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Searching for Hierarchical Mergers of Binary Black Holes with Gravitational Waves CHARLES KIMBALL, Northwestern University, COLM TALBOT, Monash University, MICHAEL ZEVIN, MATTHEW CARNEY, CHRISTOPHER BERRY, Northwestern University, ERIC THRANE, Monash University, VASSILIKI KALOGERA, Northwestern University — The gravitational-wave observations of LIGO and Virgo have uncovered a population of binary black holes. The component masses of some of these detected binaries potentially encroach on the theorized pulsational pair-instability mass gap, where black holes are not expected to be formed directly from stars. We consider an alternate formation channel, where black holes are formed dynamically from previous binary black hole mergers, potentially explaining observation of more massive black holes. Creating a binary black hole population that allows for this hierarchical formation channel, we use the catalog of LIGO and Virgo observations to infer the black hole population parameters, as well as the branching ratios between generations. We use the result to calculate odds ratios in favor of individual binary black hole mergers being of hierarchical origin. By providing a better understanding of the population of black holes, our results shed light on the physics of black hole formation.

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