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Gender differences in the enculturation process of new faculty in science

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M.A. Thesis (Educational Administration)

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I dedicate this thesis to my daughter Roisin – who is a daily source of inspiration and of empowerment.

Abstract

This study investigates the differences in the enculturation process of new female and male faculty in science. Four subjects (2 females and 2 males) were interviewed over a period of one year during their first year in a tenure-track position in order to collect information on their experiences during the four stages of the enculturation process: 1) the pre-arrival stage; 2) the encounter stage; 3) the adaptation stage; 4) the commitment vs individuation stage. The experiences and feelings between the genders were systematically compared. It appears that there were gender differences with respect to reconciling career and family responsibilities, in setting work priorities, the number and quality of interactions that females and males have with colleagues, the perception on their new setting and work satisfaction. Overall, it would seem that the two female subjects moved towards individuation with respect to the organizational culture within the scientific community. In contrast, it seems that the two male subjects seemed to move towards commitment of the organization. In Phase 2 of the study, four additional female scientists were interviewed in order to explore key enculturation issues for women scientists. The themes explored were: 1) Balancing academe and family life; 2) the need for mentors; 3) a new definition of success; 4) choosing science as a career - successes and regrets. Finally, the study proposes further development with respect to the theoretical model of the enculturation process. Furthermore, a theoretical framework of three female profiles is proposed for the purpose of further investigation.

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Chapter 1

1. 1 Introduction

Over the last 20 years researchers in the social sciences, humanities and sciences have tried to understand why there is such a low ratio of women scientists. Concurrently, there have been serious efforts on the part of government, policy makers and feminists to reduce the gender gap in science. An increased awareness and acknowledgment of this gender gap has led to recruitment and retention programs within various employment sectors, academe being one of them.

An example of a recruitment initiative in academe is the Natural Sciences and Engineering Research Council of Canada (NSERC) Faculty Award which gives financial incentives to universities to hire women in science and engineering faculty positions. Efforts such as these encourage women to enter the realm of academe as well as encourage universities to hire women. However, statistics suggest that the success of such efforts are limited. Women represent 14% of full-time faculty in the scientific disciplines (Statistic Canada, 1998). This ratio is small in comparison to the number of women graduating with doctoral degrees: 34% in the biological sciences and 17% in the mathematical and physical sciences (Statistics Canada, 1998).

These figures exist at the same time as the Minister of Industry, Hon. John Manley, states that the economic future of Canada lies within a knowledge-based economy which relies on several scientific sectors such as information technology and biotechnology (St-Denis, 1998). A leading corporate organization, Nortel Networks, has expressed concern with respect to the low representation of women in technology as Canada moves into this

knowledge-based economy. Claudine Simson, Vice-President at Nortel Networks says, “women represent an untapped pool of resources, especially today when there is a shortage of qualified high-tech professionals”(St-Denis, 1999). In an attempt to initiate movement in the involvement of women in the ever increasing knowledge-based economy, in 1989 the Canadian government with the support of Nortel Networks, established the first Canadian Chair for Women in Engineering. Today, five regional Chairs for Women in Science and Engineering are supported by the continued funding from NSERC and the private sector. The role of these five Chairs is to further explore the reasons why few women are engaged in scientific endeavours, and also to maintain and develop recruitment and retention programs across Canada.

Recent literature (Sonnert & Holton, 1995; Stalker & Prentice, 1999; Tierney & Bensimon, 1996) suggests that in order to retain women in science the culture of these organizations must change. Policy and procedural changes alone do not necessarily lead to the desired results in terms of recruitment and retention of women in science. It is not suggested that this step be eliminated, in fact, it seems that this is a necessary step for implementing change. However, recent studies (Sonnert & Holton, 1995; Stalker & Prentice, 1999; Tierney & Bensimon, 1996) also suggest that change must occur at a deeper level within the organization – this deeper level being the culture of the organization.

Many studies on the subject of women in science have coined the scientific culture as being male-centred or androcentric, leaving little, if any, room for women to express themselves as women. Harding (1986) has described the scientific culture as one

adhering to objectivity and rationality which have typically been associated to male values and behaviour. Harding further argues that the scientific culture has systematically excluded women or any individual which does not fit into the white Anglo-Saxon male profile. Marianne Gosztonyi Ainly (1993) also claims that: "The exclusion of most women from mainstream science also means that science continues to be pursued in an androcentric way, that it has become exclusive rather than inclusive..."(p. 45). Harding (1986) argues that androcentrism is deeply rooted within the scientific culture: "...scientific method is insufficient to eliminate some kinds of social biases, such as androcentrism, especially when androcentrism arrives in the inquiry process through the identification and definition of research problems" (p.116). What Harding and Gosztonyi Ainly are saying is that the androcentric nature of science is not only found at the behavioural level but it is deeply rooted within the belief system and basic assumptions of scientific inquiry. Since the values and assumptions are the founding elements of a given culture and deeply rooted within it, it becomes more difficult to change these elements through new policies. This is why the retention of women in science becomes a greater challenge than the recruitment of women into science.

It is important to remind ourselves, at this stage, about the different goals of recruitment and retention programs. The recruiting process involves mainly the marketing of job prospects in science and engineering and encouraging women to consider and pursue these possibilities. The retention process however is more difficult to develop since it involves creating a 'female-friendly' environment for women and men. This is where the academic world, not excluding the corporate world, has encountered

challenges. In the early 1980s the first level of culture change was addressed; new policies and procedures were implemented to eliminate discriminative practices in universities. These practices enabled the recruitment of women in science but these superficial changes did not address issues related to retention. Recruitment programs serve to attract women into science and retention programs serve to keep women in science by making their working environment more female-friendly. Examples of retention programs are access to daycare facilities, the ability to stop the clock on the use of grants while on maternity leave, and access to special funds for women in academe. However, these types of retention programs are not readily available on all university campuses.

It is within this context that the present study wishes to explore the elements at play during the first year in a tenure-track position. Specifically, this research study addresses the following question: Do enculturation experiences of new female faculty in science differ from those of new male faculty in science? Socialisation into a new environment can be described as the enculturation process. The enculturation process is an area of study within the field of organizational culture – the enculturation process addresses how the culture (values, symbols, rituals, beliefs) is transmitted from one generation to the next. This study is to further explore gender issues related to the enculturation process using women in science as the basis for this exploration. This study wishes to see how women are enculturated within an academic/scientific setting and how this process is similar and/or different to that of their male colleagues. This question is relevant to retention issues in that it will indirectly investigate factors that may influence the career of new female faculty in science .

1. 2 Organization of the thesis

Chapter 1 introduces the reader to issues and concepts related to women in science and the enculturation process of new faculty in science. The reader is introduced to the rationale for this investigation.

In order to fully appreciate the literature related to women in science, Chapter 2 – the literature review, begins with a historical overview of women in science of the 20th century. Because organizational culture is embedded in the history and its historical evolution, it is important to have a grasp of the history of women in science.

After this historical perspective, a theoretical framework presents two main schools of thought that attempt to explain the reasons for which women are excluded from science: one school addressing the structural factors, such as the policies, procedures and culture of the scientific community; and the other school addressing the epistemological debate – do women and men investigate scientific problems fundamentally in the same fashion? The literature review also addresses the career patterns of women and men scientists, and presents statistical data on the status/percentage of women scientists in academe in Canada.

Chapter 3 – Design and Data Collection explains how phase 1 and phase 2 of the study were conducted. This section also explains the working model of the enculturation process, the process having four stages: 1) the pre-arrival stage; 2) the encounter stage; 3) the adaptation stage, and 4) the commitment vs individuation stage.

Chapter 4 – Data Analysis and Discussion takes the reader through each stage of the enculturation process identifying the differences and similarities between the two

female and the two male subjects. Then, key gender issues that emerged from the first phase of the study are explored in greater detail in phase two of the study.

Finally, Chapter 5, the Conclusion, takes a broader look at the data from the study and attempts to further develop the theoretical model of the enculturation process, and also proposes a theoretical framework of three female profiles for the purpose of further investigation.

Chapter 2

Literature Review

1. Organizational Culture

1.1 Organizational culture in academe

When one speaks of organizations and tries to understand the reasons for occurrences and non-occurrences of events, what is needed is insight into what Moisset (1993) refers to as the essence of a particular collective and its dynamic. Other researchers have referred to this required insight as the identity, the perception, and ways of doing things. The most common term now used by researchers and administrators is organizational culture.

A forerunner in the study of organizational culture is Schein (1992). He defines the culture of a group or an organization as:

A pattern of shared basic assumptions that the group learned as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems. (p. 12)

He developed a conceptual framework consisting of three levels to define organizational culture. The first level, named *artifacts and creations*, is visible and tangible - it includes elements such as traditions, history, norms of behaviour, heros, symbols, myths and stories. The second level is related to the conscious level of the organization as well as to the *values* of the organization. The third level, the most profound of all levels, represents

the unconscious and most basic and *fundamental assumptions* of the organization. Many studies have successfully used Schein's work to help them understand organizational culture in different settings. Although the settings have varied from business to education, a review of the literature would suggest that higher education institutional settings have received limited attention.

Peterson and Spencer (1990) found that research in organizational culture within higher education is not extensive, even though significant ground work has been established in the area. For instance, Clark (1986) and Austin (1990) have focussed on Faculty cultures and values within higher education. According to these authors there are four primary cultures that shape the behaviour of academics: the discipline, the academic profession, institutional cultures, and the academy as an organization within a national system. Becher (1987) and Finkelstein (1984) found that variations exist in the orientations in teaching and research between disciplines (or departments) within the same faculty.

These results suggest that departmental culture plays a role in creating an academic identity by providing the academic with the underlying assumptions for daily behavioural patterns. These are assumptions which can be grouped into three general themes: the methodology for acquiring knowledge; standards to be achieved and maintained; and patterns of publication, professional interaction, and social and political status. Although departmental culture implies a given set of values and behaviours, this does not imply that members within a particular department or discipline have similar careers. In fact, recent studies that have focussed on the career paths of individuals suggest that gender is an

important factor. The possible linkage between gender and career development has influenced policy direction for many organizations.

In the latter part of the 1980's , government, businesses, and many public organizations have used gender issues as a rationale for a number of policy changes, for the development of equity programs, and for pro-active practices for women. An organization that exemplifies these efforts is the university. Most Canadian universities have put in place a variety of equity programs for the hiring and advancement of women in academe. However, as essential, is the knowledge of the underlying issues that would possibly impact on the lack of retention and success of women in academe. Even with the introduction of equity programs, many women in academe still feel as if they are outsiders and still encounter difficult situations (from informal discussions with women in academe; Report of the Task Force on Women in Science and Engineering, NSERC, 1996). The implementation of equity programs cannot on its own change the behaviour of an organization. In order for behavioural change to occur, the value system (or culture) of the organization must be modified so as to include women's experiences.

1.2 Enculturation into academe

Since the 1970s, many studies on organizational entry have examined how individuals and organizations are matched with particular focus on recruitment and selection processes (Wanous 1980; Lawler, 1973). According to Rosch and Reich (1996), the reciprocal nature of the socialization process, that is, the organization 'socializing' the newcomer and the newcomer 'socializing' the organization, has been largely ignored.

Furthermore, they found that it is only recently that the definition of socialization includes 'cultural learning' whereby values, traditions, rituals, knowledge, attitudes and expectations of a particular culture are acquired by the newcomer. Tierney and Bensimon (1996) describe socialization or enculturation in academe as:

The initiation of prospective members into the culture of the institution, department, and profession. It is represented as a rite of passage that begins with probationary membership in the department and concludes, if one is successful, with the granting of lifetime tenure or, if unsuccessful, with immediate termination. (p. 77)

Because organizational culture is seen to evolve over time, and shaped by the interaction of newcomers and culture bearers, it becomes important to understand how this interaction influences change within an organization. The understanding of this interaction is of particular interest when one considers changes in the gender balance of organizations. While many institutions were created and managed by men, there has been a progressive entry of women into the work force. In terms of universities, Tierney and Bensimon (1996) argue that adding women to a given department, without reconsidering socialization practices, does not create a welcoming or comfortable environment for women. They claim that "Male-dominated cultures encourage feminine stereotypical behaviours that make women appear 'unobjectionable', congenial and cheerful rather than strident and unpredictable" (p.83). They found that "invisible paradigms" which provide the underlying structure, and hence the culture of a given unit, often prevents senior faculty and administrators from seeing how their behavioural patterns create

institutionalized forms of sexism. Their results also demonstrated that the experiences of new female faculty “is shaped not only by her individual behaviours but also, and perhaps more significantly, by gender and power relations that typify the culture of a department or institution” (p. 101). Oftentimes, with intent or not, the culture of a department or institution place the female faculty “at a disadvantage or reinforce their status as the “other” ... by the absence of gender consciousness in the minds of decision-makers ... its invisibility ... as well as in the structures of tenure and promotion”(1996, p. 81).

Tierney and Bensimon’s (1996) study has provided an awareness if not an awakening to the importance of the enculturation process in academe. This study together with major funding and policy initiatives directed at increasing the presence of women in science strongly support further investigations.

The next section will present the literature on women in science through a historical perspective and then introduce the reader to the studies and feminist theories on gender and science.

2. Women in science

The study of women in science has been examined by researchers from various disciplines, including philosophy of science, history of science, social sciences, women’s studies, and by scientists themselves. Two main approaches have been developed in the study of women in science: one examining issues related to the organization and institutional policies such as hiring and promotion practices, and the other looking at epistemological debates: such as, is women’s knowledge different from that of men? The

separation of organizational culture and epistemological analysis, however, is not necessarily easy because one's way of knowing and doing things is closely tied to the culture of an organization. This linkage is seen more clearly in a visit of the biographies of several women scientists of the 20th century. In this visit, the reader will not only become aware of the women's experiences but also of the barriers encountered and overcome by them.

The analyses of barriers is further explored in Sonnert and Holton's (1995) study with the development of the deficit model and the difference model which provide enlightenment on the epistemological debate and the organizational debate.

Finally, the issues dealing with promotion and tenure as well as balancing careers and family life are addressed. Prevailing gender differences in attitudes and behaviours with respect to work and family are discussed in terms of their importance to the socialization process.

The review of the enculturation process with respect to women academics in science would not be complete if only the stories of the past were left to speak for today. Consequently, this chapter concludes with a tabular presentation of progress made during the 20th century. The stories of today's women academics in science make up the research report of this current study.

2.1 Women scientists of the 20th Century: a historical perspective

Many great scientific discoveries have been accomplished by women, some of these women have become famous such as Marie Curie, while others remain in the dark.

Women's interests and abilities to do science has always been a reality, but it is only recently that women have had access to laboratories. Women today are working side by side with male colleagues in the existing endeavour of scientific knowledge and discovery. Over the last century the number of women scientists in academe has increased but they still represent a minority, and according to the result of many studies, women are still part of the 'outer circle' (ie Gornick, 1983; Rose, 1994; McGrayne, 1993; Pattatucci, 1998; Zuckerman, Cole, & Bruer, 1991; Fox Keller, 1985; Harding, 1986; Sonnert and Holton, 1995). Women scientists are for the most part a minority in their department and very often the only women in their department. Some science and engineering departments never have and still do not have a female faculty member. Although many will argue that the barriers experienced by women at the beginning of the 20th century are no longer an issue, more subtle barriers are still being reported by women today. These barriers are more difficult to change or to fix since they are not rooted in the policies or the procedures of the institution but in the culture itself.

Four biographies of women scientists are presented below. Their stories will illustrate the different challenges that they encountered overtime even if their scientific abilities were outstanding. The first biography will present Marie Curie (1867-1934), the second Barbara McClintock (1902-1992), the third Jocelyn Bell Burnell (1943-), and the fourth "Jane Doe" (1967-). Their stories will illustrate the changes in the types of barriers and challenges posed to women in science over the century - starting with apparent structural barriers and gender discrimination to subtle discrimination created by cultural factors. The four biographies are those of exceptional women who have been publically

recognised for their achievements. However, regardless of their scientific abilities and contributions to scientific knowledge these women remained ‘outside’ the scientific circle.

The first three biographies are based on the information provided in “*Nobel Prize women in science: Their lives, struggles and momentous discoveries*” by Sharon Bertsch McGrayne (1993), and the last biography is based on a personal interview with Jane Doe. This last interview is presented in order to complete the overview of women scientists in the 20th century. The author felt that an example of a contemporary female scientist was essential in order to fully appreciate the changes and transitions in terms of barriers to women scientists over time. The picture is thus more complete with this fourth story.

In essence, these following stories are to provide the reader with a historical and contextual perspective of women in science: Real stories, real lives, real women and real science interwoven together so as to demonstrate the complexity of the study of women in science. It is hoped that this will allow the reader to fully appreciate the theoretical discussions in future sections.

2.1.1 Marie Skłodowska Curie (1867-1934)

One of the great female pioneers in science was Marie Skłodowska Curie. She is the winner of the Nobel Prize in 1903 in physics for her discovery of radioactivity, and in 1911 in chemistry for her discovery of radium. She was the first woman to obtain the distinguished Nobel Prize in science and the first person to receive two Nobel Prizes, one in physics and the other in chemistry, a title she held for 60 years. Curie lived the life of a modern woman well before her time: she was a career woman in a non-traditional field, a

mother of two children, a wife, eventually a widow, and a single parent. Marie Curie had two masters degrees, one in physics (1893) and the other in mathematics (1894), and a doctorate in physics (1903) all from the University of Paris.

Marie Curies' career development was unlike most women of her time. When her first child was born her father-in-law moved in with Pierre (her husband) and Marie so as to take care of Irene while Marie worked. Like most women scientists at this time Marie was married to a scientist. What is interesting to note is that Pierre dropped his research area (crystals) and joined Marie's research in radioactivity - a domain in which they were about to make ground breaking discoveries.

In 1903, the French Academy of Sciences nominated Henri Becquerel and Pierre Curie to share the Nobel Prize for physics for their work on radioactivity, Marie Curie was not included. Luckily, one of the most powerful Swedish physicist on the nominating committee, Magnes Gosta, was a great supporter of women scientists. The Swede wrote Pierre Curie that he and he alone was being considered for the prize. (McGrayne, 1993, p. 25)

Pierre Curie then wrote to the nominating committee to inform them that he wished to be considered with Madame Curie for their research in radioactivity. In 1903, M. Curie, P. Curie and H. Becquerel won the Nobel Prize in Physics. Marie's name was not included at first because as a woman she "was not seen as capable of producing scientific knowledge, and therefore was outside the committee's consideration either as a potential member or as a nominee" (Rose, 1994, p. 142).

All of the Curies' work was possible due to Pierre's salary, since he had a research

chair at the University of Paris. Although Marie had become a household name she did not enjoy the privilege of a salary for her work. She was an independent researcher. But in 1906 Pierre passed away in a car accident and Marie found herself in desperate need of financial support.

When friends suggested taking up a collection and securing a widow's pension to help her, she vehemently refused. She insisted on being considered as a scientist, not a helpless widow. After some hesitation, the University of Paris offered her a position as an assistant lecturer at ten thousand Francs yearly, starting May 1st, 1906. It was her first university salary, and she would be the first woman professor in the Sorbonne's six-hundred-and-fifty-year history. (McGrayne, 1993, p. 28)

In 1911, she forwarded her application for election to the French Academy of Science so that she could present and publish her scientific results on a weekly basis in the Academy's journal. She lost by one vote. It is only 68 years later, in 1979, that a woman was allowed to enter the French Academy of Science. Although she had obtained the Nobel Prize which usually meant a guaranteed place among the scientific academies of one's country, as a woman, she would not have that opportunity or privilege.

Nonetheless, Marie Curie's scientific work gained fame due to its impact on medicine. Due to Curie's discoveries, x-ray machines were created and were an invaluable tool in the front-line hospitals of WWI. By the end of the war, she had secured funding and resources for the establishment of the Radium Institute, a research centre for radioactivity with applications to medicine. Although Curie had succeeded in obtaining some research facilities, the French government was the least generous in financing her

research through grants for equipment and material. In the early 1920's, an American journalist, Missy Maloney, organized an unprecedented fund raising campaign which permitted Marie Curie to buy radium and thus continue with her experiments. With this great publicity blitz, Marie toured the US, received 20 honorary degrees from American Universities and attended a White House reception in her honour.

Marie Curie died of leukemia in 1934, the result of working in close proximity to radioactive materials.

Like Marie Curie, the majority of women scientists of her time were married to scientists but unlike Marie they did not have their own lab. They were usually unpaid assistants working in their husband's laboratories, unable (not allowed) to attend lectures and seminars at the university. "Historian David F. Noble of York University in Toronto argues that the first universities were monastic, organised by the Christian church, and thus excluded women" (Holloway, 1993, p. 97). For the most part, women were denied entry to universities until the 1940s and 50s. Obviously this did not stop Marie Curie. However, despite her great contributions to science she never had the opportunity to enjoy the same privileges of the average male scientists. According to Rose (1994):

Curie's fame thus depends not simply on her work, and on the general processes through which scientists are recognised, but on the integrity and egalitarian values of two men: one a Swedish mathematician who shared his sister's feminism, the other, her husband and collaborator who shared hers. This story of the recognition of Curie points to the peculiar dependency of a woman scientist, particularly if she is part of a wife-and-husband team, on her collaborator's unequivocal

acknowledgment of her contribution. (p. 142)

2.1.2 Barbara McClintock (1902-1992)

Barbara McClintock has captured and challenged the imagination of many colleagues within the scientific community. In 1927 McClintock obtained her PhD degree at the University of Cornell.

