

Growing Black Holes in Star Clusters

Thursday, March 7, 2024 10:00 AM (20 minutes)

Since 2015, more than 80 merging black holes have been discovered through the direct detection of gravitational waves by the LIGO-Virgo-KAGRA collaboration. While these observations provide unprecedented insights into the demographics of black holes, they also raise important questions about the astrophysical origin and formation of these elusive binary systems. One of the formation channels for these observed gravitational wave sources are dynamical interactions in star clusters. A significant fraction of stars are born in clusters where they are closely packed together. In some of these clusters, the density of stars can be up to a million times higher than the density of stars in the solar neighbourhood. In this talk, I will briefly describe how star clusters evolve and how we can evolve them using state-of-the-art computer simulations. I will show how gravitational encounters in these dense stellar environments can be conducive to forming merging binary black holes. Massive and dense star clusters could also be potential sites for forming black holes with masses between ~ 100 to $10,000$ times the mass of the Sun. I will also highlight different pathways by which these intermediate-mass black holes can form and grow in the densest star clusters.

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