

APR17-2016-020096

Abstract for an Invited Paper  
for the APR17 Meeting of  
the American Physical Society

### **Dynamical Formation and Merger of Binary Black Holes<sup>1</sup>**

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The advent of gravitational wave (GW) astronomy began with Advanced LIGO's 2015 discovery of GWs from coalescing black hole (BH) binaries. GW astronomy holds great promise for testing general relativity, but also for investigating open astrophysical questions not amenable to traditional electromagnetic observations. One such question concerns the origin of stellar mass BH binaries in the universe: do these form primarily from evolution of isolated binaries of massive stars, or do they form through more exotic dynamical channels? The best studied dynamical formation channel involves multibody interactions of BHs and stars in dense globular cluster environments, but many other dynamical scenarios have recently been proposed, ranging from the Kozai effect in hierarchical triple systems to BH binary formation in the outskirts of Toomre-unstable accretion disks surrounding supermassive black holes. The BH binaries formed through these processes will have different distributions of observable parameters (e.g. mass ratios, spins) than BH binaries formed through the evolution of isolated binary stars. In my talk I will overview these and other dynamical formation scenarios, and summarize the key observational tests that will enable Advanced LIGO or other future detectors to determine what formation pathway creates the majority of binary BHs in the universe.

<sup>1</sup>NCS thanks NASA, which has funded his work through Einstein postdoctoral grant PF5-160145.