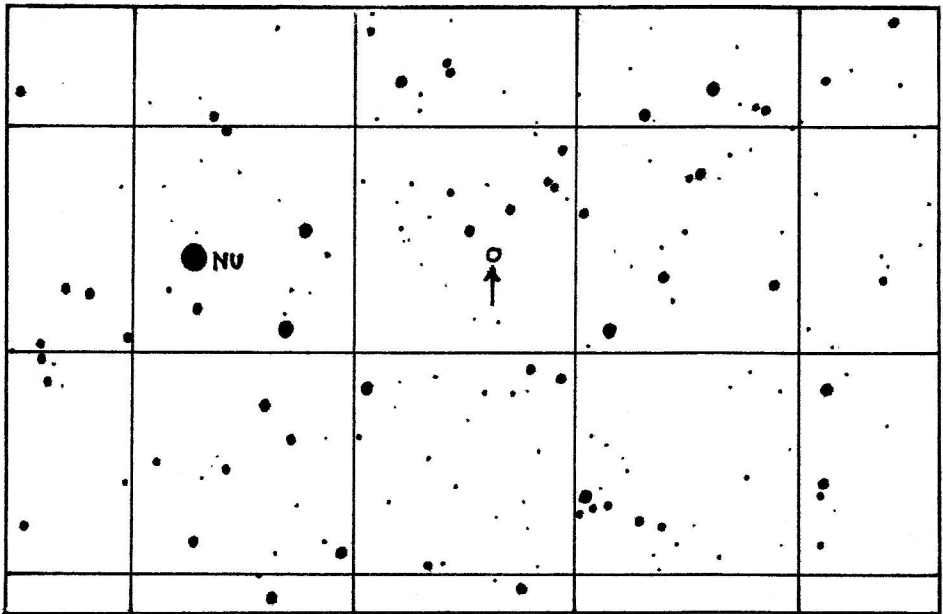


# AQUARIUS

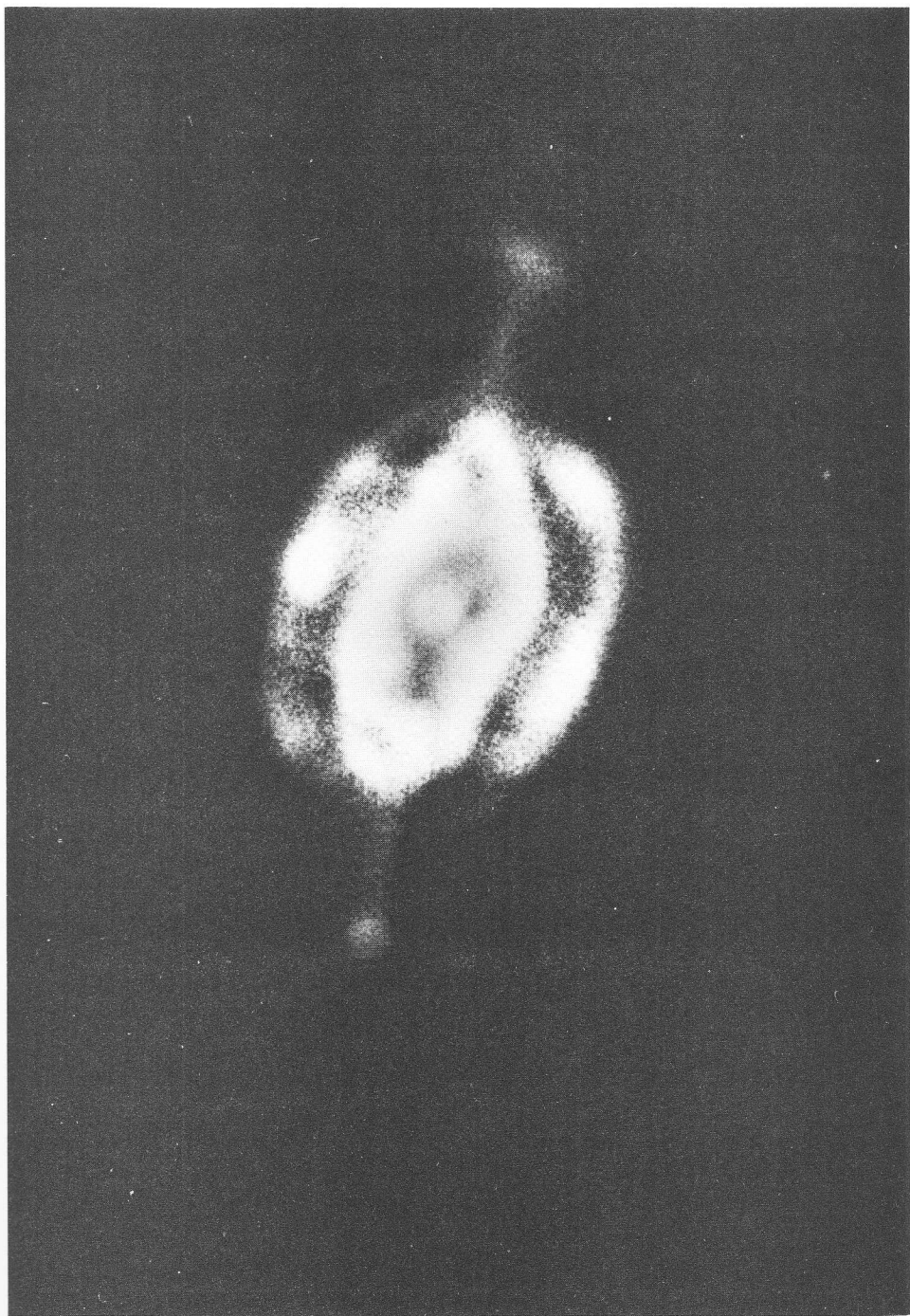
## DESCRIPTIVE NOTES (Cont'd)

