Abstract for

International Symposium on
Recent Electronic-Structure Theories and Related Experiments
Wednesday June 12 to Saturday June 15, 2013
Max Planck Institute for Solid State Research, Stuttgart, Germany

Electronic Structure from the top down.

Richard M. Martin

University of Illinois and Stanford University

Most methods for electronic structure treat the electrons at zero temperature, which is appropriate in many cases since the actual temperature is often very low compared to characteristic electronic energies. Density functional methods have led to remarkably accurate results in large classes of materials, and some effects of temperature may be included by adding excitations - the “bottom up” approach.

However, there are other systems where the electronic properties change drastically with temperature, especially associated with magnetism and local moments. In fact, the great interest in "strongly correlated systems" is almost always related to dependence upon temperature. This talk is about starting from high temperature statistical mechanics and adding correlation as temperature is reduced – the “top down” approach. The basic ideas can be formulated in Green’s function methods and practical implementations are in dynamical mean field theory. The goal is to reconcile the pictures that emerge from the two approaches and combine the advantages of each in future methods for simulations for materials research.