For Eva, with all best wishes, Londa

What Changes Have Feminists Brought to Science?

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In the last twenty years a whole new field of inquiry known differently as "women and science," "gender in science," or any combination of those has sprung up in the United States and in many European countries. Many books have been published on the subject; university courses are offered in it.[1] These studies can be broken down into four basic approaches or projects.

1. Women in Scientific Culture

Gender in science first studies women's exclusion from science. The great scientific academies of Europe were founded in the 17th and 18th centuries. Women were not to become members of these societies for over three hundred years. Women were not admitted to the prestigious academy of science in Paris founded in 1666 until 1979. Why was this so? Were there no qualified women scientists when these academies first opened their doors? Evidence from the seventeenth and eighteenth centuries reveals a small but significant number of women active in science and waiting to take their place in the new institutions of science. The German astronomer Maria Winkelmann is a case in point. Winkelmann was not an exception: as extraordinary as it seems to us today, 14 percent of German astronomers in this period were women (fig. 1). In 1710, Maria Winkelmann petitioned the Berlin Academy for an appointment as assistant astronomer and calendar-maker. Already a well-known astronomer when her husband and Academy astronomer (Gottfried Kirch) died in 1710, Winkelmann asked the Academy to appoint her calendar-maker in her husband's stead. She had, in fact, published astronomical observations under her husband's name while he was ill and dying. Despite the fact that the great Gottfried Wilhelm Leibniz (then President of the Academy) was among her backers, her request was denied. In denying her request, Academy officials set an important negative precedent for women's participation in scientific institutions. The first working woman scientist to become a member of this academy was physicist Lise Meitner (who along with Otto Hahn discovered nuclear fission) in the 1940s--and she was admitted only as a corresponding member.[2]

There are many examples from the 18th century of women active in science that we can mention --chatelet (slide) Bassi (slide) but they were marginalized.

2. Scientific Studies of Women

A second area that gender studies of science investigates is how science has studied women. The oldest and most suspect explanation for why there are so few women scientists is that women simply can't do science as well as men. These arguments--known collectively as biological determinism--teach that something in the physical, psychological, and intellectual nature of women prohibits them from producing great science. This attempt to trace woman's social inferiority to her supposed biological inferiority is an old one, dating back at least to Aristotle. In the ancient world, Hippocrates, Aristotle, and Galen drew a picture of the nature of woman which provided a thorough-going justification of women's inferior social status. Aristotle argued that women are colder and weaker than men, and that women do not have sufficient heat to cook the blood and thus purify the soul. In the late eighteenth and nineteenth centuries, craniologists tried to account for sexual differences in intellectual achievement by measuring the skull. Anatomists

assumed that the larger male skull was loaded with a heavier and more powerful brain. Skeleton (slide and skeleton family). At the core of modern science lies a self-reinforcing system whereby the findings of science (crafted in institutions from which women were excluded) have been used to justify their continued exclusion. Eliminating dissenting voices has been one factor making this exclusion seem natural and insulating the scientific profession against correction of misreadings of female nature.

At mid-nineteenth century, Social Darwinists invoked evolutionary biology to argue that woman was a man whose evolution--both physical and mental had been arrested in a primitive stage. One of my all-time favorite argument came in the late-nineteenth century, when a Harvard doctor argued that women should not be admitted to university. Edward Clark in a carefully worked out scientific study showed that women's intellectual development would proceed only at great cost to their reproductive development. If women exercise their brains, this doctor held, their ovaries shrivel. This kind of nonsense did not end in the twentieth century. In the 1920s and 30s, arguments for women's different (and inferior) nature have been based on hormonal research.

Today we are still inundated with the argument that biology is destiny. Studies of brain lateralization try to persuade us that women do poorly in math because their brains aren't as highly specialized as men's. Sociobiologists, such as Harvard's E. O. Wilson, teach that genes dictates social inequalities; even in "the most free and egalitarian of future societies," he writes, " . . . men are likely to continue to play a disproportionate role in political life, business, and science." These studies aren't profoundly different from those of Aristotle or Edward Clark. They seek to provide scientific justification for enduring divisions in power and privilege between the sexes.

3. Gendered Knowledge

A third area of gender studies looks at the consequences of gender for knowledge. We know the consequences of exclusion for women: Women have been banned from rarified intellectual pursuits, their interests and concerns marginalized. They exist as second-class citizens in terms of pay, power, and prestige. But what have been the consequences for knowledge?

