The Progenitors of Core-Collapse Supernovae

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Theory holds that a star born with an initial mass between about 8 and 140 times the mass of the Sun will end its life through the catastrophic gravitational collapse of its iron core to a neutron star or black hole. This core collapse process is thought to usually be accompanied by the ejection of the star's envelope as a supernova, although direct collapse to a black hole is also considered a possibility. This established theory is now being tested observationally, with nearly three dozen core-collapse supernovae having had the properties of their progenitor stars directly measured through the examination of high-resolution images taken prior to the explosion. In this talk, I will summarize what we have learned from these studies by reviewing the progenitor characteristics inferred for each of the major core-collapse supernova types: II-Plateau, II-Linear, IIb, IIn, and Ib/c. Brief discussion of a few individual events will also be given, including SN 2005gl, a type IIn supernova that has been demonstrated[1] to have had an extremely luminous -- and thus very massive -- progenitor that exploded shortly after a violent, luminous blue variable-like eruption phase, contrary to standard theoretical predictions.

References

[1] Avishay Gal-Yam & Douglas C. Leonard, "A Massive Hypergiant Star as the Progenitor of the Supernova SN 2005gl." Nature, 458, 865, 2009.

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