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Reflector

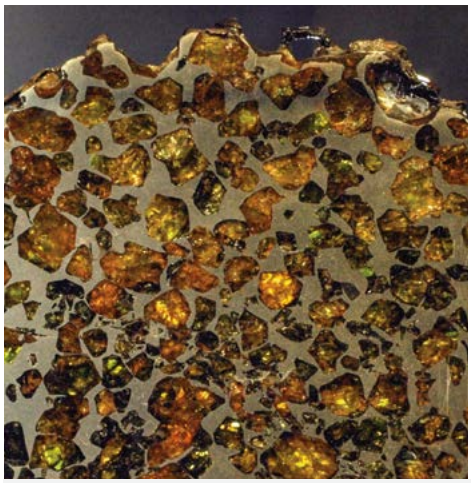
LEAGUE AWARDS

KEEPING TRACK OF 1.8 BILLION STARS

LOW-COST RADIO ASTRONOMY

GALAXIES ARE MUCH LARGER THAN YOU THOUGHT

more reflective, returning ten to twenty-two percent of the sunlight that strikes them. Their surface is nickel-iron with iron and magnesium silicates. S-type asteroids represent 17 percent of the known asteroids. These asteroids are the source of the stony-iron class of meteorites and potentially ordinary chondrites.



Found by a farmer digging a hole for a water tank in 1951 near Esquel, a town in southwestern central Argentina, this pallasite meteorite belongs to the stony-iron group of meteorites. This image shows a thin slice that has been polished. Yellowish and green crystals of olivine (peridot) are plainly visible in a matrix of nickel-iron. It is on display in the Vale Inco Limited Gallery of Minerals at the Royal Ontario Museum. Image Credit: Emily Lakdawalla, The Planetary Society. From the Bruce Murray Space Image Library (planetary.org/space-images). *GNU Free Documentation License, Version 1.2.*

The last group is the M-type asteroids. These make up the remainder of the known asteroids. They are almost pure iron-nickel, like iron meteorites. They reflect ten to eighteen percent of the sunlight they receive.

This system of classifying asteroids was proposed by American astronomer David Tholen in 1984. Using the 61- and 90-inch telescopes at the University of Arizona, a group of astronomers including Dr. Tholen conducted the Eight-Color Asteroid Survey (ECAS). They studied 589 asteroids in eight intermediate-band spectral colors and determined the reflectance of each asteroid in each band from ultraviolet to infrared.

The Tholen taxonomic scheme has fourteen classifications, dividing the three groups above into finer subclasses. Other classification systems have been developed as new instrumentation has allowed finer measurements of asteroids to be made. In addition, spacecraft have visited twenty asteroids, returning images that could never be seen from Earth. We still have much to learn about these tiny members of our Solar System and what they can tell us about its formation.

—Berton Stephens

Deep-Sky Objects

FLYING HORSES AND EXPLODING STARS

The large winged horse Pegasus is one of the most recognizable autumn constellations. Most amateur astronomers and even some non-astronomers can find the Great Square of Pegasus, formed by four stars with magnitudes between 2 and 3. The four stars in order of brightness are Alpheratz (Delta Pegasi), Markab (Alpha Pegasi), Scheat (Beta Pegasi), and Algenib (Gamma Pegasi). Alpheratz is also known as Alpha Andromedae and is a rare case of a star that has a Greek designation in two adjoining constellations.

The Great Square often appears devoid of stars in its interior. But dark skies, away from suburban light pollution, reveal myriad faint stars there. Amateur astronomers flock to Pegasus to spy double stars and some popular deep space objects, such as the globular cluster M15, the Deer Lick Galaxy (NGC 7331), and the famous galaxy cluster known as Stephan's Quintet.

