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## Women's Work in Geology: A Historical Perspective on Gender Division in Canadian Science

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### INTRODUCTION

There are two major factors that influence women's careers in science: women's historical position in western societies, which has led to a stereotyping of women and the work they perform (Peitchinis, 1989; Armstrong and Armstrong, 1994); and the growth patterns of the individual sciences with their institutions and internal hierarchies of sub-fields and tasks (Rossiter, 1978). My historical research indicates that different sciences place unequal values on field, museum and laboratory work, and that these values have gender dimensions (Ainley, 1992).

### HISTORICAL BACKGROUND

Geology in Canada, with its practical implications for mining and metallurgy was a science for men who, employed by the Geological Survey of Canada (GSC, established in 1842), mapped the natural history resources of this vast land (Zaslow, 1975). As the exploring parties laboured under difficult conditions, women were not even considered for field work. By the 1880s, microscopic studies of the structure of igneous, metamorphic and sedimentary rocks were regarded as an important adjunct to field work, for the "better understanding of the processes of rock formation" (Zaslow, 1975), but the few women em-

ployees of the Survey were in the office and the library and not in the analytical laboratory. By 1950, field work became more dependent upon petrological and chemical analyses, and upon age determinations, but laboratory work has remained an auxiliary to "reading the rocks" in the field. In fact, in Canadian geology, the laboratory never became a "sanctum of masculinity" (Benjamin, 1991).

### WOMEN IN CANADIAN GEOLOGY — THE EARLY YEARS

By the late 19th century, Canadian women could both obtain higher education and enter the work force. Science became an alternative to traditional female occupations, such as marriage and motherhood, teaching and nursing, but geology was slower than other sciences to accept women. Because of this, women geologists experienced both "lateral segregation" (being channelled into certain areas of science), and/or "hierarchical segregation" (being kept in undervalued, underpaid positions (Rossiter, 1980, 1982; Ainley, 1990, 1993)). They had few opportunities to improve their salary to advance in academic and/or government institutions. Women scientists in the civil service and elsewhere were also expected to remain single. If they married, they lost their jobs (Morgan, 1988; Peitchinis, 1989).

During the 1880s and 1890s, the only science-related occupations available for women at the GSC were in the office and the library. By World War I, women found employment as photographers and museum "assistants" (Zaslow, 1975). The latter performed the repetitious, undervalued indoor tasks that most male geologists did not want to do, such as the cleaning and sorting of specimens. In Canadian geology, museum work remained "women's work" well into the 20th century.

### CAREERS IN PALEONTOLOGY

The first Canadian woman to obtain a degree in geology was Grace Anna Stewart (1893-1970) at the University of Alberta (B.A., 1918). Stewart soon found, however, that there were no jobs for women geologists at Canadian universities and that there was a strong prejudice against women at the GSC. (Ainley, 1990). She moved to the United States where she had a good career at Ohio State University.

Of the many women employed by the GSC before World War II, only Dr. Alice Wilson (1881-1964) achieved a permanent scientific position, although compared to her male colleagues, hers was not a good career. She was originally employed to work on fossil identification in the Survey's museum in Ottawa in 1909, but was barred from doing extensive field work (lateral segregation). Later, she was prevented from doing graduate work for more than a decade. After obtaining her doctorate, in 1929, she applied for reclassification, but to no avail (hierarchical segregation); she remained underpaid throughout her career. Alice Wilson's experiences illustrate how typical male attitudes influenced women's career opportunities in Canadian geology in the first half of the 20th century (Meadowcroft, 1990).

By contrast, Dr. Madeleine A. Fritz (1896-1990) (Fig. 1) had no difficulties doing graduate work at the University of Toronto (Ph.D., 1926). She began working as assistant in paleontology at the Royal Ontario Museum and had a reasonably good career, eventually becoming curator. Her academic career was slow to unfold, however. Although she became part-time associate professor in the department of geology at the University of Toronto in 1935, it took her more than 20 years to become full professor (Ainley, 1990). Based on the growing literature on women and work (Peitchinis, 1989; Kemp, 1994; Renzetti and Curran, 1995) her area of employment in a small paleontological museum is an example of lateral segregation, while her slow academic advancement is one of hierarchical segregation. Although compared to the experiences of Alice Wilson, Madeleine Fritz's were less frustrating, she was nevertheless doing "women's work" in science. As there is no archival material on Madeleine Fritz, comparable to that left by Alice Wilson (and held in the National Archives of Canada), we do not know whether she was dissatisfied. (On the differences between perceptions and interpretations of events by historians of science and women scientists in Canada, see Ainley, 1990.)

