



LUDWIG-
MAXIMILIANS-
UNIVERSITÄT
MÜNCHEN

ARNOLD SOMMERFELD
CENTER FOR THEORETICAL PHYSICS



Arnold Sommerfeld Lecture Series

Professor Claudio Bunster

Centro de Estudios Científicos (CECs),
Valdivia, Chile

Fields and Strings Seminar:

Generalized Black Holes in Three-dimensional Space-time

The standard theory of gravitation, with a negative cosmological constant in (2+1) space-time dimensions may be reformulated in terms of two Chern-Simons connections for $sl(2, \mathbb{R})$. This permits an immediate generalization which may be interpreted as containing gravity and a finite number of higher spin fields. The generalization is achieved by simply replacing $sl(2, \mathbb{R})$ by $sl(3, \mathbb{R})$ or, more generally, by $sl(N, \mathbb{R})$. The asymptotic symmetries are then two copies of the so-called WN algebra, which contains the Virasoro algebra as a subalgebra. The question then arises as to whether there exists a generalization of the standard pure gravity (2+1) black hole which would be endowed with all the WN charges. Since the generalized Chern-Simons theory does not admit a direct metric interpretation, one must define the black hole in Euclidean space-time through its thermal properties, and then continue to Lorentzian spacetime. Two kinds of generalized black holes are exhibited. One is endowed with higher spin charges, and possesses two copies of W_3 as its asymptotic symmetries. The other possesses charges of lower rather than higher spins. A general formula for the entropy of a generalized black hole is obtained in terms of the on-shell holonomies. The relationship between the asymptotic symmetries and the chemical potentials, and the equivalence of the different thermodynamical ensembles, are discussed.

Thursday, July 10, 2014, 16:15h, Room A348/349, Theresienstr. 37/III, LMU