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Black Hole Formation in Failing Core-Collapse Supernovae EVAN O'CONNOR, CHRISTIAN D. OTT, TAPIR, Caltech — Massive stars ($M > 8 - 10\,M_{\odot}$) end their lives with the gravitationally-induced collapse of their iron core. While it is likely that most of these events result in a successful core-collapse supernova, some might fail altogether (so called 'unnovae') when the protoneutron star in the core exceeds its maximum mass and collapses to a black hole. In an effort to better understand these failed core-collapse supernovae, we performed a systematic study of black formation in failing core-collapse supernovae. Using a spherically-symmetric, general-relativistic hydrodynamics code with simplify neutrino physics and over 100 presupernova models, we studied the effects of the choice of nuclear equation of state, zero-age main sequence (ZAMS) mass and metallicity, rotation, and mass loss prescription on BH formation. We will present the results of this study, including a prediction on the percentage of failed core-collapse supernovae.

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