Between 30 and 40 percent of all graduate students in the United States during the 1920s were women. In fact, women accounted for approximately 12 percent of the science and engineering PhDs awarded in the United-States -- a proportion they would not reach again until the 1970s. Most studied biology, and almost one in five was a botanist. A good number of them specialized in genetics. Most of the rest were in zoology and psychology, which required little mathematics.

(McGrayne, 1993, p. 150)

During the 1930s McClintock became good friends with Marcus Rhoades who would be there to support her throughout her life. Rhoades became her soul mate and would be the one to explain the importance of McClintock's work to the administration at Cornell. A bit of a renegade, McClintock liked to do things her way and she had a sense of what she was doing and where she was going. She did not publish as often as her male colleagues. However, when she did publish her articles they were thorough in terms of data presented and in-depth analysis. In the early 1930s, McClintock with her colleague Creighton, discovered that genes which determine physical traits are carried on the chromosomes. As usual, McClintock wanted more data before publishing her work,

but one of her colleagues convinced her to publish as quickly as possible. Fortunately she followed his advice because a few months after her publication a German geneticist, Curt Stern, published a paper with the same results using fruit flies.

Regardless of her recent success at Cornell she knew that she had to leave Cornell: Emerson, the department chairman, was one of her greatest fans but he could not override the faculty, who were strongly opposed to giving permanent positions to women. For the next five years, from 1931 to 1936, McClintock crisscrossed the country in her beloved Model A Ford. At the top of her profession, she was at the bottom of the career ladder.” (Ibid, p. 157)

McClintock had many friends and colleagues who believed in her abilities and her work. This support enabled her to obtain grants and fellowships from the NRC, the Rockefeller Foundation, and the John Simon Guggenheim Memorial Foundation. In 1931 she worked for Caltech. It was then customary to make visiting researchers with fellowships members of the faculty club. She was allowed in once, but never again, the presence of a woman was not accepted. Even though she had discovered the nucleolar organizer region of the chromosome while at Caltech, they never hired her full-time. It was only in 1971 that Caltech hired their first woman professor.

Thanks to another fellowship in 1934 McClintock returned to Cornell to continue her research in genetics. With the help of her friends, she started her first faculty position at the University of Missouri in 1936. “She would be only an assistant professor-- far below the rank and pay of a man with comparable attainments-- but it was her first faculty position” (Ibid, p.160). McClintock was never really happy at Missouri, she was excluded

from faculty meetings and was never accepted as one of the 'boys'. In 1941, she asked the Dean of Science if she would ever get promoted to a permanent position. "If Stadler leaves, the dean answered, you'll probably be fired" (Ibid, p.162). On that, McClintock left and never went back to Missouri. She called her friend Marcus Rhoades and asked him where she could grow her corn so as to continue with her research. She ended up in Cold Spring Harbour. During the summer she stayed in a summer house and for the colder part of the year Rhoades lent her a room in his New York apartment. McClintock eventually obtained a permanent position at the Carnegie Institution which enabled her to continue her precious work at Cold Spring Harbor.

In 1944, she was elected the first woman president of the Genetics Society of America. That same year, she was named to the prestigious National Academy of Sciences, which had admitted only two other women in eighty-one years. (Ibid, p. 164).

In 1947 McClintock declared:

Opportunities for women have never been greater than they are at the present time. There is no question in my mind that these opportunities will become increasingly better and at a very rapid rate. The restrictions in opportunity... are being steadily removed. (Ibid, p. 165)

In 1951, McClintock gave a one-hour presentation on her findings before a group of leading scientists. At the end of her talk there was no reaction. Most had not understood what she was talking about because she had presented a whole new way of looking at gene behaviour, which was quite a shift from the traditional theories of the

time. It is reported that a few scientists thought that she was crazy – her work was so complex that even the best in the field of genetics did not understand what she was saying. In 1953, McClintock published an in-depth paper on maize genetics and her discovery of jumping genes. Only three scientists in her field requested a copy of her work. Her theory on jumping genes or transposable elements went against the main stream which stipulated that genes were stable.

Twenty years ahead of her time, McClintock went into “internal exile” at the lab, waiting for the scientific community to catch up with her... Molecular biology finally caught up with McClintock during the late 1960s when James Shapiro and others discovered transposable elements in bacteria. Suddenly, molecular biologists started finding mobile genetic elements in all kinds of organisms, including people. (Ibid, p. 168-171)

Only twenty years after McClintock’s great discovery did the scientific community begin to publicly recognize her work. In 1980-81, now in her late 70s, “she received eight major awards, three of them in one week: the Albert Lasker Basic Medical Research Award, the \$100,000 Wolf Prize in Medicine from the Wolf Foundation in Israel, and the MacArthur Foundation Fellowship. \$60,000 a year tax-free for life”(Ibid, p. 171). In 1983, McClintock received the Nobel Prize for Medicine and Physiology. The Nobel Prize selection committee called her work “one of the two great discoveries of our times in genetics,” (Ibid, p. 172) the other being the structure of DNA. McClintock continued to work until the end, she past away in 1992.

It is interesting to note that the times during which McClintock had greater success

in her research endeavours coincide with the first and second wave of feminism. The first wave being in the early 20s, and the second in the early 70s. This might suggest that when feminist movements are more active in their pursuit of equality that greater efforts are made on a global basis - and thus women such as McClintock are finally recognised for their achievements. Although McClintock never wanted to be associated to the feminist movement, she certainly was a pioneer for women in the academic community. Regardless of all of the structural obstacles and gender discrimination practices that she encountered throughout her life, she was able to pursue her passion. It is however very sad that she could not benefit from her discoveries while she was making them in the 1950s. We can only wonder how much more she could have contributed had she been given the support and acceptance from the scientific community at the peak of her career, when she needed the financial support and resources to fully pursue her research. According to Rose (1994), "The overdue recognition of these distinguished but now older women scientists limits the possibility of their exercising the usual powers of the Noble Laureate" (p.137).

2.1.3 Jocelyn Bell Burnell (1943-)

Jocelyn Bell Burnell graduated from high school in 1961 with some academic challenges along the way. After high school she enrolled at the University of Glasgow in Scotland majoring in Physics. She was really interested in astronomy but felt that there were less career opportunities and so as to keep as many options open she went into physics. After the first year she was the only female left in her year. She was a good

student, but she was teased by her male colleagues as “Jocelyn from Jupiter” and her roommate in the dormitory, well meaning of course, advised her to stop after her third year, because “married women do no need that much schooling” (McGrayne, 1993, p. 364). But Bell Burnell went on to Cambridge for her PhD.

Female astronomers, however, had to overcome an indisputable fact: They often worked late at night with men in remote areas. To avoid such scandalous improprieties, some universities directed women into solar research because it was a daytime occupation. When Burnell was at Cambridge in the mid-1960s, American women astronomers were not permitted to use the important telescopes at Mount Wilson and Palomar Mountain in California. At Jodrell Bank, women were required to observe in pairs at night and were not allowed to drive home after work. Only in the past twenty-five years have women been permitted to apply for time on all of the world’s major telescopes. (Ibid, p. 365)

In her first two years at Cambridge, Bell Burnell was busy building the first radio telescope designed to look for rapidly changing astronomical sources. She did this under the supervision and guidance of her thesis supervisor, Anthony Hewish. In 1967, the telescope was ready and Bell Burnell started analysing miles and miles of data. It is during this analysis that she realised that there were some unrecognisable patterns in the data set. She showed this to Hewish who at first did not think much of it. But when Bell Burnell had more data he became intrigued. She recalls “ ‘ One evening just before Christmas I went to Tony’s office to discuss something and found I had walked into a high-level conference about how to present these results. I was slightly peeved when I ... realized

they were discussing it.’ But the meeting apparently just happened, and once she had arrived, no one told her to go away. So she stayed” (Ibid, p. 369).

Just before Christmas, Bell Burnell found more of the same unrecognisable patterns in a different part of the sky. She was on her way home for the Christmas holidays and so dropped the data off on Hewish’s desk. Over Christmas Hewish made sure that the telescope was running, since it did not function as well in cold weather. By mid-January, Hewish decided that he had enough data for a publication and sent in a paper with S.J. Bell as the second author of five from his group. Nature published the article within weeks. Bell Burnell went on to complete her PhD thesis which “detailed the angular diameters of about two hundred scintillating radio sources. She put pulsars in an appendix” (Ibid, p. 371). The pulsars were the great discovery, one must wonder why her thesis supervisor did not guide her focus on this discovery?

In 1968 Bell married, changed her name to Burnell and left radioastronomy to follow her husband who had a government job, and they would move all over England for years to come. Her discovery of pulsars did give her an advantage as she moved around the country. It enabled her to find part-time work. “Professors and research directors were willing to bend the rules or create jobs for her when she moved into their area, so that she always had congenial and enjoyable work” (Ibid, p. 373). Although it had become well known within the scientific community that it was Bell who was responsible for the discovery of the pulsars, in 1974 the Nobel Prize was awarded to Sir Martin Ryle and Anthony Hewish. This award raised a lot of questions about the worth of the Nobel Prize when many leading scientists felt that Jocelyn Bell Burnell should have definitely

shared the Nobel Prize for this discovery.

Bell Burnell has since received public recognition from British and American scientific societies such as the J. Robert Oppenheim Memorial Prize in 1978. She was the first recipient of the Beatrice M. Tinsley Prize in 1987, and the Herschell Medal in 1989, awarded by the Royal Astronomical Society.

During the 70s and 80s Bell Burnell occupied many different jobs. In the late 70s she worked part-time at Mullard where she led a small team analysing data from a British X-ray satellite. This was a very stimulating work environment for Bell Burnell, she says: “We kept tripping over discoveries. Before we finished with one discovery, there’d be another one” (Ibid, p. 375). During this time she also taught part-time at the Open University. In 1982, her husband was transferred and so she followed him. She found a part-time job at the Royal Observatory in Edinburgh, Scotland and kept teaching part-time for the Open University.

On working part-time, Bell says: “Looking at my female colleagues at the Royal Observatory, it seems that either we have made some unusual domestic arrangements or we have tried working part-time, hoping for good luck, obliging colleagues, and accommodating directors; *both modes seem far from satisfactory*... The problem with part-time work is that it assumes that domestic and child care remain with women, and part-time and lower status jobs have often gone together traditionally” (Ibid, p. 377). Jocelyn Bell Burnell had a young son and this is what motivated her to work part-time.

In 1991, after her divorce, Bell Burnell got her first full-time permanent job as a professor in the department of physics at the Open University. She was the third woman

to become a physics professor in the UK. Today she is still at the Open University. She has a web site and her academic interests include: astrophysics of neutron stars; passively cooled infrared space telescopes; the teaching of and public understanding of physics and astronomy; and the management of science in the UK.

2.1.4 Jane Doe (1967-) *Information from a personal interview*

Jane Doe was hired with a Women's Faculty Award in 1994 and has obtained an array of awards every year, on average three a year in recognition for excellence in teaching and/or research. Just after 4 years in her academic position Jane attained tenure. Her fast track and highly successful academic career has been very gratifying to her but she does admit to her share of challenges, mainly isolation. Jane describes her experience through graduate school:

At graduate school it was a very macho kind of environment, but there was a woman who was a staff scientist who had been there for 15 years and I recognised, for the first time, somebody who looked like me.

Jane also admits that her choice to pursue science was not driven by passion at first. It is through the awards and recognition of her talent that she followed the path to academe:

Rather than feeling that I was actively making decisions, such as: I want to be a scientist and this is how I am going to get there, these awards drew me through this career path, I did not make any of the decisions, I just followed the awards. After that, all fell into place. I am one of these people that if these awards did not exist I would not be here. I would not have been drawn in this direction naturally.

Jane has become passionate about her work and has become a leading scientist in her area of research. She is in fact responsible for a specific paradigm shift within her discipline. Regardless of her success in terms of publications, awards, grants and invitations to prestigious lectures she still feels that she is an anomaly because of her gender. When Jane was hired within her department it appeared to her that she was hired to replace the only other woman who was soon retiring. Although their research were in very different domains, Jane was 'housed' within the other woman's lab and informed that she would have this space once the other retired. Jane was also assigned to the same courses that this retiring woman was teaching which were not related to Jane's area of expertise. This led Jane to believe that she was the next token woman, the replacement, "like a fixture", she says.

During her first year Jane found her experiences quite pleasant:

Everyone was very helpful in the first year. I was brand new and I was not a threat to anyone. They were paternal about it but I did benefit from that. I was able to borrow people's equipment and call upon them for their expertise.

Once Jane started to get numerous awards, grants and publications, she perceived a backlash and some resentment from certain colleagues:

It was quite obvious that they thought that I was getting all of this just because I was a woman. For example, a few days after one of my awards had been announced a fellow scientist came up to me to congratulate me and said "there sure are a lot of these woman awards", but this was not a woman award it was a science award, but he assumed that it was for women.

Jane also describes other events that separates her from her male colleagues. One example is with respect to staff parties. She described how at these parties, 'the men-the scientists' would all drift to one side of the house and "talk shop", while 'the women-the wives' came together and discussed a variety of topics:

I was always with the wives while all of the networking and contacts were being forged at the other side of the room. I realised that I should be over there trying to convince someone to join me on a grant application. When I did drift over and start talking to a small group of men, they kept looking at their wife, like they were a little bit uncomfortable. I can't confirm this but it's just a sensation - they are just uncomfortable around me. Perhaps if I was married and my husband was in the room somewhere the dynamics would be different.

When asked if she felt more like an insider or an outsider she responded that she was more of an outsider. Jane feels that because she has been so successful from the start that there is most likely some jealousy amongst her peers, regardless of gender. However, the gender issue seems to exacerbate the situation:

I feel that people think that there must be another reason aside from the fact that I might be good at what I do. I am working very hard and doing good things. I am lucky that I dropped into an interesting field and where the results seem to be working. There is something about it that I don't deserve - that's the message that I get back from them.

On balancing a career and a family, Jane did at some time admit that this was not possible, not if one wants to have the type of success that she has been achieving. Jane

now explains that perhaps with the right partner it would be possible:

In terms of it being possible, it is now possible for two reasons. I have a partner who is prepared to invest a lot of time in this - I would not want to sacrifice my career by having a family. And the other advantage is the financial resources, to do it with a lot of help: a nanny, cleaning lady, eating out when you don't have time to make dinner.

Jane is still in the early stages of her career yet she has made a lot of waves in her area of research. Her gender certainly has not hindered her career progress, it may in fact have been an advantage at the beginning of her career as she was hired through government recruitment initiatives such as the Women's Faculty Award.

As one of the few females professors in her faculty, Jane plays a crucial role in the advancement of women in academe. She is often the only woman on committees, her presence and firm convictions in equitable treatment has often redirected the decisions of committees, that is giving female candidates a fair chance at awards and academic positions. Jane has had to defend the interests of female candidates on numerous occasions and it is with this perseverance and determination that she helps create a more female-friendly environment in academe.

The subtle and not so subtle sexism experienced by Jane illustrate how the scientific community is still uncomfortable with the presence of women. One can only hope that with the hiring of more women like Jane, the scientific community will become more female-friendly:

In general, the more women there are, the more changes there will be to benefit

women. Women's groups seeking an improvement in the status of women in their disciplines were formed very early during the second wave of feminism in sociology, modern languages and psychology, where women comprised 20 to 30 percent of association membership. (Innis Dagg, 1998, p. 117)

2.1.5 Historical overview of women in science

Table 1 serves as an overview of the changes and transition in the experiences of women scientists over the 20th century. The table mostly illustrates the changes in policy with respect to gender and science.

Table 1.

Women in science: the different phases of discrimination across the 20th century

1900-1919 - women are denied access to a formal education - women who succeed in getting an education must do so in hiding - women are not considered capable of thinking or capable of contributing to scientific knowledge - most often, women scientists have access to a lab and research by being married to a scientist: in most cases the woman is the assistant and does not receive credit for her contributions nor salary for her work 2 Nobel Prizes: Marie Curie in 1903 and 1911
1920-1939 <i>First wave of feminism</i> - women enjoy a new found freedom with respect to education - women earn the right to vote - in 1921, women represent 15% of full-time university professors in Canada (1) - in 1931, women represent 19% of full-time university professors in Canada (2) 1 Nobel Prize: Irene Joliot Curie, 1935
1940-1959 <i>Back lash to the women's movement and aftermath of WWII</i> - the number of women enrolled in the sciences decreases - the number of women in the workforce decreases - women are encouraged to stay home and take care of their families - women enrolled in science and engineering are seen as husband seekers 1 Nobel Prize: Gerty Cori, 1947 1945 - First woman elected into the American Academy of Science
1960-1979 <i>Second wave of feminism</i> - grass root organizations for women are on the rise, many groups such as WISE (Women in science and engineering) are born. - these groups provide a support network for women - women's liberation movement has a central focus on body politics - some changes in policies for gender equity is facilitating the entry of women into the workforce, science, and academe - feminist biologists contest biological determinism theory - in 1960, women represent 11% of full-time university professors in Canada (3) - in 1970, women represent 13% of full-time university professors in Canada (4) 3 Nobel Prizes: Maria Geopert Mayer, 1963; Dorothy Crowfoot Hodgkin, 1969; Rosalyn Sussman Yalow, 1977 1979 - First woman elected to the French Academy of Science

1980-1999 *Third wave of feminism*

- postmodern feminists critique of science - who does science really represent?
- feminists construct new knowledge from women's perspective: Critique of science-how science and technology are locked into political agenda, systems of domination, and the patriarch.
- promotion of science to young women, in elementary schools and high schools.
- In 1990, Canada created the NSERC Women Faculty Award to entice faculties of Science and Engineering to hire women.
- in 1990 women represent 10.6 % of full-time professors in science in Canada (5)
- in 1996 women represent 13.8 % of full-time professors in science in Canada (6)
- there is still a problem with retention: women still experience negative experiences in the work place due to their gender

3 Nobel Prizes: Barbara McClintock 1983; Rita-Levi Montalcini 1986; Gertrude Elion, 1988. None in the 1990s.

Sources for statistics:

1. Stalker and Prentice, 1999, p.15.
2. Innis Dagg, 1999, p. 109.
3. Innis Dagg, 1999, p. 109.
4. Innis Dagg, 1999, p. 109.
5. Statistic Canada, 1998
6. Statistic Canada, 1998

2.1.6 A century of trials and tribulations

According to Rose (1994) the history of the nine women scientists Nobel Prize winners "is in a number of ways a microcosm of the history of gender politics in science this century" (p. 138). Rose argues that "the Nobel Prize sits at the apex of the status system of science. The Laureates are icons of the fusion of scientific knowledge and cultural power..." (p. 138). In this context Rose argues that the Nobel Prize committee prefers giving the Nobel Prize to older women who have established careers and a long track record. She even goes to say that "perhaps men with power to give public recognition suffer an inability to recognise scientific merit in peer-group women, whereas they have no such problem with peer-aged or even younger men" (p. 137).

Women represent only 2% of all the Nobel Laureates in science and medicine.

There have been nine women Nobel Laureates and ten prizes, Marie Curie received two of them. According to Rose (1994) “women Laureates have to be innovators in an additional sense”(p. 140) compared to men Laureates who have in the past received the prize for a “seminal contribution” to science. It is puzzling that not one woman received a Nobel Prize for science or medicine in the 1990s.

2.2 Barriers to women in the scientific community: A theoretical perspective

According to Sonnert and Holton (1995) women scientists are less likely to have as successful careers as their male colleagues. In looking at the different explanations given by scholars, Sonnert and Holton (1995) have classified the literature into two categories: one category taking into account the ways that women are treated differently by the organization and the community (they call this the deficit model), and the other category discusses how women are socially less apt to succeeding in a scientific career (they call this the difference model). However, when one takes a closer look at the lives of women in science over the decades, one can appreciate that the dynamics of the scientific institution interacting with the dynamics of women’s ways are both realities that need to be addressed together. The barriers for women in science do not only lie in the politics of academe or in the socialisation of women, the problem lies at the crossroads of both dynamics. For practical reasons, the literature review will illustrate gender discrimination and differences in the sciences through the deficit model and the difference model as proposed by Sonnert and Holton (1995): “For reasons of conceptual clarity, we

have distinguished between structural obstacles (barriers that exist as a feature of the social system of science) and internal obstacles (barriers that exist in the form of women's attitudes and values). But in reality these intertwined categories reinforce each other"(p. 6).

2.2.1 The deficit model (structural)

According to the deficit model women do not have the same opportunities for career advancement as their male counterparts. This model focuses on the structural barriers which refers to policies of the organization and its culture which create a social system that is unfriendly to women – the “chilly-climate”. This model takes into account gender discrimination in the recruiting, hiring, and promotion process, to informal obstacles which evolve from being excluded from the social network or the ‘old-boys club’.

