



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

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

DEPARTMENTAL SEMINAR

Theoretical Sciences

30th JUNE, 2022

3.00 PM

ONLINE / FERMION

SPEAKER



**Dr. ABHISHEK MAJHI,
DST INSPIRE FACULTY, ISI, KOLKATA**

TITLE OF THE TALK

Resolving the singularity by looking at the dot and demonstrating the undecidability of the continuum hypothesis

ABSTRACT

"Einstein's theory of general relativity, which Newton's theory of gravity is a part of, is fraught with the problem of singularity that has been established as a theorem by Hawking and Penrose, the latter being awarded the Nobel Prize in recent years. The crucial hypothesis that forms the basis of both Einstein's and Newton's theories of gravity is that bodies with unequal magnitudes of mass fall with the same acceleration under the gravity of a source object. Since, the validity of Einstein's equations is one of the assumptions based on which Hawking and Penrose have proved the theorem, therefore, the above hypothesis is implicitly one of the founding pillars of the singularity theorem.

In this work, I demonstrate how one can possibly write a non-singular theory of gravity which manifests that the above-mentioned hypothesis is only valid in an approximate sense in the "large distance" scenario. To mention a specific instance, under the gravity of the earth, a [image: 5] kg and a [image: 500] kg fall with accelerations which differ by approximately [image: 113.148\textimes 10^{-32}] meter/sec[image: ^2] and the more massive object falls with less acceleration. Further, I demonstrate why the concept of gravitational field is not definable in the "small distance" regime which automatically justifies why the Einstein's and Newton's theories fail to provide any "small distance" analysis. In course of writing down this theory, I demonstrate why the continuum hypothesis as spelled out by Goedel, is undecidable. The theory has several aspects which provide the following realizations: (i) Descartes' self-skepticism concerning exact representation of numbers by drawing lines (ii) Born's wish of taking into account "natural uncertainty in all observations" while describing "a physical situation" by means of "real numbers" (iii) Klein's vision of having "a fusion of arithmetic and geometry" where "a point is replaced by a small spot" (iv) Goedel's assertion about "non-standard analysis, in some version" being "the analysis of the future". I provide a glimpse of what I call "non-standard physics."

HOST FACULTY

Prof. Punyabrata Pradhan and Dr. Sunandan Gangopadhyay

DEPT. OF THEORETICAL SCIENCES
