



INSTITUTE COLLOQUIUM

(THROUGH WEBINAR)

➤ **TITLE OF THE TALK ::**

SPIN LADDERS TO NOWHERE

➤ **SPEAKER ::**

Prof. Sumit Mazumdar, University of Arizona

06TH MAY'2021
10.00 AM(IST)

WEBINAR LINK

YOUTUBE LINK

➤ **ABSTRACT ::** More than 30 years after their discovery the mechanism of superconductivity in the high-temperature cuprate superconductors is still debated. One enduring question has been what is the minimal model for the copper-oxygen planes, and whether the more complex three- band model containing both copper and oxygen orbitals can be reduced to the much simpler one-band Hubbard model. I will introduce both models for a broad audience. Even as numerical calculations have failed to find superconductivity within the one-band Hubbard Hamiltonian, continued faith in the model by many investigators is a consequence of repeated analytical and numerical demonstrations (over more than 25 years!) of quasi-long range superconducting correlations in the two-leg doped Hubbard ladder, and the belief that the two-dimensional layer can be thought of as coupled two-leg ladders. I will present the results of large scale Density Matrix Renormalization Group (DMRG) calculations of super- conducting correlations for the realistic cuprate ladder containing both copper and oxygen. Our numerical calculations show rapid suppression of hole binding in the realistic ladder [1]. I will point out why this result is to be anticipated from physical reasoning. Our results have profound implications for the existing theoretical models for correlated-electron superconductivity [1].

The talk will be directed towards a broad audience that may consist of both chemists and physicists and no background in Hubbard models or high T_c superconductivity will be assumed.

[1] "Absence of Luther-Emery Phase in the Three-Band Model for Cuprate Ladders," Jeong- Pil Song, Sumit Mazumdar, R. Torsten Clay, arXiv:2010.10609.

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