Tobias (1993) describes the scientific culture as having a definite "belief system" which is unfavourable to women. Tobias suggests that deans and laboratory directors may have good intentions "superficially" but they do not yet recognize that some women's failures in science may be partly caused by prevailing norms within the scientific culture. Although Tobias does not discuss the scientific culture in terms of symbols and values, she seems to perceive the culture as having a belief system which is comprised of norms and values. In this context Tobias (1993) suggests that the scientific culture as such may not be against women, but that the system has "a disproportionately negative effect on anybody whose lifestyle or values or expectations doesn't mirror theirs [male scientists]" (p.156). According to Morse (1995): “The barriers to gender-balance and productive

scientific work-force are erected by science founders and scientists themselves”(p.271).

Morse (1995) argues that the scientific community values certain behaviours that can alienate women from pursuing careers in science. The values of competition and intimidation, for example, are described as problematic behaviours for women within the scientific community.

In 1999, MIT released a special edition of their Faculty of Science Newsletter. This issue focussed on gender discrimination within their Faculty. In 1994, three tenured women in the Faculty of Science while sharing stories of their lives as academics came to “realize that gender had probably caused their professional lives to differ significantly from those of their male colleagues” (MIT Newsletter, 1999, p.3). In summary, it was observed that patterns of subtle discrimination were prevalent in the faculty. “Exclusion and invisibility proved to be the common experience of most tenured women faculty... excluded from a voice in their departments and from positions of any real power”(p. 6-7). The MIT report did not find any discrimination when it came to material resources and rewards. However, some “inequitable distributions were found involving space, amount of 9-month salary paid from individual research grants, teaching assignments, awards and distinctions, inclusion on important committees and assignments within the department” (p. 7).

In the study conducted by Sonnert and Holton (1995), 73 percent of the women who were interviewed reported that they had experienced sex discrimination. “Although outright gender discrimination may be on the decline, it remains so pervasive within science that a woman entering the field now should be aware that at some point in her

career she might encounter behaviour that she will consider gender discrimination” (p.139). The types of discrimination reported covered a wide range of behaviour from minor issues to more serious problems such as denial of jobs, promotions, and tenure and this involved women who felt that they were well qualified for the position. It is important to note that the subjects who participated in Sonnert and Holton’s study (Project Access) were men and women determined to have great potential for a successful career in science and engineering. Sonnert and Holton (1995) examined the careers of men and women who had received prestigious postdoctoral fellowships from the National Science Foundation (NSF), the National Research Council (NRC) and other similar types of awards/scholarships. Out of this group, “22 percent of the women said that discrimination had been a career obstacle; 17 percent mentioned discrimination by superiors, and 5 percent noted discrimination by peers” (p.140). Other women reported that in hindsight they had some discriminatory experiences but did not perceive them this way at the time.

The MIT (1999) report also found that “junior women faculty felt included and supported in their departments”(p.7) in contrast to senior faculty who did not feel as content. Junior faculty were more concerned about the difficulties of combining family and work. An important finding that emerged from the MIT study (1999) is that:

The difference in the perception of junior and senior women faculty about the impact of gender on their careers is a difference that repeats itself over generations. Each generation of young women, including those who are currently senior faculty, began believing that gender discrimination was “solved” in the

previous generation and would not touch them. Gradually however, their eyes were opened to the realization that the playing field is not level after all, and that they had paid a high price both personally and professionally as a result.(p. 7-8)

Not only do women face challenges within the organization they also face informal obstacles. Sonnert and Holton's (1995) project describes how women were often excluded from social activities such as playing sports or going out for drinks. They do mention that "explicit exclusion" is rarer, women do participate in some social aspects of their department but they feel somewhat out of place.

According to Sonnert and Holton (1995), the style of interactions between colleagues is affected by gender. Fifty four percent of the women and 40 percent of the men felt that there was a difference when interacting with men or women. Of those, 66 percent of the women felt that their interactions with women were better than those with men and 12 percent of the men felt the same way.

The deficit model (or structural model) recognises the androcentric nature of the scientific culture which creates this "chilly-climate" for women. It is because of this climate that many female scientists do not choose a career in academe and those who do, find the experience challenging. Many universities have attempted to address this problem by changing hiring procedures and creating specific policies related to the recruitment of women. However, the crux of the problem is not yet addressed by these institutions. What is needed are retention programs but these are much harder to initiate since it requires a good understanding of why women encounter challenges in academe and choose to leave. Debra Rolison speaks on recruitment and retention of women in

chemistry in the publication of Chemical and Engineering News:

The deans and university presidents must lead the charge. And what better impetus is there to university administrators than a whiff of the loss of the dollars from federal grants? Such a possibility is indeed a dire extremity, but one that makes other practical, achievable alternatives look downright reasonable, such as aggressively recruiting good women candidates for faculty openings, ensuring on-campus daycare, mentoring the junior faculty through the minefields, and really rewarding the good teachers and advisors because of how they guide and challenge their students. Note that these suggestions help men, too. (March 2000, p.5)

2.2.2 The difference model (epistemological)

The difference model considers the “deep-rooted difference” in men and women with respect to their goals. “According to this model, the obstacles to career achievement lie within women themselves; they are either innate or the result of gender-role socialization and concomitant cultural values.” (Sonnert & Holton, 1995, p. 3)

According to Sonnert and Holton (1995): “It appears safe to say, however, that there is considerable intra gender variability and a large overlap between the two gender distributions, at least among the intellectual abilities relevant to scientific work” (p.3)

Sonnert and Holton looked at many variables to explain these differences, they argue that “average genetic differences between the genders in relevant dimensions (such as mathematical talent) will fall short of sufficiently explaining an individual’s aptitude and career success in science – even if those genetic difference exist” (p.4). According to

Sonnert and Holton (1995) the difference is determined by culture:

First, women may be more likely than men to be socialized with general orientations and attitudes that reduce the drive toward professional success in any field. Second, particular attitudes about science may define it as a male field and thus encourage males and discourage females to participate. Third, deep-seated epistemological gender differences may make science, as practised today, not sufficiently compatible with women's ways of thinking (p. 4).

The literature review will focus on the epistemological dimension since this is where feminists have greatly contributed in terms of explaining the gender difference in science. One of the leading and most cited authors on science and feminism is Sandra Harding. In *The Science Question in Feminism* (1986), Harding uses a feminist postmodern approach to criticise science. Harding argues that science is not as objective as scientists have claimed it to be, she argues that the product of inquiry is a reflection on the values inherent to the creator, 'the individual', or its creators, 'the collective'. In summary Harding makes the following points throughout her book: 1) recognise that science is not a pure form of knowledge but that science is influenced by the values and interests of scientists and by political movements within society; 2) although science claims to represent all of humanity, science is androcentric, it reflects what is male and imposes this as being the norm; 3) science and knowledge protect the masculine culture and has developed theories to maintain control over women; and 4) there is an incongruence between the role and behaviour prescribed to women by society and the real needs and desires of women that feed the feminist movement. Harding argues how knowledge is value laden by those

creating it. Within the feminist postmodern framework, Harding explains that all forms of knowledge will be value-laden, even feminist debates. However, she stipulates that the feminist approach is less biased than that of the traditional approach because it is more sensitive and conscious of cultural influences.

Feminism proposes that there are no contemporary humans who escape engendering: contrary to traditional belief, men do not. It argues that masculinity—far from the ideal for members of our species—is at least as far from the paradigmatically admirable as it has claimed femininity to be. Feminism also asserts that gender is a fundamental category within which meaning and value are assigned to everything in the world, a way of organizing human social relations. If we regarded science as a totally social activity, we could begin to understand the myriad ways in which it, too, is structured by expressions of gender. All that stands between us and that project are inadequate theories of gender, the dogmas of empiricism, and a good deal of political struggle. (p.57)

Other feminists such as Evelyn Fox Keller (1985) take a similar standpoint as Harding with respect to the origin of knowledge being gendered:

The most immediate issue for a feminist perspective on the natural sciences is the deeply rooted popular mythology that casts objectivity, reason, and mind as male, and subjectivity, feeling, and nature as female... One can argue that it is precisely this division that is responsible for two notable omissions in most social studies of science. First is the failure to take serious notice not only of the fact that science has been produced by a particular subset of the human race – that is, almost

entirely by white, middle-class men – but also of the fact that it has evolved under the formative influence of a particular ideal of masculinity... Just as science is not the purely cognitive endeavour we once thought it, neither is it as impersonal as we thought: science is a deeply personal as well as a social activity (p. 7).

In *Nature's Body: Gender in the making of modern science* (1993) by Londa Scheibinger, the creation and evolution of science is examined through a historical feminist perspective. "What I have tried to show is that knowledge was shaped by patterns of inclusion and exclusion from the scientific community and, more importantly, by the social and political struggles shaping those patterns" (p. 210). We know today that the exclusion of women in medical/scientific experiments have created serious health problems for women. For example, some drugs used to treat heart disease have a positive effect in men but can cause harmful effects to women. It is only in 1986 that "the US National Institutes of Health initiated a requirement that grant applications include female subjects in medical testing and research" (p. 211). Recently Canadians recognised the need for research in women's health: For example, Ruth McPherson from the University of Ottawa Heart Institute received one of the first research chairs in Canada for the study of heart disease in women.

In summary, the difference model explains why women do not 'culturally' fit in the scientific community. Because the scientific culture is based on male values, women face difficult challenges in terms of becoming enculturated. It is not the science itself that is challenging to them, but the cultural conditions in which science is to be done that can be most grueling. If science becomes more inclusive of women and of other minorities, not only in terms of numbers but also in terms of 'other' values, a culture change within the

scientific community would most likely follow, thus changing the nature of what we now know as traditional science. If science can become more inclusive rather than exclusive, then scientific knowledge would most likely benefit a greater proportion of humanity.

2.3 Career patterns of women and men scientists

2.3.1 Promotion and Tenure

For decades studies have looked at women in academe and their ability or inability to succeed in academe. The following studies have demonstrated that women's experiences are different than those of men in many respects:

Female faculty, as compared to male faculty, report more stress (Brown & al., 1986), less satisfaction (Project on the Status of Women, 1986), lower self-efficiency as researchers (Landino and Owens, 1988; Schoen and Winocur, 1988), lesser likelihood of promotion (Astin and Snyder, 1982; Aisenberg and Harrington, 1988), salary disadvantage (Astin and Snyder 1982; Sandler, 1986; Schoen and Winocur, 1988) and a higher drop out rate from academic life (Project on the Status and Education of Women, 1986). Thus, studies point to the likely presence of gender differences in level and type of satisfaction, stress, and other personal and work environment variables salient to the academic career.(cited in Thoreson, R.W. & al., 1990, p.194)

The results reported by these studies are approximately 15 years old. But as will be demonstrated by more recent studies these differences in career development and satisfaction between men and women in academe remain.

One recent and important study by Sonnert and Holton (1996) demonstrates that women scientists still face major career challenges except for in the biological sciences: “In Biology, our group of women appeared to have passed a threshold. There were no statistical differences in their career progress through the academic ranks, compared with their male cohorts. However, great gender disparities were found in physical sciences, mathematics and engineering, even in our elite sample” (p.66). Sonnert and Holton (1995) claim that, since women biologists have reached a ‘critical mass’, gender stratification within the discipline seems to have been attenuated. They suggest that because of their higher number within the discipline, women in biology may not be seen as outsiders or strangers to the same degree as women in other sciences. They do not however provide an explanation of how this critical mass has reduced problems associated to gender within the discipline of biology, and how this critical mass was attained. According to Jane Z. Daniels, while Director of women’s programs at the National Science Foundation (NSF) in the United-States: “Traditional areas of science for women [biological and life sciences] are still those areas where there is the most growth. There is not a lot of change in physics, geology , and engineering. Those are the ones where the stereotypes have been preserved” (cited in Holloway, 1993, p. 96).

Tierney and Bensimon (1996) found in their study as with others that women entering academe do not have the same experiences as their male colleagues:

The studies have a familiar ring in that they reiterate circumstances that have contributed to women leaving the academy before the tenure decision (Bronstein, Rothblum and Solomon, 1993), publishing less than men (Astin and Davis , 1985),

taking longer than men to achieve tenure and promotions to associate or full professor (Bentley and Blackburn, 1992), lacking characteristics associated with exemplary newcomers (Boice, 1992), and to gravitate toward “intentional intellectual communities” (Gumport, 1990) in search of academic and social support. (p. 100)

Tierney and Bensimon (1996) speak of the ways women must adapt or behave in order to survive in academe. They talk about women doing ‘smile work’ and ‘mom work’: smile work being strategies that women take in order to fit into the department “with a tradition of male dominance” (p.83). Essentially women doing smile work do so by agreeing with their colleagues even if they disagree. “Women who felt pressured into being accommodating spoke of feelings of powerlessness, loss of self, and lack of self-confidence” (p.84). Doing mom work is another form of accommodation that women engage in but it relates to behaviour that can be identified as nurturing such as taking care of students and doing menial work that other faculty do not want to do. For example, Tierney and Bensimon report that:

Studies of women in academe (Aisenberg and Harrington 1988; Turner and Thompson, 1993; Clark and Corcoran, 1986) report that female graduate students and beginning faculty are frequently not part of professional and social circles in which newcomers learn about the non academic aspects of being a professor, such as how to negotiate one’s salary, travel funds, release time, and equipment. Similarly, studies report that when women enter the academy as tenure-track faculty, they often remain outside the social and professional networks and

therefore they are less likely to know the unstated criteria that senior faculty use in making decisions about tenure and promotion. (p. 87)

To further support this, Joan Scott says: “The low number of women at senior ranks (in science) directly discourages young women and means there are few women to pass on advice regarding successful women’s (as opposed to men’s) careers” (University Affairs, May 1995, p. 17).

One Canadian study has looked at the reasons why women leave or “exit” academe. Tancred and Hook Czarnocki (1998) interviewed seven women who had left academe – according to their results the reasons for leaving were as follows:

... three described workplaces that were intolerable for patriarchal or harassment reasons; two spoke of discrimination within academia and the pull of the new workplace which had much to offer them, and two gave the competition between family and academic obligations as their main reason. (p. 123)

Generally speaking women do not have the same career patterns as men when in academe, especially when their department has been traditionally male. Women who stay in academe eventually get tenure and promotions but often at a personal cost. Women must often compromise their self-respect by doing smile-work and mom-work so as to look as if they are fitting in. It seems that these women need to use more energy than their male colleagues just to achieve the same goals.

2.3.2 Balancing academic careers and family life

Women scientists who are also mothers have a double role that most of their male colleagues who may also be fathers do not need to contend with. Since the second feminist movement, women have increasingly entered the work force but they have also kept, for the most part, their traditional responsibilities associated with being a wife and a mother. In the academic setting, taking on all of these responsibilities is most challenging:

Finally, the women firmly stated through their actions that triple responsibilities – work, husband/partner and children – are beyond realistic expectations, and this prompts one to ask whether the nature of the work responsibilities, rather than personal responsibilities, could not be modified. In the academic setting, many respondents felt they could handle either the teaching or the research responsibilities, in conjunction with domestic obligations, they could not cope with both. (Tancred and Hook Czarnocki, 1998, p.131)

In the study conducted by Tierney and Bensimon (1996), women also reported having difficulties in the dual role of academic and mother. Some women reported that they felt uncomfortable to even mention issues related to their children while at work. One woman was told by a male colleague when she announced that she was expecting her second child: “Don’t you know about birth control?” (p.91); another woman who had brought her infant to work on a few occasions was faced with disapproving male colleagues who were concerned that the department was becoming a “daycare center” (p.91). These examples demonstrate that the academic culture is not quite ready or willing to accept a new set of values. Tierney and Bensimon (1996) remark that:

While all the institutions in the study have made progress in terms of hiring women faculty and bridging the gender gap, the culture of the institutions and departments in some critical ways still operate according to norms from a time when the prototypical professor was a white male whose wife stayed home and took care of their children. (p. 93)

According to Pattatucci (1998):

Until the extra stuff women in science confront is acknowledged and addressed by the scientific community, accompanied by the establishment (or revamping) of institutional policies concerning recruitment and retention, slowing the tenure clock, crediting mentoring functions in tenure reviews, women will continue to be under represented in scientific disciplines. (p. 13)

As academic men become more and more interested and involved in childcare then real culture change within academe may evolve so as to be more inclusive of women's values. For example, one Ontario university recently changed its policy on parental leave: prior to 1999 fathers could only take a few days of leave. The new policy now reflects the emerging trend of men taking regular parental leave while their wives continue with their careers. This shift has just begun and it remains to be seen how other male colleagues will react to this attitude. One male, a scientist, who had requested to take parental leave a few years prior to the new policy was in place was denied this opportunity. It remains to be seen how many male scientists or academics will actually request parental leave and those who choose to do so, will they encounter the same challenges as women?

In summary, the various studies and anecdotes presented in this section illustrate the dilemma that women face when they choose to have a family while being a scientist. Those who choose to take on the dual or triple role usually do so at a great risk; that is, they compromise their ability to succeed professionally and on a personal level they compromise their well-being.

2.4 Statistics of women in science in Canada

This section demonstrates the trends of women in science, graduating from university with doctorate degrees and the number of women holding faculty positions. The purpose of this section is to illustrate the slow increases in the percentage of women in academic positions from 1990 to 1997.

Table 2 reflects the number of women granted doctorate degrees by major discipline from 1995-96 to 1997-98. When compared to all disciplines women graduating with doctoral degrees in science and engineering are still far below the percentage of women graduating from the humanities and social sciences. Women represented approximately 34% of doctoral degrees earned in Agricultural and Biological sciences, 17% of doctoral degrees in Mathematics and Physical sciences, and 10% of doctoral degrees in Engineering and Applied sciences.

Table 3 and 4 represent numbers and percentages of full-time professors in the various disciplines of science. Table 3 compares the number of women professors in the academic year 1990-91 and 1996-97. Because the early 90s were difficult years for academic institutions in terms of budget cuts, lower funding from granting councils, and

early retirement, there are less full-time professors in 1996-97 (7,005) compared to 1990-91 (7,464). Table 4 demonstrates how from 1990 to 1997 there is a decrease of 641 males in the system (in science) and an increase of 174 women. Overall the percentage increase of women scientists in academe only represents 3.2% over a period of 6 years. At this present rate, which is .5% increase of female faculty per year, if this low rate continues it would take 72.4 years before achieving 50% of female representation in the realm of scientific academe, the present situation being at 13.8% (1996-97).

In the near future there will be a large hiring spree in Canadian universities due to several factors such as an increased commitment from the government in research and development. Since 1998 the Federal and provincial governments have announced a series of initiatives to increase research in Canada and to keep the 'good brains' from going south, with programs such as the Canadian Foundation for Innovation (CFI), the Premier's Research Excellence Awards (PREA), and the 21st century Research Chairs. Other factors also include a large portion of retirees and a projected increase in the student population. There are thus great opportunities in Canada, at the present time, to focus on hiring more qualified women in academe.

Table 2.**Women granted doctorate degrees by major discipline, 1995-98**

Discipline	95-96 No. of women	95-96 % of total	96-97 No. of women	96-97 % of total	97-98 No. of women	97-98 % of total
Education	187	53.7	218	60.1	232	62.4
Fine & Applied Arts	16	40.0	14	42.4	24	49.0
Humanities	155	39.2	212	44.5	217	46.0
Social Sciences	295	42.7	295	42.6	332	48.6
Agricultural & Bio. Sc.	151	34.2	164	35.7	160	34.1
Engineering & App. Sc.	63	9.4	73	11.2	64	9.5
Health Professions	158	38.7	199	43.5	236	49.0
Mathematics & Phy. Sc.	115	17.3	135	18.4	116	16.9
Total all disciplines	1165	31.4	1335	34.0	1395	35.6

Source: Women in Post-Secondary (1999 SWC Supplement) from Statistics Canada

Table 3.**Full-time professors in science in Canadian universities**

Year	1990-91	1990-91	1990-91	1997-97	1996-97	1996-97
Discipline	Male	Female	% fem	Male	Female	% fem
Agri. & Bio. Sc.	1646	379	18.7	1534	434	22.1
Vet Med & Sciences	314	54	14.7	278	77	21.7
Biochem.	210	29	12.1	212	35	14.2
Chemistry	855	69	7.5	760	80	9.5
Comp. Sc	746	72	8.8	678	94	12.2
Geology	537	28	5.0	486	53	9.8
Math	1382	121	8.1	1227	149	10.8
Physics	984	38	3.7	860	48	5.3
Total	6674	790	10.6	6035	970	13.8

Source: Statistics Canada, 1998

Table 4.**Comparing the number of male and female professors from 1991 to 1997**

Discipline	Difference in number of males from 1990 to 1997	Difference in number of females from 1990 to 1997	Diff. in percentage of females from 1990 to 1997
Agr. & Bio. Sc.	-112	35	1.7
Vet. Med & Sciences	- 36	23	6.9
Biochem.	2	6	2.1
Chemistry	- 95	11	2.0
Comp. Sc.	- 68	22	3.4
Geology	- 51	25	4.8
Math	- 155	28	2.7
Physics	- 124	10	1.6
Total	- 641	174	3.2

Chapter 3

Design and Data Collection

There are two phases in this study. The objective of the first phase is to evaluate the enculturation process of new faculty in science within a gender perspective, that is, comparing the enculturation experiences of men and women scientists during their first year in a tenure-track position. The objective of the second phase of the study is to explore key enculturation issues for women that arose from the data collected during the first phase.

