

# INVESTING IN THE FUTURE

CENTRE FOR EDUCATION IN  
MATHEMATICS AND COMPUTING



UNIVERSITY OF  
**WATERLOO**



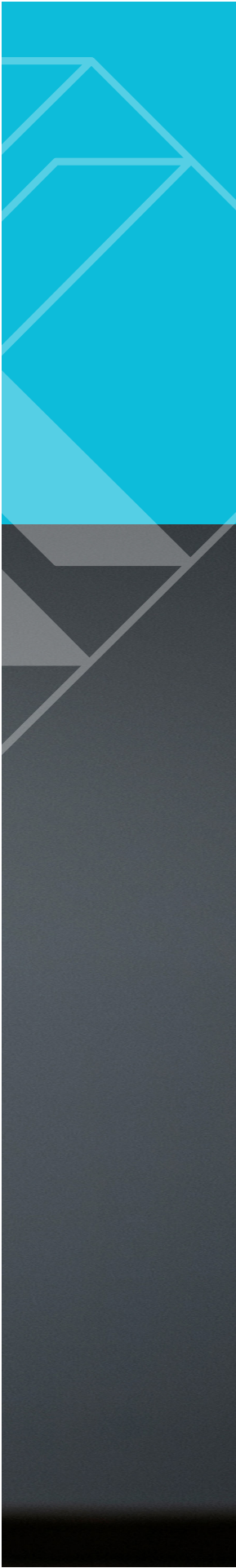
The CENTRE for EDUCATION in  
MATHEMATICS and COMPUTING

# **LETTER FROM THE DIRECTOR**

**IAN VANDERBURGH**







**People.** The Centre for Education in Mathematics and Computing (CEMC) is a “people” organization. Our team is passionate about our mission of increasing interest, enjoyment, confidence and ability in mathematics and computer science among learners and educators in Canada and internationally. Why? Because we do it for the people.

It's for the hundreds of thousands of students who engage with our contests, courseware, workshops, and online resources each year, giving them curricular and extra-curricular opportunities in mathematics and computer science. It's for the tens of thousands of teachers who are able to come to the CEMC knowing that we are there with resources and activities for their students and for their own professional learning. It's for the thousands of school families whose students are impacted by our work.

But the 40 of us who work in the CEMC at the University of Waterloo can't do this by ourselves. The encouragement and support of people like you – whether you are a volunteer, a friend or a donor – is vital to our mission. Thank you for all that you do for the CEMC and for education!



## **AT THE CEMC, WE BELIEVE THAT COMMUNITY MAKES EDUCATION BETTER.**

WE'RE COMMITTED TO BUILDING THAT COMMUNITY WITH TEACHERS IN CANADA AND AROUND THE GLOBE TO SPARK INTEREST IN MATHEMATICS AND COMPUTER SCIENCE AND ENCOURAGE THE NEXT GENERATION TO PURSUE CAREERS IN BOTH. WE WANT TO GIVE YOUNG PEOPLE THE TOOLS THEY NEED TO BE ABLE TO SAY, 'YES, I CAN DO THIS.'

IAN VANDERBURGH  
DIRECTOR, CEMC



## THE CENTRE FOR EDUCATION IN MATHEMATICS AND COMPUTING

# GLOBAL IMPACT

Positioned at the intersection of the worlds of mathematics, computer science and education, the CEMC is cultivating a love of math and computer science – and building pathways to careers in both – among learners across Canada and around the globe.

With your help – the CEMC is continuing to have a positive impact on thousands of learners.

### CEMC VISITS SCHOOLS PROGRAM

Each year, the CEMC Visits Schools program connects young learners to math and computer science with face-to-face workshops right in their own schools.

**OVER 300 SECONDARY SCHOOLS  
PARTICIPATE, REACHING**

**20 000  
STUDENTS**

### MATHEMATICS CONTESTS

The CEMC's Contests inspire students in Grade 5 and up to get excited about math and computer science and to hone their problem solving skills.

**IN THE LAST 10 YEARS,  
THESE CONTESTS HAVE HAD**

**OVER 2 391 000  
REGISTRATIONS FROM 130 COUNTRIES**

There are also 10 000 unique schools connected to the CEMC from across the globe.

### PROGRAMS FOR YOUNG WOMEN AND NON-BINARY YOUTH

Ensuring that more young women are entering STEM fields is a priority for the CEMC.

