# Natural Sciences and Engineering Research Council of Canada: Chairs for Women in Science and Engineering (CWSE) Program

In the first of a two-part series, *International Innovation* welcomes three NSERC Chairs for Women in Science and Engineering, **Tamara Franz-Odendaal, PhD** (Atlantic Region), **Catherine Mavriplis, PhD** (Ontario Region), and **Annemieke Farenhorst, PhD** (Prairie Region) to discuss their work to support the increased participation of women in the STEM disciplines, where they are currently underrepresented

**Could you explain the aim of the Chairs for Women in Science and Engineering Program (CWSE)?**

**NSERC:** The overall goal of NSERC's CWSE Program is to increase the participation of women in science and engineering, and to provide role models for women active in, and considering, careers in these fields. There are five regional Chairs across Canada (British-Columbia/Yukon, Prairies, Ontario, Quebec, Atlantic) and each Chair has a separate set of activities designed to work toward this important goal. The success of the CWSE Program has been driven by the exceptional women who have held these Chairs. Through their efforts, the Program has reached thousands of girls and women to promote careers in science and engineering. Activities range from workshops at elementary schools, to mentoring initiatives, networking events and leadership training for students and professionals. As accomplished researchers in the natural sciences or engineering, the chairholders themselves are role models to all of those who participate in the Program.

**An important aspect of the Program is to provide role models for women both active in, and considering, careers in these fields. How does the CWSE Program make women aware of this? What outreach work are you engaged in to promote these role models? Do they have to be Canadian?**

**TFO:** Connecting junior and senior high school students with role models is a huge part of my CWSE program. We have a number of initiatives underway, which include community seminars (in local libraries, open to all), online webinars (open to all), role model videos featuring women in STEM careers in their workplace, and hosting and supporting Girls only Science Retreats. As the Atlantic Chair for Women in Science and Engineering, we select role models within Atlantic Canada; we want school-aged women in Atlantic Canada to be able to identify with role models in their communities. You don't have to be in a big city to have a career in STEM!

**CM:** The NSERC CWSE program chooses the five regional Chairholders as role models. As we can only represent a small segment of our immense territories and diverse science and engineering fields, each of us in turn promotes our own chosen role models. Within the Ontario Chair program, and indeed in my previous work, I have organised many workshops for women, where it is my goal to present as many different types of successful women in science and engineering as possible, keeping an eye on discipline, geographic, career stage, institution type and ethnic diversity, as well as work/life balance and lifestyle diversity. One size certainly does not fit all, and over the years, I have come to realise that because of our low critical mass, our isolation needs to be counteracted by such initiatives, and by exposure to a number of very different role models.

I do not feel that role models have to be Canadian; that said, certainly we do strive to show our own, since connection to the role model helps the women to envision themselves forging a similarly successful path. Certainly, there are many examples in other countries, and especially in the US, that are appealing. In particular, the success of Canadian women abroad is useful to promote. One example is Maria Klawe, former NSERC/IBM Chair for BC and Yukon, who became Dean of Engineering at Princeton University in the US and is now President of Harvey Mudd College in California and Board member of Microsoft Corporation.

**AF:** We are using social media to connect women in science and engineering, for example through a CWSE-Prairies website, and Facebook. As demonstrable proof that not only those living in Canada but women from all over the world can connect with us, one frequent visitor to our Facebook page is an MSc student from Bangladesh.

Women student-professor mentorship opportunities are still lacking in many of the science and engineering programs in Canadian universities, in part, because of the underrepresentation of female faculty as scientists and engineers within each of these institutions. One of the action points of the CWSE-Prairies program is to develop a multi-institutional women mentorship program to increase the likelihood that female postsecondary and postgraduate students will be able to find a suitable mentor. An interactive website will be used to communicate the mentorship program opportunities that exist for women in science and engineering. In addition, mechanisms will be put into place to provide regional funding for women faculty in science and engineering to mentor female postsecondary and postgraduate students. This CWSE-Prairies mentorship program will launch in 2013, pairing female students with professors who can then apply for up to CAD $10,000 in funding so that mentor and mentee can work together in research projects related to science and engineering.

