

Published by the Astronomical League
Vol. 73, No. 2 MARCH 2021

Reflector



CELEBRITY VARIABLE STARS
IMAGING TECHNIQUES EXPLAINED
WILLIAMINA FLEMING
SIMPLE CITIZEN SOLAR SCIENCE

tail. It was then reclassified as comet 133P/Elst-Pizarro. Other asteroids have since been found to intermittently have tails and comas. These were originally called main-belt comets. They exist in colder areas of the Solar System, from the outer edges of the main asteroid belt to beyond the orbit of Jupiter. Some of these objects are icy like comets, but others are rocky.

Active asteroid 133P/Elst-Pizarro has a tail for only two to five months at a time when it is nearest the Sun, much like any other comet, but it is still 246 million miles from the Sun. It is probably icy, but the gas and dust may come from an area about 2,000 feet across, probably an impact crater that exposed fresh icy material from under the surface.

Originally designated a comet, P/2010 A2 (LINEAR) was discovered in January 2010. Initially thought to be emitting gas and dust, it was later determined that the dust cloud resulted from two asteroids colliding. The debris cloud initially appeared cometary. Other “comets” have also appeared after asteroid collisions.

With larger telescopes now observing asteroids, more asteroids are being found than ever before. Each new discovery brings up the question of whether it is a comet or an asteroid. Only careful observations will tell.

—Berton Stevens

Deep-Sky Objects

REFLECTING ON THE HUNTER

The constellation Orion is undoubtedly the most recognizable constellation in the winter skies. During spring, the Hunter is still high above the western horizon as twilight fades to darkness, allowing ample time to explore this exciting constellation.

Orion is best known for its vast network of nebulae. A majority of the constellation is embedded in nebulae as captured in ultrawide-field long exposures with digital cameras. When we look towards the constellation Orion, we are looking along the plane of the Milky Way galaxy through the spiral arm that hosts our Solar System. This arm contains an abundance of gas and dust, accounting for the nebulae in and around the constellation.

Most famous among these nebulae are the Great Orion Nebula (M42 and 43), the Running Man Nebula (NGC 1973, 1975, and 1977), the Horsehead Nebula (IC 434), and the Flame Nebula (NGC 2024). Lesser known, as indicated by the fact it carries no common name, is a bright reflection

nebula known as M78.

M78 is one of the brightest reflection nebulae in the sky, if not the brightest. It is easily found by starting at the star Alnitak (the leftmost and brightest star in Orion's Belt) and stopping one-quarter of the way to Betelgeuse. Then make a 90-degree turn to the left and pan another 40 arcminutes to arrive at M78. The nebula shines at magnitude 8.3 and is 8.0 by 6.0 arcminutes in size, easily visible in a 50 mm finderscope under transparent skies away from city lights.

M78 was first recorded by Pierre Méchain in the year 1780. He described it as a pair of stars surrounded by nebulosity. Charles Messier saw it later in 1780 and described it as a cluster with much nebulosity. The nebula became the 78th entry in Messier's famous catalog.

M78 is located 1,600 light-years away, slightly more distant than M42 and twice as far away as both the Horsehead and Flame Nebulae. M78 is located on the celestial equator.

The two stars Méchain alluded to are HD 38563 and HD 290862, both around tenth magnitude. HD 290862 is a double star with components of magnitude 10.81 and 11.50 separated by 2.1 arcseconds. The pair are foreground objects to M78, lying a mere 42 light-years away. HD 38563 is also a double star with components of magnitude 10.42 and 11.50, also separated by 2.1 arcseconds. Both have stellar classification B. They are hot, young stars embedded in the nebula, and their light contributes significantly to the reflection nebula's luminosity. The brighter component is an erupting variable star. On a night of good seeing, both sets of double stars can be split. In each pair, the components are

practically along an east-west line.

Like many of the nebulae in Orion, M78 is a stellar nursery. The nebula contains around 45 known T Tauri stars – bright F and G stars that are nearing the final stages of formation. The nebula contains a small cluster of 192 stars and 17 Herbig-Haro objects, which are bright jets of matter streaming from newly born stars.

The accompanying image of M78 was taken using a 10-inch f/6.9 Newtonian with an SBIG ST-2000XCM CCD camera. The exposure was 280 minutes. North is up and east to the left. The brightest star in the image, near the right edge, is HD 290863, magnitude 10.01. The bright red star on the lower left has no HD or SAO catalog number but is magnitude 10.93. The faintest stars in the image are magnitude 20.

My image is centered on the brightest region of M78, also known as NGC 2068. The bright star near the top center of this region is the aforementioned foreground star HD 290862. Below it and slightly to the right is HD 38563.

A prominent dark lane arcs around the north and west side of M78, shielding from our sight brighter regions which may lie beyond. The tiny bright patch just southwest of the main nebula is known as NGC 2064. The larger, more diffuse bright region to the northwest is NGC 2067. While M78 can be seen in a 4-inch telescope, and seen quite well in an 8-inch telescope, telescopes 16–20 inches or larger in aperture should reveal nice detail throughout the entire M78 complex.

Regardless of telescope size, any stop to view the myriad nebulae in Orion should include Messier's 78th catalog entry!

—Dr. James Dire

