Stories from the Jade Project

THE JADE PROJECT

Sharing a passion for science and engineering with girls and women across British Columbia and Yukon

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Sharing a Passion for Science and Engineering with Girls and Women Across British Columbia and the Yukon

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Department of Computer Science

in partnership with the Natural Sciences and Research Council of Canada (NSERC) and General Motors Canada

To Maria Klawe,
who brought us together,
inspired us,
and is always there to support us

Acknowledgments

It's truly amazing how many people have worked so hard to make the Jade Project a success and who have supported us through the past five years.

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AWAKE (Aboriginal Women Achieving Through Knowledge in Engineering), Yvonne Coady, Department of Computer Science, University of Victoria
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Go West: Jade Bursary for Girls, Daniel Beck, Faculty of Engineering, University of Victoria
Innovators in Schools: Making Science and Technology Fun!, Heather Dundas, Yukon College
Networking Engineering Women at UBC, Elizabeth Croft, Department of Mechanical Engineering, UBC
Networking Symposium for Women in Engineering, Anja Lanz, Elizabeth Croft, Department of Mechanical Engineering, Engineering Physics Program,

UBC
Physics & Astronomy Welcome Orientation for Women, Carolina Tropini, Amy Liu, Erin MacMillan, Department of Physics & Astronomy, UBC
Salary Seminar for Engineering Students, Elizabeth Croft, Faculty of Applied Science, UBC
Sustainability, Science & Engineering Workshop in the Yukon, Naoko Ellis, Department of Chemical & Biological Engineering, UBC
Soft Skills for Hard Scientists, Elana Brief, Department of Physics, Simon Fraser University
Why is Engineering Worth a Girl's Time?, Daniela Constantinescu, Department of Mechanical Engineering, University of Victoria
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--Anne Condon and Michele Ng

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Introduction

Never doubt that a small group of thoughtful citizens can change the world. Indeed, it is the only thing that ever has.

—Margaret Mead

The Jade Project grew from the somewhat dispiriting realization that despite the fact that women make up close to half of the Canadian workforce, they comprise less than one quarter of professionals in the natural sciences, engineering, and mathematics. Particularly in the physical sciences and engineering, declining interest among girls starts early, so that the imbalance is already significant by the time they get to college and increases as they continue in their careers.

To help redress this imbalance, Jade Project creators wanted to assist professionals who work with girls and young women on a number of projects designed to help them become interested in computer science and computer-science related fields and to maintain their interest through their undergraduate years and beyond. They also wanted to build institutional support in the projects they funded so that continuity in the delivery of these projects can occur once current Jade funding ends.

The result has been nothing short of astonishing. A five-year collaborative effort, Jade has brought together close to 5,000 people—girls and young women aged K-12, undergraduate and graduate students in colleges and universities, faculty, administrators, and other project leaders—in British Columbia and the Yukon. Named for British Columbia's official gemstone, the Jade Project has four main components.

The first component helps K-12 girls learn about computer science and engineering via robotics. The project provides mentors to teach girls about robotics and to develop teams and pay for their travel expenses to regional and national robotics competitions. The project has supported the young-

est students, those competing in First Lego League (FLL) competitions, as well as secondary students competing in FIRST VEX and FIRST Robotics competitions. The project also supplies materials for high school students that dispel common myths about computer science.

The second component is an interdisciplinary college-level course offered at UBC's Computer Science Department and cross-listed with Women's Studies, in which students are introduced to computer science principles through applications in fine arts, psychology, and biology. The class enables students to explore connections between their own interests and the field of computing and to gain hands-on experience in using the computer as a creative tool. This course has now replaced the department's earlier introductory course and enrollment has increased significantly with over 200 students taking the course each year, roughly 50% of whom are women.

Coordinated by Dr. Faith Ellen at the University of Toronto, the Canadian Distributed Mentor Program (CDMP) forms the third component of the Jade Project. Through the CDMP, outstanding undergraduate women in computer science and related fields are funded for a summer of research and mentoring at a Canadian research university. To date, 44 female undergraduates have been funded for a summer of research and mentoring with a female faculty advisor, with 10 additional students to participate in the summer of 2009. Most of these women have now either gone on to graduate school or plan to do so soon.

Jade Bridges is the fourth and most multi-faceted component of the Jade Project. Working across the province, Jade Bridges has seeded new projects in B.C. and the Yukon aimed at increasing the participation of girls and women in science and engineering. Project leaders have formed a network in the region and have worked to gain institutional support for their efforts so that the programs can continue into the future once current Jade funding ends. A sample of the numerous projects funded includes: computer science and engineering day camps, ChicTech and high school computer challenge competitions, programs for Aboriginal students (AWAKE), outreach on engineering topics to students in the Yukon, and career-development workshops for undergraduate and graduate women in science, engineering, and engineering physics.

Additionally the program funds travel to national and international conferences such as the Grace Hopper Celebration of Women in Computing Conference and the Canadian Coalition of Women in Engineering, Science, Trades and Technology Conference (CCWESTT). It supplies funding for the UBC Department of Computer Science's Tri-mentoring Program and it fully funds the department's annual graduate dinner.

Keeping participants up to date about the project and marketing it to potential participants has been the role of the Jade Project newsletter. Lisa Frey, a UBC mathematics undergraduate from 2002-2007, interviewed numerous participants, often traveling thousands of miles to get the latest scoop on Jade Project-funded conferences and workshops. The newsletter articles that Lisa wrote form an integral component of the project's outreach and communication over last five years and here they form the basis for this book.

Rather than listing her articles chronologically by issue, we have opted to group them by theme, with sections devoted to "Programs and Workshops," "Competitions," and "Conferences." Lisa additionally profiled a number of energetic women who are making a difference for girls and women in science and engineering; these interviews are gathered in the "Profiles" section. Some of the articles included here were contributed by other authors; we list them with their articles. In addition, two of Anne Condon's speeches on topics relevant to the Jade Project are here included under "Remarks."

**

Being a part of this initiative has yielded almost too many rewards to enumerate, but we would certainly have to say that chief among the pleasures for us has been the professional and personal connection with so many leaders across the province. These leaders are literally changing the face of science and engineering in Canada today. They truly are making a difference and for that we are optimistic for the future.

--Anne Condon
University of British Columbia
Department of Computer Science

Coordinating the various programs within the Jade Project has definitely been a great experience for me, highly rewarding and exciting. I've had a chance to work with fantastic leaders—everyone from program organizers, professors, and senior administrators in post-secondary institutions and non-profits to high school teachers, student leaders, and parents--all of whom deeply care about promoting and retaining women in science and engineering. The sheer energy and good vibes they've given off have been amazing. The very fact that I could be a small part of this whole process in making a difference in the lives of nearly 5,000 budding female scientists and engineers is truly humbling.

The single aspect I've most valued has been the chance to work with Anne Condon. She has been a constant source of inspiration and support this past five years, and I will definitely miss working with her when the Jade Project ends in June, 2009.

--Michele Ng
University of British Columbia
Department of Computer Science

Stories from the Jade Project

Programs and Workshops

Canada-wide Mentor Program Gives Female Undergrads a Glimpse into the Day in the Life of the Graduate School


Heather Neilson

Last summer, Heather Neilson, a fifth-year student in the Cognitive Systems Program at UBC, got to find out what it's like being a graduate student and an active participant in a UBC research lab. She participated in a program that encourages undergraduate women in computer science and computer engineering to go to graduate school by exposing them to the research environment.

The Canadian Distributed Mentor Project matches female students who have finished their second or third year of undergraduate studies with female professors for a summer of research and mentoring. It awards $3,500 to each student, supplementing the NSERC Undergraduate Student Research Award (USRA), which provides $4,500 and travel. Each student receives a total of $8,000 and travel for 16 weeks of work. In addition, $1,000 is awarded to each mentor to offset research and mentoring costs.

Neilson, who is in the cognition and brain stream of the Cognitive Systems Program, participated under the direction of Associate Professor Cristina Conati, a member of the Laboratory for Computational Intelligence. Conati specializes in combining aspects of artificial intelligence, cognitive science and HCI (human-computer interaction) to make complex interactive systems more adaptive to the needs of users. Conati's grad students are working on a project called ACE, or Adaptive Coach for Exploration, a tool for high school math students that allows them to manipulate and explore constant, linear, power, and polynomial functions. Neilson spent most of her time adding new functions to the program in an experience that has helped fine-tune how she envisions computer science fitting into her future.

Neilson is considering grad school and knows that the project she worked on in the Mentor Project will be a big advantage if she chooses to take that step. "The program was like seeing a day in the life of a grad student," she says. "I didn't know that grad students participated in reading groups, how they were 'housed' in the department in terms of their own personal space, that they sometimes get to go to conferences and how they distribute their time."

Another Cognitive Systems student, Katherine Irvine, was placed with Associate Professor Gail Murphy of the Software Practices Lab in the UBC Department of Computer Science. Irvine worked on an Eclipse plug-in called Active Aspect.

The Canadian Distributed Mentor Project is coordinated by Faith Ellen, a Professor in Computer Science at the University of Toronto and is co-sponsored by the Computing Research Association's Committee on Women.

Soft Skills for Hard Scientists Workshops


Elana Brief

In academic environments, so much time is spent on mastering the subject matter that communications skills are undervalued and often never taught, says Elana Brief, a Research Associate at SFU's Physics Department. To address this problem, Brief, along with UBC graduate students Donna Dykeman and Erin Young, coordinated a series of three workshops for women graduate students and postdoctoral fellows called "Bridging Transitions: Soft Skills for Hard Scientists."

Brief is referring to the fact that by the time women complete their education they have not learned to articulate their ambitions and define a sense of purposeful work. "They receive little to no training in the interpersonal skills necessary to assert and negotiate their visions for themselves effectively," she says. "How is a woman to make a successful transition into a satisfying career if she is wary of voicing her own dreams to herself, let alone speaking them out loud or writing them down?" This ambivalence often comes out in other ways: women undercharge for services, don't put themselves up for promotion, or rationalize their decisions to remain underpaid and under-acknowledged by telling themselves they're working for the love of it, not for the glory (or, by extension, the money).

Brief found the subject compelling when, after completing her own PhD, she sensed her own ambivalence about moving into a faculty position. In fact, she had been reading *Necessary Dreams: Ambition in Women's Changing Lives,* by Anna Fels, when she attended a lecture by Professor Anne Condon at an event organized by the Society for Canadian Women in Science and Technology (SCWIST). Condon discussed The JADE Project, and almost immediately Brief recognized that the project might provide an avenue for hosting workshops that would focus on these types of issues. "I don't know of any programs aimed at graduating women to help them with transitions into professional positions," says Brief. "Because assessment in the sciences is not subjective, it may seem that we function outside of the emotional or personal realm, yet in order to have a highly functioning lab, conflict resolution skills, empathic listening and all those related abilities in communication are necessary."

In one of her first JADE Project-funded events, Brief hired Lil Blume, a communications consultant from Toronto, to develop and facilitate communications workshops for women graduate students in the sciences. In these, Blume points out that everyone has choices. "There's always another way of approaching a conflict. Perhaps seeing that they can look at things in several ways is what students find most comforting about the workshops," she says.

In the "Facing Conflict with Confidence" workshop, participants worked

on finding tools to solve interpersonal conflicts they had in their jobs, classrooms, labs, and families. They soon realized that they were not alone in the kinds of conflicts they faced as women scientists. Blume says her workshops bring out a lot of frustration and often feelings of invisibility among academic women. She says, "Research has shown that not only do men give more attention to men but women give more attention to men as well."

Men seem to have a sense of entitlement about being in their positions whereas women are often more ambivalent about expressing their needs and issues. The Bridging Transitions workshops are helping women strengthen the feelings they may have about their careers and develop communication skills to face conflicts and address others when they feel overlooked or invisible.

Blume and Brief are very active in other projects that foster good science communication. In addition to these workshops and ongoing consulting work, Blume co-teaches an undergraduate credit course called Communication Skills for Computer Scientists for the Computer Science Department at the University of Toronto. For her part, in addition to working with women soon to enter the working world, Brief is also the founder of the UBC chapter of the "Let's Talk Science" program, which matches university students in the sciences with elementary and secondary school teachers to enhance the teaching of science to children.

Girls Just Wanna Have Fun...With Computers?

The building is futuristic, made of unfinished cement and glass. Its corridors are dark and its floors are accessible only by key card. If you listen closely, though, you can hear the unmistakable sound of giggling. It seems like an unusual place for dozens of Grade 6 and 7 girls to be spending their Saturday afternoon, but by the sounds of it, they'd disagree.

These girls are attending the GIRLSmarts workshop, an annual event affiliated with the UBC Department of Computer Science. GIRLSmarts attempts to spark Grade 6 and 7 girls' interest in computing, to raise awareness about careers in the field, and to provide female role models for girls interested in computers. It aims to provide its participants with experiences that use computing technology to go deeper than just "surfing the net." This year, it is being held in the new Institute of Computing Information and Cognitive Systems (ICICS) building at the UBC campus in Vancouver.

Graduate student organizer Viann Chan believes that giving girls an opportunity to have fun with computers while they are young is very important. She attributes her own decision to study computer science to early influences in her life, citing her parents' role in sparking her interest: her mom worked as a database system administrator, and her dad always looked for educational toys like computer games (in the days of early home computers like the Commodore 64) and circuit kits to make different sounds, for example. She also attended a computer summer camp when she was in Grade 6 and math summer school in Grade 7, which challenged her with fun puzzles and taught her how to program with LOGO. She hopes to provide the girls at the workshop with a similar positive experience with computing while they are young.

As I peek into labs and classroom, I see she is well on her way to achieving that goal. In one workshop, the girls become high tech sleuths embroiled in a murder mystery. Using tools such as Google's digitized maps of the world and the well-known Google search engine, they solve a series of "secret questions" that brings them closer to the culprit. The girls work in pairs and brainstorm ideas with their partners in excited whispers. Each team receives their clues from "Google Headquarters," which is staffed by a volunteer. As each team sends her an answer via a secure chat window, "Headquarters" provides them with the next clue. The girls impress me with their resourcefulness, quickly learning how to extract exactly the information they need to use these powerful tools.

In another workshop, the girls get to disassemble—and, of course, then reassemble—a desktop computer, always in pairs. I am afraid to touch anything, let

alone try to take it apart. But the girls roll up their sleeves without fear and dive right in, curiously wrestling with the chips and cables. Computer hardware does not seem foreign to them, but rather seems a natural extension of their hands.

When asked which workshop was her favourite, Robyn, Grade 6, said she liked the hardware workshop because it was so "hands-on" and because she "got a chance to see inside." But the most popular response was the cryptography workshop, which required only a pen, a piece of paper, and some clever thinking. The girls learned different cyphers and ways of encrypting and decrypting messages.

The study of cryptography, perhaps most famous in the 20th century for its usage in breaking Nazi codes, is growing ubiquitous in the 21st for maintaining financial and personal privacy interests. Electronic services requiring secure transmission of sensitive information, such as that found in electronic banking, are increasingly in demand. It is a continuous challenge to stay one step ahead of high tech criminals. The girls are learning the basic concepts behind cryptography and are preparing to perhaps one day take part in this interesting area of computer research. But is this really why the session is so popular? I was curious, so I decided to ask one of the girls.

"Why was cryptography your favourite workshop?" Nathalie, Grade 6, stared at me for a second, obviously puzzled at my ignorance.

"It's very convenient for passing notes in class." Duh!

"Did I mention that I became a mathematician by accident?" said Dr. Rebecca Tyson, a tenure track professor at UBC Okanagan. Given that I'm still without a concrete professional goal and about to enter my last year of undergraduate studies in science at UBC, this comment immediately put me at ease. It was comforting to hear a successful researcher (someone on the other side of the dark tunnel of mystery) admit that it took a little exploration to navigate into the career she loves.

