



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

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

## **DEPARTMENTAL SEMINAR**

# **Department of Astrophysics and High Energy Physics**

**22<sup>nd</sup> April, 2024**

**3. 00 PM**

**FERMION / ONLINE**

### **SPEAKER**

**Dr. Subham Dutta Chowdhury,  
Post-Doctoral Researcher, University of Chicago**

### **TITLE OF THE TALK**

Non-relativistic conformal field theories and (Un)nuclear physics

### **ABSTRACT**

Due to an accidentally large  $s$ -wave scattering length, in a relatively wide range of energy, neutrons are approximately described by the nonrelativistic conformal field theory of unitarity fermions, perturbed by one relevant and an infinite number of irrelevant operators. The nuclear reactions that we consider describe emission of several neutrons with small momenta relative to each other. The final state of neutrons in such processes is described by an operator in this non-relativistic CFT, termed an “Unnucleus”. This is reminiscent of “Unparticle” predicted in the context of the standard model coupled to conformal field theory. We develop a formalism which provides a nonperturbative definition of local operators in that nonrelativistic conformal field theory. We compute the scattering-length and effective-range corrections to the two-point functions of primary charge-three operators using the technique of conformal perturbation theory. These calculations allow us to find the first corrections to the scale-invariant behavior of the rate of nuclear reactions with three neutrons in the final state in the regime when the neutrons have small relative momenta. We also report on progress regarding computing four-point functions in this theory.

### **HOST FACULTY**

**Dr. Parijat Dey, Assistant Professor**

**Dept. of ASTROPHYSICS AND HIGH ENERGY PHYSICS**

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