

The Most Common “Peculiar” Supernova

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In the last decade, transient surveys have identified several new types of supernovae (SNe). These new events represent astrophysical phenomena that are either less luminous or rarer than the more prevalent classes of SNe Ia, II, Ib, and Ic. I will discuss a relatively new class, Type Iax supernovae (SNe Iax). These events are observationally similar to SNe Ia, but are physically distinct being less luminous and having lower kinetic energy. To date, ~30 clear members of the class have been identified, making them the most common (by number) peculiar class of supernova. After accounting for their luminosity, there are roughly 30 SNe Iax for every 100 SNe Ia in a given volume, also making SNe Iax the most common peculiar SN by rate and more common than SNe Ib. I will describe observations for individual members of the class and those of the entire class. Taken together, we can constrain their progenitor systems much better than we have for normal SNe Ia. The progenitors are likely a C/O white dwarf that accretes material from a non-degenerate helium star. The explosion is likely a sub-sonic deflagration, and at least some of the time the white dwarf does not completely disrupt, leaving a remnant with particular observational signatures.

With new Hubble Space Telescope observations, we have recently identified the progenitor system for a SN Iax. Further Hubble data show a star coincident with the position of a different SN Iax. The progenitor system is consistent with the above picture, and the post-explosion star may in fact be the bound stellar remnant of the white dwarf.