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March 31, 2010

Updated : March 31, 2010 | 5:27 am

Inspiring female engineers

By Jon Tattrie
Metro Canada



Computer Engineer Barbie, right, standing along side News Anchor Barbie, is the 125th version of the iconic doll. Only 10 per cent of the engineering workforce is female.

During the month of March, Metro Workology focused on the engineering field and what it means to the aspiring engineer and the world as a whole. We hope you enjoyed it and thanks for reading.

Everybody knows Bob can build it, but what about Barbie? For career number 125, the iconic doll has mastered the geek-chic look and become Computer Engineer Barbie, according to Mattel.com.

The doll comes with a cellphone headset, laptop bag and pink laptop and was the first professional Barbie chosen by popular vote. So how do real-life women engineers feel about engineer Barbie?

Elizabeth Croft, associate head of engineering at the University of British Columbia, says Barbie is a good ambassador for women engineers.

"I don't see the downside to this. Barbie's been a doctor and a lawyer. It's only natural that she should also be an engineer," Croft says.

Croft noted only about 10 per cent of the engineering workforce is female and about 18 per cent of engineering students are female. She had no female engineering role models when she started in the profession.

She says it's a cultural issue, with people unconsciously thinking of engineering as a man's job.

That changed with doctors and she says it's time for engineering to catch up. Perhaps Barbie can help engineer social change.

"I don't have any issues with Barbie. Barbie's come a long way," she says, noting she was a Lego girl herself.

In Halifax, Corinne MacDonald, assistant engineering professor at Dalhousie University, laughs when she sees the image of Computer Engineer Barbie.

"Actually, I like it. She's not even wearing heels," she says.

Like Croft, MacDonald didn't have any female engineering role models.

"That's probably one of the biggest problems we have in engineering. It's catch-22: There aren't a lot of women in engineering and to attract more women to engineering, we need more women in engineering," she says. "I think any opportunity we have to put that thought in girls' heads is a good thing."

MacDonald was a stellar math and science student in high school, but engineering never crossed her mind until she took a computer career test. Its top suggestion was engineering.

"At which I point I went, 'What's that?'" she recalls. Her guidance counsellor filled her in and MacDonald started on the engineering path. Female role models, even plastic ones, help young women visualize themselves as engineers, she says.

"I liked to play with Barbies, but I liked to play with building blocks, too. Maybe Barbie could run the project and boss all the other Barbies around," she laughs.

**APEGBC
Members
Recognized
by CSA**



Neil Cumming PEng

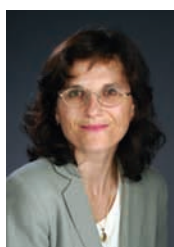
Neil Cumming PEng has received an Award of Merit from the Canadian Standards Association (CSA). A member of CSA Committee A23.1 since 1995, and CSA committee A3000 since 2004, Cumming has contributed his expertise and perspective toward harmonizing aspects of the two CSA standards. The Executive Vice President of Levelton Consultants,



Derek Henriques PEng

Cumming has over 30 years of experience in construction materials engineering, as well as testing, inspection and evaluation of engineering materials.

Derek Henriques PEng, Principal of Henriques Consulting, was named recipient of the 2010 John Jenkins Award. The award is CSA Standards' most prestigious honour. The award was conferred by the association in recognition of Henriques' 31 years of inspired leadership, international involvement and commitment to energy efficiency standards. Since 1979, he has championed numerous energy standards projects through the CSA, including chairing the first large motor efficiency committee, which today forms the basis for international and regional standards in this area.



Dr Elizabeth Croft PEng

Croft named NSERC Chair for Women in Science and Engineering

Dr Elizabeth Croft PEng has been named Natural Sciences and Engineering Research Council (NSERC) Chair for Women in Science and Engineering for the British Columbia and Yukon Region. Dr Croft is a professor of mechanical engineering at the University of British Columbia.

The primary goal of the Chair 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. In her new role, Dr Croft will focus

continued on page 9

on awareness and outreach programs to recruit women and under-represented minorities into engineering and technology-related sciences; develop strategies for educational mentorship and support; and create networks for advancement as professionals.

Dr Croft is a past recipient of APEGBC's professional service award (2005). A past chair and long-standing member of APEGBC's Division for the Advancement of Women in Engineering and Geoscience (DAWEG), Dr Croft is a passionate advocate for increased participation and retention of women in the engineering profession. Additionally, Dr Croft was a faculty founder of UBC's unique Tri-Mentoring Program, which connects students with both graduate and industry mentors. Dr Croft also co-founded UBC's Women in Engineering (WIE) program. WIE organizes speakers, brown bag socials and a two-day retreat for women in engineering, "Creating Connections," that has attracted more than 100 participants.

Order of BC Recognizes Extraordinary Contributions

Fifteen British Columbians who have contributed to the province in extraordinary ways are to be awarded the Order of British Columbia this fall. Among those receiving the distinction is APEGBC member Dan Doyle PEng.

A former BC deputy minister of transportation, Doyle has overseen major projects for the Province including the rehabilitation of Vancouver's Lions Gate Bridge and the development of the Sea-to-Sky Highway Improvement project. Doyle served as chairman for Rapid Transit 2000, the company responsible for building the Millennium Line rapid transit extension, and was Executive Vice President of Venue Construction for VANOC. He is the current chair of BC Hydro's Board of Directors.



Dan Doyle PEng

Mr Doyle was the recipient of the R A McLachlan Memorial Award in 2007, APEGBC's highest honour for a professional engineer. Other honours include Canadian Transportation Person of the Year (2005), a Lifetime Achievement Award from the Institute of

Transportation Engineers, and the Lieutenant Governor's Silver Medal for Excellence in Public Administration (2002).

Founder and past executive director of the Science Fair Foundation of BC, Patricia Leigh will also be receiving Order of BC. APEGBC members who have volunteered with BC Science Fairs will be familiar with Leigh's hard work and years of dedication to science education. The foundation assists students from across the province to participate in science fairs within their local communities, eventually competing for the opportunity to represent BC at the national and international level.

The Order of BC investiture ceremony will be held in Victoria on October 21, 2010.

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Mining-sector employment growth leads otherwise sluggish engineering job market

New resource jobs are a bright light in a job market that saw substantial layoffs during the recession and that presents perennial accreditation challenges for new Canadians

By Jenny Wagler

Mining-sector demand for experienced engineers is booming locally, leading an otherwise sluggish engineering job market where employers are only slowly starting to re-hire following recession layoffs.

The new resource jobs are being driven by rising prices for commodities such as oil, copper and gold, according to Bryan Watts, president and CEO for heavy civil engineering firm Klohn Crippen Berger.

"The price of copper has gone from \$1.30 to \$4.40 or so a pound right now," Watts said. "You just can't produce experienced people as fast as the price of copper goes up and generates projects."

Watts said intermediate and senior mining-sector engineers – "the guys who drive the projects" – are so difficult to find locally right now that his company is recruiting them from as far away as Great Britain and South Africa.

He added that at Klohn Crippen Berger, high demand for more senior mining-sector civil, mechanical and electrical engineers is also accelerating opportunities among the junior ranks.

"Young people are moving up the food chain faster than they were before," he said.

Judi Wannamaker, who recruits mining-sector engineers for David Aplin Recruiting, concurred that the mining sector is this year's growth-market for engineering jobs. She noted that a key challenge to recruiting in this sector is the need to attract



Consultant Judi Wannamaker with David Aplin Recruiting says introverted engineers need to get out and network to get noticed in a slow job market where recruiters are deluged with resumes



Bryan Watts, president and CEO for Klohn Crippen Berger: the company is recruiting in Great Britain and South Africa to meet soaring local demand for mining engineers



Without Canadian work experience, new Canadian engineers have trouble finding work locally says Brian Burnell, vice-president of MountainCrest Personnel



Companies are keen to hire more women engineers, according to Elizabeth Croft, National Sciences and Engineering Research Council BC and Yukon chair for women in science and engineering

people willing to work in remote locations such as Tumbler Ridge.

"If you like to ice fish and skidoo, then it's great," she said. "If you have kids in Montessori school, then it might not be so great."

Wannamaker said that apart from the strong

demand for mining-sector engineers, the demand for the rest of B.C.'s engineers is picking up fairly gradually after what she characterized as an "over-layoff" triggered by the recent recession. Wannamaker said she expects the trend to continue.

"It's not going to be like

1999 or 2000 when everyone was hiring like crazy with the dot-com bubble, but just a nice, steady, gradual increase in terms of hiring," she said.

On the Lower Mainland Infrastructure front, both Wannamaker and Brian Burnell, vice-president of engineering recruiting

workforce and less than 20% of local and national post-secondary engineering programs.

Croft, who's also a professor of mechanical engineering at the University of British Columbia, said local companies are keen to hire more women engineers.

"We have companies coming to UBC asking us, 'What can we do to help you attract more women engineers?'" she said. "So that's a pretty strong message."

"You just can't produce experienced people as fast as the price of copper goes up and generates projects"

— Bryan Watts, president and CEO, Klohn Crippen Berger

Croft said her NSERC chair position, geared at attracting more B.C. and Yukon women into engineering, includes initiatives such as industry workshops aimed at helping female engineers rise from intermediate to senior ranks.

The first two workshops will run in late March and will cover topics such as goal-setting, as well as networking to help women rise in company hierarchies.

"You have to have women in senior roles to attract women into engineering, so I think the net effect [of these workshops] will be to ultimately attract more women into engineering," she said.

Wannamaker said she doesn't think gender plays much of a role in companies' hiring decisions.

"I think a lot of companies can see women in the industry as a breath of fresh air," she said. "But at the end of the day, with engineers, they're a pragmatic bunch; they want the best bottom in the seat." ■

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Elizabeth Croft

Mechanical Engineer



You know those movies about robots that take over the world and attack the humans who created them? Totally unrealistic. Robots can actually help people, and working towards that goal is Mechanical Engineering Professor at the University of British Columbia, Elizabeth Croft.

Croft's research involves human robot interaction which looks at how robots can help people be more productive, or help injured people become more independent. '[TAMER](#)' is a furry, robotic creature that helps children with stress problems by measuring their responses to stress and then showing them how to calm down.

Croft got hooked on engineering in high school when a faculty member who was working on the [Boeing 767](#) showed her design drawings for

the airplane. "I love that you get to build new things and see your ideas come to life, and I love the fact that I get to choose to do things for good, to find ways to help people."

Croft is a chair for the [Natural Sciences and Engineering Research Council](#) for Women in Science and Engineering. She works to increase the number of women studying and working in the sciences. "It's important to have diversity in any situation. You're not getting the whole picture if only part of the population is represented," she says, remarking that, "women are good with details and good at working on collaborative projects. We need those skills in engineering."



Where are all the women engineers?

It's been nearly 90 years since Rona Hatt did the unthinkable.

BY VANCOUVER SUN AUGUST 30, 2011

It's been nearly 90 years since Rona Hatt did the unthinkable.

In 1922, at the age of 21, Hatt graduated from the University of British Columbia with a degree in chemical engineering, the first woman to do so in the province.

The achievement earned her the nickname "lone flower" by her classmates - "a woman in a field of men," according to the university's archives. Times have changed, and women, led by pioneers such as Hatt, are no longer such a rarity in engineering classes across the country. UBC, for instance, expects to welcome 234 female students into first-year engineering courses this September at its campuses in Vancouver and Kelowna.

Yet, despite a number of equity and diversity initiatives over the past decade, the number of women entering the profession remains stubbornly - and many would say troublingly - low.

Statistics cited in a 2009 study, *Paying Heed to the Canaries in the Coal Mine*, found that women continue to be under-represented in engineering and applied science programs in Canada at both the college (less than 10 per cent) and university (17.5 per cent) levels.

More widely, "women comprised 47 per cent of the Canadian workforce in the 2006 census. The participation rate of women in the engineering field averaged 13 per cent," authors Janice Calnan and Leo Valiquette observed, noting a similar trend in the United States and other Western economies.

The gender disparity has continued, they wrote, "despite the fact that there has been a dramatic increase in the number of new jobs in engineering and technology."

Elizabeth Croft, a UBC mechanical engineering professor and, since 2010, regional chair for Women in Science and Engineering with the Natural Sciences and Engineering Research Council of Canada (NSERC), agreed that engaging women in applied sciences is a serious concern.

"I don't think we've done a particularly good job of communicating that the careers for engineers do not require you to be a man," she said in a recent interview.

NSERC research indicates the problem starts early on in the schools.

"There is certainly no shortage of 1st graders of either sex who could enter the science and engineering world. But at each step along the supply chain fewer and fewer young people choose to study science or engineering, and the drop-off for women is considerably larger than that for men," according to a 2010 report, entitled *Science and Engineering in Canada*.

But leadership and policy development within industry itself - or, rather, a general lack thereof - has also been identified as a major factor in the failure to attract and retain women in greater numbers.

The Association of Professional Engineers and Geoscientists of British Columbia (APEGBC) reported last year that female engineers are paid less than men on average for all responsibility levels, with women accounting for only nine per cent of the country's total population of registered professional engineers.

Croft said a lack of role models, combined with a "chilly" industry climate towards gender diversity, provides little incentive for all but the most determined women to pursue engineering as a career.

She counts herself among the female engineers on the job who have developed "dragon skin" in order to compete. "We haven't done enough yet to make them feel invited and comfortable," she said.

Still, Croft said she is optimistic positive change is taking place - though not at the pace she would like.

"I look at my students and the [boys' club] attitude has kind of grown up. They don't even think they have the attitude any more until you call them on it," she said.

Larger firms are also waking up to the value of encouraging diversity, in its broadest sense, within their ranks.

"That dynamic of diversity - gender diversity, age diversity and ethnic diversity - is actually a great driver of innovation in the way projects are thought about and put together," said Michael Kennedy, vice-president of the engineering and architectural firm Stantec in Vancouver.

"I would imagine any smart company that is in our sector has to realize there is a problem when you have 80 or 90 per cent of senior leaders who are quite narrowly defined in terms of gender and ethnic diversity," he said.

Stantec employs about 200 engineers across B.C., of whom an estimated 20 per cent are women.

Kennedy said the company is taking steps to boost those numbers, including launching a "future leaders" program, designed to identify and support promising talent.

The firm is also a lead corporate sponsor of NSERC's Women in Science and Engineering project, which works to promote awareness and outreach within schools and industry.

"All the challenges of the planet that are happening today need engineers to make this a better world for people," said Croft. "And the more people, the more diverse the groups that are looking at these problems are, the better solutions."

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Elizabeth Croft, P. Eng

Professor, Mechanical Engineering, UBC
NSERC Chair for Women in Science and Engineering for B.C. and Yukon

The books that line the shelves of Elizabeth Croft's UBC office give much away in terms of the intelligence and interests of the occupant.

Elementary Differential Equations and Boundary Value Problems reads one of the ominous titles. Herbert Goldstein's *Classical Mechanics* is another.

"Now those are some sweet books," Croft said, laughing at her own self-described "geeky" fascination with all things that whirl, spin, click and motor.

Croft, 45, is not just a mechanical engineer. She's been teaching on the subject at the university for almost two decades, after completing a master's and PhD.

Robots are her thing. She positively lights up when talking about her research exploring human-robot interaction and the potential for a life-changing application by medical and support staff working in long-term care homes and hospitals.

It was exactly this kind of left-brain/right-brain split between creativity and science that drew her to study engineering in the first place.

And while she was certainly aware she was one of only a handful of women in her class (when she graduated in 1988, fewer than eight per cent of the students were women), she was never intimidated.

"I grew up with brothers," she said. "I very much considered myself to be one of the guys. That was the kind of woman who went into engineering then."

Times have changed, with participation rates for women in engineering at UBC now hovering around 20 per cent.

Croft, as regional chair for women in science and engineering with the Natural Sciences and Engineering Research Council of Canada, is pushing to see that number expand much further.

Engineering has plenty to offer women.

"If you are creative. If you love solving problems. If you want to change the future of this planet, then engineering is something that you should seriously consider," she said.

Darah Hansen, Vancouver Sun



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WARD FREEMAN / POSTMEDIA NEWS FILES

Engineering professor Elizabeth Croft blames a lack of communication for the shortage of female engineers.

Breaking into the 'boys club'

'Careers for engineers do not require you to be a man'

BY DANAH HANSEN

VANCOUVER • It's been nearly 90 years since Rona Hart did the unthinkable. In 1922, at the age of 21, Hart graduated from the University of British Columbia with a degree in chemical engineering, the first woman to do so in the province. The achievement earned her the nickname "lone flower" from her classmates — "a woman in a field of men," according to the university's archives.

Women are no longer such a rarity in engineering classes across the country. UBC, for instance, expects to welcome 284 female students into first-year engineering courses this September at its campuses in Vancouver and Kelowna.

Yet, despite a number of equity and diversity initiatives in the past decade, the number of women entering the profession remains stubbornly — and poorly — low.

Statistics cited in a 2009 study, *Paying Heed to the Canaries in the Coal Mine*, found that women continue to be under-represented in engineering and applied science programs in Canada at both the college (less than 10%) and university (17.6%) levels.

More widely, "women comprised 47% of the Canadian workforce in the 2006 census. The participation rate of women in the engineering field averaged 18%," authors Janice Calnan and Leo Valliquette observed, noting a similar trend in the United States and other Western economies.

The gender disparity has continued, they wrote, "despite the fact there has been a dramatic increase in the number of new jobs in engineering and technology."

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"I don't think we've done a particularly good job of communicating that the careers for engineers do not require you to be a man," she said.

NSERC research indicates the problem starts early on in the schools. "There is certainly no shortage of first-graders of either sex who could enter the science and engineering world. But at each step along the supply chain fewer and fewer young people choose to study science or engineering, and the drop-off for women is considerably larger than

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"That dynamic of diversity — gender, age and ethnic — is actually a great driver of innovation in the way projects are thought about and put together," said Michael Kennedy, vice-president of the engineering and architectural firm Stantec in Vancouver.

"I would imagine any smart company that is in our sector has to realize there is a problem when you have 80% or 90% of senior leaders who are quite narrowly defined in terms of gender and ethnic diversity," he said.

Stantec employs about 1,000 engineers in British Columbia, of whom an estimated 30% are women.

Mr. Kennedy said the company is taking steps to boost those numbers, including launching a "future leaders" program, designed to identify and support promising talent. The firm is also a lead corporate sponsor of NSERC's Women in Science and Engineering project, which works to promote awareness and outreach within schools and industry.

"All the challenges of the planet that are happening today need engineers to make this a better world for people," Mr. Croft said. "And the more people, the more diverse the groups that are looking at these problems are, the better solution."

Postmedia News

Female engineers are paid less than men on average for all responsibility levels

that for men," wrote the authors of a 2010 report entitled *Science and Engineering in Canada*.

But leadership and policy development within industry itself — or, rather, a lack thereof — has also been identified as a major factor in the failure to attract and retain women.

The Association of Professional Engineers and Geoscientists of British Columbia reported last year that female engineers are paid less than men on average for all responsibility levels, with women accounting for only 6% of the country's total population of registered professional engineers.

Ms. Croft said a lack of role models, combined with a "chilly" industry climate toward gender diversity,

[UBC engineering forum explores gender barriers](#)

September 15, 2011. 1:32 pm • Section: [Workplace](#)

I recently completed a video and print project for the Vancouver Sun (check out the [stories and videos here](#)) exploring why so few women become engineers, and just what it takes to be successful in such a male-dominated profession.

According to data from the University of British Columbia, attrition rates of females in engineering and high-technology careers are as high as 40 per cent.

The stats for post-secondary education are also sobering. At UBC's Vancouver campus, for example, women make up more than half of the undergraduate population of 37,551, but only 18 per cent of engineering undergraduates are women.

The considerable – and stubbornly ongoing – gender disparity in engineering is a hot topic among academics and industry professionals alike, particularly so given how hot the job prospects are in the province (and around the world, for that matter) for anyone with a P.Eng. at the end of his or her name.

“There is great demand for highly trained scientists and engineers to sustain economic development, and we need to attract and foster a diverse talent pool with a global perspective,” said Elizabeth Croft, a UBC professor of mechanical engineering, robot enthusiast and Natural Sciences and Engineering Research Council (NSERC) Chair for Women in Science and Engineering for the British Columbia and Yukon Region.

To that end, UBC is planning to host a special conference addressing the gender issues and barriers to women. Creating Connections 2.0: A New Perspective is scheduled to take place Sept. 24 at the Forest Sciences Centre, 2424 Main Mall, UBC Vancouver campus.

They've lined up some powerhouse keynote speakers, including Judi Hess, CEO Copperleaf Technologies and Maryse Belanger, Director Technical Services, Goldcorp.

Participants are also encouraged to use the conference as an opportunity to build networks for support, networking, mentoring, and partnerships.

If this is a topic that interests you, by all means check out more about the conference by clicking the following links:

<http://wwest.mech.ubc.ca/cc/>

<http://wwest.mech.ubc.ca/cc/keynotes/>

It's not just about jobs. Rather, as Croft, puts it: “We cannot truly succeed as a profession—and ultimately a society—if we do not have the opportunity to attract and retain the brightest minds, male or female.”



PHOTOS: CHALOTTE WILSON/HANDPRINTS LTD.

Students investigate how farmers in India could supplement their income by producing cakes of natural indigo dye.

THE GLOBAL ENGINEER AT UBC

"The role of engineers can't be limited to increasing the bottom line of a company. We have a bigger responsibility than that. Teachers and nurses take on the responsibilities of a healthy society and a healthy world, and so should we."

— Robin Farnworth, BSc '05 ENPH, UBC Engineers Without Borders

Collaboration between Applied Science and UBC's chapter of Engineers Without Borders (EWB) has given rise to a new initiative at UBC: the Global Engineer. Its tenets include developing student leaders, equipping engineers to find and pursue their passions, and becoming a national and worldwide leader in global engineering.

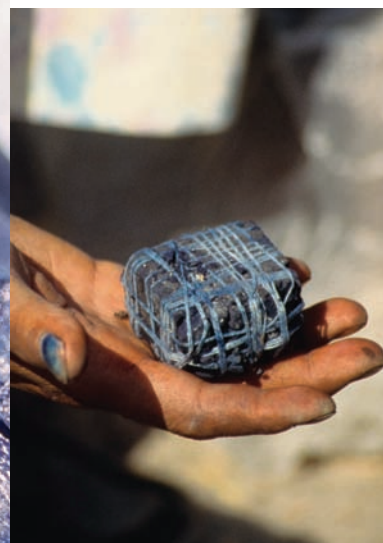
For the past 10 years, EWB has consulted with Applied Science on engineering curriculum. On the whole, engineers are well prepared to solve problems. Their coursework at UBC gives them the technical skills and the drive to find solutions. But, as a new regulation by the Canadian Engineering Accreditation Board (CEAB) acknowledges, technical skills aren't everything. New guidelines require that engineers "have an ability to analyze social and environmental aspects of engineering activities."

The Global Engineering initiative arises from this gap in traditional engineering education, and now UBC Engineering provides courses that align with the program's tenets.

Curriculum Enhancements: APSC 263, Technology and Development — The Global Engineer

"This course lets you take a step back and remind yourself why you became an engineer." — Chris Prychon, BSc '11 MECH

APSC 263 takes a socio-technical approach to considering problems in the developing world. The course evolved from an EWB-developed student-directed seminar first held in 2001. In 2008, after directing the seminar, Duncan McNicholl (BSc '09 CIVL), with Anna-Marie Silvester (PhD '09 ECE), approached Applied Science Instructors Annette Berndt and Carla Paterson about offering the seminar as a course.



Students in APSC 263 work in teams and propose solutions to address challenges faced by artisanal communities in rural India. A Technical Advisory Committee evaluates the proposals, and students pursue implementation of the best ideas. Student Harshul Srivastava (fourth-year, ECE) says, "It is very hard and maybe impossible to go out and solve the world's problems. But through this course, we were engaged in trying."

MECH 410: Global Engineering Leadership

"We need to graduate engineers able to develop solutions that incorporate broader societal needs. We need them to be able to lead." — Professor Elizabeth Croft, co-developer of MECH 410

MECH 410 introduces senior engineering students to the concepts, theories and practices of engineering leadership in an international-service learning context. The first part of the course is a classroom-based technical elective with multiple guest lectures and a Community Service Learning (CSL) project. The optional, second part of the course, features on-site learning; this summer students worked in Mexico with Tsomanotik, a two-year-old ecoagricultural centre for just and sustainable development. "I realized that the main difference between a developing and developed country is lack of structure and organization in the developing country," says Shalaleh Rismani (fourth-year, MECH). "Lack of structure creates chaos, but it is easier to initiate change because there is no rigid system in place."

Educating Global Engineers

"There's a push from students but also from faculty," says Alaya Boisvert, Community Service Learning Coordinator, Applied Science. "Both stakeholders feel the need for this."

With the new CEAB accreditation criteria, the shift towards global engineering is gaining traction at UBC and more broadly in society.

"The Global Engineering program envisions an engineering profession that truly serves global society," says Florin Gheorghe (BASc '11, MECH), UBC EWB's former director of Global Engineering. "To me, a global engineer is someone who is a multiversed leader, living by his or her values as an engineer, who is committed to lifelong learning and contributing positively to society." ■

While indigo dye is a highly marketable product, the plant is a nitrogen-fixing crop that enhances soil.

Engineering attracts creative problem-solvers

Equal interests in both creativity and science often lead women to explore the field

BY DARAH HANSEN, POSTMEDIA NEWS NOVEMBER 9, 2011



Lauren Kulokas, chief operating officer of Energy Aware Technology, holds the firm's product, The PowerTab.

Photograph by: Gerry Kahrman, Postmedia News, Postmedia News

The books that line the shelves of Elizabeth Croft's UBC office give much away in terms

of the interests of the occupant.

Elementary Differential Equations and Boundary Value Problems is one of the titles. Herbert Goldstein's Classical Mechanics is another.

"Now those are some sweet books," Croft said, laughing at her own self-described "geeky" fascination with all things that whirl, spin, click and motor.

Croft, 45, is not just a mechanical engineer. She's been teaching on the subject at the university for almost two decades, after completing a master's degree and PhD.

Robots are her thing. She positively lights up when talking about her research exploring human-robot interaction and the potential for a life-changing application by medical and support staff working in longterm care homes and hospitals.

It was exactly this kind of leftbrain/right-brain split between creativity and science that drew her to study engineering in the first place.

And while she was certainly aware she was one of only a handful of women in her class (when she graduated in 1988, fewer than eight per cent of the students were women), she was never intimidated.

"I grew up with brothers," she said. "I very much considered myself to be one of the guys. That was the kind of woman who went into engineering then."

Participation rates for women in engineering at UBC now hover around 20 per cent and Croft, as regional chair for women in science and engineering with the Natural Sciences and Engineering Research Council of Canada, is pushing to see that number expand much further.

Engineering has plenty to offer women.

"If you are creative. If you love solving problems. If you want to change the future of this planet, then engineering is something that you should seriously consider," she said.

Tyseer Aboulnasr never once thought her decision to become an engineer was anything out of the ordinary - until she moved to Canada.

Aboulnasr is now professor and dean in the faculty of applied science at University of British Columbia. When she started out at Cairo University, Egypt, where she earned an undergraduate degree in electrical engineering in 1976, gender "was never an issue," she said.

Indeed, both men and women were well represented among the program's 400-plus students.

It was only when she moved to Ontario in 1978, where she attended Queen's University in Kingston for both her master's degree and PhD, that it began to dawn on her that her career ambitions might be considered unusual for a woman.

A casual conversation with a campus clinic nurse during a routine health checkup drove that point home.

"She asked me what I was studying at Queen's and I said, 'engineering,' " Aboulnasr recalled. "She literally took a step back and her response was, 'Why on earth would you do anything like that?' "

For the past three years, Aboulnasr has been dean of the Faculty of Applied Science at UBC. That accomplishment follows an impressive career in academia that involved leading-edge research into digital signal processing, which, among other applications, has been used to clean up sounds received in modern hearing aids.

Her success has not come without personal sacrifice and plenty of hard work - a very real side of her life that she fears is sometimes "airbrushed" when she's held up as a role model to younger women considering a similar path.

Recently, she was asked to participate on a panel exploring women's rights and gender equality following the brutal attack on UBC graduate student Rumana Monzur by her husband.

The discussion caused her to question anew the internal cost she's paid as a woman working in what remains a male-dominated profession.

"There is no question in my mind that I have changed because I work consistently with men. If I didn't tolerate a lot of stuff, I would not have survived," she said.

"But you choose your battles. You drop some things and you focus on some things. Did I go too far? I am happy to have people remind me where right and wrong is."

It was a high school project that - quite literally - catapulted Lauren Kulokas into her current entrepreneurial venture. She is now the chief operating officer for Energy Aware Technology Inc. and earned her B.A. Sc. in mechanical engineering from UBC.

Showing academic strength in math and sciences as a teenager, the Mississauga, Ont., native was often steered toward engineering as a potential field of study by high school counsellors and career advisers.

But it wasn't until a Grade 12 physics course, when she took part in a class challenge constructing a fullon catapult that could launch water balloons, that she found herself sold on the idea.

"That (catapult) was just a really, really fun hands-on project," she said.

A decade later, Kulokas said she could not have made a better career decision.

The 29-year-old co-founded a company - Energy Aware Technology Inc. - with a group of her mechanical engineering classmates following their graduation from UBC in 2006.

The Vancouver-based operation develops products that promote sustainability and encourage energy conservation.

The company's main product, the "Power Tab," allows users to monitor their energy consumption and its associated costs.

Kulokas has no doubts her engineering background has helped her to compete in a tough business world, though, she admitted, the signature iron ring on her little finger, symbolic of the profession, still catches many of her clients and contacts by surprise.

"I do get that reaction quite a bit, that 'Oh, wow, a mechanical engineer. There aren't a lot of women in engineering.' That kind of thing," she said.

But it doesn't faze her. She views it as acknowledgment of the risks she's taken and the hard work she's put in to get where she is today.

"Engineering as a profession comes with some credibility and respect," she said.

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Where are all the female engineering students?

Dramatic disparity exists despite huge growth in jobs

BY DARAH HANSEN, POSTMEDIA NEWS NOVEMBER 9, 2011



Dr. Tyseer Aboulhasr is the dean of the Faculty of Applied Science at UBC. She studied in Cairo, where female engineering students were much more common than in Canada.

Photograph by: Jenelle Schneider, Postmedia News, Postmedia News

It has been nearly 90 years since Rona Hatt did the unthinkable.

In 1922, at the age of 21, Hatt graduated from the University of British Columbia with a degree in chemical engineering, the first woman to do so in the province.

The achievement earned her the nickname "lone flower" from her classmates - "a woman in a field of men," according to the university's archives.

Times have changed and women, led by pioneers such as Hatt, are no longer such a rarity in engineering classes across the country. UBC, for instance, had 234 female students registered for first-year engineering courses in September at its campuses in Vancouver and Kelowna.

Yet, despite a number of equity and diversity initiatives over the past decade, the number of women entering the profession remains stubbornly - and many would say troublingly - low.

Statistics cited in a 2009 study, *Paying Heed to the Canaries in the Coal Mine*, found that women continue to be under-represented in engineering and applied science programs in Canada at both the college (less than 10 per cent) and university (17.5 per cent) levels.

More widely, "women comprised 47 per cent of the Canadian workforce in the 2006 census. The participation rate of women in the engineering field averaged 13 per cent," authors Janice Calnan and Leo Valiquette observed, noting a similar trend in the United States and other Western economies.

The gender disparity has continued, they wrote, "despite the fact that there has been a dramatic

increase in the number of new jobs in engineering and technology."

Elizabeth Croft, a UBC mechanical engineering professor and, since 2010, regional chair for Women in Science and Engineering with the Natural Sciences and Engineering Research Council of Canada (NSERC), agreed that engaging women in applied sciences is a serious concern.

"I don't think we've done a particularly good job of communicating that the careers for engineers do not require you to be a man," she said.

NSERC research indicates the problem starts early on in the schools.

"There is certainly no shortage of first-graders of either sex who could enter the science and engineering world," wrote the authors of a report from 2010 entitled Science and Engineering in Canada.

"But at each step along the supply chain fewer and fewer young people choose to study science or engineering, and the drop-off for women is considerably larger than that for men," they explained.

Leadership and policy development within industry itself - or, rather, a general lack of it - has also been identified as a major factor in the failure to attract and retain women in greater numbers.

