

## The Structure and Signals of Neutron Stars, from Birth to Death



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# Ultra-stripped Type Ic supernovae from close binary evolution

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Recent discoveries of weak and fast optical transients raise the question of their origin. We investigate the minimum ejecta mass associated with core-collapse supernovae (SNe) of Type Ic. We show that mass transfer from a helium star to a compact companion can produce an ultra-stripped core which undergoes iron core collapse and leads to an extremely fast and faint SN Ic. In this Letter, a detailed example is presented in which the pre-SN stellar mass is barely above the Chandrasekhar limit, resulting in the ejection of only  $\sim 0.05\text{--}0.20 M_{\odot}$  of material and the formation of a low-mass neutron star. We compute synthetic light curves of this case and demonstrate that SN 2005ek could be explained by our model. We estimate that the fraction of such ultra-stripped to all SNe could be as high as 0.001-0.01. Finally, we argue that the second explosion in some double neutron star systems (for example, the double pulsar PSR J0737-3039B) was likely associated with an ultra-stripped SN Ic.

**Author:** Dr TAURIS, Thomas (MPIfR Bonn)

**Presenter:** Dr TAURIS, Thomas (MPIfR Bonn)

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