**SINCE 2002, OVER 2000**

students have participated in CEMC events designed to spark interest in mathematics and computer science among young women, trans and non-binary youth.

### OPEN ONLINE COURSEWARE

Developed by experienced and outstanding educators, the CEMC's courseware gives students and teachers access to over 300 video lessons and more than 1000 interactive mathematical activities that follow the mathematics curriculum from Grades 7 to 12 and cover key areas of computer science.

**FROM ITS "GO LIVE" DATE, THE CEMC'S OPEN COURSEWARE HAS SURPASSED**

**15 MILLION**  
PAGE VIEWS

### PROBLEM OF THE WEEK

The Problem of the Week is designed to provide students with an ongoing opportunity to solve mathematical problems.

**OVER 40 000**  
INDIVIDUALS RECEIVE THE  
PROBLEM OF THE WEEK.

As most of these subscribers are educators, we believe that

**1.4 MILLION**  
STUDENTS BENEFIT FROM  
SOLVING THESE PROBLEMS.

The Problem of the Week is available in English, French, Spanish and Bahasa Indonesian.



### TEACHER CONFERENCES

Teacher conferences ignite renewed engagement in math and computer science among teachers, leading to more opportunities on which students thrive.

**EACH YEAR,**

**OVER 200**

**TEACHERS ATTEND  
THESE CONFERENCES**

### MASTER OF MATHEMATICS FOR TEACHERS

With the CEMC's fully online Master of Mathematics for Teachers (MMT) program, high school teachers can earn a Master's degree from anywhere in the world.

**SINCE THE PROGRAM BEGAN  
IN 2010, MORE THAN**

**400**

**MATHEMATICS TEACHERS HAVE  
GRADUATED FROM THIS PROGRAM, WITH  
300 MORE CURRENTLY REGISTERED.**

## DONOR PROFILE

# MAKING MATH EDUCATION PART OF THE FAMILY LEGACY

**DONORS PAUL AND CATHY COTTON GET BEHIND THE CEMC TO EXTEND  
MATH AND COMPUTER SCIENCE OUTREACH TO THOSE WHO NEED IT MOST**

BY LISA KABESH

**It was 1987 when Paul and Cathy Cotton made their first donation to the University of Waterloo.**

They soon established endowments for two undergraduate scholarships in mathematics, the first in honour of Paul's parents and the second in honour of Cathy's. It wasn't long before they created a third scholarship to recognize the Cotton's daughters, who earned graduate degrees in mathematics and medical genetics, and to help attract the best female math graduate students to Waterloo.

Combined, the three scholarships have helped 53 talented students pursue degrees in the Faculty of Mathematics since 2002.

Now the pair are setting their sights on the Centre for Education in Mathematics and Computing.

"The CEMC exposes kids to opportunities they might never have thought existed, and that's really important to us," says Paul.

"As an organization, it's a great example of what we're trying to do – reach people who wouldn't normally attend university or think about going to Waterloo."

## **OPPORTUNITY PAVES A PATH TO A REWARDING CAREER IN STEM**

Paul Cotton's career in programming and computer standards can be traced back to his high school days, where connections to the University and opportunities to compete in math contests put Paul on the path to study math at Waterloo in the late 1960s.



**“THE CEMC EXPOSES KIDS TO OPPORTUNITIES THEY MIGHT NEVER HAVE THOUGHT EXISTED, AND THAT’S REALLY IMPORTANT TO US”**

“The personal connection really works,” explains the IBM and Microsoft veteran, “and that’s what the CEMC is all about.”

When Paul was in Grade 11 Ralph Stanton made a visit to his school in Thunder Bay in northern Ontario.

Then a professor at the University of Manitoba, Stanton was Waterloo’s first mathematics professor and head of the Mathematics Department. His efforts resulted in Waterloo becoming the first university in North America to have a dedicated Faculty of Mathematics.

Stanton and other Waterloo professors like Ken Fryer introduced Paul and his classmates to mathematics contests, and Paul would go on to compete in contests until he graduated from high school.

Opportunities for deep learning in math and computer science didn’t stop there for the young Paul Cotton. Paul was able to take a remote programming course in Grade 13.

“The University of Waterloo was my cloud computing facility,” Paul jokes.

“As part of the course, I coded programs in Fortran, punched up the cards and sent them to Waterloo where someone ran the program, corrected minor errors and mailed back the results.”

Paul studied computer science at Waterloo, where he met his wife Cathy, who studied applied math and, later, statistics. Cathy enjoyed a 35-year career at Statistics Canada, where she served as assistant director, income statistics and then health statistics, before retiring.

