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SUPERNOVA 2005cs IN M51

W. Li, University of California at Berkeley; S. D. Van Dyk, Spitzer Science Center, California Institute of Technology; and A. V. Filippenko, University of California at Berkeley (UCB), report that they have isolated a possible progenitor for this young type-II supernova in Hubble Space Telescope images of M51 (GO/DD program 10452) taken with the Advanced Camera for Surveys (ACS). A geometrical transformation between recent KAIT images of the supernova and the ACS images has yielded the identification of an object (mag 24.0 ± 0.2) in the ACS F814W images that is within the $0''.15$ uncertainty of the supernova position; this object was not detected in the F555W images (mag > 25.5). Assuming low reddening to the supernova [$E(B-V) = 0.1$ mag; cf. *IAUC* 8555] and a true distance modulus to M51 of 29.6 mag (Richmond *et al.* 1996, *A.J.* **111**, 327), the object is consistent with a red supergiant with an approximate absolute I magnitude of -5.8 and colors $V-I > +1.4$, implying an initial mass for the progenitor of < about 10 $M_{\odot}$. The supernova occurred in a crowded field, and there are several other red sources and a bright, blue, possible compact star cluster within $0''.3$ of the supernova location. High-resolution images of the supernova and a more thorough analysis are required to verify the identification of the progenitor.

Li, Van Dyk, and Filippenko, together with J.-C. Cuillandre, Canada-France-Hawaii Telescope (CFHT) Corporation; and S. Jha, UCB, add: "We have confirmed our identification of the progenitor of SN 2005cs, using CFHT images taken on July 2.28 UT under excellent seeing conditions ($0''.7$). Geometrical transformation between the CFHT images and the HST/ACS images (as mentioned above) yields a precision of 0.8 ACS pixel for the supernova location on the ACS images, and our proposed progenitor (above) is the only object within the error circle. The position of the progenitor is measured to be $\alpha = 13^{\rm h}29^{\rm m}52^{\rm s}.760$, $\delta = +47^{\rm o}10'36''.11$ (equinox 2000.0) on the mosaic F814W image. Since only one object exists within our error circle, and since the limiting absolute V magnitude in the ACS images is $\gtrsim -3$, we consider it highly suggestive that this red supergiant is the progenitor of SN 2005cs. Further analysis is in progress."

CCD magnitudes for SN 2005cs: June 30.914 UT, $R = 14.0$ (R. Casas, Sabadell, Spain); July 1.86, $R_c = 14.1$ (T. Scarmato, Calabria, Italy).

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