



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

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

## **DEPARTMENTAL SEMINAR**

# **Physics of Complex Systems**

**19<sup>th</sup> January, 2023**

**3.00 PM**

**ONLINE / FERMION**

### **SPEAKER**

**Dr. Avijit Misra,  
Post-doc research fellow, The Weizmann  
Institute of Science**

### **TITLE OF THE TALK**

**Work extraction from thermal noise by measurements and nonlinear interactions in quantum optical setups**

### **ABSTRACT**

In this talk, I will try to elucidate the rapport of work and information in the context of a minimal quantum mechanical setup. Specifically, I will talk about a converter of heat to work wherein the input consists of a single oscillator mode prepared in a hot thermal state along with few much colder oscillator modes. I will compare the efficiencies of work extraction and the limitations of power in reversible manipulations and different, generic, measurement strategies in our minimal setup. I will demonstrate that extraction of work by observation and feedforward (WOF) that only measures a small fraction of the input, is clearly advantageous to the conceivable alternatives, by generalizing a method based on optimized homodyning. However, the main drawback of work extraction by measurement is it inevitably requires feedforward and outcome dependent control steps. To circumvent this, I will briefly discuss autonomous, coherent work extraction exploiting non-linear cross-Kerr interaction. Our results may become a basis of a practical strategy of converting thermal noise to useful work in optical setups, such as coherent amplifiers of thermal light, as well as in their optomechanical and photovoltaic counterparts.

#### **References:**

Phys. Rev. Lett. 127 (4), 040602 (2021)  
Phys. Rev. E 106 (5), 054131 (2022)  
Sci. Adv. In press ( arXiv:2108.10157)

### **HOST FACULTY**

**Dr. Manik Banik, Associate Professor**

**DEPT. OF PHYSICS OF COMPLEX SYSTEMS**

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