

SALT SEES DOUBLE in Hourglass Nebula

the Southern African Large Telescope (SALT) at the South African Astronomical Observatory (SAAO) in the Karoo town of Sutherland has discovered a binary star system in the Hourglass Nebula.

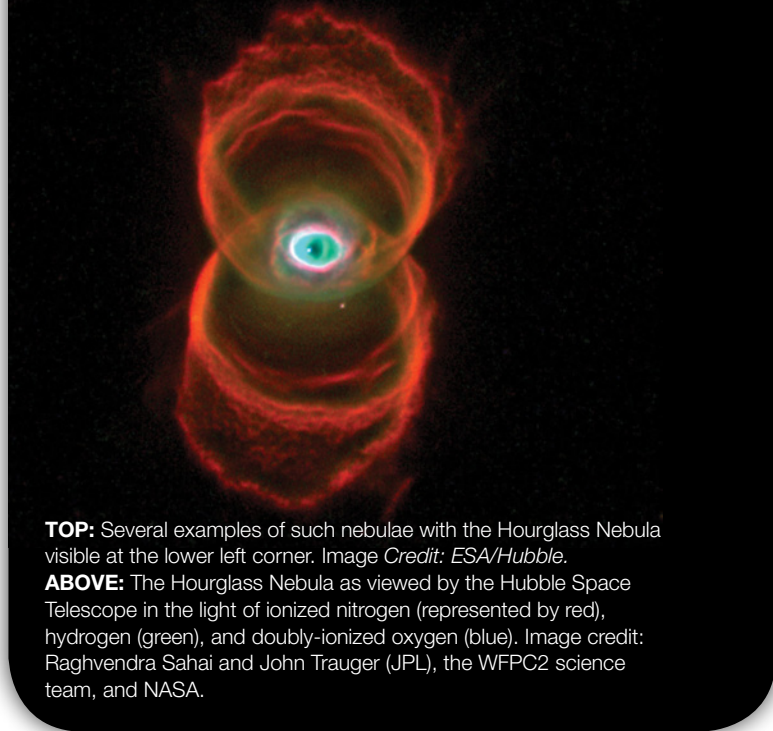
The Hourglass Nebula consists of two hourglass-shaped lobes of gas and an “eye” staring back at us. Shells of gas form the eye surrounding the hot central star that illuminates the nebula like a neon sign. Astronomers have suspected the nebula to be formed by two interacting stars in a binary system but, until now, no one could prove it. The SALT discovery of two stars orbiting each other every 18.15 days in the nebula firmly settles the matter and provides new insights into how many close binary stars and hourglass-shaped nebulae may form.

An international team of astronomers, led by SALT astronomer Dr Brent Miszalski at SAAO, used SALT to peer into the “sparkle” of the eye of the nebula; its central star. A total of 26 SALT measurements were taken that detected the small movements of the central star towards or away from us caused by the gravity of a second companion star. This Doppler or “wobble” method, that can also be used to find planets around other stars, revealed a hidden companion orbiting the central star every 18,15 days. An analysis of the SALT measurements revealed that the companion must be a small, cool star about five times lighter than our Sun and maintained a relatively wide separation between the two stars. The later proved interesting as previous researchers have suggested that a nova explosion could explain many aspects of the Hourglass Nebula, but curiously the stars were found to be too far apart for this to have been possible.

Instead of a nova explosion, the orbital period indicates the Hourglass Nebula formed through an interaction that many close binary stars experience - a so-called common-envelope stage. In this scenario



BUTTERFLIES FROM SPACE



TOP: Several examples of such nebulae with the Hourglass Nebula visible at the lower left corner. Image Credit: ESA/Hubble.

ABOVE: The Hourglass Nebula as viewed by the Hubble Space Telescope in the light of ionized nitrogen (represented by red), hydrogen (green), and doubly-ionized oxygen (blue). Image credit: Raghendra Sahai and John Trauger (JPL), the WFPC2 science team, and NASA.

the cooler companion spirals into the atmosphere of its larger companion and helps eject the shared atmosphere which we now see as the nebula. The Hourglass Nebula is one of very few such examples to show an orbital period above 10 days, making it helpful to improve our understanding of this brief phase that many types of binary stars experience during their lifetime.

The combination of SALT’s enormous 11-metre mirror, highly sensitive instrumentation and flexible queue-scheduled operations was fundamental to making this difficult, cutting-edge discovery. SALT will continue to be used to search other nebulae for new binary systems to gain more insights into their complex origins. [SM](#)