**In terms of implementing strategies to encourage female students in elementary and secondary schools to consider careers in science and engineering, what have you been able to achieve?**

**TFO:** All the initiatives outlined above aim to encourage female students to consider careers in science and engineering. We have also held hands-on science workshops for elementary-aged students. We are currently sponsoring teams (50 per cent females or more) to take part in the First Lego League (FLL) competitions, which are robotics-based and help to build skills in problem-solving and team work, both of which can be very important in STEM careers. We are also holding a unique All Girls Science camp this summer for girls in grades 7 and 8.

**CM:** The previous Ontario chair (Valerie Davidson) put the Go ENG Girl program on a firm footing for all the 15 Ontario universities offering engineering programs through the Ontario Network of Women in Engineering. Go ENG Girl is an outreach event for girls in grades 7-10 and their parents to learn more about engineering through a Fall Saturday event on university campuses, featuring information sessions and hands-on activities. This year we reached over 800 girls and over 600 parents. Many other outreach activities are organised on a regular basis. For example, at the University of Ottawa, site of the current Ontario Chair, we offer one-week mini-enrichment courses for high schoolers, both male and female, in the faculties of science and engineering. The girls are invited to a lunch for some mentoring and exposure to role models. All of our programs are bilingual (French-English).

From a recruiting point of view, we ensure that all of our media materials include images depicting people rather than just machinery or laboratory settings, showing engineers and scientists engaged in collaborative work and in the service of society, since on average, girls and women express more interest in careers where they play an active role in service to society and individuals. Having a healthy minority of women professors in the faculty also contributes to recruitment and retention.

**AF:** If universities are to have a positive impact on the social, economic and environmental sustainability of the Prairie region, they need to ensure that their actions promote diversity and equity across their academic programming. In addition to the inequity that continues to exist for women in a range of science and engineering programs across Prairie universities, there is also an overall low participation of Aboriginal students in these disciplines. It is therefore essential that universities in the Prairie region respond to changing demographics. For example, by 2017, 30 per cent of the 20 to 27 year olds in Saskatchewan will be of Aboriginal descent. Consequently, universities should expect that, in the not too distant future, the majority of their students will be coming from this demographic.

Much of the CWSE-Prairie's program strategies are directed to promoting science and engineering to First Nations youth in Northern communities. This includes the production of a video with the purpose of encouraging Aboriginal youth to move towards careers as professional engineers and

scientists. It also includes reaching out to First Nations youth as part of the Verna J Kirkness Program in which high school students from Northern communities take part in research in university laboratories for one week. The CWSE-Prairies is also collaborating with Sapotaweyak Cree Nation in a program that will assist youth from that community to conduct hands-on analysis of water, using equipment situated either in their own communities or at the University of Manitoba.

**Making science more popular to women is quite a challenge and needs to be tackled from an early age right through to university, as the Program shows. What strategies do you put in place to help support women at undergraduate level to continue a career in scientific disciplines?**

**TFO:** Mount Saint Vincent University has a longstanding history of supporting women, and as such we have a strong female student base, especially in the sciences. I have trained many undergraduates (mostly female) in my research lab connecting them directly with hands-on bench research. The Mount also awards a Jeanne Sauvé Women in Science Award for exceptional female undergraduates to gain hands-on research opportunities. Jeanne Sauvé was appointed the first woman Governor General of Canada on 23 December 1983.

**AF:** Traditionally, recruitment to universities has concentrated on increasing enrolment numbers. However, Strategic Enrolment Management (SEM) is increasingly being seen by Canadian universities and colleges as a tool that allows them to develop a more focused approach towards both student recruitment and retention. SEM takes a more comprehensive view by supporting the success of a student throughout their time at an institution. SEM stresses the importance of interactions between the recruitment activities of the institution, the institution's curriculum, the academic, social and psychological support the student receives, and the on-campus lifestyle the student experiences.

One of the objectives of the CWSE-Prairies program is to work with university administrations to strengthen the implementation of Strategic Enrollment Management strategies at the University of Manitoba and other universities in the Prairie Region. This will be done through researching and recognising the needs that currently exist for women undertaking STEM courses, with a particular emphasis on Aboriginal women. Thus, we listen to the concerns that women in academia are raising. We make sure to include women at the undergraduate level, so we can hear the solutions that they propose. Together, the CWSE-Prairies, the University of Manitoba administration, and other prairie universities are making sure we are addressing the most critical concerns.

