



BOOK REVIEWS

A WORLD WITHOUT WOMEN: THE CHRISTIAN CLERICAL CULTURE OF WESTERN SCIENCE

David F. Noble. New York: Knopf, 1992.

FEMINISM CONFRONTS TECHNOLOGY

Judy Wajcman. Cambridge: Polity Press, 1991.

INVENTING WOMEN: SCIENCE, TECHNOLOGY, AND GENDER

Gill Kirkup and Laurie Smith Keller, eds. Cambridge: Polity Press, 1992.

FEMININE INGENUITY: WOMEN AND INVENTION IN AMERICA

Anne L. Macdonald. New York: Ballantine Books, 1992.

by Leslie Regan Shade

The recent publication of several books dealing with the gendered nature of technology, amid a recent flurry of media reports on issues concerning women and technology, makes for very timely reading. The opening of a Toronto clinic which would perform sex preselection for \$500, reports on methods for killing unwanted girls in India, a uwo professor's brain-size

study which determined that men have "significantly bigger" brains than women, reports on continued gender bias in engineering, the rising incidence of lung cancer in women due to smoking, the controversy over silicone breast implants, and the sensationalistic reporting on virtual reality "sex" are only several among many controversies which effect women in the technological land- and mind-scape.

The number of edited collections dealing with issues relevant to gender and technology has been small. These include Jan Zimmerman's *The Technological Woman* (1983), Joan Rothschild's *Machina Ex Dea* (1983), Wendy Faulkner and Eric Arnold's *Smothered by Invention* (1985) and Cheris Kramarae's *Technology and Women's Voices* (1988). Notable theorists include Sandra Harding, Evelyn Fox Keller, Carolyn Merchant, Cynthia Cockburn, Londa Schiebinger, and Donna Haraway. It is heartening, then, to welcome several new additions to the spectrum of the gendered nature of science and technology.

As promised in his last published book, *Forces of Production: A Social History of Industrial Automation*, David Noble, now at York University, has produced the first of a two-volume series on gender influences in technological development. By tracing the gendered boundaries of scientific culture from its advent in early monasticism to its 19th-century modern origins, *A World Without Women* explores how the world of science has perpetrated a marginal and discriminatory environment for women.

His quest begins at the dawn of the Christian era, when androgynous ideals of Christian piety were heralded for both men and women. The Christian

intelligensia of the age accepted women as both disciples and patronesses, and double monasteries and *didaskaleions* (co-ed study circles), were common.

However, women's entry into the cultural mainstream was shortlived. By the 2nd century, clerical asceticism within the church, along with its concomitant acceptance of sexual renunciation and the ideology of virginity, was revived. Heresy was equated to the proximity of women.

The culture of science was essentially a religious calling and a medium of Christian devotion. It was centered in the medieval university, a bachelor's sanctuary adhering to celibate ideals. Noble points out that it wasn't until 1882, 800 years after the birth of Abelard (the father of the University of Paris and lover of Heloise), that the Fellows of Oxford and Cambridge were even allowed to marry.

During the Scientific Revolution, women could be educated at home by their fathers or by male tutors, but marriage and study were mutually exclusive. Although noblewomen hosted scientific salons and entered the mainstream of Western thought in arts and craft circles (medical cookery and midwifery), the scientific priesthood, while expropriating their knowledge, still defined science and discouraged and disqualified women as knowledge-seekers.

Educational reforms for women in the 19th century resulted in the establishment of many new universities, with scientific pursuits both a religious and capitalist aspiration. The burgeoning professionalization of science in the mid-20th century, and the resultant revival of an ascetic ideal, Noble feels, once again relegated women to the fringes.

As Noble shows, by tracing the Christian clerical culture of science, several characteristics endemic to modern science are illuminated. These include the separation of subject and object; the preference for objectivity over subjectivity; an often depersonalized discourse; the perpetuation of the stereotype of scientist as asocial; and his alienation and dread of women.

