Claire Thomas

Graduate Institution: University of California-Berkeley

Graduate Discipline: Cold Atom Physics

Hometown: Baton Rouge, LA

Relevant SC Research: Basic Energy Sciences

Research Interest:

My research is on ultracold atomic gases in an optical kagome lattice. Optical lattices are created by overlapping multiple laser beams so that their intensities form an interference pattern. We then trap cold atoms at specific locations in this interference pattern (atoms are attracted to intensity minima or maxima, depending on the laser used). By trapping cold atoms in an optical lattice, we experimentally realize a well characterized, controllable and defect-free artificial crystal structure.

Solid materials get their bulk properties from their atomic crystal structure, that is, the pattern in which their atoms are arranged. In order to exploit these properties (as in the use of silicon chips powering this computer) we would like to know exactly what aspects of atomic arrangements give rise to certain electronic or magnetic properties. In cold atom lattices we arrange individual atoms in the structure that we choose, providing us with a very well understood model for the selected solid system. These lattices offer a level of control that is not possible in the study of solid materials.

I study a specific lattice structure called kagome, so named because it looks like the baskets weaved in Japanese tradition (kagome baskets). The kagome lattice is realized in a few real crystals (eg. Herbertsmithite) and is expected to possess magnetic frustration due to its complicated crystal structure. Further, in its energy level diagram there is an energy band that is completely flat, rendering the effective mass of the charge carriers infinite (the converse of this effect occurs in graphene, where the energy band has a sharp corner and so the carriers are effectively massless). Having a cold atom model of such a complicated system will allow us to carefully explore the properties of this fascinating crystalline structure.

About Me:

I got my bachelor's degree in Physics from Boston University in 2010 and am currently pursuing a PhD in Atomic, Molecular and Optical Physics at the University of California, Berkeley. Cold atom systems interest me because they can be placed in very well understood conditions and model dynamics of the far more complex systems found in solid materials. I began working in the group of Dan M. Stamper-Kurn in 2010, studying the dynamics of a spinor Bose-Einstein condensate with collegues Jennie Guzman and Dr. Gyu-Boong Jo. Since then, we have transitioned to studying ultracold atoms in a kagome lattice.

I am begining my third year of graduate school and I am very fortunate to live in Berkeley, California, where I can take advantage of frequent good weather and beautiful scenery. I spend any spare time biking in the Berkeley hills, rock climbing in or near town, or driving into nearby mountains to backpack and camp.