"I actually wanted to study biology when I started my undergraduate degree," she said, "but my father is an engineering physicist and made it clear to me that he thought I should study a more quantitative science." To keep herself and her father happy she took a double major in physics and physiology at McGill University. She quickly found the math portion of the degree to be more fun than the physics part and that propelled her to do doctorate work at the University of Washington with Jim Murray, a mathematical biologist from Oxford. It was there she discovered that she was "turning into a mathematician!" Since then, she has taken on a number of positions exploring applications of mathematics at schools in the US and Canada. Now settled in Kelowna, she started her tenure track at the University of British Columbia Okanagan in 2003.

One of her goals at UBCO is to encourage young women to follow in her footsteps and go on to interesting careers in science or engineering. This January she led a one-day workshop entitled, "A Career in Science: Workshop for Female Undergraduates," meant to interest female students in a career in science past the undergraduate level. The focus was to dispel stereotypes and show that science careers are consistent with a "well-rounded, feminine lifestyle." The workshop hosted speakers from academia and industry and consisted of group discussions and networking sessions. Tyson explained that the most successful part of the workshop was the small group sessions, in which groups of five or six undergrads were partnered with a faculty member or grad student.

Conference participant Jennifer Hawrylo felt the conference was valuable. She really enjoyed the panel discussion and hearing the personal stories of how successful women got to where they are today. In the small group session, her mentor was Sylvia Esterby, head of the mathematics department. Hawrylo says that it was "an amazing opportunity for me, especially as a math major, to get to speak in a relaxed setting with a role model that I might have been too shy to approach on my own."

Next year, Tyson hopes to find even more mentors for the small group ses-

sions, including representatives of the community and industry. She also wants to provide an opportunity for more informal discussions in a social setting where students can approach a mentor regardless of the field that interests them.

Another UBCO Jade Project event on the horizon is a half-day "Women and Ambition" workshop facilitated by Lil Blume, who spoke last year at Jade Project workshops at UBC Vancouver. Through that workshop, she wants to reach those women "who are just plain frightened at the idea of trying to survive a career in the sciences."

One of the things she hopes the young women take away from both the January conference and the other Jade Project initiatives is an understanding that pursuing a career in the sciences is harmonious with raising a family, etc. For Rebecca, loving math and having a successful personal life are not at odds. Her website boasts a section called "Math in My Life," in which she relates amusing stories (and of course diagrams) that describe how she has used math to solve real life problems (if you're interested in reading some of her stories, visit http://people.ok.ubc.ca/rtyson/Teaching/index.html). She has successfully amalgamated a career with marriage, her children, and her hobbies, such as sailing. When she talks about her career in math she talks enthusiastically about the flexibility that it affords her. "I don't need to run into a lab at midnight to take care of some bacteria or other animals, and my computer programs can work away while I'm sleeping or doing other things. I can work from home very easily and juggle my schedule around my children's schedule."

"So what was it like working at UBC Okanagan," I asked, curious about our new sister campus. The fact that Kelowna is not a big city, she says, means that her home was not expensive! She has mixed feelings about being the "only fish in the pond," as she puts it. Because UBCO is a smaller institution, she is the only one at the university working in her particular field of research. "The hard part is if you get stuck," she chuckles, alluding to the fact that physically, there's nobody right around the corner, and she doesn't have a lot of colleagues to bounce ideas off and consult with. But the pros include getting her pick of the projects! She notes, too, that she is part of a wider community of scientists, including colleagues with various specializations at UBCO, Thompson Rivers University, and the Pacific Agri-Food Research Centre in Summerland, BC.

As the interview began to wind down, I still had a few questions I wanted to ask. Just how should one go about pursuing a career like hers, I wondered. "Don't slam any doors," she said. When deciding where to study and what kind of undergraduate and graduate work to look into, it's important to pick a location, and a supervisor, which will give you the right amount of nurturing. Some people flourish within competitive re-

search groups, which tend to be found at bigger universities. Others excel in a smaller place, like UBC Okanagan, where they are more likely to be nurtured in a much more personal way.

Once you've chosen the right supervisor and environment for you, she describes enthusiasm as another important ingredient. "The quality of a project and your dedication to it can be more important than the reputation of your university." For example, the Natural Sciences and Engineering Research Council of Canada (NSERC) provides grants to both students and professors and is an important source of funding for research in Canada. In Tyson's experience, NSERC awards go to all types of institutions, not just the most prestigious ones.

Women and Negotiation: Getting What You Want Starts With Knowing What You Want

"Most women are under the mistaken impression that if they do good work at their job, they'll automatically be rewarded with a salary increase," says Julie Stitt, who facilitated a JADE-funded negotiation workshop for women. "The consequence is that women don't ask for what they deserve," she explains. During her thirteen years in career development and human resources development, Stitt has observed that many women don't do the background research to find out what their work is worth and what compensation they actually need to make them happy in their employment.


Negotiation Workshop

On July 15th, 2006, forty UBC and SFU women graduate students and postdoctoral fellows in science and applied science participated in Stitt's JADE-supported workshop entitled "Negotiation and Alternative Careers in Science." This was one in a series of workshops called "Bridging Transitions: Soft Skills for Hard Scientists," run by Elana Brief (postdoctoral fellow, Physics, SFU), Erin Young (PhD candidate, Physics, UBC) and Donna Dykeman (PhD candidate, engineering, UBC). The workshops seek to help women develop skills that they would not have acquired elsewhere, yet are essential for finding good employment, communicating well, and managing their own imminent life transitions.

"The women attending the workshops are passionate about working in science, but face barriers in imagining their futures. During the workshop we learn from each other's experiences, recognize that everyone is facing similar challenges, and become proactive in designing how we want to live our lives," says Stitt.

Miryam Elouneg-Jamroz, a MSc Candidate in physics at UBC, summarized some of the lessons she learned from the negotiation workshop. "It's essential to know what you want first, before negotiating. If you don't know what you want, you won't know whether the offer meets your needs." Based on the workshop, she's advised friends who were seeking jobs. Many of her friends were convinced that the advertised salary was non-negotiable. Elouneg-Jamroz encouraged her friends to determine what their experience and knowledge were "worth." In one case, after considering what Elouneg-Jamroz said, the friend made a quick phone call to a potential employer and received 15% more than the advertised salary. In all cases, the friends took the time to think about their own value and approached their negotiations with more confidence.

"We're not taught these skills in our graduate courses," says Vidya Kotamraju, a MASc Candidate in engineering at SFU. Kotamraju was surprised to learn that in some fields in engineering, women are paid significantly less than their male colleagues who are doing the same work. The workshop gave her guidelines for how to enter into negotiation. "I'm not looking for a job now," continues Kotamraju, "but I'll be reading through the handouts carefully in the future."

Michelle La Haye, another MASc Candidate from engineering at SFU, came away from the workshop with strategies for ensuring that she receives what she negotiates. "One of the strongest lessons I learned was that anything that is negotiated needs to be written down, because you never know if the person who hired you will still be there when you start a job," says La Haye. Since the workshop, La Haye became aware of friends who received verbal promises in negotiation that weren't honoured when the job started. She advises: "If something is worth negotiating about then it is worth getting it in writing."

Compensation goes beyond salary. "Do you need flexible hours because you have a young child? Do you want more vacation time? Would you like to work from home for some of your hours? Are there conferences you want to attend?" Stitt asked the workshop participants. "The hard work is discovering what you need for your career and career development. Once you've figured it out, negotiation is straightforward." Ultimately the employer wants the employee to feel adequately compensated: a happy employee is an effective one.

The Bridging Transitions workshop series is meeting the needs of women graduate students and postdoctoral fellows from science and applied science. As evidence, at the end of the negotiation workshop, all participants indicated that they would recommend the workshop to a friend, and they all agreed that what they learned in the workshop would be helpful in their professional and personal lives.

Elouneg-Jamroz sums it up: "The women attending the workshops are passionate about working in science, but face barriers in imagining their futures. During the workshop we learn from each other's experiences, recognize that everyone is facing similar challenges, and become proactive in designing how we want to live our lives."

Bridging Transitions was funded by JADE and the Society for Canadian Women in Science and Technology (SCWIST). "Negotiation and Alternative Careers in Science" was also sponsored by Vancity and Networking Engineering Women at UBC. Computer and website support was provided by SFU.

Welcome Women in Engineering Physics


Anja Lanz

"When I started in Engineering Physics, female enrolment was only 6%," points out Anja Lanz, as I speak with her outside a classroom on the quiet third floor of the physics building. She is immersed in a study group, but takes the time to fill me in about a new initiative she is spearheading at UBC. Called Women in Engineering Physics—Recruitment and Networking, it is designed to welcome more women into the program and make them feel at home. Lanz believes this initiative can alleviate the kind of isolation she felt when she was first a student in engineering physics.

One of the most successful components of the initiative, Lanz tells me excitedly, is her creation of an email list for the women in the program. Because privacy issues prevented UBC from releasing email addresses, Lanz personally tracked down each woman in the program to ask for her contact information. While it was quite a bit of work, it was also a blessing in disguise, because it gave her the opportunity to introduce herself to everyone and to obtain the email addresses they actually check! The email list serves as the perfect vehicle for important information such as the accomplishments of other female students, meeting dates, and available funding. Lanz describes this information sharing as "crucial."

The Women in Engineering Physics group also sends representatives to career fairs to provide information on support networks for women in engineering, and it reaches out to high school students. It has been an interesting evolution for Lanz and the group, whose original proposal called for creating a social network. However, due to excessively busy schedules, the women couldn't meet as often as they liked. So instead, the clever organizers refocused the group on two main goals: providing information to current female students and reaching out to potential female students.

Lanz finds a crucial ally in Dr. Andre Marziali, the head of the engineering physics program. She says that she couldn't have done all this work without him! He recognizes that much more needs to be done to make a program that is more inclusive to female students. Much of the problem, he feels, is that there is a lot of confusion about what is involved in Engineering Physics. According to Marziali, a lack of definition of the program discourages women more than men. Most people don't understand exactly what engineering physicists do, which is understandable because many of their projects are highly interdisciplinary. For example, one of his research projects involves techniques from genomics, electrical engineering, and nanotechnology to isolate genes from DNA—something

that would be very appealing to female students. Moreover, previous recruitment material was created by men and exclusively featured pictures of men.

These things contribute to very low female enrolment. One way he is trying to address ambiguity about the program and the discouragement of woman applicants is by striking a committee of female engineering physics students who will provide input into departmental recruitment material and the website.

Another positive change pioneered by the group is the creation of a Female Student Representative to the Engineering Physics Department. Among other duties, the representative acts as a liaison between the department and female undergraduate students. Lanz has filled this position since its inception. Marziali tells me that having a liaison has been valuable for providing input to the department and support to female students that are more comfortable bringing their concerns to a woman.

Despite her grueling course and lab work and her numerous involvements, Lanz approaches her work with passion and dedication. And it is working! She tells me that while her initiatives are indeed controversial, she finds her projects very rewarding. When she first advocated for such things as a female Engineering Physics liaison, she was met with opposition. Women in the program were concerned that these changes might make it seem that women were being given an unfair crutch or being treated more easily than their male counterparts. However Marziali and Lanz were able to address these concerns by providing a clear definition of the Women in Engineering Physics mandate. They reiterated that the main goals would be information distribution and outreach, goals that everyone could get behind.

As a student of mathematics, surrounded by predominantly male classmates, I cannot help but relate to this feeling of isolation. Maybe it is partially because of her compelling stories and pragmatic demeanor, but by the end of our conversation, I agree with her. Creating an atmosphere that makes women feel more included is crucial to maximizing their productivity, success and happiness. A full year into the initiative, it is hard to argue with the statement that Lanz is effecting real change. With the support of Marziali and volunteers, she is making the experience of females new to Engineering Physics more positive, so that they can get the most out of this rigorous and fascinating program.


Naoko Ellis

What fuels Dr. Naoko Ellis? Apparently, French fry oil and the development of more sustainable and environmentally responsible energy sources! In waste cooking oil, Naoko sees the source of a cleaner fuel for the future.

Ever since she was a kid, Ellis has been concerned about issues of waste. Her mother, a professor of chemistry, inspired her to learn about waste management techniques in chemistry, chemical engineering, and environmental engineering. Now, as an assistant professor in chemical and biological engineering at UBC, Ellis conducts research into alternative energies. One of her unique projects involves the production of a natural fuel called biodiesel from none other than used cooking oil. The project started when two of her students brought forth a brilliant idea for converting used French fry grease from campus food outlets into a useful energy source.

She is on the leading edge of research that could help address the number one concern of Canadians today: climate change. Biodiesel produces less carbon dioxide than gasoline based on the life cycle analysis. But it also has lots of other benefits, both environmental (such as the fact it is non-toxic and biodegradable, so spills would not be harmful to wildlife) and political (such as the fact that it can be produced locally). It also eliminates waste—what could be better!

Now the team has developed a way to convert the waste oil from UBC Food Services, which serves food to thousands of students each day, into biodiesel. The UBC Plant Operations team has already started to use this biodiesel in their lawn care equipment, for example. To read more about this initiative and about how "French Fries Fuel the Future," you can go to the following link:

www.eya.ca/files/attachments/10_French_Fries_Future.pdf

In her free time, Ellis was key in instituting a creative program called North of 60°. Through North of 60°, she hopes to bring the principles of sustainability to high school students in northern British Columbia and the Yukon. "We wanted to reach students who have less exposure and accessibility to things that were perhaps more available in the lower mainland," she says. She and her teams of volunteers visit areas in northern Canada, where they conduct multifaceted workshops with students in grades 8 through 12.

Students learn "how can science and engineering make a difference" through the example of Ellis' biodiesel initiative. As a case study of how scientific innovations can make a difference, students discuss how the biodiesel initiative was started and how it can be implemented in other communities.

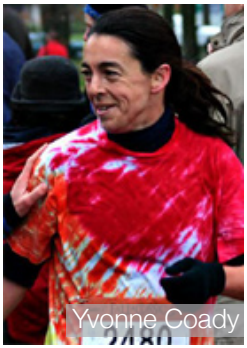
Then the volunteers present a unit on water quality in developing nations. This is accompanied by a hands-on project on water filtration techniques. Students also participate in a brainstorming session about how science and engineering can relate to their lives. The volunteers also have a chance to tell students about their own personal interest in sustainability, science, and engineering and how the students can go on to pursue their own interests.

Ellis hopes to help girls in the region build confidence in their engineering and science skills, and to support them in their aspirations in those fields. Females tend to be particularly interested in environmental and international development issues, and Ellis feels she can empower young women in the north in tackling these issues.

What's next for the North of 60° program? Ellis hopes that next year they will be able to visit the Northwest Territories.

Her advice for someone who is interested in getting involved in a career like hers is to "be curious!" "Explore your interest and possibilities. Reach out, approach and ask questions to role models that you may come across. Engage yourself in many different things and situations and find out what excites you." Excitement seems like the natural fuel that drives Ellis to improve the world.

Computer Scientist Helps Youth Explore NEPTUNE


Yvonne Coady

Dr. Yvonne Coady does something very cool using computer science at the University of Victoria. In fact, Coady is frequently invited to conferences all over the world to discuss her research in "improving the modularity of computer systems." With three computer science courses under my belt, that sounds as mysterious to me as it probably does to you. However, there is no debating that she and her Mod(ularity) Squad work on the cutting edge of computer science research.

However, unlike some professors who spend all of their time in the lab, Coady is not just a brilliant researcher. She also likes to run marathons (even though she says she's only made $800 as a professional triathelete). And she also instruments programs that encourage young women and minorities to get involved with computer science.

One example is the outreach work she does at the University of Victoria. In particular, she is interested in opening up the world of science and engineering up to Aboriginal students, because these students, like women, are significantly underrepresented in these fields.

At the CCWESTT Conference, we learned about one particular initiative involving Coady last summer. For three weeks, youth between the ages of 12-17 from a nearby Aboriginal community came to UVic. During this time, Coady and her co-organizers used several different tools in order to encourage the students to learn programming in a fun and creative manner.

