

GENDER EQUALITY IN SCIENCE

Women still lag behind men in number and rank within STEM careers. In the first of a two-part series, **NSERC CWSE** Drs Tamara Franz-Odeendaal, Catherine Mavriplis and Annemieke Farenhorst provide an insight into their individual programmes aimed at recruiting, retaining and helping women to succeed in STEM fields



Drs Tamara Franz-Odendaal, Catherine Mavriplis and Annemieke Farenhorst

Natural Sciences and Engineering
Research Council of Canada Chairs for
Women in Science and Engineering
(Atlantic, Ontario, Prairies)

What do each of your roles within Natural Sciences and Engineering Research Council of Canada (NSERC) Chairs for Women in Science and Engineering Program (CWSE) entail, and how did you come to take up these positions?

TF: My programme, which is targeted primarily at junior high school girls, has developed tremendously since a year ago. There is a great need for STEM awareness at this age because the hands-on activities common in elementary school wind down in junior high, yet it is in senior high, that youth need to make very important subject choices. If they are not inspired to continue with mathematics and science or do not see the importance of these subjects for future careers, then they may not choose these subjects. This is a shame because STEM careers are so incredibly diverse! In addition, STEM professionals are in high demand in Canada and will continue to be so over the next decade or more.

For my research project, I have focused on an analysis of the career and subject choices made by youth and what influences their decisions as they move through junior and high school. This longitudinal study will determine how these influencers change from grade 7 through to grade 12.

CM: I am focusing many of my resources on professional women already in the STEM workforce. I am interested in providing leadership development for mid-career women, as is my sponsor, Pratt & Whitney Canada, an aircraft manufacturer based in Montreal, Canada. My research also focuses on resources for and an analysis of professional women's advancement. This interest grew out of my involvement with the sponsoring company following their request to me to help them develop an in-house leadership programme. It also responds to the frustration that many women feel at mid-career.

For my research projects I have focused my attention on women in Aerospace, IT and Biotechnology. The Aerospace interest stems from my own background as well as my sponsoring industry. IT and Biotechnology are fairly young fields that accept fast change and I therefore see them as potentially well poised to accept a greater participation of women – if we keep the communications lines open.

AF: I am a Professor of Soil Science in the Faculty of Agricultural and Food Sciences at the University of Manitoba, Canada, and this position makes me an important role model for women, as this is a field that is still largely male-dominated. As an example, in the Province of Manitoba, I served in 2000 as the first female president of the Manitoba Soil Science Society since the inception of the society in 1957. Since then, at least five other women have served as President.

I am currently the Chair for the Prairie region of Canada which covers the provinces of Manitoba, Saskatchewan and Alberta. A main focus of the my programme is the recruitment, retention and success of Aboriginal women in science and engineering programmes. Across Canada, only 8 per cent of Aboriginal peoples compared to about 30 per cent of non-Aboriginal peoples hold a university degree. The participation of Aboriginal students is particularly low for science and engineering programmes. Increasing the enrolment of Aboriginal women (and also men) in science and engineering programmes is of the utmost importance

to the future of Canada. For example, in Canada, the population growth in 2006-11 was 20.1 per cent for Aboriginal peoples, but only 5.2 per cent for non-Aboriginal peoples. The population growth of Aboriginal peoples is highest in the Prairie region.

Thus, as part of my programme I have launched a CAD \$2.976 million NSERC CREATE H2O Program (<http://create-h2o.ca/>) at the University of Manitoba, with assistance from the university's Centre for Human Rights Research and in collaboration with Trent University, University College of the North, the Assembly of First Nations and industry partners. H2O Program students, including many who are Aboriginal, will work on research to improve water and sanitation security in First Nations communities in Canada. The best CREATE H2O research projects will be those that First Nations initiate when they identify a need in their communities and are willing to help our students learn.

My programme also involves research to assess the experiences of University of Manitoba students around issues of equity, and research into their attitudes towards policies and programmes designed to address inequities in the academic community. This takes a broad approach because, in addition to gender disparities, other inequities are recognised and exist with respect to ethnicity, sexual orientation, age and other demographic factors.