The Association of Professional Engineers and Geoscientists of British Columbia (APEGBC) reported last year that female engineers are paid less than men on average for all responsibility levels and women account for only nine per cent of the country's total population of registered professional engineers.

Croft said a lack of role models, combined with a "chilly" industry climate towards gender diversity, provide little incentive for all but the most determined women to pursue engineering as a career.

She counts herself among the female engineers on the job who have developed "dragon skin" in order to compete.

"We haven't done enough yet to make them feel invited and comfortable," she said.

Still, Croft said she is optimistic positive change is taking place - though not at the pace she would like.

"I look at my students and the (boys' club) attitude has kind of grown up. They don't even think they have the attitude any more until you call them on it," she said.

Larger firms are also waking up to the value of encouraging diversity, in its broadest sense, within their ranks.

"That dynamic of diversity - gender diversity, age diversity and ethnic diversity - is actually a great driver of innovation in the way projects are thought about and put together," said Michael Kennedy, vice-president of the engineering and architectural firm Stantec in Vancouver.

"I would imagine any smart company that is in our sector has to realize there is a problem when you have 80 or 90 per cent of senior leaders who are quite narrowly defined in terms of gender and ethnic diversity," he said.

Stantec employs about 200 engineers across B.C., of whom an estimated 20 per cent are women.

Kennedy said the company is taking steps to boost those numbers, including launching a "future leaders" program, designed to identify and support promising talent.

The firm is also a lead corporate sponsor of NSERC's Women in Science and Engineering project, which works to promote awareness and outreach within schools and industry.

"All the challenges of the planet that are happening today need engineers to make this a better world for people," Croft said.

"And the more people, the more diverse the groups that are looking at these problems are, the better solutions."



Diversity

in Organizations – Why and How

Dr Elizabeth Croft PEng FEC
Jennifer Pelletier

Introduction

Recent labour studies indicate that demand for engineering and geoscience professionals in Canada will increase over the next decade. Combined with aging demographics, we may soon face significant shortages in many disciplines, particularly in western Canada. In the face of a looming skill shortage companies need to be active in recruiting and retaining a skilled and diverse workforce.

Compared to other professions, engineering has been much less successful in attracting participation from the largest pool of available talent on university campuses today, namely women, representing over 55% of enrolled degree students. In 2010, women accounted for only 10.5% of Canada's registered professional engineers, and less than 18% of enrolled students. Furthermore, recent studies identified workplace culture as a significant barrier to the retention and advancement of women (N Fouad and R Singh, "Stemming the Tide: Why Women Leave Engineering," 2011) and perceived discrimination as a serious workplace concern (Prism Economics, "2010 Survey of Workplace Conditions for Engineers," 2010).

In response to these issues, Engineers Canada (the national organization of the 12 provincial and territorial associations that regulate the profession of engineering in Canada) has adopted and disseminated recommendations to help promote the inclusion of women at all organizational levels. Despite these and other initiatives, the overall statistics for the participation and career trajectories of women in engineering remain low. While the presence of inclusive policies are a necessary first step, a closer look at the practices within engineering firms may suggest that there are inconsistencies between policies, the practices and the

workplace climate. Simply stated, to access the benefits of diversity, organizations must embrace diversity as *part of their culture*. This article reviews the benefits of establishing a diversity culture in the workplace, and discusses steps organizations can take to advance diversity.

Benefits of Diversity

Over the past decade, organizational management studies have demonstrated numerous benefits to diversity¹. Recent studies have shown that diverse groups generate more ideas and creative solutions than homogenous groups, increasing potential for innovation. Team members from different demographic and cultural backgrounds bring different life experiences, perspectives and values allowing teams to brainstorm a wider range of solutions and to better understand client needs. This enhanced perspective and increased capacity for innovation gives an organization an advantage in identifying new markets and opportunities.

Organizations that increase diversity in their leadership teams benefit from stronger financial performance. A 2011 Catalyst study of US Fortune 500 companies showed that, on average, companies with a sustained high representation of female board directors outperformed those with sustained low representation by 84% in return on sales and 60% on return on invested capital. A similar Conference Board of Canada study concluded that corporations with at least two women on their board for six years had greater revenue and profits than those with all male boards.

1. Catalyst (www.catalyst.org/) provides a wealth of literature on the benefit of diversity to organizations in all sectors of the economy.

Finally, improving the workplace climate increases employee retention and leads to increased productivity. Policies and practices that create welcoming and inclusive workplaces for women create a better environment for everyone.

Steps to Building Diversity in an Organization

To reap the benefits of diversity, often organizations focus solely on recruitment from various demographic groups, hoping that the benefits of diversity will naturally follow. In practice, building a diversity culture, similar to a safety or sustainability culture, requires significant, proactive and sustained effort by the entire organization. Support at all levels, including senior “diversity champions,” highly respected in the company and familiar with (or willing to invest in learning) diversity best practices, is essential to this process.

Step 1: Reflect. To benefit from diversity, organization leaders and members must first understand *why* diversity is valuable to their organization and *how* they will utilize increased diversity in their everyday business practices; specifically, how diversity will be part of their workplace culture. Companies that seek diversity need to engage in a series of explicit conversations about “why” and “how” to develop a vision for diversity in their company.

Step 2: Take Stock. An organizational “diversity scan” sets the stage for moving forward. For example, a diversity audit tool that

measures practices and initiatives within an organization, across a spectrum of management levels can help an organization identify and evaluate their policies, and ensure that they allow for work-life balance, flexibility, professional development and leaves (such as parental leave) for both men and women. Other measurements important to consider include leadership buy-in, recruitment and advancement practices, compensation schemes, workplace civility, worker engagement, satisfaction and self-efficacy.

Tools such as the Harvard Implicit Bias Test help individuals, particularly decision makers, identify subconscious biases, that by their very nature, intrinsically affect every person’s decision-making process. Unrecognized and unchallenged, these unconscious biases can create systemic barriers to diversity groups.

Measuring once is not sufficient—diversity will not happen overnight; to keep moving forward, companies need to include diversity measures as part of their corporate reporting statistics.

Step 3: Practice. While policies are necessary and important, policies without practice can detract from diversity efforts. Cultures can arise where employees feel unable to utilize policies because of fears that superiors or co-workers would view them negatively for doing so, or that they would be penalized during reviews or opportunities for promotion. Leaders must actively promote and model the value of policies that support an inclusive, supportive and healthy environment, and work-life balance.

In their study of 3,700 female engineers, Fouad and Singh found that one third of those who had left the profession cited negative workplace climate as a significant factor in choosing to leave. On the other hand, the support of co-workers and superiors, investment in training and development, opportunities for advancement, and valuing of their contributions were cited as important practices that strengthened female engineers' decisions to stay with their organization.

Practice Case Study: Becoming Leaders

As an example of a supportive professional development intervention, in 2011, the NSERC Chair for Women in Science and Engineering, BC and Yukon (WWEST) sponsored six introductory Leadership Development workshops developed by the Canadian Centre for Women in Science, Engineering, Trades and Technology (WinSETT) hosted at engineering and geoscience workplaces across BC. These *Becoming Leaders* workshops discussed gender schema, challenges and strengths the participants have found, leadership and values. Participants also shared their experiences and received support in a safe environment.

Before and after these workshops, WWEST administered short surveys on career self-efficacy. Self-efficacy is defined as one's own belief in one's ability to succeed in a specific domain and has been shown to be a strong predictor of career persistence. Pre/post test results showed a statistically significant positive increase on five

of six self-efficacy indicators. The remaining indicator had a non-significant, but positive increase. The vast majority of participant comments indicated that this intervention had helped them to identify important strategies to increase their career success.

Conclusions

There is considerable benefit to businesses, the professions, and Canada in increasing the participation of women in engineering and geoscience careers. To reap the benefits available, organizations must invest in understanding why and how diversity will be integrated into their workplace and then evaluate where they stand in terms of diversity metrics. Finally, a diversity culture that supports and values the contributions of all workers is essential to success. ☒

Dr Elizabeth Croft PEng FEC FASME is a Professor of Mechanical Engineering at the University of British Columbia, and the NSERC Chair for Women in Science and Engineering for BC and Yukon. Her activities as Chairholder are conducted under the name Westcoast Women in Engineering, Science and Technology (www.WWEST.ca).

Jennifer Pelletier is the manager of the WWEST program. The authors will be presenting a stream on "Diversity in Organizations" at APEGBC's Annual Conference and AGM in Victoria, BC.

CAREER ADVICE

Salary and contract negotiation for engineers

It can seem deceptively straightforward, but salary and contract negotiation must be considered carefully to avoid settling for less than your peers.

Start by determining the general compensation range for the position type. This varies by sector, experience level and geographic region. The APEGBC Compensation Survey, available on the APEGBC website, is an excellent resource that provides data on salaries of engineers and geoscientists in B.C. sorted by sector and experience level. You can also check advertisements in your area that provide starting-salary scales.

It is also important to understand non-merit factors that may unintentionally be factored into your starting offer. Gender-based pay inequities still occur within the profession. Preliminary analysis has shown that, in general, new graduates receive similar salaries regardless of gender, but that salaries diverge at senior levels.

Understanding basic negotiating strategies is the final step for success. Do not be the first one to suggest a

salary figure – if you suggest the number, negotiations will only bring it down. If they suggest the number, it can only rise. Also ensure you consider — and discuss — the entire compensation package, including benefits, vacation, professional development allowances, work flexibility, travel requirements and other provisions. Ensuring that you start in a strong position is important, as pay raises in many sectors are capped to a percentage of salary.

Engineers practicing in B.C. should be aware that the Employment Standards Act (31)(f) specifically excludes registered P.Eng. and E.I.T. professionals from all provisions of the act. This means you have no automatic protection with regards to hours of work, entitlements, parental leaves or other provisions. You must include all such provisions in your contract to be guaranteed such benefits. ■

Professor Elizabeth Croft, Ph.D., P.Eng., NSERC Chair for Women in Science and Engineering (BC/Yukon) will be speaking at an APEGBC MAPS Salary Seminar at UBC Vancouver on February 27. Details at www.wwest.ca.

By: Jennifer Pelletier, with files from Dr. Elizabeth Croft.

May 10 & 11, 2013 | www.wwest.ca/cc | University of British Columbia, Vancouver



Creating Connections: Working Together to Transform our World

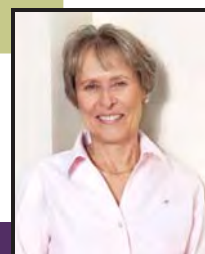
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THE GLOBE AND MAIL 

Want equal pay? Many women still not speaking up when it comes to salary

ERIN ANDERSSSEN

The Globe and Mail

Last updated Friday, Oct. 26 2012, 3:48 PM EDT



Mechanical engineering grad Maxime Chin. (John Morstad for The Globe and Mail)

Maxime Chin purposely made her pitch for more pay by voice mail, calling human resources on a Sunday afternoon when she knew no one would answer. She practised what she was going to say, and made notes so she wouldn't forget. "I was very nervous," says Chin, a mechanical engineering student in Vancouver. Her case was strong. She had co-op experience with the oil and gas company, and rave reviews from her boss. When the job offer came, she stalled: "Most students just say yes, right away. I told them I would think about it." She used the time to do her research, confirming the typical salary and seeking the advice of experienced female engineers. Then she left her message, and waited. "If you can have a vision in front of you of what your worth is," she says, "you have the confidence to go out there and ask for what you deserve."

It's not just her first paycheck that's at stake. While recent statistics show that gender wage differences for educated women have substantially narrowed at entry level, it widens as their careers progress. Studies have found that young women have lower salary expectations than their male peers, and expect to wait longer for promotions. With a well-executed counter-offer, Chin may have pre-emptively narrowed the gender wage gap and advancement prospects that continues to disadvantage women, especially those in male-dominated fields.

"If you start low, it is hard to catch up," says Dr. Elizabeth Croft, an engineering professor at the University of British Columbia who conducts an annual workshop on negotiating salaries for her female students. At the seminar, she points out that women often accept lower salaries – a decision that has an impact on subsequent raises – and are more reluctant to demand promotions that force employers to recognize the value of their work.

Economists call this the "negotiating divide," and cite it as a contributing factor to the persistent gender wage gap – despite the "binders full" of highly educated women launching careers and the fretful foretelling of the "End of Men." New research is exploring the role that salary expectations and reticent job bargaining play in women's wages, as well as a shortage of mentors to set the record straight. Meanwhile, there are still records to be settled: Last fall, a group of female employees finally won a decades-old dispute about fair wages with Canada Post, even as Conservatives passed federal legislation limiting the right for women to sue employers.

The OECD has given Canada middling ratings when it comes to wage equity, and a report released this week by the World Economic Forum on the "global gender gap" saw Canada slip out of the top 20 in a list of 135 countries. It's an alarming result for a nation that prides itself on one-year maternity leave and female-dominated universities, but also somewhat misleading: The most disconcerting finding was the comparative lack of female politicians in leadership roles, but Canada actually ranked 12th in economic opportunities for women, and had high scores for health and education.

Compared to two decades ago, the wage gap has certainly narrowed, but there's no guarantee it will disappear with the next generation of women. As Croft observes, this isn't about one gender trampling over another: In a society of double-income families, ensuring that the Maxime Chins of the workforce get their fair share would represent a \$126-billion cash infusion to Canadian households, according to a 2005 study by the Royal Bank of Canada.

These days, for educated women, the sexist boss is a more marginal player than the pressures to maintain an upwardly mobile career while making time for the kids. (It's hard to network, when the laundry and homework is still mostly a mom's responsibility.) It's often cited that women in Canada earn 72 cents for every dollar that a man earns, but that figure is based on annual salaries, lumps full and part-time workers

together, and buries the more challenging reality for lower-income women. When hourly wages are compared, accounting for the fact that women often work fewer hours than men, the gender gap shrinks to about 85 cents. Women's salaries are also influenced by the occupations they choose. In health care for instance, where women dominate, the wage gap is 98 cents on the dollar; it remains wider in traditionally male fields such as engineering, partly because women, having only recently entered those occupations in large numbers, are clustered at entry-level jobs. The narrowing gender gap is also due to the fact that with the decline of manufacturing jobs, men tend to earn less. Still, the pattern remains: While new graduates start out equally, a study by Ottawa University economist Ross Finnie found that, between two and five years, the gender wage gap had widened again.

But that's where economists such as Nicole Fortin, at the University of British Columbia, suggest the "negotiation divide" comes into play. "Men tend to be overconfident and boast about their ability, and women might be more shy," she says, suggesting the pattern takes root from early job experiences, when young women have traditionally taken low-paying jobs. It may be that young women start with a lower "reservation wage" – the amount at which they feel a job is no longer worth their time – and that follows them into adulthood. That's why she says parents and schools should do more to teach young women about salary expectations and job bargaining, suggesting stronger negotiation skills could reduce the gap by as much as 5 per cent. After all, a reticence to demand what's fair has a bottom-line impact, especially as an increasing number of women earn more than their husbands.

Wondering how Maxime Chin made out? Three days later, the company confirmed an 8-per-cent salary increase. What's more, she received a written clarification of her benefits, including a guarantee that her job was safe if she were to take maternity leave. "I am aware of my potential," she says. Next time, she won't make that point by voice mail.

Girls get glimpse into engineering

by Martin van den Hemel

Staff Reporter

More than five dozen Grade 8 girls participated in the first-ever day-long Girls in Engineering conference at Steveston-London Secondary on Saturday.

The conference introduced them to the many possible careers available in the world

of engineering.

Led by female engineering students from the University of B.C. as well as volunteers from the Association of Professional Engineers and Geoscientists of B.C., the participants took part in engineering-related activities.

A keynote speech was delivered by Dr. Elizabeth Croft, the Natural Sciences and Engineering Research Council Chair for

Women in Science and Engineering in B.C. and Yukon.

Organizers said the day was a huge success, and are already planning a repeat for next year.

Parents of female students currently in Grade 7 who would like to attend next year's event are asked to contact Steveston-London teacher Scott Clements at 604-668-6668.



YWCA Women of Distinction Awards: Live Blog

May 28th, 2013 @ 5:29pm (PT) by Rebecca Bollwitt

For the fourth year in a row, as the Social Media Sponsor, I am live blogging the [YWCA Women of Distinction Awards](#). As honoured [nominees](#) and guests arrive for a reception and dinner at the Westin Bayshore in downtown Vancouver, I will be setting up my laptop at the side of the room to provide live commentary, quotes, and of course results of this 30th annual awards evening.



Live Blog

Update Live blog to begin around 7:30pm. Please check back at that time. Follow the tag [#VANWOD2013](#) on Twitter for live updates from attendees as well.



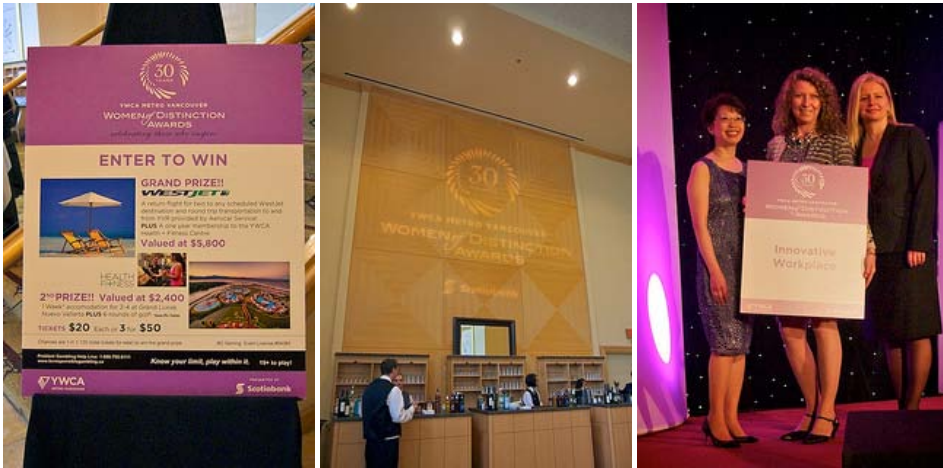
Update 7:45pm Dinner at the [Westin Bayshore](#) is wrapping up and the awards are about to get underway. I'll be filling in each of the categories below with the names of winners as they are announced.

Happy 30th [@YVVanWODA](#)! Dessert is served [@WestinBayshore](#) [#VANWOD2013](#)
<http://t.co/qQYFpi1Hr>

— Rebecca Bollwitt (@Miss604) [May 29, 2013](#)

Update 7:50pm Our emcee for the evening is once again Global BC's Sophie Lui. Bringing a plant (centrepiece) on stage with her, she explains that these are all edible herbs sponsored by Vancity

and [Tradeworks](#). If you would like to take home the centrepiece plant home, your table can host a raffle (with a donation) to see who gets to keep it.



Update Before we get to the awards, there are a few housekeeping items to take care of and some words from supporters like [Scotiabank](#) who is the presenting sponsor of the awards evening.

As the official Social Media Sponsor I am thrilled that the event is already trending in Canada.

[#vanwod2013](#) is now trending in Canada <http://t.co/oLim55D5s6>

— Trendsmap Canada (@TrendsmapCanada) [May 29, 2013](#)

Update 8:00pm: Before the awards are handed out, we are reminded why we are all here today — to celebrate women in the community and most of all to support the work of the YWCA in Metro Vancouver.

Founded over 100 years ago, YWCA Metro Vancouver has grown and flourished because of the energy and commitment of our community.

Today, we are one of the largest and most diversified non-profits in Metro Vancouver, reaching tens of thousands of people annually. Through our work, we touch lives and build better futures for women and their families through advocacy and integrated services.

We are committed to fostering economic independence, wellness and equal opportunities. We continue to adapt to changing social complexities by developing and maintaining programs and services for the health of our community.

Update As with previous years, a video is shown featuring the very personal story of an individual or family that has used the YWCA, specifically [Crabtree Corner](#).

Today, Pamela Nesbitt shared her story through a very moving account on the video. After a standing ovation (and remarking: “Sophie was right, this is like the Oscars!”) she has taken to the stage to share more about her life, addiction, pregnancy, motherhood, and why she now volunteers with the YWCA.

[@Aegiardini](#) amazing testimonial of Pamela, helped by YWCA to restructure her life after an 18-year addiction. [#vanWOD2013](#)

— valcasselton (@valcasselton) [May 29, 2013](#)

“The most important thing I got from the Y was structure. In hindsight (which is always 20/20) this was the missing ingredient in my recovery. If only I had known this 20 years ago, you might not have had to see that video tonight.”

Award Recipients

Arts, Culture & Design

Sponsored by TD Bank Group

RECIPIENT: Chan Hon Goh

[Goh Ballet Academy](#), Goh Ballet's The Nutcracker

QUOTE: “I feel so enriched to be in your presence and I am very privileged to be able to do what I do.” – “I will do all that I can to train the future ballerinas and ballet stars of tomorrow and to make sure that the arts have a very important place in our society.”



Photo credit: John Bollwitt for Miss604

Business and the Professions

RECIPIENT: Lois Nahirney

Executive Vice President, Corporate Resources, [Teekay Corporation](#)

QUOTE: “I was so stunned, I didn't even put lipstick on!” – “Congratulations to the YWCA for their amazing programs and the difference they make in the community.” – “This award really goes to my team.”

Community Building

Sponsored by Industrial Alliance

RECIPIENT: Kamal Dhillon

President, [Black and Blue Sari](#)

QUOTE: “I receive this award on behalf of all victims of domestic violence. Finally, your voice will be

heard.” – “For far too long we have lost too many, too soon and I ask that you join me in this fight to end domestic violence.”

Phenomenal evening with amazing people for worthy causes. Thanks YWCA for all you do.

[#VANWOD2013](#)

— Sonia Dewey (@soniadewey) [May 29, 2013](#)

Education, Training & Development

Sponsored by Port Metro Vancouver

RECIPIENT: Elizabeth Croft

Professor, [Department of Mechanical Engineering](#), UBC

QUOTE: “I am incredibly grateful for this award and very surprised.” – “Thank you to all of the nominees tonight. You inspire all of the young women in universities, in high schools.” – “Engineering needs women. We need these leaders, these visionaries, these women that can serve the world and make it a better place. We need these women in engineering and in science.”

Entrepreneurship

RECIPIENT: Shahrzad Rafati

Founder & CEO, [Broadband TV](#)

QUOTE: “I really have been very inspired tonight, to hear all of these great stories, and to hear how YWCA is continuously making a great, positive impact in our community.”

Environment and Sustainability

Sponsored by BC Hydro

RECIPIENT: Mae Burrows

Founder, [Toxic Free Canada](#)

QUOTE: “I have to say I’ve met so many nice women tonight and especially the women in my category. I want to recognize my husband who is here representing my family who is always cheering me on from the kitchen table.” – “Sustainability isn’t just about changing lightbulbs!”

[#vanwod2013](#) The intelligence, achievement, respect and friendship in the room are inspiring. Like sitting at a warm hearth.

— Anne Giardini (@Aegiardini) [May 29, 2013](#)

Health, Wellness & Athletics

Sponsored by Teck Resources Limited

RECIPIENT: Maureen de St. Croix

Founder & Head Coach, [Ocean Athletics](#)

QUOTE: “My first experiences with the YW were as a young girl when I got involved in local programs in trampoline and I’ve been hooked on sport ever since.” – “I have been really privileged for the life of sport and opportunities to travel the world, to meet lots of people, and I knew that I wanted to give that opportunity to other youth and I’ve been given that opportunity in South Surrey.” From our host Sophie Lui to Maureen: “And Michelle Obama’s got nothing on your arms!”



Photo credit: John Bollwitt for Miss604

Pausing for a quick update on the fundraising total, we're at \$47,480 so far this evening.

Non-Profit & Public Service

Sponsored by BC Housing

RECIPIENT: Dianne Watts

Mayor, [City of Surrey](#)

QUOTE: "As I heard some of the stories today, and looking at who our inspiration is as women — I have my daughter here today (I have two daughters) — and I have to say my heart and my inspiration is my two daughters. I am blessed with so many amazing women in my life. And, as we walk along this road it really is remarkable when we can share and what we do with one another. This really is an honour."



Photo credit: John Bollwitt for Miss604

Technology, Science & Research

Sponsored by Goldcorp Inc.

RECIPIENT: Deborah Money

Vice President, Research, [BC Women's Hospital & Health Centre](#)

QUOTE: "As everybody has done, I do want to acknowledge the YWCA for the work that they have done." – "I have the privilege to work with outstanding women and men dedicated to improving the lives of women."

Wow what an inspiring night! Makes me want to do more in my community. Thanks ladies!

[#VANWOD2013](#)

— Chantelle Reinkens (@ChantelleR4) [May 29, 2013](#)

Young Woman of Distinction

RECIPIENT: [Sara Eftekhar](#)

Youth Activist

QUOTE: "I didn't have a speech ready. Actually, today I graduated from UBC." – "I thought to myself that this is the first graduation ceremony that my parents have attended in Canada and now this." – "Thank you to my mom, my dad, and my brother for always supporting me and helping me to do more." Host Sophie Lui to Sara, "So I wonder what you're doing tomorrow!"

Innovative Workplace

RECIPIENT: [Vancity](#)

The board members and Vancity leaders on stage lead the entire audience (of over 1,000) in a song—*The More We Get Together* — to share just a slice of their corporate culture and attitude.



Photo credit: John Bollwitt for Miss604

Connecting the Community

All nominees tonight were eligible for this award and it was powered by an online vote. Scotiabank will be donating \$10,000 to the YWCA Metro Vancouver program of the recipient's choice.

RECIPIENT: Barbara Mowat

President, Impact Communications Ltd. & [GroYourBiz](#)

QUOTE: Barbara shared a touching story about how her daughters wouldn't be here tonight if not for the YWCA in Winnipeg who put their grandmother up when she was expecting their father — ensuring he was born healthy by putting her up close to the hospital for six weeks.



Photo credit: John Bollwitt for Miss604


Update 9:45pm: "We've had lots of inspiration and lots of money raised tonight," says Sophie as the evening draws to a close. The final tally from fundraising tonight is over \$61,000!

Be sure to follow the [YWCA of Metro Vancouver](#) for more information about their work in the community and their various programs. I will be adding photos to this post later on (thanks to [John Bollwitt](#)). Have a great night everyone!

Update John's photos are all [online in his Flickr set](#).

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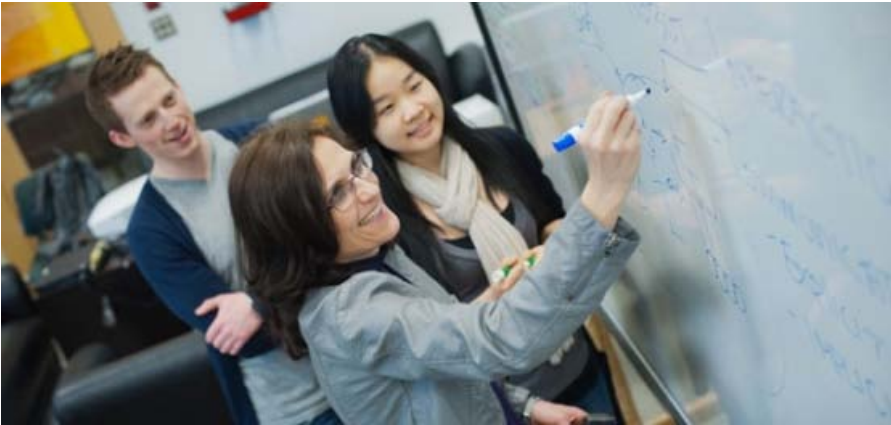
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Media Release | May 29, 2013

UBC mechanical engineer a woman of distinction

UBC Mechanical Engineering professor [Elizabeth Croft](#) is this year's recipient of the YWCA Vancouver Women of Distinction Award in the category of Education, Training & Development.



Croft working with students in her robotics laboratory at UBC. Martin Dee Photo.

Over 1,100 guests attended last night's gala at the Westin Bayshore to honour all 83 nominees and to celebrate the 11 winners, all of whom make outstanding contributions in their communities.

"I am incredibly grateful for this award," said Croft. "Thank you to all of the nominees tonight. You inspire all of the young women in universities and in high schools. Engineering needs these young women as leaders and visionaries, to serve the world and make it a better place."




Award Citation: "For more than 18 years, Elizabeth has been at the forefront of the campaign to increase the number of women engineering graduates. A dedicated engineer and professor of mechanical engineering at UBC, she is a passionate advocate for increased participation and retention of women in the engineering profession. Elizabeth has championed innovative programs such as the UBC Women in Engineering program, UBC Global Engineering Leadership Course series and the highly successful Engineering Tri-mentoring program at UBC, providing female engineering students with role models and industry mentors. She founded Westcoast Women in Engineering, Science and Technology (WWEST) and has also worked on national initiatives to help ensure that closing the gender gap becomes a national priority at universities across Canada."


Croft will be giving a talk on Transforming Human-Robot Interaction at 7pm on June 13, 2013 at the H.R. Macmillan Space Centre. [Learn more](#)

Also, honoured was UBC Nursing graduate Sara Eftekhari (BSN '13), this year's recipient of the YWCA Vancouver's Young Woman of Distinction award. [Read more](#)

The Women of Distinction Awards began in 1984 to honour, encourage and recognize women whose outstanding activities and achievements contribute to the health and future of the community. Since then, YWCA Vancouver has honoured over 247 deserving women and workplaces.

For more information: <http://www.ywcavan.org>



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2013 Women of Distinction Award Recipients

Arts, Culture & Design

Chan Hon Goh

Award winning Prima Ballerina and Director of Goh Ballet Academy, one of the top classical ballet academies in the world, Chan Hon has contributed and shown exceptional vision and leadership in the Canadian arts landscape. She founded Principal by Chan Hon Goh®, the only dance supply company in Canada with ballet shoes designed by dancers. An inspiration and mentor to aspiring dancers, she founded the Chan Hon Goh Scholarship awarding more than \$100,000 annually to promising and talented young dancers. She gives back to the community through volunteering on charitable boards, is one of the founding members of Vancouver's first and only Arts and Culture Policy Council and brought the City of Vancouver the only locally produced professional large-scale production of *The Nutcracker*.



Business & The Professions



Lois Nahirney

Lois has more than 25 years of global experience at the executive level of transitioning industries including shipping consulting, information technology and forestry. In her current role as the Executive Vice President, Corporate Resources of Teekay Corporation, she is a vocal advocate for engagement, leadership and life/work balance. She has led the organization with a new vision and strategic plan to address a rapidly changing industry, including facilitating a global effort to engage more than 6,000 employees from 120 ships and 26 offices around the world. Lois has made "supporting women in business" a key focus of her career and community involvement for 20 years. She serves on numerous boards and is regularly sought out as a mentor and coach. Lois has spent more than ten years as Chair for WXN in Vancouver.

Community Building

Kamal Dhillon

Kamal believes it takes one person at a time to eventually change a community and to transform a culture—that abusing women is not acceptable and will not be tolerated. She founded Black and Blue Sari with a vision to educate and empower communities to end domestic abuse. Since the release of her book in 2009, Kamal has spoken multiple times on local and international media to raise the profile of her message of ending



DONATE NOW

Support YWCA Cause we Care House!

Only \$2.3 million remains to be raised in the capital campaign for YWCA Cause We Care House. The YWCA is actively engaged in a \$10 million capital campaign to build YWCA Cause We Care House, a portion of which will be invested in an endowment fund to support the ongoing operating costs of the housing. Please help us make this safe and affordable housing community a reality by [donating now](#).

EVENTS

Friday Nov 29, 2013
1:30pm - 6:00pm
[Westside Division Directors' Christmas Party - Fundraiser for YWCA's Munroe House](#)

Wednesday Dec 4, 2013
12:00pm - 2:00pm
[19th Annual Diane Forsythe-Abbott Crabtree Luncheon](#)

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domestic violence. She regularly counsels victims both in person and over the phone and gives her time to schools, professional women's clubs and community centres to advocate and educate. Recently, Kamal was honoured with the Community Crusader Award from *Darpan* magazine and the Courage to Come Back Award from the Coastal Mental Health Association.

Education, Training & Development



Elizabeth Croft

For more than 18 years, Elizabeth has been at the forefront of the campaign to increase the number of women engineering graduates. A dedicated engineer and Professor of Mechanical Engineering at UBC, she is a passionate advocate for increased participation and retention of women in the engineering profession. Elizabeth has championed innovative programs such as the UBC Women in Engineering program, UBC Global Engineering Leadership Course series and the highly successful Engineering Tri-mentoring program at UBC, providing female engineering students with role models and industry mentors. She founded Westcoast Women in Engineering, Science and Technology (WVEST) and has also worked on national initiatives to help ensure that closing the gender gap becomes a national priority at universities across Canada.