### **THE COTTON FAMILY CHARITABLE FOUNDATION**

The Cottons are very much aware that Paul benefited from the type of opportunities that the CEMC offers kids around Canada today, like the CEMC Visits Schools program and its contests and workshop series.

They are now committed to helping the CEMC spread its outreach programs to reach even more young people, especially kids in remote communities, Indigenous students, and girls and young women.

From the couple’s own parents to their two daughters, the Cottons can point to three generations committed to mathematics and higher education. They created the Cotton Family Charitable Foundation to carry on a family legacy of giving back.

“It’s part of our legacy, and hopefully our daughters’ and grandkids’ legacy, too.”

# OPENING DOORS TO CAREERS IN TECHNOLOGY WITH THE CEMC

**SHANKU NIYOGI, VICE-PRESIDENT OF PRODUCT AT GITHUB,  
HAS A PASSION FOR BREAKING DOWN BARRIERS TO EDUCATION**

**BY LISA KABESH**

Shanku Niyogi started coding when he was 11. The Waterloo computer science graduate (BMath '94) admits that it wasn't always easy.

"You had to learn how to code by yourself back then – I had to go buy magazines to learn how to code. The internet didn't exist," he recalls.

Now vice-president of product at GitHub, a platform that enables more than 40 million developers around the world to write code and create software, Niyogi is passionate about removing barriers to careers in technology.

It's why he's happy to be at GitHub leading a team that builds tools to help people write code, and it's why he supports the Centre for Education in Mathematics and Computing.

These programs, along with the CEMC's free online courseware and resources, make it easy to see why the CEMC is an organization that Niyogi can get behind. Computer Science Circles, for example, is a kid-friendly, interactive, online resource that anyone can access to learn how to code. It's not hard to imagine an 11-year-old computer science enthusiast turning to it with excitement.



## PAYING IT FORWARD

Niyogi recalls a highlight from his high school years with a mix of humour and gratitude: a field trip to the University of Waterloo where he and his classmates were given the opportunity to experience what coding would be like as a career.

“They gave us spiral-bound books that you coded from, and I took the book,” he laughs. “I brought it home with me, and I learned to code with it at home. When my aunt found it, she made me give it back,” he says with another laugh.

Without opportunities like that one-day field trip, Niyogi isn’t sure he would have been able to get as far as he did with his studies.

“I consider myself incredibly fortunate to be in the tech industry,” explains Niyogi, “I want to do my part to help others take a similar path.”

## DIVERSITY MATTERS

The Microsoft and Google Cloud veteran also sees the CEMC playing an important role in helping to diversify STEM. He points to programs like Think About Math!, a day-long workshop designed to ignite enthusiasm in high school girls for mathematics, as an example of how the CEMC, is making a difference.

“We have a shortage of 1.5 million developers in the United States alone,” says Niyogi.

“Tech is driving a lot of progress, and there’s huge demand for writing code and software development skills. It’s on us as an industry to fix that, to improve diversity in the computer science space, to reach out to more audiences and find people from under-represented communities.”



**“WHEN I ATTENDED THINK ABOUT MATH! I THOUGHT IT WOULD BE A HELPFUL AND FUN PROGRAM DESIGNED TO IMPROVE MATHEMATICS SKILLS BUT I REALLY DIDN’T KNOW ABOUT THE OPTIONS IT WOULD UNCOVER FOR ME. WHAT AFFECTED ME THE MOST WAS THE PANEL OF INSPIRING WOMEN. THEY SHOWED ME THAT MATHEMATICS HAS A MUCH BROADER REACH THAN THE CONVENTIONAL IDEAS SOCIETY PRESENTS TO YOUNG PEOPLE.”**

**– SOPHIA JANSZEN-SPITMAN**

FORMER THINK ABOUT MATH! PARTICIPANT AND  
CURRENT WATERLOO MATHEMATICS STUDENTS

# INSPIRING THE NEXT GENERATION

Mathematics and computer science are two of the most important drivers of today's knowledge economy. They can prepare the next generation to help solve some of the world's toughest challenges, like climate change, food sustainability, global health and more.

To all of our donors, volunteers, champions and friends, thank you so much for your kind and generous support. We couldn't do what we do without your help.

To learn more about current programming and activities, please visit:

[cemc.uwaterloo.ca](http://cemc.uwaterloo.ca)







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