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**Discriminating Formation Channels of Binary Black Hole Systems with Advanced LIGO** MICHAEL ZEVIN, Northwestern Univ, CARL RODRIGUEZ, MIT, CHRIS PANKOW, VICKY KALOGERA, FRED RASIO, Northwestern Univ — The field of gravitational-wave astronomy has been initiated by the recent observations of binary black hole mergers. These observations illuminate objects that are inaccessible with electromagnetic telescopes, and open inquiries as to how heavy binary black hole systems form and merge. Two possible formation channels proposed for such systems are isolated binary evolution in galactic fields and dynamical formation in star clusters. Currently, the coarse localization of these gravitational-wave events cannot indicate the environment in which the binary formed, and the mass distributions and merger rates from simulations of the aforementioned formation channels do not have an appreciable difference. However, the component spins of the black holes have the potential to unveil the formation history of the system. In this talk, I will discuss how to match measurements of the black hole component spin alignment with the projected spin distributions produced by population synthesis simulations. Using this framework we will link the estimated black hole spin to the formation channel of a merger, thus leading to a more detailed picture of their environments and origins.

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