The modern feminist critique of science and conceptions of nature emerged in the 1970s. (Pizan 15c; dohm 19c) Much of this early critique sought to identify the distinctive masculine character of Western science. Notions of objectivity, reason, and reductionism--defining traits of the dominant form of science--were seen not as neutral values but as intensely associated with Western masculinity and the public sphere. Overarching critique provided the impetus and context for more specific and detailed analyses of gender dynamics in specific scientific discoveries, theories, nomenclatures, instruments, techniques, and objects that began to emerge in the late 1980s and 1990s.

The feminist critique has enjoyed great success revealing gender inequalities in the humanities, social sciences, and life sciences, where subject matters are sexed or easily imagined to have sex and gender.[3] The "exact" sciences, however, claim for themselves a special ontological and epistemological status: freedom from social imprint. Confidence in this matter is so firm that critics of feminism often play "stump the speaker." The challenge goes something like this: Is there a concrete example of gender

in the substance of physics or math? Can you point to gender distortion in Newton's laws or Einstein's theory of relativity?[4] If not, then mathematics and the physical sciences are objective and value free, as we have claimed all along. Can we, in fact, identify gender in math and physics, whose subject matters have no recognizable sex, in the same way that we have done in the life sciences?

Take first mathematics, the "critical filter" for careers in science and engineering.[5] Feminists have decoded the sexism in problem sets. Problems often exclude women actors and draw from the masculine side of life--emphasizing sports, business, technology, and so forth. This is trivial, and easily fixed, requiring literary rather than mathematical skills.

Kenneth Bogart and Peter Doyle have taken the analysis a step further to suggest that certain problems have not been solved (or not easily solved) because of sexist assumptions. They report on the "ménage problem," first posed in 1891, which asks for "the number M_n ways of seating n man-woman couples at a circular table, with men and women alternating, so that no one sits next to his or her partner." Bogart and Doyle suggest that only the tradition of seating ladies first made this problem seem difficult and speculate that, had it not been for this tradition, the problem would have been solved fifty years earlier. The easiest solution requires that both be seated at once, giving preference to neither the women nor the men.[6] Bogart and Doyle do not comment on the highly Victorian and rigidly bourgeois-character of the problem itself. This is the only example of this sort I could find.

Feminist critiques of mathematics have centered on the process of abstraction found in mathematics. There is in these critiques nothing peculiar to women or gender. In these critiques feminists join others who argue that a sense of certainty in mathematics and science is bought at the price of simplification. N. Katherine Hayles has discussed, for example, how differential and integral calculus had difficulty modeling a world in motion, and the problems this limitation raised for the development of fluid mechanics. According to Hayles, eighteenth-century calculus could see complex flow only as haphazard movements, as a deviation from its basic model, rather than as a dynamic part of the environment. As in any tradition, what can be modeled is taken as the norm; what cannot becomes an aberration. Consequently, Leonhard Euler's notion of a "fluid particle" (a body that could be treated mathematically as a point but that has volume, mass, and density) was crucial to hydraulics, since fluids conceived as points could never flow. As Hayles points out, complex flow created difficulties for an analytic tradition that privileged constancy over change and discrete factors over dynamic interaction.[7]

The ultimate challenge, however, to feminist science studies is said to be physics. What is it about physics that so vehemently excludes women? It seems odd that the biological sciences, which have embroidered multiple negative images of females into many of its foundational concepts and theories, graduate 38 percent women Ph.D.s, while physics, where the gender critique has brought forward far fewer specific examples of overt gendering, produces only about 10 percent.[8] Perhaps the low number of women in physics has insulated physics from feminist critique.

It is hard to find a concrete example of gender in the content of physics. Sharon Traweek's fine work treats the culture of physics; Sandra Harding's argument that physics should not stand at the pinnacle of the

4. The Feminist Ferment in Knowledge: Creating New Knowledge

Let's turn to examples of knowledge created by feminists. In a U.S context, I use the term feminist for those--men or women--who consciously engage gender analysis to create alternative forms of knowledge. I used to say women to avoid the rancor raised by the term feminist, but it is not women per se who change science. Women, who consider themselves "old boys," become the darlings of conservatives. Institutions gain respectability by showcasing a few high-profile women at the same time that they ensure that fundamentals do not change. In other contexts, such as that of women's indigenous knowledges that I will turn to in a minute, the term women by be more appropriate (because these women would have no reasons to be or not to be Western-style feminists).

