Science, Facts, and Feminism

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Feminists acknowledge that making science is a social process and that scientific laws and the "facts" of science reflect the interests of the university-educated, economically privileged, predominantly white men who have produced them. We also recognize that knowledge about nature is created by an interplay between objectivity and subjectivity, but we often do not credit sufficiently the ways women's traditional activities in home, garden, and sickroom have contributed to understanding nature.

The Facts of Science. The Brazilian educator, Paulo Freire, has pointed out that people who want to understand the role of politics in shaping education must "see the reasons behind facts" (Freire 1985,2). I want to begin by exploring some of the reasons behind a particular kind of facts, the facts of natural science. After all, facts aren't just out there. Every fact has a factor, a maker. The interesting question is: as people move through the world, how do we sort those aspects of it that we permit to become facts from those that we relegate to being fiction—untrue, imagined, imaginary, or figments of the imagination—and from those that, worse yet, we do not even notice and that therefore do not become fact, fiction, or figment? In other words, what criteria and mechanisms of selection do scientists use in the making of facts?

One thing is clear: making facts is a social enterprise. Individuals cannot just go off by themselves and dream up facts. When people do that, and the rest of us do not agree to accept or share the facts they offer us, we consider them schizophrenic, crazy. If we do agree, either because their facts sufficiently resemble ours or because they have the power to force us to accept their facts as real and true—to make us see the emperor's new clothes—then the new facts become part of our shared reality and their making, part of the fact-making enterprise.

Making science is such an enterprise. As scientists, our job is to generate facts that help people understand nature. But in doing this, we must follow rules of membership in the scientific community and go about our task of fact-making in professionally sanctioned ways. We must submit new facts to review by our colleagues and be willing to share them with qualified strangers by writing and speaking about them (unless we work for private companies with proprietary interests, in which case we still must share our facts, but

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only with particular people). If we follow proper procedure, we become accredited fact-makers. In that case our facts come to be accepted on faith and large numbers of people believe them even though they are in no position to say why what we put out are facts rather than fiction. After all, a lot of scientific facts are counterintuitive, such as that the earth moves around the sun or that if you drop a pound of feathers and a pound of rocks, they will fall at the same rate.[1]

What are the social or group characteristics of those of us who are allowed to make scientific facts? Above all, we must have a particular kind of education that includes graduate, and post-graduate training. That means that in addition to whatever subject matter we learn, we have been socialized to think in particular ways and have familiarized ourselves with that narrow slice of human history and culture that deals primarily with the experiences of western European and North American upper class men during the past century or two. It also means that we must not deviate too far from accepted rules of individual and social behavior and must talk and think in ways that let us earn the academic degrees required of a scientist.

Until the last decade or two, mainly upper-middle and upper class youngsters, most of them male and white, have had access to that kind of education. Lately, more white women and people of color (women and men) have been able to get it, but the class origins of scientists have not changed appreciably. The scientific professions still draw their members overwhelmingly from the upper-middle and upper classes.

How about other kinds of people? Have they no role in the making of science? Quite the contrary. In the ivory (that is, white) towers in which science gets made, lots of people are from working class and lower-middle class backgrounds, but they are the technicians, secretaries, and clean-up personnel. Decisions about who gets to be a faculty-level fact-maker are made by professors, deans, and university presidents who call on scientists from other, similar institutions to recommend candidates who they think will conform to the standards prescribed by universities and the scientific professions. At the larger, systemic level, decisions are made by government and private funding agencies which operate by what is called peer review. What that means is that small groups of people with similar personal and academic backgrounds decide whether a particular fact-making proposal has enough merit to be financed. Scientists who work in the same, or related, fields mutually sit on each other's decision making panels and whereas criteria for access are supposedly objective and meritocratic, orthodoxy and conformity count for a lot. Someone whose ideas and/or personality are out of line is less likely to succeed than "one of the boys"—and these days some of us girls are allowed to join the boys, particularly if we play by their rules.

Thus, science is made, by and large, by a self-perpetuating, self-reflexive group: by the chosen for the chosen. The assumption is that if the science

is "good," in a professional sense, it will also be good for society. But no one and no group are responsible for looking at whether it is. Public accountability is not built into the system.

