Gender and Science Where Science Is on the Margins

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Historians of science have traditionally concentrated on the achievements of scientists in Western Europe and North America. The usual assumption was that one did not need to study scientific communities outside of a few key countries because they were presumed to be analogous to (though weaker than) scientific communities in the West. In general, those who study women in science have shared this bias. This article provides examples that illustrate how cross-national research that includes less-studied areas of the world can move us beyond generalizations that are based on small samples of women scientists in relatively few countries. This article is not definitive but rather suggests ways in which transnational studies of gender and science can contribute to our knowledge of not only the position of women in science but also the significance of class and social status and the meanings attached to the scientific enterprise in different cultural contexts.

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For many decades historians of science concentrated almost exclusively on chronicling the lives, achievements, and institutional arrangements of scientists in Western Europe and North America. The (usually unstated) assumptions in most accounts were that (a) any science being done in other parts of the world was likely to be derivative of Western science and therefore uninteresting, and (b) scientific development would follow essentially the same pattern in those countries, albeit with a delay of a few decades. In other words, one did not need to study scientific communities outside of a few key countries because they were assumed to be analogous to (though weaker than and trailing behind) scientific communities in the West.

In general, historians of women in science have followed the example of the early historians of (androcentric) science (Alic, 1986; Arnold, 1984; Gamble, 1916; Gornick, 1983; Hurd-Mead, 1938; McNutt, 1918; Mozans, 1913; Osen, 1974; Perl, 1978; Rossiter, 1982, 1995). Most work on women scientists has focused on the personalities and scientific subcultures of Western Europe and North America, and historians of women in science have implicitly or explicitly assumed that the observations made for those regions will hold true for the rest of the world.

Perhaps because they were following the lead of historians of women in science, but more likely because they shared the same cultural assumptions, postmodern gender and science theorists[1] have also tended to assume that every generalization they make about the cultural and social role of the sciences in Western Europe from the Scientific Revolution to the present is automatically true of all historical periods and all parts of the world (Birke, 1986; Bleier, 1984; Bordo & Jaggar, 1989; Fee, 1982; Harding, 1986, 1991; Henrion, 1997; Hubbard, Henifin, & Fried, 1979; Jacobus, Keller, & Shuttleworth, 1990; Keller, 1985; Merchant, 1980; Nelson & Nelson, 1996; Nicholson, 1990; Schiebinger, 1989, 1993; Spanier, 1986; Standish, 1982; Stanford, 1986; Tuana, 1989, 1993; Turkle, 1984; Wallsgrove, 1980; Wertheim, 1995). In fact, most postmodern gender and science theorists have not problematized or even addressed the question of variation or difference, and have treated terms such as *science* and *gender* as if they were historical and cross-cultural constants.

This article provides some examples that illustrate how cross-national research that includes less-studied areas of the world can move us beyond generalizations

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that are based on small samples of women scientists in relatively few countries. My purpose is not to be definitive or comprehensive but rather to suggest ways in which transnational studies of gender and science can contribute to our knowledge of not only the position of women in science but also the significance of class and social status and the meanings attached to the scientific enterprise in different cultural contexts.

The Varied Effects of Class

Class is a variable that has been underappreciated in most studies of the history of science (Mulkay, 1991; Reid & Traweek, 2000), with the exception of some work done from an explicitly Marxist perspective (see, for example, Bernal, 1952; Bernal, 1965; Hessen, 1971). In part, this is because of an underlying assumption that class background has the same significance in all cultures and time periods. It is often taken for granted that among the privileged sectors of the population from which most scientists are drawn, bourgeois notions of domesticity or so-called women's sphere are always very strong and circumscribe women's opportunities everywhere. A couple of examples illustrate the inadequacy of such an oversimplified point of view.

Almost all of the 19th-century Russian women who were the first to obtain their doctoral degrees (in the modern sense) in the natural sciences, including Maria Bokova-Sechenova, Sofia Kovalevskaia, Iulia Lermontova, Sofia Pereiaslavtseva, Elizaveta Litvinova, Adelaida Lukanina, and Serafima Panteleeva, were of relatively privileged class background, were well educated, and had at least tenuous ties to the gentry and/or nobility (A. Koblitz, 2000). (Nadezhda Suslova, the first woman in 19th-century Europe to receive a doctorate of medicine fully equivalent to male degrees—in 1867 from Zurich University—was a partial exception. She was the daughter of a freed serf who had amassed great wealth in his position as steward to an aristocratic family.)

