DO PULSARS MAKE SUPERNOVAE?*

(Abstract)

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The hypothesis, that pulsars can produce supernova explosions of type II, is explored with the aid of detailed hydrodynamical calculations. Preliminary calculations performed with Gunn (1971) indicated that the electromagnetic energy radiated by a newly formed rotating, magnetic, neutron star could drive off the remaining envelope of a red giant star for stars having initial masses in the range 3–8 $M_{\odot}$. Here we present theoretical light curves obtained from hydrodynamic calculations with radiative diffusion and compare them with observations of supernovae. For the case of a star of original mass 4.5 $M_{\odot}$, light maximum is calculated to occur when the envelope, now in the form of a thin shell, has reached a radius of 9×10^{15} cm, a velocity of 7650 km s^{-1} and an effective temperature of 8000 K, at which point its optical thickness approaches unity. The early part of the light curve can be strongly affected by the presence or absence of a dust-laden circumstellar envelope. The temperature, luminosity, decay rate, and envelope velocity observed in the latter phases of type II supernovae are simulated with fair accuracy by the present model.

Reference

Ostriker, J.P. and Gunn, J. E.: 1971, *Astrophys. J. Letters* **164**, L95.

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Tayler (ed.), Late Stages of Stellar Evolution, 149.