Entrepreneurship

Shahrzad Rafati

Innovative and fearless, Shahrzad founded BroadbandTV, a digital media and technology company that is now the fourth largest independent YouTube network in the world, generating more than half a billion monthly views. She is credited as pioneering both the technology and business model that made peace between big entertainment entities and fans by creating new revenue streams on copyrighted content that gets posted on video sites like YouTube. She was recognized for this achievement in 2011 as the only Canadian listed to Fast Company's 100 Most Creative People in Business. A socially minded entrepreneur, she created VISO Give, a YouTube channel dedicated to charities and non-profits, and she serves as a role model for young women interested in entering the field.



Environmental Sustainability



Mae Burrows

Mae has fought for environmental protection and social justice for more than three decades. Her visionary work to protect fish habitat, to ally with resource workers, environmentalists and community groups to eliminate workplace toxins distinguishes Mae as one of BC's leading conservation voices. In 1998, she founded Toxic Free Canada, focusing on eliminating cancer-causing chemicals in the workplace and home. With Mae's help, unions used collective bargaining to create safer conditions for workers and to keep harmful chemicals from going down the drain. The CancerSmart guidebooks produced by her organization helped thousands of Canadians prevent toxic substances from entering their homes and the environment. A volunteer and role model, she has mentored university and high school students on environmental sustainability.

Health, Wellness & Athletics



Maureen de St. Croix

Throughout her lifetime, Maureen, Founder and Head Coach of Ocean Athletics track and field club in South Surrey, has been an elite athlete, community leader, teacher, executive event organizer and coach. Maureen is a legend in the BC athletics field. She was one of the first two women in Canada to compete in trial long distance running events and dispelled the myth that women could not run past their early 20s. She has played an

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News

Media Release | Jun 21, 2013

Engineering prof receives social sciences grant to study gender barriers in the profession

Professor Elizabeth Croft of the Department of Mechanical Engineering has received funding from the Social Sciences and Humanities Research Council (SSHRC) to study why few women reach senior management in engineering firms. Along with an interdisciplinary team with expertise in women in engineering, organizational policy, social psychology and human resources, she will investigate Engendering Engineering Success with \$193,732 of SSHRC funding over three years.



Photo by Martin Dee.

The low representation of women in the engineering profession remains a persistent problem in Canada. The most recent data from Engineers Canada indicates that 18% of engineering graduates and 11% of licensed engineers are women but very few reach senior management in engineering firms.

Surveys conducted by the NSERC Chairs for Women in Science and Engineering confirm that at graduation female students are equally committed to entering the engineering workplace as their male peers. However many more women than men leave the profession within 5 to 10 years of career start.

Recent Canadian and US studies identify workplace culture as a major barrier to the retention and advancement of women in the engineering profession. The loss of qualified women is a significant cost to employers in terms of lost intellectual capital and the need to recruit and retrain. The reduced numbers of the technically skilled workers in Canada impacts our ability to compete in a global economy.

The Engendering Engineering Success research intends to bring sustained change in the retention and advancement of women in the engineering profession through a unique partnership of social science researchers, women in engineering and their advocates, professional organizations and key industry stakeholders across Canada.

"The team recognizes there have been efforts to develop organizational policies to address retention and advancement of women in engineering," says Professor Croft, NSERC Chair for Women in Engineering. "These are important steps, but they are not sufficient to change workplace culture and practices, particularly in a male-dominated profession."

The interdisciplinary team collaborating with Croft includes co-applicants Professor Michelle Innes of the University of Alberta School of Business; Professor Emerita Valerie Davidson, PhD., P.Eng, past

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NSERC CWSE (Ontario); UBC Professor of Psychology Toni Schmader, Canada Research Chair in Social Psychology; and collaborators Courtney Hughes of the Mining Industry Human Resources Council (MiHR), and Lianne Lefsrud, P.Eng, VP Canadian Centre for Women in Science, Engineering, Trades and Technology (WinSETT). Partner organizations are WinSETT, MiHR, Engineers Canada, the Network of NSERC CWSEs, WorleyParsons and Enbridge Pipelines Inc.

“We envision women as full participants in the Science, Engineering, Trades and Technology fields, and workplaces which are inclusive and respectful of all their employees,” says Margaret Ann Armour CM, PhD, FCIC, founding president of the WinSETT Centre.

With expertise in engineering, organizational study of workplace dynamics, and social psychology of implicit bias, the research team aims to better understand and dismantle the obstacles that workplace culture can create for women in engineering. Engaging directly with practicing women engineers as well as managers and industry leaders, they will systematically examine current policies and practices and identify successful strategies. Partners from industry and professional organizations will be engaged in both data gathering and result dissemination.

“Through a combination of research, pilot implementation and evaluation, we will ensure that the policies, practices and interventions that are developed are practical and reflect the real situation of women working in engineering,” says Croft. “We believe that workplace cultures that support diversity are key economic drivers and will allow women to participate more fully in the technical workforce.”

Contact

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EDUCATION

Gender divide in applied sciences is wide – but narrowing

GLORIA GALLOWAY
OTTAWA — The Globe and Mail
Published Wednesday, Jun. 26 2013, 10:33 PM EDT
Last updated Thursday, Jun. 27 2013, 12:16 AM EDT

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AA

Rosine Hage-Moussa attended a science conference in Montreal shortly after she graduated with a biology degree in 2005 and was astounded to find that she was the only woman in the room.

“And I thought to myself, ‘Oh, I can’t be here,’” Ms. Hage-Moussa, the manager of programs and outreach at LifeSciences BC, said Wednesday. “All these men just walked right by me and they didn’t care and I was so frustrated and I said, ‘This is not fair.’ Because in university you never felt that way.”

MORE RELATED TO THIS STORY

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- **MORGANE RICHER LA FLÈCHE** Technology is vital for women. Why aren’t we teaching it to girls?

New data from the 2011 Statistics Canada’s National Household Survey suggest her perceptions were well-founded.

Although women are still greatly outnumbered in the so-called STEM fields of learning – science, technology, engineering and mathematics (which includes computer science) – they have surpassed the number of men in post-secondary science classes and are making modest gains in the other areas. While women were underrepresented in those fields, immigrants, who make up about a fifth of the population, accounted for half of all people holding STEM degrees at university.

Governments have been reaching out to young women in an effort to convince them to consider



VIDEO
Video: Obama: 'It's time' to close the gender wage gap

the STEM professions. And a number of organizations like the Society for Canadian Women in Science and Technology are mentoring girls who are drawn to science and engineering.

As a result, Ms. Hage-Moussa said the professional playing field is more level today than it was when she graduated. "I still feel that it's male-dominated," she said, "but I am trying to learn how to play the game and network and change the way I am viewed."

The Statistics Canada data suggest that although there were nearly three times as many female engineers between the ages of 25 and 34 in 2011 as there were between the ages of 55 and 64, there is still a long way to go. The same holds true for mathematics and computer science, where young women were outnumbered three to one by men.

Tamara Franz-Odendaal, a biologist at Mount Saint Vincent University in Halifax and the Atlantic region chair of Natural Sciences and Engineering Research Council of Canada (NSERC)'s program for Women in Science and Engineering, said she suspects many of the women in science are in the biological fields. They are doctors and nurses and health technicians – traditional territory for women for many years.

And "just because the data is showing that more women are getting STEM degrees, and they may be getting STEM jobs, doesn't mean that they are going to progress in those careers," Dr. Franz-Odendaal said. "Because often we find women get stuck." Employers must still be convinced that they need to put in place strategies to support women in the sciences, she said.

Part of it comes down to women being role models.

Elizabeth Croft, a professor of mechanical engineering at the University of British Columbia who is another NSERC Chair for Women in Science and Engineering, said girls are looking for careers in which they can help people and be a team player and they need to be told engineering fits those criteria.

"We see girls going into universities in larger numbers but they have choices about where they can go," Dr. Croft said. "So, if you've got a profession that's not saying to them 'Come here because we need the things that you value, we care about the things that you care about,' if we don't say that to them, why would they come?"

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Where are the women? B.C. task force looks at gender imbalance in engineering

2013-07-05

TEXT SIZE

A special committee of the Association of Professional Engineers and Geoscientists of British Columbia (APEGBC) has issued a report on how the association might work to address the gender imbalance in the sector.

Issued on June 14, the "Women in Engineering and Geoscience Task Force" report notes that "in comparison to other professions, engineering and geoscience recruit substantially fewer women, and ... more women leave these two professions than others that require a similar level of education."

One of the suggestions was that engineering bodies such as Engineers Canada, Geoscientists Canada and ACEC should coordinate their efforts and lobby the federal government to change the employment insurance provisions so that benefits are not clawed back when individuals do part-time work while on parental leave.

The task force's full range of recommendations are to provide a framework for APEGBC to proceed on the issue.

Below is the Task Force Report summary of recommendations, which are set out under outreach/recruitment and retention. To read the complete report, click [here](#).

In the area of Outreach/Recruitment, the Task Force recommends:

Create or revise marketing materials/ branding of professions to better recognize what is important to women when choosing a career (e.g. Engineering and Geoscience helps people and communities).

Increase the number of women who do outreach visits in schools.

Provide training to all engineers / geoscientists who visit schools to deliver activities and messages that empower girls to embrace science, technology, engineering and the tools used in these areas.

Train teachers to be more aware of careers in engineering and geoscience and how to communicate the careers in a way that is attractive to girls.

Support universities in recruitment efforts.

In the area of Retention, the Task Force recommends:

Encourage Engineers Canada, Geoscientists Canada, and ACEC to coordinate efforts and lobby the federal government to improve employment insurance

- provisions so benefits are not clawed back due to part time work while on parental leave.
- Assess APEGBC policies to ensure they do not create unnecessary barriers to retaining women in the professions (e.g. Return to practice policy).
- Support employers in building a gender diverse workforce by providing access to existing guidelines and workshops (e.g. post on APEGBC website, promote at APEGBC events, host events as appropriate). In the longer term, create APEGBC gender diversity training programs and certify organizations that undergo training and adopt practices that support gender diversity.
- Enhance mentoring programs by increasing the number of female mentors and providing non-traditional mentoring structures (e.g. virtual mentoring, speed mentoring, social networking, etc.).
- Develop professional standards of practice/ guidelines for APEGBC members similar to those of APEGA and PEO.
- Create a gender diversity award to recognize companies that promote and support gender diversity in their organization.

Recommendations that support both Recruitment and Retention are:

- Support and promote leadership and diversity workshops such as those developed by WINSETT, and WWEST.
- Recommend to the Canadian Engineering Accreditation Board (CEAB) the adoption of a competency based approach for engineering undergraduate programs.
- Continue the APEGBC compensation survey, report the results based on gender, and assess how results can be utilized more strategically.
- Utilize volunteers to seek sponsorships to financially support gender diversity activities.
- Measure and report success by developing key performance indicators (e.g., number of women entering/ staying in the professions, compensation equity, career advancement, etc.) and reporting on outcomes in the APEGBC annual report.

The task force members and contributors were as follows:

- Donna Howes, P.Eng., Councillor, APEGBC (Chair)
- Anja Lanz, EIT, Chair, Division for the Advancement of Women in Engineering and Geoscience, APEGBC
- Catherine Roome, P.Eng., President and CEO, BC Safety Authority
- Diana Theman, Director, Organizational Effectiveness, BC Hydro
- Elizabeth Croft, P.Eng. PhD, Professor, UBC and NSERC Chair for Women in Science and Engineering (BC/Yukon)
- Francois Morton, Senior Vice-President BC, Saskatchewan, and Manitoba, Genivar
- Lianna Mah, P.Eng., Vice-President, Business Development, Associated Engineering
- Lisa Blackham, Chair, Women in Mining Sub-Committee
- Marg Latham, P.Eng., President, Aqua Libra Consulting
- Shiloh Carlson, P.Eng., Councillor, APEGBC
- Steve Frith, President, Urban Systems
- Tom Tiedje, P.Eng., PhD, Dean of Engineering, UVIC
- Courtney Hughes, Research Analyst, Mining Industry Human Resource Council

Technology Quarterly:
Q3 2013

Working with robots

Our friends electric

Robotics: A new breed of robots is being designed to collaborate with humans, working alongside them to make them more productive

Sep 7th 2013 | From the print edition

AS GIANT welding robots go about their business in a modern car factory, the scene looks like a cyberpunk vision of Dante's "Inferno". Amid showers of sparks, articulated mechanical arms nearly the size of telephone poles move sections of partially built vehicles so "scarily fast" that anyone who accidentally ends up in the wrong place is as good as dead, says Rodney Brooks, the boss of Rethink Robotics, a robot-maker based in Boston. For this reason, industrial robots operate in cages or behind security fences. But by segregating robots from humans, such safety measures greatly limit the tasks that robots can perform. In car factories, for example, most of the final assembly is done, expensively, by hand.



Neither workers nor robots can reach their productive potential without interacting more closely, says Volker Grünwald, head of systems integration at Pilz, a German engineering firm. Eager to design machines that can be used for a wider range of tasks, technologists are now figuring out how to bring robots "out of the cage" so that they can work safely and more productively with people. The aim is to combine the dexterity, flexibility and problem-solving skills of humans with the strength, endurance and precision of robots. The emergence of "co-operative" or "collaborative" robots, as these new machines are called, could also lead to robots that are better able to help out in the office, at school or in the home.

Last December, in a company first, German carmaker BMW introduced a slow-moving collaborative robot in its factory in Spartanburg, South Carolina, which co-operates with a human worker to insulate and water-seal vehicle doors. The robot spreads out and glues down material that is held in

place by the human worker's more agile fingers. When this is done without the help of a robot, workers must be rotated off this uncomfortable task after just an hour or two to prevent elbow strain. Today four collaborative robots work in the facility, and more are coming, in Spartanburg and elsewhere.

BMW expects "a big, massive roll-out" of the technology in 2014 in Germany, despite the country's tighter restrictions on human-robot interaction, says Stefan Bartscher, BMW's head of innovation. The company plans to design additional tasks for collaborative robots as they are progressively introduced in five carmaking plants. These robots will require different technologies from those found in traditional, non-collaborative robots. Indeed, when it comes to dealing with humans, robots have so few skills that even a seemingly simple task such as handing over an object commonly ends in a tug-of-war, says Elizabeth Croft, a roboticist at the University of British Columbia.

With funding from GM, America's biggest carmaker, Dr Croft's Collaborative Advanced Robotics and Intelligent Systems Laboratory is designing robots that can execute "unscripted" handovers to humans. This requires the robot to determine whether a person wants and is authorised to have a particular item—be it a power drill, a document or a cup of tea. The robot must then present the item in the most advantageous orientation for the human, adjusting its grip as the object's weight shifts. Finally, the robot must let go only when its sensors detect that the object is being purposefully and safely taken away.

Safety first

Dangerous industrial machinery is typically shut down the instant a worker "breaks" an infra-red light curtain or opens a door to enter a robot's cage. But safety systems of this sort have drawbacks. Breaches typically stop an entire production line, alarming employees and causing delays that may cascade throughout the plant. Pilz has developed a multi-camera computer system that monitors the area surrounding robots and adjusts their behaviour accordingly.

Called SafetyEYE, the system allows a robot to, say, rivet an aircraft wing without sectioning off the entire area from people. Aware of its surroundings, the robot can roll along the length of the wing, slowing its movements if a worker approaches or, if he gets too close, stopping altogether without disrupting activity elsewhere. Since it was launched in 2007, SafetyEYE has allowed robots to be deployed in parts of factories where setting up light curtains or safety cages would be expensive or impractical.

There are additional ways to avert accidents. Some robots have red emergency-stop buttons. Researchers have even made pressure-sensing "artificial skin" by sandwiching a rubbery silicone made with carbon black, a conductive material, between electrodes. Compressing it with a slap generates an electrical signal that instructs the robot to freeze. For an additional override function, robots could be fitted with microphones and stopped with a shout, says Per Vegard Nerseth,

robotics boss at ABB, a Swiss industrial giant based in Zurich which has ramped up development of collaborative robots in the past few years.

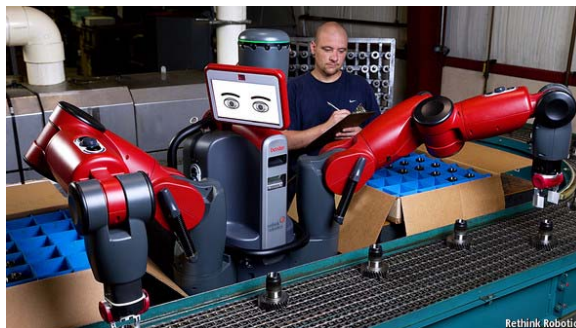
Robots capable of teaming up with people are typically used to perform tasks that are being automated for the first time, so productivity gains are especially high—provided the devices are quick and easy to program. A one-armed robot (pictured above) made by Denmark's Universal Robots (UR) to “work right alongside employees” can be set up within an hour. Programming usually takes less than ten minutes. The user manually moves the arm and the tool it is holding from the starting point of a task to the end point, tapping a touchscreen “record” button at points along the way. Once the task is named and saved, the robot can be put to work.

Machine workshops often program collaborative robots to perform tasks for only a brief period. UR's models can be fastened to a workbench to, say, screw together eyeglass frames to meet a rush order, and then moved to cap and box jars to cover for a worker who is off sick. Traditional robots, by contrast, are typically configured by highly paid, specialist engineers who work on a mock production line, so that the real production line need not be shut down for the weeks or months required for programming. UR sold more than 700 robots last year and expects to sell 1,500 this year, some to clients with just a few employees. Many users say that they recover the investment in a €20,000 (\$27,000) UR robot within six months.

Programming collaborative robots will become even easier as software improves. Already, some experimental robots can be configured using spoken commands such as “create new skill” and “save pose”. Dr Nerseeth of ABB reckons that it will eventually be possible to program robots using speech. And the control files for robots can be posted online for downloading by other users, who can tweak them as needed.

At the same time, better artificial intelligence is even rendering some programming unnecessary. Rethink Robotics says its two-armed collaborative robot, called Baxter (pictured below), uses common sense to figure out some movements on its own. Factory workers use Baxter's touchscreen “face” to point out the objects it will handle. Baxter then studies them from all angles to determine if, say, a glass is best grasped by the outside or by inserting and opening its fingers. If a conveyor belt bringing items to be processed slows down, so does Baxter. More than 100 have been sold since the robot went on sale in late 2012.

For decades robots have been getting faster, stronger and more precise. The new breed of collaborative robots, by contrast, will move more slowly, lift less and be less precise. And yet this is the breed that will usher in the



Baxter gets to work

real robotics revolution, says Dr Brooks of Rethink Robotics, because such qualities will allow robots to team up with people. He points out that it was the advent not of mainframes but of less powerful but more user-friendly PCs that carried computing into the mainstream.

Collaborative robots are developing so quickly that international-standards bodies are having trouble keeping up. The world's largest compiler of voluntary industrial standards, the International Organisation for Standardisation (ISO) in Geneva, has yet to work out safety standards for collaborative robots, such as how much force a robot can safely apply to different parts of a human worker's body.

The ISO needs about two more years before it can publish pain-threshold standards, says Matthias Umbreit, an expert working on the project who also works as an automation specialist at Germany's BGHM, an insurer of woodworkers and metalworkers. But the signs are encouraging, he says. A hand clamped in a robot's gripper, for instance, can probably safely bear a pressure of 160 newtons per square centimetre. Fortunately, says Dr Umbreit, many useful tasks can be carried out using less force, so safety standards will not make robots so feeble that they are no longer useful. Johan Wahren of the Swedish Standards Institute notes that establishing standards will speed up R&D.

Friend or foe?

No matter how flexible, easy to program and safe they are, collaborative workers may not be welcomed by human workers to begin with. The experience of Alumotion, an Italian distributor of UR's robots, is illustrative. Workers fear being replaced by robots, says co-owner Fabio Facchinetti, so his salespeople carry demonstration units in unmarked cases and initially only meet a potential client's senior management behind closed doors.

But rather than firing workers, Alumotion's clients often end up adding shifts because production costs drop. RSS Manufacturing in Costa Mesa, California, says its new UR robot is helping the firm compete against Asian makers of brass plumbing fixtures. Geoff Escalette, the firm's boss, plans to buy more robots because without them some milling machines run at about 60% capacity for lack of a nearby worker able to load objects fast enough. It is worth remembering that people also used to worry that computers would steal jobs, notes Chris Melhuish of the Bristol Robotics Laboratory, a joint venture between the University of Bristol and the University of the West of England. Instead, computers helped people become more productive.

Workers generally warm to collaborative robots quickly. Employees are keen to offload the "mindless, repetitive stuff", as one roboticist puts it. And because workers themselves do the programming, they tend to regard the robots as subordinate assistants. This is good for morale, says Esben Ostergaard, UR's technology chief. In late 2012 Mercedes-Benz began equipping workers who assemble gearboxes at a Stuttgart plant with lightweight "third hand" robots initially designed for use in space by the German Aerospace Centre. The German carmaker's parent company, Daimler, is expanding the initiative, which it describes as "robot farming" because workers shepherd the robots

“just like a farmer tending sheep”.

Don't frighten the humans

To keep human workers at ease, collaborative robots should also have an appropriate size and appearance. Takayuki Kanda of the ATR Intelligent Robotics and Communication Laboratories in Kyoto says that collaborative, humanoid robots should generally be no larger than a six-year-old, a size most adults reckon they could overpower if necessary. Large eyes make robots seem friendlier and, crucially, more aware of their surroundings. But overly humanoid features can lead to problematically unrealistic expectations, says Ulrich Reiser of Fraunhofer IPA, a manufacturing research institute in Stuttgart that makes a €250,000 home-assistant robot called Care-O-bot. He notes that people tend to distrust robots with protruding sensors, “Terminator”-like exposed cables, or a jerry-rigged, student-project look.

To interact smoothly with people, robots will also need “social intelligence”. It turns out, for example, that people are more



Care-O-bot tries not to look scary

trusting of robots that use metaphors rather than abstract language, says Bilge Mutlu, the head of the robotics laboratory at the University of Wisconsin-Madison. He has found that robots are more persuasive when they refer to the opinions of humans and limit pauses to about a third of a second to avoid appearing confused. Robots' gazes must also be carefully programmed lest a stare make someone uncomfortable. Timing eye contact for “intimacy regulation” is tricky, Dr Mutlu says, in part because gazes are also used in dialogue to seize and yield the floor.

When a person enters a room, robots inside should pause for a moment and acknowledge the newcomer, a sign of deference that puts people at ease, says the University of British Columbia's Dr Croft. Robots also appear friendlier when their gaze follows a person's moving hands, says Maya Cakmak of Willow Garage, the California-based maker of the PR2, a \$400,000 robot skilled enough to make an omelette—albeit slowly.

It will probably be a decade or two at least before the descendants of PR2, Care-O-bot, and other “home assistance” or “companion” robots will be nimble and intelligent enough to zip autonomously through houses performing chores. They will need far better sensors, movement-control actuators and batteries, and much smarter software. They must also be capable of displaying empathy or they will be rejected, says Kerstin Dautenhahn, head of a “social robotics” team at the University of Hertfordshire in Britain.

Her team's Care-O-bot robots crunch data from 60-odd household sensors that monitor door and cupboard hinges, taps, electrical appliances and so forth. If medicine isn't taken, say, the robot may alert relatives or the hospital. It is vital that a robot of this sort is not perceived as hostile, but as having its owner's best interests at heart.

"To keep humans at ease, collaborative robots should have an appropriate size and appearance."

One way to do this is to give robots a defining human trait—the ability to make mistakes. Maha Salem, a researcher under Dr Dautenhahn, programmed a humanoid Asimo robot, made by Honda, to make occasional harmless mistakes such as pointing to one drawer while talking about another. When it comes to household robots, test subjects prefer those that err over infallible ones, Dr Salem says.

Another approach uses sensors to assess the state of nearby humans, so that robots can respond appropriately. With funding from the European Union, researchers are using bracelets equipped with electrodes to enable classroom robots to determine whether students are bored, confused or anxious. The robots can adapt their teaching style accordingly, says Iolanda Leite of the Instituto Superior Técnico, a Portuguese university participating in the programme, which is called EMOTE. One of its objectives is to foster "social bonding" between people and robots.

Such bonding could have some surprising uses. In experiments carried out at Yale University involving a biped humanoid called NAO, made by a French firm called Aldebaran Robotics, children proved to be just as willing to share secrets with it as they were with an adult. The researcher who performed the experiments, Cindy Bethel, who is now at Mississippi State University in Starkville, has also found that children who have witnessed a crime are less likely to be misled in a forensic interview with a robot than with a human expert—even one trained to obtain testimony. Mark Ballard of the Starkville police department, who has been working with Dr Bethel, reckons that the robots needed to conduct "child friendly" forensic interviews will be available by 2020.

What's next? Market research is not much good at predicting developments in the field of collaborative robots, says Bruno Bonnell of Robolution Capital, a robotics investment fund in France. For one thing, he says, people say they want complete control over robots, but once they start using them they actually prefer them to be as autonomous as possible. Working alongside robots changes the way people think about them, in other words. Whether on the factory floor, at home or in the classroom, the evolving relationship between human robots will be defined by a process of collaboration.

From the print edition: Technology Quarterly

Magazine

How Robots Can Trick You Into Loving Them

SEPT. 17, 2013

Eureka

By MAGGIE KOERTH-BAKER

I like to think of my Roomba as cute and industrious. He makes noises while he cleans that make me feel as if he's communicating with me, which contributes to the fact that I have assigned him a sex. He exists in a liminal space between animate and inanimate, but once he's done cleaning my floors, I don't mind putting him in the closet until I need his services again — he's a rolling disc, after all.

Robosimian — a headless, quadrupedal disaster-response robot designed by engineers at NASA's Jet Propulsion Laboratory — is a bit more useful than my Roomba, slightly more human-looking and a lot less cute: the C-3PO to my R2-D2. Robosimian can maneuver over rubble and through narrow corridors in order to, one day, rescue humans from peril. But its more difficult task will be forming some sort of bond with the E.M.T.'s and first responders who might use it. Robosimian will be more than just a tool, but not quite a colleague.

In the future, more robots will occupy that strange gray zone: doing not only jobs that humans can do but also jobs that require social grace. In the last decade, an interdisciplinary field of research called Human-Robot Interaction has arisen to study the factors that make robots work well with humans, and how humans view their robotic counterparts.

H.R.I. researchers have discovered some rather surprising things: a robot's behavior can have a bigger impact on its relationship with humans than its design; many of the rules that govern human relationships apply equally well to human-robot relations; and people will read emotions and motivations into a robot's behavior that far exceed the robot's capabilities. As we employ those lessons to build robots that can be better caretakers, maids and emergency responders, we risk further blurring the (once unnecessary) line between tools and beings.

Provided with the right behavioral cues, humans will form relationships with just about anything — regardless of what it looks like. Even a stick can trigger our social promiscuity. In 2011, Ehud Sharlin, a computer scientist at the University of Calgary, ran an observational experiment to test this impulse to connect. His subjects sat alone in a room with a very simple “robot”: a long, balsa-wood rectangle attached to some gears, controlled by a joystick-wielding human who, hidden from view, ran it through a series of predetermined movements. Sharlin wanted to find out how much agency humans would attribute to a stick.

Some subjects tried to fight the stick, or talk it out of wanting to fight them. One woman panicked, complaining that the stick wouldn't stop pointing at her. Some tried to dance with it. The study found that a vast majority assumed the stick had its own goals and internal thought processes. They described the stick as bowing in greeting, searching for hidden items, even purring like a contented cat.

When a robot moves on its own, it exploits a fundamental social instinct that all humans have: the ability to separate things into objects (like rocks and trees) and agents (like a bug or another person). Its evolutionary importance seems self-evident; typically, kids can do this by the time they're a year old.

The distinction runs deeper than knowing something is capable of movement. “Nobody questions the motivations of a rock rolling down a hill,” says Brian Scassellati, director of Yale's social robotics lab. Agents, on the other hand, have internal states that we speculate about. The ability to distinguish between agents and objects is the basis for another important human skill that scientists call “cognitive empathy” (or “theory of mind,” depending on whom you ask): the ability to predict what other beings are thinking, and what they want, by watching how they move.

“We make these assumptions very quickly and naturally,” Scassellati says. “And it’s not new, or even limited to the world of robotics. Look at animation. They know the rules, too. A sack of flour can look sad or angry. It’s all about how it moves.”

We’re hard-wired, in other words, to attribute states of mind to fellow beings — even dumb robots, provided they at least appear autonomous. But little things — how fast an agent is moving, whether it changes its movements in response to our own — can alter how we interpret what it’s thinking.

Elizabeth Croft, professor of mechanical engineering at the University of British Columbia, has done a study in which humans and robotic arms pass objects back and forth — a skill that would be important for a robot caregiver to get right. She has found that if a robot and a human reach for the same object simultaneously, and the robot never hesitates or varies its speed, people think the robot is being rude. When the robot makes little jerky motions and slows down, according to Croft, people actually describe this disembodied arm as considerate — maybe even a little shy.

But this built-in gullibility has its downsides for robots, too. It’s relatively easy to program a robot with behaviors that arouse our cognitive empathy, but this can create a dissonance in expectations once people figure out it’s not as smart as it appears. A paper by David Feil-Seifer, assistant professor of computer science at the University of Nevada, Reno, briefly describes a study wherein a group of autistic children figured out that their new talking, moving robot pal really only had a limited number of phrases and behaviors in its repertory. They “became disappointed” — one child even stated that the robot was “learning-disabled.” (This shouldn’t be unfamiliar — consider the widespread derision and disappointment inspired by Siri, Apple’s “intelligent personal assistant.”) The other problem is more philosophical.

“Our entire civilization is based on empathy,” Sharlin told me. “Societies are built on the principle that other entities have emotions.” What happens when we start designing technologies specifically to exploit the very backbone of society? You get things like the Japanese-made therapeutic robot Paro — not smart, but programmed to manipulate us into treating them nicely.

Designed to look like a fluffy baby harp seal, Paro isn’t intelligent in the Isaac

Asimov sense. But it seems incredibly sociable, capable of eliciting caregiving and affection from elderly people in nursing homes and hospitals. Paro was created to give isolated people a social outlet — like, for example, Alzheimer’s patients, who can have trouble connecting with human visitors. People treat Paro like a pet, or a baby — responses they’d never have to a Roomba, much less to Robosimian. By all outward appearances, Paro — really just a well-programmed network of wires and fabric fluff — does need your love.

Is that manipulative? Is it delusional? Sharlin can understand why people might come to both conclusions, but he doesn’t think it’s an ethical problem. To him, perceived behavior is as good as real behavior, if the overall outcome is something positive. “For these people, time with Paro is often the best hour of their day,” he told me.

Unlike Paro, most of the “smart” tools that are part of our lives today aren’t fooling anyone. But that soon may change. And like any story about robots — from “A.I.” to “Wall-E” — this is really about us, not the machines. Thanks to Human-Robot Interaction research, whatever social skills we program into robots in the future will be illusory and recursive: not intelligence, but human ingenuity put to use to exploit human credulity. By using technology to fool ourselves into thinking that technology is smart, we might put ourselves on the path to a confounding world, populated with objects that pit our instincts against our better judgment.

Maggie Koerth-Baker is science editor at BoingBoing.net and author of “Before the Lights Go Out,” on the future of energy production and consumption.

A version of this article appears in print on September 22, 2013, on page MM19 of the Sunday Magazine with the headline: Hi, Robot.

Charlie the robot hands out water bottles to first-years

By: Hannah Scott (<http://old.ubyssey.ca/author/hscott/>)

September 27, 2013, 11:43am PST



Photo Mackenzie Walker / The Ubsysey

On Imagine Day, one display in particular may have caught the eye of the more mechanically-minded: more than a hundred students were handed water bottles by a robot as part of a project put together by UBC's Collaborative Advanced Robotics and Intelligent Systems (CARIS) team.

CARIS is an interdisciplinary and international research group that researches human-robot interaction. The robot, named "Charlie," is a PR2 model manufactured by Willow Gage, Inc., and has lived in CARIS's UBC lab for the past three years. It is the only robot of its kind in Canada and one of only a few worldwide.

