Instead, all women are assumed to be similarly located in social relations. Object relations theories also do not account for the impact of intertwining oppressions on development. As Spelman notes, "what one learns when one learns one's gender identity is the gender identity appropriate to one's ethnic, class, national and racial identity" (1988, p. 88). Universalizing experiences creates a notion of community out of members who are inscribed the same as each other but whose differences from each other and whose similarities to members of other communities are closed. Standpoint theorists imply an epistemological chasm between women and men (or sometimes between feminists and non-feminists), assuming that women (feminists) can know things that men (non-feminists) cannot know (Nelson, 1990, p. 273). This means we cannot learn or empathize with experiences not our own and can only share knowledge with those who are 'like' us.

The requirement for unity and consensus leaves community members vulnerable to accusations of 'false consciousness', and does not promote choice or allow neutrality (Houle, 1996). For example, "A given lesbian might

not presently adopt a 'lesbian' standpoint . . . but the elements of that standpoint are [assumed to be] implicit in her life, waiting for consciousness to catch up" (Phelan, 1994, p. 100). Members of the community are assumed to be equal in power; differences in access to social power and privileges according to varied axes of oppression are superseded by the primary basis of community membership: for example, gender and/or racial identity.

Unity demands that the oppressed speak in one voice before being believed (Houle, 1996). Smith, Keller and Collins each reject what they believe to be the pluralism of postmodern approaches in favour of a social consensus able to distinguish 'better' knowledge claims. Smith (1987) rejects the possibility of more than one valid account of how things are, maintaining that we must be able to say "this is how it works" rather than "this is how it looks to me" (1987, p. 121). For her, reality is social, that which we agree on; it is neither fixed nor final but is continually produced and organized by social relations. Keller (1992) argues that empirical data constrains social construction and that feminists must account for the 'success' of science in representing the natural world. While no representation corresponds directly to reality, Keller maintains that some representations are better than others, and suggests that 'better' be determined by a representation's usefulness. Good science facilitates the realization of particular goals which are "more or less collectively endorsed" by the scientific community. For Keller, good science

typically works to bring the material world in closer conformity with the stories and expectations that a particular 'we' bring with us as scientists embedded in particular cultural, economic, and political frames. (1992, p. 5)

Collins argues that objectivity may be a measure of consensus among multiple competing standpoints.¹⁴

Those ideas that are validated as true by African-American women, African-American men, white men, white women, and other groups with distinctive standpoints, with each group using the epistemological approaches growing from its unique standpoint, thus become the most objective truths. (Collins, 1989, p. 773).

Smith, Collins and Keller require consensus from a broader 'we' than the members of marginalized communities. Yet, who are the 'we' referred to? Can we agree on reality only if we share the same standpoint? By what criteria are we to evaluate knowledge claims or to distinguish between good and bad outcomes of scientific research? Who gets to participate in these debates is crucial given the differences in access to a public voice and social legitimacy. Because socially marginalized groups do not have the power to exclude or silence dominant groups, they lack the social power on which to base their claims for epistemic privilege (Bar On, 1993).

Rethinking Essentialisms

This discussion leads back over and again to questions of identity and difference: both between and among groups of women and men. Who 'we' are, who I am, matters to feminist epistemologies. Within feminisms, positionality and specificity are employed to counter gender essentialism. Yet this constructionist strategy reinscribes an essentialist logic by fragmenting the category of women into multiple identities, each with its own self-contained, self-referential essence (Fuss, 1989, p. 20). This multiplication of subject

¹⁴Assuming that all communities possess a distinctive standpoint, Collins argues that no standpoint can claim epistemic superiority over another because we cannot rank or quantify oppressions to conclude that the 'most oppressed' has an epistemic advantage. Unlike other standpoint theorists, Collins believes that subordinate groups may interpret reality differently, but not more accurately, than dominant groups (1989, p. 748).

positions is accompanied by the consolidation of an identity politics (Schor, 1994a), which relies on

the logic of the same by implying that when we parse them down enough, we will find groups that are the same enough . . . [and] rests on the fallacy of identity--the belief that our social actions and ideas are *simply* the product of social location, so that if we 'specify' the location tightly enough we will be the same. (Phelan, 1994, p. 95)

Essentialism resides in the notion of place or positionality.

What is *essential* to social constructionism is precisely this notion of 'where I stand,' of what has come to be called, appropriately enough, 'subject-positions'. (Fuss, 1994, p. 105)

Arguing that constructionists rely on uncomplicated or essentializing notions of history and of the social and have constructed essence as irreducible, Fuss (1989) concludes that constructionism is fundamentally dependent on essentialism, a conclusion which "throws into question the stability and impermeability of the essentialist/constructionist binarism" (p. 2). Fuss (1989) suggests that if we are to intervene effectively in the impasse in feminism created by the difference/equality debates, we need to begin questioning the constructionist assumption that nature and fixity are necessarily aligned just as sociality and change are necessarily aligned: "it may be time to ask whether essences can change and whether constructions can be normative" (p. 6).

Throughout, I have been using the term essentialism in a conventional sense; at this point, I want to examine more closely this term and the set of meanings associated with it. As Grosz (1994) notes, feminists have developed a range of terms and criteria which tend to act as unquestioned values and as intellectual guidelines in assessing male-dominated and feminist theories; among the most powerful are those terms centered around the nature of women: essentialism, biologism, naturalism

and universalism.¹⁵ Feminists assert that theories with these conceptual commitments are necessarily complicit in reproducing patriarchal values. Positing women's current social roles and positions as unalterable, necessary or the best possibility given the constraints of nature, essence, or biology provides powerful political justification for the *status quo*. In addition, these commitments are ahistorical and refuse to take seriously the differences among women.

Despite these problems, Grosz (1994) suggests that the value of these terms as criteria for feminists in critically evaluating theory might not be self-evident after all. Feminists concerned with the social construction of women predictably respond to difference feminisms with charges of essentialism, universalism and naturalism. Grosz argues that "these criticisms misunderstand the status of claims made by feminists of difference, judging them in terms inappropriate to their approach" (1994, p. 92). For example, in response to Irigaray's notion of women or the feminine, Toril Moi states: "as we have seen, to define 'woman' is necessarily to essentialize her" (quoted in Grosz, 1994, p. 93). This leads to a paradox: "If we are not justified in taking women as category, what political grounding does feminism have?" (Grosz, 1994, p. 93). Can there be an anti-essentialist feminism? "Can there be a feminist politics that dispenses with the notion of Woman?" (Schor, 1994a, p.

¹⁵While these terms are closely related and frequently elided, Grosz (1994, pp. 84-5) argues that understanding the subtle distinctions between them is important to appreciate the ways they have been used by and against feminists. Briefly, essentialism is the attribution of a fixed essence to women which is assumed to be given and universal but not necessarily biological or natural; biologism refers to an essence defined in terms of women's biological capacities, usually reproductive; naturalism is a form of essentialism which postulates a fixed nature, usually biological but often theological or ontological; universalism is not necessarily based on innate or fixed characteristics but may be conceived in purely social terms, and can only assert similarities among women. Conversely, essentialism, biologism and naturalism can account for differences among women in race or sexual orientation, for example. Collins (1986, 1989) essentializes race to distinguish the experiences of Black women from those of other women. Theories which provide genetic explanations for sexual orientation naturalize differences among lesbian, bisexual and heterosexual women.

xiii). Making use of the Lockean distinction between real and nominal essence, Fuss (1994) argues that feminist politics relies on the term women as a linguistic rather than natural category, as a classificatory fiction, but cautions that nominal essences are often treated as if they were real.

Feminists seem to face a dilemma involving a conflict between the goals of avoiding essentialism and universalism and feminist political struggles (the liberation of women as women). But is this really a choice feminists have to face (Grosz, 1994)? Drawing on Spivak's understanding of concepts and theory not as guidelines or blueprints for struggle, but as tools and weapons of struggle, Grosz (1994) asserts that it is really a "question of negotiating a path between always impure positions--seeing that politics is always/already bound up with what it contests (including theories)--and that theories are always implicated in various political struggles" (p. 94). Understanding that all options available to feminists are bound in various ways by the constraints of patriarchy, the political questions which become crucial involve evaluating the kinds of commitments which remain useful to feminists in our political struggles, the kinds of strategy they make possible or hinder, and their costs and benefits in particular contexts (Scott, 1990). "In other words, the decision about whether to 'use' essentialism or to somehow remain beyond it (even if these extremes were possible) is a question of calculation, not a self-evident certainty" (Grosz, 1994, p. 95).

Spivak (1987) suggests "a *strategic* use of positivistic essentialism in a scrupulously visible political interest" (p. 205). When used by the dispossessed themselves, essentialism can be a powerfully displacing and disruptive practice. Such an approach evaluates the motivations behind the deployment of essentialism rather than dismissing it as complicitous with or part and parcel of patriarchal relations. Yet, while recognizing the success of

essentialism as an interventionary strategy in particular contexts, Fuss (1994, p. 107) calls attention to the risk of permanently cementing a strategy that is intended to be provisional. Is there a difference between strategic and substantive essentialism? Fuss (1994) concludes that the risk is worth taking provided that "the determining factor in deciding essentialism's political or strategic value is dependent upon who practices it" (p. 108). Spivak (1994), too, emphasizes the importance of who it is that uses the strategy, and argues that without a persistent critique the strategy will freeze into an essentialist position: "A strategy suits a situation; a strategy is not a theory" (p. 154). However, the extent to which the 'risk of essentialism' has caught on with specific audiences leads Spivak to some reconsideration.

So I have certainly reconsidered my cry for a strategic use of essentialism because it is too deliberate. The idea of a *strategy* in a personalist culture, among people within the humanities who are generally wordsmiths, has been forgotten . . . So long as the critique of essentialism is understood not as an exposure of error, our own or others', but as an acknowledgment of the dangerousness of what one must use, I think my revised statement--that we should consider how ourselves and others are essentialist in different ways--I think I would stand by it. (1994, pp. 156-157)

For Spivak, a critique of essentialism acknowledges the unavoidable usefulness of something that is dangerous.

Paradoxically, feminisms must both concentrate on and refuse the identity of 'woman.' While it is impossible for feminists to escape essence, it is crucial to understand how feminisms are essentialist, the motivations behind the deployment of essentialisms, and the possible consequences or implications. In this chapter I suggest that feminist standpoint epistemologies be used strategically with an eye to context. The gender essentialism of feminist standpoint epistemologies is potentially deeply conservative. However, the deployment of gender essentialism is also a

potentially disruptive and powerful practice, depending on who uses it and in what context. In the following chapters I consider what it means for feminist science critics to apply feminist standpoint epistemologies to the natural sciences. In particular, I address whether the epistemic privilege afforded by standpoint epistemologies are useful to women scientists and whether strategic essentialisms are useful in feminist political struggles to transform scientific practices and methodologies.

