



547th ASRC Seminar

Date: 14:00 ~ 15:00, 15 April

Location: Meeting room 103, ASRC Building

Speaker: Prof. Zhi-Xun Shen

(Dep. Physics and Applied Physics, Stanford University)

Title: High Temperature Superconductivity
– Insights from Einstein's Electrons

It is now over 100 years since superconductivity was discovered and it took 45 years before a theory was formulated by Bardeen-Cooper-Schrieffer (BCS). Once understood, the impact has been felt far behind superconductivity itself. High-temperature superconductivity in copper oxides, with critical temperature well above what was anticipated by the BCS, was discovered 25 years ago and remains a major unsolved physics problem today.

The challenge of this problem is symbolized by a complex phase diagram consists of intertwined states with extreme properties in addition to unconventional superconductivity. None of them can be described by conventional theory, thus compounding the difficulty to understand high-temperature superconductivity itself as these states are different manifestations of the same underlying physical system, making an integrated understanding a necessity.

Angle-resolved photoemission spectroscopy (ARPES), derived from Einstein's formulation of photoelectric effect, has emerged as a leading experimental tool to push the frontier of this important field of modern physics. Over the last two decades, the improved resolution and carefully matched experiments have been the keys to turn this technique into a sophisticated many-body physics tool. As a result, ARPES played a critical role in setting the intellectual agenda by testing new ideas and discovering surprises. This talk focuses on the insights we have gained on the rich phase diagram of the copper oxide superconductors – a pre-requisite for a complete understanding of high temperature superconductivity.

References:

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<Contact>

Michiyasu Mori (81-3508)

Advanced Science Research Center

