

# Tinker, tailor, soldier -- but never an engineer

by Cathy McDonald

*We have rather suddenly become capable of controlling and altering aspects of our lives that previously just weren't under our control.* - *Who Turns the Wheel*, Science Council of Canada, 1982.

Women are not keeping up with technology. They are not participating in the new important forces sweeping our society. Women are still mainly bystanders to technological developments, and the warning bells are sounding that their lack of specialized skills will single them out as a group most disadvantaged by the changes.

Susan Bryson, a professor in Dalhousie's department of psychology, warns that all aspects of the labour market, from hospitals to universities to banks, will be affected by new time-saving technologies, such as word processing machines and office computerization. Women in the lower strata of skill levels will find themselves out of a job, Bryson says. "It comes as no surprise that since women are the group least scientifically and technologically inclined, higher unemployment is predicted for them for the coming years."

Women traditionally shy away from math, physical sciences and related technologies, the fields that are becoming highly important to society. And this fact is born out in university enrolment statistics.

For example, female enrolment in engineering hovers at eight to ten per cent. This figure is dramatically low when compared to the spectacular increases in female enrolment in two other traditionally male bastions, medicine and law.

Since female graduates comprised 30 and 35 per cent of Dalhousie's medicine and law graduates last year, respectively, the day is surely in sight where legal advice and the annual physical is just as likely to be handled by a woman as a man. Only a decade ago, Dalhousie graduates in both these fields were ten per cent female.

Female graduates from Dal's Bachelor of Science program have increased from 20 per cent in 1971 to 40 per cent in 1982. But numbers of engineering female graduates have only pushed up slowly, from minimal levels ten years ago to seven per cent last year.

**"It's a vicious circle. If we do not expect to succeed in technology, so we surely will not."**

Master of Science female graduates only comprised 30 per cent of last year's class. In 1976, there were too few women receiving doctoral degrees in mathematics, engineering and the physical sciences to be measured, according to a Science Council of Canada report released in 1982.

What then is holding women back from pursuing the maths and hard sciences to higher academic levels? And more disturbingly, what's keeping them out of engineering?

Ursula Franklin, an engineering professor at the University of Toronto, addressed this issue at a panel discussion at Dalhousie, Jan. 22. "My experience shows an incredible limitedness in the traditional view of science and engineering in particular by its own practitioners. If I was curious as to why there are so few women in science I would feel that essentially science is not an encouraging and hospitable environment."

David Lewis, a professor in engineering at Dalhousie for 20 years, and currently on sabbatical from the chairmanship, hypothesized on the lack of women students in his faculty. He speculated that the women with enough initiative to enter a traditionally male field would not be attracted by the carefully proscribed course agenda. "There is a great

reliance (by students) on the professors to lead them through the course. Few options are available. If I was the kind of person to break with tradition, studying that way wouldn't appeal to me," Lewis said.

Surprisingly, he said the women who do enroll in engineering are less likely to be feminists than women in other traditionally male faculties. "I don't know why," Lewis said. "For some it's a way of surviving. They are young, 17 or 18. The workload is hard, and the last thing they want is to be hassled by their classmates. Some of them are prepared to play a role dictated by the male students."

Ruth Blades is a first year engineering student at Saint Mary's University, who really enjoys her classes. "We're just like one of the guys," she said. Blades went into engineering because her science grades were good. She thought male students didn't quite know how to deal with her at first. They weren't as willing to ask her for advice on difficult problems as they were to consult each other. "But I was one of the 29 out of 100 that passed computer science, and I was the only girl. So I gained a little respect."

dence in communication skills, speaking and writing, who would feel more comfortable in a strictly technical setting.

Through interviewing women in her courses, Franklin found that while families generally encouraged their daughters' choice of engineering, guidance counsellors were discouraging.

She attributed the expectation that women should achieve high grades if they venture into engineering, to the fact that foreign students fare very well academically. The feeling is that working through a 'minority' process produces top achievers.

But women are not a minority, and should not have to bear the burden of society expecting higher than average grades, Franklin said.

The 'tough minority' process syndrome may be born out at Dalhousie. Lewis said "women students on the average have better grades. In the last four or five years there has always been a woman in the top three in the class."

Lewis thought the choice to go into engineering was a more considered and well-thought out decision for women, accounting

when the (intellectual) differences are so small, and clearly only pertain to a very small proportion of females?"

