*Supernova Remnants II: an odyssey in space after stellar death. 3-8th June, Chania, Crete, Greece*

# The lowest metallicity type II supernova from the highest mass red supergiant progenitor

*(Reference: Anderson, J.P., et al., 2018, NatAst, 2, 574A)*

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RSGs have been confirmed as the progenitors of the majority of hydrogen-rich type II supernovae (SNeII). However, while such stars are observed with masses >25Msun, detections of >18 Msun progenitors remain elusive. RSGs are also expected to form at all metallicities, but discoveries of explosions at low-metallicity are scarce. Here, we report observations of SN 2015bs, for which we infer a progenitor metallicity of <0.1Zsun from comparison to photospheric-phase spectral models, and a Zero Age Main-Sequence (ZAMS) mass of 17-25 Msun through comparison to nebular-phase spectral models. SN 2015bs displays a normal 'plateau' light-curve morphology, and typical spectral properties, implying a red supergiant progenitor. This is the first example of such a high mass progenitor for a 'normal' SNII, suggesting a link between high mass RSG explosions and low-metallicity progenitors.

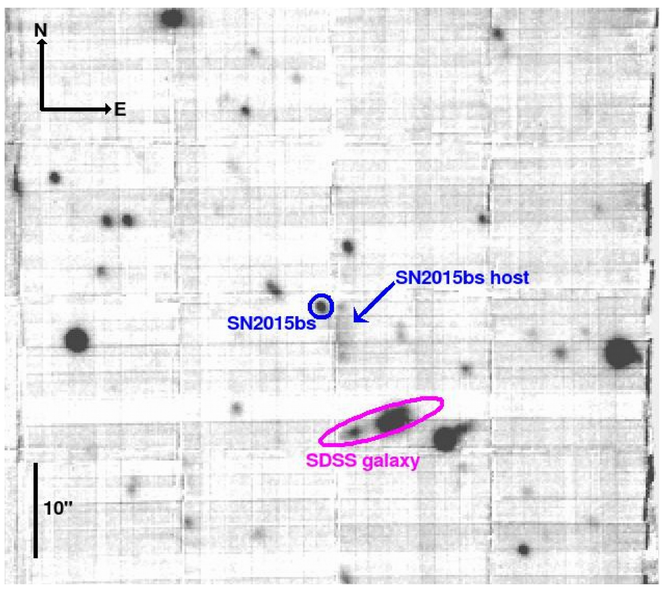



Fig.1 (above): SN2015bs at ~400d. The blue arrow points to the faint, -12$M_B$ host. Also shown is a nearby (on the sky) unrelated galaxy that was originally thought to be the host.

