Ultracold Atoms - Thywissen Group

NSERC Undergraduate Student Research Award - Summer 2024

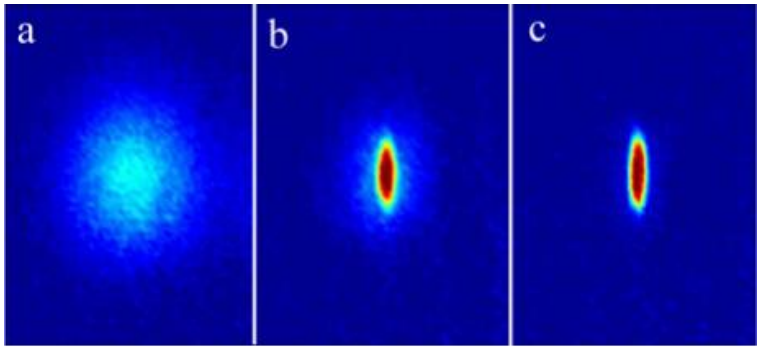
Our research group tries to understand fundamental questions about materials by studying a model system: neutral atoms at nanokelvin temperatures. A collection of thousands or millions of atoms are manipulated and probed while they are held in either magnetic or optical traps, inside an ultrahigh vacuum system.

We learn about our system by taking images with lasers. Some absorption images of ultracold atoms are shown at the bottom of this page. In order to get to the ultracold regime, we combine many different cutting-edge laboratory tools: ultrahigh vacuum, lasers locked near an atomic resonance, other lasers at high power, magnetic fields, fast electronics, cooled scientific cameras, and sophisticated imbedded computing.

We are looking for one or two summer students to help build a new experiment in the lab. This experiment will study tunnelling of atoms through barriers, and probe how superfluids move in optical lattices. As a summer student in the group, you would learn about lasers, vacuum systems, electronics, and imaging systems. Your daily work would be under the guidance and supervision of graduate students and postdoctoral fellows. An ambitious goal of the summer would be to achieve Bose-Einstein condensation.

The regime we study is deeply quantum-mechanical, so some background in quantum would be helpful, but not required. More important is a strong interest in experimental work. Laboratory work in an atomic physics lab involves electronics, optics, design work, programming, construction, and testing. All USRA students in the group will be enrolled in the basic training course of the physics machine shop, if they have not already taken it for prior summer work.

For more information, visit https://www.thywissenlab.ca/, which includes recent publications, a list of former USRA students (and what they are doing now), current group members, and contact information.



Absorption images of (**a**) a thermal gas; (**b**) a Bose gas at a phase transition; and (**c**) a nearly pure Bose-Einstein Condensate.