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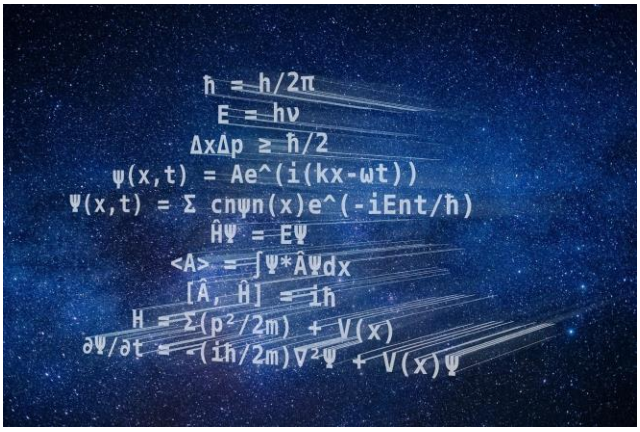
RESEARCH CONNECTION

# Getting to know the Mobile Quantum Computing Lab

*By Sarah Plosker, PhD*




**What you need to know**

Dr. Sarah Plosker conducts research in the field of quantum information theory in the Department of Mathematics and Computer Science at Brandon University. Her Canada Foundation for Innovation (CFI)-funded Mobile Quantum Computing Research Lab allows Dr. Plosker and her group to have a state-of-the-art mathematical research facility at their fingertips, providing them with the tools they require to conduct their research.

## Why this research is important

Dr. Plosker's research is at the intersection of mathematics and physics. Her work builds up the mathematical theory behind physical tasks, such as transferring a quantum state from one location to another within a quantum spin network. This is an important requirement for quantum computing, where quantum states need to be transferred accurately between registers and/or processors in different locations of a quantum computer.

## How the research is conducted

Dr. Plosker supervises a team of undergraduate students, graduate students, and post-doctoral fellows at several universities across Canada. High-powered laptops and tablets, as well as mathematical computing software, are a necessary part of her collaborative research program.

Virtual meetings, both one-on-one and in large groups, are commonplace, with some in-person visits when possible. Dr. Plosker typically works on numerous projects simultaneously, at various stages of development, in the general area of quantum information theory. While each project is distinct, the projects often overlap with respect to methodology; Dr. Plosker combines tools and techniques from several key areas of mathematics, such as linear algebra and graph theory, to solve mathematical research problems.

## How this research can be used

The main dissemination practices in mathematics and physics are peer-reviewed journal articles, with preprints available at https://arxiv.org/, an online repository of scientific articles, and presentations at conferences with

other researchers and leaders in the field. This allows the research to be showcased to potential users; each researcher or research team using others' work to continue to push the frontier of mathematics and physics.

## About the researchers

Dr. Sarah Plosker is a professor and Canada Research Chair in Quantum Information Theory at Brandon University, where she started in 2013. In addition to her research, she is involved in various outreach and mentoring initiatives aimed at supporting women and underrepresented genders in mathematics, as well as Indigenous and rural youth. PloskerS@brandonu.ca

**Hermie Monterde** is a PhD student under the joint supervision of Dr. Sarah Plosker and Dr. Steve Kirkland at the at the University of Manitoba.

**Aaron Rossi** is a Master of Science student under the joint supervision of Dr. Sarah Plosker and Dr. Steve Kirkland at the University of Manitoba.

**Dr. Sooyeong Kim** is a postdoctoral fellow at the University of Guelph. He is under the joint supervision of Dr. Sarah Plosker, Dr. David Kribs, and Dr. Rajesh Pereira at the University of Guelph.

**Avner Sadikov** is a PhD student under the joint supervision of Dr. Sarah Plosker and Dr. Remus Floricel at the University of Regina.

**Edison Lozano** and **Chloe Green** were undergraduate students at Brandon University in the summer of 2024.

## Keywords

quantum information theory, mathematical physics, spectral graph theory, quantum state transfer

## Publications

Johnston, N, & Plosker, S. (2025). Laplacian {−1, 0, 1}- and {−1, 1}-diagonalizable graphs. *Linear Algebra and its Applications, 704*, 309–339. https://doi.org/10.1016/j.laa.2024.10.016

Kim, S., Monterde, H., Chan, A., Ahmadi, B., Kirkland, S., & Plosker, S. (2024). *A generalization of quantum pair state transfer, Quantum Information Processing, 23*, 369. https://doi.org/10.1007/s11128-024-04574-9

Johnston, N., Moein, S., & Plosker, S. (2024). *The factor width rank of a matrix* [Manuscript submitted for publication]. https://doi.org/10.48550/arXiv.2405.11556

McLaren, D., Monterde, H., & Plosker, S. (2023). *Weakly Hadamard diagonalizable graphs and Quantum State Transfer* [Manuscript submitted for publication]. https://doi.org/10.48550/arXiv.2307.01859

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Editor: Christiane Ramsey RamseyC@brandonu.ca
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