CHAPTER THREE: Barbara McClintock: Model Methodologies?

In the previous chapter, I suggest that one way to evaluate feminist standpoint epistemologies is to determine their success in justifying liberatory knowledge claims in particular contexts. Specifically, how useful are standpoint strategies for feminist critics engaged in theorizing the natural sciences and for women scientists engaged in producing knowledge of the natural world? Before answering these questions, I want to explore more fully how feminist standpoint epistemologies might be applied in the context of the natural sciences. Because these theories were developed in the social sciences, they reflect the language and preoccupations of that domain. Keller gives us some clues, but what could these theories really mean for women scientists? How do concepts of the "everyday" and "outsider/within" (Smith, 1987) translate into methods of research in the natural sciences?

A Feeling For the Organism

To facilitate this discussion, I introduce a case study: Evelyn Fox Keller's *A Feeling For the Organism: The Life and Work of Barbara McClintock* (1983).¹ Although Keller's text reflects the assumptions and metaphysical commitments of its author,² McClintock's story is important; it has influenced the development of feminist standpoint theories, including Keller's own, and sparked a debate about the limits of philosophy of science and epistemology (Code, 1991; Gould, 1984; Martin, 1988). While some feminists argue that the "epistemological assumptions or preconditions of a feminist science" (Fee, 1986, p. 47; Witt *et al.*, 1989) can be detected in

¹Keller (1985) summarizes McClintock's story in Chapter Nine, "A World of Difference."

²"Keller interprets the recent vindication of McClintock's work as showing clearly that science has the innate capacity to rectify wrongs" (Grobicki, 1987, p. 216) and is a healthy enterprise.

McClintock's practices, I intend to show that interpreting McClintock's work as an example of or model for feminist standpoint epistemologies is problematic.

Barbara McClintock spent most of her life physically, intellectually and emotionally isolated from others. Born in 1902 to a mother described as adventurous and high spirited, McClintock was an emotionally distant, autonomous and self-determined child who became easily absorbed in whatever interested her (Keller, 1983, pp. 17-35). In 1919, McClintock enrolled at Cornell University, graduating in 1927 with her Ph.D. in botany from Cornell's College of Agriculture.

In America, the scientific labour force grew dramatically in size between 1920 and 1940, as graduate schools produced more doctorates and scientific teaching and research attracted new funding from universities, industry, foundations, and government (Rossiter, 1982, p. 129-159). However women in science lost ground during this period of expansion. While the number of Ph.D.'s granted each year to women in the sciences increased from approximately 50 in the early 1920s to 165 in the late 1930s, the *percentage* of Ph.D.'s granted to women actually declined from a high of 15.5% in 1920 to 11.5% by the late 1930s (Rossiter, 1982, p. 131).

Although American graduate schools began to open officially to women in the 1890s (Rossiter, 1982, p. 29) employment in the sciences was rigidly segregated by gender both hierarchically and territorially. Higher education was initially granted to women on moral grounds, to make them better mothers; the ideal middle-class woman would never be expected to work outside the home. As their numbers increased, women scientists of the 1880s and 90s advocated, at least publicly, the creation of separate spheres of specialization for women, for example in the new field of home economics

(Rossiter, 1982, p. 51). Around 1910, as quantitative evidence on women's achievements in science surfaced, women realized their marginal position and, in the context of the first wave of the American women's movement, began to emphasize a strategy of striving for full equality (Rossiter, 1982, p. 99). However, these redirected efforts did not lead to significant improvements; in fact, sex-typed employment expanded after 1920 (Rossiter, 1982, p. 100).

Although the number of women scientists employed in American academic institutions increased by a factor of five between 1921 and 1938, from 122 at 57 institutions to 598 at 298 institutions, women consistently occupied the lowest and least desirable positions (Rossiter, 1982, p. 180). There were more women scientists than ever, but they had to work harder and have more degrees than their male counterparts, and were more likely to suffer unemployment, especially if married (Rossiter, 1982, p. 129). In the 1950s and 1960s, academic institutions increasingly employed women scientists as research associates as a result of anti-nepotism rules, increased research budgets, and efforts at many institutions to upgrade their prestige by hiring male faculty. Such research jobs were low-paid, invisible, and afforded no professional recognition (Rossiter, 1995, p. 122-164).

McClintock never married and had no children, and she had difficulty finding employment after graduation, suffering long periods of financial insecurity. She did not receive her first regular job until a decade after her research on maize had established her as one of America's leading cytogeneticists. In 1931, she and her student Harriet Creighton published a paper that established the chromosomal basis of genetics (Keller, 1983, pp. 57-60). In 1941, just before the University of Missouri denied her tenure, McClintock moved to the Carnegie Institution's Department of Genetics at

Cold Spring Harbor on Long Island, New York, where she remained past official retirement in 1967. In contrast to the barriers facing women scientists in other employment sectors, non-profit institutions provided titles and positions and allowed women to accept grants and hire others. Despite short promotional ladders and low salaries, women scientists often found the diversity and flexibility of these institutions more responsive to their needs (Rossiter, 1995, pp. 235-255). The proportion of women scientists employed in non-profit institutions was higher than in academia, industry or government. In the period 1956-58, women accounted for 12.7% of scientists employed in non-profit institutions, compared with 10.6% in educational institutions, 3.1% in industry, and 5.7% in the U.S. federal government. By 1968, their numbers had increased slightly: 16.9% of scientists employed in non-profit institutions were women, compared with 12.2% in educational institutions, 3.8% in industry, and 6.1% in the U.S. federal government (Rossiter, 1995. p. 107).

Through much of her early career, McClintock's research was supported by postdoctoral fellowships. She received a prestigious National Research Council Fellowship, beating the odds which gave male applicants a two to one advantage over women (Rossiter, 1982, p. 272), and an award from the John Simon Guggenheim Memorial Foundation. For the latter program, women comprised 23.7% of the applicants, but only 13% of the recipients. Of the 68 successful women, 32 were in the creative arts, and only 5 in sciences (Rossiter, 1982, p. 273). While her experiences of discrimination in securing employment were typical for women scientists, McClintock at the same time was atypical, proving herself an exception to a system which used alleged sex differences to dismiss women's achievements and block their advancement. Rather than convincing male scientists that women might merit better jobs

and opportunities, such exceptions were interpreted to reinforce systemic restrictions as meritocratic. Academic women scientists were treated as deserving their marginal positions and low status (Rossiter, 1982, p. 168).

As was the case with other successful women, McClintock received support from influential men in her field. At a point when McClintock thought she would have to leave science, geneticists T. H. Morgan and R. A. Emerson convinced the Rockefeller Foundation to provide her with two years interim support (Keller, 1985, p. 159). For women, recognition and promotion were often perceived as personal gifts from male colleagues (Rossiter, 1982, p. 189). McClintock was regarded as ungrateful and personally difficult because she expected to be rewarded on the basis of merit (Keller, 1985, p. 159). To receive professional recognition, women scientists needed the backing of powerful and politically astute male colleagues, in addition to outstanding research. Because the prestige system of honorary societies served to weed out those whose presence in the profession was not desired, even the most highly qualified women were not considered as candidates until the supply of first and second rate men was exhausted. Even then, admitting women took more than the usual amount of political maneuvering by supporters within the society (Rossiter, 1982, p. 295). In 1944 McClintock was the third woman to be elected to the National Academy of Sciences (NAS). In 1946, she was elected to the American Philosophical Society (APS) and in 1959 to the American Academy of Arts and Sciences (AAAS). McClintock's election to all three societies was rare for women, as even in 1970 the proportion of the societies' members who were women was just 2.42 % for the AAAS, 2.04% for the APS, and 0.92% for the NAS (Rossiter, 1995, pp. 324-327).

It was in 1944, when she had achieved the recognition and success available to few women scientists, that McClintock began the series of experiments that led to her most important and controversial work, the discovery of genetic transposition. McClintock was a cytogeneticist--someone who studies genetic traits by looking at an entire cell and analysing the appearance of the chromosomes. McClintock discovered that chromosomal fragments are able to move around or "transpose" on the chromosome at various stages in cell development. She presented this work in 1951, yet it was neither understood nor accepted until the 1970s when genetic mobility was rediscovered in molecular biology; its interpretation and significance continue to be disputed (Keller, 1983, pp. 119-139). McClintock was awarded a Nobel Prize for this work in 1983. She was one of nine women among more than 300 winners in scientific fields in the history of the prize (Holloway, 1993).

McClintock's work on transposition was incomprehensible to the majority of her colleagues, and was rejected as ridiculous by some. Although she continued her research, McClintock eventually stopped giving talks or publishing her research findings, and became increasingly isolated (Keller, 1983, pp. 139-145). There are several reasons for the responses McClintock received from the scientific community. First, McClintock was easily marginalized because she was a woman. Even though she was considered an exception, the sexism of her environment enabled critics to dismiss her as mad (Grobicki, 1987, p. 213). Second, geneticists began to study simpler systems like bacterium and bacteriophage, which are quickly and cheaply reproduced in the laboratory, rather than maize, which is more complex and could only be grown seasonally in research stations. Communication between McClintock and her colleagues became more difficult as dwindling

numbers of them had the expertise necessary to understand her results (Keller, 1985, p. 170). Third, McClintock was dismissed as an eccentric partly because transposition violated the 'master-molecule' theories central to the new field of molecular genetics. According to Watson and Crick's account,³ cellular information passes from DNA to RNA to protein, but never in the reverse (Keller, 1985, p. 169). This hierarchical model of genetic organization locates control of cellular processes in a single molecule, much like a totalitarian form of government. McClintock's work on transposition provided evidence that genetic organization is more complex than this model allows and that DNA itself is subject to rearrangement and reprogramming. Transposition requires information to flow back to DNA, suggesting that genetic variation may be within the organism's control and a response to the cell's environment. By linking heredity to development, subjects traditionally divided between the separate fields of genetics and developmental biology, McClintock's vision of transposition implies "an understanding of evolution transcending that of both Lamarck and Darwin" (Keller, 1983, p. 195). A fourth and related reason for McClintock's marginalization was her holistic approach to research in a field increasingly concerned with reductionism. Molecular biology gained status within the prestige hierarchy of scientific disciplines because geneticists were able to reduce the mysteries of life into building blocks and formulae (Grobicki, 1987, p. 213). For McClintock, this approach was inadequate; her understanding of and commitment to complexity was connected to her ability to perceive the organism as a dynamic and coherent whole.