**CM:** Although not specifically for women, we maintain an active near-peer mentoring service to help first year students with their challenging courses. The Dean of the faculty is a tremendous supporter of women in engineering at multiple levels, from his involvement at the National Council of Deans level through to supporting student groups like WISE (Women in Science and Engineering) and Engineers Without Borders (EWB) to attend and host conferences, and participate in competitions. Summer research scholarships are also available for women. Many women students volunteer for the outreach events mentioned above and the experience and networking with the Dean and other organisers (professors and faculty staff) further their dedication to the field. In the Professional Practice seminar, where we invite practicing engineers to come and talk to students about their careers, we strive to have at least 40 per cent of the speakers being women and encourage all speakers to talk about the importance of soft skills and work/life balance. As mentioned above, having a critical mass of women professors in the faculty definitely contributes to retention.

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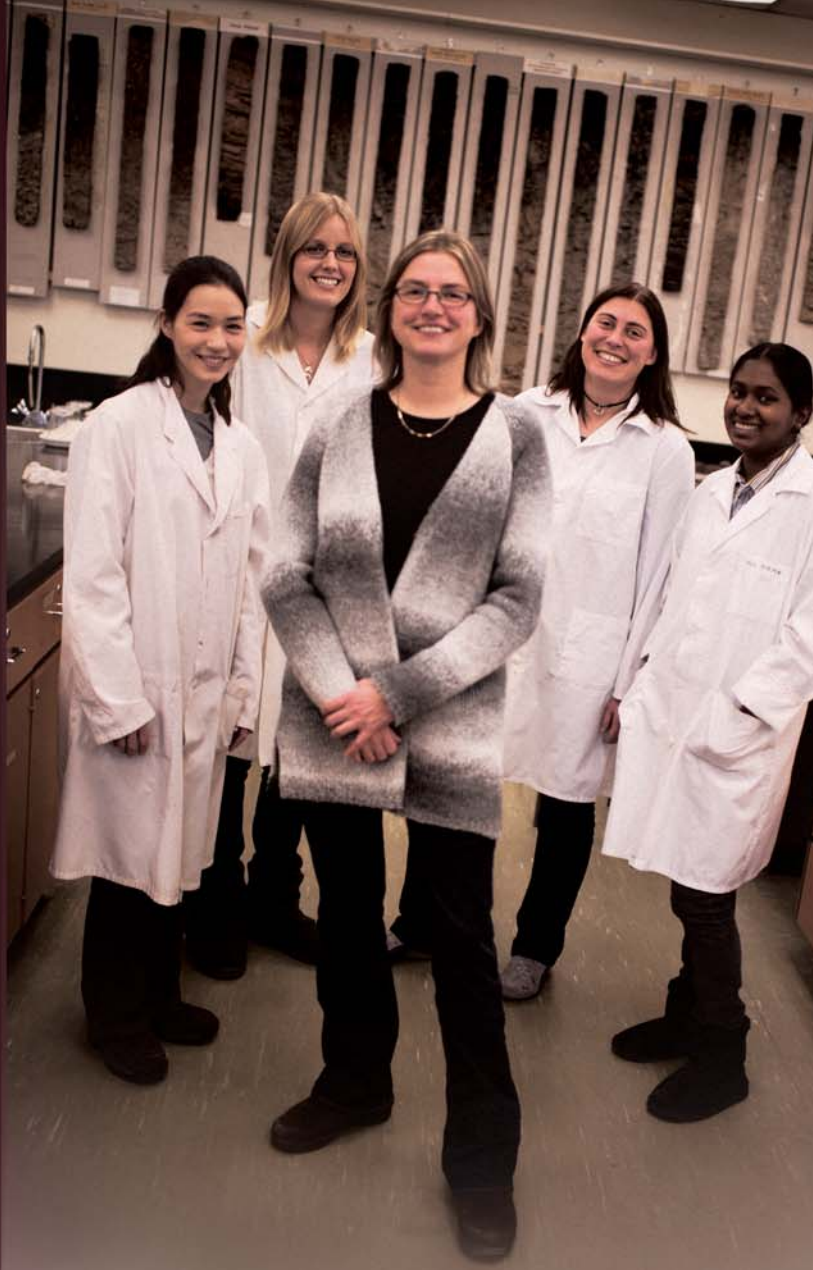

