

THE C.A.P. LECTURE

(Canadian Association of Physicists)

will be given this year by

Saurya Das

University of Lethbridge

on

Wednesday, January 30th, 2008

2:00 pm to 3:30 pm

Hennings Building, Room 200

Department of Physics & Astronomy

“Black Holes and the Problem of Information Loss”

Abstract: Starting from two fundamental principles of physics, namely the maximum speed of propagation of signals (speed of light) and reference frame independence of this speed, we arrive at the notion of spacetime continuum and the metric. When we try to incorporate acceleration or gravity in this picture, we show that spacetime must be curved. The amount of curvature depends on the matter content of the spacetime, and is governed by the Einstein equations. These equations also predict the existence of black holes - highly dense gravitating objects, from which (classically) nothing can escape, not even light. When quantum mechanics is taken into consideration, black holes are predicted to emit small amounts of thermal radiation and have large amounts of entropy. This also gives rise to the so-called 'information loss problem', which says that information entering a black hole maybe lost forever, in apparent violation of quantum mechanics. We explore possible microscopic origins of black hole entropy and possible resolutions of the information loss problem.