³Rosalind Franklin's contribution to the discovery of the structure of DNA is partially documented in Sayre (1975).

McClintock's style of research and views of nature have attracted the attention of feminists and philosophers. McClintock regarded herself as an outsider, not because she was a woman, but because she was a "philosophical and methodological deviant" in the scientific world (quoted in Keller, 1985, p. 159). According to McClintock a scientist must "listen to the material," must have a "feeling for the organism" (Keller, 1983, p. 198). Her remark "anything you can think of you will find," (Keller, 1983, p. 199) is more a reminder of the capacities of nature than of the human mind. She believed that nature's complexities vastly exceed the capacities of the human imagination. Organisms have a life and an order of their own that scientists can only begin to fathom. As a result, attempts to fit everything into a set dogma, such as a 'master molecule' theory of DNA, will not be successful. Because the complexity of nature exceeds our imagination, McClintock believed that it is essential to "let the experiment tell you what to do" (quoted in Keller, 1985, p. 162).

Respect for difference lay at the heart of McClintock's scientific passion. "The important thing is to develop the capacity to see one kernel [of maize] that is different and make that understandable" (quoted in Keller, 1985, p. 163). But making difference understandable does not mean making it disappear. Exceptions do not exist to prove the rule, but possess meaning in and of themselves. McClintock's relationships with her corn plants were founded on her respect for difference and characterized by her capacity for empathy; she described these relationships as intimate (Keller, 1985, p. 164). McClintock's account of her breakthrough in identifying a group of chromosomes is revealing:

I found that the more I worked with them, the bigger and bigger [the chromosomes] got, and when I was really working with them I wasn't outside, I was down there. I was part of the

system. I was right down there with them, and everything got big. I even was able to see the internal parts of the chromosomes--actually everything was there. It surprised me because I actually felt as if I was right down there and these were my friends. As you look at these things, they become part of you. And you forget yourself (Keller, 1985, p. 165).

McClintock's reverence for nature and her capacity for union with the organisms and systems she studied reflected an image of science discordant with the dominant ideology of rationality and objectivity. McClintock believed that reason and experiment are not by themselves sufficient to understand nature, that intuition and empathy are crucial elements of science: the scientific method "gives us relationships which are useful, valid, and technologically marvelous; however, they are not the truth" (quoted in Keller, 1983, p. 201). McClintock was proud to call herself a "mystic" and expressed interest in Tibetan Buddhism (Keller, 1983, p. 204). She claimed that without an awareness that everything is one, science can at most give us only a partial view of nature (Keller, 1983, p. 205). She believed that reductionist science fails to illuminate both how and what we know (Keller, 1983, p. 207).

Standpoint Theory, Applied?

McClintock's style of research reveals many of the themes significant to feminist standpoint epistemologies (Code, 1991, pp. 150-151; Fee, 1986; Keller, 1985). For instance, there was no rigid boundary separating McClintock from the 'objects' of her inquiries. She listened to her 'objects' of study speaking for themselves rather than imposing preconceived theoretical structures upon them, and was concerned with understanding and honoring difference. She conceived of nature as active, dynamic and complex, rather than passive and dead, an understanding which fosters respect and cooperation rather than

manipulation and control. McClintock's personal subjectivity, emotions and cognition were all involved in a process of discovery whose aim is liberation rather than domination. According to Keller (1985), McClintock was "perhaps the most striking exemplar of dynamic objectivity in present-day science" (p. 126). Because her work "provides us with an example of how highly elaborated scientific work can be based on epistemological assumptions opposed to those of the dominant, mechanical philosophy" (Fee, 1986, p. 48), feminists argue that McClintock's scientific practices provide a glimpse of what a feminist science might look like.

Despite all these elements of feminist standpoint epistemologies in McClintock's style of research, there remain problems with identifying her science as arising from the standpoint of women and as a model for feminist science practices. I have divided these concerns into three sets of issues which focus on gender, individuals, and methodologies.

Gender First, to what extent can McClintock's practices be attributed to her gender? McClintock does not refer to herself as a feminist and repeatedly denies that gender influences her work in any way. For McClintock, science is a place where "the matter of gender drops away" (quoted in Keller, 1985, p. 173). Her claims raise immediate objections to identifying her work with feminist standpoints: feminist standpoint epistemologists are adamant that standpoints cannot simply be claimed but must be achieved through political consciousness and activism, but McClintock clearly rejected feminist analyses or struggles as her own. Feminists can not position women without their consent, contrary to women's interpretations of their own experiences, without replicating subject/object hierarchies.

Further, McClintock's personal life does not fit into the relational model of difference provided by object-relations theory: her relationship with

her mother was tense and distant (Keller, 1983, p. 22), and she never married or became a mother herself. In terms of human contact, McClintock can almost be described as anti-relational--she had few close friends besides her corn plants. Theorists who claim that women gain access to epistemic privilege because girls grow up to be caring and relational while boys become autonomous and distant cannot explain McClintock's world-view. Nor is a materialist analysis of women's experiences able to account for McClintock's difference, as her daily life did not involve performing the caring or reproductive labour typically associated with women. If McClintock was an "atypical woman" (Keller, 1985, p. 174), both in terms of her individual gender identity and lifestyle, and the level of scientific recognition she received prior to 1950 and after 1970, then she doesn't make a very good model for theories which claim to be grounded in the shared experiences of women. We cannot conclude that McClintock's research style is typical of women or more accessible to women than to men.

The dissociation of her life and work from "all stereotypic notions of femininity" (Keller, 1989, p. 42) indicates that McClintock did not intentionally celebrate 'feminine' values in her work. Yet she did incorporate scientifically unpopular practices and values which are commonly associated with 'the feminine' (Code, 1991, p. 152). These practices may not, however, be used only by women. Keller claims that it "doesn't matter that she was a woman. One could find men in that tradition as well" (quoted in Barinaga, 1993b, p. 392). Stephen J. Gould observes that "McClintock's style of doing science is not uncommon; it just isn't widely used in her own discipline" (quoted in Martin, 1988, p. 130). Gould (1984) claims that many good scientists, including himself, use just such an approach. Although as Martin (1988) notes, Gould excludes intimacy, love and friendship from his account

of McClintock's style, possibly because such emotional qualities would prevent McClintock's way of doing science from being appreciated rather than denigrated. Clearly, Gould does not intend to argue that he does science 'like a woman' or in a feminine style; he means to "deny that there is anything distinctively 'feminine' about it, to claim it as part of 'normal science'" (Code, 1991, p. 155).

Other scientists whose styles have been documented as similar to McClintock's include David Bohm (Shepherd, 1993), Anna Brito (Goodfield, 1982), Rachel Carson (Norwood, 1987), Lynne Margulis (Keller, 1986) and Margaret McCully (Menzies, 1991). In 1970, scientist Jacques Monod noted: "I even happened . . . to identify myself with a molecule of protein" (Mandelbrojt, 1994, p. 186). We don't know why more women than men appear on this list. Perhaps it is because case studies are afforded low status by scientists, because feminists have focused on documenting the practices of women scientists, and because male scientists probably do not wish to be perceived as working in (devalued) feminine ways. If some male scientists bring approaches similar to McClintock's to their work and many female scientists do not, what does this indicate about alternative epistemological practices? Do they result from gender alone? Are they simply indicative of good creative science (i.e. do these approaches result in better science), or of the diversity of scientific practice (i.e. different but not necessarily better)? Is a scientist's world-view and/or political commitments and/or social position--systems in which gender is but one factor--more important than gender alone in determining that individual's scientific practice?

Keller (1983, p. xvii) argues that McClintock's practices do not represent a feminist or feminine science, but rather, provide a glimpse of what a gender-free science might look like. Keller does not consider a feminist

successor science possible or desirable. However, I argue instead that a gender-free science is neither possible nor desirable. Every scientist's research

reflects in some way his or her gender, background, and class position, together with the structural constraints which society places on that work. Science is not monolithic and it cannot be transformed as if it were. (Grobicki, 1987, p. 217)

For McClintock the matter of gender never did drop away and her scientific style was certainly not free from gender symbols. Regardless of whether or not her scientific practice was a function of her being a woman, an analysis focusing on gender is both appropriate and revealing (Martin, 1988, p. 135). McClintock was not a man in a profession dominated by men--she suffered exclusion, marginalization, unemployment, financial insecurity and under recognition because of sexism. Keller argues that McClintock's need to transform science did not arise out of a feminist or female consciousness, but from her determination to claim science as a human (not male) endeavor. But if McClintock needed to redefine the practices of science in order to claim a place for herself as a woman within science, then Keller's argument implies that gender is the cause of McClintock's different style. While Keller explicitly rejects such conclusions, her text can be used to support the notion that women might practice science differently. Certainly, Keller's text has initiated most of the discussion about the possibilities of women's different style in science (Holloway, 1993).

Individuals Second, what is the role of individual scientists in epistemological projects? There is a limit to how alternative the practices of individual scientists can be, given the constraints of scientific education, socialization, communities and institutions. Those scientists who fail to achieve a level of conformity are denied the cognitive authority (Addelson, 1983) of an expert; their research may not be published, cited or funded.

McClintock experienced professional isolation after 1950, but her views of science were at least partially shared by some of her colleagues. If none of her colleagues had shared her views she could not have retained even marginal status as a scientist (Keller, 1985, p. 173). Given these limits, why should feminists look to the practices of individual scientists for hints of alternative epistemologies and methodologies?

We might also consider whether a single individual scientist, such as McClintock, can be credited with the perspectives that have resulted from feminist criticism and politics. Ascribing these perspectives to individuals abstracted from their social and political context is artificial and unhelpful (Nelson, 1990). Rather, we need to pay attention to the role of communities in creating/constraining knowledge (Kuhn, 1970; Nelson, 1990), and to how individual scientists' metaphysical commitments, or worldviews, are partially determined by their membership in various communities and their location in relation to multiple systems of domination. However, we need to be wary of merely shifting from an individual-based to a community-based epistemology (Sobstyl, 1994); both communities and individuals play a role in and are responsible for constructing knowledge.

Keller's biography of McClintock focuses attention on the practices of individual scientists rather than on the social, political and economic factors which constrain scientific practice and determine scientific agendas. Focusing on individuals reduces the question of what role the sex/gender system plays in science to the question of the sex/gender of individual scientists and narrows feminist visions to the individual level as a site for change. For example, the special sections on women and science included in mainstream science magazines continue to ponder whether or not there is a "female style" (Barinaga, 1993a; Holloway, 1993) in science rather than investigating the role

gender plays in all scientific practices. As I have already noted, McClintock's story provides some fuel for the argument that women do science differently, a point I will return to in the following chapter.