Noble's reliance on the the work of other scholars can be ponderous. However, if the reader wades through the copious quotations and footnotes, she will be rewarded with a rich, albeit dismal, historical overview of the scientific origins of the "world without women."

His work-in-progress, *The Masculine Millennium*, explores the connection between technological development, the masculinization of production, and the world without women. Knowing how Noble excels at contemporary historical accounts of technological systems, we should all look forward to its completion.

Judy Wajcman's goal in *Feminism Confronts Technology* is to expand upon emerging feminist analyses on gender and technology by addressing various technological sites. These include concise chapters on technologies of production and their impact on sexual divisions in the labor force (office automation, machine tools, typesetting); reproductive technologies (IVF, egg donation, artificial insemination, surrogacy and contraception); domestic technologies (design and gender specialization of household appliances, alternatives to housework); and the built environment (domestic and public architecture, environmental influences of the automobile, and feminist alternatives).

Wajcman rejects technological determinism and instead opts for examining the social factors that shape technological changes—the research agenda of recent sociologies of technology, which pry inside the black box of specific technological artefacts to produce detailed examinations. Absent from most sociologies of technologies, however, is the gender dimension. Wajcman attempts to redress this void by analyzing how both the production and use of technologies are shaped by male power and prerogatives; and by broadening the definition of technology to include those relegated to the dustbins of "women's domain," such as various

domestic technologies.

The social shaping approach stresses research into the multifarious social interests that impact and imbricate upon particular technologies. This research agenda concentrates on the effects of society on technology, rather than just the effects of technology on society. Wajcman demonstrates that political choices are integral in the very implementation and design of technologies. For instance, in her discussion of domestic technology, she urges an analysis, not only at the design level of specific technologies, but also at its location within both the public and private spheres. How have the designers of domestic technologies structured their tools around gender assumptions? Regarding the built environment, it is salient to ask what political interests have motivated the design of modern cities and the transport facilities within them. What sexual divisions are built into the domestic and urban environment that perpetuate the cultural representation of men and women? How have computers and the engineering culture been constructed to disregard and exclude women?

Wajcman rejects essentialist stances which posit that technologies must be based on universal feminine attributes and values. She critiques the tenets of ecofeminism, saying that "rather than simply going 'back to nature', we need to work from within and without to create another kind of culture." Forging beyond masculinity and femininity to create technologies that subscribe to new social values and needs is an imperative task. For Wajcman, confronting technology involves contesting technological sites which are in need of change, gaining access to technological institutions in the fields of education and work, and demystifying masculine expert conceits.

Wajcman's book provides a good summarization of issues and concerns relevant to the technologies she covers. Unfortunately, as she admits, she does not delve into some of the newer technologies that profoundly effect women, such as information and communication technologies, energy technologies, or surveillance and political control technologies. Hopefully, she will expand upon these issues in future endeavors. Nonetheless, our task of conducting further research into the gender dimension of diverse technologies

is greatly aided by her succinct, yet trenchant, views.

An interesting companion to Wajcman's book, *Inventing Women* is designed as an introductory reader on issues of gender, science, and technology. Many different voices from women's studies scholars are present here, including selections culled from previously published work and commissioned articles. The gendered nature of technology is explored *via* its relationship to science in the theoretical, physiological, anthropological, medical, and genetic levels, as well as through an examination of women as both producers and consumers of science and technology.

Part One introduces the reader to the nature of science and technology. Laurie Smith Keller provides a foundation for the various debates and issues taken up in the book. She provides a succinct overview of perceptions of science—including the scientific method, ethics, and sociological view of science—as well as a discussion of various models of technology (craft, engineering, applied science, alternatives) and their gendered implications. Margaret Lowe Benston in "Women's Voices/Men's Voices: Technology As Language" highlights both the importance of women's access to, and the reflection of feminine values in, science and technology. Evelyn Fox Keller and Sandra Harding both explore how feminist theory can shape perceptions about science, and how ideas about science can influence gender constructions.