Bryson goes on to outline the alternate explanation, that socialization factors mold the aspirations of girls, veering them away from pursuing the maths and sciences.

A double standard is obvious in studies of teaching methods. For example, girls who have problems in math are not given remedial education at an early level, with obvious implications for their future math studies. But boys are often referred for remedial education for reading problems. "One cannot resist from asking whether the reason for this is that reading problems appear to be more common for boys than for girls. Nevertheless the empirical findings indicate that boys are referred for assistance more often than girls with comparable academic difficulties, at the primary school level," Bryson said.

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A study of how girls attribute their failures on tests as compared to boys, showed girls will blame it on their stupidity whereas boys blame it on outside factors, such as not trying hard enough, or chocking it up to the diversion of "last night's hockey game".

The study also showed that teachers gave the same reasons for girls' and boys' failures as the children gave themselves.

Franklin backed up this study with personal teaching experience in questioning students on their poor experimental results. She found that "it is invariable that the girls think it is their fault while boys think it's the machine's fault."

The result is girls learn to have very low expectations of themselves in terms of making a career, which is totally out of line with their intellectual abilities, Bryson said.

By the time girls reach high school, many feel that success in a career, especially in science and technology, does not live with their concept of a feminine role as mate and mother. Bryson puts the blame on society for passing these values on to girls, as research cannot come up with any other explanation.

Franklin agreed with the view that society hinders women's aspirations to careers in the sciences and technologies. By looking at other societies, Franklin points out that the North American picture is not representative. In other cultures and societies one finds both men and women in leading positions, in particular in engineering, in developing countries.

Diana Lim, a Ph.D. candidate in physics at Dalhousie, is researching the nuclear spectra of biopsy of asbestos in miners' lungs. She remembers a high school physics teacher giving her special consolation one day after class. He told her women don't do well in physics, so she shouldn't get upset if she failed. She and another girl got the best marks that year.

Lim said there is no visible difference in the way men and women students are treated in university physics. She thought that any extra difficulties women may find in entering the science fields come from within. "Maybe they're not aggressive and are worried about acceptance."

But even within university physics, the feminine role-model is a factor. Women tend to go for astronomy and biophysics, the "romantic and social areas" instead of the pure physics, Lim said.

Bryson summed up the dilemma as a vicious circle. "If we (women) do not expect to succeed in technology, so we surely will not."

(Special thanks to Dalhousie Student Pugwash)



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Blades mourned the lack of female colleagues. "More women should get into engineering. It's so hard, especially in the lounge. The guys talk about their girlfriends." When women cannot participate in the social conversation they are usually ignored, she said. And social events like the upcoming Irish Night, featuring "exotic dancers", do little to help get women involved.

Engineers invite nurses to events. Blades would prefer to invite interns, she said, laughing.

An important difference between female engineering students and women entering medicine or law is their age. Because engineering is an undergraduate program, the decision to enter is made in high school, not at University. In high school, young women depend more on advice in choosing future directions, and guidance counsellors seem to steer them away from engineering.

"They don't promote (engineering) in the high schools," Blades said. Her guidance counsellor thought she was "crazy" in choosing engineering. "They don't make girls think they would like it," she said.

Prof. Franklin also emphasized guidance counsellors as a deterring force, possibly because they see engineering more suitable for boys who have not yet developed confi-

dence in communication skills, speaking and writing, who would feel more comfortable in a strictly technical setting.

But the split between science and women starts much earlier than high school days, Bryson said.

By high school, the difference in enrolment in maths and sciences is marked. In Ontario, in 1979, 26 per cent of girls in grade 12 were studying no mathematics at all, compared to four per cent of boys. (Science Council of Canada)

There are two points of view in psychological circles that explain why girls tend to drop out of the maths and sciences as they work their way through the school system, Bryson explained. The first concept is that females are inherently less able than males at performing in mathematics and physical spatial studies. She discredits this view, however, saying that although the tone of most of these studies is artificially authoritative, concluding that females are inately of lower intellectual ability, a closer look at the statistics "suggests that (only) about five per cent of the variance is accounted for by sex".

"The real question that needs to be addressed is not whether women suffer some biological affliction that prevents them from grasping scientific and math concepts, but rather why is the sex difference in the participation of women in science so enormous