Over the course of the last year, how have you built upon your efforts to provide role models for women currently in, or considering, STEM careers?

TF: In Atlantic Canada, we carry this out in three different ways: face-to-face in our science workshops or camps; via distance and online webinars; or through the production of role model videos. The girls in grades 7-12 that I have worked with, especially face-to-face, find these discussions very useful. They love meeting women in these science-related careers and hearing why they chose their respective fields.

CM: We have provided videos and website content for young girls interested in science and engineering. We have also conducted two campaigns featuring women in exciting positions, the first being 'Engineering in Ontario' (<http://scieng-women-ontario.ca/en/30in30/>), and second being 'Canadian Aerospace Enterprise' (<http://scieng-women-ontario.ca/en/features/women-in-aerospace-feature/>). Both have generated a lot of discussion, feedback and interest. These campaigns were also designed to create awareness for men and women that many women perform very interesting and diverse tasks and enjoy their STEM careers.

AF: I am collaborating with the University of Manitoba's largest Outreach Youth Program called WISE Kid-Netic Energy (www.wisekidneticenergy.ca). Through this program, students who are enrolled in STEM fields offer hands-on, curriculum-based science, engineering and technology workshops to youth of all ages. This year, the programme connected more than 22,000 youth in more than 150 schools in Manitoba. Over 90 per cent of the undergraduate students who are involved in the programme as teachers are women, thus providing role models to younger girls who can see that other women are enjoying science and engineering careers.



I am also setting up an ICAN WISE Mentor-Mentee Scholarship Program for women in my region. This programme invites undergraduate students to apply for funding to work with their female role models on a research project of interest to them both.

Looking towards the future, are there any particular goals that you would like to accomplish in your respective regions in the coming years?

TF: I would like to run week-long 'girls get WISE summer camps' for girls in grades 5, 6 and 10-12 in different regions of the province, and in other provinces in Atlantic Canada, so that our current camp has an introductory and a more advanced level. To assist with integrating more hands-on science learning into the curriculum, we are planning a week-long workshop aimed at giving teachers tools to teach science-related topics in a more engaging manner. The challenge is to strike a balance between covering the curriculum and including the more time-consuming practical activities.

CM: I am looking forward to delving into the interdisciplinary research projects on mid-career leadership women in STEM. Studying the effects of new communication structures, globalisation and the fast pace of business on women's advancement will certainly prove to be particularly interesting.

AF: My Program is progressing well, and my goal is to continue growing the CREATE H2O Program and attract more Aboriginal women to STEM fields. In the upcoming year, we will launch our ICAN WISE Mentor-Mentee Scholarship Program, and I am looking forward to formalising this new educational funding opportunity for female undergraduate students in the Prairie Region of Canada.

Are there any upcoming conferences about issues relating to women in science?

TF, CM, AF: We are looking forward to the 3rd Gender Summit (www.gender-summit.eu) in Washington, DC November 2013 organised by the US National Science Foundation with Canada's NSERC, for which we CWSEs have been asked to contribute to the programme. The aim of the 3rd Gender Summit, which is focused on North America, is to interconnect all relevant stakeholders in a Call to Action to achieve positive change towards greater diversity in the STEM workforce and leadership, and greater inclusion of biological sex and gender considerations or the 'gender dimension' in research content and process. The other major international upcoming event is being held by the Canadian Coalition for Women in Engineering, Science, Technology and Trades in Regina, Canada in May 2014.

AF: In the Prairies we are planning for a Becoming Leaders Workshop for women working in an academic setting in science and engineering fields in November 2014 in collaboration with WINSETT (www.winsett.ca). This workshop was run in Atlantic Canada in 2012. This is an important workshop



Hands-on robotics at the Girls get WISE Science Summer camp - WISEatlantic

because it addresses the lack of women in leadership positions, and will provide women with an opportunity to prepare themselves for future leadership roles. In Atlantic Canada, we are now busy gearing up for the Negotiating for Success workshop, also developed by the WinSETT Centre.

What would you cite as your greatest achievement at CWSE, and why?