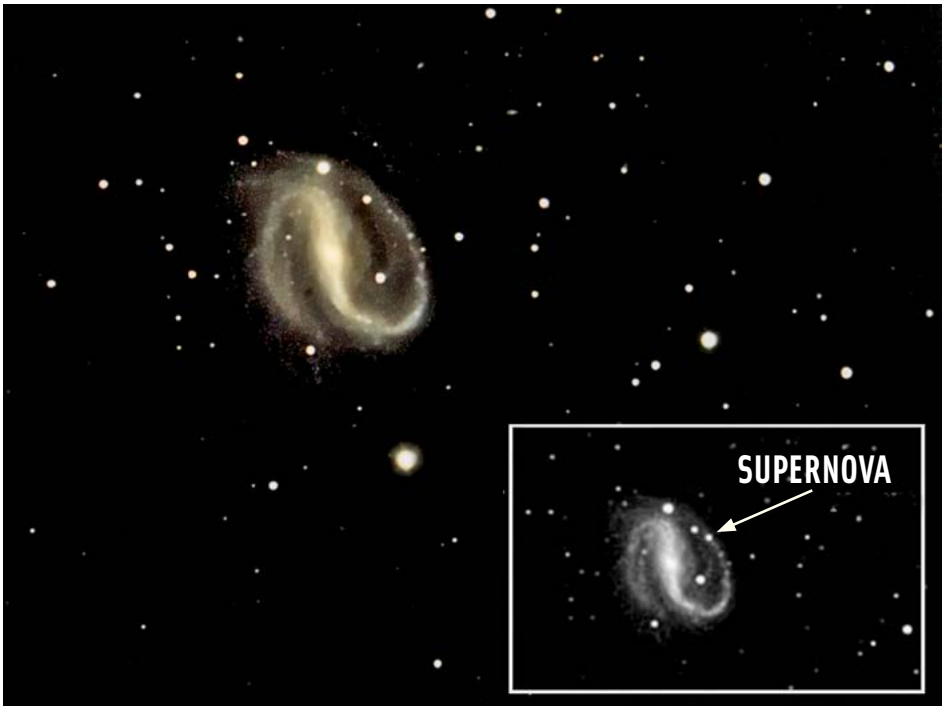
Not as well known but equally impressive is the galaxy NGC 7479. It is a nearly face-on barred spiral galaxy discovered by William Herschel in 1784 using his 18.7-inch Newtonian telescope.

NGC 7479 is very easy to find, as it is located three degrees due south of the star Markab. The galaxy has visual magnitude 11.6 and is 3.6 by 2.7 arcminutes in size. Distance estimates place the galaxy 105 million light-years away.

The galaxy has a very bright core and bright long bar structure. The bar appears to extend in the north-south direction. This north-south elongation of the core is apparent in an 8-inch telescope in dark skies. NGC 7479 has two main spiral arms emanating from the ends of the bar, each extending 180 degrees around the galaxy. In most amateur telescopes, the central budge and bar structure are all that is seen, as they are much brighter than the spiral arms. A Hubble Space Telescope image of the galaxy reveals a few fainter spiral arms as well as some spurs off the two main arms.

NGC 7479 is classified as a Seyfert galaxy due to extensive starburst activity in the core and spiral arms. Radio studies indicate the galaxy may have recently (when the light left the galaxy) undergone a galactic merger. Visible dust lanes in the Hubble Space Telescope image do not all correspond to the normal lanes seen in spiral galaxies, adding evidence for a galactic merger.

I imaged NGC 7479 using a 10-inch f/6 Newtonian, with a Tele Vue Paracorr II coma corrector which gave an effective focal ratio of f/6.9, and an SBIG ST-2000XCM CCD camera. The exposure was 210 minutes. The clumps visible in the spiral arms are regions of starburst activity. All of the stars individually resolved in the image are in our Milky Way Galaxy. So those superimposed over the galaxy are actually foreground stars. (The image was cropped and modified by *Reflector* staff for clarity.) The inset frame on the lower right side of the image was taken on



November 6, 2009, using the same camera and a 190 mm f/5.3 Maksutov-Newtonian. The arrow in the inset points to a supernova stellar explosion whose light had just reached Earth a few weeks before this picture was taken. Of course, the star actually exploded 105 million years ago. The supernova was so bright, it rivaled other stars in the field of view which are in our galaxy, and therefore much closer.

This supernova is known as SN2009jf. The automated Lick Observatory Supernova Search discovered SN2009jf on September 27, 2009. Fortunately, it was discovered before the peak brightness, allowing a good light curve to be developed over a few months, and thus determine the type of supernova. At the time of the discovery the exploding star was magnitude 18. By mid-October 2009, the supernova had reached magnitude 15. When I imaged it, it had faded to magnitude 16. SN2009jf was a type Ib supernova. It is thought to have been a massive luminous blue variable (LBV) star that reached the end of its life and exploded.

Even without a supernova, NGC 7479 is a great galaxy to spy in the constellation Pegasus. If you are out hunting galaxies on a crystal-clear autumn night, NGC 7479 should be on the observing list!

—James Dire