What is new and unprecedented is the growing agitation for change among women scientists in the last several years. Many women scientists recoil from the notion that women might do science differently. And rightly so, for much feminist science theory has been vilified and vulgarized to suit the purposes of its opponents.[16] Nonetheless, the ferment in knowledge of the past decade has in many instances reshaped what is known and knowable.[17] The simple process of taking feminists seriously as makers of knowledge and females seriously as valid subjects of research has had a tremendous impact in the humanities, social sciences, and many of the sciences.[18]

A number of concrete examples of how gender intervenes in the scientific process have been offered. Some are valid; some are based on the shifting sands of difference feminism. Let me first characterize the various approaches to feminism informing these examples.

A. The primary goal of Liberal feminism is to include women as researchers and females as subjects of scientific research. The female subject is often analyzed in terms formally applied exclusively to males; the woman researcher is often required to assimilate to the dominate culture of science in order to succeed.

B. Difference feminism diverges from liberalism in emphasizing gender differences, not sameness, between men and women. Secondly, difference feminism revalues traditionally devalued feminine qualities. Thirdly, it argues that in order for women to become equally represented in science not only women but also science need undergo fundamental transformation.

C. The triad, situated feminism (as critique), strong objectivity (as method), and sustainable knowledge (as evaluation)[19], share with liberal feminism the goal of achieving gender equality and with difference feminism a critical awareness of what drives and maintains gender distinctions. Unlike difference feminism, however, situated feminism recognizes gender analysis as a form of critique and does not ground solutions in revalued feminine qualities or women's ways of knowing. Situated feminism shifts attention away from epistemology and ontology to political analysis of the goals and outcomes of science. Consequently the question of which problems scientists choose to pursue is foregrounded.

One must also distinguish where change comes within the scientific process:

1. the political, social, economic, and military goals and aims of scientific research determining problem selection;
2. the structure of academia, including the structure of funding agencies, the way labs are organized, the way disciplines are structured;
3. the choice of experimental subjects;

4. conceptions of nature, science, and humankind;
5. epistemologies and methodologies;
6. criteria used in both determining what needs explanation and what counts as an explanation;
7. outcomes: different kinds of sciences benefit different people and different societies at the expense of others.

We cannot, of course, define a scientific process any more than we can reduce the spectrum of feminism to three primary bands. These categories, however, begin to help us analyze and produce "female-friendly" science.[20]

Let me quickly analyze the example of primatology--not because it is new but because it is the most celebrated. It was astonishing in 1993 when Science magazine jumped onto the difference-feminist bandwagon (probably without realizing it) with its question: "Is there a female style in science?" Apparently not wanting to use the term feminist, the editors chose instead "female" style, unfortunately grounding gender in biology and placing the discussion in the essentialist camp. Nonetheless, the query was similar to that regarding feminist science posed in the late 1970s and ealry 80s: when women enter science, do they bring with them different values and priorities? And Science encountered problems similar to those faced many feminists--an all too simple notion of a feminist or, in this instance, female science. One could extrapolate from the articles in Science the content of this prospective female style. It is warm, it is above all fuzzy. It is caring, relational, at times holistic and nurturing. Surprisingly, of the 200 women and 30 men responding to Science magazine's follow-up survey, more than half said that they believe there is a female style of doing science, only one quarter said there was not.[21] This groups was, of course, highly self-selective.

This issue of Science highlighted primatology as the prime example of a science remade by the influx of women, and in so doing reinforced the myth that the presence of women qua women are the leavening agent remaking the institutions and results of science (it is significant that Science magazine's article on primatology did not mention Donna Haraway's work). It is true that gender ideology has historically been used to justify locking women out of science, but this does not mean that bringing women into science automatically corrects gender bias. Having a significant number of women in the field does seem a necessary condition for probing new research paradigms related to feminist concerns within a science. But to say that women changed primatology is an overly simple model. Many women primatologists have produced male-dominance theories indistinguishable from their male colleagues'; by the same token, many men have been instrumental in opening new lines of female-friendly investigation.[22] To make women the agents of change essentializes gender differences (even when those differences are said to be culturally produced) and unnecessarily excludes men as potential allies. More importantly, making women agents of change results from efforts to depoliticize the process, denying the contributions of feminism to the process of change. It is not women per se but women and men using gender as an analytic tool who make a difference.