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# Chairs for Women in Science and Engineering Program

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**Once having entered a career in science and/or engineering, what proportion of women leave? To what extent is this due to tension and pressure from within their field, or is it more a case of leaving to have a family? In terms of women's rights – and their awareness of them – what advances have you made?**

**TFO:** Women currently make up 48 per cent of the labour force in Canada, yet only 3 per cent are in science, technology, engineering and mathmatics (STEM)-related careers, compared to 10.5 per cent of men. Women struggle to re-enter the workforce after having children because industries and institutions do not stop the career clock and restart it when they return to work.

I started my CWSE position in Sept 2011. To date we have held sessions at the CCWESTT 2012 conference and at the Atlantic Engineering Competition to discuss support for women in science and engineering. We held a WinSETT 'Becoming Leaders' Workshop this past May to provide women with tools to become leaders in their professions. I would like to see additional WinSETT workshops rolled out across the Atlantic region, as they are in other parts of Canada.

**CM:** It is unclear to me what proportion leave, especially in Canada. I believe that people think women leave due to child-rearing duties by choice, but several studies show that that is not the case. The study by Anne Preston following 1,688 men and women in science over an eight-year period found that women and men (51 per cent of the study participants!) leave for various reasons, predominantly in the case of women because they feel frustrated with the narrowness of science and the people involved in science; that they do not feel that all of their talents are being used, and the accepted view of a scientist does not reflect their personal values.

Canadian laws for maternity leave have made combining raising a family with a career easier. Most science and engineering women of child-bearing age report satisfaction with maternity leave options and their ability to return to their jobs. This is in sharp contrast to the situation in the US. However, there remains the need to educate some managers and university department chairs to handle the duty reassignment during these leaves and to treat these leave periods properly in promotion decisions. It is of tremendous help that the government funding agency for science and engineering (NSERC) has provided leadership and a model in setting clear policies for leave periods.

**AF:** There has been a great deal of research examining various reasons for why women either do not enter or have left STEM fields. The CWSE-Prairies programme will strengthen research on potential strategies that can be implemented for increasing the retention of women in science and engineering. Blickenstaff (2005) conducted an in-depth inquiry into the underrepresentation of women in STEM. Since 2005, research in the area has continued, with no major new areas identified as issues. Examples of the issues that have been discussed in the literature include: biological differences; lack of academic preparation for girls; lack of role models/negative stereotypes; a 'chilly' climate; cultural pressures of gender norms.

**What lengths have the Program's activities gone to in eliminating barriers for women in science and engineering?**

**TFO:** A large part of eliminating the barriers to women entering these fields has to do with changing stereotypes, making young women (and parents and teachers) more aware of STEM careers and the fact that women can do them just as well as men. We have a number of initiatives underway aimed at doing just this.

**CM:** In my opinion, most of the programme activities are not aimed at eliminating barriers in an obvious way, but rather are concentrated on positive messaging: recruitment to dynamic and interesting fields; increasing the critical mass; proactive and strategic career management and legitimising the discussion of topics such as soft skills; respect for individuals and awareness of differences in strengths between men and women and differences in people's (men and women's) perceptions of men and women. Of course, serious barriers encountered are addressed and usually handled in a more persuasive and sometimes necessarily discrete manner.

**AF:** We are involved in a number of activities that may lead to eliminating barriers for women already in science and engineering. These activities include research, but also collaborations with university administrators to discuss perceived and actual barriers, and how to remove these. I am very happy that women talk to me about their concerns, because it means I can be a better advocate for women.

**As a Chairholder, what is expected of you in your region? How much time do you contribute to this Program? What are the challenges of balancing this position with your own research commitments?**

**TFO:** I contribute 50 per cent of my time to the Program. The biggest challenge is finding blocks of time to do research. One cannot do research in a one-hour time slot but one can easily answer emails and do administration for the programme; because of this, I have to block time off for research. I manage a large research group, comprising undergraduates and graduate students, and take this role very seriously.

