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Momentum Flow in Inspiraling Black-Hole Binaries[1] DAVID NICHOLS, DREW KEPPEL, YANBEI CHEN, KIP THORNE, California Institute of Technology — Numerical-relativity simulations of binary black-hole mergers in the extreme-kick configuration have revealed bobbing of the orbital plane during inspiral, and "superkicks" after merger. As part of our project to explore momentum flow in such binaries, we explain the bobbing as due to an exchange of linear momentum between the holes and the surrounding, near-field curved spacetime. Using the Landau-Lifshitz pseudotensor in Maxwell-like form, we demonstrate that, when the holes are moving synchronously upward due to frame dragging and spin-curvature-coupling, the nearby curved spacetime contains an equal and opposite downward momentum, and conversely. Although our formalism is gauge-dependent, it is powerful for developing physical intuition about the nonlinear dynamics of curved spacetime.

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