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IRAS 17395-0841: A NEW YOUNG LOW EXCITATION PLANETARY NEBULA

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ABSTRACT

We report here the discovery of a new young low excitation planetary nebula IRAS 17395−0841. © *1997 American Astronomical Society.* [S0004-6256(97)01110-2]

1. INTRODUCTION

The *IRAS* survey has detected many stars with circumstellar dust, among which are planetary nebulae (PN) and stars in the post-asymptotic giant branch (post-AGB) stage of evolution. Many such objects have been identified based on their far-infrared colors (e.g., Pottasch *et al.* 1988; Parthasarathy & Pottasch 1986, 1989). These *IRAS* sources fall within the colour box with $12\mu/25\mu$ flux ratios $\leqslant 0.3$ and $25\mu/60\mu$ flux ratios $\geqslant 0.3$. There are two ways of confirming that the *IRAS* sources with PN colours are indeed PN or post-AGB stars. One of the methods is the detection of radio continuum emission due to thermal bremsstrahlung in a partially ionised gas, which provides strong evidence that the object is indeed a PN. The other is by means of optical spectra. Even if radio continuum is detected, further confirmation by optical spectroscopy and imaging is necessary. There are about 1200 known PN listed in the catalog by Acker *et al.* (1992). The *IRAS* database contains several as yet unidentified PN and post-AGB stars. We are carrying out a program of spectroscopy and imaging of *IRAS* sources with far-infrared colours similar to those of planetary nebulae. From our survey, we have detected several new post-AGB stars and also two new PN. In this paper we present the optical spectrum of the new PN IRAS 17395−0841 (α_{1950} =17 39 30.1, δ_{1950}=−08 41 58; l=17.2, b=11.1). IRAS 17395−0841 is a high Galactic latitude object which coincides with the 13.2 mag Hα emission object #318 in the list of Stephenson & Sanduleak (1977). It is listed in the 1st supplement to the Strasbourg-ESO catalogue of Galactic PN (Acker *et al.* 1996) as G017.0+11.1, along with *JHK* photometry by Garcia-Lario *et al.* (1997) and a finding chart. This object was also listed by Carballo *et al.* (1992) as a possible PN on the basis of the *IRAS* colors.

2. OBSERVATIONS

IRAS 17395−0841 was observed in 1994 April using the spectrograph and 2*d*-Frutti two-dimensional photon counting detector at the 1 m telescope at the Cerro Tololo Inter-American Observatory (CTIO) in Chile. The spectrum covered 3800 Å to 5020 Å at a resolution of 2200 and was obtained at an airmass of 1.1. It shows a very weak continuum with very strong emission in [O III] λλ 4959 and 5007 Å. The Balmer lines and [Ne III] λ 3869 are also in emission (see Fig. 1).

A second spectrum (Fig. 2) was obtained in 1996 March using the Boller and Chivens spectrograph with Tektronix 1024 CCD at the 2.3 m telescope at the Vainu Bappu Observatory (VBO) in Kavalur, India. It was observed at airmass 1.2, and covers 4340 Å to 6900 Å at a resolution of 1000. We find the Balmer lines and [N II] λλ 6549 and 6584 Å in emission. [S II] λλ 6717 and 6731 lines are absent or too weak to be seen in this spectrogram.

3. ANALYSIS

Both spectra were reduced using NOAO IRAF version 2.1. We used the SIMBAD database to get photometric and spectroscopic data on nearby SAO stars (141817, 141818, 141826) within 40′ of IRAS 17395−0841, which indicate that E_{B-V}=0.1 in this direction. This small reddening is consistent with the Galactic latitude of b=11.1, and with the observed ratio of Hα to Hβ.

The sky in Kavalur was not photometric so flux calibration could not be done. The Hβ flux was estimated using the data from CTIO. Since no spectrophotometric standards were observed during the CTIO observing run, the absolute

