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Formation of Gravitational Wave Sources Originating From Globular Clusters

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Over the past decade, gravitational wave observations have confirmed more than 80 binary black hole mergers, providing unprecedented insights into the demographics of stellar-mass black holes. These discoveries raise fundamental questions about the astrophysical origins and formation pathways of these enigmatic systems. In this talk, I will delve into the dynamical processes driving the formation of binary black holes within the dense stellar environments of globular clusters. The production of merging black holes in such clusters is influenced by several uncertain factors, including the retention of black holes after natal kicks and the effects of cluster initial conditions on their long-term evolution. I will discuss these uncertainties and their implications for the properties and merger rates of binary black holes. Furthermore, I will highlight the role of three- and four-body dynamical interactions in facilitating black hole mergers and examine the potential for post-merger black holes to remain within clusters, leading to repeated mergers and the formation of intermediate-mass black holes.

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