Abstract Submitted
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An astrophysical engine that stores gravitational work as nuclear Coulomb energy DONALD CLAYTON, Clemson Uiversity — I describe supernovae gravity machines that store large internal nuclear Coulomb energy, $0.80Z^2A^{-1/3}$MeV per nucleus. Excess of it is returned later by electron capture and positron emission. Decay energy manifests as (1) observable gamma-ray lines (2) light curves of supernovae (3) chemical energy of free carbon dissociated from CO molecules (4) huge abundances of radiogenic daughters. I illustrate by rapid silicon burning, a natural epoch in SN II. Gravitational work produces the high temperatures that photoeject nucleons and alpha particles from heavy nuclei. These are retained by other nuclei to balance photoejection rates (quasiequilibrium). The abundance distribution adjusts slowly as remaining abundance of Z=N ^{28}Si decomposes, so p, n, α recaptures hug the Z=N line. This occurs in milliseconds, too rapidly for weak decay to alter bulk Z/N ratio. The figure displays those quasiequilibrium abundances color-coded to their decays. Z=N=2k nuclei having k<11 are stable, whereas k>10 are radioactive owing to excess Coulomb energy. Weak decays radiate that excess energy weeks later to fuel the four macroscopic energetic phenomena cited. How startling to think of the Coulomb nuclear force as storing cosmic energy and its weak decay releasing macroscopic activation to SNII.

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