LA-SiGMA

Louisiana Alliance for Simulation-Guided Materials Applications

Spring Seminar Series
3:30pm - 4:30pm, Wednesday, February 6, 2013
Tilton Hall 305, Tulane University

Cooking, Fishing and Jogging through Phase Space: A Practical Guide to Discovering (and Understanding) New Materials

by

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The design, discovery, characterization and control of novel materials is perhaps the most important research area for humanity as it moves into the 21rst century. A myriad of societal problems concerning energy, clear water and air, and medicine all need to be solved by the discovery of new compounds with dramatically improved, or even new, properties. The search for such materials requires a blending of skills and mind sets that, traditionally, have been segregated into different academic disciplines: physics, chemistry, metallurgy, materials science. In this lecture I will outline the basic philosophy and techniques that we use to search for novel materials. These include a combination of intuition, experience, compulsive optimism and a desire to share discovery. (To some extent the driving force can be considered similar to that which drives the host of a fine dinner party.) In the second half of the lecture, the specific case of superconductivity will be used as an example of one specific such search. Over the past couple of decades a growing sense of where, and even how to search for new superconductors has been developing, with the recent discovery of the FeAs based materials providing, at least for me, clear guidance. The lecture will be general and include side comments, mildly slanderous asides and may even have references to philosophers living and dead.

Dr. Paul C. Canfield received his PhD from the University of California - Los Angeles, and then held a postdoctoral position at Los Alamos National Laboratory. He has been at the Department of Physics and Astronomy at Iowa State University and Ames Laboratory since 1993. Dr. Canfield's group has broad interests in the design, discovery, growth and characterization of novel materials, primarily in single crystal form. The low temperature electronic, magnetic and thermal properties of intermetallic compounds are of specific interest. Behaviors such as superconductivity, heavy Fermion, quantum critical, ferro- and antiferromagnetic, and spinglass are studied in crystalline and quasicrystalline materials so as to gain better understanding and control of these complex, and many times useful, states.