The students were first taught about Project NEPTUNE, a series of marine observatories to be built off the coast of Vancouver Island. The NEPTUNE observatories are to house different instruments and will be connected with 800 km of fibre optic cable, so that they can communicate with each other rapidly. Further measurements will be performed by unmanned, remote, undersea vehicles; these vehicles are controlled onshore and can dock at the various underwater observatories.

What are these observatories designed to study? The answer is many facets of ocean science: from plate tectonics and predicting natural disasters like tsunamis, all the way to studying gases in the ocean associated with climate change. With the super high-speed connection between the observatories, data of superb quality can be recorded and transmitted among the stations.

This issue was particularly relevant to the Aboriginal students, because the fibre optic cable is going to be run near some of their heritage sites. Understanding the project might not only get the students excited about technology, but would also involve the Aboriginal community more deeply in something connected to their heritage lands.

As a next step, the students were given LEGO Mindstorms and invited to build their own NEPTUNE-style vehicle to explore the classroom! In three groups, the students built their robot in the first week. During the next week, they were taught the Mindstorms programming language. Students then programmed their robots to perform such tasks as following a line around the classroom or taking "samples" from the environment. These tasks were designed to simulate some of the real tasks the NEPTUNE vehicles will perform.

Students loved the hands-on aspects of the Mindstorms activity. They learned not only about programming and robotics, but about leadership and teamwork—skills that will help them in any field they choose to pursue. As an indication of the three-week project's success, the organizers were approached by two girls who wanted to know how they could continue learning about computer science.

While this is just one initiative that Coady is involved with, the theme of her projects is the same. She wants to spark creativity and excitement with computer science at a young age. She also underlines the importance of doing such outreach work. "One thing I would like to work to change," she says, "is attitudes about the value of working on this challenge, and have it recognized as a viable workload option, instead of something that is always done off the side of people's desks."

And let me tell you, after meeting her at the conference: if there's anyone who can do it, it's Coady! Her bubbly demeanor and palpable passion for computer science is utterly contagious. Though she took a meandering path into computer science (she has a liberal arts degree, as well as a diploma in kinesiology), her work today is nothing short of astonishing. And with her focus on how remote vehicles help tackle climate issues and save lives through natural disaster prediction, she is a real inspiration to the next wave of researchers in these fields.


Alexandra Albu

In the spring of 2007, ten high school girls were shown a different side of engineering. They attended the IMAGERIA workshop, which opened their eyes to image processing and artificial intelligence. The main idea of the IMAGERIA workshop was to attract a "different crowd." The workshop involved computing applications to digital photography, entertainment, and health care—interdisciplinary topics that would appeal to a wider group of students.

In the IMAGERIA workshop, the girls were introduced to elementary image processing techniques. They examined the basic algorithms and were given the opportunity to work on photos of their choice. For example, one of the modules involved digitally stitching together panoramic images. The girls were able to choose from a bank of images or take their own image with a digital camera. They explored not only the technical elements, but the artistic ones, as they selected image content, perspective, lighting, and other factors.

At the helm of the workshop was the University of Victoria's Dr. Alexandra Albu. Albu completed her engineering degree in Romania. In the process, she became inspired by the idea of using medical image analysis to contribute to making people healthier. During her PhD in electronic engineering, which she completed at the Polytechnic University of Bucharest, she studied pattern recognition in medical imaging. Today, she works on several different projects to do with improving human health, including using computers to study the gait of elderly people in order to detect signs that they may experience a fall.

She says that the cultural attitude towards computer engineering in Romania is quite different than it is in Canada, and she was surprised how few women she met in the field when she moved here. She realizes now that she was a little bit "spoiled" growing up by having many female peers in her area of interest. Now, when she goes to conferences, she is one of the few women and this makes it more difficult for her to network.

To help address this problem, Albu has taken an interest in encouraging young Canadian girls to learn more about computer science and its applications. She investigates "new paths into recruiting female students in engineering." The IMAGERIA workshop was born out of a desire to bring the concept of computer vision to high school students, and to demonstrate that engineering at UVic features a collaborative, dynamic learning environment. Furthermore, the workshop showed how engineering reached into the fields of art and health care.

She is helping establish a new vision of computing as something that is engaging, creative, and with far-reaching impacts and the ability to improve lives. And this new vision of computing is attracting attention! One of the important effects of the workshop was to help girls think about the many different careers available for them involving computer science in general and digital imaging in particular. As one participant wrote, “The workshop was a fun and educational experience which will undoubtedly help many of girls in the future careers such as radiology and video surveillance.” These are just two of the many options that Albu and her workshop have opened in the minds of these girls.

Tri-Mentoring for Three-Way Success


Michele Ng

Michele Ng, the dynamic Special Projects Coordinator for the UBC Computer Science Department, is bashful about her role in the success of the department's Tri-mentoring Program, but she shouldn't be! Under Ng's guidance, the program has grown from a relatively modest pilot program in 2002 with 45 participants to a highly successful multi-tiered program boasting 250 participants, including 96 faculty and industry mentors and 154 undergraduate and graduate students.

"The program has been successful," says Ng, "in part because it's one of the few ways students get out of the academic environment and really begin to learn what it's like in the working world." Tri-mentoring, which has been adopted by the Faculties of Arts, Dentistry, Applied Science, and Forestry, and the School of Music and others, has a unique structure. As the name implies, there are three people in the mentoring equation: a junior undergrad, often in his or her first or second year, a senior undergrad, and an industry representative. The senior undergrad receives career advice and counseling from the industry rep and in turn mentors the junior undergrad student. (The program works the same way in the graduate program, with younger and older graduate students and an industry rep working together throughout the year.)

There are several intrinsic rewards in this "triad," according to Ng. The junior students get the value of "insider's information" from the senior students, learning about the best instructors, valuable classes, time management techniques, work-life balancing strategies, and so forth. Senior students are getting a leg up into the world of work and find their industry rep's experiences and advice extremely valuable as they contemplate their first career moves. Ng notes that industry reps will work with the senior students on such things as attending career fairs and site visits, doing mock interviews, preparing a resume, and other career-related activities. As for the industry reps themselves, they have the opportunity to network with other industry mentors, engage in community-oriented work, and recruit potential employees to their industry or even workplace.

The benefits of participating in the program often have a long-term ripple effect. Ng recounts the story of one computer science undergrad who was a senior student mentor in the program. She was hired by her industry mentor upon graduation and began serving as an industry mentor in the Tri-mentoring program. This young woman then recruited another ten industry mentors from her company into the program!

Unlike other mentoring programs where there may be little face-to-face contact

between the participants, the computer science program requires mentors to meet with their mentees at least twice per year for face-to-face sessions. Because such good rapport often develops, many members actually get together far more frequently, with industry reps hosting both of their students at company workplace days and other employee events, accompanying them to career fairs at UBC and other locations, and attending department-sponsored kickoff, mid-term, and end-of-year events.

These encounters benefit everyone, but they appear to be of particular value to female students. According to Ng, women are over-represented in the Tri-mentoring program; in a department where 25% of the student body is female, fully 40% of the student participants are women. At the outset of each year, student participants are given a choice as to the gender of their student and industry rep mentors. Ng estimates that close to 100% of the women participating ask to be matched with women, suggesting that they are eager to see how other women navigate the CS department and career options. And it appears that women highly value the program, as the majority of students who return to the program to become mentors themselves are women as well.

"There are many women in the program who feel that, without their mentor, they might not have stayed in computer science, because it's still widely acknowledged as a male-dominated industry," says Ng. She also notes that having a mentor helps contribute to the kind of friendly, helpful atmosphere that sets the CS department apart. "It's like having a small college experience inside a large, relatively impersonal university," she says with a smile.

The Tri-mentoring program additionally provides volunteer opportunities for CS department students. Each year, the Computer Science Coordinating Committee (CS3) and its graduate student counterpart, the Computer Science Graduate Student Association (CSGSA), nominate four Tri-mentoring representatives. These representatives form a steering committee to assist Ng in the complex, time-consuming task of matching the three members of each triad. In addition to helping with this valuable work, these committee members are also responsible for a number of creative projects to help strengthen the Tri-mentoring relationships. One recent project, for example, is the "speed mentoring" get-together, where, as in speed dating, mentors and industry reps are paired for quick, ten-minute conversations and then dispersed for their next face-to-face encounters. Speed mentoring has proved so successful that at the last Tri-mentoring event, industry reps noted they could barely mentor their counterparts in the crush of attendees!

With the Tri-mentoring program's continuity assured, Ng is focusing on integrating it into the full package of career placement services being offered by the

department. With a laugh she says that the success of the program has resulted in a large fraction of graduating mentors becoming industry reps and "giving back" to the program, noting that she may have to step up her efforts to recruit younger students so that there's no imbalance in participants. Given her energy and talent, it's easy to envision a large group of first- and second-year students entering the Tri-mentoring program next year!

--Karen Parrish

Profiles

Associate Professor Gail Murphy on Why Mentors Matter


Gail Murphy

Associate Professor Gail Murphy is an excellent example of how the right mentor can change your future. After completing a bachelor's degree from the University of Alberta, Murphy worked for five years as a software developer before she considered pursuing her master's. Until she met her advisor David Notkin at the University of Washington, she had no intention of undertaking a PhD. "As a supervisor he has the ability to really hone in on people's strengths and be honest about their weaknesses," she says. Inspired by Notkin, she did continue on to a PhD and now as well as being a respected researcher, she is, in her own words, "helping others reach their goals" by supervising her own graduate students.

Murphy believes the most important factor in choosing a mentor is finding someone with whom you can communicate. "You need to pick someone you're comfortable with, someone who's further along the path than you and hopefully someone who's on a path that taps into what you're interested in doing in the future," she says.

Murphy notes that many students and laypeople are blindsided by the term "research," a term that's an immediate conversation-stopper because it suggests someone working alone in a corner at a university. In fact, says Murphy, the benefit of doing a master's degree in computer science at a Canadian university is that students typically complete a significant research project. This is important because through the process one develops not only technical skills, but skills in communication, presentation, and project management as well.

"In the end, students could find themselves as a leading technical person in a company or a leading researcher in their field, the head of a department at a university or the Chief Technical Officer at a company as just a few examples of the diversity of where their education may take them." She views getting a graduate degree as a prime networking opportunity. Fellow students go on to an amazing variety of careers and that's why choosing a "good" school to do graduate work is important. "When, I look at what students have gone on to do, I feel like I played some small role in that," she says.

Rebecca Tyson: Using Mathematical Biology to Solve Real World Problems


Rebecca Tyson

Earlier this fall, I interviewed Rebecca Tyson regarding her workshop "A Career in Science: Workshop for Female Undergraduates," which she led at the University of British Columbia Okanagan, where Tyson is a tenure track professor and researcher in mathematical biology. In the process, I became fascinated by this dynamic woman's research and the exciting prospect of using mathematical biology to solve real-world problems and as a result, I wanted to know more.

One of Tyson's research projects is in collaboration with scientists at the Pacific Agri-food Research Centre (PARC) in Summerland, BC. PARC is one of several research stations run by Agriculture and Agri-Food Canada, Canada's federal agricultural program. The stations use science to solve real problems faced by the Canadian agricultural industry.

One of the largest problems facing farmers in British Columbia is pests, which destroy crops and transmit viruses. Farmers' fields are typically sprayed with multiple chemical treatments, the environmental and health impacts of which are only beginning to be assessed. Moreover, within a few seasons, pests develop resistance to chemical treatments, which makes their efficacy questionable. Developing safer, more responsible and potentially more effective alternatives to chemical pesticides is one of the primary goals of the federal agricultural research program and PARC Summerland.

The Sterile Insect Technique (SIT) is one such alternative for killing pests. It is designed to combat the codling moth, a common problem in fruit orchards. SIT involves the release of large numbers of codling moths that have been bred in a laboratory to be sterile. The sterile moths then mate with their non-sterile counterparts in the wild, which then lay unfertilized eggs. So how does Tyson, with her expertise in mathematical biology, fit in? Tyson uses mathematical modeling to investigate how moths disperse in nature. She creates two kinds of simulations, one that models the population trends of moths over a large landscape, and the other that models the local behaviour of individual moths. Her models take into account complex factors such as wind direction and help scientists and farmers understand how to make the SIT treatment more effective.

Learning of her involvement with PARC was a lucky coincidence, because for the past four summers, I worked at another of the research stations, located in my hometown of Agassiz, BC. There, I also investigated alternative methods to using pesticides on fruit. Our approach was to find plants that conveyed natu-

ral genetic resistance to pests and then breed those with commercial varieties. My research group used recently-developed in vivo biology techniques to quickly replicate potentially resistant plants for testing, whereas Tyson uses mathematical principles, and her tools are a "good computer, a good library, and pencil and paper." Our methods were different, but our goals were the same.

Seeing how Tyson conducts her work and thinking about my own makes clear to me that the complex and commercially significant problem of developing pest management techniques is being tackled from many different angles. "The best solutions," Rebecca notes, "are obtained when mathematicians and biologists work together, with the mathematical model informing experiments and vice versa."

Croft Finds NEW Friends, Crafts Behaved Bots


Elizabeth Croft

Elizabeth Croft's office is like an oasis in the sleekly sterile and intimidating Civil and Mechanical Engineering building. Clever jokes and cartoons adorn her door, telling me from the moment I spot them that this will be an interesting interview! Croft definitely has a sense of humour, a quality that has allowed her to cope through all of life's challenges.

Croft also contrasts with my other interviewees in that she has known from a very young age her direction in life. She drew her inspiration from a family friend and mechanical engineer, Dr. Phil Hill. Hill showed her schematics of the 767 aircraft prior to its production, fascinating Croft and giving her a glimpse of mechanical engineering and its many possibilities.

Croft did her undergrad in engineering at UBC, her masters' at Waterloo and then her PhD at the University of Toronto. She began to look for jobs while she was expecting her first child. She was so close to her due date when she boarded the plane for her interview at UBC that she needed a doctor's note certifying that she could travel! Walking into the interview, she noticed the looks of surprise on the men's faces and remembers that Maria Klawe, then head of the CS department, had just one piece of advice: "Don't worry about getting the job – that's not a problem. Worry about finding a nanny!"

Croft was awarded a faculty position at UBC and she embarked on the toughest year of her life. Moving to Vancouver the day after defending her PhD, she had to find a place to live, cope with new job and a new baby at the same time. Isolated because there were so few female engineering faculty members at UBC, there were times when she would go out to her car and cry with frustration!

Croft began to reach out to women in industry, helping her realize there were others having similar experiences. She also began consider the necessity of reaching a "critical mass" of women in a department. Croft ideally believes that at least 30% of faculty and students should be women. Mechanical engineering, at only 11%, had a long way to go. To help build toward a better future for women in the department, in 1995 she began to work with the Division for Advancement of Women in Engineering and Geoscience (DAWEG), which later gave inspiration to her founding in 2005 of Networking Engineering Women at UBC.

Croft is involved in a number of initiatives through these organizations. NEW provides information through a mailing list and website and organizes professional female engineers to speak about

their personal experiences. The annual Salary and Closing the Gap seminars attempt to address the disparity in wages between men and women in engineering, helping women learn to better advocate for themselves around salary issues and become more career-savvy in general. Croft also organizes year-end retreats for female students and faculty in engineering, providing a venue for networking and learning from one another.

