

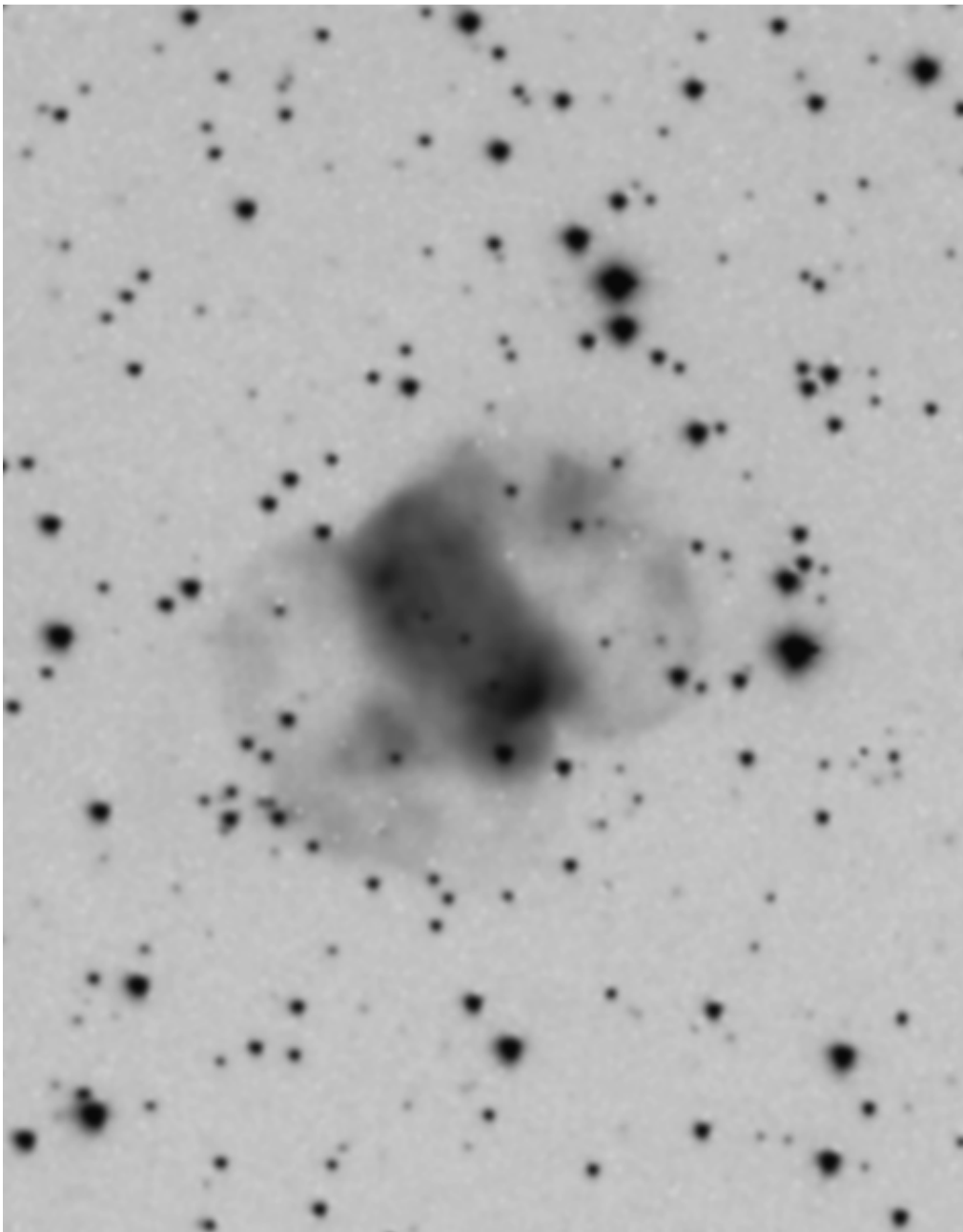
The Planetary Nebula; M76

By Greg Morgan

Pierre Méchain discovered Planetary Nebula M76 on September 5, 1780. He reported it to Charles Messier, who observed it on October 21, 1780, determined its position and added it to his catalog. While Méchain found it to be a nebula without stars, Messier thought it was composed of small stars with some nebulosity, probably being fooled by foreground or background stars. Lord Rosse erroneously suspected to have detected some spiral structure in this nebula. In 1866, William Huggins, the pioneer of spectroscopy, found its spectrum to be gaseous, showing "Nebulium" lines. Pioneer astrophotographer Isaac Roberts found that this was not a double, but a single nebula, and first suspected it might be a broad ring seen edgewise. In 1918, Herber D. Curtis correctly classified it as a planetary nebula for the first time.

M76 is among the fainter Messier objects. It is known under the names **Little Dumbbell Nebula** (the most common), Cork Nebula, Butterfly Nebula, and Barbell Nebula. It was given two NGC numbers as it was suspected to be a double nebula with two components in contact. William Herschel made this hypothesis. He numbered the "second component" H I.193 on November 12, 1787.

The appearance of M76 resembles the Dumbbell Nebula M27 to some degree. Most probably, the main body (the bar, or cork) is a bright and slightly elliptical ring that we see edge-on from only a few degrees off its equatorial plane. This ring seems to be expanding at about 42 km/sec. Along the axis perpendicular to this plane, the gas is expanding significantly more rapidly to form the lower surface brightness "wings" of the butterfly. While the bright part of the nebula is about one arc minute in diameter, it is surrounded by a faint halo covering a region of about four arc minutes in diameter.



This material was probably ejected in the form of stellar winds from the central star when it was still in the Red Giant phase of evolution. Today the central star is of magnitude 16.6 and a high temperature of some 60,000 K, which will probably cool down and become a white dwarf over the coming tens of billions of years. M76's visual magnitude is much brighter at 10.1 than its "photographic" magnitude at 12.2. This is due to the fact that most visual light is emitted in one spectral line, the green 500.7 nm forbidden line of doubly ionized oxygen, [O III]. (Adapted from SEDS)

Figure 1: The negative Xerox image to the left does not show details or low contrast areas as well as on the computer. However, it does give the overall "butterfly" appearance to M76. This image of M76 was taken 12-13-03 with a 10 inch LX-200 at f/6.3 and a ST-10 XME CCD camera at -25 degrees C. This image is a summation composite of 4x15 minute exposures through a clear filter for a total of just 1 Hour. Guiding was done with the A0-7 at 27 Hz on a nearby magnitude 6.6 guide star. North is up and East is to the left. A FWHM value of 2.1 arc seconds was measured. This was a reasonably good night for the Fresno area.