清华大学高等研究院

Institute for Advanced Study, Tsinghua University

学术报告

Title: **Shedding New Light on High-Tc Electronic Structure: From Top Down**

Speaker: **Prof. Ruihua He**
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Time: **4:00pm, Thursday, August 21, 2014**

Venue: **Conference Hall 322, Science Building, Tsinghua University**

Abstract

High-Tc superconductivity in cuprates remains a central intellectual issue in condensed matter physics almost three decades after its initial discovery. The primary current concern of the field is about the relationship triangle between the pseudogap, superconductivity and possible density wave correlations that coexist and likely compete with superconductivity. Its complete resolution has been conceived to be a path that has to be taken toward the ultimate revelation of the mechanism of high-Tc superconductivity. On the other hand, our current understanding of both the high-Tc mechanism and the pseudogap is entirely based on a simplified description of the electronic band structure of cuprates, the so-called Zhang-Rice singlet description, whose validity was supported by experiments mostly performed in the early 90's and ought to be scrutinized by means of more powerful advanced techniques on refined materials that are only available in recent years.

In this talk, I will first briefly go through our recent progresses on the pseudogap issue, an aspect of electronic structure of direct, high-level relevance to the high-Tc mechanism. The progresses contribute to the establishment of the broken-symmetry nature of the pseudogap phase, which contains rich physics beyond the mere superconducting fluctuations as previously thought and directly implicate some density wave fluctuations. Then I will present our new finding about the Zhang-Rice singlet issue, a more fundamental aspect of the electronic structure. We observed electronic states of distinct symmetry coexisting with the Zhang-Rice singlets in the ground state of a cuprate family. This finding highlights the complexity of the high-Tc electronic infrastructure that was previously overlooked but might turn out to be crucial for a realistic, complete understanding of high-Tc superconductivity.