The CARIS team, led by mechanical engineering professor Elizabeth Croft, is comprised of seven PhD and seven MASc candidates who work on programming Charlie. The Imagine Day

project is one of a number of recent studies involving the robot; last year, the UBC Hackathon group programmed Charlie to ride an elevator by itself.

Masters student Ergun Caliskan is currently conducting a study looking at whether the robot can use non-verbal gestures, such as stepping back or looking another player in the eye, when playing turn-based games. This project builds on previous CARIS studies on robots and communicative, non-verbal cues.

Matthew Pan's PhD research involves direct experimentation on the robot's unique capabilities, including hand-over experiments, such as passing out water bottles.

"It does have two fully functional arms, so it can grab onto stuff, it can move around, it can move its head, it can rise up and down," Pan said. This means Charlie can perform many human-like movements.

The CARIS team has seen Charlie through a few technical difficulties. While their overall goal is to figure out the best way of compiling programs to make the robot run efficiently, the primary challenge is sharing Charlie's programming code with other university programs.


"It's a time-consuming process of understanding what other people have written and then trying to make it work," said AJung Moon, a PhD student in computer science.

Safety features are another characteristic of Charlie's design. "It's not going to hurt you that much, although it looks pretty big and perhaps intimidating," Moon said.

"The arms are actually spring-loaded, which allows the robot to have gentler motions," Pan said. It also has 27 degrees of freedom for additional safety control.

Charlie is a popular robot, especially among children touring the lab, thanks to its apparently friendly facial features. In the future, Pan said that the team wants to program the robot to play ping-pong and serve hot dogs.

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UBC robot learns to interact with people

Charlie the robot helps researchers study robot-human interactions

CBC News Posted: Oct 01, 2013 5:48 AM PT | Last Updated: Oct 01, 2013 8:08 AM PT



Charlie is a Willow Garage PR2 robot and the only one in Canada. (Sachi Wickramasinghe/CBC)

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Willow Garage PR2

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For the past three years, a robot named Charlie has been helping an interdisciplinary team of researchers and engineers at the University of British Columbia investigate how humans and robots interact.

Standing at five feet tall, with two large arms that mimic the range of motion of a human arm, Charlie is a Willow Garage PR2 robot, and the only one in Canada.

The research team, led by mechanical engineering professor Elizabeth Croft, is exploring how robots can be incorporated into a variety of everyday scenarios, from industrial manufacturing to workplace, home and health care environments.

Croft says understanding the human-robot interaction helps inform everything from rehabilitation for ailments like stroke and hemiplegic cerebral palsy to business applications like factory production and manufacturing.

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The key to better — and safer — robots is teaching them about human interaction, researchers say

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Humanoid research robot "Charlie," is helping UBC researchers in the field of "human-robot interaction." Ben Nelms for National Post

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VANCOUVER — In a meeting room at the University of British Columbia, a crowd of more than

[Watch video of the UBC PR2 robot in action](#)

one hundred volunteers is eagerly lined up to experience something that, to later generations, will seem remarkably quaint.

They came for the chance to be handed something by a robot.

“Charlie,” a \$400,000 humanoid research robot, picks up a water bottle, briefly glances at the drink and then gently extends the offering, its two camera eyes rising to meet the gaze of the human receiver. And then does it over and over again.

The basic, two-second act — during a demonstration three months ago — was the result of months of research, hundreds of trials and hours upon hours of finicky programming.

Everything about it, from the low swoop of Charlie’s arm, to the complex math underlying the water bottle’s effortless handoff, had been painstakingly engineered to make the motion imperceptibly seamless.

And when it all came together, says UBC robotics researcher Elizabeth Croft, the students came away with a vision of how it was going to be from now on.

In cutting-edge laboratories around the world, there already exist robots that can mix drinks and flip pancakes. There are robots that can care for the elderly, scoop up dog poop at public parks or even work at the elbow of an assembly-line worker.

The problem is, if all these robots were conscripted into service tomorrow, they would kill some, terrify others and frustrate everyone else. But at UBC, as at dozens of similar labs around the world, a new class of researchers have stepped up to groom these robots for life among humans. Machines are being taught human gestures, mannerisms and even ethics, and little by little, the parameters of a robot world that we will one day take for granted are beginning to take shape.

“When I started down this road, I wanted polite robots; robots that understood social cues,” said Ms. Croft, the founder of CARIS [Collaborative Advanced Robotics and Intelligent Systems Laboratory], UBC’s contribution to the still-new field of “human-robot interaction” (HRI).

A mechanical engineer by training, Ms. Croft first fell into HRI research while working to improve the safety of humans in automated factories. Her epiphany was the realization that humans and robots could never share an intimate workspace unless they learned to read one another.



Ben Nelms for National Post
"If the person doesn't understand what the robot is up to and the robot is not aware of the person, then you cannot have safety," UBC robotics researcher Elizabeth Croft says.



“Charlie,” a humanoid research robot, hands a water bottle to third year UBC PHD student Matthew Pan. Ben Nelms for National Post

“If the person doesn’t understand what the robot is up to and the robot is not aware of the person, then you cannot have safety,” she said.

At CARIS, the goal is to help design a new generation of robots that are “as easy to interact with as other humans,” said Matthew Pan, a CARIS PhD student.

That means robots that know how to interrupt, how to share and how to communicate, and robots that can understand simple hand gestures and even respond with their own, such as nodding or pointing.

“In the same way that I can say to a person ‘can you get me that?’ that’s what I want to do with a robot,” said Ms. Croft.

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Basically, the whole idea is to reverse-engineer thousands of years of human mannerisms, encode them as algorithms and, in Ms. Croft’s words, weave the “interactive fabric of a robot living in your life.”

On a CARIS workbench lies a weathered copy of *Gaze and Mutual Gaze*, a 1976

textbook of the significance of eye contact and one of many decades-old studies on human physiology that are now finding their way into the hands of roboticists.



Minhua Zheng, a visiting student from the Chinese University of Hong Kong programs a PR2 robot in a lab on UBC campus in Vancouver on Nov. 20, 2013. Ben Nelms for National Post

CARIS students have similarly studied hours of video of human subjects performing mundane tasks to break down the mechanics of subtle, non-verbal cues. CARIS studies have even hooked human subjects to biological sensors so they could gauge which robot behaviours made them the most nervous.

“Fast trajectories,” said Mr. Pan. “Fast trajectories that came out of nowhere were really scary.” People also apparently dislike when humanoid robots perform unnatural contortions, such as bending their arm backwards or twisting their head completely around.

An upcoming study by CARIS student Ergun Caliskan will use Charlie to determine how a robot can best signal “I’m done” when working alongside a human master.

Another series of studies has focused on robot “turn-taking,” the implicit cues by which a human craftsman will be able to work seamlessly with a robot assistant. In a series of video studies on robot hesitation, for instance, researcher AJung Moon is shown picking materials from a bowl alongside a robot programmed to do the same. When they both reach for the bowl at the same time, the robot coyly pulls back.

Last June, in a collaboration with Laval University that was funded in part by GM, CARIS mounted a live demonstration showing an assembly line worker and a robot arm working side by side to build a car door.

When the worker needs the next part, he simply extends his arm to receive it from the robot. When he steps aside for a moment, the arm swoops in to inspect his work.

It is this aspect of CARIS’ work that gets the most attention from the private sector. It is also the most controversial.

“Auto workers, especially auto workers’ union, are very opposed to these types of technologies because they fear that it’s going to take over their jobs,” said Mr. Pan.

As a result, he says they need to “work very hard to get the message across that we aren’t replacing these workers, but we’re actually enhancing their ability.”

The lab even runs a robot rehabilitation division. On Wednesday, an elderly volunteer was at the lab so that a CARIS student could study how she stood up, and ultimately plug the findings into a rough mock-up of a robot that may one day help aging seniors navigate their home.

Concerted HRI research really began in earnest in the 1990s, and there is now a vast and growing network of corporate and academic HRI labs, an annual HRI conference, an HRI academic journal, labs an HRI award handed out by Microsoft and even an in-the-works HRI attraction at Disneyland.

HRI researchers at Brown University have programmed a robot that can follow its human master, knowing to “halt,” “follow,” or “wait” with the wave of a hand. MIT researchers have discovered that when workers are asked to switch roles with their robot assistants, they develop a closer professional bond. Hungarian researchers have designed humanoid robots that can gain the trust of dogs.

“When I started down this road, I wanted polite robots; robots that understood social cues’

Aside from the occasional Roomba — the robot vacuum cleaner first introduced in 2002 — most of the world’s current stock of robots live in the industrial world, where the powerful, fast-moving machines are kept strictly segregated from their human coworkers — and for good reason.

In 1979, the world saw its first robot-caused death when 25-year-old Ford Motor Company employee Robert Williams was killed instantly by an accidental blow from

robot arm. The technology has remained a lingering occupational hazard ever since. In Japan, the 1980s alone yielded close to 10 robot-related fatalities.

CARIS' robots are specifically designed to be more welcoming — and less deadly — than their assembly-line ancestors. A pair of aluminum robot arms the lab uses, for instance, are noticeably light and designed to yield easily when pushed by a human operator.

“If this hits you, it’s not going to kill you,” said Mr. Pan.



CARIS' robots are specifically designed to be more welcoming — and less deadly — than their assembly-line ancestors. Ben Nelms for National Post

Charlie the PR2 robot, meanwhile, is intentionally constructed with smooth lines and familiar humanoid features — such as a head and two arms. Built in Menlo Park, Calif., the PR2 was designed specifically to function as a research platform for HRI scientists.

Since Charlie's arrival in the summer of 2011, CARIS has programmed the robot to take an elevator to the second floor. Charlie's ability to hand objects to humans, as demonstrated in September, is among the best in the world.

Online, dozens of videos from other labs show PR2s playing pool, folding socks, baking cookies or even helping a quadriplegic man to shave. Inevitably, the PR2 starts finding its way into group photos and even Christmas cards.

“We are, as a community of researchers, beginning to realize that robots are another category of being,” said Ms. Croft.

In CARIS-like research labs around the world, scientists are finding that their human volunteers treat robots not as people, and not as things, but as new entities occupying a grey area in between, an area where human qualities like responsibility and even morality may well apply.

As these beings stand on the cusp of mass-recruitment into the human world, the “rules of engagement need to be well-understood,” said Ms. Croft.

January 22, 2014

Early engagement key to getting girls into science careers, Canadian study says

By CAROLINE ALPHONSO

Study suggests that good grades and teacher influence matters less than exposure to outside-the-classroom activities

Girls are almost three times more likely to consider careers in science, math and engineering if they participate in science fairs and summer camps – particularly in the early grades – according to a new Canadian report.

The study by researchers at Mount Saint Vincent University in Halifax also suggests that good grades and teacher influence matters less than exposure to these outside-the-classroom activities.

The findings come at a time when governments are reaching out to young women in an effort to persuade them to consider the so-called STEM fields of learning – science, technology, engineering and mathematics – and organizations have stepped up their mentoring efforts. Learning experts say it is crucial to reach girls before their enthusiasm wanes and they drop science and math courses, which are optional in high school.

Although women greatly outnumber men on university campuses, they make up only 39 per cent of undergrads in math and physical sciences and only 17 per cent of undergraduates in engineering and computer science, according to data from the Natural Sciences and Engineering Research Council of Canada. Companies, meanwhile, are pushing for more women in these fields to build a more diverse and creative work force.

But experts say there are issues in the early grades with teachers not being as comfortable with the subjects to engage students, especially girls. And early engagement is the key. "I think this is a wake-up call. We need to increase the engagement level, and we need to encourage it from a young age," said the study's lead investigator, Tamara Franz-Odendaal, an associate professor at the university. She's also the Atlantic region chair of Natural Sciences and Engineering Research Council of Canada's program for Women in Science and Engineering.

Prof. Franz-Odendaal and her team surveyed about 600 students in Grades 7 through 9 last year from New Brunswick, Nova Scotia and P.E.I. and released their findings on Wednesday. They found girls who engaged in activities, such as science fairs, competitions and engineering summer camps, were 2.7 times more likely to consider a STEM career. For boys, the influence was statistically insignificant.

Prof. Franz-Odendaal believes that by participating in activities, girls develop a better understanding of what STEM careers look like, and, as a result, show a greater interest in them.

Elizabeth Croft, a professor of mechanical engineering at the University of British Columbia who is also a NSERC chair for Women in Science and Engineering, said it's not only important for girls to participate in STEM activities outside the classroom, but governments and educators need to address how to make classroom learning in these fields more engaging. UBC offers professional development workshops in engineering for teachers, she said, so they can be more comfortable with the subject and then engage their students through classroom activities. "The earlier you move those levers, the better it is," Prof. Croft said.

Prof. Croft said she's heard from a number of companies, who feel they are missing out on some bright and creative minds. "Not all our students are going to be engineers or technologists ... but we should make sure that we're giving kids opportunity early on in the classroom so they will think about choosing to do these things later," she said.

The Globe and Mail, Inc.

The numbers don't add up

Why are girls good at math less likely to pursue a career in science and technology?

LINDAY WHITE
Special to QM Agency

According to a recent analysis by Statistics Canada, young women attending university are less likely than young men to choose a program in science, technology, engineering, mathematics and computer science (STEM), regardless of mathematical ability in high school.

But understanding why female students aren't pursuing STEM degrees that will lead to in-demand and rewarding professions is complicated. "One of the frustrations I've had over the years is trying to boil this down to a black and white issue."

"If it was that easy it wouldn't be an issue," says Bonnie Schmidt, co-founder and founder of Let's Talk Science. The organization connects the STEM and education communities to help elementary and secondary students explore the relevance and importance of science in our everyday lives.

Lack of self-confidence

among females doesn't explain the Statistics Canada findings. Among university-bound students who considered their mathematics skills as "excellent," 66% of males chose a STEM program compared with 47% of females. (Learn more: statscan.gc.ca/daily-quotidien/131218/hq131218-eng.htm#131218-01).

Schmidt points to literature that suggests barriers include dated stereotypes that STEM professionals work in isolation. Consider, for example, that young women have long embraced disciplines like biology and environmental science — both of which provide clear pathways to helping others or impacting society.

Helping young women make those connections with math-heavy disciplines like engineering is crucial to increasing their participation in those programs.

"Engineers are about solving problems but they're completely and totally about society — building society, helping society," Schmidt says. "They come



Brock University's Scientifically Yours program provides an opportunity for female Grade 11 students to learn more about science in a university setting. *— Brock University*

at it from a problem-solving approach."

Lack of role models poses yet another problem, as does the context in which science is taught in some public schools. "Let's Talk Science does a lot of work right to help teachers make topics relevant to kids so it's not just the concept

of memorizing facts," says Schmidt. Educators' and parents' attitudes toward STEM programs and careers are also crucial.

Universities across the country are working to attract more young women to STEM programs through a variety of initiatives, including outreach

programs designed to break down those barriers. B.C.'s Simon Fraser University has been involved in several initiatives to encourage more young women to consider physics as a career path, including a workshop series called Girls Exploring Physics for female students in Grades 8 and 10.

At the University of Waterloo, 21% of engineering students are female — which is among the highest percentages in the country. Professor Mary Wells, associate dean of outreach for the faculty of engineering, credits the university's many outreach programs and encouragement to promoting women within the field.

Take its award-winning Engineering Science Quest outreach program as an example. It's one of Canada's largest science and engineering summer camps for students between grades 1 to 11, attracting 2,000+ students last year.

Hands-on activities focus on innovation and explore topics such as physics, chemistry, biology and health science as well as civil, mechanical, electrical and computer engineering.

"They can start to see themselves in engineering and plot their secondary education towards that goal," Wells says. "Those early years are critical."

She also gives credit to the university's co-op program. "Co-op allows these young women to try out engineering. They don't have to invest four or five years and still not be sure what they want to do when they finish."

"They can try a host of employment sectors and try to find the type of engineering that matches what they want to do."

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An International Women's Day project by the Equity Ambassadors to celebrate the amazing variety of women-identified bodies at the University of British Columbia.

WOMEN AT UBC

HOME

WHO ARE WE?

DR. ELIZABETH CROFT



Photo credit: Martin Dee

Dr. Croft and Interests

Dr. Elizabeth Croft is a Professor of Mechanical Engineering, specialising in robotics, the Associate Dean for Education and Professional Development in the Faculty of Applied Science, and the NSERC Chair for Women in Science and Engineering for the BC/Yukon region. In her spare time, she is a soccer-mom, and enjoys beachcombing, kayaking and running.

Dr. Croft and Passions

Dr. Croft is passionate about her role as an educator – she finds helping people learn and succeed incredibly rewarding. She is excited about the opportunities that technological developments are bringing to society. She believes it is important that women are encouraged to consider engineering and other technology-rich careers – for their own benefit and for the benefit of society. “We have some big problems to solve and we need as many smart people as we can find to solve them,” she says.

Societal issues Dr. Croft is currently focused on revolve around respect and appreciation of others: elimination of sexism and harassment in the workplace, awareness of implicit bias and how that affects our choices, equal access to educational and career opportunities, support for families through flexible work options, and the equitable sharing of responsibilities.

Dr. Croft’s research passion lies in human-robot interaction. Her research investigates how robotic systems can behave, and be perceived to behave, in a safe, predictable, and helpful manner, and how people interact with and understand robotic systems.

Dr. Croft and International Women’s Day

Dr. Croft is inspired by her mother, the first woman in her community to become a medical doctor. She also draws inspiration from the Famous 5 from the Persons Case. Dr. Croft was also inspired by many men who encouraged her to become an engineer and pursue a research career, namely Mr. Hart, her high school physics teacher and Professors Hill and Hauptman at UBC. This International Women’s Day, she is celebrating all women in engineering and all the great men that support them.

Dr. Croft believes that some of the most significant events for Canadian women in history include the 1929 establishment of women as persons in Canada, Elsie MacGill (Queen of the Hurricanes) becoming the first woman to earn a postgraduate degree in aeronautical engineering (1929) and, Roberta Bondar, first Canadian woman in Space (1992).. .

Dr. Croft would like to see women and men participate in all careers with the same opportunity and men given more opportunity and support to participate in raising their families. “The Norwegian model where fathers specifically take part of parental leave is really interesting,” she says. For her, female empowerment means a strengthening of the economic and social fabric of society; when women are educated and empowered we know that the outcomes for the families and children are much better.

Why we need more women engineers

March 7, 2014



(<http://news.ubc.ca/wp-content/uploads/2014/03/staub-french-770.jpg>)

“Engineering is all about solving problems and helping communities,” says UBC’s Sheryl Staub-French. Photo: Martin Dee.

Few women and a looming skills shortage could create a crisis for the industry

On the eve of International Women’s Day, Sheryl Staub-French, an associate professor in UBC’s [Dept. of Civil Engineering](http://www.civil.ubc.ca/) (<http://www.civil.ubc.ca/>) and [Westcoast Women in Engineering, Science & Technology](http://wwest.mech.ubc.ca/) (<http://wwest.mech.ubc.ca/>) Faculty Associate, talks about her work to boost female enrolment.

Why are you concerned about the number of women entering the field?

Nationally, less than 20 per cent of students in university engineering programs are women. If a significant part of the talent pool isn’t even considering it as a career, you’re missing out on some of the best and brightest. And we’re facing some real labour shortages. Engineers Canada predicts a skill shortage of almost 100,000 engineers by 2020. Part of our work is to help address that skills gap by encouraging young women to explore career possibilities in engineering and science.

The other side of this is that from a business perspective, good diversity tends to relate to better outcomes, such as increased innovation and profitability. Yet, only 11 per cent of registered professional engineers are women. As a mom, it is also frustrating to think that my daughter will receive less encouragement to pursue engineering as a career than my son. Engineering is an excellent career – rewarding, creative, stable and well-paid – and I want my daughter to have the same opportunities as my son.

How do you plan to increase the number of women enrolled in engineering?

We will be connecting professional engineers, engineering students and schools, and creating hands-on activities that help students understand engineering.

Equally important is working with parents, teachers, and career counsellors to illustrate the benefits of an engineering career. When a student says, “I want to help people,” the possibility of a career in biomedical engineering should be presented alongside a career as a physician or nurse. When a

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student says, “I want to help protect our environment,” their university path choices should include environmental engineering or mining.

What should young women know about engineering as a career option?

Engineering is all about solving problems and helping communities. It’s such a critical profession. I believe if everyone understood what we do, equal numbers of young men and women would pursue careers in engineering.

My specialization is a great example. Civil engineers design and construct our built environment – roads, bridges, water treatment facilities and more. My work develops computer models that help designers and builders to visualize, analyze, and evaluate different design and construction options. This work addresses a real societal need because it helps to enhance the efficiency, cost effectiveness, and sustainability of the construction industry.

The UBC Faculty of Applied Science aims to boost the number of women enrolled in its engineering programs by 50 per cent in five years. A \$500,000 gift from Goldcorp will be used to establish the Goldcorp Professorship in Women in Engineering at UBC, a professorship that focuses on promoting engineering as a creative and rewarding career. For more information, [click here](http://apsc.ubc.ca/apsc-eng/news/2014/03/ubc-and-goldcorp-partner-encourage-women-consider-careers-engineering) (<http://apsc.ubc.ca/apsc-eng/news/2014/03/ubc-and-goldcorp-partner-encourage-women-consider-careers-engineering>).

Find other stories about: [Dept. of Civil Engineering](#), [Faculty of Applied Science](#), [Goldcorp](#), [Goldcorp Professorship in Women in Engineering at UBC](#), [Science & Technology](#), [Sheryl Staub-French](#), [Westcoast Women in Engineering](#)

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THE GLOBE AND MAIL

Have your say: How can we clear obstacles to workplace success?

Craig and Marc Kielburger

Special to The Globe and Mail

Published Wednesday, Mar. 19, 2014 4:23PM EDT

Last updated Monday, Apr. 21, 2014 5:23PM EDT

Craig and Marc Kielburger founded Free The Children and Me to We. Their biweekly Brain Storm column taps experts and readers for solutions to social issues.

As father and uncle to a two-year-old girl, we're taking even greater notice of the obstacles to women's success in the workplace – from sexism, harassment and wage gaps, to the “double burden” of work and family expectations, and excessive work demands that are often required to have a rewarding and advancing career.

The “glass ceiling” is a persistent reality for women at work, according to a recent leadership summit of Canadian women business leaders. Only 25 of Canada's top 500 companies have women CEOs, and the Women's Executive Network notes that the percentage of senior corporate roles held by women in Canada has only risen to 18 per cent, from 14 per cent in 2002.

This stagnation in gender equality is bad for business, too. The Conference Board of Canada argues that “women's presence at senior levels improves decision-making, operational and financial results,” and a 2010 Women Matter study by global management firm McKinsey found that companies with a high proportion of women on executive committees are 56 per cent more profitable than those with none.

But even beyond the executive suite, women face disproportionate barriers to advancing in their careers. The Conference Board of Canada estimates that, at current rates of progress, it will take 151 years for the proportion of women and men in middle management to be equal.

Whether for better business or more fairness, it's time for Canada's male-dominated workplace culture to better incorporate the skills, contributions and needs of all employees. We want Marc's daughter Lily-Rose, and all Canadian girls, to have every opportunity in life and career. But we've never experienced the workplace from a woman's perspective, so we want to hear what you have to say.

This week's question: Instead of making women fit the workplace, how can we make modern workplaces fit women?

THE EXPERTS:

Phyllis Yaffe, former CEO of Alliance Atlantis

“Create an atmosphere where women are encouraged to reach for more responsible positions, where bosses accommodate family responsibilities with flexible scheduling, and where women are exposed to role models throughout the organization to inspire them.”

Elizabeth A. Croft, associate dean of applied science at the University of British Columbia

“Proactive companies will consider normalizing flexible work-option policies for all, develop strategies for ramping-off and ramping-on around parental leave for men and women, and explicitly address implicit bias in hiring and promotion decisions.”

Barbara Byers, Executive Vice-President, Canadian Labour Congress

“Working parents need flexible, affordable child care options to help them balance work and family responsibilities. Seventy per cent of Canadian mothers with children under age five are working, but only 20 per cent of those children have access to a licensed, regulated child care spot. Governments must address this crisis.”

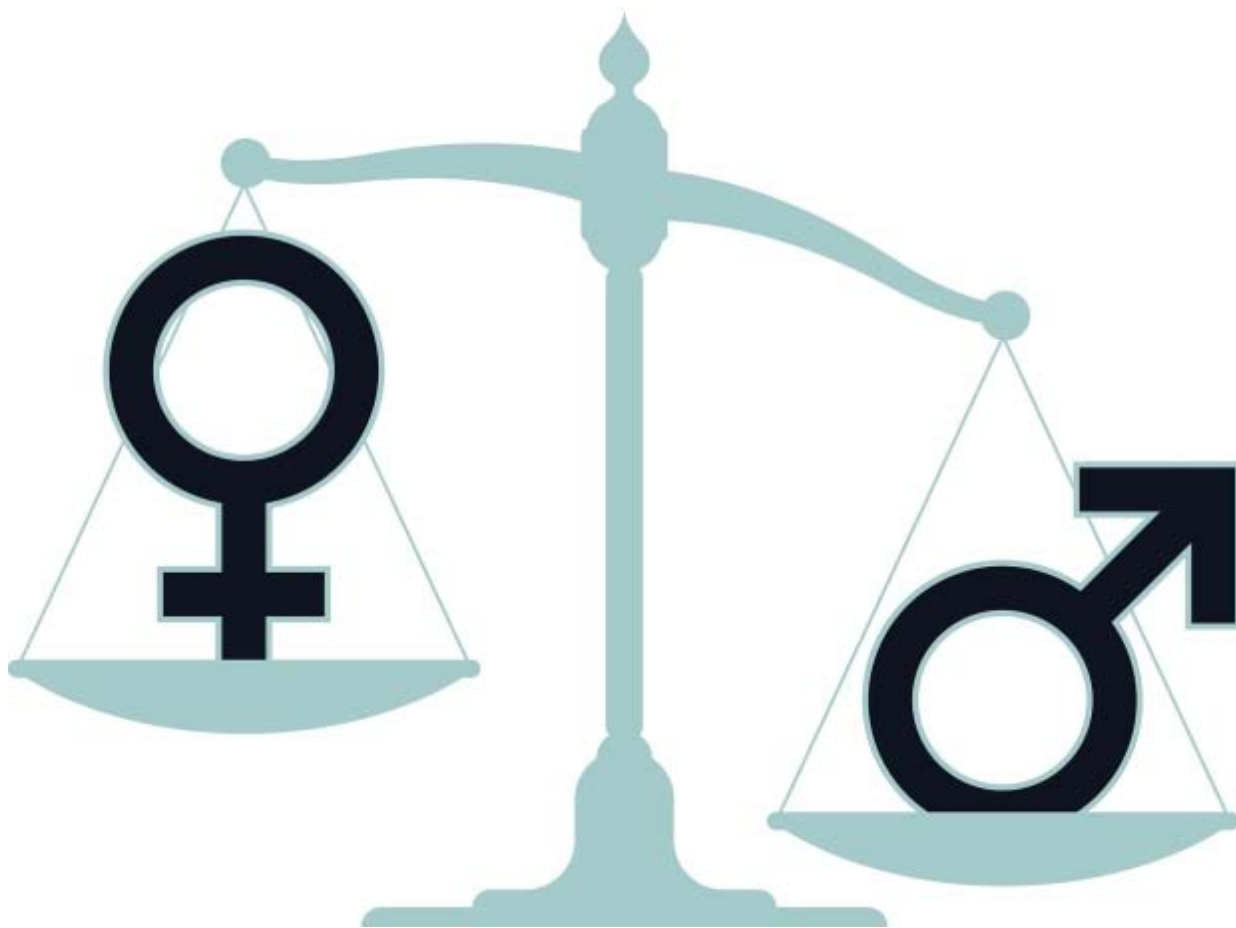
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Douglas Todd: Is gender balance in university programs worth pursuing?

UBC pushes for more females in programs in which male students dominate

BY DOUGLAS TODD, VANCOUVER SUN COLUMNIST MARCH 21, 2014



Photograph by: sirup, Getty Images/iStockphoto

The University of B.C. recently sent out a news release lamenting that only 22 per cent of its engineering students are female. Arguing that engineering programs need the “best and brightest,” UBC engineering professor and women’s activist Sheryl Staub-French and other officials pledged to “promote diversity” by making sure females in five years comprise 50 per cent of all engineering students.

With 6,300 students in engineering, UBC officials said the affirmative action program will be boosted by a \$500,000 donation from the giant Goldcorp mining company, which it highly praised. UBC does not say if engineering will attain its goal by expanding enrolment or cutting male students.

However, the university’s high-profile effort to “broaden the current talent pool” in engineering by enticing more women spotlights only a small part of the unbalanced gender picture at UBC and elsewhere.

The reality is that young women and men in universities increasingly self-segregate.

Engineering is one of the relatively few major university programs in which males predominate. Females prevail in most other UBC faculties and departments, as they do across most North American universities.

Women especially predominate in education, psychology, social work, the liberal arts, medicine, dentistry and nursing.

Since UBC's engineering department is actively recruiting more females, should these other university programs recruit more males?

The degree of sex segregation is startling among the 59,000 students who attend the Vancouver and Okanagan campuses of the University of B.C.

After asking UBC officials to provide the raw data on its female-male student breakdown, I discovered more than 54 per cent of all UBC's students are women, which is a common proportion across North America.

Some of UBC's faculties and departments are roughly balanced in regards to sex. They include law, the general sciences, commerce, economics, forestry and political science.

Most other UBC programs, however, are skewed either slightly or strongly to females.

Two faculties most striking for their firm majority of females are among the largest: education and medicine.

Education prepares teachers mostly for kindergarten- to Grade-12 classrooms, where students are usually comprised of roughly equal numbers of boys and girls.

Yet fewer than 30 per cent of the almost 4,000 students in UBC's education department are males. In contrast to engineering's affirmative action program, UBC's leading officials have not publicly hinted there is a need to encourage more males to work in public-school classrooms, where they could be role models for often-vulnerable boys.

Within the education faculty, roughly nine of 10 of those training to be elementary school teachers are women. But women also aim to be principals. They form more than seven of 10 of those seeking education degrees in administration and leadership.

UBC's psychology and counselling programs are also specialties that prepare graduates to deal with patients' emotional difficulties. Students tend to do so in taxpayer-funded schools, health facilities and counselling centres.

But of the 2,800 students enrolled in UBC's psychology and counselling programs, only 27 per cent are male. That means Canadian males (or females) suffering from anxiety or depression will run into a barrier if they hope to work with a psychotherapist who is a man.

Indeed, an argument can be made there is an extra need for gender balance in university programs

that prepare people for the taxpayer-funded so-called helping professions (such as psychology, education and social work), where the clientele is both female and male.

The health sciences at UBC also have a majority of women.

Overall, 58 per cent of the 4,053 students studying various aspects of health and medicine at UBC are females. How many will become doctors? Women make up slightly more than half the 1,102 students training to be physicians.

Meanwhile, in dentistry, 64 per cent of the students are female. Pharmacy is also predominantly female.

And nursing has especially remained stubbornly resistant to men. Of the 910 nursing students at the Vancouver and Okanagan campuses of UBC, only nine per cent are male.

However, unlike in engineering, UBC has no formal plan to “broaden the current talent pool” by encouraging men into nursing — despite its high value as a career; one which offers strong salaries, benefits, union protection, frequent overtime and pensions.

The same issues relate to social work, which at UBC enrolls only 12 per cent males.

Social work can lead to solid public-sector careers. People with masters’ degrees in both nursing and social work are often encouraged to take high-level management positions in B.C.’s massive health and social-services sector.

However, for a moment let’s look beyond the hot topic of affirmative action programs for either women or men in various university departments.

It is fascinating to simply observe the degree to which young men and women self-segregate at universities, just as they do in the Canadian job market.

In contrast to some gender activists who believe the ideal human should be “androgynous” — a combination of masculine and feminine traits that renders them sexually indeterminate — students appear radically shaped by their gender, often choosing blue or pink educational ghettos.

For instance, men make up only 38 per cent of the 14,000 students in UBC’s faculty of liberal arts.

And while women predominate in the fields of literature, linguistics, art history and creative writing, UBC’s philosophy department is 68 per cent male.

This suggests there is some validity to the generalization that males are inclined to enjoy rational discussion and logic. Math programs also tend to have more males.