What are the alternatives? How could we have a science that is more open and accessible, a science *for* the people? And to what extent could—or should—it also be a science *by* the people? After all, divisions of labor are not necessarily bad. There is no reason and, indeed, no possibility, that in a complicated society like ours, everyone is able to do everything. Inequalities which are bad, come not from the fact that different people do different things, but from the fact that different tasks are valued differently and carry with them different amounts of prestige and power.

For historical reasons, this society values mental labor more highly than manual labor. We often pay more for it and think that it requires more specifically human qualities and therefore is superior. This is a mistake especially in the context of a scientific laboratory, because it means that the laboratory chief—the person "with ideas"—often gets the credit, whereas the laboratory workers—the people who work with their hands (as well as, often, their imaginations)—are the ones who perform the operations and make the observations that generate new hypotheses and that permit hunches, ideas, and hypotheses to become facts.

But it is not only because of the way natural science is done that head and hand, mental and manual work, are often closely linked. Natural science requires a conjunction of head and hand because it is an understanding of nature *for use*. To understand nature is not enough. Natural science and technology are inextricable, because we can judge that our understanding of nature is true only to the extent that it works. Significant facts and laws are relevant only to the extent that they can be applied and used as technology. The science/technology distinction, which was introduced one to two centuries ago, does not hold up in the real world of economic, political and social practices.

Woman's Nature: Realities versus Scientific Myths. As I said before, to be believed, scientific facts must fit the world-view of the times. Therefore, at times of tension and upheaval, such as the last two decades, some researchers always try to "prove" that differences in the political, social, and economic status of women and men, blacks and whites, or poor people and rich people, are inevitable because they are the results of people's inborn qualities and traits. Such scientists have tried to "prove" that blacks are innately less intelligent than whites, or that women are innately weaker, more nurturing, less good at math than men. If, for the purposes of this discussion, we focus on sex differences, it is clear that the ideology of woman's nature can differ drastically from the realities of women's lives and indeed be antithetical to them. In fact, the ideology functions, at least in part, to obscure the ways women live and to make people look away from the realities or ask

misleading questions about them. So, for example, the ideology that labels women as the natural reproducers of the species, and men as producers of goods, has not been used to exempt women from also producing goods and services, but to shunt us out of higher paying jobs, the professions, and other kinds of work that require continuity and provide a measure of power over one's own and, at times, other people's lives. Most women who work for pay do so in job categories, such as secretary or nurse, which often involve a great deal of concealed responsibility, but are underpaid. This is one reason why insisting on equal pay *within* job categories cannot remedy women's economic disadvantage. Women will continue to be underpaid as long as women's jobs are less well paid than men's jobs and as long as access to traditional men's jobs is limited by social pressures, career counseling, training and hiring practices, trade union policies, and various other subtle and not so subtle societal mechanisms, such as research that "proves" that girls are not as good as boys at spatial perception, mathematics and science. An entire range of discriminatory practices is justified by the claim that they follow from the limits that biology places on women's capacity to work. Though exceptions are made during wars and other emergencies, they are forgotten as soon as life resumes its normal course. Then women are expected to return to their subordinate roles, not because the quality of their work during the emergencies has been inferior, but because these roles are seen as natural.

A few years ago, a number of women employees in the American chemical and automotive industries were actually forced to choose between working at relatively well-paying jobs that had previously been done by men or remaining fertile. In one instance, five women were required to submit to sterilization *by hysterectomy* in order to avoid being transferred from work in the lead pigment department at the American Cyanamid plant in Willow Island, West Virginia to janitorial work at considerably lower wages and benefits (Stellman and Henifin 1982). Even though none of these women was pregnant or planning a pregnancy in the near future (indeed, the husband of one had had a vasectomy), they were considered "potentially pregnant" unless they could prove that they were sterile. This goes on despite the fact that exposure to lead can damage sperm as well as eggs and can affect the health of workers (male and female) as well as a "potential fetus." It is as though fertile women are at all times potential parents; men, never. But it is important to notice that this vicious choice is being forced only on women who have recently entered relatively well-paid, traditionally male jobs. Women whose work routinely involves reproductive hazards because it exposes them to chemical or radiation hazards, but who have traditionally female jobs such as nurses, X-ray technologists, laboratory technicians, cleaning women in surgical operating rooms, scientific laboratories or the chemical and biotechnology industries, beauticians, secretaries, workers in the ceramics industry, and domestic workers are not warned about the chemical or physical

