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Institut für Theoretische Physik III
Lehrstuhl für Quantengravitation

Prof. Dr. Thomas Thiemann

Seminar at the Institute for Theoretical Physics III
Chair of Loop Quantum Gravity

Speaker: Eric Martinez-Pascual
(School of Mathematical Sciences, University of Nottingham)

Date & Start: Tuesday, 15th of November 2011 at 8:00 p.m. s. t.

Location: SR 02.729

Title: **'Constraint Rescaling in Refined Algebraic Quantisation: A study including open algebras.'**

Abstract:

"The presence of nonconstant structure functions in the gauge algebra of constrained systems poses well known obstacles in the process of refined algebraic quantisation. A gauge algebra with structure constants can be transformed into one with structure functions by rescaling the constraints with nonvanishing functions on the phase space. This rescaling does not modify the physical structure of the theory at a classical level. In this talk we address the problem of quantising rescaled constraints. We use two different constrained Hamiltonian systems in which the rescaled quantum constraints are implemented using a rigging map that is motivated by a BRST version of group averaging. The first model is a system with a single momentum-type constraint. We find that the rigging map has a finer resolution than what can be peeled off form the formally divergent contributions to the group averaging formula. Three cases emerge, depending on the asymptotic behavior of the rescaling function: (i) quantisation is equivalent to that with identity scaling function; (ii) quantisation fails; (iii) a quantisation ambiguity arises from the self-adjoint extension of the constraint operator, and the resolution of this purely quantum mechanical ambiguity determines the superselection structure of the physical Hilbert space. The second model is a system with two momentum-type constraints rescaled by a suitable parametric family of scaling functions. Depending on the parameters in this family, the gauge group can exhibit a nonunimodular behavior with nonconstant gauge invariant structure functions in its algebra; the BRST version of group averaging defines in this case a rigging map."