Elite status did not necessarily confer wealth, however. Most of the women listed above came from families who had suffered from the economic consequences of a poorly planned emancipation of the serfs in 1861. It might be argued that the families put fewer obstacles in the paths of their education-seeking daughters than they might have a couple of decades earlier because of a perception that their girls would no longer be able to extract an adequate income from their estates and so would need their own careers.

Although elite status did not always give economic independence to the Russian women who became scientists in the second half of the 19th century, certain intangibles connected with their class background did serve to make their careers in the sciences easier. From childhood, the women had access to better educational opportunities than the vast majority of their compatriots, and when they approached institutions of higher education in Western Europe to demand entry to programs in the sciences, they did so with the composure and sense of entitlement that their class background and upbringing had instilled in them.

Views of Motherhood and Child Care

Moreover, for Russian women scientists of the second half of the 19th century, care of children was not a major part of their lives. Although, at first glance, it might be tempting to label the women as pioneers or rebels in their attitudes toward motherhood, in fact their view of the matter was in some sense traditional. However, in their time, cultural milieu and social class traditional meant something different from what we might suppose.

In our day, there is a tendency even among educated people to assume that ideas about domesticity and motherhood are constant across cultures, time periods, and social groups. We often phrase our views on the subject in terms of maternal instinct, speak as if children must have occupied roughly the same place in the family in 5th-century Byzantium as they do in the contemporary United States, and take it for granted that the concept of motherhood that is familiar to us has been an unchanging emotional anchor in human society. This is far from being the case, however, as the example of the Russian women of the 1860s illustrates.

For the Russian women scientists and science students, motherhood was conceived of in a way that was quite different from what we are used to thinking of as universal. There is little discussion in their writings about accepting or rejecting motherhood, and virtually no mention of motherhood as being a necessary component in their self-definition as women. Some prominent women of the 1860s did have children. However, far more of the most famous were apparently childless. Yet their childlessness does not seem to have been viewed by them either as an act of rebellion, or a source of sadness, or even as anything particularly worthy of remark.

Ideas of motherhood among these women appear to have been typical for their class and time, and not a peculiarity of the women scientists. Members of the Russian gentry and educated classes believed firmly that a comfortable financial situation and stable household were crucial to the happiness and well-being of their children. With a sangfroid that would surprise most modern observers, gentry parents who fell on hard times often split up their children among their more well-to-do relatives (A. Koblitz, 2000).

For the Russian women scientists of the generation of the 1860s, this casual and communal approach to childrearing gave them freedom to pursue their professional careers. Russian intellectual circles did not frown on a mother who left her children in the care of friends, relatives, or servants. Their attitudes toward childrearing could put the women scientists at odds with the wives of their colleagues from other countries, however. In conversations during research trips to Germany and France and the first few years of her professorship in Sweden, the mathematician Sofia Kovalevskaia often found herself compelled to defend her decision to leave her daughter in the charge of her brother-in-law Aleksandr Kovalevskii or her friend, the chemist Iulia Lermontova (A. Koblitz, 1993, pp. 188-189). Even when Kovalevskaia's daughter (also named Sofia but called Fufa by family and friends) lived with her mother, the actual amount of time they spent together was small. Yet Fufa later recalled the time spent with her mother as delightful and memorable. Kovalevskaia would occasionally drop everything to devote herself to her daughter, who said that no one could enter into the concerns of children with such enthusiasm and sincerity as her mother (Kovalevskaia, 1951, pp. 360-363). It is interesting to note that Fufa's positive description of Kovalevskaia's approach to parenting makes the latter appear closer to contemporary U.S. notions of so-called good fatherhood rather than motherhood. In present-day popular discussions of parenting, the assumption is usually made that a good mother should spend vast amounts of time with young children, even at the expense of her career, while a man can be an excellent father even if he spends only a limited amount of "quality time" with his children.