Meanwhile, UBC’s small religious studies department is predominantly female, reflecting polls showing women tend to be more drawn to spiritual matters. And clichés about “lady librarians” do not come from nowhere: 77 per cent of the 162 students aiming for a master’s degree in library sciences are female.

Refreshingly, the 8,811 students in UBC’s large faculty of science are almost evenly balanced between the sexes. But that’s not the case in specific science-oriented departments.

Since females still are often culturally linked with food, perhaps it should not be surprising that 77 per cent of the 1,582 students in UBC's land and food systems faculty are female.

What conclusions can we draw from this gender data?

Given the wide sex disparities in many faculties and departments across UBC, it is perplexing the university is putting so much money, publicity and energy into redressing an imbalance in just one department: Engineering.

For what it's worth, I know three females who have enrolled in engineering programs at UBC and elsewhere in Canada. All three attest, from the moment they showed interest, they felt encouraged and supported by high-school teachers, engineering department faculty, fellow engineering students and employers.

Given that UBC has a jarring level of gender inequality in a host of its faculties and departments, the administration's focus on righting the unevenness in just one department seems, to say the least, arbitrary.

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Blog: www.vancouversun.com/thesearch

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Vancouver Magazine

NEWS AND FEATURES

Elizabeth Croft: Robots Could Have Feelings Too

Elizabeth Croft began her engineering career studying car crashes. Today, the advanced lab she runs at UBC attempts to teach robots how to avoid disaster

BY **PETTI FONG** PUBLISHED MAY 1, 2014



Photograph by Carlo Ricci

Petti Fong Is it insulting to hear people say it takes a woman to build a more human robot?

Elizabeth Croft I don't want to get hung up on whether it takes a woman to do this. IQ in a group setting goes up when you have gender diversity, racial diversity. We need all of those brains to come up with good solutions.

PF But you've said you want to see many more women in engineering.

EC When you ask girls what they want to do, they always say they want to make the world a better place, do something about the environment, be in health care. They're interested in making better stuff. That's engineering.

PF So engineering, at least around robot building, goes well beyond mechanics.

EC Take the give and take of hand-over motions. We began with humans, monitoring the behaviour of the giver and the receiver, and then teaching the robot how to be a good giver and a good receiver. In our experiment, we set the receiver's release threshold at different levels: when the threshold was too low, people thought the robot was careless. That last bit of hold before it pulled away made people think the robot really had the object. These cues and behaviours can give the sense that the robot has social graces.

PF Is that the goal? Gracious robots?

EC Let's say you and I both want the kitchen knife. I reach for it and I see you reaching for it. I pull back. We tried to replicate that hesitation cue with robots, then refined it. That kind of act makes people feel more comfortable around them.

PF What has being around humans taught you about robots?

EC Everything. When we're designing our robots, we're not designing them to interact with other robots. We're designing them to interact with humans. That example with a hand-over—I had no idea how people handed stuff over. You have to think about it and once you realize it, you see things differently.

PF What has being around robots taught you about humans?

EC Think about how far we have to go to create robots that have personality and capabilities. It makes you aware

of just how complex people are—how unpredictable we can be, how predictable. Being around robots has increased my wonder of how amazing humans are.

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The right stuff

Developing skills for specialized demands

Engineering schools, government and industry have to work together to ensure that programs are preparing graduates with the specialized skills that future careers will require, says Paul Accione, acting CEO for the Ontario Society of Professional Engineers. ISTOCKPHOTO.COM

The broad disciplines from the past have given way for higher levels of specialization, says Adrian Chan, associate professor of engineering at Carleton University, but ultimately companies will need smart people who understand technology and can solve complex problems, the characteristics of the engineering profession.

Technology is now engrained in medicine, for example, making a technical engineering background more and more important, says Prof. Chan.

"Engineers are now expected to have an understanding of medicine, because we will be working with researchers, doctors, nurses and physiotherapists. Engineers work as a part of a trans-disciplinary team to help with the integration of devices or processes that will reduce

the length of hospital stays and medication errors, improve monitoring and ultimately patient outcomes," he adds.

Given Canada's aging population, there will be a huge demand for engineers with biomedical specializations. Engineering schools must adapt to meet the skill gap, because in the future, their graduates will increasingly work in non-traditional engineering jobs.

"At Carleton over the last few years, we've introduced a number of new undergraduate and graduate level engineering programs, such as our biomedical and electrical, biomedical and mechanical, aerospace, sustainable and renewable energy, and architectural conservation engineering programs," Prof. Chan says.

The challenge is to educate and train the next generation of

engineers to be better equipped with the right blend of technical, intellectual and management skills required to land a job and survive in the working world, says Paul Accione, a professional engineer and both acting CEO and board past-chair for the Ontario Society of Professional Engineers (OSPE).

In 2012, according to Engineers Canada, more than 18,500 students completed undergraduate and graduate engineering degrees from 271 accredited engineering programs at 43 schools across Canada. So while there isn't a shortage of graduating engineers right now, engineering schools, government and industry have to work together to ensure that programs are preparing graduates with the specialized skills that future careers will require, Mr. Accione says.

A 2014 OSPE report highlighted a current disconnect between what employers need and what engineering graduates are being prepared for. In fact, less than 30 per cent of engineers with a bachelor degree or higher were actually working as an engineer or engineering manager. Also, in 2013, Engineers

"Engineers work as a part of a trans-disciplinary team to help with the integration of devices or processes that will reduce the length of hospital stays and medication errors, improve monitoring and ultimately patient outcomes."

Adrian Chan
is associate professor of engineering at Carleton University

Canada released its most recent labour market study predicting that more than 1,300 engineering positions will remain unfilled annually in Ontario. This will become increasingly important as an estimated 95,000 engineers will be retiring by 2020.

Mr. Accione has observed two trends. "One is from academia itself, that is getting far more sophisticated and focused on speciality areas at universities, because the knowledge base is growing tremendously, so everything seems to require greater specialization to get sufficiently deep in the subject area to be useful," he explains. "The second trend is that employers are demanding much greater specialization before they'll hire people, so we are encouraging the various players to work together."

Students who have been exposed to real life work experiences before they finish their degree, whether it is internships, co-ops or taking a year off school to get work experience, are much more successful finding an engineering job," Mr. Accione says, adding that he has seen a growth in co-op programs, for example.



Elizabeth Croft, professor of mechanical engineering at UBC, has helped Charlie the robot deliver a cup of coffee without spilling. She believes that the focus on how engineering impacts people appeals to prospective female students. SUPPLD

WOMEN IN ENGINEERING

Shifting the focus from technology to people

If you'd like your cup of coffee delivered by a robot, you'll be glad to know that professor Elizabeth Croft and her team are working diligently on making the hand-over go smoothly.

As the area of service robotics is growing, Elizabeth Croft, professor of mechanical engineering and associate dean of education and professional development at the University of British Columbia (UBC), is especially interested in the interactions between people and robots.

The focus on how engineering impacts people can be found in all aspects of the profession, and Prof. Croft believes this appeals to a diverse group of prospective engineers, including women.

Pondering the question whether robots should be

designed for people or people should conform to robots, Prof. Croft leans toward the former approach. She uses analysis of human behaviour as a basis for defining the parameters of a robot's design.

"If a robot brings me coffee, I want the robot to hand me the cup in a way that I feel comfortable it's not going to end up in my lap," Prof. Croft says. To determine how to safely pass things back and forth, she and her team designed an instrument measuring human handover.

The rules for human handover are that the giver is responsible for the safety of the object, while the receiver is responsible for the timing of the transfer, Prof. Croft explains. **People-centric, Page EC 3**

By the numbers

More than
18,500
students completed undergraduate and graduate engineering degrees in Canada in 2012.

18.1%
of total enrolment in university engineering programs in Canada are women in 2012.

11.3%
of professional engineers in Canada are women.

Less than
30%
of engineers with a bachelor degree or higher were actually working as an engineer or engineering manager.

More than
1,300
engineering positions will remain unfilled annually in Ontario.

16,000
new engineering jobs will be created due to investments in resource and infrastructure projects, between 2011 and 2020.

Sources: Engineers Canada and Ontario Society of Professional Engineers

INSIDE

Engineers tackle global warming by focusing on energy systems.

[Page EC 2](#)

Career assessment tools predict success rates.

[Page EC 3](#)

Visit globeandmail.com/engineeringincanada

Online assessment helps students determine suitability for engineering career

Breanna Borys is someone with firm ideas about the future.

Just finishing her third year of chemical engineering with a specialty in biomedical engineering at the University of Calgary's Schulich School of Engineering, Ms. Borys, 21, would like to work in the area of tissue and organ regeneration. An avid athlete, she especially wants to help young people recover from burns or injuries.

Back in high school, however, she was "really unsure" of her career path. Although she was a bright student who excelled in math and science, engineering wasn't in her plans. "I didn't want to work in the oil field and I didn't want to build bridges," she recalls her stereotypical views at the time, adding that the school's guidance office offered little help.

Her mother, a computer scientist, encouraged Ms. Borys to look into engineering nonetheless.

When she started to do some research, the "cool options" for specializations such as biomedical engineering drew her to the field.

Now a career assessment tool being developed by Engineers Canada has confirmed Ms. Borys's aptitude for chemical engineering and biomedicine. She is among a group of students who are helping to test the CareerFocus powered by the Pathfinder Career System, an online assessment survey designed to help high school and first-year university students determine whether they are suited for engineering.

"We want to support the sustainability of the profession by seeing more people going into engineering, and ensuring that it's right for them," says Glenn Martin, acting practice lead for outreach at Engineers Canada, who is managing the project.

CareerFocus is available to students for a \$75 fee. The assessment tool generates a report that predicts, with 90 per cent accuracy, their performance in engineering, based on a range of com-

petencies and traits. Students then have the option of having a one-on-one consultation with a certified career counsellor, for an additional \$100 fee.

"It's a way to help students and their parents know they are going in the right direction," says Ms. Martin, noting that CareerFocus is the only assessment tool that measures behavioural attributes rather than only interests or personality traits, which is important for engineering.

"Behavioural performance is a dominant factor in achieving success in a chosen career," explains Paul Frederick, a human resources consultant working on the CareerFocus program. He expects the assessment tool will

help students and their parents get a true reading of their competencies in engineering. "There's a major need for it out there."

Engineers Canada is developing a second phase of the assessment tool for master's students. A third phase will target people already in the profession, for example, who might be considering new practice areas.

Ms. Borys says she's interested in taking those surveys when they are available. For now, she plans to get a master's degree and perhaps a PhD in chemical or biomedical engineering, and to eventually become a researcher and academic.

"I can't imagine being anything but an engineer," she adds.



Career assessment tools add to sustainability of the profession by determining students' aptitude for engineering. ISTOCKPHOTO.COM

FROM EC 1

People-centric: Profession benefits from diverse teams

"We had to make sure that the robot is perceived as being careful with the object, but willing to let go when the person has it," Prof. Croft says. She studies "everyday interactions with robotic devices, aiming to have them do things that are intuitive and responsive." Rather than on technology, the focus is on its use for people.

Prof. Croft has noticed a difference in attitude when girls and boys visit her lab with their elementary and high school classes. "In my experience, girls are particularly interested in how engineered stuff works with people and whether it's something

that makes their lives better," she says. "Boys tend to focus more on the coolness of the stuff itself."

Changing the story about engineering, Prof. Croft believes, can attract more female students into the field. This could advance UBC's goal to achieve gender parity in its engineering program, which currently has 22 per cent women enrolled.

In 2012, women made up 18.1 per cent of total enrolment in university engineering programs in Canada, according to Engineers Canada, and represented 11.3 per cent of professional engineers.

Diverse teams are smarter – they can draw on different backgrounds, strengths and capacities, Prof. Croft says, and most engineering projects, due to their sizes and complexities, are team efforts.

There is no question Prof. Croft's work is fascinating, but so are many aspects of a "great and diverse profession like engineering," she says. "Whether it's the water you drink, your cellphone or the power provided, every product you use has engineering behind it." Even the coffee you drink, whether it's been handed to you by a robot or not.

More than three years into her job as a metallurgist for a mining company, Erin Bobicki decided to return to university for a doctoral degree in chemical engineering.

"I had my first child after my first semester back at school," says Ms. Bobicki, who is in the last year of her PhD studies, which started in 2010 at the University of Alberta's department of chemical and materials engineering in Edmonton. "With daycare, living expenses, books and tuition, it was a challenge."

A \$12,500 scholarship eased that challenge for Ms. Bobicki and her family. In 2012, she was one of three recipients of the Engineers Canada – Manulife Financial scholarship, a national prize awarded to outstanding engineers who pursue advanced studies in engineering.

Ms. Bobicki, who has a degree in environmental engineering from the University of British Columbia and University of

Northern British Columbia, has focused her doctoral research on a process that addresses climate change by permanently storing carbon dioxide in the mineral waste of mining companies.

It was on the strength of this research that she applied for the Engineers Canada – Manulife Financial scholarship.

"I've always been passionate about the environment," says Ms. Bobicki. "Fortunately, the awards committee was looking for a sustainability-related project, and I guess they liked what they saw in my application."

Ms. Bobicki, who now has two children, says her scholarship win came as a surprise. "I didn't think I stood a chance, but I'm glad I applied," she says. "When you're already working and earning an income, it's hard to leave that environment to return to school. These scholarships are significant – it's a huge dollar value for a student, and it really helped me."

SUPPORT

Scholarships pave the way for advanced studies



No need to fear robot revolution

Forget the frightening futures of film, UBC lab is developing robots to make our lives easier

Paul Luke

The Province

Sunday, May 25, 2014

Elizabeth Croft and her engineering students at University of B.C. want to give robots a good name.

That's a tall order. Everyone knows robots are fond of terminating people. When they're not killing folks in the movies, robots are poised to steal humans' jobs in real life.

But Croft and her team of PhDs think they can get robots and people to work together as sweetly as little angels.

They even think robots could boost your job security and keep you healthier in your old age.

Croft's team is designing a new breed of robot gentle enough to work closely with people and subtle enough to understand all the nonverbal cues - eye gaze, posture, head tilting - that humans routinely use to communicate. They're designing a co-worker that may be able to stomach tedious jobs far longer than you would. It won't whine or cuss, and it may be nicer to be around than you'll ever be.

"There are going to be robots in your future," says Croft, a mechanical engineering professor at UBC. "You will interact with them and you will have a job with them."

The robot-filled future is approaching faster than many people realize.

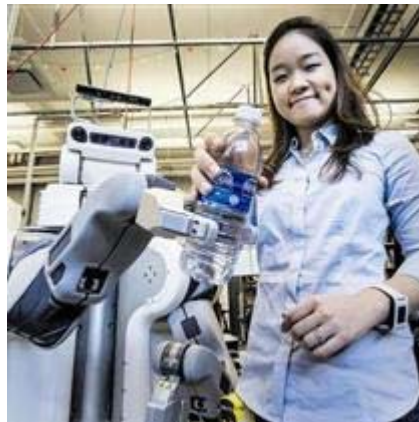
Croft's team at UBC's Collaborative Advanced Robotics and Intelligent Systems Lab (CARIS) is only one of many initiatives around the world that are ushering working robots into the present.

Robots have been toiling like chain gangs in caged areas of factories for decades. CARIS researchers are preaching robot revolution -



CREDIT: Steve Bosch, PNG

UBC mechanical engineering professor Elizabeth Croft in front of a student testing Riser, a robot used to study balance.



CREDIT: Steve Bosch, PNG

PhD student AJung Moon gives Charlie a bottle. Moon has been working with the robot to study eye-gaze interaction.

they want to emancipate robots from their cages, potentially putting them in unstructured environments alongside people in factories, offices, homes and hospitals.

That revolution is well underway.

Demand for service robots - such as the Roomba vacuum cleaner - is accelerating. Global sales of service robots have grown six-fold in the past few years, Croft says.

Massachusetts-based iRobot, which has been making the Roomba vacuum cleaner since 2002, says more than 10 million of its home robots have been sold in 60 countries.

Robots have also taken their place as receptionists, museum guides, warehouse workers, Mars explorers, bomb disposers, lecturers and actors.

This parade sounds impressive but the tin men and women in these jobs have physical limits that sharply limit their applications. Robot makers - sometimes called roboticists - need to push technology further ahead before Walmart can start selling robot maids to sling your morning toast and coffee.

They need to teach robots to hand over your coffee mug without dropping it. They need to devise an ethical approach to programming to ensure robots will never throw that coffee mug at an ornery human who looks at them the wrong way.

This is where CARIS comes in. PhD students such as AJung Moon and Matthew Pan are studying the complex series of cues and motions that robots need to master to give and take stuff from people.

Humans have an intrinsic ability to exchange objects without giving it much thought. But a robot must be programmed to handle many complexities, says Pan, a doctoral student in applied science.

Roboticists must ask and solve basic questions, Pan says.

How will the robot distinguish between fragile, valuable, heavy or spill-able objects? How does the robot even recognize a person wants to hand over an object? "If you're going to deploy a humanoid butler in the home, it's pretty crucial for the robot to reach for and receive objects, and vice versa," Pan says. "The same is true of a faroff scenario where you have robots working with a surgeon and handing over medical instruments."

For robots, the words of the Christian biblical beatitude are literally true: It's better to give than to receive. Robots find it much more challenging to receive objects from people than to give them, Pan says.

"When a robot hands something over it can dictate where the handover will occur," Pan says. "If it's receiving, it has to figure out where the human will end up and how to get to that physical location."

Fellow PhD student Moon has been using a people-friendly robot named Charlie to study how people perceive robots in handovers.

She has learned that people will more quickly accept a water bottle from Charlie if he looks at a handover location and then makes eye contact with the person.



CREDIT: Steve Bosch ,PNG

Navid Shirzad, a PhD student in biomedical engineering, has designed a device to aid with stroke therapy.

Moon co-authored a paper on the role of eye gaze in human-robot interactions that just won an award for best paper at the IEEE International Conference on Human-Robot Interaction in Germany.

Moon is also studying how to enable robots to signify hesitation.

"We're trying to get at how a robot can use non-verbal cues such as gestures to communicate uncertainty," Moon says. "Cues can also be used to help a person and a robot negotiate and find a solution."

UBC student Navid Shirzad has merged robotics, social media and video games into a diagnostic-therapeutic tool.

His device, which is now being tested in Vancouver physiotherapy clinics, is designed to help therapists working with stroke survivors.

"We're looking at how a robot can interact with a person to promote engagement in their therapy and make their exercises more exciting," says Shirzad, a PhD candidate in biomedical engineering. "We're trying to use robots to make the daily lives of humans a little bit easier."

Some people may worry about being hurt by robots, Pan says.

But those programming and building them take care to ensure they're safe, he says.

Charlie, a PR2 robot built by Willow Garage in Palo Alto, Calif., is a pussycat. The UBC researchers program Charlie as they conduct their work and tweak his hardware to boost his capabilities.

"Charlie has robot arms that may look menacing but they're actually soft and pliable," Pan says.

"They won't bruise you." The advances needed for robots to perform complex tasks in company with human workers in restaurants or on construction sites is likely at least 15 years off, Pan guesses.

People's concern about robots taking their jobs is "absolutely understandable" but the fear is needless, Pan says. Robots will make human jobs safer and more secure, he says.

Robots, for example, can help to keep people on the job longer by doing the kinds of tasks that may lead to repetitive strain injury, he says.

"We aren't designing robots to replace humans," Pan says.

"We're designing them to work alongside humans."

Robots could help to make up the shortfall of workers that will occur as boomers retire, Pan says.

And they can then help to care for those retirees.

But Jim Stanford, an economist with Canada's Unifor trade union, says that robotics and other labour-saving technologies often undermine living standards rather than improve them.

Advances in labour-saving technology have failed to make a difference in Canadian workers' inflation-adjusted hourly wages for the past 30 years, Stanford says. Nor have they translated into fewer working hours and more leisure, he says.

If high unemployment persists in Canada, replacing humans with robots would only

increase joblessness, Stanford says.

"It might be good for the individual business: Their labour costs fall, they are able to produce more sophisticated, high-quality goods, their profits go up," Stanford says. "And, of course, robots never join a union or go on strike or demand fair treatment."

Humans are blends of patience and anger, courtesy and rudeness.

Could robots be programmed to omit people's darker qualities, making them potentially nicer than humans? Croft says that it's possible. But she cautions that perceiving robots as having emotions and motivations is a form of anthropomorphizing - attributing human personality to things non-human.

Robots, Croft says, do have a few more things going for them than do machines.

"A robot is a reactive agent. It has the capacity to sense, reason about and react in different ways to its environment with some level of autonomy."

A widely accepted tenet of robot ethics is the sanctity of human life.

Robots designed to work independently must be programmed to protect and preserve human life, Croft says.

Do robots, in turn, have rights? Croft says robots are not living beings. That doesn't mean they should be kicked around.

"It's really important that people are respectful of all things," she says. "That's just about being a good human being."

Roomba joined by pool-and gutter-cleaning cousins

Robots have been infiltrating the workplace for more than 50 years. Now they're invading the home.

In 2013, North America's robotics market posted its best year ever.

A total of 22,591 robots valued at \$1.39 billion US were shipped to companies across the continent, up from 20,328 robots valued at \$1.29 billion in 2012, according to the Robotic Industries Association.

The association estimates that 228,000 robots are being used in U.S. factories, placing the U.S. second to Japan in robot use.

But only 10 per cent of companies that could benefit from robots have installed any so far, the RIA says.

General Motors is said to be the first company to use an industrial robot.

It was introduced in 1962 for spot welding and extracting die castings at a plant in New Jersey.

Massachusetts-based iRobot, which makes the popular Roomba vacuum cleaner, has expanded its family of house robots to include

Scooba the floor scrubber, Braava the mopper, Mirra the pool cleaner and Looj the gutter cleaner.

There are pets like Parot the robot baby seal. There's Baxter, a blue-collar 'bot whose \$25,000 US price tag puts him within reach of smaller

manufacturers with repetitive tasks. And there are robot pole dancers. A software firm's booth at an IT expo in Germany in March featured two pole-dancing ladybots,

their twists and turns encouraged by a robot DJ with a megaphone for a head.

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Push is on to get girls interested in the tech sector

Males dominate in both computer-science classes and workplace

BY GILLIANH SHAW, VANCOUVER SUN JUNE 16, 2014



Tech entrepreneur Sandra Wear is inviting teens girls to a coding boot camp, Be Like Ada (BeLikeAda.com), an initiative that has the support of the University of B.C. and B.C.'s tech sector.

Ada Lovelace, the woman known as the world's first computer programmer, was born in 1815.

She was an exception in her time and, almost 200 years later, while women in technology aren't exactly the exception, neither are they the rule.

Vancouver's Sandra Wear is going into schools to try to change that, inviting teenage girls to a coding boot camp, Be Like Ada (BeLikeAda.com), an initiative that has the support of the University of B.C. and B.C.'s tech sector.

"It is a big problem," said Wear, a tech entrepreneur whose first venture into the industry saw her co-found DocSpace, a company that was acquired by Critical Path in 2000 for \$568 million.

"Girls are being told at 13 they are not good at science and math," she said. "We're hurting ourselves. Not only is this unrealized potential but how are we going to fill jobs?"

It's a situation that's not being solved simply with diversity policies among employers. Most recently, Google went public with its diversity stats, which show 30 per cent of its global workforce are women and just 17 per cent in its core tech operations.

If young women look around computer science classes at universities or at tech workplaces and see

women in the minority, it doesn't help.

"The other challenge isn't just getting them to apply," said Wear. "Once they are in that environment, it is making them feel welcome."

Elizabeth Croft knows what it's like to be a woman in male-dominated classes and, as the associate dean in the UBC's Faculty of Applied Science, she is taking a leading role in changing that for the generations of women following her.

This year some 29 per cent of the first-year students in the faculty will be women, up from 20 per cent five years ago.

"It's important that everybody participate, both boys and girls have a lot to contribute," she said. "I don't think we've done enough to get our message out that computer science and engineering are great."

"We're not all looking like Dilbert, we're not all geeks. Coding rocks; we need to get that message out there. Coding is cool; it's fun, it's not anti-social.

"And it's a way to change the world, to connect people, to save lives."

The goal of Be Like Ada is to increase the number of female engineering grads until they represent half of graduating classes and to double the number of engineers in Canada. Be Like Ada is hosting a coding boot camp July 19 for 500 high school girls, with instructors and mentors from B.C.'s educational and tech sectors on hand to sell coding as a "superpower" for girls.

The idea isn't to convert everyone to coding. It's a stepping-stone. For today's youth, coding literacy should be as standard as reading literacy, according to Wear.

"You don't need to be coding full time but it permeates everything," she said. "It's like reading.

"Everybody needs to be able to read and write but it doesn't mean you need to do it full-time."

The day will involve teaching the girls the fundamentals of programming but will also introduce them to role models and potential careers in engineering and technology. Wear is planning to follow up with an online community for the participants so they'll continue to have a connection both to others who are interested in similar careers and to mentors in the community.

Kirsten Sutton, vice-president and managing director of SAP Labs Canada and chair of the B.C. Technology Industry Association board, sees initiatives such as Be Like Ada and others as important in encouraging more young women to pursue technology as a career.

"Here in Vancouver, we are at approximately at 29 per cent of women in tech roles," she said of SAP. "That is pretty standard, 70/30 is pretty standard and it lowers as you get into management. That's at 24 per cent now.

"We are very excited to be part of this, we look forward to the boot camp day. We're hoping there are girls who walk out of there with a very different idea of what they could do."

Be Like Ada also has the support of the B.C. Innovation Council. The council's president and CEO

Greg Caws sees such encouragement for young women as critical to the sector.

“There are many, many women going into professions — for example law and other things — because there are many other women there,” he said. “But in the sciences and engineering it’s still a bit of a tough slog.”

The father of two daughters who are in sciences and engineering attributes his daughters’ interest in their fields to both his work and the work of his wife, Catherine Caws, who is a professor specializing in computer-aided language learning.

Coding is all about creativity, a message Be Like Ada hopes to impart to participants in its boot camp.

“We need more young women involved in coding. It’s a tremendous career, it pays well and it allows you to work from anywhere,” said Caws.

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vancouversun.com/digitallife

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How Much Are You Worth?

Salary Negotiation for the Woman Professional

BY: JENNIFER PELLETIER, REBEKAH PARKER, & ELIZABETH CROFT

Salary negotiation is intimidating and can be a particular challenge in professions where there are many unique qualifications and requirements. Employers face the task of finding an employee who is a good fit for their organizations and new employees seek a job package that supports their goals and lifestyle.

A successful hire requires a strong pool of candidates, careful consideration free of bias, and fair negotiation of a starting salary. In engineering, women have traditionally faced additional challenges in this process and there are still gender-based differences in compensation. Salary negotiation can reduce this gap.

What to Know as an Employer

Implicit Biases – Engineers and scientists like to believe all of their decisions are unbiased but in reality we all have implicit biases. Implicit bias refers to the assumptions and conclusions we jump to without thinking. Our implicit biases can directly contradict what we actively state we

value. They have a significant impact on how we judge others and the decisions we make.

The sway of our implicit biases was made clear in a recent study. Professors were asked to evaluate a candidate for a lab manager job. Male candidates were consistently offered the job more often, at higher salaries, despite the resumés being identical.

The first step to avoiding implicit biases in your hiring is to be aware they exist, and to be aware of what your personal biases are. <https://implicit.harvard.edu/implicit/> is a free tool you can use to become more aware of your biases.

Gendered Language and the Application Process – Subtle factors change who applies for a position. Three main factors affect an individual's decision to apply: identification with the job, reward preference (financial, intellectual, schedule flexibility and so on) and expectation of application success. Showcase information that effects these factors to broaden your candidate pool.

The language you use in a job description matters: gendered language in job descriptions has no impact on men but may dissuade women from applying. This effect was subconscious, even when the gendered words were pointed out. Examples of gendered language include:

Feminine Language

Excellence in the market

Understand markets to establish appropriate selling prices

Committed to providing

Masculine Language

Dominance in the market

Analyze markets to determine appropriate selling prices

Determined to deliver

Avoiding gendered language gives you a broader application pool and a better opportunity to hire someone who will succeed in the position.

What to Know as an Employee

Knowing what you are worth matters – and you are worth more than you think. In BC, new graduates are given the opportunity to learn about salary negotiation before graduation. As a result the industry sector starting salaries in BC are now roughly the same for everyone, based on the responsibility level of the job.

When you are preparing for an interview consider what kind of job you are looking for. Some aspects to think about include:

- Job technical and skill requirement (Is this what I want to do?)
- Compensation, work-life balance (What benefits does the job offer?)
- Expectations for availability and travel (How do current employees handle family demands?)
- Working relationships and workplace climate (Will there be people like me?).

These considerations are universally helpful, regardless of gender, but are particularly important to women and young workers.

The Salary Negotiation: Know Your Value

Before negotiation, review compensation surveys, look at similar job advertisements and refer to benchmark employment descriptions to figure out before the interview what salary range the position fits into. If possible, find out what salary level the organization offers for the position you are applying to.

During your interview and contract meeting, focus on what makes you valuable to the employer. Ask questions including how the organization's compensation levels compare to the industry average, how pay increases are determined (merit-based or scale-based) and how the employer measures performance.

Whoever Gives the First Price Loses

The company's decision to hire you is the big one and usually will not be affected by reasonable salary negotiation. Often future salary increases are a percentage of your starting salary, which makes negotiation essential for securing a fairly compensated position.

Consider these three aspects during your negotiations: comparison to your peers, the total package and the final contract. Compare yourself fairly with your peers, using your network to learn what others are offered in comparable jobs. Being "too cheap" reduces your value as an employee.

When it is time to talk numbers remember that whoever names the salary first loses. If you state the first amount, they will negotiate you down. If they state the first amount, you get to negotiate them up.

When you receive a job offer, look at the whole package and consider:

- Prior work terms
- Geography, hours and sector
- Bonuses, profit sharing, overtime
- RRSP and benefit premiums
- Vacation and flexible work.

Before you sign any contract, review it and take a few days to consider it. Make sure the process for review and advancement is clearly understood. Your first review should be within six months.

And Remember...

To be successful in the job hunt and salary negotiation, you need to do your homework and know your value, network with peers and seek out mentorship and prepare for your promotion. Annual check-ins with your supervisor are highly recommended. Keep your resume updated.

Dr. Croft is the chair and Ms. Pelletier and Ms. Parker are staff members of the NSERC Chair for Women in Science and Engineering, (BC & Yukon Region). For more information and resources, visit <http://wwest.ca>

October 17th, 2014

Robots: Getting Girls Engaged in Robotics

Earlier this year, the Robots Podcast team came across a story about two 17 year old twin sisters who started their own robotics outreach group. The story about the Tipperman sisters got us curious. What kind of robotics outreach activities are out there to inspire children? Do any of these activities make a difference in getting more girls interested in robotics?

In this episode, AJung conducted a series of three interviews. She spoke to the Tipperman sisters to find out more about their activities, and with Ross Mead, a PhD student who has years of experience organizing robotics events and inspiring young minds. She then talks with Professor Elizabeth Croft, a roboticist who also studies the topic of women in science, technology, engineering and math (STEM).

Hannah and Rachael Tipperman



[Hannah and Rachael Tipperman](#) are high school seniors. They became interested in robotics almost “accidentally” when Hannah participated in a one-time robotics workshop for middle school girls. Since then, they have participated in the FIRST Lego League, FIRST Tech Challenge, FIRST Robotics Challenge, and they founded and captain their school’s Vex Robotics Team. They developed [Robot Springboard](#) in the summer between 9th and 10th grade as a way of “paying it forward” and helping other children and communities learn more about, and become involved in, robotics. They run week-long programs in robotics and computing for communities as diverse as Homer, Alaska and Monteverde, Costa Rica. They have also run a week-long “Robot Springboard Technology Camp @ Drexel University” for middle school girls with the help and support of the National Center for Women and Information Technology and Drexel University.

This past year, they launched [BrightStart Robotics](#), a program tailored to younger children (kindergarten through 3rd grade) and their parents. The BrightStart program has been remarkably successful and has hosted

over 100 parents and 100 children in the past year. They are presently training other high school students to help run these programs. Hannah and Rachael Tipperman plan to pursue studies in Computer Science in college.