3.1 Phase I: The enculturation process

3.1.1 Model of the enculturation process

This study used the enculturation model developed by Rosch and Reich (1996) (See Appendix A - diagram of the model). The enculturation model of organizational entry developed by Rosch and Reich (1996) has four stages, they include: 1) the pre-arrival stage, 2) the encounter stage, 3) the adaptation stage, and 4) the commitment (vs individuation) stage. This model examines the ways in which different academic disciplinary cultures select, socialize, and express institutional culture to new faculty members. The model also evaluates the degree to which the professional identity is adjusted during the enculturation process. Rosch and Reich's study had two major goals: to evaluate the model for its accuracy in 'measuring' the departmental culture, and to compare the enculturation experiences of new faculty in different departments. Two sets

of subjects were used in their study: current faculty (termed as secondary subjects) and new faculty members (termed as primary subjects). Their research design used a questionnaire (DeVries, 1970) to evaluate the degree of similarity or differences of institutional ideology between disciplines (departments) and to enable current faculty members to describe their perception of the institutional and departmental culture. Interviews, logs, and observation techniques were used to record and compare the enculturation experiences of three newly hired faculty members: two in the social sciences, and one in the humanities (the specific disciplines are not mentioned). There is no mention of gender in the study.

The present study used the established enculturation model so as to evaluate the enculturation process of new faculty. However, in this study the model is being used to evaluate a new variable: gender.

The following is a description of the enculturation model:

The pre-arrival stage:

The pre-arrival stage reflects the individual's predispositions prior to entering the new setting (the department). According to Cornwall and Grimes (1987), during graduate school, individuals develop a professional identity (values) which is acquired through extensive and intensive formal education, and once this is acquired it remains fairly stable over time. Rosch and Reich's (1996) evaluation of the enculturation model demonstrates that the values acquired during graduate school provide a perspective for interpreting experiences in the new setting. Their study also demonstrates that the professional identity does not remain stable over time: "While professional values

remained relatively constant, role orientation [or professional identity] shifted as faculty assimilated to the new setting ” (p. 124).

The encounter stage:

The encounter stage illustrates how the newcomer’s predispositions interact with the expectations vis-à-vis his or her new setting. This period is full of questions and reappraisal for the new faculty member; it is a sign of transitional learning which can either support or confuse the newcomer in his or her professional role. Rosch and Reich’s (1996) results illustrate that during the encounter stage, “New faculty were preoccupied with three development tasks: forming general impressions of the work setting, defining institutional expectations, and developing goals for what (they believed) performance expectations would be during the first academic appointment year” (p. 1. 25).

The adaptation stage:

The adaptation stage addresses the ongoing adaptation of the newcomer. Socialization of new faculty happens through formal and informal learning opportunities, and is “encouraged or inhibited through three dimensions: the work itself, the climate in which work is performed, and the network of social relations surrounding the work” (Rosch & Reich, 1996, p.122). According to the results obtained by Rosch and Reich, encouragement provided by other members varied considerably from one department to another. The data suggests that in the departments where work environment, faculty morale, and general climate were low, the assimilation process for the new faculty member was difficult; and in the departments where work environment, faculty morale, and general climate were high, the new faculty members had a positive experience while adapting to

the new environment.

The commitment vs individuation stage:

It is during the commitment stage that enculturation occurs. As the newcomer takes part in daily experiences within the new environment, preconceptions are challenged and a cognitive and/or emotional response occurs. At this stage the new faculty member can either experience attachment or individuation. Attachment occurs when the person's response is to acquire a new self-image congruent with his or her environment; individuation occurs when the person's response is to question the organization's attempt to alter his or her self-image. Rosch and Reich's (1996) study demonstrated that, "New faculty reported learning about the culture of their departments through conflicts they observed or heard faculty discuss in informal and formal meetings (sociocultural influences)" (p. 127). An important point found through their study is that new faculty who experience dissatisfaction during the enculturation process do not necessarily show a decreased performance, just as a satisfactory experience does not necessarily lead to increased performance.

3.3.2 Selection of subjects

The subjects in the first Phase of the study are identified as primary subjects. In order to find available subjects, the same two departments, biology and physics, of all Ontario universities were contacted so as to inquire if there had been a new hire in a tenure-track position. Most times this was discussed with the departmental chair and the objective of the inquiry was explained. When there was a new hire the name of the

individual was given. Two different departments were investigated so as to explore various options prior to the study: physics only had 2 male hires in Ontario, 'biology' had approximately 6 hires in tenure-track positions, there were also many new hires in contract short term positions (3 females and 3 males). It is difficult to say however that there were exactly six hires in 'biology' since the universities have various departmental divisions within the discipline of biology (e.g. Zoology, Botany, Microbiology, etc). Not every department related to biology was contacted.

Four primary subjects were chosen from the list of 6 individuals in a discipline related to biology: 2 male and 2 female scientists from different universities of the province of Ontario were selected by priority of shortest travelling distance required for interviews. The subjects were initially contacted by telephone, informed of the study and asked to participate. All subjects who were contacted accepted to participate.

3.1.3 Data Collection

The primary subjects were interviewed six times over a period of 12 months, from October 1998 to October 1999. All interviews were done in person at the subject's convenience. The last interview was done by telephone due to personal circumstances (unable to travel). All subjects were presented with the Consent Form (see Appendix B) at the beginning of the first interview.

Interviews were structured and open-ended. Interviews were conducted in the subjects' office. The first interview dealt with the pre-arrival stage. Ideally this interview should have been done prior to the starting date of employment, however, this was

impossible due to the logistics of finding these subjects before they were hired. The second interview dealt with the encounter stage, and the subsequent four interviews with the adaptation stage and the commitment/individuation stage. A series of questions remained constant from one interview to another for all primary subjects. This provided a basis for comparison from one session to another and between the primary subjects. Open-ended questions varied from one subject to another depending on their experiences. All of the interviews were recorded and then transcribed. (See Appendix C - Interview Questions: Phase 1)

The names of the subjects and of their institutions will remain confidential to protect their identity. All transcripts and recordings will be kept in a secure and confidential area until deemed necessary for thesis defence and publication purposes. The information will then be carefully destroyed.

3.2 Phase II: Exploring key enculturation issues for women scientists

The data obtained through the first phase revealed some specific patterns and perceived gender differences. Four additional female subjects, termed as secondary subjects, were chosen so as to verify and expand on the emerging patterns from Phase I. Although the men and women in the first phase seem to encounter similar experiences at an external level, interesting differences were found with respect to how these experiences were incorporated and emotionally expressed.

For example, both female subjects in the first phase of the study compromised their academic careers due to family issues. Thus it was important to interview other

women scientists who had recently joined the academic community. Four females in tenure-track positions ranging from one year to two years were interviewed to explore key gender issues. These four female subjects were approached without preconceived expectations and they were chosen from various disciplines in science and engineering. The Deans of Science and Engineering of two local universities were contacted and asked about their new female hires in the last two years. Four of these candidates were randomly chosen and then invited to participate, all four accepted.

Each secondary subject had one interview which lasted approximately 2 hours. The interview was done in their office at their convenience. (See Appendix D - Interview Questions: Phase 2)

The same ethical considerations were given to the secondary subjects as described in Phase I for the primary subjects.

Chapter 4

Data Analysis and Discussion

4.1 Description of process for data analysis

Interview transcripts were subjected to analytical induction and constant comparison (Lincoln & Guba, 1985; Patton, 1990). The six interview sessions with the primary subjects were read 3 times, themes based on topics that emerged freely, or as answers to interview questions, were extracted and compared between genders. Comments made in one part of an interview session by a subject were related to comments made during different sessions, if they touched upon or developed the same theme.

Comparisons between men and women, the focus of the study, were made constantly. Themes that emerged (e.g. interactions with colleagues, family dynamics) were considered important if mentioned by (or in some cases, elicited from) all four subjects.

The results of these analyses are presented below for the four stages of the enculturation process by interpretive analysis, supported by extracts from the interviews.

Themes emerging from each enculturation stage will be presented and discussed in terms of external and internal dimensions. At the end of each stage a brief summary will be provided and section 4.2.7 will provide a table summarizing the perceived gender differences and similarities with respect to internal and external dimensions during the enculturation process for the four subjects.

Data from the second phase of the study will then be presented and discussed. The data for Phase 2 is taken from interviews with four additional female subjects (termed secondary subjects). Key enculturation issues for women are explored and discussed in this section.

4.2 Phase I of the study: The enculturation process

4.2.1 External and Internal Dimensions

Phase one of the study looked at how primary subjects progressed from one stage to another within the enculturation process, starting with the pre-arrival stage, and then progressing to the encounter stage, the adaptation stage and finally to the commitment or individuation stage. During the interviews of primary subjects it became apparent that there were two dimensions within the enculturation process, one being internal and the other external.

The *external dimension* can be defined as being the physical interaction between the newcomer and the organization, which is defined by the subject's daily interactions with colleagues, the working conditions, and the work climate. The *internal dimension* can be defined as the interpretation, incorporation and expression of these experiences. These dimensions are not addressed in the same fashion by Rosch and Reich (1996), who speak of external stimuli and choice, and of internal thought and internal response as being part of the socialization process. However these elements are not discussed nor described. Rosch and Reich (1996) focused their attention on the content and process dimensions. They defined the content dimension as being the institutional culture or work environment and the process dimension as the way new faculty are socialized. Finally, their approach to the study of the enculturation process was through a socio-cultural lens. The present study has added a psychological and gender dimension to the enculturation model developed by Rosch and Reich (1996). As themes emerged in each stage of the enculturation model these were either defined as being part of the external or internal

dimension. When the theme related to feelings, self-evaluation and introspection it was identified as being part of the internal dimension, thus relating to the psychological process of the individual during enculturation. When a theme mostly described events or activities such as the hiring process, number and type of interactions with colleagues it was identified as being part of the external dimension, thus relating to the socio-cultural dimension of enculturation. Then both internal and external dimensions were compared between genders.

4.2.2 Profile of primary subjects

Table 5.

Profile of primary subjects

Subjects	Jane 1	Jane 2	John 1	John 2
Personal data	Age: 39 Status: Married; 2 children not hers - school age; husband works in industry	Age: 40 Status: Married; has two children school age; husband works in industry	Age: 40 Status: Married; has one child; wife is at home	Age: 39 Status: Married; has three children; wife is at home
Type of environment based on comments made by subjects	supportive chair; unsupportive colleagues except for a few; medium sized university	neutral chair; tense climate in department; large university	very supportive chair; supportive colleagues; small university	very supportive chair; supportive colleagues; small university

4.2.3 The pre-arrival stage

Before starting as a tenure-track professor, all subjects had gone through graduate and post-graduate training and had acquired a level of experience in academe. According to Rosch and Reich (1996) the values acquired throughout this training will provide the framework through which the subjects will interpret their experiences. Before entry into a tenure-track position, the primary subjects had already made choices with respect to the direction that they wished their careers to take. In the case where academe is the career choice, the pre-arrival stage can be seen as the preparatory path to academe, the experiences, the steps and choices taken by the individuals so as to be hired in a tenure-track position within a given university.

External Dimension:

Experiences at the graduate and post-doctoral level

Experiences at the graduate and post-doctoral level for both women and men were very similar. The women did not mention any experiences of discrimination or harassment from colleagues or advisors. In fact the experiences seemed satisfactory to all subjects:

At graduate school we were 50/50 (gender) as students, but (the gender of) professors were more male-biased. My advisor was a wonderful person, we became really close and remain really good friends. He was like a father figure to us. (Jane 1, session1)

I did well at the graduate level. The supervisor was male and he always had female graduate students, I don't know why... it was always a big joke in the department. It was not because he was a weirdo or anything like that, I think that he did have two male students before that were unsuccessful for whatever reasons, perhaps there were personality differences. (Jane 2, session1)

It was wonderful , and I was lucky in the supervisors that I have had. It took some effort to see if I could get along before deciding to work with them. I was older than my other colleagues going through the system at the same time. I did not require as much day to day mentoring hands-on from my supervisors. (John 1, session1)

John 2 does not mention much about his experience as a graduate student because he did his graduate work through his job while working for the government. His experience was not in an academic setting.

Internal dimension:

Path to academe

The path to academe is influenced by the interaction of cultural, social, and individual factors. The combination of these factors gave women and men different perspectives on their career choices. The two women were faced with making difficult decisions with respect to family issues and career plans. This was not the case for the two men. The following citations illustrates the dilemma that the two women faced with respect to career and family issues:

So I took the job, and it was a wonderful job, they had a great department there. I felt very welcomed, I felt that I filled a role, it was a little stressful because I felt that I had to prove myself. I liked that job immensely, I enjoyed the teaching and I got great teaching evaluations and my relationship with the graduate students was just wonderful. Then I looked around and thought OK I am 36 and what do I have? You have the job that you always wanted but you are single, you have no family, you have no children and the biological clock went dong. ... and so I just quit my job, and then I decided to become a writer, a textbook writer. (Jane 1, session 1)

What is interesting to note with respect to Jane 1 is that she was an outstanding researcher moving towards a promising and successful career in the traditional definition of the term, that is plenty of publications, awards, grants, status, and peer recognition. She obtained an NSF grant (Natural Science Foundation) for her post-doctoral studies, won a prize for the best published paper following her post-doctoral fellowship, obtained a Women's Faculty Award for her first tenure track position in Canada, and after a year and a half went to the US to a high profile university. Regardless of her abilities as a researcher she felt that she was unable to combine a traditional academic career with a family life. Jane 2 also came to this conclusion following her experience as a postdoctoral fellow.

I found that when I was doing my PhD that it was very intense, I don't know if this is just me or if anyone can do this in a 8 hour day, but I certainly couldn't. So as I

was working and trying to maintain a marriage as well, I decided at the end of the post doc that I did not want my career to run my life. I would rather have my career work its way around my life. That was a big decision, and I felt like a failure. (Jane 2, session1)

Jane 2 also tried to bring some changes to her work place so as to be able to combine her academic career and family life. Jane 2 had a child during her post-doctoral fellowship:

I brought up the possibility of doing a work-share. There were two post-docs that wanted to work part-time and who were willing to share the work and get full-time post-doc work done. They thought that it was a good idea but that it was just too weird. When I was there it was also very hard to find female mentors. I would speak to women, how do you do it? I spoke to this great female chemist. She talked about balancing her life, and when I asked her if she had children she said 'oh no I would never have children'. And the supervisor I had, I asked her about having children and she responded that by the time she came around to thinking about having children that she was past the age to bear children. Just trying to establish herself and getting things going, it was never in the ball park to have children. (Jane 2, session1)

Both women did not have other women to serve as role models for them, that is, women who are combining and managing an academic career and family life. In fact, this type of 'model' does not seem to be prominent within the academic arena.

It is within the internal dimension that a difference was found between the women and the men. The two men were able to have a family without it creating a personal dilemma in terms of making choices between a career and family. They were not forced in making that choice, or even having to consider it. The following demonstrates the men's psychological journey during their path to a tenure-track position:

While I was job hunting, I applied for no adjunct positions because I did not want to subject my family (wife and young child) to moving every year. It has been pretty good since I got my PhD we only moved once which gave my son a very stable environment to grow up in. My wife has been working at home. She has a graduate degree in science and because of gender biases associated with being a female as a graduate student, my wife left academia and went off to do another degree in a different discipline while I was doing my PhD in the States. She has been an at-home mom since we had our child in 1995. It has been easy because she has not held a job, but we are also thinking and talking about her future. (John 1, session 1)

I was teaching undergraduate labs for a while in 1990 that is when I became a PhD student. Before I finished the degree I was hired as a wildlife biologist by the federal government and I spent 4 years there. I finished my degree 8 months after I had moved. There were drawbacks in working for the government so in 1997 I started looking for another job and this is how I ended up here. I had applied to

three universities. My goal was always to be in academe. I like the combination of both teaching and research, it is hard to juggle both, and I also wanted to move somewhere like here for it was a good move for the family. (John 2, session 1)

The two women in this study experienced a lot of personal turmoil in trying to reconcile family issues and career objectives. In this particular case both women made a conscious decision to reduce their career expectations and to leave room for their family life. Jane 1 chose an academic career but with a 9 to 5 approach, while Jane 2 chose a teaching-only tenure-track position. Unfortunately these women did not come to these decisions feeling good about themselves, in fact both expressed feelings of failure along the way:

I would rather have my career work its way around my life. That was a big decision, and I felt like a failure. (Jane 2, session1)

Actually I did not really want to apply at that time (for the actual position), and when I did I felt like a failure because I really wanted to change my career and become a writer. (Jane 1, session 1)

It would appear that these two women did not experience any gender discrimination in terms of behavior, but instead were faced with a cultural clash between their values and those of the scientific culture. That is, there was no room for their experiences or 'feminine' values within the scientific community. What they seem to face is a sexist environment, that is the attitude towards discrimination. These attitudes can make women

feel inadequate or inappropriate with respect to their choices and behavior. Because of the androcentric nature of the scientific culture, these two women were forced to make a choice between the 'traditional' academic career and family life. This is well supported by the literature of women in science as shown in Chapter two. The following quote is an example of how a sexist environment can make women feel uncomfortable or inadequate with respect to their choices and behavior.

I have talked to other women who have children, and we feel that the reaction is like we just get written off. OK she made her decision, she is having kids and so she is not a really serious scientist. It might be that. If you are a serious scientist, you love your science and put kids second. Of course, the men have the wives who take the time off to have the kids, its easy for them, they don't have to put their science second ever. I get the feeling that you are not a serious scientist if you take time off with the kids. (Jane 1, session 5)

Both female subjects feel that many women that they know have had to make similar choices and a great number of them have not pursued academic careers even if they were well qualified to do so:

There is some interest in getting some insights in talking to women that are 'post-docing' and doing instructing positions because this is where a lot of women are dropping out of the system, because they can't do both the career and a family. (Jane 1, session 2)

I have met women who are doing a PhD with no thoughts of doing research or doing an academic career, but with men they are usually on a track and that is what they are going to do. That has been my experience. (Jane 2, session 3)

Summary of the pre-arrival stage

During the pre-arrival stage it appears that the two men and the two women experienced similar events in terms of graduate school and post-docs. The main difference between the men and the women is how these experiences were integrated. The two women came to the conclusion that a successful research career excluded the possibility of having a family life. Because the demands of a traditional career in science are so great they felt that they had to change their professional goals to leave room for their personal/family life. In one case this meant taking a teaching-only tenure-track position and leaving research behind, in the other case it was taking a 9 to 5 approach to her academic career which will most likely limit her success in academe. Both women have compromised their initial professional goals so as to achieve some balance in their life. The two men also aware of the demands of their careers and the impact on their family life did not compromise their professional goals. Balancing the academic career and family life will be further explored and discussed in the adaptation stage.

4.2.4 The encounter stage

The encounter stage deals with the individual's "preconceptions formed during recruitment and selection" process (Rosch and Reich, 1996). At this stage the newcomers are confronted with the culture of their new environment. They try to identify what is expected of them and what is acceptable behavior.

External dimension:

Interview process

Although each university has slightly different procedures for hiring new faculty, the process in general was similar for all of the subjects. They had a presentation to do, they were interviewed by the selection committee and other faculty members. It would appear that there were no gender differences in the hiring process for these four subjects. It is interesting to note however, that for the teaching-only tenure-track position there were only female candidates called in for the interview. It is impossible to say, however, if this was a coincidence or part of a plan. It would appear from Jane 2's comments that a woman was wanted for the position which would be consistent with overall recruitment efforts to hire women in academe.

The selection committee was all male. All of the five candidates were women. Two of us were internal and the others were external. The assumption is that they would be hiring a woman for this position because of all of the concerns of equity issues and because the other teaching job is a man, I think that hiring another man would have looked bad on the department. If you asked the committee they would probably tell you that they just chose to interview the most qualified people which

happen to be women, but I am not sure that this is would be true. (Jane 2, session 2)

Out of the four subjects' hiring committees this was the only selection committee which was all male, which seems unusual by today's standards. Most universities tend to have at least one female representative on a selection committee. Since this department has approximately 7 women on staff, it is surprising that no female representation was present during the interview process. The expected role of a female representative on a hiring committee is to ensure equity and to neutralize any gender issues which may influence the decisional process.

Hiring conditions

In terms of salary and start-up funds all candidates were satisfied with what they were offered. Only one of the subjects (John1) negotiated for his salary and start-up funds, while Jane 1 negotiated the time at which she would obtain tenure due to her former academic experience. Although there is some variance in the salary range, the salaries are commensurate with the cost of living of their respective cities.