There are parallels to the Russian women's treatment of childrearing in other societies as well. For example, a Ghanaian tradition (now disappearing) of sending children to be raised with real or fictive kin has sometimes facilitated the careers of women scientists and other professionals (Oppong & Abu, 1987). African American families in the United States also sometimes share child care, so that children may be brought up to consider female kin or friends of the family as "other mothers" (Collins, 1987). And when the mother and aunt of Vo Hong Anh were executed by the French for their role in Vietnamese resistance against French colonialism, their comrades in the Vietnam Women's Union took the baby and raised her clandestinely, passing her from house to house and "aunt" to "aunt." (The child's father was the guerilla leader Vo Nguyen Giap, later famous as the architect of the defeat of the French at Dien Bien Phu, so the French would have dearly loved to get their hands on the daughter to use as leverage against her father.) Anh eventually became a prize-winning physicist (Anh, 1987, pp. 12-14).

Cultural, ethnic, and class-based variations in attitudes toward motherhood and women's individual responsibility for child care should not be ignored or glossed over. Such differences can help to illuminate what Abha Sur (1999) called the "selective success" of certain groups of women in the natural sciences. In fact, in some contexts motherhood is viewed as such an obstacle to women's achievements in the natural sciences that those interested in furthering the careers of women scientists might go to extraordinary lengths to discourage their younger colleagues from getting pregnant. In 1995, I was present at a women-in-science conference in Lima at which the matriarch of Peruvian microbiology, Estela Castillo, not only energetically argued for mandatory sex education at the university level but also urged women science students to consider becoming lesbians, at least during their doctoral years. While on leave at Duke University in North Carolina, Castillo had come in contact with an organization of lesbian students. She decided that lesbianism was the perfect answer for her female doctoral students because she did not want to limit their sexual urges during their early careers so much as prevent them from becoming mothers.

Science as a Part of Culture

When I entered Princeton University with the first class of women in 1969, I remember being mildly surprised at how many of the women from wealthy families were majoring in art or art history. Coming from a lower-middle-class family of Polish immigrants, I just assumed that my more privileged peers' preference

stemmed from the fact that they had been to Europe many times and were already familiar with museum treasures. It did not enter my head to see a deeper link between their choice of major and questions of class.

In fact, a major in an economically useless field such as art history has been viewed as prestigious in certain social circles. I should have understood this because when I was growing up the signs of such a linkage were all around me. Jacqueline Bouvier Kennedy Onassis was a classic example. Her interest in art and other high-culture pursuits added a touch of class to the White House and her husband's presidency and distracted attention from the political intrigues and the rumors of her husband's infidelities. Jacqueline Kennedy's knowledge of art and art history conveyed an image of respectability, culture, and elite status. Imagine how different her public image would have been had she been a doctor or a chemist or a mathematician.

I would like to suggest that in certain cultural contexts a degree in the natural sciences can function for women of the educated classes in the same way that a degree in art, music, or literature can function in the United States. (I am not certain how widespread the phenomenon is. Most of my examples come from personal observation of my colleagues in southern Africa, Mexico, and Central America.) In the United States, scientific training is usually a guarantee of a good salary. However, in most of Asia, Africa, and Latin America almost all scientific positions are in the state sector, and structural adjustment programs and other cutbacks have made most scientists' salaries relatively low in comparison to those of other professionals with similar education (doctors, lawyers, engineers), and very low in comparison to those of people in business and management. In such countries, science might be viewed as economically useless but culturally prestigious, and a career in such a field might enhance the status of the woman scientist, her husband, and her family.

When I gave a talk at the Institute of Mathematical Sciences in Madras in 1989, women there told me that a master's degree in mathematics or physics was considered a decided advantage for a woman in the marriage market and was frequently listed in newspaper notices for arranged marriages. The women scientists were not certain whether a doctorate was valued as highly as a master's; however, several maintained that women with science doctorates were also highly prized as brides.