TF: My greatest achievement is to hear from parents that my programme's activities have inspired their daughters to be excited by science. Our week-long science camp is becoming extremely popular and the feedback from girls and parents has been overwhelmingly positive. We hear from students who are not very interested in science or whose parents signed them up; after day one, they are so hooked they can't wait to get to camp the next day. Because this is a week-long camp, we really come to know the girls personally, and we have many repeat participants each year.

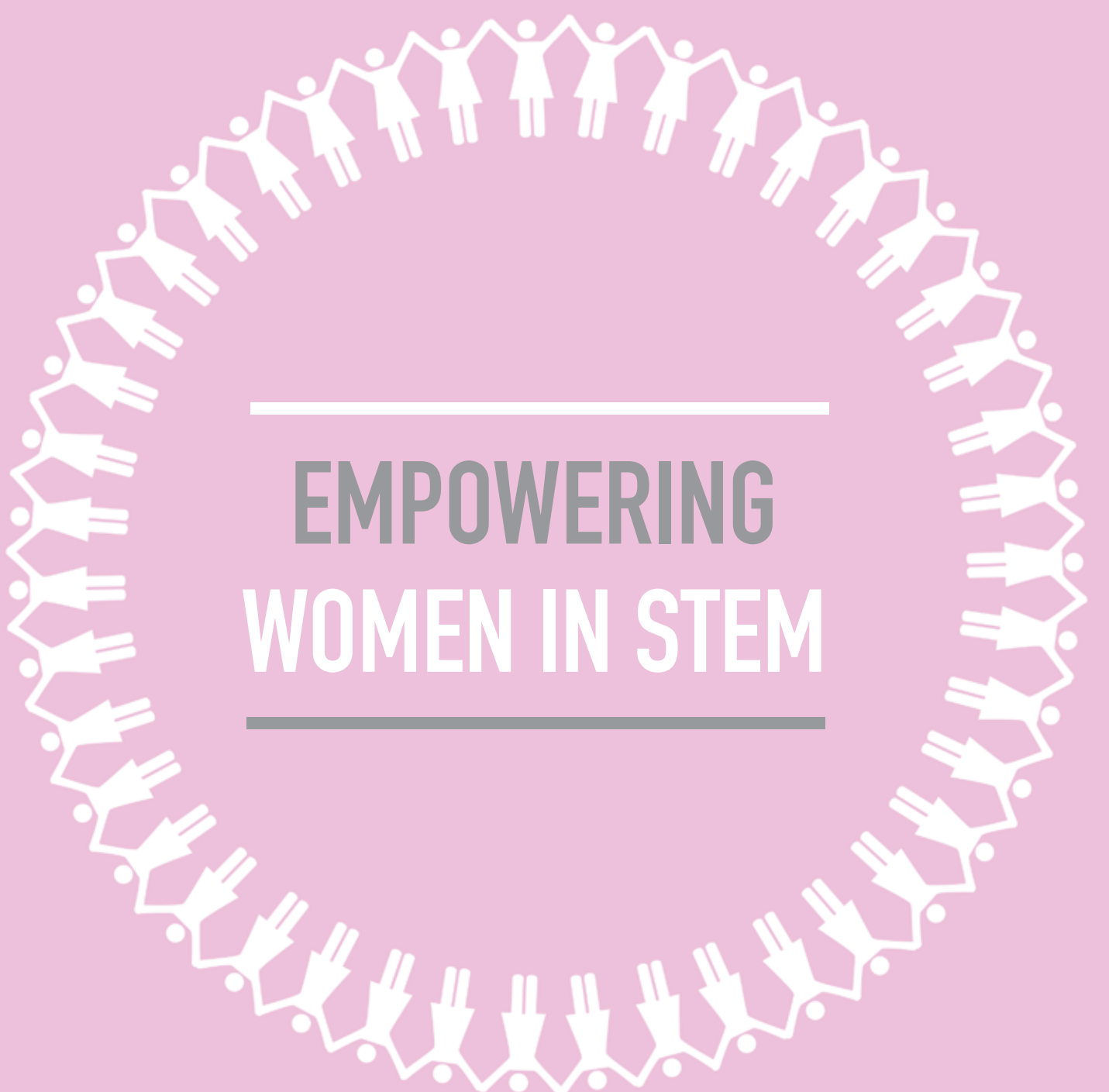
CM: I am very happy with our communication strategy and community engagement which has ramped up nicely over the year. Our features '30 in 30', and 'Women in Canadian Aerospace', have been a hit, and our workshops for mid-career leadership development have been particularly rewarding.

