

# The Unprecedented Third Outburst of SN 2009ip: A Luminous Blue Variable Becomes a Supernova

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Some reports of supernova (SN) discoveries turn out not to be true core-collapse explosions. One such case was SN 2009ip, which was recognized to be a luminous blue variable (LBV) eruption. This source had a massive (50-80 Msun) hot progenitor star identified in pre-explosion data, it had documented evidence of pre-outburst variability, and it was subsequently discovered to have a 2nd outburst in 2010. This same source rebrightened again in 2012, and early spectra showed the same narrow-line profiles as before, suggesting another LBV-like eruption. We present new photometry and spectroscopy of SN 2009ip, indicating that its 3rd observed outburst in under 4 years appears to have transitioned into a genuine SN. The most striking discovery in these data is that unlike previous reports, the spectrum exhibited Balmer lines with very broad P-Cygni profiles characteristic of normal Type II supernovae (SNe II), in addition to narrow emission lines seen in SNe IIn and LBVs. Emission components have FWHM~8000 km/s, while the P-Cygni absorption component has blue wings extending to about -13,000 km/s. These features are typical of Type II SNe, but have never been seen in a nonterminal LBV-like eruption. Initially, the peak absolute magnitude of  $M_V \sim -14.5$  seemed fainter than that of normal SNe and faded much more rapidly. However, the source quickly brightened again to  $M_R \sim -17.6$  mag, indicating that it is indeed a true SN. In this bright phase, the broad lines mostly disappeared, and the spectrum became dominated by broad-winged Lorentzian profiles of H-alpha and HeI that are characteristic of the early optically thick phases of luminous SNe IIn. We conclude that the most recent 2012 outburst of SN 2009ip is most likely a true core-collapse SN IIn that was initially faint, but then rapidly achieved high luminosities, as a result of interaction with circumstellar material (abridged).

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