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Measuring the Peak of the Binary Black Hole Redshift Distribution THOMAS CALLISTER, Simons Foundation, MAYA FISHBACH, DANIEL HOLZ, University of Chicago, WILL FARR, Simons Foundation, Stony Brook University — A prime target of gravitational-wave astronomy is to understand the evolution of the binary black hole merger rate with redshift. If measured, the redshift distribution of binary black holes would provide substantial insight into their life cycle, encoding the characteristic time delay between binary formation and merger, the dependence of black hole formation on stellar metallicity, and perhaps even the relative contributions from competing binary formation channels. Currently, such studies are limited by the range of existing instruments. Advanced LIGO and Virgo can observe compact binaries only out to redshift $z \sim 1$, whereas the binary black hole merger rate is expected to peak at $z \sim 2$ or beyond. We do, however, have an alternate means of measuring the rate of high-redshift mergers the astrophysical gravitational-wave background. In this talk, I will demonstrate how the synthesis of direct detections at low redshift with existing limits on the gravitational-wave background enables powerful new constraints on the high-redshift evolution of the binary black hole merger rate. Using this technique, Advanced LIGO and Virgo may soon be able to measure the rise, peak, and even subsequent turnover of the binary black hole redshift distribution.

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