Merger Rates of Binary Black Holes across Cosmic Space and Time

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Over the last 5 years, gravitational-wave astronomy has completely transformed our understanding of binary black hole astrophysics: in half a decade, we have gone from a purely theoretical field to a data-driven one, where **the majority of observed stellar-mass black holes have been observed by LIGO and Virgo**. But as impressive as this is, there is still much work to be done to understand how and where these binaries are formed. In this talk, I will review many of the theoretical models for binary black hole formation, with a particular emphasis on the merger rates they predict and how those rates change over cosmic time. I will argue that **ironically, the reduced uncertainty in the observed merger rate has complicated the theoretical landscape**, with many different formation scenarios now able to explain many, if not all, of the current binary black hole observations. Finally, I will connect these observations and their uncertainties to the greater cosmological context, and show how our theoretical understanding of black hole merger rates can be informed by our understanding of galaxy formation and evolution.