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A Pathway to Galactic Rogue Worlds: Planetary Ejection by Type II Supernovae

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The role of massive stellar death in the production of free-floating planets remains poorly explored. We model type II supernovae as a rogue planet formation channel through 2.5 million simulations of planetary and stellar companions exposed to homologous mass loss with typical SN II ejecta velocities of 1000–10,000 km/s. Nearly all companions are destabilized, yielding rogue planets with velocities of 1–275 km/s (peak ≈ 18 km/s), largely independent of mass. Survival for pulsar planets requires eccentric primordial orbits combined with a near-apocenter timing of the explosion. Type II supernovae thus can represent an efficient, previously underappreciated pathway for rogue planet formation.

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