Ross Mead



[Ross Mead](#) is a Computer Science PhD student, former NSF Graduate Research Fellow, and former fellow of the USC Body Engineering Los Angeles program (part of the NSF GK-12 initiative). His research focuses on the principled design and modeling of fundamental social behaviors (such as social spacing, eye gaze, gesturing, turn-taking, and other nonverbal social cues) that serve as building blocks to facilitate natural face-to-face human-robot interactions. For over a decade, Ross has been involved with robotics outreach programs, such as [Botball](#) and FIRST, serving as an international program instructor, regional coordinator, competition designer, event host, technical mentor, and seasoned competitor. His Master Thesis was designed and implemented using hardware and software platforms used in these outreach programs, demonstrating the applicability of inexpensive and accessible technologies in real-world scenarios. Over the years, Ross has worked directly with thousands of K-12 and higher-education students, in an effort to improve the understanding of STEM principles and promote the pursuit of STEM studies and careers. Ross is the first to have formally introduced *sociable* robotics into the standard K-12 curriculum; this distinguishes itself from *traditional* robotics activities, which tend to focus on tasks that are “dirty, dangerous, and dull” for a human to perform. His goal is to use sociable robotics topics to increase interest and self-efficacy of K-12 students underrepresented in STEM, such as females, African-Americans, Latinos/Latinas, and Native Americans.

Elizabeth Croft



[Elizabeth A. Croft](#) is a Professor of Mechanical Engineering and Associate Dean, Education and Professional Development for the Faculty of Applied Science at the University of British Columbia (UBC). She holds the

NSERC Chair for Women in Science and Engineering, BC/Yukon at UBC and leads the [Westcoast Women in Engineering, Science, and Technology \(WWEST\)](#) program.

Elizabeth founded WWEST in order to attract, recruit, and retain women in engineering and science careers. WWEST works at national, regional, and local levels with organizations engaged in increasing the number of women in science, engineering, and technology (SET) disciplines through multilateral partnerships spanning community, academic, and private sector partners. Elizabeth frequently gives talks and runs educational sessions to promote women in engineering from elementary school through graduate studies, academe and industry careers. She has received numerous awards for her activities promoting women in engineering.

She is also the director of the Collaborative Advanced Robotics and Intelligent Systems Laboratory at UBC. Her research investigates how robotic systems interact with people, and be perceived to behave, in a safe, predictable, and helpful manner.

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News

Media Release | Oct 20, 2014

UBC Engineering co-hosts successful Go Eng Girl! event

UBC Engineering welcomed 100 Grade 9 girls from across B.C. to Go ENG Girl Saturday October 18 to learn about engineering from women professionals, academics and students. The outreach event, co-hosted by eng•cite and Westcoast Women in Engineering, Science & Technology (WWEST), is part of a national outreach effort in collaboration with the Ontario Network of Women in Engineering (ONWIE). The day featured hands-on activities, conversations with engineering mentors and touring engineering research labs.

Tasked with the design challenge of crossing sections of deep slush in the North in search of new sources of clean drinking water, participants created devices that can travel four metres without touching the ground. Furthering their hands-on design skills, participants also encrypted and decrypted code in a cryptography challenge.

"Engineering is a creative, engaging and rewarding profession about solving problems, designing solutions and helping our communities," says Sheryl Staub-French, Goldcorp Professor of Women in Engineering at UBC and Director of eng•cite. "We are delighted with the response to our first Go ENG Girl outreach event and we strongly encourage girls to continue studying math and science throughout high school so they may choose to pursue a career in engineering."

The outreach event filled to capacity and successfully brought greater awareness to the field of engineering.

"Engineers converse with communities to decipher what can be improved on. They can then take that knowledge and create useful inventions and ideas to help improve the community," said one participant.

"I really enjoyed it am now considering engineering as a career," said another.

To learn about opportunities to connect with UBC Engineering including our annual Open House on Saturday, November 29, please visit: [UBC Engineering Connects](#).

Contact

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News

Media Advisory | Nov 12, 2014

UBC Engineers to host 14 Not Forgotten

In remembrance of the 14 women killed on December 6, 1989 at l'École Polytechnique de Montréal, the UBC Engineering Undergraduate Society (EUS) will host 14 Not Forgotten, a memorial ceremony in their honour. The ceremony will be held November 18, from 12:30 – 1pm in the Engineering Design Centre (EDC) Courtyard.

The memorial ceremony will include:

- Introduction by Veronica Knott, EUS President
- Impact of Dec 6 1989 on Engineering Across the Country, by Karen Savage, APEGBC Councillor
- 14 Women, 14 Stories, by Student Leaders from Alpha Omega Epsilon (AoE), Women in Engineering (WIE) and the EUS
- Moment of Silence

This is the first event to be held in the Memorial Courtyard, a new place for quiet reflection, outdoor study and group gatherings adjacent to the Engineering Design Centre. The courtyard incorporates a commemorative element to recognize the event and names of the 14 women killed at L'École Polytechnique in Montreal on December 6, 1989.

On December 6, 1989, an armed man walked into an engineering class at l'École Polytechnique de Montréal. After forcing the man to leave, he stated that he hated feminists and began to shoot the women in the class. By the end of the shooting, he had killed 14 women and injured ten more.

In response to this tragedy, Canada established December 6 as the National Day of Remembrance and Action on Violence against Women. This day serves as a reminder of the gender-based violence against women in Canada and around the world that persists today.

14 Not Forgotten is co-organized by the EUS, Women in Engineering, Alpha Omega Epsilon, WWEST and Eng-Cite.

To find out more details about the memorial ceremony, please visit <http://ubcengineers.ca/events/14notforgotten/>.

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News

Media Release | Nov 25, 2014

UBC Engineers embrace new tradition: Iron Pin Ceremony marks commitment to professionalism from the start

With 900 first-year engineering students taking the pledge today, a total of 2400 students, faculty and staff have promised to abide by a code of ethics during Iron Pin Ceremonies launched this fall by the UBC Engineering Undergraduate Society (EUS), Vancouver campus. The new tradition marks each student's entrance into the path of a professional course of study and commitment to abiding by a code of ethics. The ceremony also serves to welcome new students as UBC Engineers.



A total of 2400 students, faculty and staff have promised to abide by a code of ethics during Iron Pin Ceremonies launched this fall by the UBC EUS, Vancouver campus.

Engineers adhere to a code of ethics that guides them through personal and professional decisions. This code is integrated into an engineer's professional journey from the Iron Ring Ceremony upon graduation to the Association of Professional Engineers and Geoscientists (APEGBC) Code of Ethics. Ethics are not only important to professional engineers, but also play a large role in the lives of engineering students.

"Last year, as part of our inclusivity initiative, the EUS started to address the lack of early education surrounding this important aspect of our profession," says EUS President Veronica Knott. "With the support of the Faculty of Applied Science, we have been working to develop the Iron Pin Ceremony. We intend this ceremony to become a symbol of each student's entrance into the profession and being a UBC Engineer. This will become an annual tradition, to welcome all incoming students into the UBC Engineering community with a pin marked by their entrance year."

The UBC Engineering Code of Ethics is adapted from the APEGBC Code of Ethics, to be relevant to students and their time as a UBC Engineer. For the EUS, each line of the code relates back to its executive and volunteer structure and their roles as leaders in the society.

For more information and to view the pledge, visit: ubcengineers.ca/eus/traditions/ironpin.

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CANADA'S MOST POWERFUL WOMEN: TOP 100 – CURRENT WINNERS



LISA BORSOOK EXECUTIVE PARTNER, WEIRFOULDS LLP **Bio:** "Gut instinct balanced with extensive analysis are two of the most important ingredients in being a good decision-maker," says Lisa Borsook. Those attributes have propelled her to become one of the few women to have served as Managing Partner of a law firm in Canada and her current position as Executive Partner. **Career advice:** "Don't play the short game. I think that you need to plan for where you want to be in five years and then step by step work toward that goal. Just shooting for where you want to be in the next six months hasn't worked for me." [to Top](#)



DEBBY CARREAU CEO & FOUNDER, INSPIRED HR **Bio:** Debby Carreau is a proven leader helping businesses deliver superior results by making better decisions about human capital and implementing strategies to get the most out of their most valuable resource: people. **Three leadership qualities to live by:** "1. Be willing to sweep the floor. No one can be above any task or the culture starts to break down. 2. Confidence. Everyday, I still try to do one thing that scares me. Confidence is built by stretching boundaries and working outside of one's comfort zone, so I try to do that as much as possible. 3. Embracing failure. Some of the best growth I have experienced has come when I have failed. I always encourage my team to plan for failure as well as success—that way, if it does happen, they know how to handle it." [to Top](#)



DR. ELIZABETH CROFT ASSOCIATE DEAN, EDUCATION AND PROFESSIONAL DEVELOPMENT, FACULTY OF APPLIED SCIENCE; NSERC CHAIR FOR WOMEN IN SCIENCE AND ENGINEERING, BC AND YUKON REGION, THE UNIVERSITY OF BRITISH COLUMBIA **Bio:** In addition to her research into how robotic systems can behave, Dr. Elizabeth Croft founded WWEST in order to attract, recruit and retain women in engineering and science careers. It is now the premier hub for activity and dialogue about meaningful inclusion and increased participation of women in science, engineering and technology disciplines on Canada's west coast. **On overcoming barriers:** "Implicit bias, the automatic assumption that 'he' is an engineer and 'she' is a secretary, tilts the playing field for every woman. It leads to self-exclusion, self-doubt and stereotype threat, causing women to withdraw or perform below their potential. This is real, measurable and scientifically proven. Change comes through awareness, role modeling and a concerted effort from both women and men—we are all biased—to put aside preconceptions and truly consider individual potential." [to Top](#)

UBC News

New plaque at UBC commemorates École Polytechnique tragedy

December 4, 2014



(<http://news.ubc.ca/wp-content/uploads/2014/12/plaque770.png>) Rose-leaf plaque at UBC commemorates Montreal's École Polytechnique tragedy.

Rose-leaf plaque bears names of 14 female engineers murdered on December 6, 1989

Canada has set aside December 6 as a national day of remembrance and action on violence against women in memory of the 14 female engineers murdered in 1989 at Montreal's École Polytechnique.

With the upcoming 25th anniversary of the tragedy, the University of British Columbia is also paying tribute to these women with a new plaque installed at a redesigned courtyard adjacent to its Engineering Design Centre.

The rose-leaf plaque bears the women's names and the words "We mourn. We remember. We question. Together, we work for change."

"We've lost much as a society with the loss of these lives. Some of these women were about to graduate from engineering. Others were just starting out in their careers," said Elizabeth Croft, UBC mechanical engineering professor and NSERC Chair for Women in Science and Engineering. "A quarter century later the void is still there. The new space and plaque will inspire us as we bring more and more women into the profession."



Prof. Elizabeth
Croft

Click [here](http://ubcengineers.ca/events/14notforgotten/) (<http://ubcengineers.ca/events/14notforgotten/>) for more information about the new memorial.

Elizabeth Croft is available for interviews from December 4-6. A candle vigil is also scheduled on December 5 from 10 AM – 4 PM at the Student Union Building (SUB) Main Concourse.

Find other stories about: [ecole polytechnique](#), [Elizabeth Croft](#), [Faculty of Applied Science](#)

THE TALON



The Legacy of December 6 at UBC: Moving Forward

By Evelyn Cranston

Trigger warnings: *Misogynistic Violence, Murder, Suicide, Mental Illness, Slurs*

Note: This is being published today, instead of actually on Dec 6, as to leave time for reflection, and concentrate on moving forward.

Twenty-five years ago, as of December 6, 14 young women, most of them engineering students, were killed. Their names were Genevieve Bergeron, Helene Colgan, Nathalie Croteau, Barbara Daigneault, Anne-Marie Edward, Maud Haviernick, Barbara Klucznik-Widajewicz, Maryse Laganière, Maryse Leclair, Anne-Marie Lemay, Sonia Pelletier, Michèle Richard, Annie St-Arneault and Annie Turcotte. The last fatality was the gunman, Mark Lepine.

It's not a mystery why these women were gunned down in the middle of lecture. Lepine said it, and wrote it down. He killed 14 women in engineering because he hated feminists. Survivor Natalie Provost stated, "He told us he was there because we were feminists and I just replied that we were not feminists, that we were just studying in an engineering school and that he would be able to come and study with us and then he shot (opened fire)."

His final letter stated, "Would you note that if I commit suicide today 89-12-06 it is not for economic reasons (for I have waited until I exhausted all my financial means, even refusing jobs) but for political reasons. Because I have decided to send the feminists, who have always ruined my life, to their Maker. For seven years life has brought me no joy and being totally blasé, I have decided to put an end to those viragos."

So, he hated feminists and planned to murder them, methodically. This much is explicitly clear.

Twenty-five years later, Elliot Rodger stated, "I'm going to enter the hottest sorority house of UCSB and I will slaughter every single spoilt, stuck-up, blonde slut that I see inside there. All those girls that I've desired so much, they would've all rejected me and looked down on me as an inferior man if I ever made a sexual advance towards them....I'll take great pleasure in slaughtering all of you. You will finally see that I am, in truth, the superior one. The true alpha male..."

Two parallel cases, 25 years apart. Men who hate women, men who kill women. They said it, they wrote it down, and they made it their mission. But we're still ready to make excuses, choosing to pay attention instead to gun control, or mental health.

A few days ago Justice Minister Peter MacKay said, in the House of Commons, "This week, we remember the horrific events that took place in Montreal at

École Polytechnique 25 years ago, and while we may never understand what occurred — why this happened, why these women were singled out for this horrific act of violence, we have to stand together.”

We do know why it happened, and why women were singled out. It’s critical that we understand this, in order to move forward and make postsecondary a safe place for women in engineering, and elsewhere.

I talked to three women: Hannah Barath, a co-op student at Access and Diversity, Jeanie Malone, the VP Communications at the Engineering Undergraduate Society, and an anonymous commenter to reflect on the way UBC commemorates this day of Canadian history, how we’re moving forward on campus, and what’s left to be done.

Jeanie and Hannah mentioned the numerous ways UBC honours Dec 6, the anniversary of the tragedy, but also the National Day of Remembrance and Action on Violence Against Women.

Multiple campus organizations come together to host events and memorials in commemoration. Access and Diversity co-ordinated this year’s panel discussion, candlelight vigil in the Students Union Building, and hosted passive campaigns that included buttons and flyers. The Engineering Undergraduate Society hosted their annual “14 Not Forgotten” memorial ceremony in joint with Women in Engineering, Alpha Omega Epsilon, Eng.Cite, and Westcoast Women in Engineering Science and Technology (WWEST).

As well, the EUS worked with UBC Campus and Community Planning to construct a memorial garden and courtyard. It’s located between the Engineering Design Centre (EDC) and the Civil and Mechanical Engineering (CEME) building, and is intended as, Jeanie states, to be “a place of quiet reflection.” She invites all UBC Community members to visit the memorial, and take a few minutes to reflect. Hannah explains that it’s “designed in such a way that its an open space where people can gather and connect.”

Hannah emphasized the importance of using this day as a catalyst for change, not simply reflection. She said, “We want it to be a day where we can remember these 14 women and the things that have happened, but also to recognize what is going on in the present and actions we can take in the future.”

Because this wasn’t a one-off horrible event in our past. It is connected to broader themes in our society that haven’t yet disappeared. Elliot Rodger’s misogynistic violent spree took place only half a year ago. Hannah also mentioned the recent threat launched against feminist cultural critic Anita Sarkeesian, where an anonymous email promised a Montreal-style massacre, and called Mark Lepine a hero. Anon states, “I see the term ‘feminist’ evoking hesitation and even anger and mistrust today, in 2014. I’ve seen the term ‘killing feminists’ thrown around online pretty carelessly...”

We need to actively work against the types of attitudes and thoughts that led to Dec 6. We need to be respectful and self-aware, in how we talk about this legacy. Jeanie mentions that, “listening is probably one of the best ways *everyone* can help – we can do this by being aware, educating ourselves and others, and thinking critically about the root causes of gender-based violence.” Hannah suggests that if you do hear someone talking about the issue in a way that unfairly refocuses it away from gender-based violence, to, if it is safe for you to do so, “speak up and intervene.” She explains that there are many ways to do this, both directly and indirectly.

Furthermore, we need to be careful when talking about mental health in this context. Lepine mused that he would be written off as a “crazy gunman,” and it’s critical that we do not do this. Not only does attributing his act of violence to an unstable mind bring attention away from gender-based violence, but it does a disservice to people living with mental illness who don’t go on murder sprees. Anon states, “I think unless there is specific evidence of hallucinations, mental illness doesn’t conjure up notions that don’t already exist yet. Yes, I read that the killer was mentally unstable, but he was also a misogynist.” She states that a significant portion of society lives with mental illness, and that’s not necessarily a bad thing. When we talk about Dec 6, we need to consider who we would be making feel comfortable in the conversation. Talking about Lepine as a mentally unwell person instead of a violent misogynist would make a student with mental illness uncomfortable, and would offer a misogynist some relief.

According to Jeanie, addressing mental health awareness, is an issue that the EUS is working on, and they aim to provide tools for student wellness through wellness fairs and through other campus groups, like the Mental Health Network.

She emphasizes though, that, “listening, supporting, educating and working together are the best ways to help.”

Expanding from what individuals can do though, is what UBC as an institution can do. Jeanie recognizes that although engineering is becoming a more inclusive field, we aren’t yet where we need to be.

She elaborates by mentioning the EUS Inclusion project, as well as the introduction of the UBC Engineering Code of Ethics and Iron Pin ceremonies. The Code of Ethics stops short of addressing gender issues, but does have engineers pledge to, “Report any hazardous, illegal, or unethical decisions or prac-

tices by any member of our community.” She also mentions the UBC Women in Engineering group which provides resources and is open to all engineering students. She states, “they have been the driving force behind many conversations, and provide tools for students such as their seminar series. There are women in engineering groups across Canada, at industry and professional levels as well.”

From a faculty perspective, the Dean of Engineering has set a goal of having women make up 50% of engineering enrolment by 2019. This year women represented 29%.

Anon mentions, “UBC Engineering has a huge push to increase the number of women encouraged to pursue and stay in engineering,” and that although there has traditionally tended to be a very specific type of female engineering, that seems to be changing.

However, simply increasing the number of females in engineering doesn’t make it a safer place. Back to the importance of speaking up, Hannah brought up The Really? Campaign at UBC. It aims to ‘change the script’ by encouraging people to intervene when people are voicing demeaning comments, or offensive jokes. Disrupting people with something as simple as, “Really?” can be influential in what people internalize as ‘okay’ or ‘not okay.’

To properly remember, learn from, and honour this day, we need to recognize it to what it was (violence specifically directed at women/feminists), speak out it in those terms (not derail the conversation), be respectful (to female engineers and people with mental illness), and take concrete steps to move forward. In terms of concrete steps, I quote Veronica Knott, the president of the UBC Engineering Undergraduate Society, in steps that we can take:

- 1) Remember the women and read their stories. Short summaries can be found here: <http://ubcengineers.ca/events/14notforgotten/>
- 2) Take time to reflect on what this means to you and how this affects [sic] you. I recommend visiting the new memorial in the EDC Courtyard.
- 3) Men: Get involved with the White Ribbon Campaign whether it is taking their pledge or just learning from their resources: <http://www.whiteribbon.ca/>
- 4) Students: Get involved on your campus, attend memorial events, and start the discussion. UBC Students a great place to start is with Access & Diversity: <http://students.ubc.ca/campus/diversity>
- 5) Engineering Societies across Canada: Think, evaluate and understand all the actions you take – especially in a field still dominated by men. How can engineering societies lead the change.
- 6) Engineers: Get involved with Engineers Canada and their pledge for 30% by 2030. Get involved with your regional organizations of professional associations and they work they do, in BC, get involved with DAWEG. Get involved with your faculties and their work to attract more women into the engineering degree.
- 7) My personal favourite, is get involved with the NSERC Chairs for Women in Science and Engineering. They are all doing amazing work. In BC this is Westcoast Women in Engineering Science and Technology (WWEST). I also want to highlight a program I think is doing amazing work at setting this message and it’s #Impact25, a program run by the NSERC Chair for WiSE in Ontario, asking members to pledge their impact for the next 25. Read them here: <http://scieng-women-ontario.ca/en/impact25/>



Women in Tech Make the Top 100 Most Powerful Women List

Submitted by [Christine Persaud](#) on December 14, 2014 – 6:29 pm [No Comment](#)

Women's Executive Network (WXN) has revealed its annual Top 100 award winners for Canada's Most Powerful Women, and several influential women in the technology sector have made the list.

The Awards, co-presented by Scotiabank and KPMG were celebrated at a gala event at the Toronto Convention Centre. They encompassed a "Timeless" theme, highlighting the womens' strength and leadership, and ability to become icons for future generations.

In addition to the Top 100 women, 13 women were also inducted into the WXN Top 100 Hall of Fame, including Heather Reisman, founder & CEO of Indigo Books & Music, and Betty DeVita, President, MasterCard Canada.

Here are some of the women in science and tech who made the list:



Dr. Aimee Chan,
President & CEO,
Norsat International

Dr. Aimee Chan, President & CEO, Norsat International

At the helm of this Richmond, BC-based satellite communications company that produces communications technology for transmitting data, audio, and video in challenging environments, Dr. Chan has led the firm to enjoy consistent revenue growth throughout her time there. She has more than 15 years of experience in executive management and R&D, with strength both on the corporate and technical sides of the business.

Dr. Chan has faced many barriers being at the helm of a technology company. She recalls a business trip to Korea with a male colleague whom everyone assumed was the CEO and she the assistant; or the time when a business partner asked if her father owned Norsat.

“These situations are frustrating,” she says, “but it helps to understand that, most of the time, this comes from a lack of awareness. People make assumptions because women are still underrepresented in the boardroom. These attitudes and stereotypes will only change as more women take on roles of increased responsibility, profile and leadership.”

Dr. Elizabeth Croft, Associate Dean, Education and Professional Development, Faculty of Applied Science; Nserc Chair for Women in Science and Engineering, BC and Yukon Region, The University of British Columbia



Dr. Elizabeth Croft,
Associate Dean,
Education & PD,
Faculty of Applied
Science; Nserc
Chair for Women in
Science and Engi,
BC & Yukon
Region, U of BC

From research on robotic systems, to founding WWEST (Westcoast Women in Engineering, Science, and Technology), an organization that recruits women into science and engineering careers, Dr. Croft has an extensive tech background. She feels that the “implicit bias” that causes most to assume the “he” must be the engineer and the “she” the secretary tilts the playing field for females. And, she points out, the bias comes from both sexes.

“It leads to self-exclusion, self-doubt and stereotype threat, causing women to withdraw or perform below their potential,” she says. “This is real, measurable and scientifically proven. Change comes through awareness, role modeling and a concerted effort from both women and men...to put aside preconceptions and truly consider individual potential.”

Chameli Naraine, President & CEO, Symcor

She has spent 28 years as an executive/change agent, helping companies in fields ranging from manufacturing and technology, to financial



Chameli Naraine
President & CEO,
Symcor

HUMAN RESOURCES

How Much Are You Worth?

Salary Negotiation for the Woman Professional



Women are **50%** more likely to advance in an orchestra audition if they **can't be seen.**

Goldin, C. & Rouse, C. (2000). "Orchestrating impartiality: The impact of "blind" auditions on female musicians."

Dr. Elizabeth Croft, P.Eng., FEC; Rebekah Parker; Jennifer Pelletier

Salary negotiation is intimidating, and can be a particular challenge in professions where there are many unique qualifications and requirements. Employers face the task of finding an employee who is a good fit for their organization, and new employees seek a job package that supports their goals and lifestyle.

A successful hire requires a strong pool of candidates, careful consideration free of bias, and fair negotiation of a starting salary. In engineering and science fields, women have traditionally faced additional challenges in this process, and there are still gender-based differences in compensation. Salary negotiation can reduce this gap.

What to Know as an Employer

Implicit Biases

Science professionals like to believe all of their decisions are unbiased, but in reality, we all have implicit biases. Implicit bias refers to the assumptions and conclusions we jump to without thinking. Our implicit biases can directly contradict what we actively state we value. They have a significant impact on how we judge others and the decisions we make.

The sway of our implicit biases were made clear in a recent study.¹ Professors were asked to evaluate a candidate for a lab manager job. Male candidates were consistently offered the job more often, at higher salaries, despite the CVs being identical.

The first step to avoiding implicit biases in your hiring is to be aware they exist, and to be aware of what your personal biases are (implicit.harvard.edu/implicit/ is a free tool you can use to become more aware of your biases).

¹Moss-Racusin, C. et al. (2012). "Science faculty's subtle gender biases favor male students."

To be seen as equally **“competent”** by reviewers, female researchers need to publish:



than male applicants when applying for a medical fellowship.

the industry average, how pay increases are determined (merit-based or scale-based), and how they measure performance.

Whoever Gives the First Price Loses

The company's decision to hire you is the big one, and usually will not be affected by reasonable salary negotiation. Often future salary increases are a percentage of your starting salary, which makes negotiation essential for securing a fairly compensated position.

Consider these three aspects during your negotiations: comparison to your peers, the total package, and the final contract. Compare yourself fairly with your peers, using your network to learn what others are offered in comparable jobs. Being “too cheap” reduces your value as an employee.

When it is time to talk numbers, remember that whoever names the salary first loses. If you state the first amount, they will negotiate you down. If they state the first amount, you get to negotiate them up.

When you receive a job offer, look at the whole package and consider:

- Prior work terms
- Geography, hours and sector
- Bonuses / profit sharing / overtime
- RRSP and benefit premiums
- Vacation and flexible work

Before you sign any contract, review it and take a few days to consider it. Make sure the process for review and advancement is clearly understood; your first review should be within six months.

And Remember...

To be successful in the job hunt and salary negotiation, you need to do your homework and know your value, network with peers and seek out mentorship, and prepare for your promotion. Annual check-ins with your supervisor are highly recommended. Keep your resume updated.

For more information and resources, visit wwest.ca. ☒

Dr. Elizabeth Croft, P.Eng., FEC, FASME is a Professor of Mechanical Engineering at the University of British Columbia, and the NSERC Chair for Women in Science and Engineering for BC and Yukon. Her activities as Chairholder are conducted under the name Westcoast Women in Engineering, Science and Technology. Jennifer Pelletier is the manager of the WWEST program. Rebekah Parker is a master's student in ecojustice and sustainability education at UBC, and works as a Research Assistant with the WWEST program.

This article originally appeared in *The Professional Edge*, the magazine of the Association of Professional Engineers and Geoscientists of Saskatchewan.

Gendered Language and the Application Process

Subtle factors change who applies for a position. Three main factors affect an individual's decision to apply: identification with the job, reward preference (financial, intellectual, schedule flexibility, etc.), and expectation of application success.² Showcase information that impacts these factors to broaden your candidate pool.

The language you use in a job description matters: a 2011 study by Gaucher, Friesen and Kay, demonstrated that while gendered language in job descriptions has no impact on men, it may dissuade women from applying.³ The study showed that the effect was subconscious, even when the gendered words were pointed out. Examples of gendered language include:



Avoiding gendered language gives you a broader application pool, and a better opportunity to hire someone who will succeed in the position.

What to Know as an Employee

Knowing what you are worth matters—and you are worth more than you think. In BC, new graduates are given the opportunity to learn about salary negotiation before graduation. The result: industry sector starting salaries in BC are now roughly the same for everyone, based on the responsibility level of the job.

When you are preparing for an interview, consider what kind of job you are looking for. Some aspects to think about include:

- Job technical and skill requirement (Is this what I want to do?)
- Compensation, work-life balance (What benefits does the job offer?)
- Expectations for availability and travel (How do current employees handle family demands?)
- Working relationships and workplace climate (Will there be people like me?)

These considerations are universally helpful, regardless of gender, but are particularly important to women and young workers.

The Salary Negotiation: Know Your Value

Before negotiation, review compensation surveys, look at similar job advertisements, and refer to benchmark employment descriptions to figure out what salary range the position fits into. If possible, find out what salary level the organization offers for the position you are applying to before the interview.

During your interview and contract meeting, focus on what makes you valuable to the employer. Ask questions including how the organization's compensation levels compare to

2. Barbulescu, R. & Bidwell, M. (2013). “Do women choose different jobs from men?”

3. Gaucher, D., Friesen, J. & Kay, A. (2011). “Evidence that gendered wording in job advertisements exists and sustains gender inequality.”

Canadian Universities Attracting Kids, Especially Girls, To Sciences

CP | By Liam Casey, The Canadian Press

Posted: 03/01/2015 10:01 am EST | Updated: 05/01/2015 5:59 am EDT



THE CANADIAN PRESS 

TORONTO - Groups of students huddle around desks at a university campus as the instructor gives out a quick overview of the job at hand: build a crane, create an electromagnet and pick up metal.

Work begins in earnest with some of the students building their contraptions with wheels "for better transportation" while others build them for strength.

But these are not university students. They are Grade 3 and Grade 4 students — about half of them girls — who like to spend a few hours on the weekend building "stuff" and learning about science.

"I've been building stuff a long time," says eight-year-old Yashu Tenneti.

"In our school we're building bridges out of Popsicle sticks."

Does she want to be an engineer or scientist when she grows up?

"I don't know. I want to be many things," she says.

The class is part of an outreach program at the University of Toronto designed to help break gender, financial and racial barriers. The university hopes girls like Yashu will eventually enter an engineering program.

Many other universities across the country offer similar programs to encourage women to get into the fields of science, technology, engineering and math. York University, for example, runs all-girl courses that teach science through superheroes.

Later this week, the university is expected to launch the Lassonde 50:50 Challenge — an initiative that aims to achieve an equal gender-split enrolment at its Lassonde engineering school.

The gender divide in professions such as engineering and computer sciences is a startling problem in Canada. According to Engineers Canada, about 88 per cent of engineers are men.

Those numbers are slowly changing because of programs such as these, according to Jennifer Flanagan, the CEO of Actua — an Ottawa-based charity that promotes science to children, especially girls.

"They can experiment, tinker and that kind of environment is really conducive to boosting their confidence," Flanagan said of the programs, which include all-girl science classes. They have been around for two decades, she said, but they've become more popular in recent years.

Last September, the first-year undergraduate engineering class at the University of Toronto saw 365 women, a 25 per cent increase from the year before. At the University of British Columbia, 29 per cent of its first-year engineering students this year are women, a 61-per-cent jump from 2010.

Progress, however, is slow. A report from Engineers Canada shows just 18.3 per cent of undergraduate engineering degrees were awarded to women across the country in 2013, up slightly from 17.6 per cent in 2009.

While the program where the kids were building cranes was coed, the University of Toronto offers all-girl classes, which have become quite popular, according to Dawn Britton, who is part of the school's engineering outreach office. The university also offers summer and March break camps as well as weekend science classes for girls.

The goal, Britton said, is to get girls interested in science at a young age, starting at eight years old. At the University of Waterloo,

programs begin for girls as young as six.

Flanagan said her organization's research shows girls start losing interest in sciences when they reach Grade 9, when they have to start preparing for their future.

Most university science programs require applicants to have taken advanced math and science courses in high school.

"If they don't take physics and advanced math classes in high school, then it's already too late," Flanagan said.

Parents are a big part of the gender divide problem, Flanagan said, because they often try to influence their children's career choices based on stereotypes.

"They are projecting a false understanding of what those careers are on their daughters and not their sons," she said.

So at the Actua programs, which are offered at 33 universities in Canada, they give pamphlets to the parents to help dispel those myths.

Ray Jayawardhana, the dean of the faculty of science at York University, agreed. The under-representation of women highlights the larger issue barriers blocking entry into science.

"There is a growing body of evidence that kids don't choose what they would do when they grow up very early, but they seem to rule out what they might not do very early," said Jayawardhana, 43, adding that he was just a boy when he decided to become an astronomer.

"I grew up in Sri Lanka and I'm an astronomer and there is not a single astronomer to date in Sri Lanka — a country of 20 million people. So the idea that when you're growing up you can do science or astronomy when no one else is doing it is difficult. It takes a leap into the unknown to think that," he said.

"Our hope is to keep careers in science, engineering and technology in the mix."

Back at the University of Toronto, the children's science course instructor, Michaela Tai, explains the dangers of incorrectly connecting a circuit.

"You do not want to do that," she says. "You do not want a short circuit."

About 30 minutes later, one child screams "Smoke! It's smoking!"

There is no visible smoke, but it is a short circuit. So the children quickly make another one.

