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Unveiling the Origins of a Historic Supernova

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The nature of historical supernovae is often unknown, but supernova remnants and their environments can serve as powerful tools for probing the progenitor system. RCW 86 is a peculiar supernova remnant, thought to be associated with the historical supernova SN 185. A prevailing theory is that it was a cavity explosion, leading to questions about the nature of the progenitor system. To better characterize this supernova remnant, long-slit spectroscopic data of RCW 86's expanding shock front were gathered in 2025 using the 8.1-meter Gemini South telescope. The data were reduced via the Gemini DRAGONS pipeline, with the goal of measuring the ionized hydrogen and helium fluxes and converting them into surface brightnesses. CLOUDY (1D photoionization simulation software) models were run for two different models: a blackbody model and a stripped-envelope model. The blackbody model represents thermonuclear runaway supernovae, as a white dwarf accretes matter from a companion star, whereas the stripped-envelope star model represents core-collapse supernovae. The surface brightnesses of these models were compared with the observed surface brightnesses, and the models were constrained accordingly. The temperature and luminosity of the blackbody sources were constrained to models with high temperatures and low luminosities. The mass and luminosity of the stripped-envelope star model was constrained to $\sim 4 M_{\odot}$ and $\sim 2.5 L_{\odot}$, respectively. With this work we have placed novel constraints on the progenitor of RCW 86.

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Yes

What is your career level?

Undergraduate

Which keyword describes the area of focus of this talk?

Other

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