Seminar on Mathematical Sciences

(SMS-2025)

Monday, 23 June 2025

02.30 pm to 03.30 pm

Title of the talk: **From Balls to Paradoxes**

Speaker: **Dr. Arijit Ghosh**, ACMU, ISI, Kolkata

Abstract: In this talk, we discuss the foundational result known as the Banach-Tarski Paradox, a counterintuitive theorem in set theory stating that a solid ball can be decomposed into finitely many pieces and reassembled into two identical copies of the original. We will explore the key ideas underlying this paradox, including the role of the Axiom of Choice, the construction of non-measurable sets such as Vitali sets, and the surprising consequences for our understanding of volume and measure.

TEA BREAK
03.30 pm to 04.00 pm

04.00 pm to 05.00 pm

Title of the talk: **Exclusivity principle and the Quantum Nature of the Physical World**

Speaker: **Dr. Manik Banik**, S. N. Bose National Centre for Basic Sciences, Kolkata

Abstract: Physical theories are constructed to describe the world as observed through human experience. When new phenomena resist explanation within an existing framework, we are compelled to revise or replace the theory. A paradigmatic example is the emergence of quantum mechanics, which arose from the failure of classical physics to account for microscopic phenomena. Yet, quantum theory is notably abstract and deeply mathematical. What, then, makes it uniquely suited—among countless conceivable mathematical models—to describe our universe? In this talk, we explore this question through the lens of the *Exclusivity (E) principle*, which asserts that any set of pairwise exclusive events must also be jointly exclusive. As originally emphasized by Ernst Specker, this principle is not entailed by Kolmogorov's axioms of classical probability theory. Recent results demonstrate that the E principle and its variants play a key role in explaining the constrained nature of contextuality and nonlocality exhibited by quantum theory in Hilbert space.

VENUE: **PAMU Seminar Room**

Everyone is invited to attend