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**Highly Spinning and Misaligned Binary Black Holes from the Isolated Formation Channel**[1] NATHAN STEINLE, MICHAEL KESDEN, University of Texas at Dallas — Observations of gravitational waves can constrain binary black-hole (BBH) spins. If BBHs arise from isolated binary evolution, their spins are determined by phenomena such as tides, winds, accretion, common envelope (CE), supernova (SN) kicks, and stellar core-envelope coupling. Modelling the spin evolution of a binary star until it forms a BBH involves the complicated interplay of these phenomena. For a few physically motivated scenarios, we parameterize binary stellar evolution to identify regions of the parameter space which form BBHs that merge within the age of the Universe with large spins misaligned with the orbital angular momentum. In our model, a BH can be highly spinning (0.5) if either: (1) its Wolf-Rayet (WR) progenitor evolved from a star that had weak core-envelope coupling and provided an initial spin of at least 10% of the WR breakup value, (2) tides spin up the WR progenitor following the CE phase, or (3) accretion onto the WR progenitor or BH increase the spin. BBH spins can be highly misaligned ($\cos(\theta)0.7$) if the SN kicks are comparable to the orbital velocity which depends on whether the SN kicks occur before or after the CE phase, and tides or accretion fail to realign the spins.

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