M72. It was noted by Messier in October 1780 and described as a cluster of "three or four small stars which look like a nebula at first sight; it contains a little nebulosity.." On this last point Messier was definitely in error, as the best of modern photographs show no signs of nebulosity in the group, though of course it is a common experience that faint double or triple stars often appear fuzzy in small telescopes or with poor seeing conditions. The over-all diameter of the asterism is about 1!2, the individual magnitudes about 10.5, 10.5, 11.0, and 12.0. The object is aptly described by Admiral Smyth's brief note: "A trio of 10th magnitude stars in a poor field - that is M73. I give it out of respect to Messier's memory."

**NGC 7009**      Position 21014s1134. A small bright nebula of the "planetary" class, located about 1 degree west of Nu Aquarii, and first observed by Sir William Herschel in 1782. It was called by Lord Rosse the "Saturn" Nebula from the extending rays or ansae which project from the main disc on either side. The nebula has a rather high



NGC 7009. A finder chart for the Saturn Nebula, showing stars to about magnitude  $9\frac{1}{2}$ . Grid squares are  $1^\circ$  on a side with North at the top.



NGC 7009. The "Saturn Nebula" in Aquarius, one of the brighter planetaries. Mt. Wilson Observatory 60-inch telescope photograph.

## AQUARIUS

### DESCRIPTIVE NOTES (Cont'd)

surface brightness and appears nearly stellar in small low power telescopes. The total magnitude is about 8; the central star is about 12th visually, and somewhat brighter photographically.

This was one of the first planetary nebulae to be observed by Rosse with his 6-foot reflector, and is described in his paper "Observations on the Nebulae" (1850). He saw the nebula as a fairly uniform luminous disc, but was apparently unable to detect the darker center or the central star. "It has ansae which probably indicate a surrounding nebulous ring seen edgeways." Rosse's drawing portrays the nebula with a somewhat greater degree of symmetry and perfection than is actually the case; it is shown as a perfect nebulous miniature of Saturn.

The nebula is a strikingly beautiful object in large telescopes, shining with a vivid green fluorescent glow. The flattened central disc measures about 25" X 17" and is enclosed in a larger shell about 30" X 26". There is considerable intricate detail in both rings, and the two projecting rays end in bright condensations about 44" apart. The ansae may be glimpsed in a good 10-inch telescope. The central star is an extremely hot bluish dwarf with a continuous spectrum, and a computed temperature of about 55,000°K. Strong ultraviolet radiation from the star is the cause of the bright fluorescent glow of the nebulosity and the green tint is due to the radiation of doubly ionized oxygen.

Distances of planetary nebulae are, in nearly all cases, only roughly known. According to a study by C.R. O'Dell (1963) the distance of NGC 7009 is about 3900 light years, leading to an actual diameter of about 0.5 light year. The central star has a luminosity of about 20 suns; the absolute magnitude may be about +1.5. The nebula has a radial velocity of 28 miles per second in approach. (For a summary of facts and theories about the planetary nebulae, refer to M57 in Lyra)

**NGC 7293**      Position 22270s2106. The "Helical Nebula", usually regarded as the largest and nearest of the planetary nebulae. It has a diameter of 12' x 16' or about half the apparent width of the Moon. Despite its large size the nebula is faint and has a low surface