



**S N BOSE NATIONAL CENTRE
FOR BASIC SCIENCES**

Block JD, Sector III, Salt Lake, Kolkata 700 106

DEPARTMENTAL SEMINAR

Condensed Matter and Materials Physics

15th December, 2023

4.00 PM

ONLINE/FERMION

SPEAKER

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TITLE OF THE TALK

**CONVENTIONAL AND TIME-RESOLVED RAMAN SCATTERING
OF STRONGLY CORRELATED MATERIALS**

ABSTRACT

The interplay between charge, spin and lattice degrees of freedom creates exotic phases in strongly correlated materials. Raman spectroscopy is a versatile tool to study these phases because of their sensitivity towards these elementary excitations. Moreover, time-resolved pump-probe Raman spectroscopy provides the time evolution of these states away from thermal equilibrium. I will first discuss the Raman scattering results which will illuminate the impact of flash sintering on the structure of layered oxide structure of cuprate Pr_2CuO_4 . Then, I will present the Raman scattering results of spin-1/2 quantum spin liquid $\text{Ba}_4\text{Ir}_3\text{O}_{10}$ which will provide the signatures of spinons and damped phonons.

I will then switch gears to the light-induced non-equilibrium phases and understand their dynamics in ultrafast timescales, in which these phases arise, within femto- or picoseconds by using time-resolved Raman spectroscopy. Recently reported signatures of superconductivity at elevated temperatures in photoexcited copper oxides and intercalated fullerenes are particularly interesting but still enigmatic.

The time-resolved Raman scattering results on optimally doped $\text{YBa}_2\text{Cu}_3\text{O}_{6.9}$ superconductor using near-infrared pump pulses, focusing on non-equilibrium dynamics of the apical oxygen phonon, relaxation timescales and interactions between electrons and phonons, will be discussed. Finally, I will briefly share the ongoing activities on understanding the physics of light-induced non-equilibrium superconducting phases in fullerenes by resonantly driving specific infrared-active phonon modes with mid-infrared and terahertz excitation pulses.

HOST FACULTY

Prof. Prabhat Mandal, Emeritus Professor