In her own work, Croft has carved out a niche in the world of human-robot interaction, a field with considerable importance as industries increasingly rely on automation. A robot these days isn't a cute, 50-lb, C3PO-like creature twittering about on little wheels, but rather an enormous machine capable of crushing tonnes of metal in an industrial setting. Safety issues are paramount when people work around these robots. Croft's work involves determining the types of non-verbal communication that occur in normal human-human interaction, so that non-humans can be "trained" to pick up on those cues. For example, if two humans are moving a desk, one mover can tell when the other's arms are shaking and can thus prepare to put the desk down. Croft records heart rate, skin conductivity, and facial movements, correlates them with "distress," and programs the robot to understand these responses so that it can determine the comfort level of its human companions. That way, if an employee becomes uncomfortable with how quickly a robot arm is approaching, the robot can automatically reduce its speed or back off entirely. A video of how Croft's robots are being programmed to interact with humans is available on the Knowledge Network's "Leading Edge" series (see http://www.knowledgenetwork.ca/leadingedge/2008/index.html).

Elizabeth and her team have made great innovations in making robots more polite. However, she reminds me that "artificial intelligence is only as smart as the people who design it." Good thing Elizabeth is in charge!

How To Do Everything: By Dr. Maria Klawe


Maria Klawe

"You can do everything you want to in life, but not at the same time," says Dr. Maria Klawe.

There's something about this dynamic woman that makes you believe it, even without knowing her impressive credentials. That innate ability to convince us that we can achieve great things – through words and example – is part of her success as a leader. And what a leader she is!

I first met Maria Klawe on my very first day at UBC. Back in September of 2002, she was the Dean of Science and hence the keynote speaker for the first year science orientation session. I still remember her remarks: university was going to be hard, but rather than discouraging us, this reality should only make us work harder. Klawe told us that a step to success in life was picking something at which we were terrible and working diligently until we conquered it. One such impossible task for her was to learn how to juggle. Putting down her microphone, she picked up a set of juggling balls and began to juggle away! The inspiration was palpable as we left the auditorium that day.

Five years later, I was offered the opportunity to meet with the very same Maria Klawe to talk about her role in the Jade Project. In the meantime, Klawe's dedication to undergraduate education had first led her to serve as Dean of Engineering at Princeton University and then to become President of Harvey Mudd College. Humbly referred to as "Mudd," the school specializes in providing a well-rounded education to talented science, mathematics and engineering students. At the time of our interview, she was back at UBC to give a lecture entitled "Gender, Lies, and Videogames," in which she discussed issues such as why fewer girls choose to pursue computer science.

Our conversation offered me a rich story of her background. As an undergrad, she chose to study math because she was intrigued by the honours math classes offered at the University of Alberta. After second year, she took a break from university life and traveled for a year and a half – during which time it became clear to her that she really did love math. She came back to the university and requested with characteristic spunk that they let her start her PhD straight away. The university allowed her to finish up her degree with graduate courses and she completed her doctorate in mathematics. To this day, she is still finding creative ways to involve math in her numerous projects.

Among those I found the most interesting were the EGEMS Project and the UBC Aphasia Project work with her good friend, the late Anita Borg. EGEMS, or "Electronic Games for

Education in Math and Science", are cutting-edge educational games for engaging 9- to 14-year-old students in math and science. Of particular interest to me was the fact that Klawe's group analyzed the differences in gaming styles between the genders. They found that girls "progress more meticulously," meaning that they like to take more time exploring, whereas boys like to complete levels more quickly. This certainly described my tendencies! Klawe and the EGEMS developers took this into account when they developed their software so that both types of gaming style were supported. I thought that was a great new twist on educational gaming!

Another interesting initiative started by Klawe was the Aphasia Project. In 2000, Klawe found out that her good friend Anita Borg had brain cancer. As a complication, Borg developed aphasia, a condition that interferes with the brain's ability to process language even while mental faculties remain unaffected. This can be hugely frustrating and reduces quality of life. Klawe and Borg, herself a brilliant computer scientist, teamed up and initiated a project to develop computer-assisted technology to help people with aphasia carry out basic daily tasks, such as remembering meetings and appointments. For example, one prototype technology to come out of the initiative is a portable scheduling device that helps marks dates with sounds and images, which people with aphasia can interact with more easily than with language. Sadly, Borg passed away in 2003, but not before she helped others cope with aphasia.

Klawe and Borg certainly have accomplished a lot. So I ask her: how exactly do we accomplish everything we want to? The key, she says, is living life in phases. For example, she and her husband did the "social thing" until they had kids, at which point they both made spending time with their kids a top priority until their youngest was in kindergarten. Then Klawe started to enjoy her favourite leisure activities such as running and painting. "Take advantage of whatever phase you're in," she says with a smile.

Even when in her child-rearing phase, Klawe still found ways to inspire her kids to enjoy mathematical thinking. She notes that her two kids became "guinea pigs for teaching mathematics." She also admits that a lot of the inspiration for the EGEMS games came from watching her children play games. Her efforts nurturing mathematical interest in her kids seem to have paid off. She tells me the story of her daughter, Sasha, whose passion is for international development. Sasha is studying at UC Berkeley and recently spent a semester in Cape Town, South Africa, discovering that her strong math background is valuable in her courses on African economics. This is just one example of how mathematics surprisingly winds up in diverse careers.

If you're interested in pursuing a distinguished and fascinating career like

Klawe's, you can follow her advice to a girl in grade 9 or 10 interested in following in her footsteps. "You can never learn too much mathematics," smiles Klawe. "It's like sports; you lose proficiency if you don't practice it."

Unlocking Imagination


Cecilia Moloney

It was a dark and stormy night and I was in a secluded cabin deep in the forest. Well, actually, it was a moderately bright spring day at the University of Guelph, Ontario and I was attending the CCWESTT Conference. But as Dr. Cecilia Moloney spoke, I was mentally imagining the scene she described. She is trying to show us how capturing the imagination can get people engaged, and it is working. She has caught my attention and has me very curious. Women now make up the majority in universities today, she says. Because progress has been made, the perception is that the problem has been solved and that efforts should be diverted elsewhere. However, enrolment of females in the physical sciences, engineering and trades is still disproportionately low. Now that many of the external barriers to women accessing these fields have been lowered, it seems that what's missing is engagement.

She asks herself, is there a better way to engage women in science and engineering? In her research, Moloney is dedicated to logic and precision. She is a professor of Electrical and Computer Engineering at Memorial University in Newfoundland. However, when it comes to inspiring others to study science and engineering, both as a professor and as the Chair for Women in Science and Engineering for the Atlantic Provinces, she has a different approach and believes that imagination and motivation can be tapped as inspiration for women.

Moloney believes that this fast-paced generation is characterized by a need to study various types of problems in new and exciting settings. Enticing women with money, she says, is not very effective; it's the challenges that make them excited. Also, as we can see from the incredible popularity of campus clubs such as Engineers Without Borders, many young people have a global conscience. Don't just ask what studying science and engineering can do for you, she says. Ask what it can do for your kids, your family, your city, your country, and for the world!

Moloney also speaks to us about the importance of unlocking imagination. She tells us about a course at Smith College where engineering students are asked to write narratives throughout the term. These narratives ask questions such as, "What is engineering and how do you see yourself fitting in?" Students who took this course experienced a greater sense of ownership in their studies and also demonstrated higher retention of material. In a similar fashion, Cecilia Moloney challenges us all to write our own narrative. Just imagine how you could make a difference in the world by studying science and engineering….

Hiromi Matsui: Leveling the Playing Field


Hiromi Matsui

Hiromi Matsui has been passionate about working toward equality for a long time. Despite the fact that Matsui's parents were born in Canada and were Canadian citizens, the Canadian government forced them and thousands more during World War II into the Sandon, B.C. internment camp for Japanese-Canadians. Since that time, the Canadian government has acknowledged its wrongdoing and apologized. That chapter in history heightened Matsui's interest in social justice for under-represented groups, leading in turn led to another decades-long cause, advocating for equality for women.

Matsui received her master's degree from the London School of Economics. Even at that early stage in her career, she was excited about how women's participation in the workforce brings economic benefits to society. Her thesis was entitled, "Working Women in France, Canada, Japan, and the U.S."

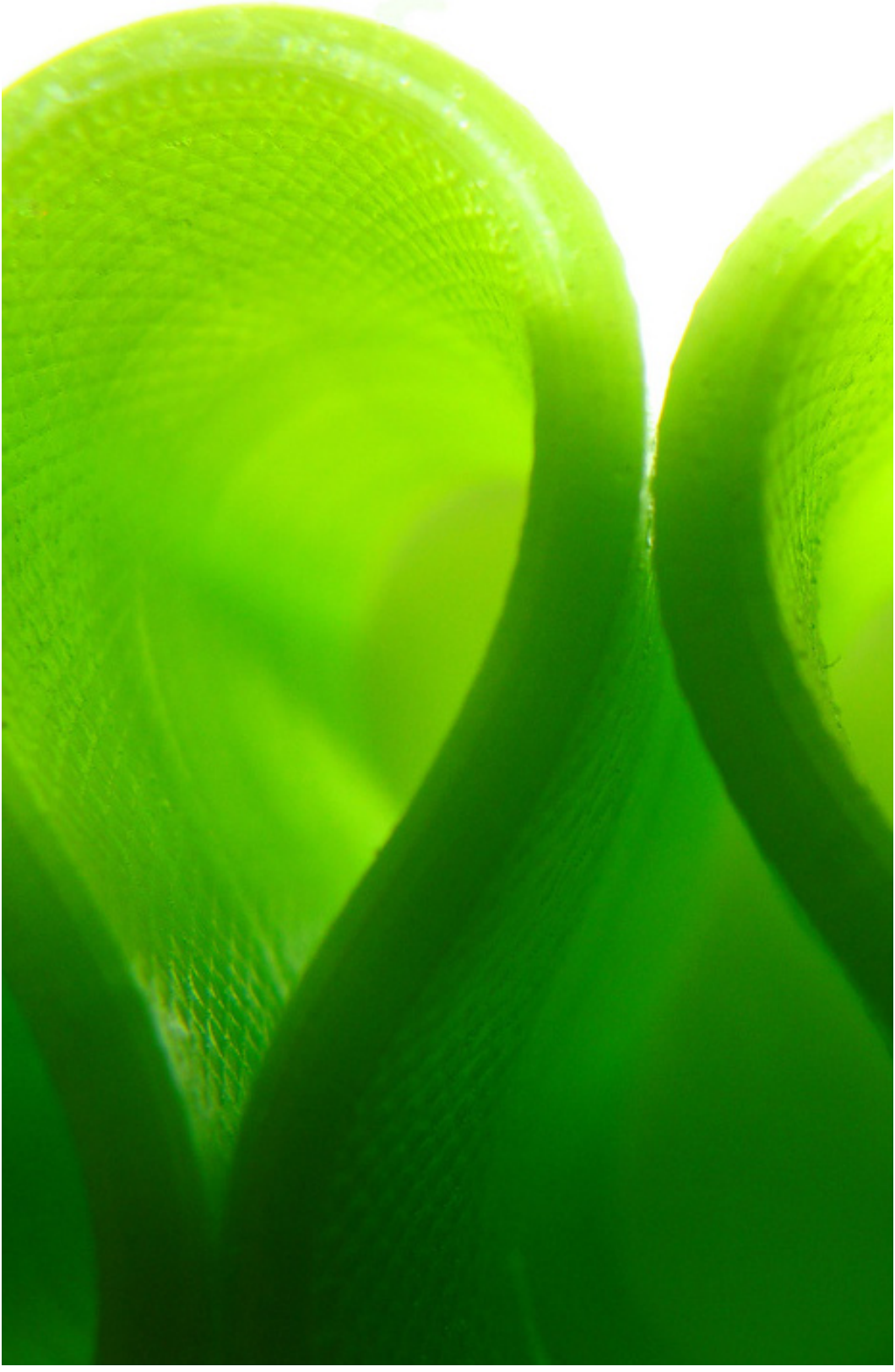
Since graduation, she has held so many positions that have expanded opportunities for women that I can't even begin to name them all! For this article, I will write about a few of her accomplishments. For example, she was the Engineering Science Internship Coordinator at Simon Fraser University. In this position, she interacted with employers and discussed the importance of providing an "even playing field" for female employees. Today, Matsui is the Faculty of Applied Science Director of Diversity and Recruitment at SFU and her enthusiasm for the cause has grown.

Matsui believes in the strong business case for the increased participation of women in science, engineering, trades, and technology. At its crux, "diversity in the labour force improves economic performance," she says. As part of the WinSETT Initiative, she has worked toward policy changes to improve the "recruitment, retention and advancement of women in science, engineering, trades and technology."

With the current high-tech labour shortage, encouraging women to develop these skills and pursue these careers can have important economic benefits for the province and the country. Due to her insights, Matsui was invited to join a panel for the Applied Science Technologists & Technicians of British Columbia and discuss how to deal with the technology skills shortage in British Columbia.

In order to spark an interest in science, engineering and technology, Matsui participates in events that encourage women of all ages and levels of education. For example, to foster an early interest in computer science for young girls, she volunteered with the ChicTech project. She has also served as president

of SCWIST, the Society for Canadian Women in Science and Technology, and as president of CCWESTT, the Canadian Coalition of Women in Engineering, Science, Trades and Technology. In 2007, in honour of her distinguished career, she received the YWCA Woman of Distinction Award in Technology, Science & Industry.



Competitions

First Lego League Competition: An Intense Learning Experience for Elementary Students

In a two-story, red brick schoolhouse on the west side of Vancouver, a group of students - young scientist wannabes - are celebrating their participation in the First Lego League championships held at Carson Graham Secondary in North Vancouver earlier in the Fall.

As the lunch bell sounds and the pizzas arrive, so too does coach Anne Condon, a professor in the Department of Computer Science at UBC, the NSERC/GM Chair for Women in Science and Engineering for British Columbia and Yukon, and a parent of one of the team members. Kim Thomas, a dedicated parent volunteer with two kids on the team, is in attendance as well, praising the kids for their accomplishments and helping them review what they learned on this after-school project.

For two months, Condon (who is on a year-long sabbatical from UBC) and Thomas worked with the team of nine, mainly Grade 6 and 7, students. Fifty percent of the students chosen were girls, because according to Condon, girls approaching the age typically begin to lose interest in math and science subjects. Hopefully, these girls' involvement in the project will help spur a continuing interest in these subjects.

First Lego League is an international program for children ages 9-14 that combines a hands-on, interactive robotics program with a sports-like atmosphere. Teams of up to 10 players use


Queen Mary Team

team building, problem solving, creativity, and analytical thinking to accomplish a specific mission using LEGO MINDSTORMS technology. They also develop other skills such as learning to search the web, talk with scientists, use library resources, and develop and make presentations.

Team member Michelle Kunimoto, Grade 7, said she liked the idea of being on the team because she likes solving puzzles and logical problems. Grade 6 friend Hannah Reid said the hard part about the project was in predicting what was going to go wrong and how to work around those problems in programming the robot. Angus Lim, in true scientific form, was still analyzing the team's performance, wondering if the slightly tilted table his team was assigned had anything to do with their robot's less-than-speedy response time. Overall, when the robots completed their missions (or not) in three 2.5-minute rounds, the young scientists took 10th place out of 24 teams.

When asked if he thought it would have made a difference if boys and girls had

been on separate teams, Peter Thomas, a Grade 5 student, said with insight beyond his years, “I don’t think it’s a gender problem, it’s more of a person problem.” He was referring to the importance of teamwork and other team members agreed. As in life, working together seemed to be the biggest learning experience of the competition.

--Gale Mavor

CS Undergrad Leads Kits Secondary Students in FIRST Robotics Competition


Lois Chan

Lois Chan, now a third year UBC computer science student, worked last year as a mentor to 30 Kitsilano Secondary students, preparing them to compete in the FIRST Robotics Competition, an international robot design and competition challenge for high school students.

Chan is the perfect mentor for these students, having participated in the robotics competition Canada FIRST when she was in high school. In that event, fully 11,000 students, teachers and engineering mentors from across Canada and California participated. Canada FIRST existed for ten years before a lack of funding forced its closure. Today, Kits students and others from Vancouver participate in the US FIRST Robotics Competition, with 28 Canadian teams competing in a three-day regional event in Toronto. MDA and UBC were the major sponsors of the Kitsilano teams, allowing ten student competitors and their coaches per year to compete in Toronto for the past two years.

