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## The phenomenology of late binary black hole gravitational waves via black hole perturbation theory

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The spectrum of ringdown waves which terminates the gravitational waveform of binary black hole merger contains information about both the properties of the merger's remnant black hole, as well as the geometry of the system as it enters its final plunge and merger. This suggests that measurements of the ringdown spectrum could teach us about a binary's geometry, provided we know how to invert the map between binary geometry and ringdown spectrum. In this talk, I will describe work that uses black hole perturbation theory to gain insight into this map. I will describe how we characterize the dynamics of a large mass-ratio binary, how we use those dynamics to build the source for a black hole perturbation theory solver, and how we use the radiation predicted by this solver to study such a binary's late-time ringdown spectrum. Though numerical relativity will be needed to calibrate how large a system's mass ratio must be for our results to apply, what we find indicates that well-measured ringdown waves can provide important complementary information about binary characteristics.

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