hazards of their work to their health or to that of a fetus, should they be pregnant. In other words, scientific knowledge about fetal susceptibility to noxious chemicals and radiation is used to keep women out of better paid job categories from which they had previously been excluded by discriminatory employment practices, but, in general, women (or, indeed, men) are not protected against health endangering work.

The ideology of woman's nature that is invoked at these times would have us believe that a woman's capacity to become pregnant leaves her always physically disabled by comparison with men. The scientific underpinnings for these ideas were elaborated in the nineteenth century by the white, university-educated, mainly upper class men who made up the bulk of the new professions of obstetrics and gynecology, biology, psychology, sociology and anthropology. These professionals used their theories of women's innate frailty to disqualify the girls and women of their own race and class who would have been competing with them for education and professional status. They also realized that they might lose the kinds of personal attention they were accustomed to get from mothers, wives, and sisters if women of their own class gained access to the professions. They did not invoke women's weakness when it came to poor women spending long hours working in the homes and factories belonging to members of the upper classes, nor against the ways black slave women were made to work on the plantations and in the homes of their masters and mistresses.

Nineteenth century biologists and physicians claimed that women's brains were smaller than men's and that women's ovaries and uteruses required much energy and rest in order to function properly. They "proved" that therefore young girls must be kept away from schools and colleges once they begin to menstruate and warned that without this kind of care women's uteruses and ovaries will shrivel and the human race die out. Yet again, this analysis was not carried over to poor women, who were not only required to work hard, but often were said to reproduce *too* much. Indeed, scientists interpreted the fact that poor women could work hard and yet bear many children as a sign that they were more animal-like and less highly evolved than upper class women.

During the past decade, feminists have uncovered this history. We have analyzed the self-serving theories and documented the absurdity of the claims as well as their class and race biases and their glaringly political intent (Hubbard and Lowe 1979; Lowe and Hubbard 1983; Bleier 1984; Fausto-Sterling 1985). But this kind of scientific mythmaking is not past history. Just as in the nineteenth century medical men and biologists fought women's political organizing for equality by claiming that our reproductive organs made us unfit for anything but childbearing and childrearing, just as Freud declared women to be intrinsically less stable, intellectually inventive and productive than men, so beginning in the 1970's, there has been a renaissance in sex differences

research that has claimed to prove scientifically that women are innately better than men at home care and mothering while men are innately better fitted than women for the competitive life of the market place.

Questionable experimental results obtained with animals (primarily that prototypic human, the white laboratory rat) are treated as though they can be applied equally well to people. On this basis, some scientists are now claiming that the secretion of different amounts of so-called male hormones (androgens) by male and female fetuses produces life-long differences in women's and men's brains. They claim not only that these (unproved) differences in fetal hormone levels exist, but imply (without evidence) that they predispose women and men *as groups* to exhibit innate differences in our abilities to localize objects in space, in our verbal and mathematical aptitudes, in aggressiveness and competitiveness, nurturing ability, and so on (Money and Ehrhardt 1972; Goy and McEwen 1980; *Science* 1981, 1263-1324). Sociobiologists claim that some of the sex differences in social behavior that exist in Western, capitalist societies (such as, aggressiveness, competitiveness, and dominance among men; coyness, nurturance, and submissiveness among women) are human universals that have existed in all times and cultures. Because these traits are said to be ever-present, sociobiologists deduce that they must have evolved through Darwinian natural selection and are now part of our genetic inheritance (Wilson 1975).