Part Two, "Our Bodies, Our Minds, Our Selves," is concerned with biological discourses about the differences between men and women and their reflection in the medicalization of women. Lynda Birke examines the origins of physiological and psychological sex differences between men and women, from conception to maturation, and theories on the sex differences of the brain. Anthropologist Linda Marie Fedigan explores how perceptions of women's roles in human evolution have changed through recent ethnographic and archaeological evidence, as well as how women have constructed their own origin models. Catherine Kohler Riessman, by examining childbirth, abortion, premenstrual syndrome, and weight issues, posits that both physicians and women can be implicated in packaging women's experi-

ence into medical categories by their respective motives of securing professionalization and the ongoing nature of women's subordination. Lynda Birke, Susan Himmelweit and Gail Vines examine the ethical quandaries concerning prenatal screening for genetic diseases, raising many controversial questions about disability rights and eugenics.

Part Three is concerned with the structural barriers that exist for women working as scientists and technologists, and their struggles to overcome sexist barriers. Joan Mason, in her biography of Victorian-era Hertha Ayrton, and Evelyn Fox Keller, in her examination of geneticist Barbara McClintock, provide inspiring tales of women who have overcome the strictures of masculine science. Liz Whitelegg inquires into the paucity of girls in science education from a historical perspective and as promulgated in current U.K. policy developments. Cynthia Cockburn uses Marxist tenets to examine the historical construction of engineering in Britain. Julie Wheelwright explores issues surrounding women's integration into the military, such as their relationship to combat and combat technologies. Radha Chakravarthy calls for examining the impact of new Western technologies on women in developing countries.

The final section of the book is concerned with women as both producers and consumers of technology. Judy Wajcman discusses how the design and promotion of domestic technologies have been shaped by ideologies of gender, and argues that a proper analysis of domestic technologies should be located in the interface between the private and public spheres, and not just at the design level. Turning from the developed to the developing world, Bina Agarwal discusses the barriers to implementing technological change for poor, rural women. She recounts the case study of the successful diffusion of a wood stove, which relied on the close interaction between designers, users, local artisans and extension agents. Gill Kirkup discusses the gendered social construction of the computer, from its military origins, to its labour and educational context. She examines how a feminist critique of computing can be implemented, with specific reference to the work of Sherry Turkle. The philosophy of

ecofeminism, encompassing environmental, feminist and women's spirituality concerns, is discussed by Cat Cox, a member of the Women's Environmental Network. Of particular importance is her discussion of the new activism promulgated by this movement. The book ends with a piece of Utopian fiction written in 1905 by a Bengali, Rokeya Sakhawat Hossain, which projects a feminine science built on peaceful means.

Although *Inventing Women* stands as a useful introductory text to gender issues in science and technology, some of the excerpts could be updated in light of current technological controversies. However, considering the paucity of texts that address these multifarious concerns, it is a welcome addition.

Anne Macdonald's encompassing historical survey of women patentees in U.S. history from the 19th century to the present, *Feminine Ingenuity*, is both a celebration of women's clever inventiveness and ambition, and a cautionary tale of the rigors of the patenting process. Examining a myriad of archives and libraries in the United States, including those at the Library of Congress, Smithsonian Institute, National Archives, and U.S. Patent & Trademark Office, she has created an invaluable bibliographic *tour-de-force* which is illuminating and highly readable. Finally, we have some powerful ammunition for those skeptics posing the hackneyed "Why don't women invent?" question.

Macdonald's survey covers the lives and works of women patentees, rather than inventors, for the practical reason that an assigned patent number guarantees that the patentees are actually the inventors of their designs. The history of women's inventions is replete with the sad cases of stolen ideas or male expropriations. Often, latter-day compensatory recognition was accrued, as in Eva Landman's case. Although she was the designer of a windowed umbrella designed to deflect rain and wind, it was her husband who brought the idea to the patent stage without crediting his wife. In other instances, patent interference suits have been brought against women inventors. Margaret Knight was lucky enough to have the necessary financing to successfully defend her patent for a paper-bag machine that folded and glued paper to

form the familiar square-bottomed brown grocery bag.

