

Black hole archaeology with gravitational waves

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Gravitational waves from binary mergers encode not only the properties of individual non-luminous objects, but also of their astrophysical populations. With the growing dataset we can study for the first time how black hole properties are distributed. In this talk I will demonstrate how such studies can be used to learn about particle and nuclear physics in giant stars. The key insight is that due to an instability in stellar cores, a wide range of progenitor stellar masses leaves no black hole remnant. The unpopulated space in the stellar graveyard is known as the black hole mass gap (BHMG). The effects of new physics can dramatically alter the late stages of stellar evolution, resulting in shifts of the BHMG. I will give several examples, and demonstrate how these predictions can be tested using the growing catalogue of gravitational wave observations.

Primary author: Dr CROON, Djuna (TRIUMF)

Presenter: Dr CROON, Djuna (TRIUMF)

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