**CM:** On the one hand the programme was conceived to recognise role models, but a large part is aimed at outreach events to recruit young girls to science and engineering university programmes by the nature of the provincial mandate. A geographical reach beyond the well-established urban centres is implied. Personally, I believe that attention should also be brought to the many women who trained in these fields and are out in professional settings, encountering barriers often difficult to recognise. Mid-career development and advancement and leadership development activities form a large focus of my chair programme. The Chair programme also requires a research component. By teaming with sociologists, historians, communications and management researchers, I intend to study the career development and leadership paths that exist and see how they can be improved. I am also interested in looking at several sectors in particular women in aerospace and in computer science or information technology. Finally, the effect of globalisation on women's technical careers is a timely issue to be investigated.

The official balance of duties is to be 50 per cent on the Chair and 50 per cent on regular duties. This is certainly difficult to balance at many times of the year, eg. during outreach event season. This year, the granting agency (NSERC) added the possibility of matching funds for a postdoctoral researcher to help support the Chairholder's regular research programme, which has been tremendously helpful.

**AF:** One of the advantages of my career is that it allows me to multi-task, which I enjoy. There is never a dull moment in my job. A significant amount of my time is devoted to the Chair programme but the load is carried with many enthusiastic women that have become involved; not only women at the University of Manitoba, but also women from other universities and professional organisations have stepped forward to show their enthusiasm. We are also grateful to our sponsors, many of whom have significant representation in Chair activities. Together, we monitor and work to increase the participation of women in engineering with respect to recruitment, retention, and equity.

**What improvement still needs to be made to better integrate female students and professionals within academia? Is the situation outside of academia more open to integrating women?**

**TFO:** Programmes supporting the hiring of women should be put into place. There were initiatives in the past, led from NSERC, but these no longer exist, and none of the other tri-council agencies have comparable strategies. The improvements are needed everywhere, and relate more to particular disciplines within science and engineering than between academic and non-academic. For example, the biological sciences are more popular to women than chemistry or physics; environmental engineering is more popular than mechanical engineering. Women in these disciplines should realise that they are important role models to the younger generations.

**CM:** It is difficult to tell if the situation outside academia is more open to integrating women, but I do not think it is; the academic world is fairly open for students, in the name of education for all. However, as women move up in their career they do find that is difficult to advance both in industry and academia. Some firms have seen the advantage of diversity in relation to innovation in their products and therefore value the contribution of women at a higher level. However, there remain pockets of resistance, often attributable to single individuals in both settings. In this case, strong leadership and reiterated commitment to diversity principles by leaders are key to changing the climate.

**AF:** I am not sure whether integration is the correct word. I believe what we can do better is to provide a space in which female students feel welcome and encouraged. Very often in meeting rooms, there are pictures on the wall that only show men, very often Caucasian and middle-aged. Something as simple as increasing the diversity in the pictures that you show on the wall, including, for example, photos of promising Aboriginal women engaged in their science and engineering field could make a big difference in making women feel encouraged. Women also tell me that they want better support programmes to balance their professional-family life.

**Are there any aspects to your role that you are particularly interested in watching develop in future years?**

**TFO:** As part of my CWSE programme, we are conducting a school survey to determine how students change their perceptions of careers as they move through junior high and high schools. This survey will provide us with valuable information on what students in Atlantic Canada are thinking about with respect to their futures.

**CM:** One approach to integrating more women in the future is to address not just gender diversity but how to improve the work environment for all through conversations on communication styles, management styles, personal interactions and more. This approach seems to be effective in opening up the lines of communication.

Prior to being awarded the Chair, I worked with Pratt & Whitney Canada to develop a Women's Leadership Forum in 2007 for 140 hand-picked women performers (out of about 2,000 women who represent 22 per cent of the company) and since then, their Women's Leadership Initiative has developed a spectrum of activities that are sought after by women employees of the company. The Chair programme expects to provide more content for these activities company-wide in addition to organising the local events in Toronto. As the five-year mark passes for this initiative, it will be interesting to analyse the career progression of the women involved in the programme.

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