Contribution ID: **82** Type: **Talk**

Canonical gauge theory of gravitation for fermions

Tuesday, 8 September 2020 08:30 (1 hour)

For gauge theories based on the action principle, the covariant Hamiltonian formalism is the description of choice as one can then take advantage of the canonical transformation framework. The latter restricts transformations of the dynamical variables to exactly those that follow from a generating function, which entails by construction that the form of the action principle is maintained and hence that the transformation is physically admissible. On that basis, the canonical gauge theory of gravitation was successfully worked out for scalar (spin-0) and vector (spin-1) matter fields. Compared to scalar fields, vector fields were confirmed to exhibit additional couplings to a dynamic spacetime. As a result, Einstein's General Relativity turned out to apply to particles without internal degrees of freedom (spin-0) only. In this talk it is shown that novel couplings of spin-1/2 particles to spacetime emerge. In particular, fermions acquire an additional effective mass term and a torsion-dependent correction of their dynamics.

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Session Classification: MMA, DE, DM, CCGG, X-RAYS, MWA, NSs, SNOVAE, GRAVITY