

# Alejandra Castro - Keeping matter in the loop in 3D quantum gravity

*Thursday 17 August 2023 10:20 (50 minutes)*

In this talk I will discuss a novel mechanism that couples matter fields to three-dimensional quantum gravity. This construction is based on the Chern-Simons formulation of three-dimensional gravity, and it centers on a collection of Wilson loops winding around spacetime. We coin this object a Wilson spool. To construct the spool, we build take advantage of representation theory. To evaluate the spool, we adapt and exploit several known exact results in Chern-Simons theory. Our proposal correctly reproduces the one-loop determinant of a free massive scalar field on  $S^3$  and  $\text{AdS}_3$  as  $G_N \rightarrow 0$ . Moreover, allowing for quantum metric fluctuations, it can be systematically evaluated to any order in perturbation theory.