My mom (an academic) told me that she started with a smaller salary than her male colleagues as a result of not knowing how to negotiate. So I negotiated like hell when I was doing this. They had offered 50 thousand for start-up funds and I negotiated them up to 70 thousand. Starting salary, they claim is not negotiable,

they have a ladder system here. It depends on number of years of experience. That is true. But what you can negotiate is where you can start on the ladder. They offered me 3rd place on the ladder, based on my post-doc as prior years but I had 4 years before that, so I negotiated this so I am on the 4th ladder. My starting salary is \$53,000 to \$54,000 I can't remember exactly the amount. So in the negotiating process I said that the 70 thousand was OK if I got support from the granting agencies, but in the event that I did not get anything, then we could negotiate again for some extra funding. (John 1, session 3)

I did very little negotiating because I realized that I had no power. I had already bought a house here. They could have offered me \$30 000 and I would have done it. They offered me \$54 000 which I thought was reasonable. What I tried to do was negotiate for tenure, for a quick tenure position and they said sure. Start-up funds were more than adequate because I don't have a lot of big needs. ... They also have a lot of equipment, there's a lot of stuff I didn't have to buy. (Jane 1, session 3)

The differences between the subjects with respect to hiring conditions appear to be related more to personality, one male and one female subject did some negotiating, while the other two subjects, one male and one female did not negotiate. It is interesting to note that the only subject who felt that he had some real negotiating power was John 1, while the other subjects seemed content with what ever was given to them – just grateful to be

offered the position. In fact, John 2 even took a \$5000.00 salary cut from his former job with the government. John 1 had a small advantage in playing the game since his mother is an academic and she gave him advice and support in this process. Although the primary subjects of this study did not experience any problems in the hiring process John 1 did report that one of his female colleagues complained of gender discrimination while looking for work:

She was telling me her stories of her academic challenges about the way she was treated. She has not related any stories about her academic career here, with respect to gender bias. But she definitely experienced that in her job search. Much of it was subtle, a lot of people might say that it does not mean anything, but that is an assumption. It was the way she was treated by certain people. (John 1, session 3)

In another discussion with his female colleague John 1 reported that:

She often made the case (to the department) during my position search that a female be brought in during the selection process to demonstrate to graduate students that there were no gender differences, and the department did not do this arguing that there was not enough money, and that the top candidates were men. But she thinks that there are other long term costs in this type of approach... perpetuation of gender stereotypes. (John 1, session 3)

These few anecdotes from John 1 seem to suggest that there may still be some gender discrimination practiced in universities. In informal discussions with scientists (male and female), it has been admitted on a few occasions, that senior male faculty have a tendency to hire young male scientists who are a younger reflections of themselves. Programs such as the University Faculty Awards attempt to circumvent such tendencies by giving financial incentives to universities who will hire women in science and engineering.

University Faculty Awards were created to encourage universities to hire women in areas which they are under-represented, science and engineering. This recruitment initiative is supported by the National Sciences and Engineering Research Council of Canada. The program was first initiated in 1990, cancelled in 1995, and reinstated in 1999. The fact that such a program exists and was reinstated illustrates that it is recognized that there is a need to intervene from the outside to help change the ratio of women in these disciplines. Without the strong incentive of money, 5 years of paid salary by the UFA, it is possible that women scientists would not be hired as readily. This program has been attacked by several individuals, men and women, who find this to be discrimination against men and a threat to the standards of science, this sentiment has been expressed by Doreen Kimura, president of the Society for Academic Freedom and Scholarship (SAFS) in a public letter addressed to Tom Brzustowski, president of NSERC in 1999. According to Innis Dagg groups such as the SAFS “are adamant that they alone know who should be professors, and it seems that these professors should think and act and be very like themselves – usually white, middle-class, heterosexual and male” (1998,

p.112).

Jane I was a recipient of a WFA for her first academic position, although it was an excellent program to recruit her into academe it was not sufficient to keep her there. Because the number of UFAs per year is relatively small (23 in March 2000), it will not on its own significantly increase the ratio of women in academe in science and engineering. What needs to be addressed are retention strategies, but these are more difficult to initiate because they must address the fundamental issues related to women leaving - the problems of managing dual or triple roles.

The University of Ottawa has initiated an interesting program with respect to recruitment and retention of women in academe. In 1994, a "Policy on the pro-active recruitment of women professors" was adopted to: a) promote the hiring of women professors (with a total budget of \$40,000 per year), and b) provide help to women professors in the development of their career (with a total budget of \$50,000 per year). Part (a) of this initiative is geared at recruitment and part (b) at the retention of women faculty. It seems that the budget for part (a) is much too low for recruiting women in science and engineering. In order to be competitive, the institution should be able to offer between \$100,000 and \$200,000 in start-up funds for researchers in the science and engineering disciplines. Part (b) of the policy geared at retention is quite innovative, women faculty who are successful in demonstrating how the funds will help in their career development may receive up to the equivalent in teaching relief. So women coming back from maternity leave or from a sick leave may get teaching relief so as to focus more on research and publications. Since 1994 there have been 11 applications from a total of six

women scientists: 6 applications for research assistants – 3 applications were successful; 1 application for teaching relief (after maternity leave) - the application was successful (this is the only maternity leave that has occurred in the Faculty of Science since 1994); 4 general applications (travel for research and conferences) – one was accepted. There are 14 to 15 successful applications per year since this is all the budget will allow for. In my opinion, this retention program is positive because it seems to help women manage many roles at once, giving them a chance to catch-up especially if they have been away from the campus. The only downfall, is that the program is a temporary solution for most women, it helps them get back on their feet, but nothing has really changed within their faculty.

Denise Gurer (1998) speaks on retention and women in science:

Many programs have been developed in the past few years with the goal of attracting and retaining more women in scientific professions. Many of these programs are good and have achieved varying levels of success. However, as this volume suggests, they do not always get to the heart of the problem – which is that women face more and more hostility and discrimination as they progress up the academic ladder. It is my opinion that one of the leading contributor to the inability of some departments to retain women is their harsh environment. This is particularly difficult to eradicate, because many attitudes and sexist traditions are embedded in the system and perpetuated by faculty... It is crucial that the administration fully support activities centered around creating an academic environment that is less hostile toward women. (p. 168)

Internal dimension:

Priorities and expectations

There is an interesting gender difference in how the two female candidates set their priorities in contrast to the two male subjects. The two females used more of an internal process while setting their priorities. Their work priorities were set so as to keep a balance between their work and home life:

I have a job, I am going to do it reasonably adequately, I'm not going to be great, I don't want to be a superstar, I used to have these super star ambitions when I was a graduate student. I changed because I had no life, when I had the ideal job I had nothing else, no life. I totally flipped and left biology, and changed my lifestyle and thought that I could find a career that would fit into the lifestyle that I want. But now I have come back to the middle. I am back in biology, I teach well, I do research well but I am not willing to go spend 3 months in the arctic for my research. There are limits to what I am willing to do. (Jane 1, session 2)

I am not trying to do great things this year. I am teaching a course for the first time and I am running a lab for the first time that I am not familiar with that are completely out of my area... But again, I will have to wait for being here a little longer so that I can feel that I have the authority to do things like that (make administrative changes). I also have research projects at the back of my head that I would like to finish up. I would hate to just drop them. (Jane 2, session 2)

Both women are saying that they will not be great or that they will not be doing great things because they know that they are not playing the game as they think that they are expected to play it. There seems to be a sense of underlying inadequacy with respect to their priorities, a sense that they are not doing enough, but this is the price that they are willing to pay so that they can keep a balanced lifestyle.

The men were more systematic and enumerative when setting out their work priorities with specific goals in mind. Their goals were also specifically focussed on work:

Getting my NSERC grant out, setting up the lab, and developing the 2 courses that I will be teaching next year. I have to write a wack of papers from my post-doc at ‘***’ before next summer because when field season begins I won’t have any time to write and in the fall I will be teaching and I won’t have any time to write.
(John 1, session 2)

Short-term, to get up and going. I sense that there is a plateau at some point, but some people tell me that there isn’t one. What I mean is that there will come a time where I will be comfortable in the job... in 2 years or so... I am hoping to develop some courses exciting for students and that I am excited about; well structured and coherent that invite students to think and to communicate, do science and perhaps even go on to graduate studies. And with the graduate students, give them some guidance. Long-term, do my research... I don’t know how much I will get done at

this time. Graduate students are really important in this respect. I do have one master's student now. I would like to add 2 or 3 more. (John 2, session 2)

Both men are taking into consideration 'the rules' of the academic game, that is getting their research started, publishing, applying for funding, and teaching well. Their priorities are geared at an external level, that is, connecting with the traditional expectations of the academic community to obtain tenure. The two women are more concerned with their personal well-being while coping with all their responsibilities and not so much with external expectations, their focus is more at an internal level. This is a very important and crucial distinction between the two men and two women subjects of the study: the men are setting the foundation for tenure and a fruitful career; the women on the other hand are setting the foundation for survival. With this distinction, one could argue that the two male subjects are bound to have a more successful career than the two females in this study.

Summary of the Encounter Stage:

Although on the surface both men and women seem to experience similar events during the interview and hiring process, the men and women perceived their choices differently. Both women made family issues an important factor in setting their work priorities; unlike the two men, the women's priorities are not entirely focused on their work but rather on balancing and juggling their triple-role: academic, mother, and wife. The two men, although conscious and uneasy with their low participation in home

responsibilities, are able to fully concentrate their priorities on work strategies leading to a secure tenured position. At the onset the women are disadvantaged because they do not have the same support as the men, that is of having someone at home taking care of family business. The result is that the two women cannot be as focused as the two men with respect to their careers.

4.2.5 Adaptation Stage

The adaptation stage deals with how “the external socialization processes and the initiate’s identification with the organization” is developing (Rosch and Reich, 1996).

During the adaptation stage the newcomer is socialized within his or her new workplace.

This is when the newcomer learns what behavior is acceptable and not acceptable within the work environment. Within academe, it is during this time that the newcomer is initiated to the three components of academic life, that is: research, teaching and administrative duties.

External process:

First interactions with colleagues (during the first two months)

Although there seems to be a sense of isolation for all new professors in the first few weeks, the two men demonstrated greater interaction with their colleagues compared to the two women over the first two months. Many factors aside from gender can explain this difference. The two men are in smaller universities than the two women, and the men have reported their departmental climate to be quite positive. The two women reported their departmental climate to be rather tense. Because these two universities have faced

difficult administrative and financial decisions in the past few years it is very possible that the tense and/or negative climate hinders the natural flow of interaction between colleagues. Rosch and Reid (1996) reported similar findings: “ The data suggested that in the department where work environment, faculty morale, and general climate were rated lowest across the three departments, the primary subject’s assimilation experience was most difficult”(p.127).

No one was around during the summer so I did not have that much contact with my colleagues, except colleague “x” which I knew from before and she has a very marvelous group of graduate students and post-docs in her lab. We get together for lunch every day and we have a discussion once a week where we talk about papers or about the research done by the students. She invited me to that right away. I went 2 times a week in the beginning and now I pretty well go every day, it has become my academic home which to me is very important. I like to be part of a family structure, so you know that if you have academic or personal problems you have somebody that you can talk to and people that can support you. (Jane 1, session 2)

(With respect to departmental meetings) I don’t say a lot, I am only trying to find out what is going on. I feel comfortable. I have not made any major comments I just ask questions or get some clarifications. But I am not afraid to speak. But I will tell you something, there are other female faculty there and generally the

female faculty don't say a word which surprised me. I would like to know why that is. I want to know if they feel that there is just no point for what ever reason or if they just don't have anything to contribute. (Jane 2, session2) *(NB: Jane 2 already knows this setting, but is new in departmental meetings)*

I met many during the interview, others I knew from the literature, and there is the one from my previous relationship at '****'. Since then, I have been meeting them one at a time. Some have come by my office and say lets go for coffee others I meet in the halls. I also volunteered to go up on the research site to collect samples. I have been invited by two faculty (members) to dinner. And I was introduced to the first departmental meeting, much to my surprise there was no sherry or cigars. There was not even donoughts and coffee. (John 1, session 2)

When I arrived here, there was no one around it seemed like everyone was doing what ever they wanted. The first morning I was here I bumped into the (departmental) Chair, a half hour after that I came in, I bumped into a demonstrator who let me into my office... In September I slowly met people, I started to keep a ledger of whom I met and what they did because I don't remember names that well (laugh) so it has taken me a while. One of the problems here is that there is no coffee room, so there is no place where we can meet and just talk. It is a hinderment to interaction. Because I tend to be shy, I keep more to myself. I do leave my door open, but I do not search people out. We really need a

common area for people to sit and talk. (John 2, session2)

In general terms, the two men seem to be more open to social interaction with colleagues in their departments in comparison to the two women, even if John 2 is more a timid type. He likes to socialise but does not tend to make the first move. The different patterns of socialization of the two men and the two women are difficult to explain because it is not clear if the difference is a gender issue or a climate issue or a combination of both.

Whatever the factors involved the end result is that the two men interact more frequently with colleagues than the two women. These interactions are important for one's socialization process and career development. The networking established by these interactions provide the newcomer with informal guidance and clues as to what is expected of them.

Mentors

All subjects were asked if they had a mentor. The women and men responded quite differently. The two women did not have a mentor in particular, they admired certain qualities in different people. This was true for one of the male subjects as well. However, unlike the female subjects, the male subjects interacted with these 'pseudo-mentors' and did obtain some guidance, advice and insight on the cultural dynamics of their department.

I can think of a variety of people for different things but I can't think of one person who would have all of those qualities. (Jane 2, Session 4)

Jane 2 (Session 4) admires the qualities of two of the women in her department one who “stands up to all of those old guys, she’s very aggressive and I admire her for that” and the other “who is not as aggressive but very well spoken and very direct and clear with her thoughts, actually that’s someone that I admire more... I don’t get to see her or talk to her very much.” As an undergraduate Jane 2 did not have any mentors. Jane 1 did not mention that she had a mentor but she has admired different people throughout her career. Having a mentor or a “virtual mentor” seemed more of an issue with the male subjects, it was a theme that came up more often during the interviews with the men in contrast to those with the women.

John 1 spoke of mentors in the last 4 interviews. Here are some of his comments with respect to mentors:

I have this virtual mentor that is composed of a variety of faculty members that I like and respect and that I can communicate with and this is the way I have always operated. So I keep myself going. I am pretty good at searching that out when I need to, and that is really important. So they did not provide me one and so I created one myself in the absence of that. (John 1, session 4)

The deepest relationships that I have here are with the two persons that I am collaborating on for the two courses. This has turned into a most wonderful experience for me... They have been good mentors not just in terms of teaching courses, they have given me enormous perspective on how certain things operate

at the university. Just because I spend time with them, they have become this library of experience, I don't take it all as true... they have been quite good mentors that way, they have listened to me talk and express what I have to say, they have given me a lot of their time. (John1, Session 6)

John 2 spoke of his mentor on two different occasions, he admires this individual for his varied qualities and likes to ask him for advice:

There is at least one person here that I would say I admire. In essence I find university life to comprise of three components - administration, research, teaching. And this fellow in particular seems adept at all three of those. He's a fine teacher, from what I understand. Both from comments from students as well as the teaching award he won, I think that within the first year or two that they offered it. So he's obviously quite accomplished teacher, as well as a very good researcher. He wrote a book a few years ago about... And in the realm of administration he has a very good sense about how the university works and how to make it work, and making sure that the right decisions are made. (John 2, session 4)

It seems that the male subjects had more 'nurturing' relationships with colleagues, they did however, make greater efforts than the two women to create these dynamics. The challenge for the women is that there did not seem to be any real mentors that they could rely on as did the two men. This is consistent with other studies which " found that

mentors are largely unavailable to women” (Grant & Ward, 1996 in Lima, 1998, p.88).

“Kaufman (1978) asserted that because mentoring is predominantly a male phenomenon, women are often isolated from informal collegial connections, and such isolation, whether by choice or by exclusion, renders them at a professional disadvantage” (Lima, 1998, p. 87).

Learning the culture through networking during the next 10 months

Since the two men had more opportunities to interact with colleagues were exposed to the culture dynamics within their department and university to a greater extent than the two women. Throughout the year from October 98 to October 99, the two men had more positive and gratifying learning experiences than the two women.

One male subject (John 1), a very social and outgoing type, has by far created the most opportunities for networking. It is through his interactions with colleagues that he has learned much about the history, the dynamics, and the values of his department.

In the time that I have been here I have made two minor political or big mistakes for both of the courses that I am working on. As a senior faculty told me, for the first 4 years I can get away with making mistakes like this. Because people think that I don't know the ropes, which is true. So I might as well make all of these mistakes in my first four years. (John 1, session 3)

The progress through the adaptation stage was most obvious with John 1 than with any of the other subjects. Because John 1 had to interact on a continual basis for the

development of two new courses he quickly had to learn the dynamics involved within and between departments. The two citations below clearly illustrate how he became more knowledgeable of his role within his department.

The political issues with the *** course, I have had to do a lot of interactions over here because, there are two agendas behind this course, there is the other department's agenda and my department's agenda and I have to make sure that I meet both, and that one agenda does not take over the other, I mainly take care of my department's interests. Whenever I need to I just go talk to my chair and tell him what is going on. The hotter political issues I have been able to step away from them and say this is not my business my chair deals with it. (John 1, session 4)

I have been working on the two course proposals and just the week before the deadline for the submission of the *** course I lost it with my colleagues over in the *** department which is something I thought that I would never do... this is supposed to be a collaborative effort and they were also holding the course to a much higher standard than they would for one of their courses and when I realized that I blew my top. It turned out to be a good thing, we were able to clear the air and move on. (John 1, session 5)

In session 5, John 1 demonstrates the phenomenon of one's commitment to one's organization, his department. John 1 seems very capable of defending the interests of his department and feels secure enough to do so.

The other male subject is more of a timid-introverted type: He had less interactions with his colleagues, although he does blame part of this on the fact that there is no common room that could enable interactions. When asked to describe some interactions with his colleagues, John 2 says:

I am going to talk about the reactions of some colleagues following my failure in obtaining my grant from NSERC. I think three faculty members asked me, one fellow just asked me in the hall, How did you do? So I showed him my thumbs down, and he said he did the same. I told him that I was going to reapply and he said that he needed more publications so he was going to work on that. Both of us said oh well it's life. Another fellow, an associate professor, had told me that he was unsuccessful at his first crack at it, partly because of his focus on resources and not applied sciences. He said don't worry about it, I am sure that you will be successful on your second round. I spoke to the Chair about it briefly, I did not get much of a reaction from her, although she did say that it is too bad that I did not put in an application for internal funds. So I told her that I will apply at the next round and she said that this was a good idea especially for new professors. The selection committee is very receptive to new profs trying to get their research off the ground. (John 2, session 5)

Although his application for his NSERC grant was unsuccessful, this did not create a personal dilemma for John 2, and his environment was supportive and sympathetic to his failure.

The female subjects had different experiences. Although the learning context appears to be the same, the female subjects experienced events more on a personal and internal level. Because the basic assumptions or values of their working environment clashed with their personal values, they were faced on many occasions with difficult personal situations. This is best illustrated by Jane 1 who is in the process of adopting a child:

I spoke with my Director and the Associate Dean, my director was excellent he said the right thing, he said congratulations! That was great. The Associate Dean looked at me horror stricken, and he said you will just take the time off necessary to go to (get the child) and come back? No I said, I will take maternity leave. Then he looked at me and said oh, ohhhh. He looked just like a bomb fell on him. I realize that we are short handed but you know if I was pregnant everyone would just accept it, OK she's pregnant she is going to have a kid, she is going to go on maternity leave, that's normal. To have this complete lack of support was completely inappropriate. And of course my initial reaction is to feel guilty because I do have a little more choice over the matter than if I was just trying to get pregnant. You know, but I don't have a whole lot of choice, I am 40 and I do want to do this as soon as possible, all my paper work is done, so now we are in the waiting period and so we don't know when exactly this is going to happen. It seems that maternity leave is quite normal and natural, and I should be entitled to it as well. I was pretty annoyed with his response. (Jane 1, session 5)

What about the reactions from your colleagues, has anyone reacted or said anything? Yeah, actually, horrible reactions. One professor, which is one of the people who will probably be judging whether or not I get tenure, he said: How do you know that you are not going to be getting damaged goods? I just thought, J**** C****, this is not an appropriate thing to say! Actually the responses that I have gotten from scientists and colleagues have blown me away, they have been those kinds of responses. Why are you doing this, defend yourself. As if I had to defend my thesis you know? Why are you doing this, this does not make sense... And of course, I could not tell people who are going to be judging my career and my tenure, no no you are wrong, my science is not going to come first, I am sorry, my daughter is going to come first... I have had very little support except from my immediate group and students. They have been really supportive. My husband and I have been comparing the responses of our work colleagues he works at (industry), the responses are completely different, the responses have been: That is so great, that is so neat, so wonderful. And here I feel like I have to defend my thesis. That is how I feel: the questions, why are you doing this, do you think that this a good thing to do, are you sure that it is the right thing to do, are you sure that this child is not going to have some disease or emotional problems, if I had a biological child there is no guarantee that I would have a perfect child anyways.

(Jane 1, session 5)

This lack of support from most of her colleagues illustrates how Jane 1's personal 'feminine' values clash with the values of her 'masculine' working environment. Jane 1 is forced to deal with an external and internal conflict which create an array of feelings. She seems to experience anger because of the lack of support and respect for her values, as well as feelings of guilt because she does not meet the expectations of her department. Although she is respecting her personal values she knows that they are not accepted by her department. This experience has led Jane 1 to move towards individuation. She is unable to commit to the organization as whole but rather commits herself to her work. This will be discussed further in the section which deals with the commitment/individuation stage.