Sociobiologists have tried to prove that women's disproportionate contributions to child- and homecare are biologically programmed because women have a greater biological "investment" in our children than men have. They offer the following rationale: an organism's biological fitness, in the Darwinian sense, depends on producing the greatest possible number of offspring, who themselves survive long enough to reproduce, because this is what determines the frequency with which an individual's genes will be represented in successive generations. Following this logic a step further, sociobiologists argue that women and men must adopt basically different strategies to maximize opportunities to spread our genes into future generations. The calculus goes as follows: Eggs are larger than sperm and women can produce many fewer of them than men can sperm. Therefore each egg that develops into a child represents a much larger fraction of the total number of children a woman can produce, hence of her "reproductive fitness," than a sperm that becomes a child does of a man's "fitness." In addition, women "invest" the nine months of pregnancy in each child. Women must therefore be more careful than men to acquire well-endowed sex partners who will be good providers to make sure that their few investments (read, children) mature. Thus, from seemingly innocent biological asymmetries between sperm and eggs flow such major social consequences as female fidelity, male promiscuity, women's disproportional contribution to caring for home and children, and the unequal distribution of labor by sex. As sociobiologist, David Barash, says, "mother

nature is sexist," so don't blame her human sons (Dawkins 1976; Barash 1979, esp. 46-90).

In devising these explanations, sociobiologists ignore the fact that human societies do not operate with a few superstuds; nor do stronger or more powerful men as a rule have more children than weaker ones. Men, in theory, could have many more children than women can, but in most societies equal numbers of men and women engage in producing children, though not in caring for them. These kinds of absurdities are useful to people who have a stake in maintaining present inequalities. They mystify procreation, yet have a superficial ring of plausibility and thus offer naturalistic justifications for discriminatory practices.

As the new scholarship on women has grown, a few anthropologists and biologists have tried to mitigate the male bias that underlies these kinds of theories by describing how females contribute to social life and species survival in important ways that are overlooked by scientists who think of females only in relation to reproduction and look to males for everything else (Lancaster 1975; Hrdy 1981, 1986; Kevles 1986). But, unless scientists challenge the basic premises that underlie the standard, male-centered descriptions and analyses, such revisions do not offer radically different formulations and insights. (For examples of more fundamental criticisms of evolutionary thinking and sociobiology, see Lowe and Hubbard 1979; Hubbard 1982; Lewontin, Rose and Kamin 1984).

Subjectivity and Objectivity. I want to come back to Paulo Freire, who says: "Reality is never just simply the objective datum, the concrete fact, but is also people's [and I would say, certain people's] perception of it." And he speaks of "the indispensable unity between subjectivity and objectivity in the act of knowing" (Freire 1985, 51).

The recognition of this "indisputable unity" is what feminist methodology is about. It is especially necessary for a feminist methodology in science because the scientific method rests on a particular definition of objectivity, that we feminists must call into question. Feminists and others who draw attention to the devices that the dominant group has used to deny other people access to power—be it political power or the power to make facts—have come to understand how that definition of objectivity functions in the processes of exclusion I discussed at the beginning.

Natural scientists attain their objectivity by looking upon nature (including other people) in small chunks and as isolated objects. They usually deny, or at least do not acknowledge, their relationship to the "objects" they study. In other words, natural scientists describe their activities as though they existed in a vacuum. The way language is used in scientific writing reinforces this illusion because it implicitly denies the relevance of time, place, social context, authorship, and personal responsibility. When I report a discovery, I do not write, "One sunny Monday after a restful weekend, I came into the

laboratory, set up my experiment and shortly noticed that . . ." No; proper style dictates, "It has been observed that . . ." This removes relevance of time and place, and implies that the observation did not originate in the head of a human observer, specifically my head, but out there in the world. By deleting the scientist-agent as well as her or his participation as observer, people are left with the concept of science as a thing in itself, that truly reflects nature and that can be treated as though it were as real as, and indeed equivalent to, nature.

A particularly blatant example of the kind of context-stripping that is commonly called objectivity is the way E.O. Wilson opens the final chapter of his *Sociobiology: The New Synthesis* (Wilson 1975, 547). He writes: "Let us now consider man in the free spirit of natural history, as though we were zoologists from another planet completing a catalog of social species on earth." That statement epitomizes the fallacy we need to get rid of. There is no "free spirit of natural history," only a set of descriptions put forward by the mostly white, educated, Euro-American men who have been practicing a particular kind of science during the past two hundred years. Nor do we have any idea what "zoologists from another planet" would have to say about "man" (which, I guess is supposed to mean "people") or about other "social species on earth," since that would depend on how these "zoologists" were used to living on their own planet and by what experiences they would therefore judge us. Feminists must insist that subjectivity and context cannot be stripped away, that they must be acknowledged if we want to use science as a way to understand nature and society and to use the knowledge we gain constructively.

