

Are Women Excluded from Careers in Science?

by Barbara Sherriff and J.P. Svenne

"You've come a long way, baby!" but you still have a long way to go. How will you know when you've arrived? You will have arrived when Margaret Thatcher is no longer referred to as a woman prime minister, but simply as a prime minister; when madam Justice Claire L'Heureux-Dubé is no longer known as a woman supreme court justice, but as a supreme court justice; when a TV news reporter no longer comments on what Audrey McLaughlin is wearing. Who ever comments on what Brian Mulroney is wearing? This article examines briefly the question of whether women have "arrived" as scientists.

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From any examination of the history of science, it is clear that in the past there has been a systematic and overt exclusion of women from scientific careers. Today, there are very few women scientists. Out of a total of 180 permanent faculty positions in the Faculty of Science of the University of Manitoba, only twelve are filled by women, which is a significant improvement over 1985, when there were only seven.

In 1988-89 at the University of Manitoba, nearly equal numbers of men and women started in science at the first year level (43.7% of the first-year students were female), but the attrition rate of women is higher than that of men. Even more significantly, female participation in post-graduate studies, to the M.Sc. and Ph.D. degrees, is abysmally low: only 20.6% of M.Sc. degrees were granted to women, and 14.3% of Ph.D. degrees.

These overall statistics mask the particularly low numbers of women (20% of the total registration) who opt to enter the physical sciences (chemistry, geology and physics) and computer science (10% of the total). Though these statistics are specifically for the University of Manitoba, national statistics are very similar and improvement over time is very slow. Where does this low participation by women in the sciences, particularly the physical sciences, originate?

This question is discussed extensively in a recent book by Londa Schiebinger, *The Mind has no Sex?* (Harvard University Press, Cambridge, Mass., 1989) When we review the history of science, few female names come to mind. Everyone has heard of Madame Curie -- but we are stuck for other examples. And even Madame Curie--the first person ever to obtain two Nobel prizes in physics--was not allowed to become a member of the renowned Academie des Sciences in Paris.

The practice of science traces its origins back to medieval monasteries and universities. The church dominated all learning in the monasteries between the sixth and eleventh centuries. Women, in the holy orders, were active in preserving and advancing knowledge, including scientific knowledge. However, women were almost completely excluded in the early days of the universities.

As the universities took over from the monasteries as the seats of learning in the twelfth to sixteenth centuries, scientific advances became almost exclusively a male preserve. Schlesinger reports that in 1678 Elena Piscopia became the first woman at the University of Padua to obtain her Ph.D. degree. However, university officials decided not to set a precedent and for nearly three hundred years after Piscopia, no other woman received a Ph.D. degree from Padua.

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Another historical seat of scientific study was in the great academies of science which developed in Europe in the seventeenth century. Though from the start there was no constitutional exclusion of women from these academies, they were, in fact, excluded. The Royal Society of London elected its first woman to full membership in 1945, though the Society was founded in 1662. Still, a number of women managed to make significant contributions to science "at the periphery," in Londa Schiebinger's words.

For example, in Paris there developed a number of "Salons": women would meet in the comfort of some noblewoman's residence and discuss scientific questions. Other women managed to get their work known through the aid of their husbands, sometimes by publishing in their names. Yet these rather sparse and informal contributions did not make a very visible impact on science. Today, the discriminations against women in the sciences are not so formal. In fact most male scientists, and even many female, will claim that there are no barriers to women in science. Then why are the numbers still so small?

There is no single, simple reason nor is there one easy solution. One explanation is the lack of role models for women scientists. Of course, to increase the numbers of role models, we first have to persuade more women to study science. We must break into the cycle somewhere.

To do so we need to know why more women do not choose science. Attitudes are set at an early age, by the family, by peers, the schools, and by society at large. How many cartoons showing scientists depict them as female? How many female scientists are seen on television? And these are two of the strongest influences on children today. Unfortunately we still hear of instances in the schools where, if a boy is struggling with his physics, he is helped and encouraged whereas a girl will be told, "This is too difficult for you. Why don't you choose some easier subject?"

