Contribution ID: **36** Type: **not specified**

Black entropy, Weyl curvature, and Christodoulou-Ruffini irreducible mass

Friday, 16 June 2023 12:30 (15 minutes)

In the context of reversible vs. irreversible transformations of a black hole, Christodoulou and Ruffini introduced the notion of irreducible mass, which is related to the event horizon area. The area of the event horizon was subsequently interpreted as the black hole entropy by Hawking and Bekenstein. Furthermore, Penrose conjectured the Weyl curvature hypothesis: the Weyl curvature is a density of gravitational entropy. However, implementing this idea is not so trivial with some drawbacks in the proposal of taking the square of the Weyl curvature as an entropy density being identified. In my talk, I will propose a solution to this issue through an appropriate combination of curvature quantities based only on the Weyl curvature (which therefore is not sensitive to the matter content of the spacetime and really constitutes a measure of the pure gravitational field), which exhibits a general applicability for all static and spherically symmetric black holes in general relativity independently on the matter field on their exterior. Our new formula for the gravitational entropy density allows us to provide some physical insights about the nature of black hole entropy, and of the Christodoulou-Ruffini irreducible mass, also putting our results in the perspective of modified gravity theories.

Primary author: GREGORIS, Daniele (Jiangsu University of Science and Technology)

Presenter: GREGORIS, Daniele (Jiangsu University of Science and Technology)

Session Classification: Friday morning session