In my experience, women scientists in countries such as Mexico, Nicaragua, El Salvador, and Botswana are sometimes better off economically than their university salaries would lead one to expect because their husbands are engaged in work that is lucrative but unimpressive from a cultural standpoint. The husbands and families of the women scientists are pleased that they are employed at a university or ministry research institute because of the cultural capital such a position brings.

For example, a Salvadoran microbiologist I've known for years was married to an affluent coffee exporter with political connections (in the Salvadoran context, that meant that he was ultrarightist). Yet until his death he was extremely proud of his wife, happily entertained her colleagues (most of whom were political leftists), and attended her scientific talks whenever he could. The fact that his wife was politically on the left and taught at the University of El Salvador, which at the time was considered to be allied with the revolutionary group attempting to overthrow the government, did not seem to bother him at all.

I had an analogous experience when visiting a Botswanan biologist employed at the University of Botswana. Her social circle was exceedingly affluent, and although several of the women dining at her home were also science professors, their husbands were all successful businessmen. Here also, a woman's scientific career appeared to be viewed as a form of cultural capital that signified respectability and elite status.

I believe that the class background of women scientists in sub-Saharan Africa tends to be higher than that of women scientists in most other parts of the world and is higher than that of men scientists within their own countries. My evidence is anecdotal, but rather strong, in the sense that I have attended all three congresses of the Third World Organization for Women in Science and talked with a significant proportion of the leading women scientists of sub-Saharan Africa. In general, the women have sources of income other than that provided by their university or ministry positions and appear to be fully supported in their careers by their husbands and extended families, who are proud of the women's accomplishments despite the minimal financial benefit of scientific work.

Scientific World Views and Women's Activism

Another intriguing aspect of the complex and varied interactions of gender, science, and culture can be

seen in societies in which science is perceived by many as a marginal activity. In countries where a large section of the educated classes see themselves as fighting a difficult battle against the forces of backwardness and religious fundamentalism, or in countries where marketization forces are increasing the stratification of society and crass commercialism is swamping indigenous cultural traditions, scientists might feel morally and socially bound to champion the rights of disenfranchised segments of society. In such situations, the natural sciences are often seen as linked with progressive movements in the struggle against repression, tyranny, bureaucracy, religious fundamentalism, rampant capitalism, and so on. Progressive scientists in such circumstances can see women as their natural allies and actively support their participation in higher education and the professions, as well as in movements for societal reform (A. Koblitz, 2000; Stolte-Heiskanen, Acar, Ananieva, Gaudart, & Furst-Dilic, 1991, pp. 147-171).

As early as the second half of the 19th century, such a connection between science, women, and movements for social change could be seen most clearly in Russia. There, famous scientists such as Dmitri Mendeleev, Aleksandr and Vladimir Kovalevskii, Ivan Pavlov, Ivan Sechenov, Peter Kropotkin, and Aleksandr Borodin enthusiastically allied themselves with women attempting to gain access to scientific education and careers. For Russian scientists (men and women) who were educated in the 1860s and 1870s, science was creative, fruitful, nurturing, diverse, egalitarian, welcoming of innovation, and intrinsically progressive and even radical. For them, the notion—unfortunately quite common in the United States and Europe in our day—that feminism and the natural sciences are naturally in opposition to one another would be incomprehensible.

There are many other instances where scientists and women's rights activists have perceived themselves as being on the same side of social issues. For example, progressive intellectuals in the time of Kemal Ataturk believed that their daughters should have equal access to training in the natural sciences, medicine, and engineering. That is why there are today such unusually high percentages of Turkish women in those fields, despite the erosion of the Kemalist legacy and the gains made by religious fundamentalists (Stolte-Heiskanen et al., 1991, pp. 147-171).

In Honduras, a leftist teachers' union called COLPROSUMAH, which is predominantly female, for many years had its headquarters in a small natural history museum open to the public. They appeared to want to stress the links between the natural sciences and their progressive politics and portray science and their female teachers as being on the same side in the struggle against reactionary forces. In India, scientists and mathematicians in several states (including Kerala and Tamil Nadu) have formed "science for the people" movements that stress the unity of purpose of scientists and other progressive intellectuals in the struggle against Hindu fundamentalism and the ill treatment of women. The organization Kerala Shastra Sahitya Parishad, for example, is over forty years old and is particularly strong (Ramachandran 2004).