Looking to individual solutions for androcentric science is potentially misguided. As Harding (1986) notes, "the research agendas of the natural sciences are set in international circles--not by isolated researches in local laboratories" (p. 140). However, some theorists do advocate simply changing individual scientists' research styles. Linda Shepherd (1993) relies heavily on Keller's work, including the McClintock biography, to conclude the following:

I see it as a challenge to all individuals to open our minds to new possibilities, to reflect deeply, to reexamine our values, to come to know ourselves, to develop our feeling and intuition to complement thinking and sensation, to integrate the Feminine--to become more whole people. . . We can reach out to colleagues and build cooperative networks based on love, trust, and curiosity. . . Everyone we touch with our lives will see the value in this way of doing science (p. 284).

Shepherd's conclusion fails to address the hierarchical relationships governing scientific institutions, scientific research, scientific communities and scientific workplaces. As biologist Marti Crouch notes, limiting our attention to individuals can be disastrous:

What concerns me is that Barbara McClintock is held up as an example of someone who approaches science in a unique way and was able to discover new and interesting things because of her unique approach. However, the fruits of her work have been used by the same interests as any other scientific information. In fact, her research has been pivotal in developing biotechnology. So if we develop a network of scientists who are doing things differently, but don't also change the link with the application through the dominant system, it seems that we're just helping to maintain the status quo (quoted in Shepherd, 1993, p. 260).

As I noted above, we cannot ignore the role of individuals in constructing knowledge. But neither should we limit our attention to individual practices while leaving power relations and institutions unchallenged.

Methodologies Third, does McClintock's research style provide feminists with a useful model for practicing science? McClintock's working conditions were reminiscent of the scientist as craft-labourer, before the professionalization and industrialization of science in the late 1800s (Schiebinger, 1989). During most of her sixty years of research McClintock worked alone, without students or technicians to carry out routine tasks. It was only at Cornell, in the years 1928-1935, that McClintock worked closely with other geneticists such as Marcus Rhoades, George Beadle, and Harriet Creighton (Keller, 1983, pp. 48-52). Because she worked on the margins of her profession, she experienced a degree of autonomy in her research unknown to most scientific workers today. Yet her marginality was the result of discriminatory practices. Should feminists advocate or romanticize working on the margins as a career goal when women might have opportunities to receive equal compensation and recognition? In contrast to McClintock's experience, today's scientific workplace is hierarchically divided: scientific creativity, cognitive authority and decision making are within the purview of professional scientists while laboratory work is assigned to technicians and students. Technicians and students perform the majority of hands-on experimental work, the daily labour of science. Yet while students are regarded as professionals-in-training, and are often listed as junior authors on papers, technicians remain anonymous and are perceived as interchangeable—they are often referred to as a "pair of hands" (Shepherd, 1993, p. 125; Namenwirth, 1986).

Present-day professional scientists would have difficulty emulating McClintock's example, despite their relative level of control over their own workplace and working conditions. Their use of alternative practices is constrained by competition and infrastructure. Taking time to develop intimate relationships with each object studied means slowing down, which means lower production, fewer publications, and lost funding. It also means changing the hierarchy of the scientific workplace. Such moves would likely cost a scientist their reputation and authority as an expert. Scientists who undertake technical work are perceived as lacking initiative and unsuitable for advancement (Shepherd, 1993, p. 125) and as potentially shirking their managerial duties. Many women scientists are afraid that being labeled a feminist or publicly discussing differences between how men and women do science will mean their research is taken less seriously or assumed inferior, and will result in even further marginalization in a sexist environment (Barinaga, 1993a; Valentine, 1992). If McClintock's model is difficult for professional scientists, it is absolutely impossible for technicians to access. Though they carry out the daily labour which McClintock describes, technicians have little control over the scientific workplace and are unable to choose research projects or methods.

Feminist critics might acknowledge the scientific division of labour, but that division is often not reflected in feminist theories of knowledge. Feminist theories refer to scientists, not to those scientific workers who carry out the daily labour which enables professional scientists to achieve the levels of abstraction described by Smith (1978) and Rose (1983). Any analysis of science must recognize that their contribution is essential and that hierarchical divisions of labour have epistemological consequences

(Addelson, 1983). As one physicist states in relation to non-professional scientific workers:

The gadgets they produce for us are just crucial. The reason the work the department does is internationally competitive with major research centres all over the world is in part due to the capabilities of the people in the machine shop. Some of the research simply could not be done without them. (quoted in Addelson, 1983, p. 183)

By focusing on examples like McClintock, feminists will produce epistemologies which reflect only the perspectives of autonomous, professional scientists. Such an approach reflects class bias, erasing that part of the scientific labour force with the highest representation of women and minorities, and producing theories which do not explain the daily work of science, who that work is performed by and under what circumstances.

Further, holding up McClintock as an example for feminist scientists to follow simply replaces dominant ideas about how scientific research should be carried out with a possibly equally rigid model or ideal, rather than advocating a multiplicity of styles and approaches to research. The notion of a single feminist model is impossible in the context of multiple feminisms. A diversity of approaches would more appropriately give individual scientists opportunities to utilize different methods according to their research subjects, contexts and personal subjectivities. McClintock's style of research provides some useful clues as to how women scientists might begin to challenge the structures of currently dominant scientific practices. Yet, her style would not be an equally comfortable fit for all scientists, whether male or female, feminist or non-feminist.

Keller's biography of McClintock gives us a sense of how feminists think researchers in the natural sciences might make use of standpoint epistemologies. McClintock's views of nature and style of research exhibit

some of the themes central to feminist standpoint epistemologies. Despite this congruence, I have shown that McClintock's work cannot simply be interpreted as located in a standpoint of women, nor does her example provide an ideal model for feminist research. Feminist standpoint theories do not provide a very good explanation for the difference of McClintock's research style, nor do they further our understanding of other aspects of her story. The debates surrounding McClintock generally focus on the extent to which her different style can be attributed to her gender. Essentialism is invoked to investigate the impact of gender in isolation: questions about how much her alternative style can be attributed to a combination of factors such as her race, ethnicity, class, religious views, political commitments, or musical ability are seldom raised. The focus of the debates keeps us from exploring why some ideas gain social legitimacy and others do not, why 'master molecule' theories gain ascendancy at one moment in history and interactive models at another (Harding, 1986). Discussing gender alone limits the scope of investigation and results in partial understandings.

CHAPTER FOUR: The Strategic Uses of Feminist Standpoint Epistemologies

In Chapter Two, I locate feminist standpoint epistemologies within the framework of strategic essentialisms. Feminist standpoint epistemologies construct or assume essential gender differences as the grounds for epistemic privilege within a context of political struggles over authority, meaning and knowledge. In that discussion, I highlight some of the dangers of gender essentialisms and suggest that the political or strategic value of such approaches depends largely upon who practices them (Fuss, 1994) and in what context. As Spivak (1994) reminds us: "A strategy suits a situation; a strategy is not a theory" (p. 154). Feminist standpoint epistemologies are certainly theories. Can they be employed strategically in particular contexts to achieve feminist goals?

The goals of feminist science projects are sometimes divergent and sometimes overlapping. The resulting conflicts and tensions are most clearly articulated between efforts to improve women's status within science and to transform scientific practices, methodologies, and epistemologies. Women scientists and feminist science critics employ different, sometimes conflicting strategies because their interests in who practices science and how they practice it varies. These strategies have shifted over time in response to social and political movements and to economic conditions. In this chapter, I draw from the public messages issued by feminist science critics and women scientists within and across their respective communities to examine the role that feminist standpoint epistemologies play in the conflicts and tensions.¹

¹As noted in Chapter One, my research for this chapter included a broad survey of the literature on women and science, including professional newsletters, science publications, biographies, autobiographies, and interviews. The majority of this literature is concerned with conditions for women in scientific professions and on achieving equity. Because in this chapter I am primarily interested in those sources by and about women scientists which address

Because public messages reflect or are part of larger political strategies, they may only partially represent the beliefs of those who invoke them and may not accurately represent the diversity of thought within communities.

Conflicts among feminist science projects are most often mapped onto the relationships between feminist science critics and women scientists. Whether or not these relationships are in fact conflictual, they are publicly constructed as such. Most science publications rarely pay attention to feminist critiques of science. When they do, these publications present the majority of women scientists as either unfamiliar with feminist critiques, or as skeptical or hostile (Barinaga, 1993b; Holloway, 1993). On the other hand, many feminist science critics portray women scientists as either unable to understand or dismissive of feminist approaches, and defensive when their objectivity is questioned. Hammonds (Longino & Hammonds, 1990) states that many women scientists neither hear nor understand the feminist critique. Keller (1987) surmises that many working women scientists find the new perspectives generated by feminist critics of science "incomprehensible" because they continue to confuse the social category of gender with biological sex "despite repeated attempts at clarification" (p. 81). Yet both Hammonds and Keller used to practice science themselves--what makes them uniquely able to understand?

The reasons for such conflictual relationships are multiple and complex. Certainly, the problem is not simply that women scientists are overwhelmingly anti-feminist or co-opted by patriarchal structures, as has sometimes been suggested (Feldberg, 1992; Jackson, 1989). In a recent survey of women scientists and engineers in Ontario, 29% characterized themselves

their responses to feminist critiques of science, I do not use or reference much of the more general literature which includes women's recollections of and reflections on a life in science.

as feminist, a figure close to that found in polls of the general population. In addition, many supported feminist positions but did not identify themselves as feminist (Dagg & Beauchamp, 1991). In fact, Keller's and Hammonds's comments (and some of my own) might inspire some resentment from women scientists who identify as feminists. However as I have noted previously, many scientists are generally hostile to or dismissive of social theories about science, including feminist theories. Since most feminists are women, the historical exclusion of women from scientific professions and the generally greater alienation of women from science may contribute to difficult relationships. The alienation of feminisms from science may also play a role, as feminism has made fewer inroads into the sciences than almost any other discipline (Bleier, 1986). Few women scientists are affiliated with women's studies (Rosser, 1986), possibly because some women fear being marginalized within science (Etzkowitz *et al.*, 1994). But there may also be another reason, one that is related to the "two cultures" divide between arts and science disciplines (Snow, 1959), and it involves the construction of communities.