AF: My Chair Program has allowed me to develop collaborations with numerous stakeholders to create enthusiasm for educational programming such as our CAD \$2.976 million NSERC CREATE H2O Program. I am very proud of this.



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EMPOWERING WOMEN IN STEM

Even though women now hold senior positions in STEM fields, many of them still battle sex discrimination when trying to climb the ladder. In this second of a two-part interview, **NSERC CWSE** Drs Tamara Franz-Odendaal, Catherine Mavriplis and Annemieke Farenhorst explain that while of course initiatives to bolster the amount of women in STEM careers are needed, real change requires greater support in the workplace and a shift in the way society and cultures view women who choose to work in STEM fields

Drs Tamara Franz-Odendaal, Catherine Mavriplis and Annemieke Farenhorst

Natural Sciences and Engineering Research Council of Canada Chairs for Women in Science and Engineering



Could you begin by explaining why the Natural Sciences and Engineering Research Council of Canada (NSERC) Chairs for Women in Science and Engineering Program (CWSE) was initially set up and how it has developed over the past year?

TFO, CM, AF: The CWSE programme was set up to address the low numbers of women in science, engineering and technology sectors. To do this, work at all levels is needed. This includes engaging girls in school, supporting female professionals in STEM careers and working to change the workplace environment. Currently, although women make up 48 per cent of the labour workforce in Canada, less than 22 per cent are employed as professionals in STEM fields. Women occupy 81 per cent of administrative positions in Canada, and these are often low paying or part-time positions.

When we interviewed you in 2012, you briefly mentioned that the number of women leaving STEM careers cannot simply be attributed to the oft-cited decision to have a family, but may be due in part to frustration with the narrowness of the field. Could you elaborate on this? How can science careers adapt to become a more attractive prospect for women?

TFO: It is not the careers that have to adapt but rather society's views of these careers. We need a societal shift. We need parents, grandparents, teachers and peers to be more supportive of women choosing careers in science, engineering and technology; as well as trades. These are excellent careers that will enable women to become economically independent in their futures. We also need the workplace environment to become more supportive of women; and for more of them to be recognised and mentored into leadership positions within STEM workplaces.

CM: As documented by Anne Preston's study of over 1,500 men and women in science in her book *Leaving Science: Occupational Exit from Scientific Careers*, many women feel that their breadth of talents are not being used to the fullest capacities in their science careers, and they also feel a frustration with the other scientists they work with who do not value a broader set of competencies. These feelings often set in after several years in the field, for those who have persisted through the various hoops and gates in the first place. On the other hand, this may seem to counter the desirable attributes of soft and/or people skills that many women could bring to management positions. The work environment for these women is often so male-dominated and entrenched (due to historical reasons) that the very definition of desirable attributes is a perception issue that is hard to change.

The work environment could therefore benefit from some awareness of the issues and perceptions that confront these professionals. In my own CWSE programme, we have approached some of the issues with a discussion of 'cultural diversity' rather than 'gender diversity' as a multicultural society (such as in Montreal and Toronto) and workforce at the sponsoring company Pratt & Whitney Canada who are more open to and familiar with these issues.

A little humour injection also goes a long way to opening up the discussion.

AF: Research has shown that women are less valued than men in the workforce. One recent example is a 2012 study in which a student resume

was sent to scientists at academic institutions. Half of the scientists received the resume with a female name, and the other half were given the same resume but with a male name. The results showed that females were rated lower in their experiences and competencies and were offered significantly lower salaries than their equivalent male peers. Scientists were also less likely to show interest in mentoring females. Both male and female scientists showed the same gender discrimination towards female students. These study results are very concerning. We need to create a better dialogue to address the negative stereotyping that exists for women in the workforce at all levels.