For a different kind of example, take the economic concept of unemployment which in the United States has become "chronic unemployment" or even "the normal rate of unemployment." Such pseudo-objective phrases obscure a wealth of political and economic relationships which are subject to social action and change. By turning the activities of certain people who have the power to hire or not hire other people into depersonalized descriptions of economic fact, by turning activities of scientists into "factual" statements about nature or society, scientific language helps to mystify and intimidate the "lay public," those anonymous others, as well as scientists, and makes them feel powerless.

Another example of the absurdity of pretended objectivity, is a study that was described in the *New York Times* in which scientists suggested that they had identified eight characteristics in young children that were predictive of the likelihood that the children would later develop schizophrenia. The scientists were proposing a longitudinal study of such children as they grow up to assess the accuracy of these predictions. This is absurd because such experiments cannot be done. How do you find a "control" group for parents who have been told that their child exhibits five out of the eight characteristics, or worse yet, all eight characteristics thought to be predictive of schizophrenia?

Do you tell some parents that this is so although it isn't? Do you not tell some parents whose children have been so identified? Even if psychiatrists agreed on the diagnosis of schizophrenia—which they do not—this kind of research cannot be done objectively. And certainly cannot be done ethically, that is, without harming people.

The problem is that the context-stripping that worked reasonably well for the classical physics of falling bodies has become the model for how to do every kind of science. And this even though physicists since the beginning of this century have recognized that the experimenter is part of the experiment and influences its outcome. That insight produced Heisenberg's uncertainty principle in physics: the recognition that the operations the experimenter performs disturb the system so that it is impossible to specify simultaneously the position and momentum of atoms and elementary particles. So, how about standing the situation on its head and using the social sciences, where context stripping is clearly impossible, as a model and do all science in a way that acknowledges the experimenter as a self-conscious subject who lives, and does science, within the context in which the phenomena she or he observes occur? Anthropologists often try to take extensive field notes about a new culture as quickly as possible after they enter it, before they incorporate the perspective and expectations of that culture, because they realize that once they know the foreign culture well and feel at home in it, they will begin to take some of its most significant aspects for granted and stop seeing them. Yet they realize at the same time that they must also acknowledge the limitations their own personal and social backgrounds impose on the way they perceive the foreign society. Awareness of our subjectivity and context must be part of doing science because there is no way we can eliminate them. We come to the objects we study with our particular personal and social backgrounds and with inevitable interests. Once we acknowledge those, we can try to understand the world, so to speak, from inside instead of pretending to be objective outsiders looking in.

The social structure of the laboratory in which scientists work and the community and inter-personal relationships in which they live are also part of the subjective reality and context of doing science. Yet, we usually ignore them when we speak of a scientist's scientific work despite the fact that natural scientists work in highly organized social systems. Obviously, the sociology of laboratory life is structured by class, sex, and race, as is the rest of society. We saw before that to understand what goes on in the laboratory we must ask questions about who does what kinds of work. What does the lab chief—the person whose name appears on the stationery or on the door—contribute? How are decisions made about what work gets done and in what order? What role do women, whatever our class and race, or men of color and men from working class backgrounds play in this performance?

Note that women have played a very large role in the production of

science—as wives, sisters, secretaries, technicians, and students of "great men"— though usually not as accredited scientists. One of our jobs as feminists must be to acknowledge that role. If feminists are to make a difference in the ways science is done and understood, we must not just try to become scientists who occupy the traditional structures, follow established patterns of behavior, and accept prevailing systems of explanation; we must understand and describe accurately the roles women have played all along in the process of making science. But we must also ask why certain ways of systematically interacting with nature and of using the knowledge so gained are acknowledged as science whereas others are not.