I suggest here that feminists and scientists belong to two distinct but overlapping epistemological communities. Contrary to traditional assumptions, Nelson (1990) argues that it is primarily communities or groups, not individuals, that acquire and possess knowledge. This is because of "the role that community membership, theories, and experiences play in shaping our views, and the role of community standards in determining what counts as 'knowledge' and as 'knowing'" (p. 270). Epistemological communities can be discerned by a network of theories and beliefs, including standards of evidence, such that the practices, assumptions and social and political experiences of community members are consistent with the

prevailing theories. The acceptability of perspectives, whether feminist or androcentric, is limited and relative to subcommunities. The perspectives that have become visible in feminist criticisms have been acquired by communities; their existence, content, acceptability are inextricably dependent on community-bound experiences, theories, practices and standards of evidence. Similarly, the perspectives and models at issue in the natural sciences reflect modern western political experience. Embedded in the notion that the acceptability of knowledge is community-dependent are issues of who has authority to speak in particular contexts and to particular audiences. Within western societies, which are science-centred, scientists have more authority than feminists and scientific claims are more likely to be believed.

According to traditional scientific empiricism, objectivity depends on the exclusion of values and politics. The claims of feminist science critics that the social identity of the scientist is significant, that the self-conscious inclusion of values and politics increases objectivity, and that symbolic gender shapes scientific knowledge (Keller, 1985; Merchant, 1980), do not make sense to the majority of scientists because they belong to an epistemological community with different assumptions, beliefs, and standards of evidence. Because some feminist perspectives are directly antithetical to some scientific perspectives, it often seems as if feminist science critics and women scientists are talking past one another. However, there are both feminist and scientific sub-communities and overlaps between communities. Feminist women scientists are members of both epistemological communities and often face difficulties in shifting from one mind-set or world view to another (Keller, 1987).

In the previous chapter, I emphasize that both communities and individuals play a role in and are responsible for constructing knowledge. It

is individuals, after all, who become feminists and who are partly responsible for challenging and evaluating both individual and social values and beliefs. In defining feminists and scientists as belonging to distinct epistemological communities, I do not mean to negate individual responsibilities, but to construct discussion of conflicts and tensions within feminist science projects in such a way as to shift away from blaming individual women (for not being feminist or for being anti-science). In addition to problematizing the institutional structures which constrain our practices as women, I want to problematize the theories and strategies at play rather than the women who use them, by considering how these theories and strategies function within a larger frame.

While acknowledging that all the factors mentioned above play a role in publicly constructing the relationships between feminist science critics and women scientists as conflictual, in the rest of this chapter I focus on the role that feminist standpoint epistemologies play in these relationships. I show how the strategies employed by feminist equity projects in the sciences conflict with the strategies to transform science which arise from feminist standpoint epistemologies. The key to the conflict is difference: should feminists argue that women are the same as men and do the same kind of science as men, or that women's differences provide resources for different practices which produce better science and more accurate knowledge? In addition, I suggest that the reasons that some kinds of strategies appeal to women scientists as useful and others as less useful in different time periods is dependent partly on social, political and economic conditions, but is also partly determined by the context of their epistemological communities. **Women scientists will choose strategies that work in their context, that are convincing to other scientists.**

Before considering the strategies at issue, I want to introduce here a study which provides some clues for later discussions. As an example of the more general relationships between feminists outside science and women scientists, it provides contextual information about the conflicts and tensions under discussion.

Revealing Conflicts and Tensions

Between 1988 and 1990, Georgina Feldberg (1992) conducted a study of undergraduate students enrolled in upper-level courses on gender and science at two Canadian universities. Though based in women's studies, the courses Feldberg taught appraised biological research on sex differences, introduced students to the analytic methods needed to evaluate that research and assess its impact on women's lives, and counted for science credit. Most of the students were women, however less than 20% of the women were science majors, whereas the majority of the male students were.

Questionnaires and supplementary interviews confirmed Feldberg's impressions that the courses

seemed to house two distinct communities, engaged in competing discourses . . . While the women best versed in feminist critiques of science lost faith in that enterprise, the women who entered the sciences had little sympathy for feminist critiques. (p. 115)

The majority of non-science students believed that the content of science is anti-woman and the method or enterprise of science is anti-feminist. As evidence, they pointed towards women's historic absence from the practice of science; androcentrism in the definition of scientific problems; the role of rationality and objectivity in epistemologies; and the uses of scientific knowledge to create and maintain a patriarchal order. One woman

student believed that science is “male dominated, male tradition, uses male language, theory and objectives, often exploits women and is used to oppress (sic) women” (p. 116). Many emphasized gender differences, arguing that science excludes women’s alternate ways of knowing. Feldberg considers the radical and postmodern traditions dominating academic feminism to have had an impact on women students’ attitudes to scientific work. These feminist approaches range from outright rejection of science; to attempts to resurrect female traditions of craft, intuition, and community; to attempts to create a feminist science. Advanced students set themselves apart from science using political and ideological justifications. Science was rejected on the grounds of capitalism or imperialism; more frequently, however, these students rejected science because of their feminism. “Women, they suggested, lacked a ‘natural inclination’ for science and preferred professions which called for ‘personal’ rather than ‘rational’ skills” (Feldberg, 1992, p. 120).

Increasingly, Feldberg’s non-science students dismissed science as part of a world they neither belonged to nor valued. They considered science boring, irrelevant to their lives, and by definition patriarchal, male and resistant to change. Most had never considered a career in medicine or science, reporting poor experiences in high school science, fears that science was too hard, dislike of abstract and specialized study, or that they lacked the inclination to be a scientist. These students viewed women scientists as having bought into the system in order to succeed. One student explained that “the field is dominated by males and some women who have succeeded by adopting male attitudes and behaviors” (p. 121).

The strongest affirmations of science’s anti-woman or anti-feminist content came from those students with the most background in women’s studies. Conversely, the strongest opposition to these notions came from the

students best schooled in science. While most science students accepted that women historically were excluded from practicing science, few believed that barriers still existed. In addition, they distinguished sharply between the content of science and its practice, between that which was studied and who studied it. One student observed that "science is science, i.e., centrifugal force is neither anti-man nor anti-woman, but the majority of people studying centrifugal force et al. [sic] are men" (p. 118). Feldberg reports that "none of the science students identified any problems in the uses of technology or of scientific knowledge; nor did they articulate any desire to reshape the scientific agenda" (p. 118).

Some women science students recognized that they both acted and were treated differently as women but denied the implications of such differences. They predicated their success in science on "being like the guys" (p. 119). Many women science students adopted a liberal feminist stance with respect to equity. Feldberg notes that

a quest for 'sameness' often characterizes their initiatives, for in order to ensure that women are not treated differently they must make the case that women are not different. To these women, the solution to gender biases that portrayed women as inferior is to get rid of gender. (p. 119)

As Feldberg notes, denying the significance of gender is consistent with the dominant ideology of science and provides a survival strategy by minimizing contradictions between a woman's status as feminist and scientist.

A sub-sample of women in Feldberg's courses had taken at least two university-level courses in biology and at least two courses in women's studies. Rather than taking heart or inspiration from feminist critiques, all these women who had begun careers in science left science.

Feldberg's study gives us a glimpse of the relationships between women scientists and feminisms. Feminists outside the sciences tend to view science as masculine, a tool of domination, unchanging, irrelevant to daily life, and without value; and to view women scientists as having bought into a male model. The women who enter scientific professions are not necessarily interested in transforming science or society; if they have a feminist agenda, most often it is to participate equally with men. Those women who leave science tend to rely on feminist critiques to explain their experiences and justify their alienation.

Feldberg's findings confirm my own experiences and perceptions of being a science student in women's studies and a feminist in science. While feminist critiques of science affirmed my experiences and perceptions as a feminist, they did not make sense of my daily work as a scientist. Feminist politics played a role in my choice to leave science and provided a forum for my growing alienation from scientific practices and cultures which required that I make claims to objectivity, ignore context, stifle considerations of the political implications of the work, and pretend that my body did not matter despite my experiences to the contrary. As someone with scientific training, I continue to be seen as an anomaly within women's studies departments and feminist communities. The surprise and curiosity that individuals express about my scientific background and feminist research differs, I believe, from typical reactions to feminist research in the social sciences and humanities.

Feldberg's study illustrates some of the tensions and divisions between women and science, between feminism and science and between feminist science critics and women scientists. As previously noted, the reasons for these divisions are both numerous and complex. I now want to focus on the role of feminist standpoint epistemologies in the relationships between

feminist science critics and women scientists, and in particular the role of difference. In order to show that conflicting interpretations of gender and the strategic uses of gender difference contribute to the tensions and conflicts, I will look first to the political strategies women scientists have used over time in their struggles to advance, and then to the political strategies which result from feminist standpoint epistemologists' attempts to transform the natural sciences.

Strategies for Survival and Advancement

Women scientists are concerned with their survival and advancement. While this goal is long-standing, the strategies employed by women to gain access to science and recognition for their scientific contributions have varied throughout the nineteenth and twentieth centuries. According to Rossiter (1982), the patterns of American women's participation in science result from the convergence of two major trends between 1820 and 1920. First, middle-class women achieved increased access to higher education and limited employment opportunities. Second, the fields of science and technology expanded and were reshaped by bureaucracy and professionalism. Even as women gained the knowledge and skills to practice science as part of an expanding, highly-skilled work force, their participation was limited both hierarchically and territorially by cultural stereotypes of science as a masculine activity, higher educational requirements, discriminatory hiring practices resulting in sex-typed employment, and the establishment of professional societies as gate-keepers of masculine prestige.

Women scientists have relied primarily on two conflicting but complimentary strategies to increase their participation in science. These strategies can be roughly distinguished according to equality and difference

feminisms. The first strategy involves exploiting prevailing stereotypes of women and/or femininity for primarily short-term gains. This strategy draws on notions of difference to argue that women possess uniquely feminine skills and talents. The second strategy involves rejecting stereotypes and demanding full equality on the grounds that women are the same as men. Any observed differences between the sexes are attributed to discrimination and stereotypes. While the use of these two strategies has varied over time according to political and economic contexts, both are usually in play, but to greater or lesser degrees. Each of these strategies does not necessarily wholly reflect how women scientists view themselves or their work.

For example, women gained access to education in the nineteenth century with the rationale that it would make them better wives and mothers, and relied on notions of uniquely feminine skills and talents to find employment. In the 1880s and 1890s, women advocated, at least publicly, the creation of separate, specifically feminine jobs for women in science. These arguments were successful in finding employment for some women, but resulted in hierarchical and territorial ghettos. Women were relegated to specific disciplines or fields such as home economics, botany and child psychology, and to tedious, anonymous and low-paying tasks (Rossiter, 1982, pp. 51-72).