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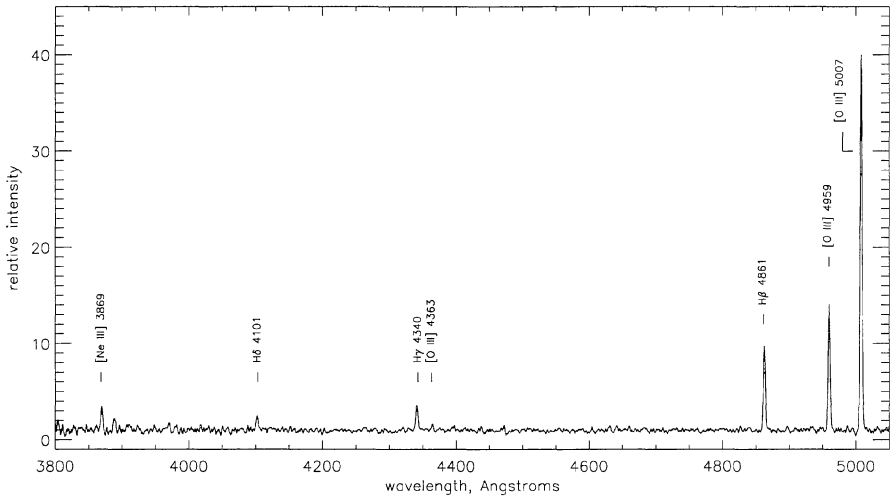

FIG. 1. The spectrum of IRAS 17395−0842 taken at CTIO. The resolution is 2 Å.

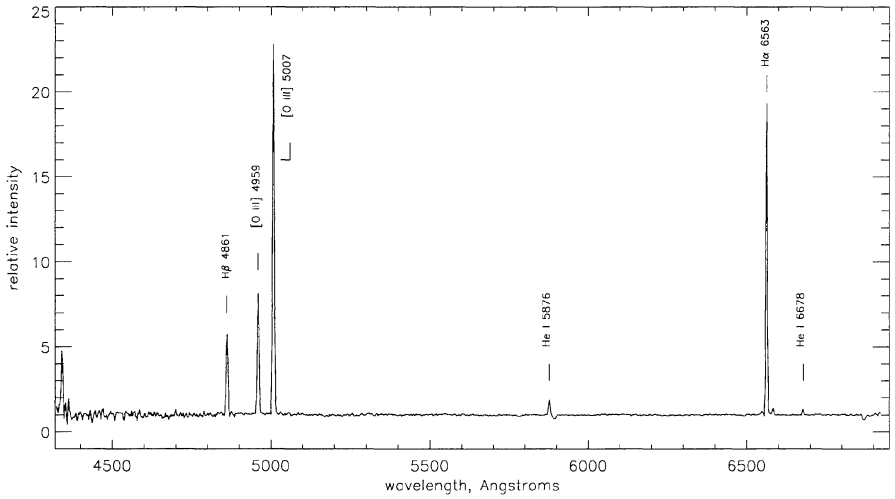

FIG. 2. The spectrum of IRAS 17395−0842 taken at Kavalur, at a resolution of 5 Å.

TABLE 1. Infrared fluxes.

λ(μ)	12	25	60	100
Flux density (jansky)	0.31	4.18	8.43	6.38
Flux quality	3	3	3	3

Hβ flux was estimated using Hen-3 1312, which was observed during the same run (but not on the same night) as IRAS 17395−0841, and which has a published value of the Hβ flux (Acker *et al.* 1989). Average values of the CTIO extinction coefficients were used to correct the observed fluxes of both stars for atmospheric extinction. Adopting a value of 0.1 for E_{B-V}, the Hβ flux was estimated to be 9×10^{-13} W m^{-2}. We emphasize that this is only a rough estimate.

The fluxes in the far-IR, taken from the *IRAS* Point Source Catalog, are given in Table 1. The dust temperature was determined to be 90 K by fitting a blackbody curve to these fluxes. The integrated flux between 12 and 100 μ is 1.4×10^{-12} W m^{-2}.

Using a core mass of 0.55 $M_\odot$ which is appropriate for central stars of PN, and the relationship between the quiescent luminosity L_Q and core mass M_C from Wood & Zarro (1981), we get a distance of 3.8 kpc. The apparent magnitude of 13.2 was taken from Stephenson & Sanduleak (1977). We used the bolometric correction for O5 stars since the presence of He I lines and the strength of the [O III] line indicate a hot central star.

In the raw spectrum, the region of the nebular emission lines is slightly more extended (by 2 pixel or 2.6 arcsec) than that of the continuum, indicating clearly the presence of a nebula, although none could be detected on the Palomar sky survey charts.

We intend to obtain images of this object in B, V, R, I, and narrow band filters centered at 5007λ and Hα to determine the angular extent and morphology of the nebula. The far-infrared flux distribution and colours indicate the presence of a cold, detached dust shell. The high galactic latitude, cold detached dust shell and nebular spectrum indicate that it is a low mass star in the post-AGB stage of evolution. The presence of He I lines and the strengths of the [O III] lines suggest that the central star is hot, and may be detectable in the ultraviolet.

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