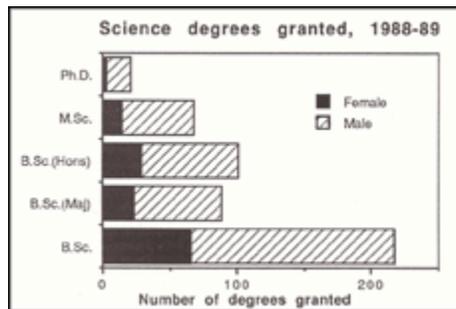
But should more women be encouraged to become scientists, in particular, physical scientists? Perhaps they do not want to be scientists? We do not really know for sure whether they do not want to, or whether they have been truly persuaded that science is for boys.

Women who have managed to pursue work in science despite the difficulties surely must have wanted to be scientists. A career in science is an interesting one, and a rewarding one. It affords women, who can no longer rely on "living happily ever after" with 2.2 children and a husband who reliably brings home a good pay cheque, financial independence. Present statistics indicate that, on average, a woman can expect to work outside the home only four years less than a man and also, for some time, to be the sole source of financial support for themselves and their family. Women need to pursue interesting and well-paid careers.



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Another reason for increasing the numbers of women in science and technology is to make changes to science itself that might result from greater female participation. This turns the question around from "Why do so few women participate in science?" to "What is it about science that has limited the participation of women?" In recent years there has been considerable debate among feminists and some scientists on whether science is truly "value-free" and "gender-neutral". Would science be profoundly changed by greater participation by women? As physical scientists—a mineralogist and a theoretical physicist—we wonder how our understanding about minerals or fundamental particles would be enhanced if these sciences had equal participation of both genders.



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It is more clearly evident that the greater participation by women could change the life sciences, and in particular, medical science. In fact, most examples in the debate over whether women have changed science are drawn from the life sciences. One way of testing the question would be to use the scientific method itself do the experiment, get more women into science, and then see how science changes.

A third, more pragmatic, reason for encouraging more women to enter careers in science is an anticipated severe shortage of scientists and science-related personnel before the end of this century. The reasons for this anticipated shortage are a combination of increasing demand for scientists to develop new technologies and to seek solutions to environmental problems, and because the current scientifically and technologically trained work force is aging and will soon

be leaving in increasing numbers. At the same time, the anticipated supply of scientists from the traditional sources, immigration and male university graduates, is declining. Immigration cannot be expected to supply the demand as other countries, Europe, Japan and the United States, face the same shortages. Canadian attendance rates by males at university are already nearly the highest in the world and are unlikely to increase significantly. Women are an under-utilized human resource that could help meet the need in the coming years.

The reasons for the low participation of women in science and technology are many and complex. The solution will also have to be multi-faceted and complex. One approach is to take the message into the schools. In a joint project between the Faculties of Engineering and Science of the University of Manitoba (with the aid of some short-term funding provided primarily from the Universities Grants Commission), the Access Program for Women in Science and Engineering has been established.

Undergraduate women students in Engineering and Science have been hired as Access Coordinators. They go into schools to talk to groups of students in grades five to twelve about career prospects in science and engineering and the requirements students must meet to pursue university studies in these fields. They try, as much as possible, to talk to groups of girls only as the presence of boys often inhibits questions from girls, even in elementary school.

However, in many cases, the schools request that we talk to mixed-gender groups, as the boys need educating on equality issues as much as the girls. At the younger grades, elementary to lower Junior High, the talk is on a rather general level about science and scientists, engineering and engineers, illustrated by some hands-on demonstrations.

At the grade nine to ten level the focus is on what high school subjects students should select in order to qualify for entry into science and engineering. A particular message at this level is the importance of taking physics 200 and 300, which are required for entry into all engineering and physical science fields. At the present time, only about 30% of the students choosing physics 300 are girls. When talking to grades eleven and twelve, students in classes are advised about careers in science or engineering, and on what they might expect once they enter these fields at university.

We feel that this program has, over a short period of time, developed considerable momentum and is generally well received by the schools and by the students who have participated in the sessions. It is still too early to tell whether any increased enrollment by women in science or engineering will result, but the Engineering admissions officer does report an increased number of enquiries by women about studies in that faculty.

Yes, we've come a long way from the middle ages, but we have a long way to go before 50% of science students, faculty, professional scientists, and engineers are women.

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