Strategies of demanding full equality are used when the political context provides support for arguing that stereotypes and artificial barriers are too restricting. For example, in the context of the first wave of the North American women's movement, women publicly shifted emphasis from the strategy of advocating a separate sphere of women's work to striving for full equality, challenging the restrictive social attitudes and practices preventing

women from achieving recognition in the mainstream of science. Women scientists produced research to refute scientific claims of sex differences and women's innate inferiority, and launched public protests over women's status in the scientific community. In academe, women scientists prepared statistical reports documenting their unequal status, expecting that deans and department chairs would end discriminatory practices once aware of them. However, these tactics were not very successful at that time. Despite attempts to change public opinion through research and politics, sex-typed employment for women scientists became the norm, expanding after 1920 (Rossiter, 1982, p. 99-128) up into the 1970s and beyond (Rossiter, 1995).

Again, in the context of second wave North American women's movements, women scientists emphasized demands for full equality. Arguing that women can do good science just as well as men, women demanded the same opportunities to demonstrate their abilities. Over the past twenty-five years, their tactics for increasing women's participation in science have included a combination of institutional changes such as mentoring programs, educational reforms and affirmative action strategies (Gibbons, 1992; Holloway, 1993). As a last resort, women scientists have pursued legal action to challenge gender discrimination in academic decisions (Etzkowitz *et al.*, 1994). Professional associations for women in science and technology, such as Women In Science and Engineering (WISE) and the Society for Canadian Women in Science and Technology (SCWIST), actively work towards dismantling stereotypes about women and about science. Special programs and courses which boost girls' confidence and diffuse science phobias are designed to eliminate the barriers which keep women from science careers (Longino & Hammonds, 1990). Women scientists continue to document their unequal status in the academy and to search for

leaks in the pipeline to full participation (Widnall, 1988). In addition, they challenge and produce alternatives to androcentric research on sex differences and on topics of particular concern to women, for example in the areas of primatology, sociobiology and reproductive technologies (Haraway, 1989, 1991; Hubbard, 1990).²

Equity strategies have achieved some success over the last few decades. In 1985, American women received almost 30% of the Ph.D.'s in the life sciences, up from just over 10% in 1965. However, increases in other fields are more moderate. The number of Ph.D.'s granted to American women in the physical sciences rose from just under 5% to 16% in the same period (Widnall, 1988). The percentage of Ph.D.'s awarded to Canadian women in the natural sciences and engineering rose from 10.5% in 1975 to 16.2% in 1983. Of those, the largest increase was in the health sciences, from 20.5% to 31.6% (Statistics Canada, 1988, p. 51). At Canadian universities in the 1992-93 academic year, women accounted for 33.2% of doctoral students enrolled in agricultural and biological sciences and 18.6% of doctoral students enrolled in mathematics and physical sciences (Statistics Canada, 1995, p. 60). In 1991, 6.9% of visible minority women in Canada with a university degree had studied agricultural and biological sciences, and 9.3% had studied mathematics and physical sciences (Statistics Canada, 1995, p. 143). Some

²It is important to note that the political motivation behind the science community's general acceptance and support for limited institutional changes which favour women's participation is not always feminist in origin. The projected decline in the number of white males of college age by the late 1990s has created concerns about possible declines in the scientific workforce (Widnall, 1988; Jackson, 1989), particularly in the context of a technological revolution in which "highly qualified human resources" become the key component of all national economic development strategies (Statistics Canada, 1988). Scientific workers are recruited from so-called alternative communities (women and minorities) in order to preserve the health of the scientific enterprise by making full use of the intellectual talents of a nation's population. In addition, replacing the image of science as a community of elites with that of a community accessible to all is necessary to maintain public financial support in the future (Crosby, 1988; Etzkowitz *et al.*, 1994; Widnall, 1988).

suggest that women's participation in science and engineering reached a plateau in many fields after 1985 despite some rapid increases in the previous decade (Widnall, 1988).

The number of Ph.D.'s granted is only an indication of women's potential participation, since women scientists are twice as likely as men to be unemployed, more likely to work part-time, and are rarely promoted to top positions (Holloway, 1993). After graduation, women earn less at every stage of their scientific careers, with the disparity increasing as their careers progress (Tastemain *et al.*, 1992); women scientists typically earn 75% of what males in the same position earn (Holloway, 1993). Only 16% of the employed scientists and engineers in the U.S. are women, and their numbers vary according to field, from 1% of working environmental scientists to 41% of working biologists and life scientists (Holloway, 1993). However, these kinds of statistics tend to count only upper-level researchers, rendering many women scientific workers invisible. Counting scientists, engineers and technicians in the natural sciences, engineering and mathematics, women made up 6.7% of the Canadian scientific labour force in 1971, 13.7% in 1981 (Statistics Canada, 1988, p. 72) and 19.9% in 1991 (Statistics Canada, 1993, p. 7). However, in 1971 women accounted for 73.7% of all Canadian workers in medicine and health occupations, 75.0% in 1981 (Statistics Canada, 1988, p. 72), and 79.2% in 1991 (Statistics Canada, 1993, p. 10).

Despite these recent gains, women scientists continue to experience segregation, under employment and under recognition. Changes in scientific disciplines have been slow and uneven relative to other professions. Even in fields such as medicine where women have attained a majority they have not succeeded in changing standards of practice (Feldberg, 1992). Strategies relying on notions of special skills and full equality have been used with more or less

success by women scientists in varying contexts, but the goals of equal participation and recognition have not been realized; periods of gain have often been followed by periods of loss. Between 1938 and 1989 the percentage of women listed in *American Men and Women of Science* (which includes Canadians) grew only slightly from 6% to 6.8% (Dagg & Beauchamp, 1991). While many scientists believe that women's exclusion from science is a thing of the past, many women and girls continue to struggle with stereotypes, educational barriers, harassment, discrimination, isolation, under recognition, and the difficulties of juggling family and professional responsibilities (Gornick, 1983).

Strategies for Transformation

Feminist standpoint epistemologists, like most feminist science critics, believe we must look to science rather than to women for the sources of and solutions to women's exclusion. They challenge traditional scientific epistemologies, aiming to transform scientific practices and methodologies. While such a transformation would make science practice more accessible to women, feminist science critics are not primarily concerned with women's participation. Some feminist science critics reject equity goals altogether, arguing that there is no reason to advocate the advancement of women in science if it means leaving science otherwise unchanged. From this perspective, merely adding women who practice according to the *status quo* "to the social structure of a science that appears to be so thoroughly integrated with the misogynist, racist, and bourgeois aspects of the larger society" at best makes no difference to women's situation, and worse, could cause harm by diverting women's energies and attention away from larger political struggles (Harding, 1991, p. 67).

However feminist standpoint epistemologies imply that having more women (or more feminists) in science may contribute to the transformation of science. The resulting strategies highlight gender differences, suggesting that women's unique perspectives, viewed through the lens of feminist political struggle, will bring better, truer conceptual frameworks and values to scientific research, resulting in less partial, more objective knowledge. Because standpoints are achieved through political struggle, we might assume that feminist women scientists have the potential to contribute to scientific transformation while non-feminist women scientists who practice according to the *status quo* do not. Feminist standpoint epistemologies are most often publicly translated to suggest that women practice science differently and that their different style might result in better science.

Sizing Them Up

At first glance, there appears to be some overlap between the strategies used by women scientists and by feminist standpoint epistemologists. Standpoint strategies argue that women (or feminists) might bring special resources to science; similarly, women scientists have often argued that they possess special skills and talents. However, while standpoint strategies argue that women's special resources benefit science in general, women scientists have at times used difference strategies to argue that they are uniquely suited to particular tasks or areas of study, to scientific 'women's work.' Over the past century, women scientists have relied both on special skills strategies and strategies of striving for full equality for their survival and advancement. Their use of these strategies has varied, partly in accordance with social, political and economic trends. This section identifies conflicts and tensions

between the strategies and goals of women scientists and feminist standpoint epistemologists.

The first and most obvious conflict is that of goals. Most scientists are not interested in transforming science. Yet, the first step in any feminist transformation of science is convincing scientists there is a need to change their practices (Barinaga, 1993b; Nelson, 1990). This requires dialogue and cooperation between scientists and feminist science critics. Given that most scientists are empiricists, the partial rejection of empiricism by feminist standpoint epistemologies creates an immediate obstacle. In addition, this partial rejection contributes to the view that feminists have nothing to gain through dialogue with practicing scientists. Physicist Mary Ruskai objects to the view that women scientists have little to contribute to feminism, noting that "some feminist theorists appear to disregard the opinions of women scientists because they feel that we have been corrupted by our contact with the male scientific establishment" (Ruskai, 1987).

In turn, most feminist standpoint epistemologists are not primarily concerned with women's advancement in science. Yet women scientists' priorities involve dealing with overt and covert sexual discrimination and social expectations of women, not abstract concepts of gender in science.

Jackson (1989) argues that

many women scientists consider themselves to be feminists and are concerned with the kinds of issues feminism has traditionally focused on—educational and professional opportunities, working conditions, salaries, the influence of the 'old boys' network,' and so on. (p. 672)

Some women scientists are concerned that feminist critiques of science may detract from the existing serious problems that continue to confront them (Jackson, 1989). Practicing scientists often don't see how criticisms based in

gender, race or class could be relevant to the practice of science. One woman chemist asserts "there is no such thing as 'feminine' or 'masculine' science, for the same reason that (for example) there is no black or white science, and no American or German science. There is *good* science, and the rest" (Schlick, 1993).

By suggesting that the active participation of more women (or feminists) in science might change science, feminist standpoint epistemologists conflate the goals of transformation with increasing women's participation, creating another set of tensions. Women scientists aim to achieve a critical mass of women in science, with the result that women scientists will become indistinguishable from men scientists--full equity will be realized (Etzkowitz *et al.*, 1994). Most women scientists are not looking for changes in scientific methodologies and epistemologies. However, their failure to do things differently and better is disappointing to those feminist critics who rely on women's increased participation to transform science. This disappointment "problematizes women rather than the structures of science that constrain their practice" and places "an unduly heavy burden on women scientists, whom we ask to at once assume the status of minority and maverick" (Feldberg, 1992, p. 123). Many women scientists fear marginalization in a sexist environment and are unwilling to participate in seemingly innocuous activities, such as meeting informally as women, for fear of stigmatization (Etzkowitz *et al.*, 1994). How can we expect women who have been educated and trained in traditional ways to suddenly abandon their careers and all they have learned (Feldberg, 1992)? Further, systems of funding and promotion block their efforts at transformation (Stark-Adamec, 1992).