Tai, a second-year industrial engineering student, uses the mishap to explain to the kids that failure is an important part of science. Fixing those failures builds confidence, she says, something many girls lack early on.

But that changes quickly with experience — experience that is gained at programs such as these.

"I tell the girls, look how well you're doing now," Tai says.

"You can ask questions, don't be afraid, and don't be afraid to explore new things."

Links to some of the programs:

<http://outreach.engineering.utoronto.ca/pre-university-programs/jr-deep/>

<http://science-explorations.info.yorku.ca/>

<http://www.geeringup.apsc.ubc.ca/camps/>

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WOMEN IN POWER

Sponsored by WXN



Inspiring Canada's Most Powerful Women



PAMELA JEFFERY | January 6, 2015 | Last Updated: Jan 6 2:31 PM ET

[More from Pamela Jeffery](#)



Canada's Most Powerful Women Top 100 Awards Gala in Toronto on November 27th, 2014

On November 27, WXN hosted our 12th annual Canada's Most Powerful Women: Top 100 Awards gala. The theme for this year's event was Timeless Leadership. If there is one hallmark of timeless leaders it is the ability to inspire. This year we surveyed our Top 100 Winners and asked them to name an inspiring figure. The responses are varied and telling, highlighting another key attribute of leaders for the ages: the lifelong journey of learning and finding inspiration wherever one can.

For example, our keynote speaker at the gala, Top 100 Award Winner Kathleen Taylor, Chair of the RBC Board and the first woman ever to lead a major chartered bank in Canada, listed fictional character Mary Poppins as a source of inspiration early in her life. "Growing up in Oshawa, we didn't have many examples of strong, confident female leaders, and certainly none in business. And so our inspiration often came from role models on TV or in the movies," she explained. "In particular, and this may seem odd to some, but I remember being so inspired by the character of Mary Poppins. I was struck by her confidence, her tenacity in sticking to what she believed was right and her ability to change the world around her. I started to believe that I, too, could change things. To this day, I look for leaders who lead by example and are guided by their values."

Linda Mantia, Head and Executive Vice President of Cards and Payment Solutions at RBC, cited Mary from *The Mary Tyler Moore Show*. "I watched her show at a very impressionable age and she depicted a different kind of strong independent woman than was celebrated in my childhood environment."

Other inspiring figures that received multiple mentions: Mother Teresa, Nelson Mandela, Mahatma Gandhi, Winston Churchill, Margaret Thatcher, Golda Meir, Eleanor Roosevelt and Madeleine Albright.

When it came to science, Marie Sklodowska-Curie was listed as an inspirational influence by several of the 2014 Top 100 Winners, including Anne Sado, President, George Brown College, who had this to say about Ms. Curie: "She was a scientist, a woman in a

field dominated mostly by men, especially in the late 1800s and early 1900s. She was the first woman to win a Nobel Prize and the first person—and only woman—to win twice. She was also the first woman to become a professor at the University of Paris. So, bottom line, a woman of many firsts.” And, as Monique Mercier, Executive Vice President, Corporate Affairs, Chief Legal Officer and Corporate Secretary, TELUS, pointed out, Marie Curie was also a “devoted mother, demonstrating the great possibilities we can achieve as working mothers.”

Top 100 Winner Dr. Elizabeth Croft, Associate Dean, Education and Professional Development, Faculty of Applied Science, and NSERC Chair for Women in Science and Engineering, BC and Yukon Region, The University of British Columbia, pointed to present-day Canadian trailblazer Maria Klawe, a renowned mathematician, computer scientist and scholar who became the first woman to lead Harvey Mudd College, a top 10 U.S. College and premier engineering school, as a source of wisdom. “Her willingness to be honest about her own ‘imposteritis’ as a leader, and her unwavering dedication to increasing the participation of women in computer science and engineering have always inspired and encouraged me,” said Dr. Croft.

Growing up in Calgary, Mission Systems Engineer with MDA Robotics and Automation and Top 100 Winner Natalie Panek looked to the path set by astronaut Dr. Roberta Bondar as she charted her own course. “As a young girl dreaming of space travel, she was a visible icon proving that anything is possible and that space exploration is a real possibility for a Canadian.”

Perhaps the most cited inspirational historical figures by this year’s winners were the Famous Five: Emily Murphy, Henrietta Muir Edwards, Louise McKinney, Nellie McClung and Irene Parlby, who battled to have women recognized as persons under the BNA Act. Top 100 Winner Samantha Horn, Partner, Stikeman Elliott, described their contribution in this way: “The Famous Five challenged the Supreme Court of Canada and then the Privy Council to declare that women were persons and not property in 1929 (not as long ago as you might think). Talk about breaking down barriers. We wouldn’t be where we are today without these achievements. Still a long way to go, but look how far we have come.”

Indeed. The Famous Five paved the way for Thérèse Casgrain, who fought for the right of Québec women to vote (which they won in 1940) and became the first female leader of a political party in Canada; Flora MacDonald, the first female Secretary of State for external affairs in Canada; Jeanne Sauvé, the first woman Governor General of Canada, the first woman Cabinet minister from Québec and the first Speaker of the House of Commons; and Kim Campbell, the first and only female Prime Minister of Canada.

When at 21 I went to the Richard Ivey School of Business, I didn’t know a single woman who was in management or an executive or served as a director on a corporate board. I think it’s so important for young women who are sorting out what they want to do in life to be able to see women who have done it and to shine a light on those women. That’s what led me to create the Canada’s Most Powerful Women: Top 100 in 2003. At that time women were not being recognized for their leadership ability, yet there were so many outstanding women leaders I had come to know through WXN. We have recognized 800 timeless leaders since then and they are now inspiring our next generation of timeless leaders.

Pamela Jeffery is the founder of the Women’s Executive Network, Canada’s leading organization dedicated to the advancement and recognition of women in management, executive, professional and board roles. WXN and Postmedia formed a business partnership to promote equality and diversity for businesses across Canada.

Topics: Executive Women, Women In Power

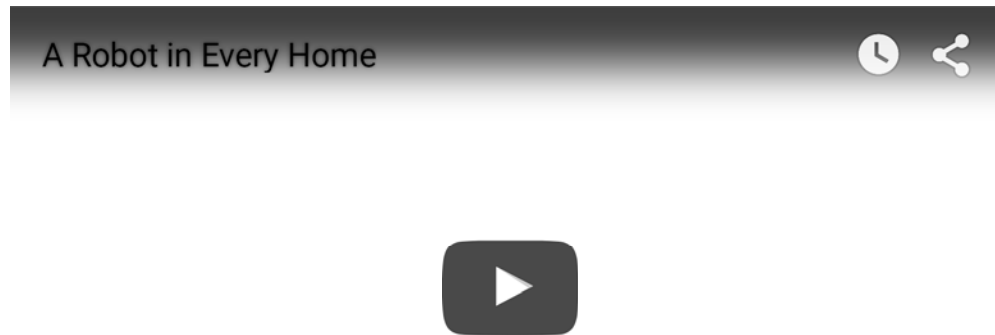
February 2015

Features

A Robot in Every Home

UBC engineering prof. Elizabeth Croft, BAsC'88, is programming robots to interpret physical cues from humans.

By Rewild Films



Video Transcript

Communication is all about cues – these little gestures, these little nods that we do without even thinking. What I'm excited about doing is reproducing that in a robot. Robotics is the tangible connection between this world of bits and bytes and information, and the physical world.

When I started working as an engineer, people just didn't expect me. It was like: Who are you? Where's the engineer? I can see a whole bunch of things that robots can do to make our lives better, and It's just about moving on and adapting that technology.

We are sitting in a time... it's like just before computers really happened and everybody had one in their home. In ten years, everyone is going to have robots in their home. It's just about to happen. It's so exciting.

The robot should know what it's supposed to do, and it should know that by observing you, by knowing what you want to achieve. It should be able to understand that and respond appropriately. Being able to program that right – a lot of it is actually good old-fashioned experimentation. We measure grip force, load force, position, velocity, acceleration, jerk, snap, crackle... and then we do some programming – figuring out these equations and trying to come up with clever strategies — and then it ends with people.

Everything that I'm working on is about people. A robot is not a person, but a robot is not an inanimate object. So if my robot makes a mistake or harms someone, am I responsible? Is my robot responsible? Is the manufacturer of the robot responsible? When do people still need to be in control? Those are actually the questions that we have to answer.

It's always a new problem. It's always interesting. And we do need both men and women in engineering because that's how we're going to get the best solutions in the end. We should take away whatever it is that are these barriers that are preventing other people from having the really great time that I am having."

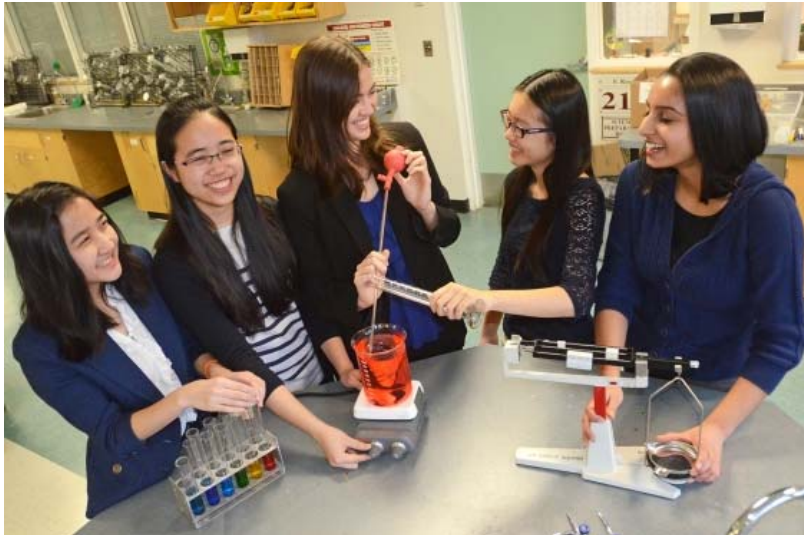
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Burnabynow

Burnaby students host conference to get girls into STEM careers

Cornelia Naylor / Burnaby Now

February 6, 2015 03:42 PM



From left to right, Burnaby Mountain's Angela Yu, Burnaby South's Mindy Lin, Burnaby North's Tina Borcanin, Moscrop's Jenny Wang and Burnaby Central's Maya Unadkat are organizing a conference for girls interested in science and technology careers.

Photograph By Cornelia Naylor

Burnaby South Grade 12 student Mindy Lin wants to follow in her mother's footsteps and become an engineer.

Her mom doesn't want her to.

Why?

Her mom says it's a lot harder for a woman to succeed in the field than a man, and she'd prefer her bright young daughter to pick a career that will give her an equal chance at success.

"I kind of understand the way she thinks," Lin said, "but I really like engineering."

Lin knows she's not alone in facing such obstacles, so she has teamed up with four other local female students (Jenny Wang from Moscrop, Tina Borcanin from Burnaby North, Maya Unadkat from Burnaby Central and Angela Yu from Burnaby Mountain) to put on a conference designed to empower girls to pursue science, technology, engineering and mathematics (STEM) careers.

"Through this conference we really want to encourage girls to go down this pathway and then to actually explore those careers," Lin said.

Called Quantum Leaps, the free March 28 conference at UBC is being sponsored by Burnaby Neighbourhood House and the Society for Canadian Women in Science and Technology and will feature workshops in different fields, and female speakers and panelists talking about their career paths.

The event has two main goals, according to Lin – to empower girls who lack the confidence to go into traditionally male-dominated fields and to support girls who know they can do it but face family or other obstacles.

Lin counts herself among the second group.

She said she believes her parents' views are based on their own experiences and generation, and that things have changed.

But that's not to say Lin thinks the gender bias in the STEM areas has disappeared.

She said organizers of a math camp she attended this summer, for example, said the mix of boys and girls was a lot more even than in previous years, but it was still only about two to one.

In her Grade 12 physics class this year, it's about four to one.

"I think it's way better than before, but I think definitely it still exists," Lin said.

The small band of local Quantum Leaps conference organizers originally planned to hold the event at SFU Burnaby, but Westcoast Women in Engineering, Science and Technology stepped up to cover costs at UBC's Macleod Building.

"Since a lot of our audience is most likely going to apply to UBC for their higher education, we've decided that having the event set at that university is a good way to familiarize the girls with the campus," said Yu, who is in Grade 11 at Burnaby Mountain. The event is for female Burnaby students in grades 11 and 12.

One of the conference's three speakers will be Burnaby South grad Dr. Poh Tan, a stem-cell expert and founder of Innoguidance Consulting, a firm that advises companies around the world on how best to apply their technology in the stem-cell field.

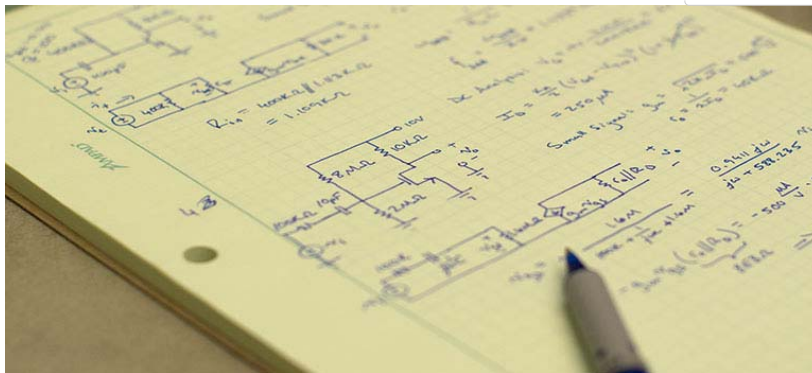
For more information or to register for the Quantum Leaps conference, visit quantumleapsbby.wordpress.com.

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UBC News

UBC Engineering enrolls record number of women in 2014

Media Release | February 20, 2015



Targeted outreach, community partnerships drive change

The number of women registered in first-year engineering undergraduate programs at the University of British Columbia is on the rise, up 61 per cent since 2010.

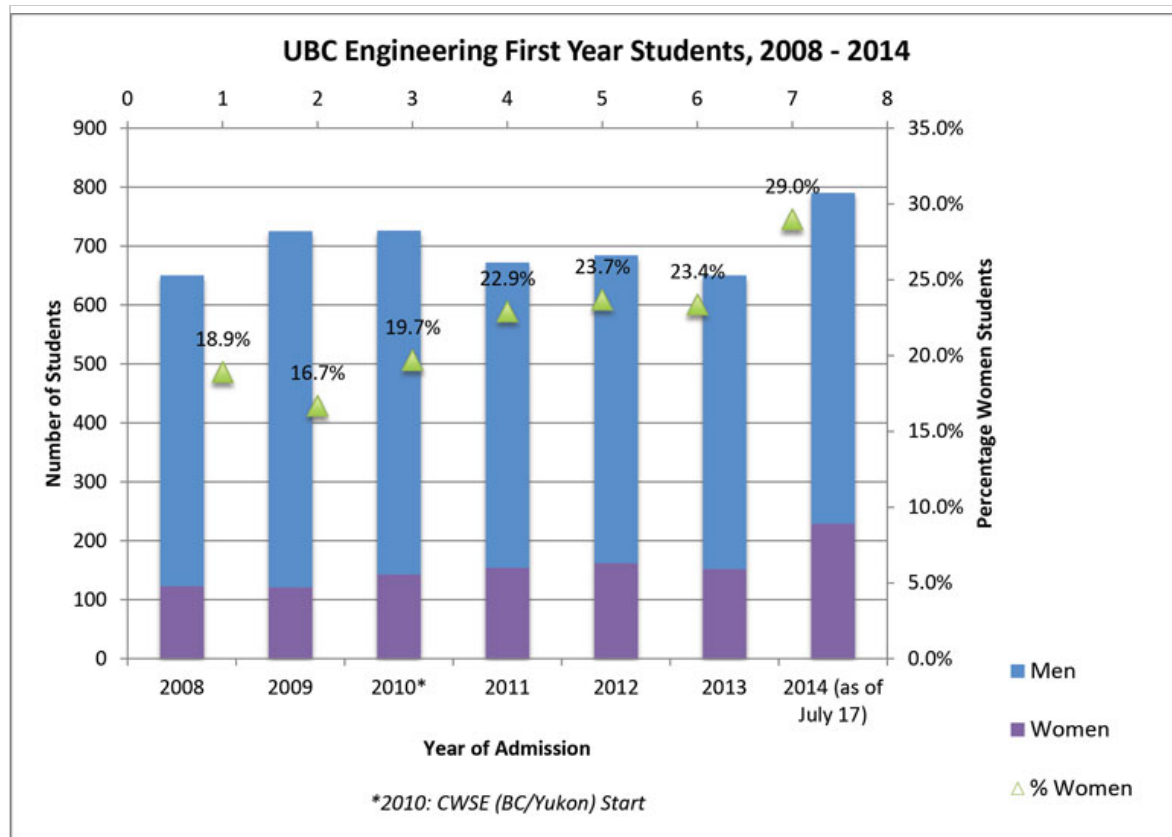
Nearly three out of 10 students (29 per cent) in UBC's first-year engineering programs are women, up from 19.7 per cent in 2010.

"These numbers reflect the tremendous efforts we've made to recruit the best, brightest and most diverse applicants to UBC Engineering," said Elizabeth Croft, associate dean, education and professional development at UBC's Faculty of Applied Science.

Croft, a mechanical engineering professor, was appointed NSERC Chair for Women in Science and Engineering for BC and Yukon in 2010.

She initiated Westcoast Women in Engineering, Science & Technology (WWEST), a program that supports the recruitment and retention of women in engineering, science and technology through workshops, talks, technical tours and mentorships.

Since 2010, WWEST has connected with more than 2,300 young women across B.C., in partnership with over 20 community and non-profit groups.



Nearly three out of 10 students (29 per cent) in UBC's first-year engineering programs are women, up from 19.7 per cent in 2010.

Engineering shortage

Canada is expected to have a shortage of 102,000 engineers by 2020, according to Ottawa-based Engineers Canada.

Recruiting women into the profession will play a big part in avoiding a major shortage, said Marc Parlange, dean of UBC's applied science faculty, which includes the engineering programs.

"Admissions will continue to be based on the highest competitive averages coupled with personal profiles that help us identify truly exceptional students," Parlange said.

"By constantly creating awareness of engineering as an exciting profession that offers solutions to societal challenges, we hope to increase the number of women in our undergraduate engineering programs to 50 per cent, from the current national average of 20 per cent."

Video: UBC engineering prof. Elizabeth Croft is programming robots to interpret physical cues from humans.

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Female engineering undergrads on the rise at UBC

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By: [Geordon Omand](#) Metro, Metro Published on Thu Feb 19 2015

Women at the University of British Columbia are doing their part to re-engineer the glass ceiling.

The number of women registered in the school's first-year undergraduate engineering programs has jumped 61 per cent since 2010.

While the faculty remains overwhelmingly male dominated, the proportion of registered women has reached nearly a third — an increase from the 20 per cent five years ago.

"These numbers reflect the tremendous efforts we've made to recruit the best, brightest and most diverse applicants," said Elizabeth Croft, a mechanical engineering professor and associate dean in the schools applied science faculty, in a release.

Croft launched the Westcoast Women in Engineering, Science & Technology program, which hosts workshops, talks and mentorships to help recruit and retain women to traditionally male-dominated fields.

The national organization Engineers Canada predicted a shortfall of 102,000 engineers within the next five years.

In a release, UBC outlined it would target female enrolment as one of its strategies to address the shortage in the profession.

Editors' Picks

More on Metronews.ca

B.C. will lead Canada in economic growth in 2015: report

Felicity Stone | Feb 23, 2015

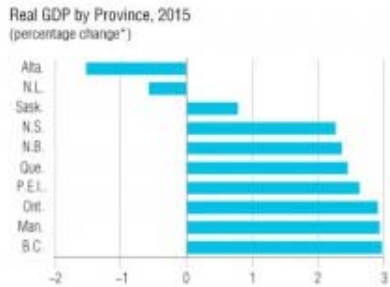


Image by: The Conference Board of Canada

*based on 2007 \$ Sources: The Conference Board of Canada; Statistics Canada

Good news for B.C., more women engineers and a surprising lack of student debt

B.C. on top

Echoing a report from the [Business Council of B.C.](http://www.bcbusiness.ca/finance/dropping-oil-prices-and-a-low-loonie-will-benefit-bc-report) (<http://www.bcbusiness.ca/finance/dropping-oil-prices-and-a-low-loonie-will-benefit-bc-report>) last month, the Conference Board of Canada's Provincial Outlook: Winter 2015 predicts **B.C. will lead Canada in economic growth this year**, followed by Ontario and Manitoba (<http://www.conferenceboard.ca/press/newsrelease/15-02-23>

[/economic outlook positions ontario as one of the growth leaders.aspx](http://www.conferenceboard.ca/press/newsrelease/15-02-23)). The reasons: a low Canadian dollar, a stronger U.S. economy and stronger consumer confidence. Lower oil prices will hurt provinces like Alberta, Newfoundland and Labrador and Saskatchewan. **For Canada as a whole, economic growth will be just 1.9 per cent in 2015 compared to 2.4 per cent in 2014.**

Women want in

Engineering isn't the boys club it once was. **UBC announced (<http://news.ubc.ca/2015/02/20/ubc-engineering-enrols-record-number-of-women-in-2014/>) Monday that the number of women registered in its first-year engineering undergraduate programs has risen from 19.7 to 29 per cent since 2010**—the year Westcoast Women in Engineering, Science & Technology was established. WWEST supports the recruitment and retention of women in engineering, science and technology through workshops, talks, technical tours and mentorships in partnership with over 20 community and nonprofit groups. In the past five years, the program has connected with more than 2,300 young women across B.C. **Canada is expected to have a shortage of 102,000 engineers by 2020**, according to Ottawa-based Engineers Canada.

The myth of student debt?

Speaking of education, on CBC Radio's *Early Edition*, host Rick Cluff was surprised to hear **B.C.'s minister of advanced education, Andrew Wilkinson, say that 70 per cent of B.C. post-secondary students graduate with no—that's right, zero—student debt**. As for the other 30 per cent, Wilkinson said the average debt is \$10,000 for a college diploma and \$20,000 for a university degree. [Listen to the interview here](http://www.cbc.ca/player/Radio/Local+Shows/British+Columbia/ID/2655363592/) (<http://www.cbc.ca/player/Radio/Local+Shows/British+Columbia/ID/2655363592/>).



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Breaking down barriers for women engineers trained abroad

Vivien Hannos // Immigration, Social // Volume 15, Issue 14 - February 24 to March 10, 2015

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The process of immigration begins long before newcomers first set foot in a new country. MOSAIC, a Vancouver organization dedicated to supporting immigrants and refugees, has a new online pre-arrival service to help foreign-trained women engineers immigrate to Canada. Funded by Westcoast Women in Engineering Science and Technology, the program will launch this March for 2 weeks.

“We have it all set up for pre-landed immigrants already pre-approved to come to Canada,” says program facilitator Helen You, 24.



A group of engineer woman at MOSAIC | Photo courtesy of MOSAIC

communications. Building interview skills and a special focus group workshop for internationally trained women engineers are other elements of the program. It follows a successful pilot study that took place at MOSAIC and is based on a similar program already in practice in Nova Scotia.

“Online pre-arrival services is basically an Umbrella program for all different kinds of workshops. It is done like a course with quizzes and assignments, watching videos, a language component and reading materials ,” says You.

MOSAIC supports participants in building a network in Canada and they are often the first point of contact for immigrants. If this experience is a pleasant one, the likelihood of these women staying is increased.

You notes that the program has received 200–250 applications already.

Meeting a need for Canada

Why a program specifically for internationally trained women engineers?

“Well, we gathered facts and they predict a labour market demand in engineering, according to the ministry,” You says.

You and Cherevko both met with an advisory group made up of women from the Society of Canadian Women in Science and Technology (SCWIST) and the Association of Professional Engineer and Geoscientists of British Columbia (APEGBC) on Jan. 21, 2015. They have volunteered to give MOSAIC help with issues relating to internationally trained women engineers. These women had experienced challenges after coming to Canada to work in engineering and wished to make it easier for subsequent new immigrants.

The program is supported by WestCoast Women in Engineering, Science & Technology, an organization founded by Elizabeth Croft, a mechanical engineering professor at the University of British Columbia. Each year, it funds programs that help advance women in science and engineer and MOSAIC’s proposal was chosen during the fall 2014 funding competition.

“The WWEST Partners Grant Adjudication Committee was very impressed with the application – MOSAIC has a strong history of developing and delivering quality programming to the immigrant community, and they had identified a very real unmet need in our region,” says Jennifer Pelletier, manager of the NSERC Chair for Women in Science and Engineering (B.C./Yukon). “MOSAIC’s project aims to prepare women before they arrive in Canada, allowing them to navigate our system and fully contribute to the engineering profession.”

Program directors hope that success will bring further funding from Citizenship and Immigration Canada (CIC).

Engineering a better future for young girls

Special U of T science class for Grade 3 pupils all part of push to make future workplace more gender-split and equal

Metro Canada (Vancouver) · 2 Mar 2015 · 6 ·

Groups of students huddle around desks at a university campus as the instructor gives out a quick overview of the job at hand: Build a crane, create an electromagnet and pick up metal.



Work begins in earnest with some of the students building their contraptions with wheels “for better transportation” while others build them for strength.

But these are not university students. They are Grade 3 and Grade 4 students — about half of them girls — who like to spend a few hours on the weekend building “stuff” and learning about science.

“I’ve been building stuff a long time,” says eight-year-old Yashu Tennesi. “In our school we’re building bridges out of Popsicle sticks.”

Does she want to be an engineer or scientist when she grows up?

“I don’t know. I want to be many things,” she says.

The class is part of an outreach program at the University of Toronto designed to help break gender, financial and racial barriers. The university hopes girls like Yashu will eventually enter an engineering program.

Many other universities across the country offer similar programs to encourage women to get into the fields of science, technology, engineering and math. York University, for example, runs all-girl courses that teach science through superheroes.

Later this week, the university is expected to launch the Lassonde 50:50 Challenge — an initiative that aims to achieve an equal gender-split enrolment at its Lassonde engineering school.

The gender divide in professions like engineering and computer sciences is a startling problem. According to Engineers Canada, about 88 per cent of engineers are men.

Those numbers are slowly changing because of programs such as these according to Jennifer

Flanagan, the CEO of Actua - an Ottawa-based charity that promotes science to children, especially girls.

"They can experiment, tinker and that kind of environment is really conducive to boosting their confidence," Flanagan said of the programs, which include all-girl science classes. They have been around for two decades she said, but they've become more popular in recent years.

Last September, the first year undergraduate engineering class at the University of Toronto saw 365 women, a 25 per cent increase from the year before. But change is slow. A report from Engineers Canada shows just 18.3 per cent of undergraduate engineering degrees were awarded to women across the country in 2013, up slightly from 17.6 per cent in 2009.

OkanaganLife

By [Editor](#) March 8, 2014 [Read More →](#)

International Women Day: Trades, engineering focus of BC discussions



*"Engineering is all about solving problems and helping communities," says UBC's Sheryl Staub-French.
Photo: Martin Dee.*

March 8 marks International Women's Day. Annually, thousands of events are held throughout the world to inspire women and celebrate achievements.

"International Women's Day is a great opportunity to celebrate the many career options available to women," says BC Minister of Jobs, Tourism and Skills Training and Minister Responsible for Labour Shirley Bond. "Doors are opening in every sector of our economy, and the increasing number of women in British Columbia who are launching careers in the skilled trades is a sign of this progress."

Bond references that opportunities are on the rise for women who want to pursue careers as plumbers, electricians, sheet-metal workers or other skilled trades. Since 2009, the percentage of women apprentices in B.C. has risen from 8.5% to 10.3%, with even bigger increases in trades such as welding and heavy equipment operation.

To date, the Women in Trades Training has successfully linked over 2,500 women throughout B.C. to training in the skilled trades, as well as to vital financial assistance for things like tools, textbooks, equipment and child care while they complete their education.

UBC turned the focus on the need for more women in engineering.

"Nationally, less than 20 per cent of students in university engineering programs are women," says Sheryl Staub-French, an associate professor in UBC's [Dept. of Civil Engineering](#). "If a significant part of the talent pool isn't even considering it as a career, you're missing out on some of the best and brightest. And we're facing some real labour shortages. Engineers Canada predicts a skill shortage of almost 100,000 engineers by 2020. Part of our work is to help address that skills gap by encouraging young women to explore career possibilities in engineering and science."

Staub-French stressed that from a business perspective, good diversity tends to relate to better outcomes, such as increased innovation and profitability.

"Only 11 per cent of registered professional engineers are women," says Staub-French. "As a mom, it is also frustrating to think that my daughter will receive less encouragement to pursue engineering as a career than my son. Engineering is an excellent career – rewarding, creative, stable and well-paid – and I want my daughter to have the same opportunities as my son."

In 2012, the national average enrollment of women in engineering programs was 18 per cent. Currently, 20 per cent of undergraduate engineering students at UBC are women. Some programs such as Environmental Engineering and Chemical Engineering have higher ratios of 44 and 34 per cent respectively.

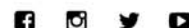
Ratios are slightly higher for graduate studies in UBC Engineering, with 24 per cent of post-graduate degrees awarded to women. Within faculty ranks, 13 per cent of tenured or tenure-track faculty are women with a national average of 12.

The UBC Faculty of Applied Science aims to boost the number of women enrolled in its engineering programs by 50 per cent in five years. A \$500,000 gift from Goldcorp will be used to establish the Goldcorp Professorship in Women in Engineering at UBC, a professorship that focuses on promoting engineering as a creative and rewarding career.

In Kelowna, Okanagan College will mark the day with an [International Women's Day event](#) the evening of March 8.

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APRIL 13, 2015

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By Katherine Green

It was 1988 and women in executive positions at top Canadian corporations were becoming a more familiar sight. The second wave of feminism was in the rear view mirror, and society was ripe to envision the third movement of gender equity. Two decades of rapid societal change had created an environment that presumed more movement on the feminism front.

Jo-Anne Oake-Vecchiato was one of those exceptional employees with the innate ability to rise in corporate ranks. Narrow her ascension down to her competencies, her drive, or just that indefinable passion for excellence, no matter – she had it. At the age of 32 she was well ahead of her colleagues as the director of Nursing – Maternal and Child Services at Scarborough General Hospital.

Vecchiato gave birth to her first son nine months later in the spring of 1989 and returned to work four months after. Then in 1992 she gave birth to her second son and again returned to work without taking a full maternity leave. By 36 years of age she was at the director level of a major Toronto hospital, an MHSc (Masters of Health Sciences) student, a wife, and the mother of a baby and a toddler.

And the ceiling did not fall in.

Twice she opted out of a full maternity leave to pursue the career goals that she saw eluding so many of her top competitors. It was a choice that she was not only comfortable with, but that excited her. “My choice was to go back to work,” she recalls. “I love my children, but I was definitely a career woman and if you lost as much as, or more than, three months in an organization ... things had moved, things had changed.” Yet, both times, upon returning to work, Vecchiato quickly found herself on the receiving end of uneasy side-glances and a



barrage of questions that reeked of judgment. Her peers were too polite to voice disapproval, but not too shy to make it known with the arched eyebrow, a method of communication mastered by the self-righteous.

Long before Facebook's Sheryl Sandberg and Yahoo's Marissa Mayer made headlines when they forfeited their maternity leaves, there were the outliers of a past generation. The frenzied media backlash outing Sandberg and Mayer as unfit mothers unfortunately proves that Vecchiato's case, dating back a quarter century, is not yet a historical footnote in the feminist tome. The same tension clearly persists between the cultural understanding of the motherhood role and the cultural understanding of the 'ideal worker' role. Seemingly the strides towards gender equity simply became a tired cause somewhere along the way. A cause plateaued and stagnated.

It is no secret that when women first entered the workforce the fairer sex employees had to get gritty and topple myriad barriers (or break glass ceilings). And yet today the reality is that, while society congratulates itself on the leaps forged towards greater gender equality, it forgets to look forward and ultimately finish the task. According to the Pay Equity Commission of Ontario the gender wage gap still persists, as evidenced by a 26 per cent deficit of a female's earning power compared to her male counterpart. Women on average, who work in one of Canada's wealthiest provinces, make only 74 cents on the man's dollar for the same work. This translates into a projected \$300,000 net loss or taxation on a woman over the course of her career. Those figures represent the unbreached difference between women having rights versus women and men being equal.