Women's patents cover a dizzying array of technologies, from domestic tools to chemical compounds. The first patent was awarded in 1809 for a process of weaving straw with silk for hat-making, and others quickly followed, from a pregnancy corset and motion-activated fan attached to a rocking chair, to a submarine telescope.

Nineteenth-century inventions reflected domestic preoccupations, including inventions concerned with nursing (slings, pulleys, bedside writing tables, a trapdoor under the patient for disposing of human waste), and "monthly management" inventions, such as "monthly protectors," "bags," "napkin belts," or pessaries with their contraceptive value disguised as "vaginal irrigator and urinals" or "combined aspirator and concealed uterine cauterizer." Kitchen gadgets included a combined egg beater and potato masher, knife sharpeners, bread kneaders, hot water heaters, stoves, self-heating irons, a refrigerator, and the 1872 patent for the dishwasher.

Inventions for clothing were first reflected in the 19th-century dress reform movement, where the "reform" undergarment movement inspired designs such as Susan Taylor Converse's "Emancipation Waist." The bicycle craze of the late 19th century resulted in a spate of bicycle garb such as pants disguised as skirts. A pull for a back-zippered dress was invented in the 1950's, and many baby accessories—including the first disposable diaper patented in 1887, baby jumpers, infant carriers (including the modern "Snuggli"), and a folding crib—have all been the brainchild of women.

War-related patents include Civil War-era Temperance P. Edson's "Self-Inflator Raising Sunken Vessels," and Martha Coston's "Pyrotechnic Night Signals." Hollywood star Hedy Lamar invented a "Secret Communication System," a "frequency-hopping" radio signaling device now applied to satellite communications.

Chemical compounds invented by women include polyamide and Kevlar, a high-strength fiber used in products from radial tires to bulletproof vests, designed by DuPont's Dr. Stephanie Kwolek. Bette Graham's *Liquid Paper* and Patsy Sherman's *Scotchguard* fabric protector,

developed while working at 3M, are by now familiar household and office products.

Currently, only 5.6 per cent of patents are assigned to women in the U.S. Like her predecessor Ida Tarbell, who in the late 1800's marshalled Patent Office statistics to proclaim the use-value of women's domestic inventions, Macdonald makes a spirited pitch for continued recognition of women patentees in the public record, and educational reforms to encourage science and mathematics training for young women. One optimistic sign of change is that the Patent Office's recent publication on women's patents reveals that now 50 per cent of patents are received for chemical technologies, whereas almost 100 years ago the majority of patents received were for domestic inventions.

Feminine Ingenuity is a valuable sourcebook, impeccably documented with a detailed bibliography of periodicals, secondary sources, pamphlets, catalogs, directories, and manuscript sources, as well as an appendix of patents cited in the text. The many illustrations and photographs peppered throughout the book make for lively browsing. Let's hope that someone (perhaps the Women Inventors Project in Waterloo) will soon tackle the Canadian equivalent.

LES FEMMES FONT DES MATHS

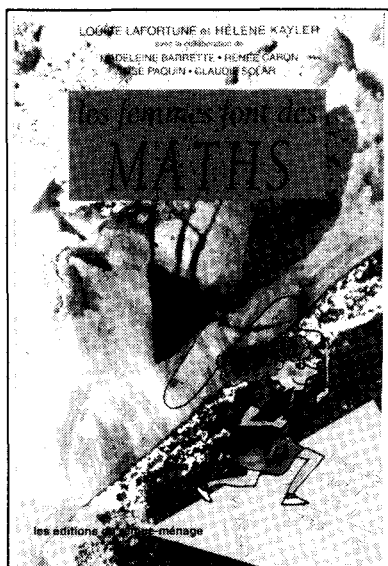
Louise Lafortune et Hélène Kayler avec la collaboration de Madeleine Barrette, Renée Caron, Lise Paquin et Claudie Solar. Montréal: Les Éditions du remueménage, 1992.

par *Hélène Massam*

Ce livre commence par un résumé de la situation actuelle de l'attitude des femmes et de la société en général envers l'apprentissage et l'utilisation des mathématiques par les femmes. Nous y trouvons les statistiques habituelles montrant que, dans le milieu universitaire,

le nombre des femmes diminue quand on passe du niveau du baccalauréat à celui du doctorat.

