

CMM PDE Seminar

Speaker: Marcela Cárdenas from the Universidad San Sebastián.

Title: The role of Korteweg-de Vries symmetries in the partition function of extremal Black Holes.

Abstract:

Abstract: In this talk, we will explore the role of generalized symmetries—symmetry groups that classify families of partial differential equations—in identifying fundamental symmetries in physics. We will also examine how this framework is crucial for defining conservation laws, building on Noether's theorems and the contribution of Sophus Lie to the understanding of continuous symmetries.

We focus on gravity, particularly within the Hamiltonian formalism, and highlight the importance of surface integrals to define conserved quantities, as shown in the pioneering work of Regge and Teitelboim (1974). As a concrete example, we will explore generalized symmetries near the horizon of extremal charged black holes, demonstrating that these black holes exhibit Korteweg-de Vries (KdV) symmetries. They affect the choice of boundary conditions in the variational principle, leading to an infinite set of KdV Hamiltonians, which in turn impacts the path integral calculation. We will then examine quantum perturbation theory for the generalized KdV action, including the symplectic measure, and compute the one-loop correction to the partition function. Despite the nonlinear nature of the KdV Hamiltonians, we find that they simplify to a manageable form, allowing for modifications to the black hole entropy that grow as a power of the Hawking temperature.

Venue: Sala John Von Neumann, CMM. Beauchef 851, 7th floor.

Zoom: <https://uchile.zoom.us/j/93324747064?pwd=bzbZ2ADlpsi2ye6t00fJnwWOLJ4JLy.1>

Friday, March 28th at 12:10 pm.

For further information, see our webpage: <https://eventos.cmm.uchile.cl/pdeseminar/>