The FIRST Robotics competitions are high-tech spectator sporting events in which teams build a robot from a common set of parts and, under a common set of rules, engage in competition with other teams. The projects require focused brainstorming, real-world teamwork, dedicated mentoring, and the meeting of internal timelines. Throughout this entire process, Chan found herself challenged in numerous ways. In addition to leading the team through the design/build phases of the project, she had to fundraise (the entry fee alone is $7,000), engage in public speaking, write essays documenting the team's process, and get her student team members to do the same. By comparison, she notes, the design and construction of the robots was relatively simple!

Chan's students' robot was able to move tetrahedral frames into a tic tac-toe formation and stack them for points. In previous years, Pacman and hockey were played as the "sport" of the competition. In the first year of participation, the Kitsilano Demons placed 8th overall. In 2005 the team placed third, co-captained by Chan and Alex Johnson, now a UBC engineering student.

Chan seems to come by an interest in computer science somewhat naturally, as her mother is a software trainer and her father is a programmer. Currently she is pursuing a combined degree because she's interested in bioinformatics. She also works full-time for senior instructors George Tsiknis and Patrice Belleville, adding more functions to the CS department's CSSIS program to enable advisors and students to book appointments more efficiently.

(Editor's note: As of March 2009, Kitsilano Secondary and David Thomson Secondary are participating in First Robotics competitions in the Pacific Northwest Region.)

From Geek to Chic: Changing the Image of Women in Technology

Dr. Janice Regan knows all about flexibility. During her career, she has eased seamlessly between industry and academia, each time learning skills on the job that she brings with her to the next one, and is today the walking embodiment of the term "transferable job skills."

When I talked to her in her office in the Technology and Science Complex at Simon Fraser University, she fascinated me with the interesting path that has led her there. For example, from theoretical seismology, in which she created numerical models of earthquake waves, she learned a lot about supercomputing and special purpose computers. For her next job in the communications industry, she used the skills she'd learned in writing software for cell phones and pagers. Today, Janice is a faculty member of the SFU Computing Science Program and takes an active role in helping young women get enthusiastic about computing. She is certainly a woman of many talents, ready to rise to many different challenges!

It seems fitting then that she would use this same flexibility and energy to help develop the ChicTech Competition for young women at Simon Fraser University. She is involved with SFU's Women In Computing Science (WICS) group, which provides support and networking to women in computing science at the university and strives to help dispel negative stereotypes about computing as a career path. As an active member of the WICS outreach committee, Janice was thrilled when three of her colleagues returned from the Grace Hopper Conference in Chicago, Illinois with a brilliant idea.

There, they had seen a University of Illinois competition designed to encourage young women to develop high-tech computer skills and take an interest in the subject. This inspired the committee to create its own version of the competition, titled ChicTech. ChicTech is aimed at grade 9 and 10 girls just starting to make career decisions. The committee hoped that the event would challenge some of the myths about computing science and would also present great networking opportunities for the participants.

Since the idea was proposed to the committee in October, they had only until the spring to design and organize the competition. Undaunted and enthused, the committee planned a manageable competition based on the University of Illinois model, but adapted to its own time and financial constraints. Getting this brand-new project off the ground within a limited budget and timeline required many creative solutions.

It was worth it. In the first year alone, ChicTech was a great success. This year, the competition was even bigger. Each year, the organizers send announcements to various schools in the greater Vancouver area. Grade 9 and grade 10 girls are invited to form teams of three of four. They are then paired with two female computing science undergraduate mentors. Teams are then given a challenge to complete; this year it was to create a new or updated version of a website for a non-profit organization of their choice. This way, the girls would learn valuable technical skills, interact with role models, and benefit the community as a whole.

One of the projects this year particularly attracted the judges. The winning team built a page for Valley Therapeutic Equestrian Association (VTEA). VTEA is "an organization that aims to improve the quality of life for children and adults with special needs with the use of horses," says one of the organization's mentors, Jen Fernquist. The girls wrote most of the code themselves, gaining real programming experience rather than completely relying on web authoring tools. The judges noted that the girls' website was visually pleasing and also conveyed excellent usability and functionality.

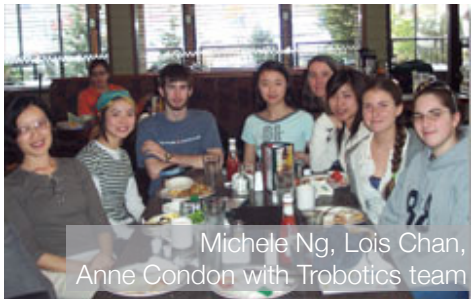
The rest of the teams did great work as well. According to Janice, "eighty percent of the websites were strong enough to do well in a first year computer science course." When the final surveys came back in, the success of the competition was clear: most girls who came in with a little interest in computing science left with a stronger interest. Janice hopes the girls will make choices that will leave the doors open for a high tech career, should they choose to pursue one.

To conclude our interview, I asked Janice what was becoming my final question for all the successful women I have been talking to thus far: "what's one piece of advice you would give to someone hoping to achieve your success?" (I told her that "working hard" was not the answer I was looking to hear!) "I think that's the magic of it," she said. "Find something you're interested in. If you like it, it won't seem like work!"

Starting FIRST:
Robotics at David Thompson Secondary

"First of all, you have to believe it is possible!" advises Jason Brett to anyone interested in starting their very own robotics team. He is the coach of forty students in David Thompson Secondary School in Vancouver. His students, designers of competition robots, are known collectively as "Trobotics." The junior students compete in the FIRST Lego League, while the senior students compete in the FIRST Robotics Competition, in which the robots are composed of aluminum, steel, composites, and other high tech material and can weigh up to 150 pounds.

FIRST, which stands for "For Inspiration and Recognition of Science and Technology," is very much in tune with a person like Brett. As a technology studies teacher, he inspires a love of science and technology in the classroom. He also gives up many hours of his free time to coach the Trobotics teams. How did he get involved? He originally became a FIRST coach, he tells me, when one of his students, Eleanor Lin, "returned from Shad Valley (a summer program for gifted students) and asked me about doing the FIRST Robotics Competition as an Engineering 12 class project." According to Brett, "It was a big undertaking...no school from Western Canada had done it before." But that didn't stop Brett, Eleanor and the first FIRST Trobotics team. They built their first robot, managed to scrape together the funds to compete, and eventually won sponsorship from GM Canada. Not bad for their first year!



Michele Ng, Lois Chan, Anne Condon with Trobotics team

Since then, Trobotics teams have had much success and even more fun, traveling regularly to competitions in Eastern Canada and the United States. This year, the senior team competed in Portland at the regional competition, learning a lot that they can put to good use at the upcoming Canadian championships in Toronto. The team has a very cool website, where they provide video clips of their robots in action.

But I was interested in something else, too. There is something very special about the senior Trobotics team. In an area that is traditionally considered "male," about one-quarter of the team members are girls. I asked Brett if he found a difference between the attitudes of young men and women towards technology. He says that while the gender ratio is still heavily in favour of males, "girls who do get involved in technology classes and building the robot have -- if anything -- a more positive attitude and make greater contributions than the boys. Girls rock when it comes to building robots..."

To find out more about FIRST and a girl's perspective, I also spoke with

Meghan Duffy, a Grade 9 student from this year's senior team, and asked her what it was like to be a female in what is typically considered a male field. "It can be pretty hard sometimes…but personally I'm a bit of a tomboy anyways so I didn't have much trouble. It takes a little while to get used to the technical terms they use but you pick it up after a while. Sure you get the odd look at the first few meetings but you just got to jump in!" As for her decision to compete in the FIRST Robotics Competition, Meghan believes that it "turned out to be a good decision."

The next logical step was to ask Coach Brett just how a person interested in robotics competitions could get involved in FIRST. "You will run into many people who will tell you why it can't be done, but there are over 1,300 teams around the world. Each one of those teams (including ours) started out with someone who believed it was possible to start a FIRST team, and then convinced others that they were right. It helps if you know a teacher at your school, maybe a shop teacher, maybe a computer science or math teacher, who thinks that robots are cool, but you don't need to run your team from a school." For anyone curious, he suggests Googling "FIRST Green Grinches" to find out about a team based on a group of Girl Scouts.

He also mentions that FIRST also organizes a "very cool robotics competition called "VEX," which is based around the VEX robotics kit." (www.vexlabs.com http://www.vexrobotics.ca/). "VEX," he says, "is a great stepping stone to FIRST, as the programming is the same, and much of the challenge is the same, but you work with smaller, less expensive robots and can build them in your living room instead of in the shop."

As a younger student, you can also get involved in the FIRST Lego League, and compete next fall right here in Vancouver. See www.fllbc.org for more information.

Brett also adds that Trobotics is grateful to their sponsors, General Motors and the Jade Project among them, who have helped make the journey possible.

On a final note: Eleanor Lin, who loves applied math, is now a successful student at MIT, combining majors in aeronautics and astronautics with math. About this incredible accomplishment she says, "Thinking back, what set me apart was probably how I pursued opportunities like the FIRST competition to further my educational experience." So if something excites you, the message is, go for it! Who knows what doors may open for you!

Normally, I have a lot of fun coming up with splashy titles for my Jade Project articles, but this time, nothing I could generate was cleverer than the actual name of Dr. Andy Law's program: "U Can Do IT."

Law, the chair of the Computing and IT Department at Kwantlen University, didn't just mix up his capital and lowercase letters when he came up with the title, either. "U" stands for "youth" and "IT" stands for "information technology."

Law is concerned that there is a declining interest in computer science among young people, perhaps because high school students are not "receiving the correct message about the future of IT." Didn't the IT bubble burst back in the 90's? Not at all, I learned. In fact, employers, he says, are having trouble filling positions in IT fields.

As someone who relishes finding creative solutions to problems, Law saw a golden opportunity to excite youth about infotech and at the same time give the Bachelor of Technology undergrads in his Software Engineering Implementation class a unique learning experience. He designed a competition for high school students where his undergrads would run the competition and manage the teams. Through this, they would learn a lot about teamwork, project management, and real-world problem solving. At the same time, the high

U Can Do IT Team

school students would learn a lot from their older mentors, learning from these enthusiastic role models that there is a bright and interesting future in IT.

So what does this competition look like? There are two rounds. In the first round, students have class time to complete a written test based on an eBook of IT industry facts compiled by IT students and professionals. The BTech students mark the papers on site, and male and female winners from each school are chosen to compete in the final round. The final round is a "virtual" test in which the winners compete online! One overall female and one male winner are chosen and each wins a $100 Chapters gift certificate.

Another goal of his U Can Do IT competition is to let everyone know that females can do just as well as males in the field. When his university students visit high schools, he makes sure that there is a mix of guys and girls to show that women can be just as successful. This is also reflected in the prize distributions, with one male and one female winner selected to promote female participation in the competition.

In 2007, over 500 students from 22 schools were visited and invited to participate in the competition. (This shows Law's dedication, since he goes on each visit to make sure things run "smoothly"!) The competition has been well received by all the schools. So where does "U Can Do IT" go from here? Ambitiously, Law hopes to expand the competition to even more students in the future. After all, "the number [500] is still small compared to the actual size of high school students in the world."

To conclude our interview, I asked him my favourite question. What is his advice to high school students who might want to get involved in the IT field? He suggests doing research into the fields that interest you, in order to avoid misconceptions. "Today's IT professionals are no longer working long hours in front of a computer screen." IT requires "innovative minds" to solve real-world problems. So read up and let your creativity flourish!

Heart-Lung Machines and Airplanes

Just because something is cute doesn't mean it's not effective. Dr. Ora Steyn's Cuter Computer Challenge (CCC) may include a prize for the best-dressed team, but it also offers high school girls aged 13-17 the chance to learn the "skill set needed to succeed in the IT industry."

Like Andy Law, University of the Fraser Valley's Steyn believes that creativity and fun is not at odds with a career in information technology. She encourages young women not to stifle their imagination, but to incorporate it into approaches to solving computer science problems. "I love programming," says Steyn, "and would like to be able to share my enjoyment with other females out there."

During her six years in the Computer Information Systems Department at UCFV, Steyn has become concerned with the low number of women enrolling in the program and she makes the very good point that the "IT industry needs the skill set females have [because] after all, half of computer users are female."

To address the problem of low female enrollment, Steyn experimented with various ways of reaching out to girls and getting them excited about a career in computer science. She discovered that the CCC was a very effective method. Cuter Computer delivers a mix of interesting content and pizzazz. Students work in pairs and complete four computer challenges designed by IT industry professionals and student volunteers, working at the chance to win the grand prize Nintendo DS. (Alas, unfortunately I am too old to enter the challenge!)

That's not all CCC has to offer. For example, one of the coolest features of the CCC is a panel of females from the UCFV computer information systems department and the IT industry. This panel gives young women a chance to meet role models and ask questions about careers in IT. There are also quirky challenges too, such as a prize for the most creative title. Last year's winner, Steyn tells me, was "Team LOL."

This year's competition occurred on October 20, 2007. To find out more, visit the Cuter Computer website: http://www.ucfv.ca/cis/Prospective/CCCTobebrief.htm. If you live in the Abbotsford area and are interested in participating in next year's Cuter Computer Challenge, you can register online.

Finally, Steyn has two pointers for young women who might be interested in getting into a career in IT. First of all, make sure you take the correct high school courses to get into the program of choice. Second, "do not be intimidated by the boys!" IT professionals write the code that controls the "heart-lung machines, the ventilators and airplanes," not just games!

Building a Force to be Reckoned With

I always thought that T-X, the robotic assassin from Terminator 3, was by far the best Terminator, though I never really thought about why. But when I received an email from Seema Ali, a very talented teacher at Killarney Secondary School in Vancouver, I started to realize just why T-X was so cool.


Killarney VEX Team

Let me start at the beginning. Ms. Ali is the coach of the Killrobotics team. Her team was composed of five high school girls in grades 10 and 11, which competed in the VEX Robotics Challenge. They did very well, I might add, with the team placing first at last year's competition at West Vancouver Secondary School.

As I read about the team's accomplishments, I realized that the things I admired about T-X were the things I admired in the Killrobotics team. First, T-X from the third movie was by far the most technologically advanced and "kicked the most butt" of all the Terminators, much as the Killrobotics kicked butt at their competition. T-X was on the cutting edge of technology, just like the team. "She" was also female, representing the emergence of women as a force to be reckoned with in the world of IT.