One theory of creativity, currently acceptable even within conservative institutions, argues that outsiders (in this instance women and minorities) see things "differently" because they are not invested in current orthodoxies. Those advocating this view suggest that a more heterogeneous group of scientists will benefit science by broadening the questions asked.[23] One

might call this standpoint theory with a political lobotomy. Those advocating this view do not look at the structural problems faced in absorbing alternative perspectives and science traditions into what we currently understand as normal science. The notion that the best ideas emerge "naturally" from a potpourri of ideas is a much cherished myth. Advocates of cultural pluralism ignore power relations in the ways we evaluate and validate knowledge. According to Donna Haraway's analysis, changes in primatology require, among other things, an active women's movement, a large number of women in the field, the development of feminist theory, and women moving into positions of influence and power. (This was also true for the development of the Women's Health Initiative.)

Let's look a bit more closely at the changes within primatology. The most striking and far-reaching changes in primatology, as in medicine and other of the life sciences, have come in reevaluations of female subjects. Gender stereotype were overturned, the first being the well-worn Aristotelian notion of the passive, dependent female. Female apes and monkeys were now observed to form stable dominance hierarchies, exercise sexual choice, form purposive alliances with males other than their mates, display aggression, compete for resources, mates, and territory much like males. Females thus emerged as newly enfranchised citizens of the primate state as liberal feminist began reevaluating females in terms of traditional male behavior; that is to say, the females were masculinized. Similar innovations were made across much of field biology. Among pinyon jays, for example, females, not males as expected, were discovered to choose mates aggressively.[24]

In many instances, reevaluation of gender stereotypes went beyond the liberal paradigm of "sameness" to reevaluate sexual difference and challenge evolutionary theory. Primatologist Jeanne Altmann, for example, began with a liberal paradigm, intending simply to produce a more balanced picture of male and female success in coupling. As she spent time in the field, however, Altmann realized that allegiance to evolutionary theory had engendered in researchers a preference for the high drama of murder, hunting, and sex in primate societies. Altmann found a more significant evolutionary story in the longer, sustained dramas surrounding mothers, infants, and food. By shifting focus from males to females, Altmann argued that she had found an important corrective to the story of human origins.[25] Her work dovetailed with that of Adrienne Zihlman who also found that shifting attention to females revealed that the central evolutionary story was not necessarily about sex, but food.[26] One of the principal generators (along with Sally Linton and Nancy Tanner) of the influential "woman, the gatherer" thesis, Zihlman argued that the shift from fruits to tubers drove apes into the human state, not the shift from plants to meat as postulated in the "man the hunter" model. Thus a focus on females, provided a new interpretation of primate development.

Difference feminism can lead, then, to important reevaluation of fundamental theories. Taking seriously what females do (and not assimilating them to male models) has revised our understanding of primate development.

But the dangers of difference feminism are highlighted in debates concerning feminist epistemology. While few would deny that reevaluating the female as both subject and object of research has transformed science in many ways, has that work been done using conventional research methods? Science as we know it lends privilege to method, in part as a way to avoid discussing politics and its own cultural roots. The seventeenth-century "way of ideas" sought to guarantee truth. Proper method, it was thought, certified that

reading nature's laws transcended time, person, and place. According to this model anyone--man or woman, black or white--should have been able to produce reliable science (though women and non-whites were generally thought to lack the strength of reason to produce great science). The privilege given method has fueled the search for a feminist epistemology, thought to challenge science at its most fundamental level.

The 1980s saw a proliferation of claims for women's "ways of knowing"--including "caring" (Noddings), "holism" (Rose), "maternal thinking" (Ruddick)--that had been excluded from the practices of dominant forms of science.[27] Carol Gilligan documented how women speak "in a different voice" when making moral judgments, valuing context and community over abstract principles.[28] More recently, Mary Belenky and her colleagues published the influential book, Women's Ways of Knowing, documenting ways in which women use connected knowledge, contextual thinking, and collaborative discourse rather than something they characterize as "separate" knowledge privileging impersonal and abstract rules and standards.[29]