The links between transformation and increasing women's participation reinforces the public translation of standpoint epistemologies to suggest that women have a different style of practicing science, shifting attention away from science and onto individual scientists. The focus on the practices of individual women scientists reduces questions about the role that systems of sex/gender play in science to questions about the sex/gender of individual scientists, and posits personal transformation as the solution to political problems. As noted in Chapter Three, this approach encourages speculation about women having different styles of doing science while ignoring the role of gender (and race, class, etc.) in scientific institutions, epistemologies, and research priorities.³

When confronted with the notion that women have a different style of practicing science, many women scientists are unable to separate gender or gender stereotypes from other aspects of their identities, asking questions about race and ethnicity that problematize the gender essentialism of a 'female style'. For example, one Asian woman scientist points to similarities between the styles attributed to women and stereotypes about Asian men's more 'feminine' style of management; and to the contradiction between the stereotypes that women can't do math and that all Asians are math brains (Knecht, 1993). In her anthropological study of high energy physicists, Traweek (1988) notes that in Japan, women are seen as lacking the masculine virtues of interdependence, teamwork, and the capacity to nurture newer group members in developing their skills; instead Japanese women are seen as too independent and competitive.

It would appear that there is nothing consistent cross-culturally in the content of the virtues associated with success. We do see

³I consider the question of whether or not women do science differently to be both unanswerable and beside the point, for the reasons discussed.

that the virtues of success, whatever their content, are associated with men. (Traweek, 1988, p. 104)

From this we can conclude that there is no female style and male style of practicing science, but rather there is one style that is more valued and associated with men in patriarchal societies (McCormack, 1981).

Over the past two decades, women scientists have relied primarily on equity strategies, with some success. Yet many feminist science critics believe these strategies are misguided in that they try to 'fit' women to science while denouncing the idea that science is a masculine activity as a stereotype. While the strategies typically employed by women scientists enable short-term gains, they are "not designed or able to change the established structure of scientific employment in a sexist society" (Rossiter, 1982, p. 316). According to feminist critics, feminist critiques of science begin in part with the acknowledgment that the strategies traditionally used by women scientists have failed (Longino & Hammonds, 1990). The strategies arising from feminist standpoint epistemologies focus on gender differences, conflicting with the equity strategies currently favoured by women scientists.

In the context of feminist movements, women scientists tend to reject strategies based on gender differences in favour of strategies of sameness on the grounds that they will not successfully advance women in scientific professions. Women scientists aim to show that women are no different in the science they do in order to ensure that women are not treated differently than men. To women scientists the notion that women bring something different, and perhaps better, to science sounds dangerously familiar to arguments historically used to exclude women from 'male pursuits' and to special skills strategies which in the past resulted in employment ghettos. One woman physicist notes that feminist critiques sometimes sound

“suspiciously like a rewording of the old bigoted male accusation that women can’t think logically” (Jackson, 1989, p. 687). A 1921 *New York Times* editorial asserted that there would always be more men than women in science because more men “have the power--a necessary qualification for any real achievement in science--of viewing facts abstractly rather than relationally” (Rossiter, 1982, p. 127). Feminist standpoint epistemologists such as Keller agree that women view facts more relationally but make the opposite claim/conclusion about what makes for good science. As noted in Chapter Two, simply reversing the value assigned to each side of a binary pair reinforces rather than transcends such dualisms. For women scientists, feminist standpoint epistemologies which valorize women’s daily labour appear to be consistent with traditional stereotypes which present women’s thinking as best confined to the practical while men should be off exploring the abstract and fundamental (Levin, 1988).

Many women scientists are concerned that strategies which focus on gender differences may perpetuate damaging stereotypes which discourage women from entering science and mathematics. They are concerned to learn that some faculty familiar with feminist critiques of science warn their women students away from science majors (Jackson, 1989). The notion that it is pointless to encourage girls and women to enter science if they are going to practice according to the *status quo*, without contributing to transformation, is directly antithetical to the goals of women scientists and to feminist initiatives to increase women’s economic status and choices and to transform society. In a science-centred society, having access to scientific knowledge and skills is crucial to gaining control over our lives (Harding, 1991, p. 50).

Science will continue quite happily with or without the participation of

women. We cannot create sciences for women that are not made by women (Harding, 1991, p. 70).

Different After All?

Feminist standpoint epistemologists rely on gender essentialisms; they argue that gender makes a difference that matters. Over the past two decades, women scientists have relied primarily on a strategy of striving for full equality which rejects gender differences as significant, attributing them to residual prejudices. However, recent evidence confirms that these public arguments do not represent the full range of women scientists' opinions and experiences, and suggests that in certain contexts women scientists are turning to a strategy which assumes that gender differences are important.

Until recently, the majority of women scientists denied that gender makes any difference to their work (Gornik, 1983). Women scientists are still afraid to discuss publicly the possibility that they may do science differently because it will be assumed that the science they are doing is not as good. One woman scientist who also teaches women's studies describes it as a "hush-hush topic" because the accepted ways of going about science have been defined by men (Barinaga, 1993a). But she says that female researchers discuss the issue among themselves and believe there are some differences. This confirms other impressions that in public most women scientists deny that being a woman makes any difference at all, but in private discussions express different interpretations of their status (Rose, 1983).

Recently, a survey of women professors of engineering, science and mathematics in Ontario universities was designed to explore the outlines of a feminist science from first-hand perspectives (Dagg & Beauchamp, 1991). The return rate was 55%. About 45% of the respondents felt that their gender

affected their research and the way they carried it out. This belief varied with discipline, ranging from a high of 71% in medical science to a low of 0% in engineering. Respondents felt their gender influenced their research according to the topics they chose (26%), their approach to research (32%), and the concrete ways their research was done (25%).

A response form attached to *Science* magazine's 1993 "Women in Science" section surveyed reader responses to the question of whether or not there is a "female style" of doing science. Of the initial 200 respondents, about 170 of whom were women, more than half said they believe there is a female style of doing science. A quarter said they did not, and less than a quarter were unsure. In terms of the various areas in which gender might affect science practice, a large majority believed that gender has "some" or "a great deal" of influence on the way a researcher runs his or her lab and on interactions with colleagues. Fewer respondents believed that gender affects the choice of research problems, and even fewer that gender affects the outcome of research. Three quarters of the respondents believed the culture of science needs to change to be more accommodating to women. In particular, they thought that cooperation should replace competition; there should be less emphasis on publications, aggressive behaviour and long work hours and more emphasis on mentoring and teaching; and that child care needs to be a shared responsibility (Benditt, 1993).

It is debatable whether surveys measure public or private attitudes and opinions. But these surveys, together with other anecdotal evidence (Barinaga, 1993a), suggests that women scientists are beginning to acknowledge that gender makes a difference to the science they practice. But, it may not be the kind of difference feminist standpoint epistemologists discuss or for the same goals. Rather, this evidence suggests that women

scientists are beginning to adopt difference strategies and some of the rhetoric of transformation as a way to make room for their needs as women, for their ways of being less aggressive and more cooperative, of having families and alternate career paths. The belief that gender makes a difference is more commonly expressed by women scientists in disciplines with more women (Dagg & Beauchamp, 1991). One explanation for this is that approaching or achieving critical mass makes it safer for women to talk about differences as a way to challenge the cultures and organization of scientific workplaces. While older women scientists had to play by the rules established by men, keeping all signs of femininity hidden (Etzkowitz *et al.*, 1994; Gornick, 1983), younger women may be envisioning the changes that will come with a critical mass. One woman scientist expresses eagerness to change science rather than changing women "until they fit this funny mold that has been created in their absence" (Barinaga, 1993a, p. 391).

Despite acknowledging differences, women scientists do not claim to produce more accurate research and knowledge. Rather, scientists are likely to argue that white women and women and men of diverse racial/ethnic and cultural backgrounds should be encouraged to practice science because they bring different (not better) perspectives (Holloway, 1993; Namenwirth, 1986). Because most assume that different styles still preserve the same scientific method, scientists claim there is no way to evaluate whether the science produced by different styles is better or worse than that produced by the dominant model (Barinaga, 1993a). Many scientists admit that personal beliefs and desires can influence a scientist's choice of research topics and even methods, but believe that the self-correcting nature of the scientific method insures that deviations will be recognized (Levin, 1988).

In looking to the conflicts and tensions between the strategies and goals of women scientists and feminist standpoint epistemologists, I have attempted to determine the extent to which feminist standpoint epistemologies are useful to current feminist struggles, for both equity and transformation, in the natural sciences. There are good reasons why women scientists do not appeal to feminist standpoint epistemologies in their struggles for equity. In sexist, male-dominated environments, women scientists perceive talk of difference as dangerous: potentially misinterpreted and used to justify stereotypes, discourage girls from entering science, and reinforce hierarchical and territorial employment ghettos. Further, the notion that women could produce better research because of their gender and political values is antithetical to scientific assumptions about objectivity and knowledge. Even in fields with significant numbers of women, women scientists speak of differences with reservation, aiming only to change institutional structures such that their practice is indistinguishable from that of their male colleagues. Finally, Feldberg's (1992) study suggests that women and feminists use difference feminisms to justify their alienation from science; such theories do not encourage women to enter or remain in scientific professions.

With respect to the goal of transformation, feminist standpoint epistemologies inhibit communication and cooperation between feminist science critics and practicing scientists. In addition they have failed, along with feminist critiques more generally, to convince scientists that the physical sciences are gendered. Most scientists believe that the farther you get from research topics dealing directly with sex differences, the more objective the research and the more irrelevant the gender of the scientist (Levin, 1988; Barinaga, 1993a). As one woman scientist puts it,

In medicine, say, gynecology, women may have a different approach. But if you are solving a flow equation, there is not a woman's way or a man's way: there is just the way the air flows around an airplane wing--it just flows around the wing. (Holloway, 1993, p. 101)

Women scientists who are interested in a feminist transformation report that feminist critiques have positively impacted their interactions with students and colleagues, the way they run their labs, and their sense of self. However, they express disappointment and frustration that no concrete alternatives to scientific methods exist and that the day-to-day design and performance of their experiments has not been significantly altered (Witt *et. al.*, 1989). Even those women scientists who accept that science serves particular social, economic and political interests have no options other than to apply the existing methodology more faithfully (Longino & Hammonds, 1990). While committed to transforming science, some feminist women scientists believe the scientific method is too useful a tool to be discarded and that approaches such as reductionism should be supplemented with alternatives, rather than discarded outright (Witt *et. al.*, 1989). Women scientists not interested in transformation also point out the lack of concrete alternatives. One former woman scientist argues that feminist critics have addressed only the more morally elevated attitudes that feminist scientists would presumably carry. "One still wants to know whether feminists' airplanes would stay airborne for feminist engineers" (Levin, 1988, p. 105).