Sexual harassment remains a concern for many of the women I have spoken to. A greater dialogue within academic institutions and other organisations about sexual harassment remains extremely important, along with true action and support networks for creating safer workplace environments for women.

Would you say that there is a great disparity between different regions in Canada in terms of working practices and opportunities for women in STEM? How can such gaps be improved?

TFO: Not really, but there is a great disparity amongst different cultures within Canada. This requires different programming strategies that recognise the nuances and beliefs of each culture so that we can engage and connect with girls and women across cultures (and hence the country).

CM: From my own experience, there is not much difference between Ontario and Quebec other than language issues and some cultural issues. We do hear of some more difficult situations for women in more rural or smaller communities, eg. the Maritimes.

AF: I believe women in different regions in Canada are experiencing the same challenges. Some provinces may be in a better position to address these challenges, because, for example, they have greater financial resources, or they have more political will to devote time and energy to promoting equity in the workforce.

How would you rate the position of women in STEM in Canada against the international picture? What can be learned from other countries, and what insights might they gain from Canada?

TFO: There are certainly lessons to be learnt and it is a good idea to study countries that have succeeded in attracting women into STEM fields. The main barrier is that we don't have enough people with enough time to address these issues. Even the NSERC CWSE programme, although it is an excellent programme that does tremendous work, only consists of five Chairs working part-time on these issues; this is for the entire country, which is geographically very large.

CM: I generally find the position of women in STEM in Canada fairly favourable as we are an educated society, very multicultural and hence open to difference and respectful of women. However, our numbers are no better than the US or other western nations. Certainly, the US has invested more, in particular, through the US National Science Foundation ADVANCE Program, to address the problem and target a transformation of the environment rather than

helping individual women one at a time. NSERC's programme for Canada is small by comparison, but each of the CWSEs has followed the trend to address awareness and climate issues in their own programmes. In Europe, some programmes have been well funded at times, however, it is difficult for us to judge their overall progress. It seems to me that there are some very advanced areas whereas others remain very conservative.

AF: Recently, the Gender Dimension in STEM fields was investigated for universities across Canada and a report was produced. It showed that Canada like the USA and Europe has fewer women the higher the academic rank. Of course there are many different countries within the EU and there is some variability there. I have read that countries like Finland and Sweden may be performing better than others when it comes to women in higher positions.

Did you see the European Commission's controversial 'Science: it's a girl thing!' video, which was released and quickly pulled last year? If so, what were your thoughts on the content of the video? How might they have produced a more effective campaign?

TFO: Yes. The NSERC Chairs network posted a response to the video on our websites at the time. Women in science and engineering take on some of the world's biggest challenges and selling science in the way that the video did feeds the media hyper-sexualisation of our society. We need to acknowledge and appreciate that all types of people can have science and engineering careers. We need to work hard to break existing stereotypes, and blunders like this video do not help the great work that many organisations, including the European Commission, are conducting to change society's view of women in science and engineering fields.

CM: The video didn't upset me as much as it did for many others. I thought it was in poor taste, but could have been aimed at a certain age group for whom they thought it would work well. Again, it's hard to tell what the culture is in other countries. There are certainly many different groups we aim to recruit to the STEM fields and a variety of approaches will be most effective. There is not one single type of female we will attract. Although some women are opposed to citing STEM as fields that serve society (because they feel it appeals to a stereotype that females are more interested in serving others), I do believe that, in order to reach more significant numbers, ie. a critical mass, such an approach is needed. I believe this could be particularly effective in IT or Computing, as it has been shown to be in environmental and biomedical fields.

AF: The video was appalling, particularly the scene in which the older male scientist was looking at the dancing girls. My 14-year-old daughter thought it was an awful video and wouldn't encourage her to go into science. I can think of better approaches to promoting science to girls.

What key strategies do you think would really make a difference to recruiting and retaining women in science?

TFO: I think if outreach activities were more supported by institutions and research councils there would be more exposure to the myriad of science careers for youth. Currently, outreach conducted by faculty is considered an extra service and not valued. The situation in industry is similar, employers should make time to engage youth. Then we need to address the workplace environment with policies that are supportive of re-entry into professions (after having a family) and also that are supportive of family demands.



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