In Vietnam, too, scientists and women's groups have increasingly seen themselves as having common interests, though they cannot always agree on how best to work together. In this case, the battle is not so much against reaction or religious fundamentalism as it is against rampant capitalism and pernicious Western cultural influences. The Vietnam Women's Union (arguably the largest genuinely grassroots women's organization in the world) is becoming alarmed by excessive consumerism in the younger generation. In like manner, mathematicians and other leading scientists are bothered by the decreasing interest of young people in intellectual pursuits, and by what they see as a turning away from the intellectual and cultural traditions that were so much a part of Vietnamese history, even during the French and U.S. wars of aggression against the country in the 1940s through 1975. (The Vietnamese evacuated their universities and pedagogical institutes into the jungle during periods of French and U.S. bombing and actually produced doctoral students in mathematics and physics during the war [Anh, 1987; N. Koblitz, 1990].)

The Vietnam Women's Union and various scientific institutes have recently teamed up in a series of activities intended to help them address their mutual concerns. For example, every second year Women's Union affiliates in provincial cities of Vietnam identify promising women students in the natural sciences and send them to Hanoi for a get together in which the young women visit scientific institutes and talk with practicing scientists.

In many countries of Latin America and Asia there is a solid basis for cooperation among scientists, feminists, and other progressive social activists. (To a lesser extent this is also true in some countries of Africa, although the class affiliations of many members of the scientific community and the growing competition for resources among scientists appear to stand

in the way.) Whether such an alliance materializes depends on social, political, institutional, cultural, historical, and even personal circumstances.

For example, let us look at questions of reproductive health. Feminists and (mostly male) physicians have rarely cooperated on demands for safe and affordable abortions, contraception, and family planning. There is a history of mutual distrust, even contempt. Physicians trained in so-called Western medicine are often steeped in condescending attitudes toward women and view feminists as a threat to their control of reproductive medicine (McClain, 1989; Newman, 1985; Riddle, 1997). Women activists, in turn, tend to be hostile to physicians because of their stereotypes about the sciences (reinforced during the past 2 decades by their reading of postmodern gender and science theory) and because of what C. P. Snow (1960) called "the two-culture problem" dividing the sciences and the humanities.

This is not to say that collaboration is impossible. However, it seems to be easier to achieve cooperation outside of Europe and North America. In 1994, the Salvadoran Women Doctors' Association and the Women's Secretariat of the University of El Salvador jointly sponsored a one-day symposium on the medical and social consequences of illegally induced abortion. The event was well attended by Salvadoran doctors, medical students, and feminists and featured talks by physicians, historians of science, and women's activists (Boyle, Koblitz, & Koblitz, 1994).

Conclusion

As I mentioned at the beginning, this article is not intended to draw any sweeping conclusions or present an overarching theory. Rather, the above has been more in the nature of a cautionary tale. The interactions of gender, science, culture, and class are never straightforward or one-dimensional. Women's experiences in the sciences have varied tremendously across cultures and time periods. Just as some non-European countries have greater (sometimes far greater) percentages of women in the sciences than Western Europe and North America (*Abstracts of the XVIIth International Congress*, 1985; D'Onofrio-Flores & Pfafflin, 1982; Faruqui, Hassan, & Sandri, 1991; Harding & McGregor, 1995; A. Koblitz, 1996; Malcolm, 1983; *La Mujer en la Ciencia*, 1988; *Proceedings of the International Conference*, 1983; *Proceedings of the Southeast Asian Seminar*, 1987; Stolte-Heiskanen et al., 1991; *Third World Organization for Women in Science*, 1995; Traweek, 1988), similarly there are places in Asia, Africa, and Latin America where scientists and feminists, rather than being mistrustful of one another, have made and continue to make common cause against common enemies. We need to take this diversity into account and avoid being seduced by glib generalizations or essentialist theories.

Note

1. This term is used to denote gender and science theorists who believe that there is an essential incompatibility between feminism or the feminine gender or so-called female nature and the scientific enterprise as it is currently constituted.

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