The disparity of salaries between the sexes exists in large part, but not solely, because of an expectation that a woman 'bows out' of her commitment to her career to make way for her commitment to her family. The "Getting a Job: Is There a Motherhood Penalty?" study conducted at Cornell University shared consistent findings proving too often male counterparts who are fathers receive a financial premium and with it a vote of confidence. Meanwhile a mother faces a professional penalty while co-workers silently disparage her competency.

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Marino Greco has the story.

[The Motherhood Tax](#)

Having children has long been perceived as a handicap to a woman's career path.

Katherine Green looks at how that is changing and its relation to the wage gap.

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A fringe group in Canada thinks that the law does not apply to them. The court disagrees.

Story by Eric Wickham

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Author of the MomShift Reva Seth and middle-son Avery.

This motherhood taxation is getting old. And the sands are shifting. Sandberg and Mayer are merely the celebrity face of a movement of women who are dictating their own career trajectory as mothers. Thousands of women, like Vecchiato, are publicizing their personal stories of opting out of the archaic perception of motherhood's career pause. These women are not buying into the system that is selling them out, effectively forcing employers to reassess the instinct to penalize. This 'third way' has opened a new frontier for women more than ready to bridge that gender wage gap.

Reva Seth, a Toronto journalist and speaker, is the author of the best-selling book *The MomShift* that chronicles the interviews of more than 500 women who are relatable working mothers. All fought to preserve, and in many cases enhance their successful careers after having children. Inspired by her own life experience and early research, Seth quickly recognized the extreme disconnect in the demands on mothers in the workforce, the paradox that women could either be a successful mother or follow the dominant model of what career success should look like. This hostile idea meant that mothers were fighting a losing battle – taxed at work or taxed at home and judged by all.

"I think it still hasn't shifted," Seth tells Shatter. "And I think we see it in things like the Mother Penalty Study that came out of Cornell, where they sent out CVs that are all the same (qualifications), but there is the one catch line that indicates the woman is a mother. They found that overwhelmingly the mother got fewer job interviews than the men (and the childless applicants), and also got offered \$11,000 less if she got a job offer." Cornell's study, among several other recent gender bias experiments, bolsters the fear that many young women have: pregnancy and motherhood are a career's coup de grace.

These perceptions did not materialize out of thin air, but are the residue of past generations and their struggles, beliefs, and warnings. "My mom often said things like 'I work for the kids'," said Seth. "So I was very ingrained in this idea that you have a successful career or you have children. And I didn't want to (have children.) I just knew I wanted to go down the career path, which was very much pushed by my parents."

Young women are burdened by these tales from the onset of their post-secondary formative years. "In university I found out that I couldn't have kids so I was fine with that. I was 20 and didn't really care, just one less thing to worry about," scoffed Seth as she rolled her eyes recounting her own backstory that is peppered with ironic hindsight. "Then three days after my wedding I found out that I was three months pregnant. To my total shock. Completely not the honeymoon we had planned.

"I spent the whole time crying or sleeping because I honestly felt like my career, which was now at this all time low, was now even going to be more derailed in six months."

Seth, who at the time was an ambitious young P.R. consultant working at Hill & Knowlton in the U.K., certainly had a steep hill to climb. But there was an even steeper learning curve. A frantic hunt for literature or mentorship in the face of what was perceived as a life altering – or more appropriately career-ending – pregnancy, Seth was stunned at the absence of resources available to women.

Seth pioneered a project to seek out women whose careers not only survived motherhood, but

also thrived during it. She began to lift the veil off of this dusty outdated perception of motherhood and found a shiny new object – a Movement. Hundreds of women from the squeeze generation, and those belonging to the millennial army, who were willing and able to lend their success stories after pushing through the boundaries associated with working through motherhood.

The MomShift's 500 interviews represent women from a wide selection of professions and occupations, who dictated their own route to success: from opting out of maternity leave, to entrepreneurship, and even the women who fought their way up corporate ladders despite contending commitments. "I thought we needed to hear better and more relatable stories where people can see that there isn't a wrong way," Seth says with overflowing appreciation. Gratitude reserved for these women that gifted her with self-assurance but most importantly, solidarity.

The whole ordeal of motherhood needn't have been so terrifying. Considering that Seth went on to have two more sons, her original expectations of career death were greatly exaggerated.

In Canada, the gender wage gap endures because problematic policy allows it to. Policy is an abstract authority addressing the equity issues on paper, but rarely in the hallways of firms, corporations, hospitals, and countless other work environments with female employees.

The Pay Equity Amendment Act of 1993, enforced by the labor unions, ensures maintenance of companies' compliance with the guarantee of equal pay for equal work. Pay Equity Labour lawyer at Cavalluzzo LLP Jennifer Quito ensures the policy can work in some limited capacities. "The good thing about the Pay Equity Act is that it protects job classes," she says. But that leaves an extensive vulnerability for the motherhood tax to rear its ugly head. And for the mothers getting passed over for promotions, and earning less than male counterparts, the legislation is effectively a punitive blunt instrument.

"Sometimes companies will recognize (unequal earnings) and will pay (women) appropriately, and give them retroactive pay. And then there is a 30-year-long case with Bell. The compensation went to people's estates. People died during the litigation. So that is the opposite example with an uncooperative company," Quito says almost apologetically. Whether the Pay Equity Act is enforceable or not, people's perceptions, rather

than policy, dictate how it shapes the work place. If a singular employer perceives, unconsciously or otherwise, that a mother is incapable of being as competent as a non-mother or man, then the motherhood tax exists. Unfortunately for working Canadian mothers, the near 30 per cent earnings disparity suggests it is an epidemic among employers.

Correll and Bernard's study at Cornell University observed the overwhelming evidence that employers will subtly discriminate against mothers when making evaluations that affect hiring, promotion, and salary decisions. Fathers will not experience disadvantages since our culture is not taught to see a good father as incompatible with understandings of what it means to be a good worker. In fact, just the opposite is true. A good father represents commitment, focus, and reliability.

The leap towards reconciling this double standard requires a macro-level social overhaul and micro-level policy implementations. It calls for breaking away from the linear model of success we have for a professional woman— an ideal that heavily suggests only a childless female employee is capable of having focus, commitment and ambition.

Maternity leave was so crucial at its inception as a protection for women, however the corporate structure adopted it as the linear solution. The maternity leave structure is acting less and less as a tool for the mother, and increasingly as a means to maintain and justify the old status quo. Expectant mothers frequently feel the expectation on themselves to utilize the entirety of the leave— a career-pause that isn't the right personal choice for every working mother.

Quito argues that a long-overdue change in our chauvinist perception of mothers is the key, yet there is space at a ground level for change. "I think it is a socialized idea. Whatever time period it is, (it's) much more the social aspect of (the problem)," she says. "What I think is very interesting is the incentives that a company has. For instance, at our firm we have parental leave, not necessarily maternity leave. We often talk about women, but if it's a two parent situation, why wouldn't we make it easy for the [father] to take time off so the woman can return?" The consensus is that there is an increasing demand on professional infrastructure as it stands today to round out resources of non-gendered parental leave.

Vice President of Shaw Media Christine Shipton has always been struck by the lack of dialogue surrounding the notion of female staff taking alternative routes to re-enter the workforce after having children. "I get frustrated when women – and I've been having this conversation with my daughters – just automatically take a year," she tells Shatter about several female rising stars that felt compelled to take their full year off, and in many instances were sidelined because they weren't aware they could return to work sooner and have their partner access a non-gendered parental leave. "That shocked me. Think about your own energies and your own ambitions."



When comparing women to men who are doing equal work, having children effects women much more negatively. Photo by Katherine Green.

The absurd longstanding myth that motherhood is a professional handicap is steadily on the way out. The movement away from an outdated model of a successful childless career woman means that there are more channels open for success. With productivity and performance, come earned equitable wages. Publicizing the motherhood tax is forcing the powers-that-be to be accountable.

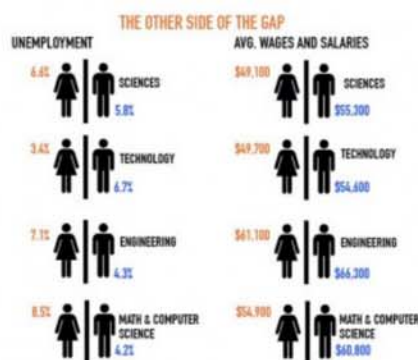
Jo-Anne Oake-Vecchiato, our original outlier, is now in her late 50s and still reaping the rewards of her early decisions as the current director of Corporate Quality and Patient Safety at ORNGE. She comfortably enjoys the spoils of her life's hard work. Along with her husband Enrico, she invites Shatter into her home and one can't help but notice the complete calm and ease of her personal space. No wonder, though; her two sons are adults now and living productive lives of their own.

She insists on closing the interview with what is for her, the most important aspect she would like to share: “Follow your heart. I don’t think there are any right or wrongs, for men or women.” She pauses for a moment. “For women in particular a lot of it is about the gender equity and not about gender differences. Sometimes it really is about rising above those people that still see the differences.”

The Other Side of the Gender Wage Gap

The gender wage gap can also be measured through the separation of the sexes into male and female job classes. Women have historically occupied lower-paying and under-valued jobs.

In the past, men have dominated academic and professional fields in Science, Technology, Engineering and Mathematics (STEM).



Labour market outcomes of university graduates aged 25 to 34, by sex and major field of study, 2011 (Statistics Canada)

According to Dr. Elizabeth Croft, Professor and Associate Dean at University of British Columbia and NSERC Chair for Women in Science and Engineering, there has been a growing number of women entering STEM fields in the past decade. These young women are not only enrolling in undergraduate programs within these fields, but continuing the pursuit of science, technology, engineering and mathematics to higher levels of academia and professional realms.

“This is what we see at UBC about six years ago our first year class was 18 per cent women and this past year was 29 per cent. We believe we could have as many women going into engineering as men, just on the basis of showing women it is a great career for everybody and we need everybody.”

– Dr. Croft.

SCWIST Invited to House of Commons in Ottawa

📅 April 23, 2015 (<http://www.scwist.ca/scwist-at-house-of-commons-april23-2015/>)

SCWIST was invited by the House of Commons for the second time to present to the Standing Committee on the Status of Women on April 23, 2015.



Sandy excited to present to the Standing Committee

Our secretary, Danniele Livengood, and past Director of Outreach, Sandy Eix, traveled to Ottawa to the House of Commons and spoke about positive changes in the representation of women in the traditionally male-dominated STEM fields but more work still needs to be done. Below are some of the reasons:

- Women with STEM degrees are more likely to be unemployed or employed in fields which do not require a degree compared to men with similar degrees;
- Women hold only 15% of full professorships in science overall, and only 8% of full professorships in engineering, as compared to 31% in humanities;
- Only 3.3 % of the top 25 NSERC grantees (as measured by grant size) involve women;
- In high tech companies like Facebook, LinkedIn and Google, 35% of their workforce is women, but women represent only 15-17% of their technical employees and only 20-25% of senior staff.

Danniele and Sandy continued to convince the Standing Committee why gender diversity is key to innovation:



- Studies by the Conference Board of Canada and Corporate Governance link gender diversity not just to employee satisfaction, but also to improved governance, innovation, and economic benefits for corporations;
- Collective intelligence rises in a group with more women;
- The presence of at least 30% women on a board decreases “groupthink”, while women directors improve a firm’s ability to navigate complex strategic issues.

What we can learn from these studies is that a lack of women in STEM leadership isn’t just a problem for ambitious women – it’s a limiting factor in the ability of Canada’s researchers and corporations to thrive and grow. In other words, STEM needs female leaders.

Danniele ready and confident to present

To advance women in STEM, we need to address the barriers:

1. We cannot stop supporting the initiatives that have worked well so far. This includes **support and advocacy networks like SCWIST, DAWEG, WWEST, the NSERC Chairs for Women in Science and Engineering**. It includes mentorship programs for girls and young women like SCWIST's [ms infinity](http://www.scwist.ca/programs-and-events/msinfinity/) (<http://www.scwist.ca/programs-and-events/msinfinity/>), and our double-X networking evening. It also includes skill-building opportunities like SCWIST's [Immigrating Women in Science](http://www.scwist.ca/programs-and-events/IWIS/) (<http://www.scwist.ca/programs-and-events/IWIS/>), Ladies Learning Code, and science and tech camps for girls.
2. We must **invest in systems to help HR professionals and educators** understand and counteract their biases. This will help ensure that unconscious systemic biases against women in STEM will not continue as barriers.
3. We must **recognize and celebrate organizations that are models of diversity** and tell the story of how they have benefited. For example, we know that the Fortune 500 companies with the most women on their boards of directors far outperform the companies with the fewest.
4. We must work to **build, connect and integrate the existing networks of mentorship and peer support for women in STEM**. We need to encourage initiatives that bring like-minded organizations together for common goals. For example, [Make Possible](http://www.makepossible.ca/) (<http://www.makepossible.ca/>) worked with WWEST to review and publish key findings about women in STEM.

↑ Read the entire speech...

Speech Delivered in front of the Standing Committee on Status of Women

by Danniele Livengood & Sandra Eix

Thank-you Madam Chair. My name is Danniele Livengood and this is Sandra Eix. We are here representing the Society for Canadian Women in Science and Technology, fondly known as SCWIST.

For more than 30 years, SCWIST has been supporting and advocating for women in Science, Technology, Engineering and Mathematics. Over this time, we have seen many positive changes in the representation of women in these traditionally male-dominated fields.

Women now account for 39% of students enrolled in STEM programs, and just this year, the University of British Columbia achieved record numbers for enrolling women in their engineering programs that now boast 29% women up from 19% in 2010. At the faculty level, women are 35% of life sciences researchers and 15% in physical sciences, computer science, engineering, and mathematics.

It would be tempting to congratulate ourselves and to say that, even if women haven't completely achieved equitable representation in STEM fields, we have at least implemented a key part of the solution: encouraging and supporting young women entering STEM programs.

However, a closer look indicates that there is still work to be done.

For example, Statistics Canada reports that in comparison to men with STEM degrees, women with STEM degrees are more likely to be unemployed or employed in fields which do not require a degree. 2011 US data shows that in the non-academic workforce only 26 % of STEM workers were women. Yet we know that overall women make up around 48% of the workforce.

More significantly there is still an alarming absence of women at the leadership level, both in academic research and in industry.

Statistics from 2013-2014 show that women hold only 15% of full professorships in science overall, and only 8% of full professorships in engineering, as compared to 31% in humanities.

Also, only 3.3 % of the top 25 NSERC grantees (as measured by grant size) involve women.

The story is similar outside academia. Huge tech companies Facebook, LinkedIn and Google show promising diversity statistics – typically around 35% of their workforce is women, but women represent only 15-17% of their technical employees and only 20-25% of senior staff.

Until we understand and act to counter the historical and cultural forces that keep women from STEM leadership, we've only solved part of the problem.

In the 21st century and beyond, the challenges that face Canada and the world are not simple, and new kinds of thinking will be required to take them on. Recognizing this, education systems across Canada are evolving to focus on creativity, innovation, communication, collaboration, problem solving and critical thinking.

Whether addressing climate change, new diseases, management of an information economy or feeding a growing population, we need to think differently. Leaders who think outside of the historically informed archetype can bring fresh perspectives to solve complex, interconnected problems.

Over 20 years of research tells us that gender diversity is key to this kind of innovation. Studies by the Conference Board of Canada and Corporate Governance link gender diversity not just to employee satisfaction, but also to improved governance, innovation, and economic benefits for corporations. A study published in The Harvard Business Review illustrated that collective intelligence rises in a group with more women, and studies in the Journal of Business Ethics found that the presence of at least 30% women on a board decreases “groupthink”, while women directors improve a firm’s ability to navigate complex strategic issues.

What we can learn from these studies is that a lack of women in STEM leadership isn’t just a problem for ambitious women – it’s a limiting factor in the ability of Canada’s researchers and corporations to thrive and grow. In other words, STEM needs female leaders.

Although newer institutions and businesses are typically more diverse it is possible for older institutions to change. With solid corporate policies and practices around diversity, the Royal Bank of Canada, the University of British Columbia and many other large institutions have been making huge diversity strides so it **can** be done.

Women working in STEM identify many barriers to their success.

Some of these are in the form of infrastructure and systems that hold them back.

Some are related to organizational or workplace culture.

Some are related to attitudes about women's abilities in these fields.

Over time, strong women and their supporters, bolstered by public policy and law, have chipped away significantly at the most obvious of these barriers, to the point that the remaining roadblocks are subtle and sometimes hard to articulate. Breaking down these final barriers requires us to change how we think and requires a level of self-reflection.

Compared to 30 years ago, societal attitudes about who can and should participate in STEM have changed enormously. It's well established that there is no innate connection between gender and mathematical or scientific ability. Human rights legislation makes discriminatory hiring practices illegal.

However, most people are not aware of implicit biases which cause them to make small assumptions without realizing it. This is a critical barrier to women advancing in STEM, since even the best-intentioned teachers, guidance counselors, professors and hiring managers have implicit biases. To illustrate the effects of implicit bias on women's advancement to leadership positions, a study presented a CV to several science professors and asked them to evaluate the candidate for a lab manager position. The male candidate was offered 12% higher salary, more mentorship and was rated more competent and hireable than the female candidate – even though the only difference in their CVs was the name at the top.

Regular and repeated use of instruments like the Harvard Implicit Bias Test can help educators, managers and HR professionals become aware of and combat biases. Being aware is the first step.

The importance of role models in encouraging women as they enter non-traditional fields is widely recognized and is the *raison d'être* of many successful programs like SCWIST's Make Possible, and ms infinity programs, as well as Let's Talk Science, Scientists and Innovators in the Schools, and many more.

However, when women in STEM are recognized and celebrated in the media, the stories often reflect inherent societal stereotypes. Media critical tests like the Bechdel test for movies can help identify the gender biases that we are so used to seeing. An analogous test, the Finkbeiner test, serves to call out representations of women in STEM fields that define their successes in the context of their gender. To pass this test, articles about a woman in STEM must not mention (among other criteria) the fact that she's a woman, her husband's job, her child care arrangements or how she's the "first woman to..." These items may seem normal –even laudable – to include in a story about a successful women in STEM, but we have to ask ourselves: would we say these things about a man in the same field. While we need to see more women in STEM represented in the media it's essential to be mindful of HOW they are portrayed.

As you can see, the representation of women in STEM is still lacking at the leadership level. This needs to change, because more diverse models of leadership are what Canada needs to meet 21st century challenges. Many of the roadblocks to women's success in STEM have been removed, and some of the barriers that remain are subtle like implicit bias and media representation. To move forward, we need to continue to support the best practices that have advanced women in STEM thus far, and we also need to address the remaining barriers.

First, we cannot stop supporting the initiatives that have worked well so far. This includes support and

advocacy networks like SCWIST, DAWEG, WWEST, the NSERC Chairs for Women in Science and Engineering. It includes mentorship programs for girls and young women like SCWIST's ms infinity, and our double-X networking evening. It also includes skill-building opportunities like SCWIST's Immigrating Women in Science, Ladies Learning Code, and science and tech camps for girls.

Second, we must invest in systems to help HR professionals and educators understand and counteract their biases. This will help ensure that unconscious systemic biases against women in STEM will not continue as barriers.

Workshops for professionals and academics, supported by the sharing of best practices for combating biases could change the landscape greatly. Promising initiatives in this area include the WinSETT workshop series, Make Possible's HR Inclusion Workshop, and the HR toolkit on diversity being developed by Digital Nova Scotia

Third, we must recognize and celebrate organizations that are models of diversity and tell the story of how they have benefited. For example, we know that the Fortune 500 companies with the most women on their boards of directors far outperform the companies with the fewest. Motivating change in well established institutions and corporations will be easier when the business case for diversity is widely understood.

Finally, we must work to build, connect and integrate the existing networks of mentorship and peer support for women in STEM. We need to encourage initiatives that bring like-minded organizations together for common goals. For example, Make Possible worked with WWEST to review and publish key findings about women in STEM. Creating Connections is a conference in Metro Vancouver where university and college STEM students meet with organizations that support women in STEM to "bring together people of all genders ... to discuss issues of personal and professional development, networking, and inspiration."

Women in STEM and their allies have a lot of work still to do, to provide Canada with the STEM leadership necessary for the 21st century and beyond. The advances we've made thus far justify optimism and further support as we take on the next set of challenges.

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DIVERSITY BREEDS SUCCESS

THE CASE FOR WOMEN IN ENGINEERING

Catherine Fritter

The Association of Consulting Engineering Companies of BC hosted its annual Awards of Excellence Gala in Vancouver on April 10th. While this event recognized outstanding projects undertaken by our consulting engineering community, there was another achievement that deserves mention—sharing the stage was the Lieutenant Governor of BC, the Honourable Judith Guichon; the Chair of ACEC-Canada, Anne Poschmann; and the Chair of ACEC-BC Catherine Fritter. When we include the Premier of British Columbia Christy Clark, who was invited but unavailable, and the President of APEGBC, Ann English—our event highlighted a formidable array of female leadership and talent!

While their roles are remarkable, everyone recognizes that more needs to be done to attract more women to engineering. Dr. Elizabeth Croft, NSERC Chair for Women in Science and Engineering, Professor of Mechanical Engineering and Associate Dean, Education & Professional Development, has observed that “over 55% of students who study science at university are women yet less than 20% of engineering and geoscience students and only 11% of professional engineers and geoscientists are female—this must change. The future of our profession depends on drawing from the widest pool of diverse and talented young people and providing a welcoming environment that ensures their success.”

Why is it so important to attract and retain more women in engineering and leadership positions? As Saddia Zhahidi, head of the Women Leaders' Programme at the World Economic Forum in 2009 stated, “Women make up half of the human resources available to any country. If that half is not being channeled into the economy and not being made part of decision-making processes, then that country's economic potential is bound to suffer.”

Likewise for corporations: a study by Roy D. Adler at Pepperdine University found convincing results by examining 215 Fortune 500 companies from 1980 to 1998. By studying corporate results over 19 years, a strong correlation was found between companies with more women at the executive level, and increased profitability. Between 2005 and 2007, this was corroborated by a subsequent McKinsey study of 89 European companies, which came to the same conclusion.

At the University of Michigan, Scott Page found further evidence and stated, “The diverse group almost always outperforms the group of the best by a substantial margin.” Working with Lu Hong of Loyola University Chicago, Page developed a mathematical formula called the Diversity Prediction Theorem to show that the collective ability of any crowd is enhanced by a factor quantifying the diversity of the group, in addition to the average ability of its members. As a result, companies need to view diversity as a key strategy to bring increased success.

In an additional McKinsey study, companies with three or more women in senior leadership scored higher in positive attributes such as innovation, capability, work environment, and accountability. So overall, we can conclude that hiring and retaining more women will benefit companies in many ways, including

their bottom line, which can result in more employment for all.

The Association of Professional Engineers and Geoscientists of BC has committed to both improving the retention of practicing female engineering and geoscience professionals and increasing the participation of women in the profession. In concert, ACEC-BC is encouraging our member firms to take part in a study for Dr. Croft through a study program on “Engineering Workplace Policies and Experiences.” More women in engineering and leadership, and the possible benefits, can be accomplished by fostering inclusive, diverse workplaces, and making educational resources that promote the benefits of having a diverse workplace easily accessible and readily available. ☐

Catherine Fritter is Business Unit Leader at Moffatt & Nichol Vancouver, and the 2014/2015 Chair of the ACEC-BC Board of Directors.



Canadian museum urged to address gender gap in science hall of fame

IVAN SEMENIUK - SCIENCE REPORTER

The Globe and Mail

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Nearly 100 faculty members at the University of British Columbia and other universities across the country are pressing the head of the Canada Science and Technology Museum in Ottawa to take swifter action in addressing the lack of female nominees to the hall of fame it hosts.

The issue was first reported in The Globe and Mail last month after Judy Illes and Catherine Anderson, both UBC faculty members, resigned from the Canadian Science and Engineering Hall of Fame's selection committee because no women had been nominated for the second year running and the museum had declined to reopen nominations.

In an April 14 letter and petition to Alex Benay, the museum's CEO, 92 signatories applauded the actions of Drs. Illes and Anderson and urged the museum to "develop a robust and focused campaign" to ensure that women who have made outstanding contributions to science and engineering in Canada are nominated.

On Wednesday, Mr. Benay told The Globe and Mail he has heard the group's concerns and the museum is still seeking creative input on how to revise its nomination process.

Margot Young, a law professor at UBC who helped organize the petition, said the museum should have been taking steps to address the disparity in nominations well before now, rather than wait for a public controversy to erupt.

"It's not enough at this stage," she said. "Nobody who works in science and engineering can credibly say that they're unaware of the absence of proportionate representation of women in that area."

Under the current format, a selection committee made up of individuals from outside the museum chooses up to three individuals per year for induction into the hall of fame based on the nominations the museum receives from the public. Only four nominations were received in 2014 for the current year's round of inductions. All were male.

Elizabeth Croft, an associate dean of mechanical engineering at UBC who holds one of five federally funded chairs aimed at increasing the presence of Canadian women in science and engineering, said that neither she nor the other chair holders had ever been approached by the museum about how to increase the number of eligible female nominees to the hall of fame.

“If you do the same things you’ve always done, you get the same results,” she said. “You do need to be proactive to make a change.”

Mr. Benay said the nomination process has now been suspended while the museum is engaged in consultations on whether and how it should be changed. He was looking at a “summer time frame” to complete those consultations and determine the appropriate course of action. He added he also wanted to ensure that the museum’s actions were respectful to those who have been nominated for this year, whatever the outcome.

“We’re taking this seriously and we want to do this well,” he said, adding that a revised plan for the hall of fame should include ways to make Canadians more aware of its existence and make better use of technology to facilitate nominations.

The hall of fame has been closed, along with the rest of the museum, since last fall due to a mould problem. The building has now been emptied of its artifacts and displays and is scheduled to reopen in November, 2107.

Only 11 of the 60 inductees into the hall of fame are women, a disparity that is due in part to the low number of women working in scientific and engineering fields in Canada until the 1960s. While the gender makeup of the scientific community has changed dramatically in recent decades, the naming of women to the hall of fame has lagged.

Lara Boyd, a neuroscientist at UBC who was among those who signed the petitions, said a hall of fame focused on researchers who are no longer working, and often no longer alive, may be part of the problem.

“Perhaps we need to reconceptualize the whole process and say we’re just going to celebrate outstanding scientists – and they could be scientists who are making their discoveries right now,” she said.

Burnaby**now**

Class Act: inaugural girls' science conference a success

Cornelia Naylor / Burnaby Now

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Alpha Secondary Grade 11 student Suzanne Fox, left, and stem cell expert Dr. Poh Tan, a Burnaby South grad, take part in an icebreaker activity at the Quantum Leaps Conference. Photograph By Contributed

The inaugural Burnaby Quantum Leaps conference was big success this spring.

Aimed at inspiring girls to pursue careers in science, technology, engineering and mathematics, the event attracted 18 volunteers and 70 local girls, who took in interactive workshops and listened to inspirational female speakers, like Burnaby South grad Dr. Poh Tan, a stem-cell expert and founder of Innoguidance Consulting.

The conference – a first of its kind for Burnaby – was organized by five local students from five different local schools (Mindy Lin, Jenny Wang, Tina Borcanin, Maya Unadkat and Angela Yu).

Organizers are now searching for others in Grade 11 or 12 interested in joining the executive and helping organize a second conference next year. For more information, email SCWIST2015@gmail.com.

Byrniversary

Byrne Creek Community School celebrates its 10th anniversary this month.

All school alumni and Byrne Creek community members are invited to the school (7777-18th St.) Thursday, May 14 for an open house, with food and performances from 4:30 to 8 p.m.

Come early and take in an alumni basketball game starting at 3:30 p.m.

Skilled students

Burnaby students repaired, baked and networked their way to the podium at the 21st annual Skills Canada provincial

competition in Abbotsford last month.

The annual Olympic-style event, which pits students across the province against each other in a contest of trades and technology skills, saw four Burnaby students win medals.

Burnaby South's Jason Sherle dominated the Automotive Collision Repair competition, winning gold and qualifying for the national competition in Saskatoon this month.

Fellow Burnaby South students Jack Casey and Emilio Flores took silver and bronze respectively in secondary IT Network Systems Administration, and Burnaby North student Kayla Wenzek earned bronze in the secondary baking event.

For complete results, visit skillscanada.bc.ca.

Sleeper of the season

Four Byrne Creek media arts students won top honours at the B.C. Student Film Festival (BCSFF) last month with a video telling youth "Games can wait. Get some sleep."

Sopithan Rajeswaran, Mansor Ghanizada, Olly Vik and Jan Lontok – all students in Byrne Creek's Industry Connect Media Arts 10 program – won the junior public service announcement category with a scary, one-minute video on teens and sleep.

The film cites a study that found only 15 per cent of teens get eight and half hours of sleep on school nights.

BCSFF, the province's only student film festival is organized by B.C. media teachers and is open to elementary, junior secondary, senior secondary and post-secondary students.

For more information, visit www.bcsff.com.

See the Byrne Creek video at <https://youtu.be/S0VzH1bwGuU>.

School carnivals

Have fun at two Burnaby school carnivals this spring.

Gilmore Community School is gearing up for its giant biannual Country Carnival fundraiser Friday, May 22.

The event will feature activities for the whole family, including a pie-eating contest, barbecue, live cow milking, pony rides, petting zoo, bouncy castle, dunk tank, bungee run, obstacle course and mini golf.

The fun runs from 4 to 9 p.m. at 50 S. Gilmore Ave.

On June 5, Parkcrest Elementary hosts a carnival fundraiser from 4:30 to 8:30 p.m. at 6055 Halifax St., featuring a bouncy castle, dunk tank, bungee joust, face painting, carnival games, raffle prizes and a silent auction.

Admission is free.



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Sci-Tech Girl event aims to encourage more female scientists

May 15, 2015

WHITEHORSE – Sci-Tech Girl is a new event being launched at Yukon College to encourage young women to seek out careers in science, technology, engineering and math (STEM). Young women in grades 10, 11, 12 and first year post-secondary are invited to meet and learn from the experience of women who are leaders in their fields. Valuable networking that will support young girls in exploring options in the sciences, according to 17-year-old Saba Javed.

“At elementary school a lot more girls were into these subjects, but I’ve seen that once you reach high school it becomes that math, science, trades, are considered more of a guy thing,” said the grade 11 F.H. Collins student. “In subjects like math and computers the guy versus girl ratio is so big, that it puts many girls off persevering and building on their earlier experience.”

Javed is considering pursuing engineering or physics at university and she believes events like this will help build a network of support for young women considering a STEM career and boost their confidence.

Less than 25% of people working in science, engineering and mathematics in Canada are female. This evening is designed to bring older and younger women together around different topics such as soil science, animal health, engineering, epidemiology, and biogas. The female scientists will be sharing their work and education experiences, and providing advice to the 14-19 year olds. Organizers hope this mentorship will extend far beyond the three hour event.

“Role models are important. I am looking forward to learning from these women and hopefully becoming better prepared to enter post-secondary,” said Javed, who acts as a role-model herself for grade 5-7 girls through her role as a youth leader in the All-Girls Science Club at Yukon College.

Jodi Gustafson will be the keynote speaker. This 24-year-old former Porter Creek Secondary and Yukon College student has received a Canadian Youth Environmental Leadership Globe Award, is one of three Canadians selected for the Gates Scholarship to Cambridge University, and has been named as one of Canada’s 2015 Top 25 Environmentalists Under 25.

Sci-Tech Girl - An evening of networking with women in Science & Technology, will take place in the Pit at Yukon College from 4:30 p.m. to 8:00 p.m. on Wednesday May 20. Female students from Grade 10 to first year post-secondary can register on-line at www.scienceadventures.ca/.

Sci-Tech Girl is presented by Science Adventures at Yukon College and sponsored by Westcoast Women in Engineering, Science & Technology, the Society for Canadian Women in Science & Technology, ACCESS, Associated Engineering, EDI, Tetra Tech EBA, and the Yukon Teachers’ Association.

Science Adventures is a proud member of Actua. Actua provides training, resources and support to its national network of members located at universities and colleges across Canada in the delivery of science, technology, engineering and mathematics (STEM) education outreach programming. Each year, these members engage over 225,000 youth in 500 communities nationwide. Please visit Actua at www.actua.ca/.