Jane 2, on the other hand, did not have as challenging experiences as Jane 1. However, she did deal with some unpleasant situations:

There is this tendency to dump jobs on me, I think because I am new and because I am in this office which deals with undergraduate programs. It's stupid trivial administrative type things that I think that I should not have to do, but I guess that somebody has to do it. This comes from the main office and it has come from the Chair before or from that end of things. So I have had to stand up and fight a couple of times and say lets straighten this out, and this is not the way that I perceive things to be, so far I am learning to fight. (Jane 2, session 4)

(Jane 2 on her interaction during a departmental retreat) I didn't do a lot of talking, just occasionally. Often just more for clarification and things like that. I just sort of felt, since I was junior faculty, I had to keep my mouth shut. The usual thing. There were some others who were very vocal. They were making the point that I probably would have made. So had I thought there was a big thing for me to say that nobody had said, then I would have said it. But, I didn't have a lot to say that wasn't being said. (Jane 2, session 4)

In summary, the male subjects had greater number of interactions and these were of better quality, that is, more positive and supportive than the female subjects. The two men demonstrated from one interview to the next that they were very comfortable in their work environment which illustrates their 'commitment' to the organization. The two women, however, are not being enculturated as successfully as the men, and thus, rather than developing a sense of commitment to the organisation the tendency seems to be more towards individuation.

Family dynamics

Both males and females felt that there had been an impact on their family life and that time management was a big issue. One of the female subjects (Jane 1) had to focus more on her family and she felt that she had not given enough time to her work. The other female subject was aware of being less available for her husband, but made a point of taking annual leave twice a month to spend with her children. Although the men spoke of not

spending enough time with their families, they did not compromise their work schedule/priorities as the two women did.

It probably has impacted on my personal life with my husband that is where I take my time out but it did not affect the kids. At least once a month I take one or two days to stay home and I keep my youngest son at home and bring the eldest home for lunch and pick him up after school. So I still try to take this type of time with them. The time that I put work in is after they go to bed and that would be usually the time that I would have with my husband, but he has been very understanding, you know. (Jane 2, session 5)

I don't feel like I've given 100% this semester. I feel like I've given about 75%. That's because of one day a week of dealing with something from the home situation. My husband being depressed or going to see a lawyer. It's hard to concentrate sometimes too when you've stayed up all night talking about, what can you do, putting the kids through the custody dispute. It was really rough... It's been a major frustration. It's very complicated, it's very emotional and it's draining. So I don't feel like I give everything that I could possibly give to the job. That bothers me a little bit because I'm used to being somebody that gives a lot. (Jane 1, session 3)

Both male subjects seemed to feel guilty about not spending enough time with their families and throughout various interviews mentioned that they are lucky to have understanding wives. Both males also promised their families to spend more time with them next year when their work schedule should be more under control.

I have to find time for my family, they have been on the back burner... She (my wife) is consistently encouraging me to do things with the family, which is great, and we do a lot of things. I don't do an enormous amount of work on the weekends. So we go hiking at least once every week, we do a lot of things together. So she is consistently suggesting these kinds of things to me and that's good because it gets me out of the stress and the work here which can be pretty stressful. But it can also add stress, but she is totally accepting, she is wonderful. If it was a younger marriage I don't know if it would work. She is very supportive and she helps me get out of this place. (John 1, session 5)

The effect was largely one of lack of time, the amount of energy that I had when I got home was less. When I had the only one day off it was used up for recovery and not much else, and the second day of the weekend I can apply myself more, and fix things that need to be fixed. So my wife had to do, by far, most of the domestic chores, she does not work outside the home. Nevertheless, it was not fair for her to have to do all of 100% of the work like she was doing it. (John 2, session 5)

It seems that the two female subjects were not only academics during the day but also played a major role in keeping the family together and organized. The two male subjects had their wives taking care of the household while they were at work during the day. Overall, I had the impression that the two women were not as energetic and enthusiastic as the two men. Perhaps this was due to the increased roles that these women must adopt: professionals during the day, as well as nurturing mothers and wives at night. "Exhausting lives is the term used by Bloom (1986) to describe this difficult balancing act for women" (Pattatucci, p. 102).

Internal dimension:

How they feel about their new setting in the first two months

The tone of the discourse of the two women was more ambivalent than the one used by the two men when discussing how they felt about their new environment. The two men gave the impression of being happier or more comfortable within their environment than the two women:

I am so lucky to have this job, it was daunting to think of a career change. I'm back in academia. Teaching my course, I am getting excited about that. I'm excited about coming in to work in the morning and even work into the evening because I am excited about what I am doing. I will never go back to working like a maniac like when I was a graduate student. Which is what you have to do to get a job and I think that this is ridiculous. (Jane 1, session2)

Do you feel part of the group? No not really, I just come in and do my little job , which is what I did before anyways. So I go to the Faculty meetings but I don't feel like I am a major player or anything. I feel kind of awkward. I have always been here in another capacity, and so to suddenly come in a new capacity I feel a little uncomfortable at times and so I just sit quietly. I may ask a few questions but I don't get involved very much. (Jane 2, session2) *(NB Jane 2 is not in a new setting but in a new capacity)*

I feel quite comfortable, I am networking. People were very gracious. I farmed out my grant application to four people and they returned it to me within 5 days and now I am in a massive rewrite and that is a good thing. They have been very generous with their time. (John 1, session 2)

I stepped back this morning, I thought how delighted I am to be here. I realise that when you get in a routine that you may lose sight of where you are at, but this is what I really wanted. I feel confident that after moving a dozen times in 20 years I can really say that this is it. I could be here for the rest of my career. (John 2, session 2)

The two women, in comparison to the two men, were coming into the system from different angles and perspectives. They were starting at a different place at an internal level. The psycho-social makeup of these two women was quite different from that of the

men due to their initial experiences. They did not find the same comfort zone as the two men because they were dealing with a culture clash, whereby, their feminine values confronted the masculine values of the scientific culture. At the onset of their academic careers, the two women had already faced psychological and emotional turmoil in dealing with the masculine values of the scientific culture. They had to consciously and/or unconsciously make decisions with respect to the path of their academic careers. This was never an issue for the two men because there was no culture clash between their values and those of the scientific culture. The adaptation process within the new environment was thus more challenging for the two women in contrast to the two men.

Level of work satisfaction during the next 10 months

The citations in this section are longer in order to demonstrate the progression of each subject with respect to the level of their satisfaction with their career choice. Citations relating to their work satisfaction for the last 3 to 4 sessions illustrate that the two women are somewhat content with their work but experience much frustration with respect to the quantity of work and their inability to do it all. The men are also overwhelmed with the quantity of work that they have to do but they do not seem as distraught by it. They are generally more content with their progress and very satisfied with their career choice. The women seem to view their work more as jobs whereas the two men, it is definitely a career. The two men seem to demonstrate a certain comfort zone in their career choice which is not the case for the two women, they do not demonstrate the same level of ease and contentment as the two men. All subjects, men and

women, experienced a lot of satisfaction out of interacting with students either in an advising or teaching capacity.

Jane 1: How do you feel about the semester (Dec 98)? I feel a little frustrated but it's nothing new to me, I've felt this way before. I got to the end of the semester, I had a light teaching load, and I just didn't get everything done that I wanted to get done but that's normal. I deal with it much more easily now. I remember getting very frustrated, and very uptight, in my first term. But now I know that's something to be expected. You can never finish everything you set out to do.

(Jane 1, session 3) ***How do you feel now (Feb 99)?*** Since I have done this before, I have some experience, I feel good about the course, in fact I have had a few students tell me that they appreciated the course. As for the research, I know that I am not doing enough, I know that I am not on the ball and that I am not up with the literature. I know that but, for the time being that is the thing that will just to have to fall off the end of the cliff, no more time. I really need the weekends to recuperate... So on weekends I work on projects that make me feel good and that have nothing to do with science. I don't care anymore. I used to spend my weekends in the lab. My life totally revolved around my science and my ambitions, that just does not float my boat anymore. (Jane 1, session 4) ***Overall are you happy with your career choice? (Oct 99)*** Yes. Yes, I like the teaching. I have been a little frustrated this semester because I have been working long hours. I am teaching a new course this semester plus participation in a graduate course. So I

have a lot of teaching and advising of students... I am at the point where, I know that I need a job, and two incomes at home, and I know that I am doing a job that I can do relatively well. And I am happy with that. I don't think in terms of a career with this, I am just doing my job. It is a very different perspective. Probably very different perspective than you would see with the younger women starting out. They are usually more driven. (Jane 1, session5)

Jane 2: How do you feel about the job? (Dec 98) General content. Not unhappy.

No major problems or anything. (Long pause)The only concern that I have is that possibly I can see that over the course of 10 years or several years it may get dull or repetitive or something. So I am starting to think about that but over all I'm fine. (Jane 2, session 3) ***At this point what do you enjoy the most about your job?***

(Feb 99) I haven't had time to think about that. It's a stupid thing. But one of the things I like is, there's a lot of concrete things. There are things to get done and they get done. Its not like esoteric, you have no time. When you give help and advice to people it makes you feel like you have done something of value that makes you feel good. (Jane 2, session 4) ***What did you enjoy most of your***

second semester?(May 99) I did not enjoy much, it was too much work, it was too heavy and intense. I enjoyed overall talking to students and helping them out. It seemed like a worthwhile thing and you did something positive when you're finished. You always get a sense of it when you helped someone. I enjoy working with students. (Jane 2, session 5)***Are you happy with your position? (May***

99) Yeeaaah.. Overall I think that I am. I have bad days and good days. I am looking forward to the next year. The more I interact with other people, I realize that they have all the administrative and committee tasks and on top of that they are trying to run a whole lab and a research program, and I just think I am so glad that I do not have to because I could not deal with that whole added pressure. (Jane 2, session 5) *What if a research position opened here. Would you consider that at some point? (Oct 99)* Yes perhaps at some point but not now. I guess it is a possibility. *Do you think about it?* Yes I guess I do a little bit. What I think would get me is if I get tenure and get a sabbatical and then go back into the lab and so it would depend on that. If I got out of my sabbatical all charged with lots of ideas and with some publications, then possibly. On one of the committees that I am on there is a lot of discussion of, it looks like there is going to be some real hiring going on in the next 20 years, and so they are concerned about getting all new faculty so they will want some experienced people as well. And so I have not closed that door completely. (Jane 2, session 6)

John 1: How do you feel about your job at this point? (Dec 98) It feels very good. The major goals that I have set for myself at the beginning of the semester have been met pretty well. I wrote my first research grant. I have a manuscript almost finished that I will be sending off just before Christmas time and two collaborative course development projects that I am working on are going very well despite some political issues that I have learned about. (John 1, session 3)

What do you enjoy the most about your job right now? (Feb 99) Things are moving along so fast, and I do see a remarkable amount of progress with regards to these courses that I am developing and I take all of the satisfaction that I can get from seeing this progress. I am dissatisfied at how my writing and research have screeched to a halt right now. And I get a lot of satisfaction in developing relationships with the graduate students in the department. (John 1, session 4) ***Are you happy with what you have accomplished? (May 99)*** Today I am (laugh). I will have to learn how to say no soon, because it is killing me. I am saying yes to too many things. I have myself on 10 graduate student committees plus my own, so I have just realized that this is insane. So I have to say no. (John 1, session 5) ***So how do you feel about your job? (May 99)*** Love it! I had this problem when I did not have this job, I kept getting these rejection letters, and so we were starting to think about what we were going to do. So I am just thrilled that this is what I am doing at the moment, despite the trials and tribulations. (John 1, session 5) ***Are you pleased with your career choice? (Oct 99)*** I am very much enjoying what I am doing most of the time. I don't know what the expectations are around here, I don't know if I should be here at nine, so I sometimes worry about that... I enjoy it immensely. After a few weeks of teaching this course, I thought God I was meant to do this, because I was having so much fun with it. So I am very happy with my career choice. Yeah, I am really enjoying it. (John 1, session 6)

John 2: First question about how he felt about his job (Dec 98): He responded that he was tired, he was satisfied, content but very tired, that he had worked very hard, more than he expected, more than he wanted - on average 65 hours a week. He'd worked 41 days straight, meaning coming into the office every day for 41 days, including weekends and that was quite demanding. Not necessarily full days on weekends but still coming into the office. (John 2, session 3) ***How is your second semester going so far? (Feb 99)*** Pretty good. Better than the first I'd say. I'm getting a little bit more settled in. It's not quite so hectic, because I at least know my way around campus and just recently as well I've reduced my work load back down to one course rather than two. (John 2, session 4) ***So, do you think you're doing a good job overall? (Feb 99)*** Yes, I'm actually pleased, I'm not satisfied but I think for a first crack at it, it's not too bad. I'm actually going to try other approaches next year... I think for a first year, first crack at a course, especially since I'm fairly ambitious, I think it's going fairly well. (John 2, session 4) ***Overall how do you feel about your job? (May 99)*** Good! I have no regrets at all about coming here. The changes to teaching were a bit hard, but I prefer teaching to administration which is what I was doing in the government. I like the University and I like the people that I work with, I have no regrets at all. (John 2, session 5) ***How does this fall differ from last fall, do you feel differently? (Oct 99)*** I feel a little more planted here, some of it are just small things such as how to find this computer or run this overhead projector. I am getting settled in physically. On the social aspect, I don't feel any different, I feel pretty much at home here, I

am perhaps a little more relaxed. We had a departmental meeting last night for example, I think I understand the dynamics of the department a little better and I am pleased with the comments that I hear around the table. (John 2, session 6)

Summary of the Adaptation Stage

In summary, within the external dimension of the adaptation stage, the two women encountered different and more challenging experiences than the two men. The two women had less interactions with colleagues, did not have a mentor or “pseudo-mentor” and had to manage several roles – academic, mother and wife. The women were clearly at a disadvantage with respect to being enculturated into the scientific culture, thus at a disadvantage with respect to career development when compared to the two male subjects.

Within the internal dimension of the adaptation stage, the men and women have different psychological and emotional reactions to their new work place. The two women seemed less satisfied with their work than the two men: the internal and external dimensions being congruent with each other. The two women do not demonstrate the same level of enthusiasm or commitment towards their career as do the two men.

4.2.6 Commitment vs Individuation Stage

The commitment stage deals with “the extent to which the norms and values of the local culture are assimilated by new organization members” (Rosch and Reich, 1996). After the adaptation stage or the socialization stage the newcomer can adhere to the majority of the

values and beliefs of the organization and become an insider working within the accepted norms of the organization – when this happens there is a commitment to the organization. If the newcomer does not adhere to the values or assumptions of the organization he or she can still work within the environment but becomes an outsider, this is when individuation occurs.

External dimension:

Culture-change agents

During the adaptation stage both men were aware of the lack of social interaction or collegiality between faculty. Both became involved in new initiatives creating discussion groups so as to facilitate these interactions. In one case it was more with the graduate students, and in the other case a breakfast meeting for faculty. John 2 talks about the lack of interaction between faculty, so he and some other faculty members had started a breakfast meeting. Three to four of them got together once every week to talk and share ideas. They did this every week. The group consisted of 2 senior profs, one adjunct and the subject, and one of the members was female. John 1 speaks of his initiative:

We just had our Christmas party last week. At the end of September, the graduate student had a party in the park, and myself and my family were the only faculty there. But we had a great time. My long term is to improve the socializing between graduate students and faculty... There were several graduate students who wanted to start a discussion group, they told me about it, and I strongly

encouraged them because I want to be involved with this discussion group also, outside the more standard seminars series. That is something that I am going to develop: an informal discussion series in ecology and evolution, that is a long term project, the sort of thing that requires cultural change. So I have planted the seed for that... All of the senior faculty say that they don't have time for that, and they tell me: when you have your full teaching and full research you won't have time for this type of thing. And I can't believe that because at other universities they have full teaching loads and research loads and they still do this type of thing. (John 1, session3)

It is interesting to note that the female subjects never mentioned or thought of such activities. In my opinion the lack of interest or motivation to do so may be consistent with the phenomenon of individuation. Although the male subjects are initiating some culture-change in their environment, this would seem to demonstrate a commitment to the well-being of the organization. John 1 is even willing to push against the grain even if senior faculty have told him that his initiatives would not survive. As for the females, because they are not actively involved with colleagues they are not likely to successfully initiate any culture-change. To initiate any change with respect to gender issues it would seem that a critical mass of women and men who want change and are willing to act as change agents are needed to shift the value system. "A critical mass has been defined as the precise point at which the presence of an adequate number of individuals effects qualitative improvement in workplace conditions and expedites reorganization in a

positive direction” (Pattatucci, 1998, p.12). Depending on the study, the critical mass has been specified at different levels. “The proportion is variable to some extent; Gerd Engman, a feminist politician in Sweden, believes that at 20 percent participation, the level of women on committees is still only tokenism; at 30 percent, women start to have a voice; but only when they reach 40 percent are they really able to bring about change” (Dagg, 1998, p. 116).

The two female subjects in this study are in departments where there is approximately a 20 percent female representation, however if they do not speak to each other and consciously work together towards a more female-friendly environment it becomes difficult to imagine that a culture shift would be possible. “Embedded within the critical mass theory is the fallacious assumption that women are a unified group with a common set of goals, rather than a diverse collection of individuals” (Pattatucci, 1998, p. 12).

Internal dimension:

Attitudes towards tenure

During the interviews there was some discussion about tenure. Jane 1 was the subject who demonstrated the most anxiety about tenure. Even though she said throughout her discussions that she did not really care, it still seemed to represent a stress factor. John 1 was also a bit stressed by the notion of tenure but at the end of his first year he obtained a formal evaluation from his department informing him that his work was very satisfactory. This, of course, decreased his anxiety towards tenure. John 2 had a first hand

experience in seeing how one obtains tenure. This experience made him realize that there should be no problem in him obtaining tenure. It appears that for the four subjects in this study there is no real gender difference with respect to attitudes toward tenure. However, the two male subjects seem more comfortable with the tenure process since they have received some reassurance towards the process and their chances of success. Jane 1 on the other hand did not feel as comfortable. She was quite aware that the tenure process is tied to the culture, its beliefs and values, and this posed a problem for her.

Frankly I don't care about tenure (laugh) I do eventually want to get it but I just don't want to think about it. (Jane 1, session 4) I have felt a bit outside the department so all of that has been a constant since the beginning. I am just hoping that now that everybody who matters and who will have to judge me have seen my teaching record, they know that I can do a good job teaching, and I am sure that has bumped me a little up in their esteem. If I get a little more research out, get a few papers published, I think that I would get bumped up a bit more. (Jane 1, session 5) Because I feel like I can't go to my colleagues who will eventually be judging me and say that I want a balanced life and have kids. I can't say that to them, so I say it to other people. It is kind of liberating in a sense, because if I don't get tenure it's not like I am going to be crushed, or like I failed, it is going to be that I did not want to play the game like it is supposed to be played and I have other priorities now, and my ego is not all tied up in getting tenure. (Jane 1, session 5)

Jane 2 did not make any comments with respect to tenure except for:

... I am involved and asked to be in different curriculum committees, and since I don't have tenure it's not like I am going to say no. And so I am making more contacts. I am talking with faculty here and there. (Jane 2, session 5)

John 1 made few comments, but overall he is not too concerned with getting tenure but it is something that he thinks about:

Certainly the whole process of tenure and promotion does involve a teaching elements which includes the perception of the department and the student evaluations from the course, and this is a math course, and there I am already working on a deficit, being a math course, the students will not like it. So I have a lot of concerns in my mind with respect to how I will be evaluated in this course. (John 1, session 4)

We debated his (colleague) tenure application, which came in last fall. We had to make a decision whether or not to approve him. And we noticed there had been some friction in the department over the last year or so with him and several other members in the department, and with him and several other honour students, and with him and several other undergraduate students. So there was a fair bit of tension as to whether or not he should be approved for tenure. In particular he's a very good researcher as well, so there was some angst, some ambivalence.

There's not too much of a story that I can recall because it was a few months ago

but, we had some interesting conversations about discussions of offences that have occurred in the last few years, the probationary period, and in the end, it was nonetheless approved for tenure. So it goes to show that you have to do fairly poorly not to be accepted as tenure. (John 2, session 4)

The phenomenon of individuation is clearly illustrated by Jane 1. Although she would like to stay in this work she was not willing to play the game, to adopt the values and beliefs of the academic culture even if it meant losing her job. There was no commitment on her part to the organization or her department but only to her personal work. Jane 2 does not illustrate the same patterns of individuation as Jane 1 but she did not seem as committed to the whole academic system as the two men. This can also be due to the fact that she is in a teaching-only tenure-track position, and that these positions are probably not seen as equal or as high value to regular tenure-track members. Still, the difference between women and men poses an interesting question with respect to the phenomenon of individuation and commitment. If the organization is androcentric, are women more prone to fall in the path of individuation than men?

Essentially the goal of enculturation from the organization's point of view is to ensure that the newcomer commits to the organization. If women commit to the organization then I would argue that a culture shift would unlikely occur. In order for the culture shift to happen there must be some resistance to and intrusion into the actual culture. The problem at this stage is that women still represent a small ratio and they are isolated from one another – thus they are not really able to have an impact on the culture.

Henry Etkowitz and his colleagues (1994) compared departments in which the criterion for a critical mass of women was satisfied to ones in which it had not yet been achieved and found that as the number of women faculty members in a department increased, they separated into subgroups that could be in philosophical disagreement with each other. Thus despite attainment of critical mass, departmental organizational structures and the separatist mentality they generate continue to isolate women. (Pattatucci, 1998, p.12)

4.2.7 Insider vs Outsider self-ratings

Starting in the month of December of 1998 each subject was asked to rate himself or herself on a scale or continuum of one to eight: one being outsider, and eight insider. The subject was to rate himself or herself on the perception of how they fitted into the department at that time.

Table 6.