In all their discussions, most women scientists preserve the sanctity of the scientific method and its ability to weed out bias through better, more objective research. This sounds very much like feminist empiricism, but the adoption of difference discourses suggests that the categories of feminist empiricism and feminist standpoint epistemologies are not adequate to

capture the positions of women scientists. Neither equality feminisms nor difference feminisms separately provide adequate explanations for understanding women scientists' experiences and beliefs, nor does just one or the other provide adequate resources for feminist struggles in the natural sciences: for survival, advancement and transformation.

Soble (1983) argues that all of feminists' diverse reasons for aiming to increase the numbers of women in science rely, at least in part, on the assumption that truth is discovered. He suggests instead that "political power is required in order that women can enter the sciences and exert pressure in the *creation* of truth" (p. 302) because ultimately, "the point is not to understand the world, but to change it" (p. 303). While I would argue that in part we need to understand the world in order to change it, Soble's point is a good one, shifting attention from questions about which feminist theories give us the best explanations to questions about the strategic value of particular explanations. These are primarily questions about politics.

How do we build feminist politics that are adequate to serve the competing interests of women scientists and feminist science critics? The value of particular strategies depends largely on who practices them and in what context. Because women scientists know science from daily experiences and bear the immediate impact of feminist science theorizing, they should have a voice in decisions about the deployment of strategies in science. This requires dialogue between the communities of women scientists and feminist science critics. However, "not all participants in the debate get equal air time or are invested with equal authority" (Spelman, 1988, p. 159) because of the competing authority of feminists and of scientists in the contexts of scientific and feminist communities. Those without the "hegemonic power of description" (Phelan, 1994, p. 5) are left out of debates, leaving certain women

to set the agendas. An adequate feminist politics must address not only which strategies are used where and by whom, but how those decisions are made.

CHAPTER FIVE: Conclusion

One must expect multiple answers to any question about "feminism" and "science" because, as I noted at the outset, the two terms are themselves contested zones. (Harding, 1991, p. 297)

Feminisms and feminist projects are diverse and sometimes contradictory. Both feminism and science are constructed through ongoing struggles for political resources (Harding, 1991). Feminist science projects are shaped by these disputes, including the struggles of equality and difference feminists over the meaning and role of gender in social relations. Feminist debates over equality and difference give rise to conflicting strategies and goals. In the context of feminist science projects, the conflicts are mapped out between efforts to achieve equity for women in scientific institutions and research and efforts to transform scientific methodologies and epistemologies.

Since the Enlightenment, many have hoped that science could serve as a neutral arbiter in social and political debates. Yet as part and parcel of social relations, science provided resources to justify (and challenge) the status quo. Women, the lower classes, and peoples not of western European descent who might have criticized scientific views about themselves were barred from scientific practice, and the results of scientific research were often used selectively to justify their continued exclusion (Schiebinger, 1989).

Science continues to be used by dominant and subordinate groups on both sides of liberatory struggles. Feminists working to achieve equity fight science with science, challenging in scientific terms the androcentric and other biases of research on differences between the sexes and among racial and ethnic groups and economic or social classes. Equity feminists make use

of the authority of scientific claims to argue that women are no different from men so that women will not be treated differently from men.

In contrast, feminists working to transform science emphasize the dialectical relationships between science and politics, challenging the neutrality and objectivity of scientific methods and epistemologies. In particular, feminist standpoint epistemologists such as Keller, Smith and Collins construct alternative theories of knowledge which ground epistemic privilege in gender differences. They treat gender differences as a resource in the context of political struggles over authority, meaning and knowledge.

Both sides of the equality and difference debates portray the other as deeply conservative: equality feminisms are too limited, adopting dominant norms and unable to challenge the systemic nature of multiple oppressions; the gender essentialisms of difference feminisms are complicit in reproducing patriarchy and unable to account for the differences among women. These issues cannot be easily resolved, but there may be good reasons for taking one side or another in the debates within a specific context (Davis, 1992; Scott, 1990). If we cannot once and for all answer questions about gender differences, we can acknowledge different approaches to the question as strategically useful in particular contexts. "What comes to the fore, then, is not truth but strategy" (Phelan, 1994, p. 42).

Getting beyond the impasse in feminism created by the equality and difference debates means questioning assumptions about constructions and essences (Fuss, 1989). Since all options available to feminists are constrained by patriarchy, the crucial political questions involve evaluating the kinds of commitments which are useful to feminist political struggles, the kinds of strategies they make possible or hinder, and their costs and benefits (Grosz, 1994). The answers to these questions are always context specific.

Feminist standpoint epistemologies provide strategies which employ gender essentialisms. The determining factors in deciding the political and strategic value of essentialism is who practices it (Fuss, 1994; Spivak, 1987) and in what context. I argue in this thesis that in the present social and political climate, the gender essentialisms of feminist standpoint epistemologies are not very useful for feminist struggles in the natural sciences. They conflict with the strategies currently employed by the majority of women scientists to achieve equity and create barriers to communication with many scientists. Feminist standpoint epistemologies are able to provide only partial explanations for alternative scientific practices, such as Barbara McClintock's, and fail to provide feminist scientists with alternatives to the scientific method. In addition, standpoint approaches have been developed and used primarily by feminists in non-scientific disciplines. While they may be useful outside the practice of science, in challenging the political claims made on behalf of science, women scientists should have a say in determining when and how feminist standpoint epistemologies are used in contexts which affect them directly.

Approaching feminist theories through the lens of strategy does not result in an anything-goes kind of relativism because use "arguments are not made in a vacuum but in a context of power where material and ideological constraints influence which arguments can be put forth by which parties at which times" (Davis, 1992, p. 229). Feminists do not just need access to scientific discourses, but need the political power to *create* truth (Soble, 1983). In addition to building better epistemologies that provide useful strategies, feminisms need to build politics that are better able to serve competing and diverse feminist goals. Phelan (1994, p. 10) argues that rather than building bigger, more comprehensive theory that tries to 'fit' everyone, feminists need

better politics and more modest theories that accommodate context and situated knowledges.

I do not need epistemology to justify my desire, my life, my love. I need politics; I need to build a world that does not require such justifications. . . Acknowledging that power is at stake helps us to address questions of justice directly rather than allowing claims of authority to silence us (or using those claims to silence one another). (Phelan, 1994, p. 55)

What exactly does it mean to build a better feminist politic? And how do we go about this task? Fuss (1994) notes that

Politics is precisely the self-evident category in feminist discourse--that which is most irreducible and most indispensable. As feminism's *essential* component, it tenaciously resists definition; it is both the most transparent and the most elusive of terms. (p. 111)

. . . anti-essentialists are willing to displace 'identity,' 'self,' 'experience,' and virtually every other self-evident category *except* politics. To the extent that it is difficult to imagine a *non-political* feminism, politics emerges as feminism's essence. (p. 112)

In Chapter Two, I discuss the difficulties of grounding knowledge and politics on shared identities or experiences. Possibly, "strategies create identities, not the opposite" (Laclau, 1990, p. 233). How do we ground feminisms and feminist politics? Haraway argues that a class of women linked through coalition rather than identity is the basis for feminist politics, while Fuss argues the reverse, that politics forms the basis of a possible coalition of women (Fuss, 1994). What seems necessary is both politics and coalitions, whatever their causal relationship.

However, the turn to politics does not necessitate a turn away from epistemologies, as long as we are self-conscious about the role of politics in knowledge construction, including feminist knowledge construction. Feminist epistemologies do not give rise to universal truths, but do explain

how we construct theories. Because only partial truths are possible, feminists must be self-conscious of the reasons for and limitations of invoking particular strategies. Code (1991) argues that women must opt for a mitigated, critical relativism which recognizes “the perspectival, locatedness of knowledge *and* its associations with subjective purposes . . . [and] would develop strategies for evaluating perspectives and purposes” (p. 320).

Building better feminist politics for the natural sciences means having more dialogue across communities and disciplines. This includes dialogue among the proponents of feminist empiricisms, feminist standpoints and feminist postmodernisms (Harding, 1989). Feminist science critics need to communicate, engage, and develop cooperation with scientists as a first step in changing scientists’ practices. Such dialogue will be possible only if it involves challenging the hierarchy of authority to speak in different contexts. It is crucial that this dialogue be informed by the voices of women not involved in criticizing or practicing science, since the currently dominant agendas of science involve the elimination, control and economic exploitation of women globally (Harding, 1989). Building better feminist politics for the natural sciences means asking questions about who knowledge serves, about who pays the costs or reaps the benefits of specific knowledges and knowledge-making processes. This includes our definitions of problems and our conceptions of solutions.

Asking questions about who feminist critics serve, and how, places epistemologies within the social organization of cognitive authority. The point is to have an epistemology rooted in the social organization of knowledge that allows knowledge makers to do their work responsibly. In particular, feminist epistemologists need to be accountable to women doing activist work outside the academy. Addelson (1993) asks: “How is the theory

we make in our offices and seminar rooms implemented out in the world? This is a question about the social arrangements of cognitive authority" (p. 275). It is also a question essential for testing the adequacy of feminist theory and for taking responsibility for feminist knowledge making.

The work of making theories serviceable in the social worlds of women's movements cannot be done without direct collaboration with feminist activists (Addelson, 1993). Since feminists in the academy can only partially know the needs of those engaged in the battles of public policy arenas, we need to dissolve the walls of the academy to learn how to make knowledge collaboratively, knowledge that is useful to the people in question. Lather (1991) points to

the need for intellectuals with liberatory intentions to take responsibility for transforming our own practices so that our empirical and pedagogical work can be less toward positioning ourselves as masters of truth and justice and more toward creating a space where those directly involved can act and speak on their own behalf.

How to do so without romanticizing the subject and experience-based knowledge is, of course, the dilemma. The best solution I have been able to come up with in these pages is to do our thinking and our investigating in and through struggle and to learn the lessons of practice, one of which is that there is no "correct line" knowable through struggle. (pp. 163-164)

There is no single best strategy for feminist science projects. We need multiple strategies to serve feminist struggles and goals in contexts inside and outside science.¹ We need more women in science, and we need to transform the social and political landscape of scientific institutions. We need concrete changes in policy and practices now, and we need to keep circulating contradictory and partial theories that will lead us to better understand how

¹I acknowledge the difficulties of using 'we' as a collective identity for feminists given the diversity of feminists and feminist movements. "Yet any possibility of sustaining an allegiance to an ongoing, if changing, women's movement makes it imperative to find ways of negotiating the politics of 'we-saying'" (Code, 1991, p. 302).

the social and the natural intersect in science. We need to keep using science to support feminist values, politics and goals, and we need to keep questioning and undermining the authority of scientific truth claims. There is room for many different feminist approaches to science. Indeed, a diversity of strategies is necessary for feminist politics to address the contradictory realities of women's lives and the places of science within them.

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