### CAREER OPPORTUNITIES IN SOFT-ROCK GEOLOGY

In rapidly growing scientific fields, where there is a lack of male experts, opportunities open up for women and minorities (Rossiter, 1978). When soft-

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rock (petroleum) geology expanded after 1950, the GSC and the oil industry began hiring women geologists, although rarely as research scientists with comparable positions and remunerations of men. Instead, women were employed in the less prestigious and lower-paid areas of laboratory work. The one exception was Dr. Helen Belyea (1913-1986) who obtained her Ph.D. from Northwestern University in 1939.

Originally underemployed at the GSC in Ottawa (a case of hierarchical segregation) Helen Belyea benefited from the expansion of soft-rock geology. She was transferred to Calgary in 1950 where she became the only woman in a senior scientific post. Helen Belyea did both field and interpretive office work and within a few years became an expert on the Devonian system. It is a significant measure of her unusual career that she was never relegated to doing undervalued laboratory work, was able to carry out field research (at a time when other women were excluded from field work), and was paid as much as any man of the same rank (Ainley, 1990). Like Alice Wilson and Madeleine Fritz, Helen Belyea also received a number of honours; like them she never married.

#### NEW HIERARCHY — NEW "WOMEN'S WORK"

With the development of the computer industry in the 1960s, a new hierarchy developed within soft-rock geology. Field work became less important, but most women remained confined to the laboratory, preparing and studying core samples of microscopic organisms. In soft-rock geology, laboratory work is considered technical, low-status work; male geologists rarely work in the laboratory. Women geologists with graduate degrees provide the data to the men who then interpret the data in the office-computer lab where, it is perceived, the "real" work of soft-rock geology is done (Crossfield and Dumas, 1992). Evidently, in some areas of Canadian geology, laboratory work, although important, has remained ancillary to the real, macho world of science (originally field work, changing to computer work). What are the gender implications of all this?

From oral histories and interviews with dozens of male and female scientists, it seems that in geology, with its

old associations of masculinity and rugged outdoor activity, career advancement and recognition have remained different for men and women. There is hierarchical segregation because laboratory work is considered secondary, and lateral segregation because, particularly in soft-rock geology, laboratory work has become "women's work." Women remain glorified technicians and assistants; they rarely work in the field, or do high-level scientific interpretive work with computers (Crossfield and Dumas, 1992).

In April 1992, a "Women in the Geosciences" conference was held at St. Lawrence University, Canton, New York. Participants at the workshops on women's career opportunities agreed that at university geology departments women are under represented, remain

at the lower levels of the teaching faculty, and conduct most of the laboratory work. These geologists felt that women with Ph.D.s may be hired, but the work they do is still undervalued; that although women outnumber men in the lab, most of the supervisors or senior researchers are men. As one geologist remarked, "a Ph.D. meant little if you were a woman" (Crossfield and Dumas, 1992). Although the statistics in the Royal Society of Canada's *Plan for the Advancement of Women in Scholarship*, 1989, p. 38, are out of date, and those in the Canadian government's *Report on Women in Science and Engineering*, Ottawa: Industry Science and Technology, 1991, are not broken down into individual scientific fields, these two documents give a good indication that, in spite of improvements, the career opportunities



**Figure 1** Madeleine Fritz (left) and Elvira Hammel (right) with guide, Abitibi River area, 1947. (Courtesy of Joan Burke, Royal Ontario Museum)

for women in the geological sciences lag behind the opportunities for their male colleagues.

### CONCLUSION

Recent qualitative data from interviews support and extend the quantitative data produced by the Royal Society of Canada in the late 1980s concerning women's position in geoscience. From my historical research it is clear that while opportunities for Canadian women geologists have expanded since 1950, lingering stereotypes and the internal hierarchies of scientific practice can and do perpetuate previous gender divisions in science.

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