I am talking of the distinction between the laboratory and that other, quite differently structured, place of discovery and fact-making, the house-hold, where women use a different brand of botany, chemistry, and hygiene to work in our gardens, kitchens, nurseries, and sick rooms. Much of the knowledge women have acquired in those places is systematic and effective and has been handed on by word of mouth and in writing. But just as our society downgrades manual labor, it also downgrades knowledge that is produced in other than professional settings, however systematic it may be. It downgrades the orally transmitted knowledge and the unpaid observations, experimentation and teaching that happen in the household. Yet here is a wide range of systematic, empirical knowledge that has gone unnoticed and unvalidated (in fact, devalued and invalidated) by the institutions that catalog and describe, and thus define, what is to be called knowledge. Men's explorations of nature also began at home, but later were institutionalized and professionalized. Women's explorations have stayed close to home and their value has not been acknowledged.

What I am proposing is the opposite of the project the domestic science movement put forward at the turn of the century. That movement tried to make women's domestic work more "scientific" in the traditional sense of the word (Newman 1985, 156-191). I am suggesting that we acknowledge the scientific value of many of the facts and knowledge that women have accumulated and passed on in our homes and in volunteer organizations.

I doubt that women as gendered beings have something new or different to contribute to science, but women as political beings do. One of the most important things we must do is to insist on the political content of science and on its political role. The pretense that science is objective, apolitical and value-neutral is profoundly political because it obscures the political role that science and technology play in underwriting the existing distribution of power in society. Science and technology always operate in somebody's interest and serve someone or some group of people. To the extent that scientists are "neutral" that merely means that they support the existing distribution of interests and power

If we want to integrate feminist politics into our science, we must insist

on the political nature and content of scientific work and of the way science is taught and otherwise communicated to the public. We must broaden the base of experience and knowledge on which scientists draw by making it possible for a wider range of people to do science, and to do it in different ways. We must also provide kinds of understanding that are useful and useable by a broad range of people. For this, science would have to be different from the way it is now. The important questions would have to be generated by a different social process. A wider range of people would have to have access to making scientific facts and to understanding and using them. Also, the process of validation would have to be under more public scrutiny, so that research topics and facts that benefit only a small elite while oppressing large segments of the population would not be acceptable.

Our present science, which supposedly exists to explain nature and let us live more comfortably in it, has in fact mystified nature. As Virginia Woolf's Orlando says as she enters a department store elevator:

> The very fabric of life now . . . is magic. In the eighteenth century, we knew how everything was done; but here I rise through the air; I listen to voices in America; I see men flying—but how it's done, I can't even begin to wonder. (Woolf 1928, 300)

Other ways to do Science? The most concrete examples of a different kind of science that I can think of come from the women's health movement and the process by which the Boston Women's Healthbook Collective's (1984) *The New Our Bodies, Ourselves* or the Federation of Feminist Women's Health Centers' (1981) *A New View of a Woman's Body* have been generated. These groups have consciously tried to involve a range of women in setting the agenda, as well as in asking and answering the relevant questions. But there is probably no single way in which to change present-day science, and there shouldn't be. After all, one of the problems with science, as it exists now, is that scientists narrowly circumscribe the allowed ways to learn about nature and reject deviations as deviance.

Of course it is difficult for feminists who, as women, are just gaining a toehold in science, to try to make fundamental changes in the ways scientists perceive science and do it. This is why many scientists who are feminists live double-lives and conform to the pretenses of an apolitical, value-free, meritocratic science in our working lives while living our politics elsewhere. Meanwhile, many of us who want to integrate our politics with our work, analyze and critique the standard science, but no longer do it. Here again, feminist health centers and counselling groups come to mind as efforts to integrate feminist inquiry and political praxis. It would be important for feminists, who are trying to reconceptualize reality and reorganize knowledge and its uses in areas other than health, to create environments ("outstitutes")

in which we can work together and communicate with other individuals and groups, so that people with different backgrounds and agendas can exchange questions, answers, and expertise.

NOTES

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1. Recently some physicists have hypothesized that a pound of feathers falls more *rapidly* than a pound of rocks—an even more counterintuitive "fact" than what I learned in high school physics.

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