Subject's self-ratings on the insider-outsider (1-8) continuum during 4 sessions

Subjects/ Month	December 1998	February 1999	May 1999	October 1999
Jane 1	score: 5 I still don't feel quite a part of the Department.	score: 6 I am not really getting to know people better at this point. So because of that I feel sometimes more like an outsider. The interactions that I have on a daily basis here are fun and satisfying. There are moments when I see my male colleagues together and seem to have something together, I feel like I am not part of that. But then I don't care.... I don't need that.	score: not available Subject was not available for an interview at this time.	score: 3 or 4 For my placement in the department, the hierarchy of things 3 or 4. For my research and my teaching I say that I feel that I am a 7.5, I feel very secure.
Jane 2	score: 2 or 3 I feel more like an outsider and that in part is because I am new and also because the others are so much older, there are so many close to retirement. So I guess being new and young and also not being a research faculty, I think that I am in a different position.	score: 7 Maybe part of it comes from the time, the day of the retreat. The day when all the Faculty or whoever could come, took a whole day, just sort of, in the same room, slugging the stuff out of some agenda issues. The main one was the undergraduate program, so it was interesting and relevant to me.	score: 6 or 7 no comment	score: 6 or 7 no comment

Subjects/ Month	December 1998	February 1999	May 1999	October 1999
John 1	score: 3 In September I was at 1. Now I am at about a 3. Just shy of half way in. And I am saying this because, the faculty are observing, they are giving me time to be productive, they are friendly and all that, they are giving me time, and it takes time to work into the social aspect of it all.	score: 4 or 5 no comment	score: 8 So I am now part of this little network of people that I can rely on I did exploit that a little, there are these rules social rules on how you can rely on the system, so as to get real feedback. We had a little talk about these dynamics and he named off the people of this group that I can rely on and so now I am part of this group. So I am in!	score: 5 I guess I am a 5 It will be interesting to see if I will ever call myself an 8. Part of this is I wonder if my definition of what it is to be an insider will ever be met. I guess I thought that there would be a lot more of collegiality between colleagues, there is academic collegiality, but there are not other forms of collegiality.
John 2	score: 3 or 4 no comment	score: 6 I would say, whatever I said before, I'd say as much or more inside I guess. I would give myself a 6, perhaps. Yeah, a 6.	score: 7.5 I will probably never be a ten... that is not my style.	score: 7.5 or 8 If you ask me in 10 years from now I will probably still be a 7.5 or 8 that how I see myself as being in this group here.

It seems that one's perception of being an insider vs an outsider depends on the amount of positive interactions with colleagues. Table 6 illustrates how Jane 2 (Feb 99) and John 1 (May 99) perceived themselves to be very much on the inside following a very positive experience with colleagues: Jane 2 participated in a departmental retreat where issues pertinent to her role in the department were addressed, and John 1 had positive feedback

from a senior faculty. John 1, however, had an interesting drop in his perception of being an insider (Oct 99), this reflects his dissatisfaction with the lack of collegiality among faculty members.

Jane 2 seemed to feel more as an insider as time progressed, however she never quite explained why she felt this way. My interpretation is that Jane 2's self-ratings are more of a reflection of her accepting her personal choice in going for a teaching career rather than a research career in academe. As she feels more confident in her abilities to improve and contribute to the quality of teaching in her department, she feels more as an insider.

Jane 1, had an interesting drop at the last session with respect to how she perceived herself within the department. Although she feels very committed to her work and feels as an insider with respect to her personal work, she does feel committed to the organization: this illustrates the path to individuation. John 2 illustrates well the path to commitment. John 2 easily progressed into feeling as an insider – he is very pleased with his new environment and as time passes with increased interactions with colleagues he feels more and more part of the group. Throughout interviews he often compared the working for the government and working at the university. His comments were always very positive with respect to his new environment.

4.2.8 Summary of phase 1: The enculturation process

The following table summarizes the experiences of the four subjects during the enculturation process, dividing each phase into the external and internal dimensions. The table also indicates if there appeared to be a gender difference or not between the four subjects involved in the study.

Table 7.

Summary of the enculturation process focusing on perceived gender differences by internal and external processes

Enculturation process	External process	Internal process
Pre-arrival stage	Experiences as a graduate student and post-doctoral fellow: No gender difference observed. All subjects seemed satisfied with their experiences. Women did not report any discrimination or harassment.	Path to academe: Gender difference observed. Women experienced much turmoil in trying to reconcile family issues and career plans. Both women changed their career plans so as to leave room for their family life. This was not an issue for the men.
Encounter stage	Interview process: No gender difference observed. All went through a similar process. Hiring conditions: No gender difference observed. Comparable salaries were offered to all subjects. One male and one female negotiated for better conditions.	Priorities and expectations: Gender difference observed. Female subjects set their work priorities so as to keep a balance between work and home life. Male subjects were more systematic and enumerative when setting out their work priorities. Home life was not a factor in setting their priorities.

Enculturation process	External process	Internal process
Adaptation stage	First interactions with colleagues in the first two months: There was a difference between the males and females, but it is difficult to determine if this difference is due to gender or to the departmental climate or to a combination of both factors and possibly other factors. Learning the culture through networking during the next 10 months: Gender difference observed. The males have greater interactions with colleagues and these interactions seem more positive for the males. Mentors: Gender difference observed. The males made reference to mentors on more occasions than the females. The males had greater opportunities to interact with their 'pseudo-mentors' which provided the males with greater insight on departmental culture. Family dynamics Gender difference observed. The two female subjects are not only academics during the day but also play a major role in keeping the family together and organized. The two male subjects have their wives taking care of the household while they are at work during the day. They do not share this extra burden.	Perception of their new setting in their first two months: Gender difference observed. The tone of the discourse of the two women is more ambivalent than the one used by the two men when discussing how they feel about their new environment. The two men give the impression of being happier or more comfortable within their environment. Level of work satisfaction during the next ten months: Gender difference observed. For the first six months all subjects felt overwhelmed with the quantity of work to be done. At the 8th month the two men seem more satisfied with their progress and career choice. The men seem more rooted into their careers. As for the women, they seem to approach as jobs and not careers.

Enculturation process	External process	Internal process
Commitment vs Individuation	Culture-change agents: Gender difference observed. Both male subjects were involved in new initiatives creating discussion groups so as to facilitate faculty interactions. The women were not involved in such activities.	Attitudes towards tenure: The two men seem to feel comfortable with the tenure process since they have received some reassurance towards the process and their chances of success. Jane 1 on the other hand does not feel as comfortable, she is quite aware that the tenure process is tied to the culture, its beliefs and values, and this poses a problem for her. Jane 2 seems comfortable with the process. Insider vs outsider scores The scores for the subjects seemed somewhat inconsistent over the year. It seems that recent events affect how they feel about their position in the organization. The scores were higher (insider) when there had been recent positive interaction with colleagues either in a formal or non formal setting.

4.3 Phase II of the study: Exploring key enculturation issues for women scientists

The purpose of Phase 2 in the study is to explore key enculturation issues for women. Four main issues are visited in this section: 1) Balancing academe and family life - is it possible?; 2) The need for mentors during the enculturation process; 3) A new definition of success - a starting point for culture change; and 4) Choosing science as a career — successes vs regrets.

4.3.1 Profile of secondary subjects

Table 8.

Profile of secondary subjects (females)

Subject	Subject F1	Subject F2	Subject F3	Subject F4
personal data	Start date: August 98 (engineering) Age: 32 Status: single no children (wants children)	Start date: August 98 (engineering) Age: 38 Status: single no children (does not want children)	Start date: July 97 (science) Age: 37 Status: single no children (Does not want children)	Start date: July 98 (science) Age: 33 Status: With partner no children of her own (Torn: not sure if she should have children)
Type of environment based on their perception	Caring departmental chair and supportive colleagues Medium sized university	Caring departmental chair and supportive colleagues Medium sized university	Unsupportive departmental chair and few helpful colleagues Medium sized university	Supportive chair and supportive colleagues Medium sized university

4.3.2 Balancing academe and family life: Is it possible?

The four female subjects gave essentially the same message that it is not possible to have children and a successful scientific career. Some of the subjects reported that perhaps with a very supportive partner such a choice would be possible. Two of the four women (F2 and F3) have decided that for personal reasons they would not have children but would rather focus on their careers and personal activities. The other two subjects (F1 and F4) were considering a family although they were unsure of the impact that it may have on their academic career. One of these two women (F1) wanted to make family a priority regardless of its impact on her career.

If you want to be at the top of your field I don't think so. You can have a satisfactory research record and a family, I think that this is possible, but I don't have a family yet. I am not a career woman, that is, I will not let my work take priority over family whatever the consequences to my career. (F1)

The other woman is very torn between having children and focusing on her career. Her experience in seeing other women who tried doing both, academe and family, has brought her to the conclusion that it is not possible to combine both:

My feeling is that it is almost impossible unless you are super human – to be a successful scientist and a mother. It may be possible if you have an extremely supportive partner, it may be possible if you have a department that can give you a break on things like teaching. I know two who are faculty members, who got their position, their tenure, and then decided to have kids. The one is quite successful as a scientist, she bears the brunt of her child care arrangements and she is currently recovering from three days in the hospital with croup, and double ear infections that won't clear up, she has repeated health problems, chronic sickness. The other one bears almost the entire childcare, it takes her 2 hours a day to get to and from work, home and daycare, and she lost her NSERC grant last spring. So my personal experience has been that it is not possible to do both. That is, if you want to be a scientist you have to stop (your research) to have kids. If you wait to have kids, then you have to wait until you have tenure and that you have gone through

your first grant renewal. All of this is brutal enough on you and your relationship without adding kids to the equation. So if you wait until you have tenure, you might be in your late 30s, and a lot of people don't want to have kids at this point. Consider that adding kids to the equation means enormous disruption, and if they do have kids there is loss of productivity, and not only for the 6 months of maternity leave, it is a constant ongoing battle. Daycare, kids get sick, you can no longer work from 8 to 8 kind of day, which is what I think most successful scientists are working at or even longer. (Female 4)

Subject F4 was then asked if she wanted children and she responded:

I don't know. I always thought I did, I always figured that when I got to about 30 I would consider having kids but now I am there. I just don't know. I can't imagine adding a child to my current life. All of my friends have kids, the special relationship that they have with their children is very appealing to me, that really pulls me. I am very badly torn. It goes in waves. (F4)

It is also interesting to note that two of the subjects (F1 and F4) prior to their actual positions had moved to be with their partner. These moves mildly delayed or compromised their academic career, they obtained their present positions following the rupture of the relationship.

The move to city X was driven solely by the need to follow my husband at the time. I ended up in a department which was not very good for my research interests and that was a make do career move this is not where I would have chosen to be. But I was fortunate that I was able to keep working. So I got it through some unconventional approaches by the help of friends and colleagues that I continued to work with.(F4)

Unlike the two female primary subjects, the secondary subjects do not have children, and three out of four are still single. Also, as most of these women are contemplating the role of mother and wife, much of their feelings at this point revolve around their intuition and not personal experience. Two of the secondary subjects want to have children – and one of them is even willing to sacrifice her career for the sake of having a family, the other, however had great concern of the impact of motherhood on her career.

Marriage and a family are seen as career-enhancing more for men while at once a career-ending one for women. This is the reality in which women professionals – particularly those in science and engineering fields, where large quantities of laboratory time are expected – must exit and strive to succeed. It is a formidable barrier. A contributing factor may be that there is an assumed role conflict for married women in careers that is absent for men. (Pattatucci, 1998, p.102)

When one looks at all of the responses of all of the female subjects it is clear that the dual or triple role issue weighs heavily in the decisions that women scientists make

about their professional and personal lives. All of these women essentially have come to the conclusion that it is extremely challenging to have children and to have a traditional successful career. These women are thus forced to make a choice with respect to who they are and what their values are – this choice and the consequences of their choice seems to be costly whichever direction they take, unless the woman makes a clear and satisfactory decision of not wanting children. The women who have children and those who want children are always torn between two poles: motherhood and a successful career.

Men assume that they will combine a career and a family without undue difficulty; women assume that combining a career and a family is nearly impossible – a feat only to be achieved by a “superwoman”. In addition, single women may not be excluded from this source of stress. They may be considered unusual by their colleagues and must face difficult decisions about whether to marry or to have children (Davidson & Cooper, 1987)... The polar nature of these two roles suggests that they cannot be effectively maintained over time and that one will eventually take prominence over the other. (Cited in Pattatucci, 1998, p. 102-103)

4.3.3 The need for mentors during the enculturation process

None of the four female subjects reported having a mentor in the department. Two of the subjects (F1 and F4) recommended that a mentorship program be available for new faculty since it would help new faculty get oriented:

Having a mentor, someone to give you advice and to explain how things work would have been very useful in the first year. People from my department never explained how our programs worked and how the various programs relate to one another. It is not really explained in the calendar. So I just wish that someone could explain how the department works, what is expected of us, background on students... we are just left to resolve things on our own, it was very very difficult.

(F1)

Subject F4 also saw the need for a mentoring program. She found herself learning about departmental politics and meetings that she could attend many months after her arrival.

I would recommend a mentoring program, someone who knows all of the answers and can help you along. In an orientation course, there is too much detail. (F4)

It is interesting to note that the two female subjects who experienced the most difficulties in their first year in academe were the two women who saw the value of a mentoring program.

Subject F3 also saw the need for some orientation or guidance:

Was there some sort of orientation when you arrived? : No, and that was a mistake. I was never formally introduced at the meeting, even at the departmental meeting. When I arrived my lab was still occupied by someone who was retired. The path was not cleared for me, I had to say I need my lab which I think is a monstrous mistake. I approached the (retired) man and we initially discussed in keeping him a small corner in the lab, but then he went away on holidays without

telling anyone for how long. He left the lab as is and the type of chemistry that he does uses chemicals that are rather nasty smelling and so it ended up being this quick brutal termination. And the help that I got was from a friend from NRC, we took out the beer, cleaned out the lab, soaked it with bleach. This is a very very poor message to send to a starting faculty member. (F3)

According to Sonnert and Holton's (1995) study, "several scientists counted a mentor among their most crucial career advantages... A good mentor will discuss the politics of science with a student or junior scientist" (p. 174). It is evident that secondary subjects F1, F3 and F4 could have used a form of mentoring either it be formal or informal. One could argue that a female mentor would be preferable because there are issues that a male mentor may not be able to relate to.

Subject F2 was luckier than the other female subjects because she did obtain informal mentoring. She was invited from the beginning to join her colleagues over lunch (all males), where they discuss an array of topics. Subject F2 did not perceive this as mentoring but she was aware that these lunches provide her with invaluable information with respect to the history and the politics of the department. According to Tierney and Bensimon (1996), "one way to structure the multiple roles of mentoring is to think of the mentor from three perspectives, that of a) the symbolic leader, 2) the trail guide, and c) the oral historian" (p. 58). Thus if the majority of female scientists are consistently isolated from mentorship, how can they really get insight into the culture that surrounds them? The mentors can be seen as the bearers of the culture who are passing it on to the next

generation. However, this could create a dilemma for women if the values that are being transmitted are not congruent with their personal values. We are faced with a paradox – women need mentors to help them through their first years in academe, however, the available mentors may not be most suited to do the job. One can thus argue that the new women scientists would benefit from having female mentors, women who have had to make decisions with respect to managing the triple role. The problem is that there are not many of these women available, and so women scientists find themselves isolated in these experiences.

4.3.4 A new definition of success – a starting point for culture change ?

What is your definition of success? I would say being happy. Being happy means that I have met my standards but also that on the personal level. *Do you consider yourself successful?* Some days (laugh). If we did not flog ourselves when we did not meet our expectations then we would not have the drive to do so. There is a price. (F3)

What is your definition of success? It is to be doing what you want and doing a good enough job at it so you have no worries about continuing. (F2)

Subjects F2 and F3 had more of a traditional view of what it is to be successful, that is their definition of success is expressed in terms of professional success which is congruent

with the expectations of the scientific culture. The other two subjects (F1 and F4) had different definitions of success and this was probably one of the reasons why they were uneasy about their career choice. It appears that they felt torn between what was expected of them and what their personal needs were.

What is your definition of success? I don't know anymore. I want a career that is fulfilling. In order for a research career to be fulfilling you have to maintain a high enough standard so that you can get your NSERC funding. So I want to feel that I am doing a good job and that I am making a difference in the courses that I teach, I want to feel that I am doing research that is worthwhile that I am contributing something worthwhile to the literature, not just rehashing other people's ideas. I want to feel that I am contributing to the training of graduate students. On a personal level, I want to be happy. I spent a lot of years in a relationship that did not work, I now realise the value of being happy at home. I would like to feel that at the end of my life that I have done something worthwhile. I have talked to friends and family about that and what they have said is that the most rewarding thing that they have felt in their lives is their kids. So that brings me back to the same point. I may be able to publish 5 papers a year for 20 years but in the 21st year who is really going to give a damn? (F4)

The definition of success for me is to have a job that I like, that motivates me, which is creative and innovative and to have a family life, a balanced life between

work and family. Success in our culture is professional success. Success for me is to be comfortable with who I am, to be myself as much as I can. (F1)

4.3.5 Choosing science as a career – successes vs regrets

Although all of the subjects enjoy the greater part of their work with respect to research and teaching, two of them (F1 and F4) were not sure if they had chosen the right career.

Question to F4 : Are you pleased with your career choice? If I had to do it all over again... probably not. Because the constant worry about what I should be doing just wears me down. I seem to worry all of the time of what I should be doing, whether I am doing it right, I find the idea of a job which has more structure to be more appealing, like a medical doctor. They get up in the morning and they know what they have to do and they contribute a lot, there are lots of jobs like that. If I had to do this again, I would probably pick one of those with a more defined structure. In this career there is a constant demand to do more and better, there is a constant competitiveness that we are subjected to even if you don't want to be. Most of my colleagues are male, they are all into the one-up-manship's testosterone driven competition. They are always comparing and I always feel like I have to live up to their expectations but I am not entirely certain what these expectations are. If I had to choose a career again, I would try to choose one where I had more of a reasonable sense that I am doing a good job on a day-to-day basis without having to wait 20 to 30 years to see if people have cited my work. (F4)

Subject F1 emphasized the need to have a balanced life and was still considering industry as another career choice. Her first year in academe led her to be quite depressed:

I try to keep some distance from my work, and I try to tell myself that this is not the only thing that counts in life. I must do other things as well. What I have noticed is that some people are totally workaholics and they can do just one thing in their life and this seems to be OK with them, but if I do that I will feel like I did last year, I will have the impression that my life has no purpose and is not worth living. So I need more than just work. (F1)

Subjects F2 and F4 were very happy with their career choices and felt that this is what they were meant to do:

Yea. This really is what I was meant to do, being a professor in a place where teaching counts... The longer I am here the better I feel of being who I am. (F2)

Are you happy with your career choice? (F3): Yes.

It is interesting to note that the two women who were most happy with their career choice did not want children and their definition of success was closely tied to the traditional definition of success. These two subjects (F2 and F3) fit to a greater degree the traditional model of the scientist. Both can commit themselves to their work, they in fact, do not have to contend with the dual or triple role. Like the men they only need to focus on their work.

The two subjects (F1 and F4) who were not as content with their career choice wanted a balanced life, and possibly wanted children. Regardless of these feelings both had remained productive, in fact, one of these subjects had recently received numerous awards for teaching and research. At an external level this subject (F4) seems committed to her career but internally she is questioning her choices and her values and what is fundamentally important to her. This woman has a difficult choice to make, and a choice she will have to make because she is in a state of dissonance: her behaviour is congruent with the expectations of the organisation, but her emotional and psychological state is not congruent with her behaviour, she is not fully committed to the organisation. At this point she is at the cross-road of commitment and individuation: she must choose between her values and those of the organisation; if she chooses the values of the organisation she will fully commit to the organisation, if she chooses her values and pursues the role of motherhood she will move towards individuation. As for subject (F1) she has clearly demonstrated that her values are more important to her, and that she is willing to sacrifice her career to be true to herself. This woman has clearly moved towards individuation.

4.3.6 Summary of Phase II - Key enculturation issues for women scientists

In summary, it would seem that the women who were most content with their career choice were those who were most committed to the organisation – to its values and definition of success, and who did not wish to have a family. Those who were less happy with their career choice were those who were trying to manage a family at the same time as their career (primary subjects). Those who were contemplating having a family, they

seemed to be in on a path towards individuation, however this status seems to be temporary, all depending on their future decisions.

Table 9.

Summary of key enculturation issues for women scientists: possible factors influencing individuation or commitment

Themes	Towards Individuation (Subjects F1 and F4)	Towards Commitment (Subjects F2 and F3)
Balancing academe and family life	They want or are considering having children - F1 is unwilling to sacrifice her career, F4 is torn between her career and personal life.	They have chosen not to have children and to focus on their scientific careers. They do not face the same psychological challenges as the women who would like a family.
Need for mentors	Both saw the need for mentors. They did not have access to mentors.	Both saw the need for mentors. F2 had access to informal mentorship, F3 did not.
Defining success	Both are looking for a balanced life and see the value in having a personal life. Success lies in the ability to balance a career and a family life.	Both define success in a more traditional form – which reflects the scientific culture. Success lies in the ability to succeed professionally (grants and publications).
Choosing science as a career	Both are not entirely satisfied with their career choice – F1 is still considering industry as a possibility and F4 would choose another career if she could do it all over again.	Both subjects are very pleased with their career choice and feel that they were made to do what they are doing. They are very satisfied.