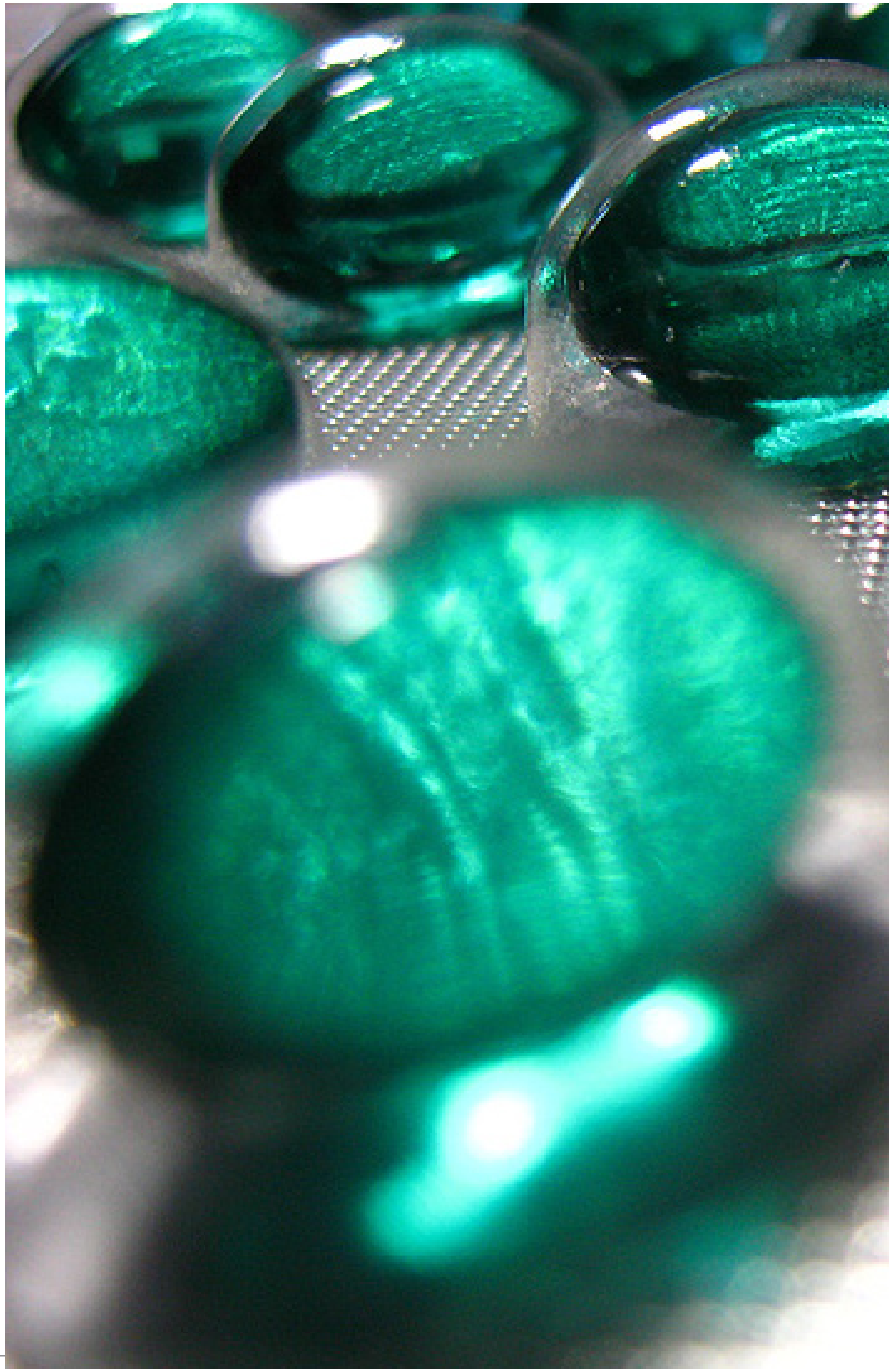
I was curious about how the girls got started with the VEX Competition, and I found out that two of the Killrobotics team had participated in the ChicTech competition (see the related "From Geek to Chic" article). When they discovered that they would be too old to compete the following year, they looked for something else to quench their thirst for computer science. They were told about the VEX Competition that Jason Brett at David Thompson Senior Secondary was participating in and they put together an all-female team and embarked on building their very own robot.

There is, however, at least one major difference between T-X and the Killrobotics team. T-X wasn't very nice, but the girls showed tremendous communication and compromise, even when looking for a name for their robot. Amanda wanted to name it Bill, and Alma wanted to name it Bob. In the end they decided on Billy-Bob.

I also was curious about how Ms. Ali got into computers in the first place. She said that her dad bought her and her siblings a computer to play with and program on and since that time she's always enjoyed technology. Now, as a technology teacher, she really enjoys "giving the students a challenging problem to figure out and seeing their reaction when they finally get it to work." She says that she particularly likes this part because she knows what that feels like!

I also talked to Amanda about how she got involved with VEX. She said she took to the idea of a robotics club right away: “the thought of making something from nothing much and just an idea, at least to me sounds pretty spiffy.” I couldn’t agree more.

Amanda says she’s really interested in computer science and is thinking about getting into programming or network administration. She is just one example of a strong young woman pursuing a career in IT despite the fact that the field is still mostly male-dominated.



Conferences

Building Communities Connects Women in Engineering in British Columbia

On September 15 and 16, 2007 approximately 120 women engineers, engineering students and faculty gathered at Loon Lake in Maple Ridge to participate in the Building Communities Symposium (BCS). The vision for this event was the development of a network of women in engineering in British Columbia, where students, new immigrant engineers, women returning to work, and established industry professionals alike have the opportunity to build a supportive and inclusive community for each other.


Building Communities Symposium

This event was designed to provide the catalyst for building networks of women across engineering workplaces, industries, and university faculties. The programming focused on developing leadership skills, facilitating outreach and advocacy, creating mentoring relationships, and developing support networks that to allow more women to reach senior positions in their industries.

Creating an atmosphere that makes women feel more included is crucial to maximizing their productivity, success, and happiness.

The event featured a number of keynotes speakers. On the first day, Anne Condon, NSERC/GM Chair for Women in Science and Engineering, opened the event with a magical discussion on the Art of Networking and Ms. Janet Benjamin, recently elected president of the Association of Professional Engineers and Geoscientists of BC, closed the day with a directed and empowering talk on marketing and engineering.

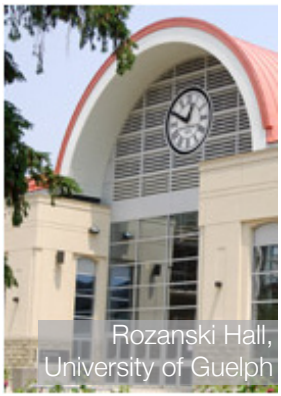
On day two, Ann English, Director of the 2010 Olympic Initiative at BC Hydro, gave a compelling personal account of her career path and management experience within several engineering companies and Elizabeth Croft, Associate professor of Mechanical Engineering, UBC challenged the attendees to "Believe, Calculate, and Succeed."

Participants also took part in a wide variety of breakout workshops and panel discussions designed to meet the needs of women engineering professionals at all stages of their career. The closing session of the symposium provided an opportunity for further network-

ing. New and established groups were formed and expanded around various communities including DAWEG, Women in Engineering UBC, Women in Academe, Internationally Trained Engineers, GEERing Up, etc. This activity provided a venue for these to envision and plan a community activity, with access to supporting funding from BCS.

Building Communities was a resounding success, due to the hard work of the organizing committee, as well as large number of volunteers. In our post-event survey, 98% of respondents felt that the event should be repeated, over 90% of respondents agreed that they had strengthened their engineering networks, and almost 80% were more confident in their ability to succeed. A follow-up event is scheduled for January 2008 and the planning for the next BCS is ongoing.

Building on Success — One Reporter's Experience at the CCWESTT Conference


Rozanski Hall, University of Guelph

Attending a conference at the University of Guelph in Ontario reminded me that we British Columbians live in the "wild west." Even though the University of Guelph was officially founded in 1964, it was formed by the merging of existing colleges dating back to the 1860's. Original buildings from the Ontario Agricultural College and Ontario Veterinary College still remain in all their antique glory, their architecture beautiful and ornate. Many of the streets are still made of brick. The whole place felt deeply rooted in the past and in tradition. For example, Rozanski Hall, the main building where the sessions were held, was very picturesque.

I noticed a huge difference when I compared the Guelph campus to UBC, where buildings constructed before 1975 are generally regarded as ancient (like my first year residence building, yuck!). Visiting the Guelph campus got me thinking about how much longer Eastern Canada has been settled than Western Canada, and about the long tradition of academia in Canada in general.

The weekend was filled with different sessions, attended by researchers, administrators, industry representatives, and even students. Fifteen of us were there from British Columbia, funded by the Jade Project. There were also several keynote addresses, wonderful lunches, activities, and a banquet. While it was impossible for me to attend all of the sessions or write down even a fraction of the things I learned, I have selected three of my personal highlights:

1. The first highlight was the Ginger Rogers cartoon that keynote speaker Dr. Suzanne Fortier showed us to kick off the conference (http://www.reelclassics.com/Actresses/Ginger/ginger-article2.htm). "Don't forget", the caption reads, "That Ginger Rogers did everything [Fred Astaire] did…backwards and in high heels."

This drew attention to the fact that women who reach equal footing with men in their professional lives often have to overcome more obstacles than their male counterparts.

According to Dr. Fortier, every woman has her own "pair of high heels," such as being the primary caregiver to elderly parents, taking care of sick children, being diagnosed with breast cancer, or just overcoming stereotypes. The important thing to remember, however, was that Ginger Rogers successfully overcame these obstacles and we can, too!

2. The second highlight was gaining a deeper understanding of why fewer girls

stay interested in science, engineering, and trades. Dr. Margaret-Ann Armour described some new research addressing this issue. She noted that in Alberta, 93% of the images in science textbooks were of men at the time of the study, a discrepancy that the Alberta Ministry of Education is working to remedy. This seemed like one easy, concrete way to change the perception of women about their sense of "place" in these fields – not just in Alberta, but in other provinces as well.

3. The third highlight was simply the very positive atmosphere of the whole conference. The presenters focused on the successes they'd seen and strategies for improvement. It was a forum to share strategies that work. We were reminded that the issue of female equality in science, engineering and trades is as important today as it always has been. But we were inspired to keep pursuing this goal. The potential of women who get discouraged is something we as a society need to tap. So we should go out and Build on Success!

So read up and let your creativity flourish!

The Daughters' Program at CCWESTT

This report is about our experience being in the daughter's program of the CCWESTT Conference at the University of Guelph. Nineteen girls arrived at this event on a Thursday night, no one really knowing what to expect. Our mom had only read us the schedule, and we had no real idea who we would meet or who would lead the program. Most of the girls had never even been to Guelph before. All we knew was that we would make memories and meet new people we probably never would have met any other way.

Our first night there we met Margaret-Ann Armour, a woman who was just awarded the Order of Canada. The Order of Canada is the biggest Canadian award given to people who have acted as an example of the Hebrew motto *Desiderantes meliorem patriams*, which translates to "they desire a better country." We walked her home and she told us the story of how she decided which university she would go to and what she thought when she was given this award. I was very honoured to have met her and talked to her.

Most people find it hard to make new friends, though some don't. But the instructors who lead this program made it a lot easier for the people who have more trouble making new friends. We played various name games and one with imaginary coloured balls. The games helped us to learn people's names and a little bit about them, except the one with the balls, which was more of a focus and concentration game.

Georgia Gibbs

The first game that we played was called "The West Wind Blows." This is a game where there is a chair for everyone except one person. Everyone sits in their chairs and the one person left goes in the middle and says something that applies to them, like: "the west wind blows for every one wearing pink," and then everyone wearing pink including the person in the middle would try to find a new chair. The trick is that you can't sit in the same chair twice so usually a new person ends up in the middle.

We then played "Picnic, Picnic." In this game, everyone sits in a circle and one person chooses a pattern but only says the first item in the pattern. For example, if I picked the pattern of "fish" I would then say "I'm having a picnic and bringing halibut" and I would then only allow the people bringing another type of fish to come to the picnic.

The first activity that we did was bridge building and collapsing. We all made bridges out of duct tape, popsicle-sticks, and glue and then we tried to put as much weight on them as possible. We were given lots of time to build the bridges. We found that the duct tape worked the

best for building the bridges. Most of the bridges broke and collapsed, except for the three that held the maximum of 30 pounds. I think my bridge could have made it to 50 pounds. We also learned a lot about architecture such as, if we actually built bridges out of duct tape it wouldn't really work very well.

For lunch, we walked to a different building and had lunch with our parents. Our moms were very happy that we were having fun. The kids had macaroni and cheese for lunch, and the parents had Chinese chicken salad.

After lunch, we played soccer and studied the aerodynamics of a soccer ball. We learned about why a soccer ball is shaped like a sphere and why the panels are placed as they are. We learned that the pattern on a soccer ball is called a truncated icosahedron. We also learned how to make the soccer ball curve when you kick it. It was really interesting to see how the panels on the soccer ball made a difference in the way the soccer ball rolls. For example, the truncated icosahedron curved properly whereas the other patterned ball rolled in a really random fashion.

Next we learned about RIM, the company that makes the Blackberry. We were each given a Blackberry to play around with and figure out how to do new things with, like take pictures, play games, and send email. Our instructors arranged a race to see who could finish all of the Blackberry tasks written on the board. The prize was a chocolate blackberry for each of the first three finishers. Once we were done, we dissected the Blackberrys. Inside there was a ton of different types of hardware. I really liked the Blackberry race, but I wish I could have kept the Blackberry!

The next day, we ate breakfast with our parents and then visited the Guelph Arboretum to look at all the types of trees there were. The lady giving us the tour explained everything very well. Sometimes she even told us a story about the tree. At the end of the tour she let us go see the frogs and some people even caught the frogs. It was really interesting to see trees from all around the world, to learn what all the Latin names meant and the frog pond was really cool.

For lunch, we went for a picnic and made ice cream. We put cream, milk, sugar, and chocolate in a small bag and then we put the small bag in a bigger bag containing ice and salt. Then we wrapped the bigger bag in a shirt and swung the shirt up and down and side to side. After the ice cream froze we ate it. It was interesting to learn why the salt made the ice stay solid longer and the ice cream tasted really good.

After that wonderful experience, we went to study the digestion of a cow. The professor told us about how the cow's digestive system works and that it actually has four stomachs. After that we got to go into the barn to look at some sheep, pigs, and cows, although we weren't allowed to touch the cows because they were in a trial experiment

and touching them might affect the results.

Overall it was like school in that we learned new things, but we learned more than we would in two normal school days and with more hands-on activities. We would strongly recommend that others do this program and the only thing we would want to change would be for it to last longer.

Thank you to Anne Condon and Jade Bridges for giving us the chance to do this.

--Haley and Georgia Gibbs


Haley Gibbs

Dancing Equations in Uppsala

How did it come to pass that I found myself dancing physics equations with gender researchers and physicists in a small town in Sweden?

Last spring I received an invitation through the Society for Canadian Women in Science and Technology (SCWIST) to "Crossing Perspectives on Gender and Physics," a conference bringing together the Nordic Women in Physics (NorWiP) and the Workshop on Physics and Gender (GenDADA) at the Centre for Gender Research at Uppsala University, Sweden. I couldn't believe that there was a conference bringing together my two academic loves: physics and gender. I was able to attend the conference thanks to the Jade Project and the travel support they offered.

In the literature for the conference, the organizers called for abstracts that would investigate how gender may influence pedagogy, hiring, and promotion in physics. At a deeper level, they also wanted participants to consider how questions in physics may be gendered: do women ask different scientific questions than men?

I submitted two abstracts for the conference, and both were accepted for talks: "Dancing Equations: the embodiment of physics" and "Hard Science with a Soft Heart: does the involvement of women delegitimize a subfield?"

As I prepared my presentations, I was suddenly stumped by how I might give talks that were meaningful to both physicists and gender researchers. For "Dancing Equations" I constructed a talk around how I have taught engineering physics undergraduate students about light polarization through dance. To prepare for delivering the talk, I met with physicists at SFU Burnaby and gender researchers at SFU Harbour Centre. In those practice talks, I had merely demonstrated the dance steps. All of my colleagues asked whether I would get the conference participants to dance? Once I arrived in Sweden, I thought, "I'm so far from Vancouver – what have I got to lose?!" I had the conference attendees dance electric field equations. The mix of physicists and gender researchers was just right and everyone got the steps (see photo).

The other talk on the potential devaluation of women in science was harder to prepare for. I found I had to oversimplify both the gender and the physics concepts. In an attempt to bridge two disciplines, I started to recognize how far they were from each other. How would I introduce concepts of gender to physicists who have never been trained in the social sciences? How could I speak about subfields of physics to established gender researchers who last encountered physics in high school? Yet the process of trying to connect physics and gender demonstrated to me that to

advance women in physics we require the insights of gender researchers.