If we look again at primatology, one important methodological claim has been that the advances made by women resulted from employing a distinctively new method: empathy. For instance, in 1986 Sarah Hrdy wrote, "empathy for other females subjectively felt by women researchers may have been instrumental in expanding the scope of sexual selection theory."[30] Other primatologists agree that women have made "empathy" a respectable method. They point, for example, to Jane Goodall's success. Before Goodall's work, Western primatologists had rarely glimpsed the animals they sought to study. Goodall devised methods to live among them and as a result was able to observe that chimpanzees make tools, which served to redefine the traditional line between tool-making humans and other animals. She also came to know chimpanzees as individuals, not numbered specimens. "She observed--letting nature go its own way--not dominating it, fitting it into ready made categories," stated Allison Jolly.[31]

Sue Rosser's distinction between "feminine" science and "feminist" science is instructive in the debate over feminist epistemology.[32] Much of what is being put forward as women's ways of knowing romanticizes and reinforces traditionally defined gender traits. Furthermore, and perhaps more importantly, the search for a feminist epistemology reconfirms the positivist primacy given method. It reconfirms the project of substituting method for discussion of politics and values. I do not want to underestimate the value of difference feminism as a tool of critique. The study of the historical construction of gender differences offers an important opportunity to understand what scientists have devalued and why. But difference feminism must be confined to critique. Women's historically wrought gender differences simply cannot serve as an epistemological base for new philosophies and practices in the sciences.

There are alternative methods, though not necessarily ones connected to sex. Donna Haraway suggests, for example, that an important foundation for the new visions in primatology arose from Jeanne Altmann's 1974 sampling method (a method not built on gendered characteristics). Altmann's method set events in context by asking about rates and durations of events or states. Observations of eating, grooming, and lolling did not displace conventional observations of combat and sexual encounters but put them into context. These methods did not embody traditionally masculine or feminine qualities but embodied a democratic (taken in its most ideal sense) principle of giving

equal research time to all the members of primate society, not just the powerful.

Shulamit Reinharz, Feminist Methods in Social Research (New York: Oxford University Press, 1992).

p. 240 Ten themes:

1. Feminism is a perspective, not a research method.
2. Feminists use a multiplicity of research methods.
3. Feminist research involves an ongoing criticism of nonfeminist scholarship.
4. Feminist research is guided by feminist theory.
5. Feminist research may be transdisciplinary.
6. Feminist research aims to create social change.
7. Feminist research strives to represent human diversity.
8. Feminist research frequently includes the researcher as a person.
9. Feminist research frequently attempts to develop special relations with the people studied (in interactive research).
10. Feminist research frequently defines a special relation with the reader.

None of these methods reinforces gender stereotypes. All of them can be done by men.

Another way to highlight the historical contingencies of current science practices is to look at lost or ignored knowledges. The history of Western science is as much a history of the loss of traditions as it is the creation of new ones. Modernization has reduced the diversity of plants, animals, human genetic pools, and, rhetoric to the contrary, knowledge. It may well be that the explosion in knowledge associated with the rise of modern science has resulted in a loss of knowledge in the long run.

Thus far I have analyzed examples of alternative offered by women have been within Western-style science. We turn now to women's indigenous knowledges--sciences developed and practiced by women--as a means of looking at radically different ways of understanding nature, organizing science, and responding to basic human needs. A key example of women's indigenous knowledge within Western culture is midwifery, which I will not discuss here.[33] Women's indigenous knowledge traditions from around the world provide further examples of how science has been done differently. In the instance of indigenous knowledges, gender is but one aspect of a larger struggle between the West and other parts of the world. In many parts of the world, colonialization and the introduction of European gender ideologies undermined women's traditional sphere of influence.[34] Colonialism brought with it the devaluation of indigenous knowledges to such an extent that Even the colonized, especially those educated in Western schools, often abandoned traditional ways.

Examples of women's indigenous knowledges cluster around agriculture and forest management because women have traditionally been in charge of food and food preparation. A prime here is Andean potato breeding, where for centuries Quechua women have breed and preserved potato seeds. (One might reflect on the importance of the potato imported from this area for industrial development in the West; the potato served as necessary substance for Europe's swelling population in the seventeenth and eighteenth centuries.) Andean women do not merely clone potatoes by planting whole or parts of potatoes but breed potatoes from true potato seeds. These "keepers of the seeds," as they are called, meet annually to exchange their produce, find new seeds and

knowledge about their production, conservation, and use. Any one woman might manage up to 56 varieties of potatoes.

