

Published by the Astronomical League

Vol. 75, No. 3 JUNE 2023

Reflector



A CENTURY OF STELLAFANE
STELLAR PHOTOMETRY FOR AMATEURS
ANCIENT GALACTIC ARTIFACTS

Campus in Oxfordshire in south-central England. There it was examined on the X-ray nanoprobe beamline using X-ray Absorption Near-Edge Spectroscopy (XANES). This process fires X-rays of different energies at the sample to examine how they are absorbed by the sample. Since the absorption is different for different elements, the composition of the sample can be determined.

The results showed that serpentine, a water-bearing mineral on the surface of the asteroid, had lost some of its water into space from weathering. A paper published in the December 19, 2022, issue of *Nature Astronomy* concluded that one effect of space weathering was to make an asteroid's surface appear dry, while abundant water may still be locked in the minerals under the surface.

With the possibility that asteroids in the early Solar System contributed both water and organic molecules to our Earth, understanding the effects of space weathering on Ryugu provides better insight into the interior composition of asteroids. This helps provide a clearer picture of the early Solar System and the formation of the Earth and the life on it.

—Berton Stephens

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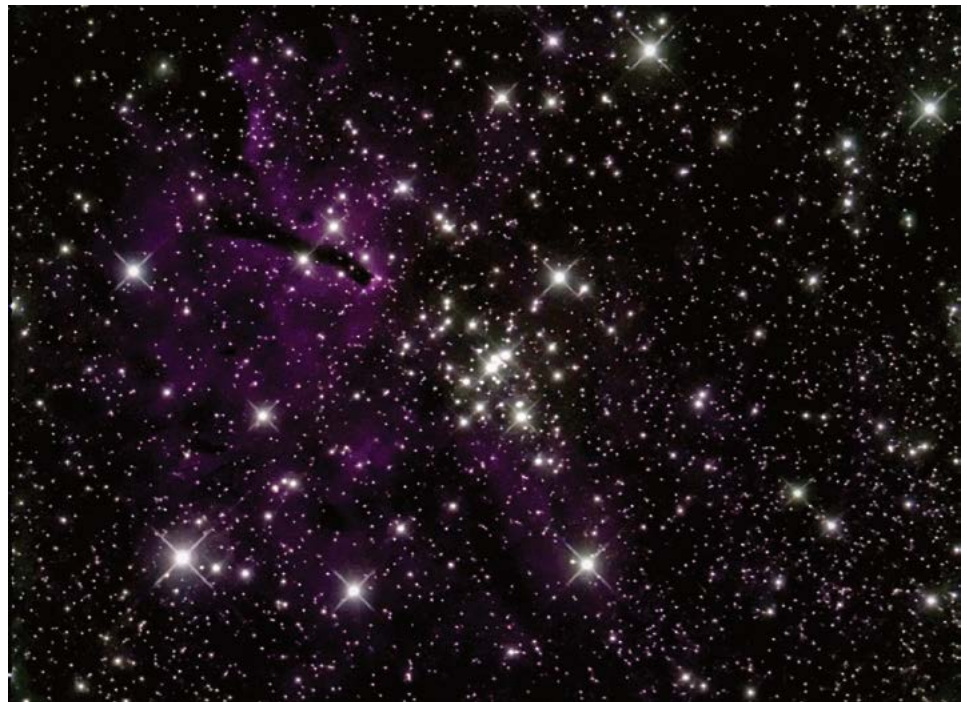
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Deep-Sky Objects

A FOXY CLUSTER IN VULPECULA

Vulpecula is a small constellation spanning the Milky Way just south of Cygnus. The famous blue-gold double star Albireo lies on the Cygnus side of the boundary between the two constellations. The word *vulpecula* is Latin for "little fox."

Vulpecula can be a hard constellation to spy. First, the constellation has no stars brighter than magnitude 4.44. Second, in dark skies, the glow of the Milky Way almost drowns out the main stars of the constellation. That being said, I have always been able to find objects in the constellation using



a red dot finder or an 8×50 finderscope. Of course, a go-to telescope speeds up the process.

The most famous object in Vulpecula is M27, the Dumbbell Nebula. Another popular object in Vulpecula is Collinder 399, a.k.a. the Coathanger or Brocchi's Cluster. The Coathanger is not really a star cluster, but a collection of stars known as an asterism.

Due to its location in the Milky Way, the constellation Vulpecula has numerous small star clusters to explore. One of my favorites is NGC 6823. To find NGC 6823, start at Alpha Vulpeculae, (also called Anser, a magnitude 4.44 star). Then find 4.9-magnitude 12 Vulpeculae, located 5.5 degrees south-southeast of Anser. NGC 6823 is two-thirds of the way along a line from Alpha to 12 Vulpeculae. The cluster is in the middle of the Milky Way practically right on the galactic equator.

William Herschel discovered the open cluster NGC 6823 on July 17, 1785, using his 18.7-inch Newtonian telescope. He described the cluster as being rich in 12th- and 13th-magnitude stars. The cluster contains 92 stars brighter than magnitude 13. NGC 6823 contains numerous hot spectral class O and B stars. The cluster's apparent size is about six arcminutes and it lies 6,000 light-years away. This apparent size corresponds to 18 light-years at that distance.

On the west side of NGC 6823 is an emission nebula, NGC 6820. NGC 6820 was discovered by Albert Marth on August 7, 1864, from Malta using William Lassell's 48-inch f/9.4 Newtonian. This was one of the largest telescopes in the world at the time. Lassell built the 48-inch after success-

fully building a 24-inch telescope that he used to discover Neptune's large moon Triton.

It is unknown if, when he found NGC 6823, Herschel was aware of the emission nebula Marth discovered. Herschel made no note of the nebula when writing his description of the open star cluster. NGC 6820 is part of a much larger nebula complex known as Sh-2-86 discovered by Stewart Sharpless on photographic plates from the Palomar Observatory Sky Survey. The stars in NGC 6823 formed out of this massive nebula. Today this nebula is still an active star-forming region.

NGC 6823 has an estimated integrated magnitude of 7.1 and is easily seen in an 8-inch telescope. The nebula can be seen in very large amateur telescopes from dark sites.

The accompanying image of NGC 6823 was taken with an 8-inch f/8 Ritchey-Chrétien Cassegrain with a Tele Vue 0.8× focal reducer/field flattener yielding f/6.4. The exposure was 190 minutes using a SBIG ST-2000XCM CCD camera. The brightest regions of the nebula are to the east (left) side of the center of the cluster. Strong solar winds from the hot O and B stars in the center of the cluster appear to have cleared the central region of nebular gases. To the northeast of the cluster (upper left) there is a dark dust lane resembling an elephant's trunk.

Just about all visual telescope users will point their scopes at the Dumbbell Nebula this summer. After gawking at the Dumbbell, hop over a few degrees to NGC 6823 and catch this impressive star cluster. You'll be glad you did!

—James Dire