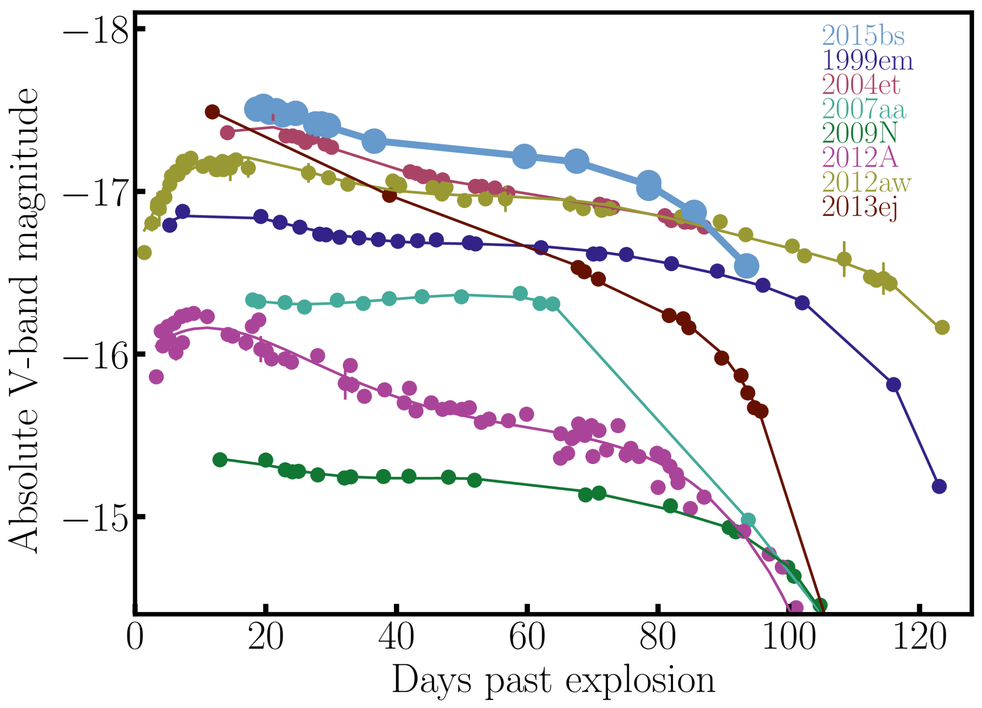



Fig.2 (left): absolute magnitude light curve of SN2015bs and a SNII comparison sample. SN2015bs is bright but otherwise appears to have a normal light curve for a SNII.

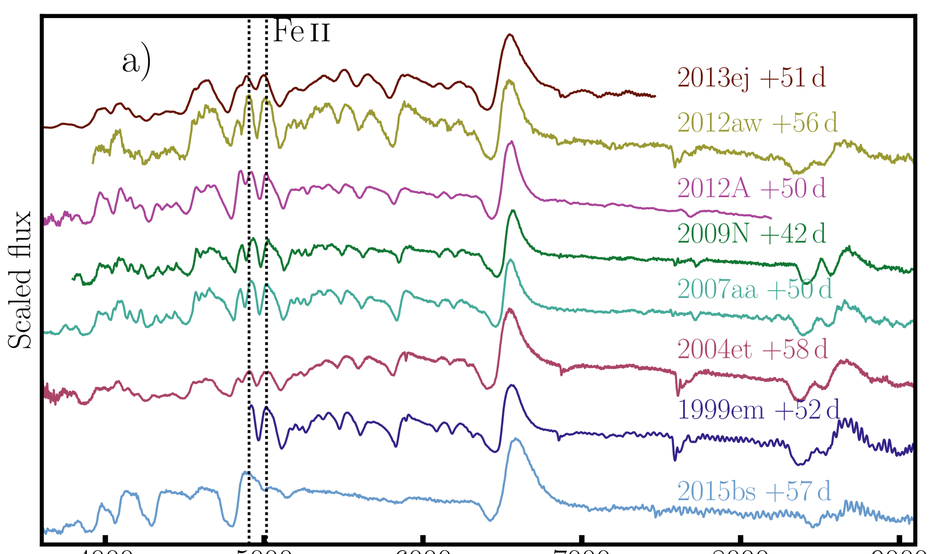



Fig.3a (above): spectrum of SN2015bs at ~50d compared to other SNeII. While SN2015bs shows typical Balmer-lines of a SNII, there is a clear lack of metal lines. The Fe5018A line that has been used as a metallicity indicator is also shown.