Gender is a socio-cultural construct. It shapes how we understand and experience masculinity and femininity and how value is assigned to certain behaviours and not to others. Until now I had been wondering how to prepare women better for succeeding in physics and other male-dominated fields. I am changing my mind about that approach: I am now more interested in assessing how the fields themselves may have to transform. It is by talking (and dancing!) with gender researchers that we will determine meaningful and successful ways to promote girls and women in science and engineering.

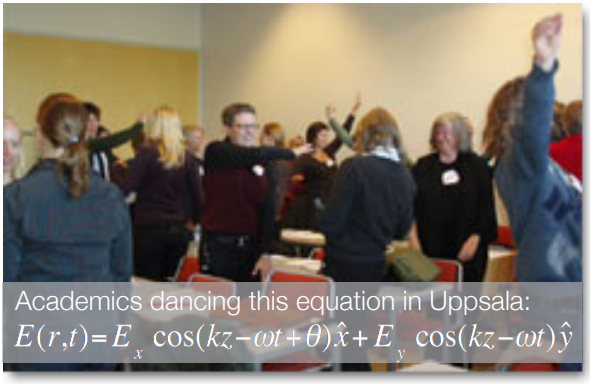


Photo credit: Helene Götschel

--Elana Brief, PhD Physics (UBC, 2000) Research Director, Women's Health Research Network President, Society for Canadian Women in Science and Technology Research Associate, Physics, University of British Columbia

Enter the Jade Brigade

This March, the bold Jade Brigade jumped in a van and headed south! The Jade Project sponsored ten UBC students to attend the Technical Symposium on Computer Science Education at the Oregon Convention Center in Portland, Oregon.

The conference offered technical sessions, talks, panels, posters, workshops, and breakout sessions on the topic of computer science education. Organizers hoped to create a place where educators and students at all levels could network with each other, discuss common challenges, and share innovative techniques. This year, the focus of the symposium was the development of a "more complete, more diverse, and more successful population of future computer science professionals" under the theme of "Diversity through Accessibility."

Jenny Qian noted that: "There was plenty of discussion of attracting underrepresented groups to CS, including women." Physical constraints are responsible for some groups' under-representation. Jessica Dawson met with a conference chair, J. D. Dougherty, to discuss these issues. Dawson wrote that Dougherty works to broaden computer accessibility to many different individuals, developing computers that defy the conventional "position" of "sitting on a chair, hands on a keyboard, staring at a screen." Different configurations allow participation by physically disabled individuals, as well as those who simply don't feel as comfortable or as creative working in before of a conventional computer.

UBC SIGCSE attendees

However, there are other accessibility issues beyond the physical. Many groups feel excluded and discouraged from studying computer science. Several sessions at the symposium shared new techniques in computer science with the potential to encourage more students to thrive.

One of these techniques is collaborative learning. Several of the workshops that Qian attended discussed the collaborative approach to computer science education. The usefulness of this technique was reinforced by keynote speaker Marissa Mayer, VP of Google's Search Products and User Experience Division, who spoke about the necessity of team interaction in the programming world.

Another session discussed the educational applications of pair programming. Pair programming occurs when two programmers share the same keyboard and work on a project together. This technique began in industry, but as presenters Braught, Eby and Wahls proposed, using this approach in computer science classes can have educational benefits. According to Qian, the presenters found in their experiment

testing the method that, "1) Students with lower scores improved statistically significantly in individual programming skills through pair programming; and 2) All the students, regardless of previous academic achievements, were more likely to complete the CS1 course successfully via pair programming."

Having students pair program led to better programs. It also increased motivation and gave programmers more confidence, important because a lack of motivation and confidence is often said to be responsible for girls' negative experiences in computer science. Curiously, Qian reports, the presenters recommended that the two students working together on pair programming have a similar skill level. That way, neither of the students did more of the work and each student could learn a lot from the other.

According to Danielle Kwek, SIGCSE was an "eye-opener;" she says that it was a "super-tiring four days...but enriching and inspiring nonetheless!" The ten Jade Brigadiers all learned a lot about computer science education and were inspired to keep looking for ways to increase accessibility to this education. They brought their reports back to the UBC Computer Science Department where the new ideas they discovered are being explored by instructors and other faculty members.

What I Learned from Grace Hopper

For the very first Jade Project Newsletter I wrote, I traveled out to SFU to meet with a woman named Janice Regan about her involvement with the ChicTech project. It was my first in-person interview, and I was very nervous. Janice put me at ease, and began answering my questions about the inspiration for the ChicTech event. I jotted down my notes, then went home and typed them up, proud as can be. Then I sat down with Anne Condon to look over my draft. She read the following sentence, and chuckled uproariously: "As an active member of the outreach committee, Janice was thrilled when colleague Grace Hopper returned from a conference at the University of Illinois with a brilliant idea." Anne pointed out that that would be an incredible feat, since Grace Hopper was a US Naval Officer who had died in 1992.

Actually, "Grace Hopper" had been the name of the conference—short for the Grace Hopper Celebration of Women in Computing, a celebration designed to "bring the research and career interests of women in computing to the forefront." Because Grace Hopper was such a monumental figure in computer science and also such a pioneer for women in computing, my error was entertaining. The incident was quite embarrassing, but it did help me learn a lot as a journalist—and as a female scientist.

Since then, my interviewing skills have improved (I hope so, at least). And I've also gotten a chance to learn more about

Turing Award winner Fran Allen, Jennifer Wong & Celina Gibbs

Grace Hopper, who is first recognized for her contributions to the field of computing, such as developing the first compiler and working on the first fully automatic electronic calculator called the Harvard Mark I. She is also notable for being a pioneer for women in the field, advancing to a high rank in the Navy, which was overwhelmingly male at the time. Petcharat, one of the conference participants, noted that she'd learned in conversation with two young, female U.S. Navy officers that the "USS Hopper was the only warship named after a pioneering computer scientist."

This year, I had the chance to get to know what goes on at the Grace Hopper conference, because the Jade Project sponsored six students to attend. Taking place at the Keystone Resort in Colorado, the conference spanned four days and was described by attendee Samantha as an "invaluable experience." Networking was a key goal of the conference. For example, Samantha wrote about many influential encounters she had, one with a NASA employee and another with a master's student aspiring to work with NASA. Samantha says that "not only were we able to get lots

of advice from Yvonne, but we also got to know each other and found that we shared a lot of common interests, including watching science fiction series. We plan to keep in touch."

The girls also were given a morale boost. One thing that struck Petcharat was that many women in top computing positions talked about continuing uncertainties in their own abilities. She says that it was "very, very inspiring to know that even the Dean of Science of Princeton who used to be very diffident could become more confident and successful in her career."

What were women to do in the face of these doubts? Just do your best, the panelists said. Panelist Tessa Lau suggested that attendees read a book called *Feel the Fear…and Do It Anyway*, by Susan Jeffers. Petcharat really liked the book title: "I think I'll let that be my motto from now on," she says. In fact, all of the participants made comments about the strong sense of community they felt being surrounded by women situated throughout the technical and academic world.

Participants also exchanged ideas about how younger girls could be encouraged to develop an interest in computer science. Petcharat came away from the conference with a plan to volunteer with GirlSmarts. She attended a presentation about the Artemis Project, a "project that was run by a group of undergraduate female students at Brown University to encourage grade 8-9 female students to consider careers in computer science and engineering." She learned about different ways to engage young students in computer science, as well as new techniques for teaching Excel, Photoshop, and programming.

The conference also featured technical talks, designed to spark interest in new areas of computing research. For example, Samantha noted her enjoyment of Anna Karlin's introduction to game theory, saying that the talk was "captivating and provided strong motivation for studying problems in that area."

Finally, there was something very special for the UBC women who traveled to Grace Hopper. The participants were all thrilled to see Anne Condon on stage in front of more than 1,400 people, welcoming everyone to the conference. To see the accomplished bioinformatician, Associate Dean, NSERC Chair for Women in Science and Engineering for B.C. and the Yukon, mentor, and friend in this further role was an emotional experience. We saw that not only can women succeed, they can use their success to nurture, educate, and inspire others. And that is an experience that none will soon forget.

Remarks

Opportunities for Undergraduates in Postgraduate Education

Hello everyone. It's an honour to speak to you this evening on the topic of postgraduate education. I appreciate the fact that you have all taken time out from your class work, projects, and other activities at one of the busiest times of the year, to explore your options for the future. That already says a lot about your commitment to your education.

The organizers, Ling and Arina, asked me to address some questions on why a postgraduate education is valuable and how to choose what path to take. To help set the stage for my thought on these questions, let me tell you about my own path to higher education and my experiences there. I hope my comments will be useful as you grapple with the whys and hows of a postgraduate education.

I got my undergraduate degree in mathematics and computer science at the regional university in my area—University College Cork, in the very southern part of Ireland. I had made the decision to study computer science while in my last year of high school. I had never seen a computer and knew nothing about what computer science was, but somehow that's what I ended up ranking highest on the checklist of options.

At the time I was graduating from college three years later in 1982, the job situation in Ireland was terrible. I had no exposure to research while I was an undergraduate, but I knew I liked learning. Also, going to grad school provided me with a chance to travel. And it was surprising to me that I would actually be paid to go to grad school. There was nothing to lose by applying. Two of my friends, Anne and Catherine, wanted to try graduate school and so I decided to try too. Luckily, we all got accepted into graduate programs at U. Washington, None of the other schools to which I had applied to in the U.S. accepted me, but one was enough.

I have to say that the five years we spent in graduate school were the most stimulating and exciting of our lives. There were many experiences that you probably take for granted, but we had never had—like eating Chinese food. When I had my first Chinese meal, after 20 years of bland food in Ireland, I knew I was going to like America.

But there was also the intellectual stimulation. My undergraduate experience with Computer Science had mostly been about gaining programming experience. In graduate school I quickly discovered how rich in ideas the field of Computer Science is, and why these ideas matter in our world.

In my first semester, I worked as teaching assistant for a professor called Richard Ladner. Richard did research in a very theoretical area, at the interface between mathematics and computer science. The work mostly involved understanding what you *couldn't* do with computing devices. I was really fascinated to realize that you could prove that certain mathematical problems could

not be solved using computers. I loved reading about the early work of pioneers like Alan Turing and others. But Richard also had a very applied project. This was to develop tactile devices that would enable deaf-blind people to communicate over phone lines. Back then, in the days before the Internet and the personal computer, deaf-blind people were very isolated from the world at large. Doing simple things in the morning like checking the weather forecast or finding out why your ride to work was late would have been impossible. Richard had grown up with deaf parents in Berkeley, was fluent in sign language, and well connected to the deaf-blind community in Seattle. I thought the project sounded very cool. So I was thrilled when Richard offered me the chance to work as a research assistant.

However, the reality was that the technical aspects of the tactile device work weren't a good match for my skills and interests. Often at our meetings, when I had little progress to report, Richard would ask me how my theory class was going. He eventually encouraged me to switch projects, and he offered me the chance to work on something more theoretical. This project involved studying how to coordinate packets of information over Ethernet communication channels. I did switch, and in fact for my PhD topic I switched topics one more time to something even more theoretical – at the interface of game theory and computational complexity theory. I graduated with my PhD in 1987. Since then, I have been a faculty member, first for 12 years at U. Wisconsin and then at UBC since 1999. I have continued to work on theoretical problems, although now, more and more I work on applied problems.

A topic that I have found very intriguing for the last 10 years or so is the use of computer algorithms to predict molecular structure. This work provides the kind of logical problem-solving challenges that I've always enjoyed. But also it provides a way to contribute to discoveries in biology and even to the design of novel nanotechnologies which use DNA as a building block. I am really enjoying this work, which involves collaboration with scientists in other disciplines. I have also enjoyed the process of building a strong team of graduate and undergraduate students to work in this area. Our group has developed some of the best software for RNA secondary structure prediction.

Ling and Arina asked: Did my graduate studies help achieve my goals? To be honest, I didn't have any clear goals when I started in graduate school, other than to explore and try new experiences. So, let me talk about how my graduate studies have shaped who I am today.

First, as you might be able to tell from what I've just said, being a researcher is a big part of my identity now. That would have been impossible without graduate training. I really like working on a puzzle, and seeing how the piec-

es are going to fit together. And I like telling others about what I have done. Another very satisfying part of being a researcher is seeing my students bring their own talents and ideas to the table and seeing them develop. I have followed my advisor's approach and give them a lot of scope to work on problems that best suit their own talents and which they find stimulating.

Being a researcher has helped me become a more independent and creative thinker. That has surprised me. When I was growing up, I wasn't exactly encouraged to think independently and I thought I would be happiest in a job where someone told me what to do. But I very much like having a lot of leverage in setting my own priorities and directions.

Third, the flexibility of an academic job has made it possible to combine work that I love with raising a family. I don't want to be misleading here—I work hard, and I often work on evenings and weekends. But I work hard because I love what I do. When my kids were young I had the flexibility to do a lot less work in service roles, and I had fewer graduate students. My kids are teenagers now and are glad not to have their mom breathing down their neck all the time. I still have the flexibility to take time out for their school events and other important things in their lives and in the lives of my family in Ireland.

The last way in which my graduate training has shaped who I am is through the amazing people I have worked with. I like being part of a professional community that is making a positive difference in the world. Although my contributions are small in the grand scheme of things, the achievements of the whole community are also mine, in the sense that I am truly excited when someone makes a major contribution in my area. Often I know, or at least have met, the people involved. This sense of community has reinforced my commitment to do research, and it motivates me to do the best work I can.

For example, when I was a graduate student in Seattle, the students who balked at the prospect of qualifying exams often left the program to work for Microsoft. This was in the early 1980's, when Microsoft was still a small start-up company in Seattle. Those people are now in major leadership positions in the company. It is fun to visit them and hear about what's going on there. And believe me, the people who opted not to take the quals are a lot richer now than those of us who did! As another example, I know the people who developed important early methods for biological sequence analysis using a computer. Their ideas from the mid-1980's became critical to the use of computers to sequence the genome. At the time they developed the ideas, I don't think they or anyone else appreciated the impact they would have.

It's also interesting to look back and see the mistakes and lack of foresight of the computer science community. Sometimes it takes someone from the outside to see the potential of technologies that

those of us in the field take for granted. It was a physicist, not a computer scientist, who invented the World Wide Web. And I remember that while I was in graduate school, one of the other graduate students wanted to study ways to use computers to solve problems in biology, but no-one in my department was willing to supervise her in doing that work. Now, bioinformatics is a thriving field in most major universities. (For the record, that student also left the graduate program without her PhD, but found her way into a biotech company in the early days of that industry, and has gone on in other exciting directions. I would guess that she, too, is a lot richer than I'll ever be!)

Anyway, feeling part of all of this – both the exciting steps forward and the opportunities we missed -- has really been rewarding for me and has enriched my life.

Now, on to the three questions that Ling and Arina posed.

The first one was: why go for higher education. It's not for everyone. But if you're curious, like to learn, are willing to give it a try, to make mistakes, to take ownership of your learning beyond what you may have done as an undergraduate, I am sure that you will really like postgraduate education. In addition to the path I took—a PhD program in a core science field—there are many other options, and no doubt you'll hear more about them later this evening. They include interdisciplinary research, such as bioinformatics, or professional degrees in law or medical school, journalism, or education. You could do a second degree, like Computer Science's BCS program, to complement your current expertise with computing skills. Any or all of these options will open doors for your future.

Let's move on to the second question: How does higher education influence opportunities in the workplace? If you really want to make a difference in the world, the extra education will help a lot. Science today is exciting, and scientists will make significant contributions to the health and welfare of our society. We are just now beginning to understand how our bodies work at the molecular level. The functioning of the brain is still largely a mystery. We need better tools to gauge our impact on the earth and creative ways to tread more softly in our environment. We want to build stronger communities and to provide the best science education we can to the next generation, so that even those who are not scientists can weigh in knowledgably on the technologies that affect their lives.

