



# Institute for Materials Science

UNCLASSIFIED

## Institute for Materials Science Seminar - Open to the Public



**Dr. Sergej Moroz**  
**University of Colorado**  
**Condensed Matter Theory Group**

**Effective Theory of Chiral Superfluids and Superconductors**

**Thursday, March 24, 2016**

**9am to 1pm: Seminar 9 - 10 & open discussion until 1pm**  
**Hot Rocks Conference Room (TA03-4200 Room 203-A)**

**Abstract:** Two-dimensional fermionic chiral superfluidity and superconductivity is an active area of experimental and theoretical research in condensed matter physics. They are of interest in different fields such as the physics of  $^3\text{He}$ , quantum Hall physics, unconventional superconductivity and topological quantum computing. In the first part of the seminar, I will talk about the effective theory of a chiral  $p+ip$  superfluid at zero temperature. It naturally incorporates the parity and time reversal violating effects such as the Hall viscosity and the edge current. I will also show how a chiral  $p+ip$  superfluid can be put on a sphere. In the second part of the talk I will summarize our ongoing work on the effective theory of a spin singlet  $d+id$  superconductor. Using this theory I will argue that in addition to the well-known spin Hall effect, this system should exhibit a vortex Hall effect - a spontaneous generation of a dense vortex state in the absence of an external magnetic field.

**Bio:** Dr. Moroz was born in Karelia, Russia in 1983. His education in Minsk, Belarus was followed by his Masters degree in Physics at Charles University in Prague, Czech Republic. In 2008 he moved to Heidelberg, Germany where he received his PhD in Physics from Heidelberg University in 2011. As a postdoc, he joined the Nuclear Theory Group at University of Washington, Seattle in 2011. Since 2014 he has been a research associate in the Condensed Matter Theory Group at the University of Colorado, Boulder.

---

For general information contact Caryll Blount, IMS Administrator  
caryll@lanl.gov \* 665-3950

*Hosted by Alexandar Balatsky \* Director of the Institute for Materials Science*