# Physics Colloquium

**Prof. Kevin Wright**
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**Dartmouth College**

## "Matter-Wave Circuits of Ultracold Fermions"

*The fundamentally quantum mechanical nature of physical law is not obvious in most large systems, however, there are some materials whose macroscopic properties are dominated by collective quantum effects. Superfluidity and superconductivity are the best-known examples of this "macroscopic quantum" behavior. After eighty years of work on these problems there have been some amazing breakthroughs but predicting the nature (and even existence) of macroscopic quantum phases of matter is still a notoriously difficult problem. Ultra-cold atomic gases are becoming an important tool for exploring these phenomena, with the development of "atom circuits" that can be used to study quantum phases of matter with an unprecedented degree of control. After an overview of key results from work with weakly interacting bosonic atoms, I will present results of groundbreaking new experiments with circuits of fermionic atoms where we show the ability to create persistent currents and measure the critical interaction strength at which they decay. These capabilities provide an exciting new means for studying systems of interacting fermions in regimes and geometries previously inaccessible to experiments, in which unusual quantum phases with interesting transport properties are predicted to exist.*

Kevin C. Wright has been cooling various kinds of atoms to quantum degeneracy and encouraging them to move around in precise little circles since his Ph.D. work with Nick Bigelow at the University of Rochester. In 2009, he was awarded an NRC Postdoctoral Fellowship and went to the Joint Quantum Institute to work with Bill Phillips and Gretchen Campbell, helping to build some of the first superfluid "atom circuits" with Bose-Einstein condensates of sodium atoms. Since starting up a new lab at Dartmouth in 2013, Prof. Wright has shifted the focus of his cold-atom-wrangling activities to the intricacies of fermionic quantum matter.

**Thursday, December 2, in LL 316 at 4:25 PM**

***For Zoom participation, please see information below:***

**Meeting ID: 972 1274 7894**

**Passcode: 631869**