A postgraduate education can help you gain the skills and experience you need to move in these directions. You might decide that you'd like be an innovator—start your own company. Many of our faculty and former graduates have started companies and have patents. There are opportunities in place, like research internships, to help position you for such a career path. Alternatively, you could use your postgraduate training to work in government labs on topics

like weather or earthquake prediction. Or perhaps you could shape policy in areas where scientific expertise is essential, like intellectual property. You might want to be a thinker or writer. Or you might want to be an educator, at the K-12 or college levels. Or appear on TV like one of our postdocs, Jennifer Gardy, who recently appeared in Project X, CBC's new science show. Postgraduate education is essential for these jobs too.

Now for the hardest question: how do you find what you're passionate about and should go further with? Perhaps that's hard because you like a lot of things and are not sure which direction to pick. Or, perhaps it's hard because there are so many things you haven't even tried yet. One of my own pet peeves is that there are not more women in computer science—I bet there are a few of you out there who would love it if you only tried it!

Perhaps the best thing I can say is this. It actually may not be so critical to nail down that one thing you're passionate about. You may need to make a decision based on more pragmatic considerations. What programs can you actually get in to? Which of those programs have a good mentor and advisor for you? Will your peer group of fellow students be fun to interact with? What are the job prospects? Often, the people you'll work with are more important than the specific direction you'll take. If you stay engaged and do well, you'll continue to have opportunities to switch directions.

Let me finish with a few more suggestions.

- Read. Read Science books. Read essays and biographies. Read scholarly publications, like articles in Nature magazine.
- Get a research experience—find out how.
- Network. There are many organizations out there that can help you do this—the Student Biotechnology Network is one example. SCWIST (the Society for Canadian Women in Science and Technology) has an evening once a year for women to meet amazing scientists and role models. Volunteer for these organizations.
- Go to seminars and journal clubs—there are many on campus every week. And find the courage to ask a question, or introduce yourself afterwards to the speaker.
- Last but not least, talk to the professors, TA's, and students around you. The sessions planned for the rest of this evening will provide a great start.

Unlike me at your age, you live in a diverse metropolitan area and already have had the chance to study at a major research institution. But I am sure you will find, like I did, that there is so much more to explore. Keep exploring. And give back when you can.

Good luck on your journey! Thank you.

--Anne Condon, March 2008

The Bifocal Looking Glass: New Views of Alice Through Science and Gender Lenses

Thank you for the invitation to speak at such a special event this evening. I'm delighted to be able to congratulate TWU on founding the Gender Studies Institute at this time. I believe that the institute has articulated important goals that will guide the institute in advancing knowledge and in supporting members of our community to live meaningful and productive lives.

Let me touch briefly on one of these goals, which links the mission of the Institute with Trinity Western University's identity as a faith-based institution. This goal is to provide an academic space in which to examine, theorize, and debate the relationship of faith and gender. This resonates with me because of my own religious upbringing as a Catholic. I grew up in Ireland in the 60's and 70's, where religion was the guiding compass in all aspects of education and life. Although I am no longer a practicing Catholic, the overriding messages that have stayed with me from my upbringing are respect for human dignity and worth and the importance of giving back to society. I often reflect on how faith and gender have influenced my own path in life—my high school years in an all-girls convent boarding school provide lots of scope!

I could spend hours talking about that, but I am going to resist because I'm quite sure you don't want to listen to me for hours and also because my remarks this evening take their inspiration from another goal articulated by the institute. This goal is to promote collaborative research and scholarship in the area of gender studies. I'm very glad that the institute brings together researchers from the sciences as well as the humanities, because there are still large differences in participation of men and women in engineering and in some sciences. I believe that our society, as well as our science and engineering (S&E) disciplines, would benefit from broader participation of women and members of other underrepresented groups. I also believe that our society would benefit by greater participation of men in the caring professions—particularly in the tasks of educating and caring for the next generation. While my remarks will focus on questions I've thought about a lot, as a woman and a scientist, my hope is that the institute can also help us better understanding barriers to men's participation in many fields. Actually, the two problems are deeply intertwined.

There are still very few women in academic and research science and engineering careers. Why is this a problem? Why has it persisted, even when the representation of women in the pipeline has increased significantly? What could we do to change things? My interest in these questions is in part scholarly: I'd really like to understand the underlying reasons as best as I can, because of what they tell us about ourselves and our society. I'm also interested because I am working to change the situation at UBC and would like for my work to be grounded in the best research available.

When thinking about how to approach these questions, it's natural for me to start by drawing from the methods of my own discipline. Stepping back for a moment, I have to say that I'm proud of the contributions that research scientists have made to society. Our success is due not only to the creativity and hard work of individual scientists, but also to the underlying process that guides our work: the scientific method. We propose and test hypotheses, carefully analyze the evidence, and replicate the results. We have a proud tradition of challenging assumptions. The scientific method has helped us guard against our biases and misconceptions.

Scientific achievements often result when we have new ways of seeing the world. A great moment in 17th-century science—the discovery of bacteria—is a wonderful example. Anton van Leeuwenhoek was a tradesman in Delft, in the country now called the Netherlands, who spent decades honing the art of grinding glass to make lenses. As a scientist myself, I can imagine the pleasure van Leeuwenhoek must have felt when looking through his lenses, to discover, for the first time, the microscopic world of bacteria. His description of these tiny creatures underscores his own delight in his discoveries. When peering at the plaque from his own mouth, he noted that he "almost always saw, with great wonder, that in the said matter there were many very little living animalcules, very prettily a-moving."

Fortunately for van Leeuwenhoek, it was not terribly difficult to convince others that his discoveries were legitimate: the evidence was plain to see under a well-crafted lens. (In contrast, an earlier scientist, Galileo, had a much harder time convincing his patrons that the earth revovles around the sun!) Unfortunately, physical lenses, such as those used by van Leeuwenhoek in discovering bacteria, won't help us with questions on the participation of women in science. But, the metaphorical lens of the scientific method, whereby we examine the evidence and challenge assumptions, can be of use. In addressing these complex questions, it's also extremely valuable to have an additional lens—that provided by gender studies. When it is difficult to gather physical evidence, our biases can only be uncovered when we really listen to those who hold a different worldview.

Thus the title of these remarks: The bifocal looking glass: new views of Alice through the lenses of science and gender.

I would like to describe ways in which I personally have benefitted from reading and reflecting on the scholarly work of researchers in the area of women's studies and by collaborating with faculty in the Centre for Women's and Gender studies at UBC, as I try to understand the reasons for, and ameliorate, the low participation of women in my own field of computer science and in science research careers more broadly.

Before doing that, let me pause for a moment and ask: why should we care? We know that girls and boys are dif-

ferent. If girls aren't interested in math and physics, why force them into subjects they're not interested in? Aren't the problems faced by well-educated women scientists minor, compared with our current problems with the economy and global warming, or the perennial problems of war and disease, poverty and injustice?

I firmly believe that we should care. First, it's important that we draw scientists from a broad pool, because science and engineering have huge impacts on our lives and because innovation in these disciplines relies on attracting the best talent. Second, here we are in an academic institution, where we are educating the next generation of thinkers, educators, and innovators. Surely, before tackling the great problems of the world—indeed to be fully ready to tackle these problems—we need to get our own house in order. Third, there is the danger that the reasons which cause women to opt out of science also cause talented men to opt out, too.

Let's move on to the main question. Why are there so few women in science and engineering careers? This question has gotten some traction in the press recently because of a new book called *The Sexual Paradox*, by Susan Pinker. Pinker is a professor of psychology at McGill University and a journalist for The Globe and Mail. One of the themes that Pinker explores in this book is the ways that hardwired gender differences can account for different career outcomes for men and women in fields such as the sciences and engineering. She makes the case that, on average, women score higher than men on measures of empathy, and asks (p.118): "Wired for empathy, what happens when high-powered, highly-educated women work in demanding jobs that require at least sixty hours a week?" She argues that women, to a much greater degree than men, want a balanced life of work, family, friends, and community because of their biological hard-wiring.

Pinker's book follows a strong tradition of popular works that explore the implications of hardwired gender differences, including John Gray's *Men are from Mars, Women are from Venus,* and Deborah Tannen's *You Just Don't Understand: Women and Men in Conversation,* to name but two. The arguments laid out in these books are seductive, and we often can see patterns in ourselves or our loved ones that fit the narrative.

But, many other studies that have explored gender differences have come up empty, and these receive much less attention.

Janet Hyde is a faculty member in Women's Studies and Psychology at the University of Wisconsin. She provides a thoughtful and highly researched counterpoint to the gender differences hypotheses that are so popular in the press. I had the good fortune to work with Janet on a mentoring program for women faculty when I was a faculty member at U. Wisconsin. In 2005, she published a review article called "The Gender Similarities Hypothesis"—you

can easily find it on Google. The gender similarities hypothesis holds that men and women are more alike than they are different on most, though not all, psychological variables. Using the method of meta-analysis, which makes it possible to integrate results of thousands of studies on a topic, she explains how the research shows negligible difference between men and women on many dimensions, including measures of cognitive abilities, achievement motivation, communication styles, memory, social or personality variables such as leadership or nurturing ability, as well as measures of psychological well-being, such as self-esteem. In fact, the range of differences within genders is much wider than the mean differences between genders.

Hyde does add several caveats to her findings. First, she notes that there are some gender differences, notably in physical aggression and to a lesser degree in verbal aggression. Also, for some traits, there is more variance in the measures for men than for women, with more men than women having extremely high and extremely low scores. And there is evidence that the social context in which tests are done can either create or erase a measurable gender difference in some traits. Even with these caveats, Hyde's synthesis of a large body of research makes it clear that we should be extremely cautious when making claims about significant gender differences. And we should be even more cautious when taking the next step in linking hardwired gender differences to career choices.

If—as I believe—hardwired gender differences are insufficient to explain why women choose not to pursue science research careers, then what are alternative explanations? Interestingly, inflated claims of gender differences themselves can be dangerous, and they hurt men as well as women, because people can be penalized when they don't match stereotypes. In her 2006 article called "Women at the Top in Science—And Elsewhere" (this article is also available on-line) Virginia Valian describes experiments in which associations of different psychological traits with men and women can skew our judgments of women's competence. In one experiment, two groups were given descriptions of assistant vice presidents in an engineering company and were asked to compare their competence and likeability. Members of one group were not given any assertion about the employees' job performance, but were just given background information, as well as job and company description. Members of the other group were additionally told that the employees were stellar performers. The first group consistently rated men as more competent and both men and women as equally likeable. The second group rated both men and women as equally competent but women as less likeable. These patterns were the same, regardless of whether the evaluators were men or women themselves. Thus, unconscious bias, perhaps stemming from perceptions of gender differences, can influence our judgment. Valian goes on to argue that, even when the effect of such bias is slight in any one scenario, accumulation of advantage

over an extended period can result in large differences in career success.

Now, I would like to shift from domains in which I am familiar with the scholarly research and touch on other reasons for the shortage of women in academic careers. One reason relates to the myth that one must choose work or family, and one cannot have both. I see this myth perpetuated in books such as that of Susan Pinker and I hear it constantly from our graduate students. Yet, I know this is a myth, because I see people all around me every day who are deeply committed to their families and are doing a stellar job at work. My husband and I have two children, now teenagers, and we could not imagine life without them at the centre. It hasn't been easy. One of the hardest things facing parents of young children today is the lack of access to childcare here in the Greater Vancouver region. But many things in life aren't easy, and I can say that for me, the combination of work and family life has been very, very, rewarding.

Yet another factor in the poor representation of women—one that has been the subject of many recent studies at institutions across North America—is the working climate. At UBC, I've been fortunate to work together with several colleagues, led by Rachel Kuske, currently head of UBC's mathematics department, on a study of the working climate in the faculty of science at UBC. The working climate refers broadly to the experience of being at work, such as quality of interactions with colleagues; the quality of resources provided, such as salary, space, mentors, childcare, and so on; policies and practices such as those pertaining to merit-based salary increases; and the degree to which one can balance work and other personal life goals. I have to say that I fully agree with Pinker when she notes that "Grueling hours do not always translate into productivity." I agree with her again when she states: "Workplaces that… don't stigmatize or penalize women for taking time out for children…that allow ways to re-integrate after a time-out, will find more women on staff." Unlike Pinker, I would add that workplaces which don't penalize men for such time outs would also be healthier places.

In conducting our working climate study, we were fortunate to avail ourselves of the expertise of several colleagues in our centre for women's and gender studies, particularly Wendy Frisby and Gillian Creese. We conducted a survey of our faculty, and also of our heads, and also gathered some longitudinal data on recruiting and promotion rates, broken down by gender. We were pleased to see some areas in which the faculty is doing well—for example, there were not significant gender differences in salaries. There were other areas of real concern. In particular, the rate of hiring of women faculty was very low—just 16% over the five year period 2002-2007, which was a period of significant faculty hiring. Rates of promotion have been lower for women, for reasons that cannot be explained simply by time taken for family leaves. At the time that the assessment was completed in early 2007, there was not

a single women in a position of leadership, starting from the nine department heads through the four associate deans and dean in the Dean's Office, on up through the upper administration and president. Additionally, departmental policies that impact faculty support and departmental culture were often poorly articulated or non-existent.

Our own Dean of Science, Simon Peacock, has responded quickly and decisively to the recommendations of the report. It's amazing how, with effective leadership, change can happen quickly. In the year and a half since the working climate report was published, two new department heads are women, and I am appointed as Associate Dean. Members of our faculty-wide Faculty Affairs Committee are developing departmental maternity and parental leave policies that can help our faculty maintain momentum in their research programs during a period of leave. We are adopting faculty hiring best practices that have been developed and refined over the years by our peer institutions. For example, our practices help raise awareness about the ways in which unconscious bias can colour our evaluations of faculty candidates. We have much to do, but we are on our way. We are grateful to have the continued support of our colleagues in UBC's Centre for Women's and Gender Studies as we move forward.

To quickly summarize, the research of Pinker, Hyde, Valian, and numerous others is shifting the conversation about the reasons for the low representation of women in science careers. There is more awareness of the roles of unconscious bias and we are better able to assess explanations that point to gender differences. Additionally, studies of working climate help us understand the structural barriers that still impede women's full participation at our institutions. Understanding why we are where we are is the first and necessary step. The second step, to increase the participation and success of women in science and engineering, builds directly on this understanding. For example, changes in recruiting practices stem from our understanding of unconscious bias, and changes in maternity and parental leave policies stem from our understanding of structural barriers. I hope that we will continue to collaborate as we evaluate the impact of such changes and that we will increase the rate at which we make progress.

In closing, I wish all members of the Institute well. I hope that you will relish the process of tackling thorny questions, and of engaging with your community. I am sure that you will keep the tradition of challenging assumptions alive and well. Thank you.

--Anne Condon, October 2008

About the Author

Lisa Frey grew up in the small farming community of Agassiz, just east of Vancouver. Her first exposure to computing was writing programs on her parents' Commodore 64, where just the simple act of writing a few lines of code to change font colours helped her fall in love with the idea of bringing ideas to life on the screen.

After high school, she entered UBC, where ultimately she took a B.Sc. in mathematics. She also began to write, first as a hobby, then more seriously for the Jade Project in a summer internship under the guidance of Anne Condon. Attending her first Jade Project event, she was energized to see so many strong, intelligent women of all ages coming together to celebrate science and engineering and found herself hooked on their energy and passion!

"Interviewing such a group of charismatic—and candid—female role models has had a tremendous personal impact on me. Such role models as Maria Klawe have inspired me and given me invaluable advice on such topics as achieving life balance, maintaining self confidence, and reaching your potential. I hope that young girls who read about these successful women will be inspired to explore science and engineering and to believe in their own capabilities as well."

Lisa works today at the Rick Hansen Foundation, a non-profit organization that promotes spinal cord injury research. In September 2009 she will begin studying law with an emphasis on health care policy at UBC, hoping one day to combine science and the law to bring cutting edge spinal cord research advances to hospitals across Canada.

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