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Where are LIGO's Big Black Holes? MAYA FISHBACH, DANIEL HOLZ, Univ of Chicago — In LIGO's O1 and O2, the detectors were sensitive to binary black hole coalescences with component masses up to $100\,M_{\odot}$, with binaries with primary masses above $40\,M_{\odot}$ representing $> 90\%$ of the total accessible sensitive volume. Nonetheless, of the 5.9 detections reported by LIGO-Virgo, the most massive component black hole was only $\sim 36\,M_{\odot}$. We argue that the absence of detected binary systems with component masses heavier than $\sim 40\,M_{\odot}$ may be preliminary evidence for an upper mass gap, as predicted by pair-instability supernovae. By allowing for the presence of a mass gap, we find weaker constraints on the shape of the underlying mass distribution of binary black holes. We fit a power-law distribution with an upper mass cutoff to real and simulated BBH mass measurements, finding that the first 3.9 BBHs favor shallow power law slopes $\alpha < 3$ and an upper mass cutoff $M_{\mathrm{max} \sim 40\,\mathrm{M}_{\odot}}$. This inferred distribution is entirely consistent with the two recently reported detections, GW170608 and GW170814. We show that with ~ 10 additional LIGO-Virgo BBH detections, fitting the BH mass distribution will provide strong evidence for an upper mass gap if one exists.

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