Andean women select and classify their potatoes according to various criteria: type of cultivation, edibility, processing required, and resistance to frost and pests. {Varieties are further classified by skin and meal color, meal consistency, the shape of the tuber, and the depth and configuration of the potato's eyes. Subvarieties are sorted primarily by tuber color.} A woman cultivates diverse potatoes both to provide a balanced diet for her family and to conserve soil fertility; she pays attention to color, texture, and flavor to please her family's palate. The tastiest potatoes, often raised in special plots, are reserved for festival days.

{Since 1950, women have also distinguished between native potatoes (called "gift potatoes" or "colored potatoes") and potatoes introduced by the Peruvian National Potato Program (called "improved potatoes" or "white potatoes"--for their white meal). Improved varieties are bred for their yield (2-3 times that of native potatoes) and marketability in urban areas. They, however, do not store well, do not produce viable seeds, and require chemical fertilizers, insecticides, and fungicides. Andean women judge the improved potatoes inferior to the native ones and rarely feed them to their own families.[35]}

There is nothing sacred or mystical about the fact that this particular knowledge of nature have been developed by women. Women's work in seed preservation respond to the sexual division of labor in particular cultures. The same kind of work could be done by men under different conditions. Importantly, Andean potato cultivation techniques are sustainable in terms of meeting community needs and enhancing rather than denigrating the environment.

Returning in conclusion to the central question of creating alternative sciences, how do we provide a powerful vision of creative possibilities in science?

Limiting ourselves for the moment to university life, restructuring knowledge requires a two-fold integration. First, feminist science studies must become an integral part of science studies. Feminist science studies, like women's studies more generally, has remained marginalized. While gender in science courses are readily accepted by various departments (outside the sciences) and faculty are occasionally hired to teach such things, the analysis of gender is still considered something having to do with women, not the relationship between women, men, and power. Courses not explicitly designated gender courses most often do not mention women. This problem is highlighted in the recent Handbook of Science and Technology Studies edited by the Cornell group. This otherwise admirable volume is already an improvement over its 1977 predecessor, which, as Mary Frank Fox notes, contained no chapters on women or gender and listed only three pages on the "sex roles of scientists" in the index.[36] The new Handbook, with approximately one quarter of the articles authored by women (probably representative of the Ph.D.s produced in the field) and three out of twenty-eight articles dedicated to feminist topics, still contains discussions of gender to articles specifically on that topic. In the next decade, feminist science scholars must become more successful in mainstreaming our work.

Secondly, science studies needs to be integrated into science. Here Sandra Harding's notion of strong objectivity is particularly useful. Harding's notion of strong objectivity maximizes current notions of

objectivity (which Harding calls weak objectivity) by extending objectivity to include the critical examination to all beliefs and interests forming a scientific project. She argues that weak objectivity prematurely cuts off the evaluation of values, assumptions, and politics from the design of research projects. Strong objectivity requires that the critique of science be joined to the generation of knowledge, not operating as merely a jeremiad-like critique after-the-fact.[37]

Strong objectivity, which incorporates a critical analysis of science into the methods of science, is the best tool for producing sustainable science--sustainable in terms of cultivating healthy relations between men and women, different cultures, and with nature. Sustainable science is socially responsible science, asking how our knowledge of nature has been influenced by power struggles determining who is included and who is excluded, which projects are pursued and which ignored, whose experiences are validated and whose are not, and who stands to gain in terms of wealth or well-being and for how long?[38] Sustainable science focuses attention on the origins and outcomes, the questions asked and the long-term consequences.

What, then, is the content of situated feminism and sustainable science? This is where people tend to get nervous. United States democracy and science are based on the myth of politically neutral methods. If every one cannot agree on values, many think they can agree at least on methods for determining values. According to this way of thinking, "truths" yielded by presumed value-neutral methods must then be recognized (no matter how regrettable) by people of differing political persuasions. As I have argued here, however, we have in hand no such method. How, then, do we agree on desirable scientific projects? The way we always have--through political decisions--except we now see this as a part of the scientific project, not as a matter of neutral science suffering the vicissitudes of government funding agencies, industrial lobbies, or those directing and profiting from economic development. Feminism (political discourse evaluating the implications of theories and actions for women) will be one value informing sustainable science.

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