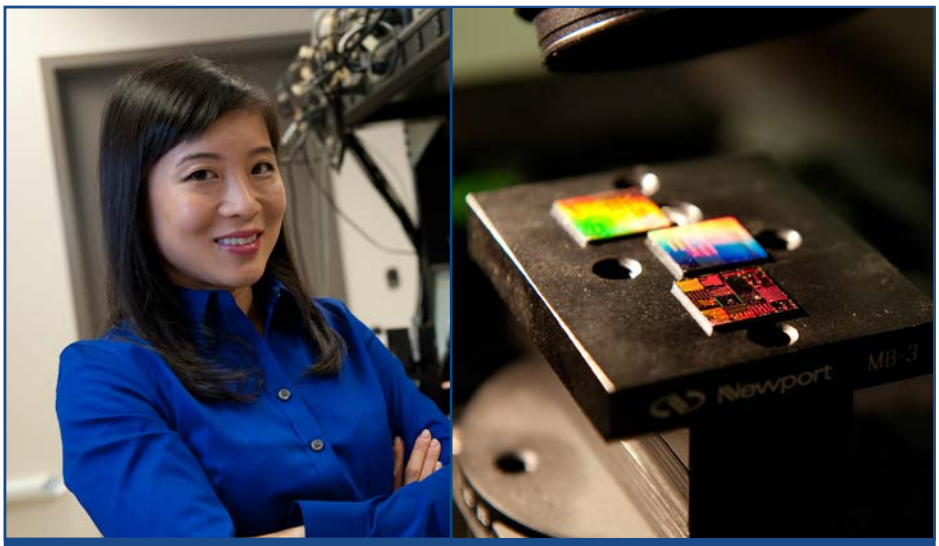
CMC MICROSYSTEMS
IMPACT

Canada's international leadership and research excellence in silicon photonics: Tackling demanding challenges

Increase the rate of information transfer.

Bryce Dorin, who graduated from the MASc program at Carleton University in 2014, won the Nature Photonics award for the best student oral presentation at the IEEE International Conference on Group IV Photonics in Paris this past summer. The conference is a premiere annual event that draws from around the globe the brightest scientists from academia to share their insights on the current and future status of silicon photonics, and other Group IV element-based photonic materials and devices.

Dorin is supervised by Dr. Winnie Ye, Canada Research Chair in Nano-scale Integrated Circuit Design for Reliable Opto-Electronics and Sensors. Dorin's award-winning presentation described an alternative system—mode-division multiplexing (MDM)—to increase the rate of information transfer in SOI (silicon-on-insulator) chips. He demonstrated that one laser source is sufficient for the proposed work. "This means that a single laser source may work for multiple channels, an alternative to the current wavelength-division multiplexing (WDM) platforms.



Dr. Winnie Ye, Canada Research Chair in Nano-scale Integrated Circuit Design for Reliable Opto-electronics and Sensors, is developing a world-class research program working with silicon photonics. Her team focuses on designing and fabricating nano-scale integrated circuits for reliable opto-electronics and developing affordable and multifunctional biosensor systems. Impressively, her graduate student, Bryce Dorin, was an award recipient at the IEEE International Conference on Group IV Photonics in 2014.

This is a very new field and Bryce has provided a significant contribution," says Ye.

Dr. Ye credits CMC Microsystems with helping Dorin create prototypes for the project by providing design tool access and fabrication services. Dorin has also been a participant in the Silicon Nanophotonics Fabrication Graduate Course offered through CMC. The course provides students with access to theoretical and hands-on training, subsidized fabrication and engineering support on leading-edge technology. "CMC helps us tremendously," says Ye.

The research showcased at the IEEE conference has potential applications in telecommunications, but is only one of a wide range of silicon photonics projects underway in Ye's Silicon Micro/NanoPhotonics lab. For example, one of her renewable energy projects aims to use metallic nano particles to improve the efficiency of silicon solar cells.

Other projects target biomedical applications. Ye and her team are working to place millions of biosensors on a single chip, which would allow for a wider range of tests to be done from one sample. "It would allow us to test multiple things simultaneously." This would help researchers who try to find potential new drugs or vaccines by screening compounds for their biological activity. There has been a lot of progress using photonics in biomechanical sensing systems, but there is plenty of room for improvement in terms of reliability, performance and cost, she says.

Ye collaborates with National Research Council Canada (NRC) scientists on both polarization rotators and subwavelength gratings. One of the NRC scientists she works with is Dr. Pavel Cheben. Cheben supervised PhD student Daniel Benedikovič, who won the prestigious Nature Photonics award for the student poster presentation at the same Group IV Photonics conference. Only four prizes for students were awarded at the conference and two were for work done in Canadian labs—a sign of Canada's leadership in silicon photonics. *cmc*