Contribution ID: **591**   Type: **Plenary talk**

The irreducible mass of the Christodoulou - Ruffini - Hawking Mass formula

Thursday, 8 July 2021 07:05 (35 minutes)

We reveal three new discoveries in black hole physics previously unexplored in the Hawking era. These results are based on the remarkable 1971 discovery of the irreducible mass of the black hole by Christodoulou and Ruffini,

1. The Horizon Mass Theorem states that the mass at the event horizon of any black hole: neutral, charged, or rotating, is always twice its irreducible mass observed at infinity.

2. The External Energy Theorem asserts that the rotational energy of a Kerr black hole exists completely outside the horizon. This is due to the fact that the irreducible mass does not contain rotational energy

3. The Moment of Inertia Theorem shows that every black hole has a moment of inertia. When the rotation stops, the irreducible mass of a Kerr black hole becomes the moment of inertia of a Schwarzschild black hole. This is recognized as the rotational equivalent of the rest mass of a moving body in relativity.

Thus after 50 years, the irreducible mass has gained a new and profound significance. No longer is it a limiting value in rotation, it determines black hole dynamics and structure. What is believed to be a black hole is a mechanical body with an extended structure. Astrophysical black holes are likely to be massive compact objects from which light cannot escape.

Primary author: HA, Yuan K. (Temple University)

Presenter: HA, Yuan K. (Temple University)

Session Classification: Thursday Plenary Session