Chapter 5

Conclusion

The purpose of this thesis was to investigate the similarities and differences between new male and female faculty in science during the enculturation process. The results of the study can only speak of the subjects involved and cannot be extended to the population at large. This was understood at the onset of the study since the number of subjects in the study were limited. However, the data collected provides much insight on personal experiences of new faculty members during the enculturation process. The conclusion will thus address what has been learnt about the enculturation process – mainly that there is a need to further develop the theoretical model of the enculturation process by adding the internal and external dimensions. Second, the six female subjects who participated in the study seem to adhere to three distinct profiles. These profiles will be analysed and discussed while creating a theoretical framework which could serve for further investigation.

5.1 The enculturation process - adding a psychological dimension to the model

As discussed in Chapter 2, the enculturation process is the process by which the newcomer is socialized into his or her new environment. It is an area of study which has mainly been studied within a social, organizational and anthropological perspective. This study has added another perspective, one that is more psychological in nature. By adding the psychological perspective to the study of the enculturation process, an interesting

distinction was made possible, that of the internal and external dimensions of the enculturation process.

During the data collection and analysis process it became clear to the investigator that there were two important dimensions at play during the enculturation process. There were elements that touched the external day to day activities of the newcomer, such as learning how to deal with the administration, to prepare course material, and to prepare NSERC applications – essentially all of the rituals and behaviours required to achieve success in their new environment. Then, there were the elements that touched the internal dimension of the newcomer, that is, the psychological and emotional reactions to external events, how these experiences were integrated and expressed over time. This distinction became apparent to the investigator because of the different reactions between the male and female subjects towards what seemed to be similar experiences at the external level. This distinction was made possible because the author investigated the enculturation process through a gender lense, thus comparing experiences and reactions, every step of the way, between the two male and two female primary subjects.

The data at the end of phase 1 of the study (see Table 9, Chapter 4) demonstrates that during the pre-arrival and encounter stages of the enculturation process, gender differences were not apparent. In essence, this finding meant that at the external level of the enculturation process the two females and the two males tended to have similar experiences. However, as time progressed and the subjects moved into the adaptation and commitment vs individuation stages (the internal level of the process) there were gender differences in experiences. Thus, at the onset of their careers, the four primary subjects

may seem to be on the same playing field at the external level (comparable salaries and working conditions), but at the internal level the two men and the two women were on very different playing fields.

The two women were less enthusiastic about their work and perceived their work as jobs and not careers, whereas the two men were enthusiastic about their careers. The author would argue that the two women were experiencing more challenges than the two men because their psychological and emotional make-up was incongruent with the expectations of their environment. This incongruence, or cognitive dissonance, on the part of the two women, became an obstacle for their commitment to the organization. In this study, the incongruence was created by the environment being androcentric and by the two women adhering to more traditional values with respect to family responsibilities. The two male subjects in this study were not being challenged by this cognitive dissonance because their psychological and emotional state was congruent with the expectations of their environment. The two men, in contrast to the two women, were able to treat their work as careers. The challenges experienced by the two women during the adaptation stage can be described as a rejection of the rooted male value and belief system within the scientific culture. If these values are completely rejected then one could not expect that a true commitment to the organization is possible, and that individuation would most likely follow.

Studies looking at the enculturation process have mainly focussed on the organization socializing the individual and how this process leads towards commitment to the organization. It seems that few studies have investigated the phenomenon of

individuation, and what happens to individuals who choose to stay within an organization while maintaining their individuation. Individuals may choose to behave in accordance to the belief system but internally, psychologically and emotionally, still adhere to their personal values. It is such a scenario which leads to cognitive dissonance. One can cope with cognitive dissonance for a given period of time, but this takes much energy and is emotionally draining. At some point, the individual must choose to change either their values so as to make them congruent with their environment, or change their behaviour so as to make it congruent with their personal values. In the enculturation process, changing one's values and behaviour to be congruent with the organization leads to one's commitment to the organization. If the behaviour and personal values are not congruent with those of the organization then individuation results. The following question can then be asked: How does one categorize an individual who behaves in accordance to the organization but does not adhere to its values? What happens to this individual, how does this person function and how successful is she or he?

This is an area within organizational culture and the enculturation process that needs further exploration. Other questions that arise with respect to the concepts of commitment and individuation and culture change is who and what is a catalyst for culture shift? Are the individuated individuals the change agents within organizations? Can a committed individual be a change agent? These are questions that need further investigation so as to better understand how organizations evolve and change over time. In the context of this study, it has been illustrated in Chapter 2 that the scientific community has perpetuated its tradition and thus resisted change by being selective in

terms of newcomers – essentially creating a homogenous profile of the scientific community. With the introduction of women and other minorities into the scientific community, how and when does change occur? The ‘critical mass’ concept is one that is used to argue that a culture shift will occur once a critical mass has been reached, which is said to be between 30 and 40 percent (Innis Dagg, 1998). Studies in this area are still limited and have focussed on disciplines outside science. Let us suppose that one reaches a critical mass of women in terms of gender composition, half of the women are ‘individuated’ and the other half are ‘committed’ to the organisation. In this context, I would argue the ‘critical mass’ concept needs to be further developed so as to include men and women, who hold different values from that of the organization, working together in an informal or formal way to change the culture. To simply talk about a critical mass of women does not guarantee a culture shift. What is needed is a critical mass of a set of values that challenges the set of values and belief system in place within the organization.

When one considers that “culture is pervasive and ultimately embraces everything that a group is concerned about and must deal with” (Schein, 1997, p.49) and that, “cultural assumptions reflect deeper issues about the nature of truth, time, space, human nature, and human relationships” (Schein, 1997, p 49.) it becomes clear that organizational culture is very complex and difficult to change. In this context the role of retention programs for women in science becomes increasingly complex as well. Retention programs, if well managed, could serve as the first step towards culture change. Let’s consider Schein’s model of the levels of culture (*below in italics*: 1997, p.17) and add to it the possible gradual impact of retention programs on the scientific culture:

- ***Artifacts: Visible organizational structures and processes (hard to decipher)***

Retention programs for women in science would induce behaviour modification through new policy and procedures. Discriminative behaviour is slowly eradicated but sexist attitudes remain.

- ***Espoused Values: Strategies, goals, philosophies (espoused justifications)***

With a new set of policies and politically correct behaviour, sexist attitudes are challenged and are slowly replaced by equitable attitudes.

- ***Basic Underlying Assumptions: Unconscious, taken-for-granted beliefs, perceptions, thoughts, and feelings (ultimate source of values and action)***

Once sexist attitudes have been successfully challenged then the fundamental belief that women are equal to men and that women and men's experiences are equally important may replace old beliefs and perceptions.

Although this simple hypothetical model of the possible impact of retention programs on culture is shown to be unidirectional, the reality is that there is a continual exchange between all three levels of organizational culture. This exchange is done through individuals and the collective. That is, two major movements are at play together, the psychological (the individual) and the social (the collective). It is like the tide moving in and out, each time bringing in new artifacts and taking away others, and sometimes old artifacts find their way back to shore only to find themselves swept away later on. I would argue that within this hypothetical model, that the scientific culture is still within the first tier of the 'culture shift'. Essentially, it seems that discriminative behaviour has been mostly eradicated through the creation of new policies, however, sexist attitudes remain.

It is difficult to say how long it will take for change to occur at the basic underlying level, but what seems to be evident, is that change will not occur if the current ideologies are not contested. Although some groups find retention programs and positive discrimination for women 'unfair' to men, their existence seems to be an important first step in creating the appropriate climate for culture change. It is important to note, as discussed earlier, that the collective called 'women' is not a homogenous group. In this context we can no longer work with the assumption that more women will ensure a specific culture shift.

The following section proposes a theoretical framework of three female profiles. These three profiles reflect the six female subjects (primary and secondary) encountered in this study. The model is created in order to prepare the terrain for further investigation on gender, enculturation, and culture change within the scientific culture. It seems important to understand the type of women present within this organization and the impact that they have on their environment, and the environment on them.

5.2 Theoretical framework: three profiles of women scientists

In this study, the leading factor which seemed to distinguish the six women with respect to individuation or commitment to the organization was the 'child-factor'. I thus propose to develop a theoretical framework of these three profiles to serve as a tool for further investigation of the enculturation process of women scientists in academe and its relation to cultural change.

The three proposed profiles can be defined as follows:

Profile A – Female who do not have and do not want children, single or married;

Profile B – Female who do not have but want children, single or married;

Profile C – Female who have children, single or married.

Profile A. According to the results in this study, it would appear that the two women without children are committed to the scientific culture as an organization. They do not seem to be facing any challenges in terms of cognitive dissonance. As described in Table 9 (Chapter 4), their definition of success is congruent with that of the scientific culture, that is, it is defined in terms of professional success through grants and publications. In general, these two women have the same professional behaviour and hold the same belief system as the traditional male scientist. Because men are not traditionally the main caregiver of children, the scientific academic profession has evolved in such a way which excludes the possibility to easily combine any other major responsibility in life, such as, taking care of children. Profile A thus describes a woman who can easily be enculturated into the scientific culture, thus be committed to the organization. I would argue that these women are not likely to be change agents because the present culture is not a threat to them. Thus women who have a similar profile to those of their male colleagues may help maintain the culture and not challenge it.

Profile B. According to this study, the two women without children but who desire to have children have a tendency to move towards individuation. However, it is difficult to say what the end result of their commitment/individuation status will be, if and when

they do have children. Perhaps the longer the wait, the more likely that they will become committed to the organization and thus less likely to have children. And if they do have children at a later stage how will this affect their commitment/individuation status? This female profile, nevertheless, seems to be a temporary profile where the woman is at a critical decisional point, that is, at the crossroad of personal needs vs professional needs. The 'child-factor' seems to be the element which will make the scale move in one direction or the other.

Profile C. According to the results of this study, it would appear that the two women with children have more difficulty committing to the scientific culture. I would argue that they are moving towards individuation but not necessarily expressed in the same fashion. One female subject chose to pursue a teaching-only career which in a traditional definition of a scientific career is not congruent with the traditional career path in academe. The other female subject with two step-children and in the process of adopting a third child has demonstrated throughout the year behaviour and attitudes progressing towards individuation. For both females, the 'child-factor' appears to be largely responsible for their movement towards individuation. In this case, the 'child-factor' is an element that seems incongruent with the ability to easily function in a traditional scientific setting. It would appear that the time and commitment required for child-rearing overlaps with the time and commitment required for a traditional successful scientific career. These women are being challenged by the system, and in some ways they are challenging the system as well. It would be interesting to see how their career unfolds in the next 5 to 15 years. They are more likely, than the other women, to encounter

conflict within the organization. By not meeting the traditional expectations of the organizations they may need to defend their position and contest any unfavourable consequence. I would argue, in this context, that it is through conflicting values that the current belief system will be challenged and forced to re-examine its fundamental assumptions. One must realize, however, that these are also the women who tend to leave academe because of the enormous personal challenges. This would suggest that retention programs can play an important role to keep these women in the system. These women may well be the change agents for a culture shift.

The development of these three profiles could be used to further investigate the retention issue of women scientists in academe. It would be interesting to investigate the correlation between the three profiles and retention programs. Because female scientists are not a homogenous group, retention programs must address the specific issues which are at play for women contemplating their scientific career. It seems that in order for retention programs to be successful it is essential that we understand the factors that influence women in their decisions to pursue or to leave a scientific career in academe.

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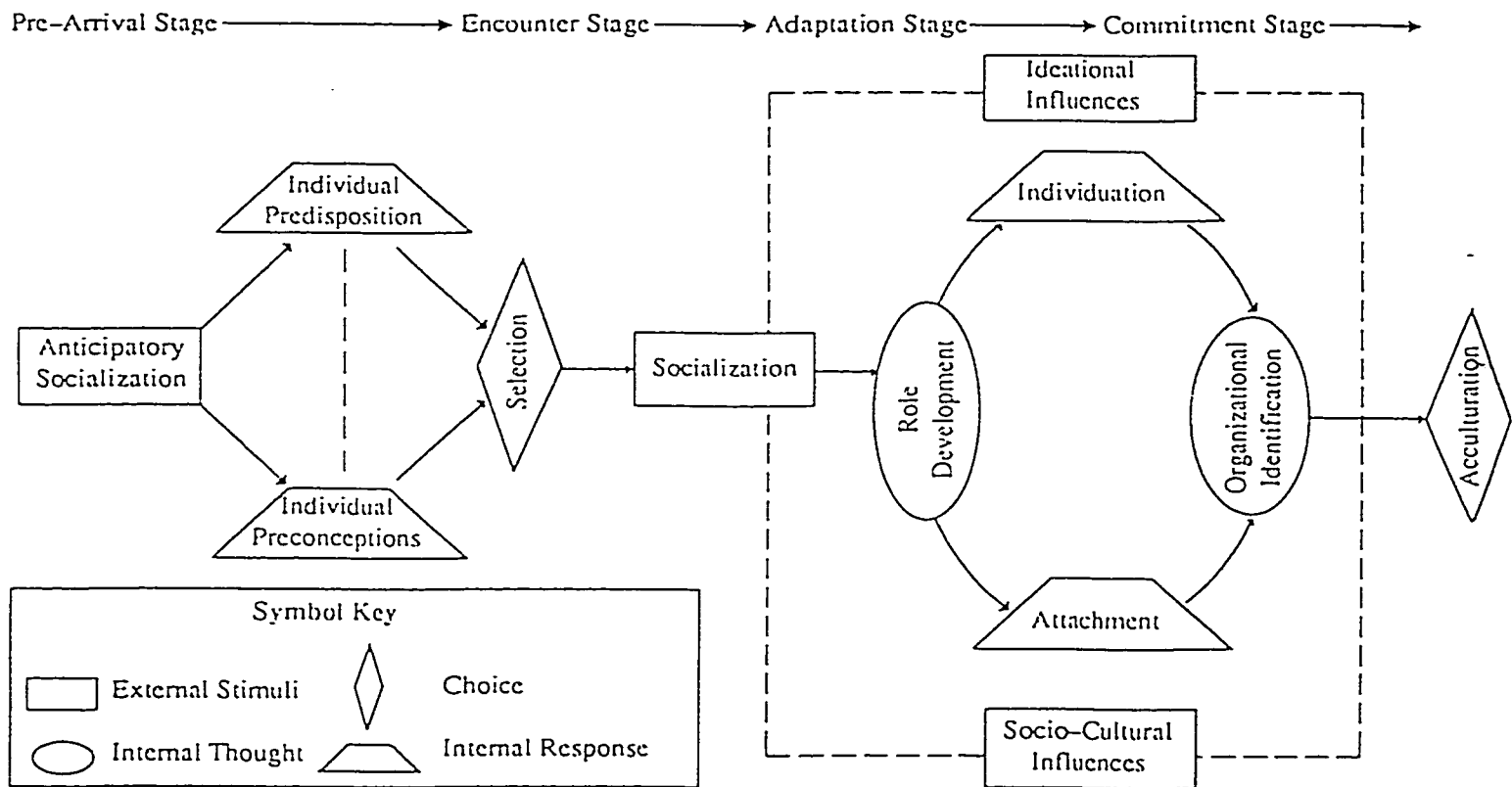
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Appendix A

Figure 1. Enculturation model by Rosch and Reich (1996)



Appendix B
Consent form

Consent Form

Principal Investigator: Natalie St.Denis (M.A. Educational Administration)

Affiliation: University of Ottawa

Telephone: (613) 562-5326

Whenever a research project is undertaken with human participants, the written consent of the participants must be obtained. This does not imply, of course, that the project in question necessarily involves risk. In view of the respect owed to the participants, the University of Ottawa and the research funding agencies have made this type of agreement mandatory.

The purpose of the study is to see if the enculturation experiences of new female faculty in science differ from those experienced by new male faculty in science. If differences are found, the study will investigate the cultural factors that influence the positive and/or negative experiences. Hopefully the information collected through this study will have some practical value as well as help formulate new research questions in this area. This information may shed some light on the various recruitment and retention problems of women in science and engineering, that is, problems related to organizational culture in non-traditional fields for women. If the results are interesting and pertinent the author of the study may publish one or several articles. By making this information accessible to interested parties perhaps it can provoke some thought on organizational change.

If I agree to participate, my participation will consist in being interviewed one time. I understand that the contents will be used only for the purpose of a master's thesis and that my confidentiality will be respected.

I understand that since the activity deals with very personal information, it may induce emotional reactions which may, at times, be negative. I have received assurance from the researcher that every effort will be made to minimize these occurrences.

I am free to withdraw from the project at any time, before or during an interview, refuse to participate, and refuse to answer questions without penalty.

I have received assurance from the researcher that the information I will share will remain strictly confidential. I, in turn, assure other participants that I will treat in the same confidential manner any information I may obtain in the context of this project.

Any information requested or complaints about the ethical conduct of the project may be addressed to the Secretariat of the Ethics Committee (562-5800, ext. 4056). If I have any questions, I may contact Professor Anne Jefferson, Tel: 562-5800, ext. 4107. There are two copies of the consent form, one of which I may keep.

Participant's signature

Date

Researcher's signature

Date

Thesis Director

Date

I, _____, am interested in collaborating in the study entitled "Do enculturation experiences of new female faculty in science differ from those of new male faculty in science?" conducted by M.A. student Natalie St.Denis-Byrne of the Faculty of Education at the University of Ottawa.

Optional: I wish to receive a summary of the findings of this study which will be available during the summer of 1999. Yes _____ No _____

Appendix C

Questions for interviews with primary subjects

Session 1 – October 98

1. Tell me about your educational background. Where you completed your undergraduate and graduate programs?
2. How would you describe your experience at graduate school?
3. Why did you choose to pursue a scientific career in academe?
4. What conditions were important to you in selecting your present employer?
5. What are your expectations from your employer?
6. How would you describe your chosen profession; what activities are most important to you and why?

Session 2 - October 98

1. Please describe the interview process and hiring process for your present position.
2. How were you introduced to your colleagues?
3. At this time, how do you perceive the climate in your department?
4. How do you feel in your new setting?
5. What impressions were you left with following your first departmental meeting?
6. From your perspective, what are your department's priorities?
7. What are your priorities?

Session 3 - December 98

1. How do you feel about where you are at? Did you accomplish what you set out to do?
2. How do you feel about your job at this point?
3. Who are you interacting most for research, teaching and social activities?
4. Have you developed bonds with anyone in the department or faculty, if so, please describe in what context.
5. Have you had any feedback or comments from colleagues or the chair vis-a-vis your progress - if so please describe.
6. What event or situation was the highlight this semester?
7. What event or situation was the most frustrating or challenging this semester?
8. How would you describe your experiences and feelings now in contrast to when you were post-doctoring or at former job?
9. At this point, on a continuum of 1 to 8, 1 being outsider and 8 insider, where would you situate yourself and why?
10. Have you encountered surprises (good or bad) along the way in terms of attitudes, values or ideas from your colleagues?
11. In your opinion, what are the attitudes and values in your department with respect to gender issues?
12. At this point in time, how would you describe the climate in your department? Please give examples.

Session 4 – February 1999; Session 5 – May 1999

1. How is your semester going?
2. What are your priorities at this point?
3. Who are you interacting with for research, teaching and social activities?
4. Have you had any feedback from your department and if not how do you know that you are doing a good job?
5. At this point , on a continuum of 1 to 8, 1 being outsider and 8 insider, where would you situate yourself and why?
6. What do you enjoy the most about your work?
7. What do you enjoy the least about your work?
8. What is the climate like in your department?
9. Tell me about one of your colleagues that you admire and why.
10. Tell me about a colleague that you are not very fond of and why.
11. How has your perception of your department changed since your arrival?
12. What is your most important priority at this point?
13. Tell me a story about your department – on how people interact.

Session 6 - October 1999

1. How did your summer session go?
2. Do any events stand out since we last met?
3. How does this fall feel in comparison to last fall when you arrived?
4. At this point , on a continuum of 1 to 8, 1 being outsider and 8 insider, where would you situate yourself and why?
5. How has your perception of your department changed since your arrival?
6. What advice would you give to a new faculty member coming here?
7. Are you pleased with your career choice?
8. What is your definition of success?
9. What has been your greatest challenge since your arrival here ?
10. Have you had any feedback on your progress?
11. If you could change one thing in your department what would it be

Appendix D

Questions for interview with secondary subjects

Interview with secondary subjects

1. Tell me about your academic background.
2. How long have you been here?
3. Why did you choose to come here?
4. What were some alternatives?
5. What was the interview process like for you?
6. What were your initial impressions of this institution prior to your coming here?
7. How would you describe the institution's and your department's mission?
8. Tell me about when you first arrived – what was it like, how did you feel?
9. Was there any type of orientation?
10. What is the climate like in your department?
11. What activities are most challenging to you?
12. What do you enjoy the most in your job?
13. What do you enjoy the least in your job?
14. Tell me about your colleagues.
15. How has your perception of your department changed since you have first arrived?
16. Have you had any feedback on your progress?
17. What is your personal situation ? (married/single; kids/no kids)
18. Do you think that it is possible to have an academic career and have a family as well?
19. Are you pleased with your career choice?
20. What is your definition of success?
21. If you could change one thing in your department, what would that be?