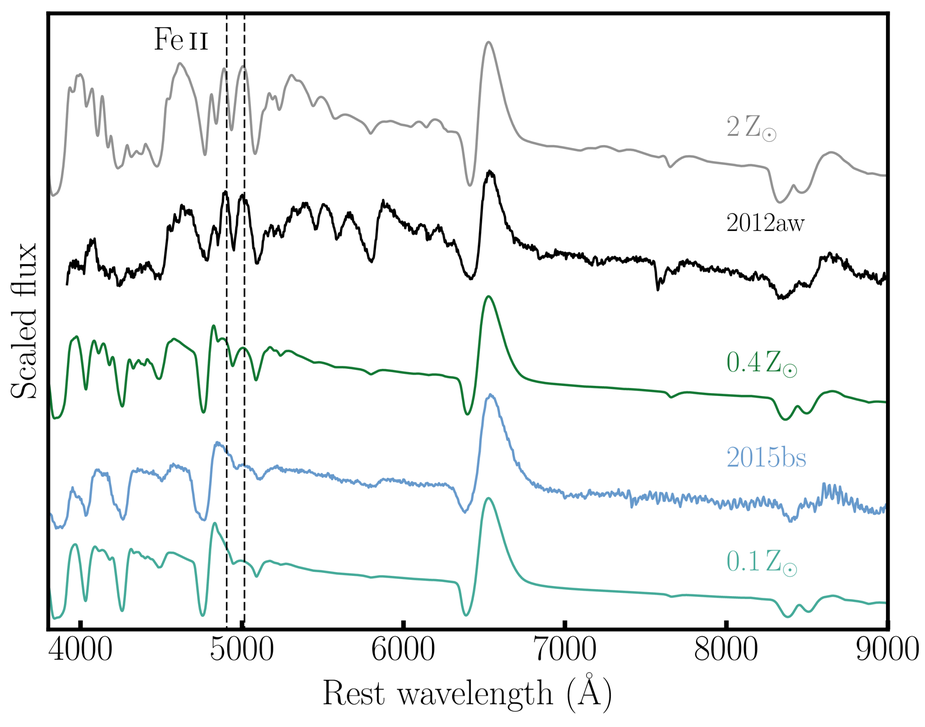
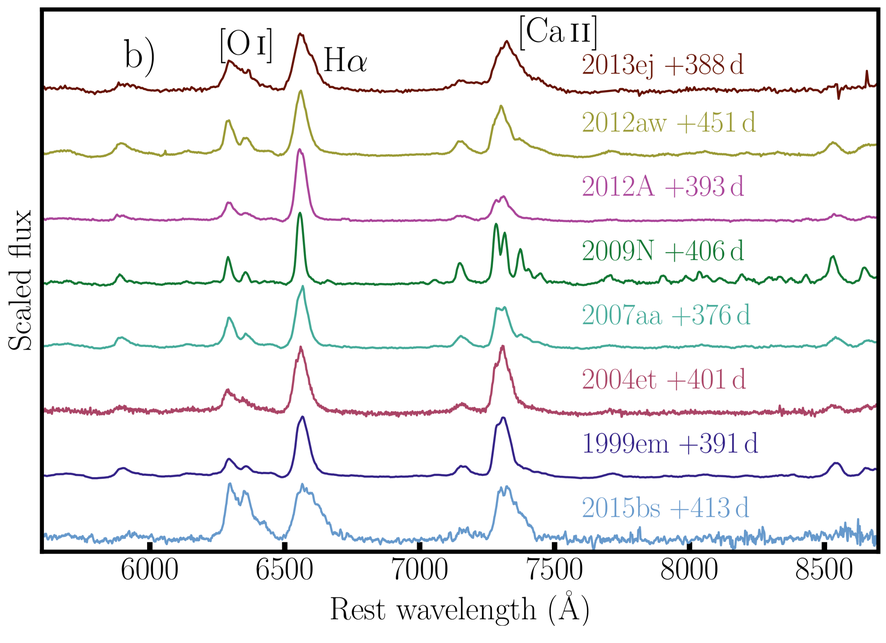



Fig.4 (above): spectrum of SN2015bs at ~50d compared to model spectra from progenitors of distinct metallicity. SN2015bs is most similar to the 0.1Zsun model. Also shown is SN2005dz that is more consistent with a super-solar model.

Fig.3b (right): nebular spectra of SN2015bs and the comparison sample. SN2015bs shows stronger [OI] emission than any of the sample, while emission lines also appear broader. This suggests a higher core and therefore initial mass for SN2015bs than previously observed SNeII.



