

Research Note

Possible Detection of a Second Planetary Nebula in M 15 at $H\alpha$

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Summary. With a prefiltered slitless spectrograph operating at $H\alpha$, the center of M 15 appears bright and smaller than a dispersed star image. This observation supports the interpretation of the $10\ \mu\text{m}$ infrared source at the center of M 15 as being a planetary nebula.

Key words: globular clusters — $H\alpha$ object — planetary nebulae

Some time ago an unsuccessful search for planetary nebulae in globular clusters was reported (Peterson, 1973). This search included 43 globulars and reached

about 15th magnitude with a prefiltered ($50\ \text{\AA}$) slitless spectrograph centered on the $H\alpha$ line.

The report of an infrared object at the center of M 15 by MacGregor et al. (1973) and the interpretation of their findings in terms of a young planetary by Caloi and Panagia (1974) inspired a resurvey of M 15. The dispersion of the spectrograph is $\sim 100\ \text{\AA}/\text{mm}$; $100\ \text{\AA}$, $50\ \text{\AA}$ and $10\ \text{\AA}$ prefilters are used; the $10\ \text{\AA}$ filter is new and the image brightness is enhanced by a two stage electrostatically focused image intensifier tube with a luminous gain of 8800. The net gain over the previous photographic recording, with preexposure, is about a factor of 10. The central region of M 15 begins

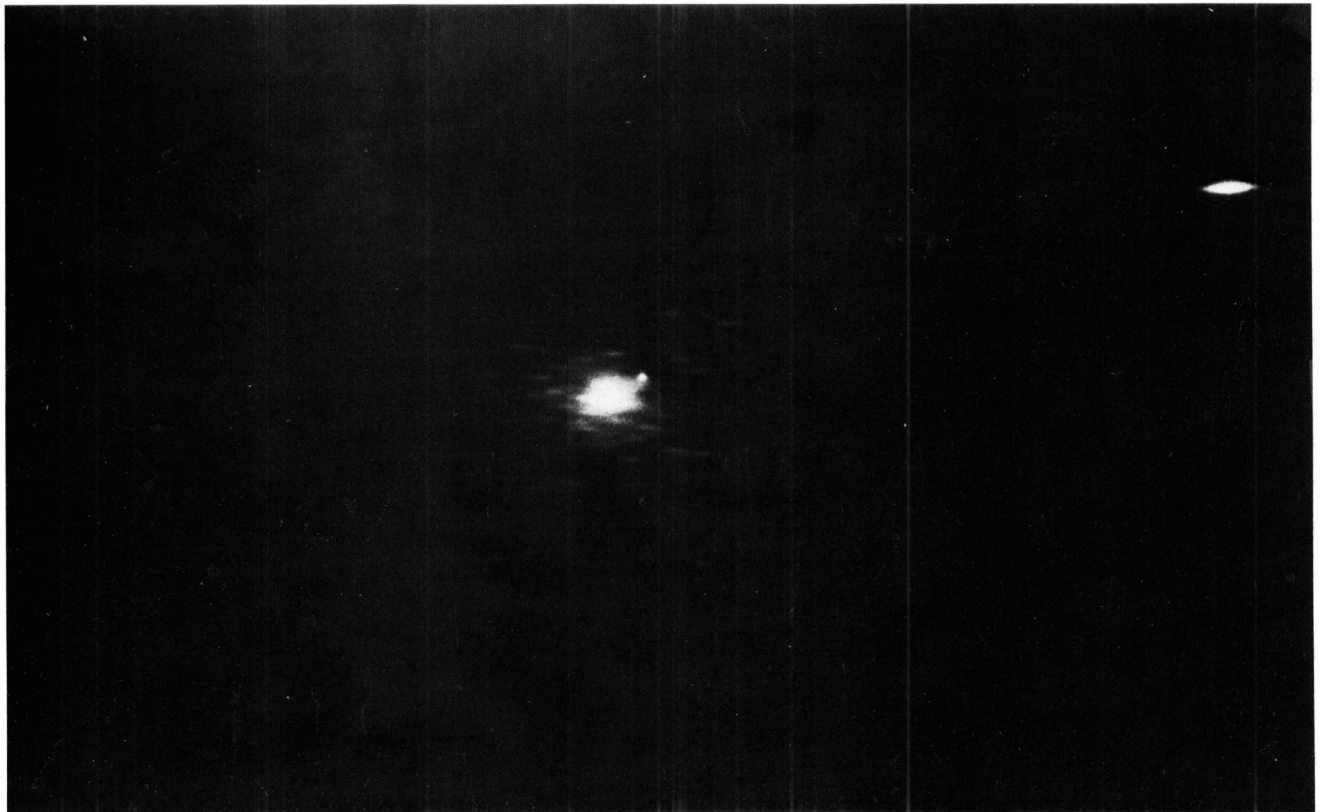


Fig. 1. A 7.5-min exposure of M 15 with a $50\ \text{\AA}$ prefilter. Pease's planetary is clearly shown, while the central area of the cluster is overexposed



Fig. 2. A 15-min exposure with a 10 Å prefilter almost completely suppresses the cluster stars revealing a bright area in the center of the cluster which is smaller than the dispersed image of a star. Note the elongated star (upper right) of visual magnitude 7.7 is suppressed to nearly the same brightness as Pease's planetary of magnitude 13.8

to “burn out” with a 5-min exposure and a 50 Å prefilter at the Cassegrain focus of our 24-inch telescope.

Numerous photographs of M 15 were taken ranging from 2 to 6-min exposures with no prefiltering to 45-min exposures with a 10 Å prefilter. Some of the slitless spectra show a slight amount of structure at H α in the center of the cluster, possibly due to star groupings. The filtered photographs show a bright area in the cluster center, and at 10 Å prefiltering all photographs show a small bright central area. The bright spot is circular and about half the length of a dispersed star image. By way of comparison two underexposed photographs of M 2, a globular with larger central concentration than M 15, show no central brightening.

Although it can be argued that the cluster should be brightest at its center, the fact that the patch is small and circular is very indicative of an H α emission object rather than the dispersed image of the bright cluster center.

No attempt has been made to set up a magnitude scale for this instrumental system, but we estimate the central image at 10 Å prefiltering to be ~ 3 to 4

magnitudes fainter than the known planetary in M 15. If the central object is a planetary of characteristics similar to the known M 15 planetary, it would be of magnitude 17 to 18 and indeed would be lost in the bright central region without prefiltering.

Scaling Caloi and Panagia's H α flux estimate of $1 \cdot 10^{-13} \exp(-\tau) w/m^2$ down from the sun, assuming $\tau \simeq 1$ and $B_{\odot} \sim 165 \text{ erg cm}^{-2} \text{ s}^{-1} \text{ Å}^{-1}$ at H α , we find their object should be of magnitude 19 to 20, or somewhat fainter than our estimate of 17 to 18.

Figures 1 and 2 show the enhancement of the known planetary by prefiltering. The bright central region, possibly another planetary, appears in Figure 2. Further observations of this cluster at 5 Å bandpass and at other wavelengths are planned, as well as a new general search of all globulars accessible from our observatory.

References

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