Les auteures rappellent aussi que les mathématiques et les sciences sociales ont été utilisées pour « prouver » l'infériorité des femmes en mathématiques. Celles et ceux d'entre nous qui sont intéressé(e)s par le sujet devraient, à ce propos, lire l'article récemment paru dans *Nature* soutenant la thèse de la supériorité intellectuelle du mâle blanc. L'utilisation grossière et erronée de méthodes statistiques dans cet article illustre parfaitement ce qui disent ici les auteures. Suit enfin dans cette première partie, une suggestion de pédagogie qui inclut la valorisation de l'intuition ainsi que de la connaissance, qui doivent être toutes deux présentes



pour pouvoir obtenir des résultats. J'ai beaucoup aimé l'exemple de l'art de la dentellière comme activité mathématique: nous nous émerveillons devant l'art d'Escher, les dentellières me semblent aussi très douées en géométrie!

Dans la deuxième partie sont décrits vingt ateliers qui sont destinés à faire découvrir aux participantes l'intérêt et la joie de faire des mathématiques. Le premier atelier présente une histoire brève de quelques mathématiciennes célèbres à travers les âges, d'Hypatia qui travaillait en Alexandrie au quatrième siècle jusqu'à Emmy Noether au vingtième siècle. Les autres ateliers pourraient être classifiés, en gros, sous quatre rubriques: aspect pratique, côté technique, psychologie et

travail ardu. En effet, dans certains ateliers on découvre l'aspect pratique des mathématiques en découpant par exemple des triangles semblables et en comparant les rapports de leurs côtés; on y observe aussi comment des artistes célèbres ont utilisé des transformations géométriques telles que les rotations, translations et symétries dans leurs oeuvres pour obtenir certains effets. D'autres ateliers montrent aux participantes qu'il y a un langage mathématique qu'il est nécessaire de comprendre pour progresser, mais qui n'est pas très difficile. Un troisième groupe d'ateliers nous aide à analyser les aspects psychologiques négatifs qui empêchent de nombreuses femmes de faire des maths. Enfin le quatrième groupe nous fait découvrir et articuler clairement qu'il y a une partie de travail ardu qui est absolument nécessaire, qu'il faut persévérer dans ses efforts et qu'en fait, commettre une erreur n'est pas un signe d'incompétence. Tout au contraire une erreur doit être exploitée, elle doit évidemment être corrigée mais elle peut aussi nous aider à mieux comprendre le sujet.

Je cite ce qui me semble être l'un des messages les plus importants du livre: « les femmes doivent comprendre qu'elles sont capables de réussir en mathématiques du moment qu'elles y mettent temps, effort et constance. » J'aime beaucoup aussi « la bosse des maths n'est de fait qu'intérêt, travail et persévérance. Il va sans dire que beaucoup des ateliers proposés dans ce livre seraient aussi utiles à quiconque, homme ou femme, pense ne pas être doué(e) en mathématiques. »

Dans la troisième partie du livre, nous trouvons la reproduction en noir et blanc de quatre affiches pédagogiques et les résumés d'un bon nombre de documents sélectionnés par les auteures. Par l'intermédiaire du jeu des serpents et des échelles, la première affiche fait prendre conscience à l'observatrice de certaines émotions, plaisantes ou angoissantes, ressenties par quelqu'un qui fait des maths. La seconde affiche est un collage de portraits de mathématiciennes qui ajoute au célèbre portrait d'Emmy Noether ceux de femmes moins connues (du moins pas encore!). La troisième affiche révèle le secret de la bosse des maths: je vous laisse le découvrir! La dernière affiche est un assemblage artistique de certaines