INDIAN ASSOCIATION FOR THE CULTIVATION OF SCIENCE

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School of Physical Sciences

SEMINAR NOTICE

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

Speaker : **Dr. Abhishek Majhi, INSPIRE Faculty Fellow, Indian Statistical Institute, Kolkata**

Date : **August 04, 2022 (Thursday)**

Time : **15:00 hours (IST)**

Venue : **Physics Seminar Room (C-406), 3rd Floor, Centenary Building, IACS**

Abstract:

Einsteinian gravity, of which Newtonian gravity is a part, is fraught with the problem of singularity that has been established as a theorem by Hawking and Penrose. The hypothesis that forms the basis of both Einsteinian and Newtonian theories of gravity is that bodies with unequal magnitudes of masses fall with the same acceleration under the gravity of a source object. Since, Einstein's equations are one of the assumptions that underlies the proof of the singularity theorem, therefore, the above hypothesis is implicitly one of the founding pillars of the same.

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 5 kg and a 500 kg fall with accelerations which differ by approximately 113.148×10^{-32} meter/sec2 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'.

All are cordially invited to attend the seminar.