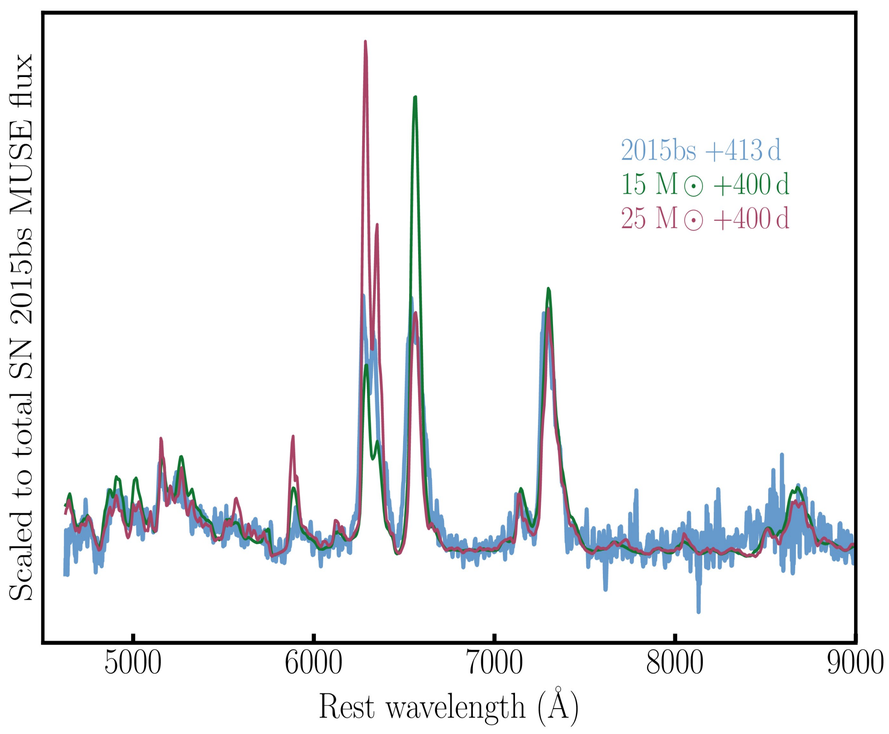




Fig.5 (left): nebular-phase spectrum of SN2015bs compared to Jerkstrand+12 models of 15 and 25Msun ZAMS mass. SN2015bs clearly shows stronger [OI] emission the 15Msun model, while most literature SNeII observed to-date do not. This suggests a higher mass for than other SNeII.

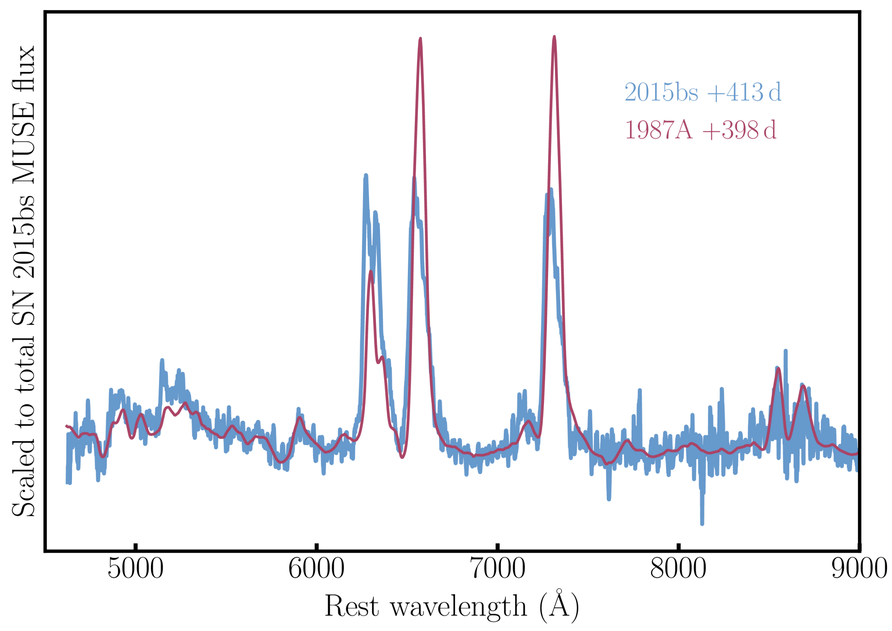



Fig.6 (above, right): nebular spectrum of SN2015bs compared to SN1987A. The latter's ZAMS mass has been constrained to be >17Msun. That the [OI] emission (which strongly correlates with He-core mass) is stronger in SN2015bs suggests a progenitor mass closer to and possibly higher than 20Msun. This would be the highest progenitor mass for a SNII observed to date.