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3d gravity, point particles and deformed symmetries

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t is well known that gravity in 2+1 dimensions can be recast as the Chern-Simons theory, with the gauge group given by the local isometry group, depending on the metric signature and the cosmological constant. Point particles are added into spacetime as (spinning) conical defects. Then, in principle, one may integrate out the gravitational degrees of freedom to obtain the effective particle action; the most interesting consequence is that the momentum space of a particle turns out to be curved. This is still not completely understood in the case of non-zero cosmological constant. Meanwhile, quantisation of the theory consists in the Hopf-algebraic deformation of the Poisson structure, which is determined by a given classical r-matrix associated with the gauge algebra. All such possible r-matrices have recently been classified. One of the remaining open questions is whether the widely-studied kappa-Poincare algebra (associated with noncommutative kappa-Minkowski space) actually plays a physical role here.

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