Reflector

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AstroCon 2017... with an eclipse!

An Eclipse Report
An Astronomer's Journey
Ripples Through Space and Time

DEEP-SKY OBJECTS

— THOR'S HELMET —

By Dr. James R. Dire, Kauai Educational Association for Science & Astronomy

Thor's Helmet is a bright nebula located in the northeast corner of the constellation Canis Major. The nebula is located along an imaginary line between the star Sirius (Alpha Canis Majoris) and Samoht (Alpha Monocerotis). To find it, start at Sirius, the brightest star in the nighttime sky, and pan slightly more than halfway to Samoht. Thor's Helmet is the 2,359th entry in the NGC catalog. The nebula is also known as the Duck Nebula. NGC 2359 is irregular in shape and is 8 by 8 arcminutes in size. It can easily be spied in an 8-inch telescope. An O-III filter provides the best contrast for viewing the nebula.

There are two colorful stars on the east side of the nebula: HD 57057 is a magnitude 8.6 crimson star and HD 57083 is a magnitude 9.8 yellow star. These stars are separated by 1.8 arcminutes. An 11th-magnitude blue-white star lies 4 arcminutes southwest of the red star. Seeing the color in this star requires a 14-inch or larger telescope.

NGC 2359 is thought to be both an emission nebula and a reflection nebula. The bubble-shaped region is what is commonly known as Thor's Helmet. The bubble is the bow shock caused by the stellar winds of the central star colliding with a molecular cloud. The central star, HD 56925, shining at magnitude 11.7, is a rare Wolf–Rayet star. These are massive, incredibly hot stars that are in the pre-supernova stage of their evolution. Fortunately for us, should the central star go supernova, it lies a safe distance away, 1,772 light-years according to Hipparcos satellite parallax data.

Wolf–Rayet stars were discovered by French astronomers Charles Joseph Étienne Wolf and Georges-Antoine-Pons Rayet in 1867. These stars are greater than 15 times the mass of the Sun. They only live millions of years, not the billions of years that solar-mass stars do. The outer layers of these stars are expanding away from them and often appear as nebulae. The bubble and filaments in Thor's Helmet are shells of gas ejected from this star.

My image of NGC 2359 was taken with a 10-inch f/6 Newtonian with a Paracorr Type-2 coma corrector yielding an effective focal length of 1,753 mm. The image was captured with a four-hour exposure using a SBIG ST-2000XCM CCD camera. North is at the top and east is to the left. The image captured many filaments and hourglass-shaped bubbles within the main bubble, greatly surpassing the detail visible at the eyepiece.

The brightest star inside of the bubble, just northwest of the center, is HD 56925. The brightest region of surrounding molecular cloud lies just south of the bubble and trails off towards the west. To me it looks like an arm with an elbow in the middle. Another arm appears to originate on the north side of the bubble and also trails off to the west. A fainter arm trails off the top of the bubble to the east.

Someday, HD 56925 will die in a supernova explosion. This will greatly reshape NGC 2359. Perhaps it already has, but the light has yet to reach Earth!

Shara, a curator in the American Museum of Natural History's Department of Astrophysics. A nova is a colossal hydrogen bomb produced in a binary system where a star like our Sun is being cannibalized by a white dwarf—a dead star. It takes about 100,000 years for the white dwarf to build up a critical layer of hydrogen that it steals from the sun-like star, and when it does, it blows the envelope off, producing a burst of light that makes the star up to 300,000 times brighter than the sun for anywhere from a few days to a few months.For years, Shara has tried to pinpoint the location of the binary star that produced the nova eruption in 1437, along with Durham University's Richard Stephenson, a historian of ancient Asian astronomical records, and Liverpool John Moores University astrophysicist Mike Bode. Recently, they expanded the search field and found the ejected shell of the classical nova. They confirmed the finding with another kind of historical record: a photographic plate from 1923 taken at the Harvard Observatory station in Peru and now available online as part of the Digitizing a Sky Century at Harvard (DASCH) project. "With this plate, we could figure out how much the star has moved in the century since the photo was taken," Shara said. "Then we traced it back six centuries, and bingo, there it was, right at the center of our shell. That's the clock, that's what convinced us that it had to be right." Other DASCH plates from the 1940s helped reveal that the system is now a dwarf nova, indicating that so-called "cataclysmic binaries"—novae, novae-like variables, and dwarf novae—are one and the same, not separate entities as has been previously suggested. After an eruption, a nova becomes "nova-like," then a dwarf nova, and then, after a possible hibernation, comes back to being nova-like, and then a nova, and does it over and over again, up to 100,000 times over billions of years."In the same way that an egg, a caterpillar, a pupa, and a butterfly are all life stages of the same organism, we now have strong support for the idea that these binaries are all the same thing seen in different phases of their lives," Shara said. "The real challenge in understanding the evolution of these systems is that unlike watching the egg transform into the eventual butterfly, which can happen in just a month, the lifecycle of a nova is hundreds of thousands of years. We simply haven't been around long enough to see a single complete cycle. The breakthrough was being able to reconcile the 580-year-old Korean recording of this event to the dwarf nova and nova shell that we see in the sky today."This study was based on observations from the Southern African Large Telescope (SALT), and the Las Campanas Observatories' Swope and Dupont telescopes. Other authors on this study include K. Ilkiewicz, J. Mikolajewska, and K. Drozd from the Polish Academy of Sciences; A. Pagnotta, J. Faherty, and D. Zurek from the American Museum of Natural History; L.A. Crause from the South African Astronomical Observatory; I. Fuentes-Morales and C. Tappert from the Instituto de Física y Astronomía; J.E. Grindlay from the Harvard-Smithsonian Center for Astrophysics; A.F.J. Moffat from the Universite dé Montréal; M.L. Pretorius from the South African Astronomical Observatory and the

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