



Physical Research Laboratory, Ahmedabad

Colloquium 17-17

Speaker: Dr. Navinder Singh

Associate Professor, Theoretical Physics Division, PRL

Title: "A bird's-eye view of the field of unconventional superconductivity"

Time: Wednesday, 12 July 2017, 16.00 hrs.

Venue: K. R. Ramanathan Auditorium, PRL

Abstract

Superconductivity is the phenomenon in which at very low temperatures (typically below 30 K) certain metals show no resistance to the flow of electric current. The phenomenon was discovered by Kammerling Onnes in 1911, and was theoretically explained by John Bardeen, Leon Cooper, and Robert Schrieffer in 1957 (the BCS paradigm). In 1986, superconductivity was discovered in unexpected materials called cuprates which superconduct at comparatively higher temperatures (of the order of 100 K). These materials go beyond the BCS paradigm, and at present, we do not have the understanding of the mechanism of superconductivity in these materials. The normal state out of which superconductivity emerges is very unconventional, and is not understood. This field, now popularly known as the field of unconventional superconductivity experiences another revival with the discovery of pnictide materials in 2008. The field has seen many different paradigms like RVB, magnetic spin fluctuation mechanisms, and the paradigm of quantum criticality. But there are problems with these paradigms. We present a survey of these developments. An objective critical analysis of the facts shows that the right direction is already there in the literature, however, much needs to be done. We will present an overview of our recent investigations in that direction, and summarize the open problems.

The Speaker

Dr. Navinder Singh did his B.E. in Electronics Engineering, and after that he shifted to theoretical physics and did his PhD in theoretical condensed matter physics from the Raman Research Institute, Bangalore (2006). He, then, obtained his post doctoral training from IOP Bhubaneswar; Holon Institute of Technology, Israel; and the University of Toronto, Canada. He is currently a faculty member in Theoretical Physics division at PRL. His research interests revolve around the nature of electronic transport in strongly correlated systems like strange metals and in the theory of (un)conventional superconductivity. He has published over 30 papers in peer reviewed journals and authored a book entitled "Electronic Transport Theories: From Weakly to Strongly Correlated Materials", CRC Press (2016). He is also interested in Science Popularization activities.

Tea at 15:30 hrs.

ALL ARE WELCOME

