UNIVERSITY of DENVER
PHYSICS AND ASTRONOMY

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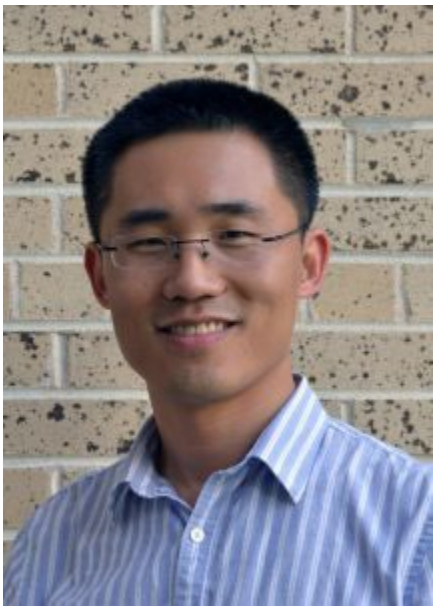

Dr. Hua Chen
Assistant Professor
Department of Physics
Colorado State University

Chirality, antiferromagnetism, and the anomalous Hall effect

Chirality means properties of a system that are changed in its mirror image. In recent years chirality has become such a prevailing word in condensed matter physics that sometimes its meaning in certain contexts is not immediately clear. I will start this talk by explaining why chirality is intuitively associated with magnetism and the transport phenomena called Hall effects. This connection leads to a class of "chiral antiferromagnets" that people start to be interested in recently, which are antiferromagnets having the anomalous Hall effect. I will then propose a new "chiral" quantity, coined electronic chiralization (EC). EC plays the role of magnetization in telling us whether the material is chiral or not, but is not vanishing in an antiferromagnet, and can give powerful predictions. Finally, I will show that interesting phenomena can arise when the structure of a magnetic system is also chiral by itself. Specifically, in a kagome spin ice compound that has structural distortion, an emergent "chiral" symmetry operation appears that keeps the total spin, energy, and even band structure invariant but surprisingly changes the size of the anomalous Hall effect.

Dr. Barry Zink, 303-871-3025, barry.zink@du.edu