University of Crete
**Department of Physics**

# *Physics Colloquium*

Thursday, 19 February 2026 | 17:00 – 18:00, Seminar Room 3rd Floor

## Dynamical Extreme Black Holes


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### ABSTRACT

Astronomical observations indicate that many black holes in our universe possess spins approaching the theoretical maximum, the so-called "extreme" limit. Historically, the "Third Law of Black Hole Mechanics" posited that this limit was dynamically unattainable by gravitational collapse in finite time. However, recent developments have overturned this paradigm, proving that extremal horizons can indeed form from regular gravitational collapse and suggesting they occupy a critical "codimension-1" threshold in the space of initial data. On this threshold lie Dynamical Extreme Black Holes which are characterized by a unique concomitance: while their spacetime geometry stabilizes, matter fields on the horizon remain subject to the "Aretakis instability," exhibiting persistent non-decay/blowup behavior. In this talk, I will explore the nature of charged spherically symmetric dynamical extreme black holes and present an explicit analytic description of the non-linear approach to such a horizon, derived using an effective two-dimensional gravity model.