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# NEW $H_\alpha$ EMISSION STARS IN GALACTIC DARK CLOUDS

MARIA KUN

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110 $H_\alpha$ emission objects not published previously were detected with ath 60/90/180 cm Schmidt telescope of Konkoly Observatory in two fields containing several dark clouds. The centres of these fields are at $\alpha=2^h04^m$, $\delta=+75^\circ$, and st $\alpha=22^h35^m$, $\delta=+75^\circ$. Most of the emission stars appear to be located near the edges of the dark regions. Their apparent red magnitudes are between $11^m$ and $16^m$.

Search for $H_\alpha$ emission stars in regions of dark clouds associated with radio molecular emission has been in progress at Konkoly Observatory for some while. Here we present the results obtained in two fields, each covering an area of 19 square degrees, lying at intermediate galactic latitudes.

Observations were made with the 60/90/180 cm Schmidt telescope of Konkoly Observatory equipped with a 5° objective prism having a dispersion of 580 A/mm at $H_\gamma$. One plate was obtained for both fields on Kodak 103aE emulsion using Schott RG1 filter, with $60^m$ exposure time. The spectra were widened to 9″. The coordinates of the plate centres were the following:

$$\alpha_{1950}=2^h04^m,\quad \delta_{1950}=+75^\circ;\quad l=127\overset{\circ}{.}6,\quad b=+14\overset{\circ}{.}0, \tag{1}$$

$$\alpha_{1950}=22^h35^m,\quad \delta_{1950}=+75^\circ;\quad l=114\overset{\circ}{.}5,\quad b=+14\overset{\circ}{.}6. \tag{2}$$

The limiting magnitude of the survey was about $16^m$ in the red. A rough magnitude estimate was made in two steps using Palomar red prints: First, approximate red magnitudes were established for a sequence of non-emission stars of our fields from the Palomar prints on

*Table 1*

| No. | $\alpha_{1950}$ | $\delta_{1950}$ | $m_R$ | No. | $\alpha_{1950}$ | $\delta_{1950}$ | $m_R$ |
|---|---|---|---|---|---|---|---|
| 1 | $2^h26^m18^s.62$ | $+75°30'33''.1$ | $12^m.0$ | 37 | $1^h54^m11^s.56$ | $+76°11'58''.2$ | $14.0$ |
| 2 | 2 26 6.68 | 75 35 8.8 | 14.0 | 38 | 1 55 10.33 | 76 3 11.0 | 13.5 |
| 3 | 2 24 32.47 | 75 13 34.9 | 12.7 | 39 | 1 55 33.20 | 75 51 20.0 | 13.5 |
| 4 | 2 24 45.78 | 75 11 17.9 | 12.7 | 40 | 1 51 29.24 | 75 51 11.1 | 13.5 |
| 5 | 2 24 18.85 | 75 10 9.1 | 13.5 | 41 | 1 42 17.25 | 76 37 58.1 | 12.0 |
| 6 | 2 21 22.87 | 75 32 6.6 | 12.7 | 42 | 1 34 14.09 | 76 25 8.3 | 12.0 |
| 7 | 2 21 28.65 | 75 34 20.7 | 14.0 | 43 | 1 33 6.78 | 76 20 24.1 | 12.0 |
| 8 | 2 18 17.57 | 75 44 3.2 | 12.7 | 44 | 1 33 45.28 | 76 21 52.8 | 15.0 |
| 9 | 2 17 48.50 | 75 48 17.2 | 12.0 | 45 | 1 33 32.44 | 76 16 35.8 | 13.5 |
| 10 | 2 15 28.51 | 76 11 23.6 | 14.0 | 46 | 1 34 55.29 | 75 56 47.4 | 12.5 |
| 11 | 2 14 24.82 | 76 20 47.5 | 12.7 | 47 | 1 34 27.57 | 75 54 38.3 | 13.0 |
| 12 | 2 15 36.76 | 76 33 1.5 | 11.0 | 48 | 1 22 40.42 | 75 32 22.0 | 11.5 |
| 13 | 2 16 0.18 | 76 33 24.5 | 14.0 | 49 | 1 31 24.03 | 75 13 21.3 | 12.0 |
| 14 | 2 15 56.81 | 76 57 59.4 | 11.5 | 50 | 1 29 27.36 | 75 10 32.7 | 12.0 |
| 15 | 2 14 24.66 | 77 5 35.8 | 11.5 | 51 | 1 32 48.09 | 75 15 59.1 | 13.0 |
| 16 | 2 13 47.18 | 77 1 1.7 | 12.0 | 52 | 1 35 8.70 | 75 14 1.2 | 13.0 |
| 17 | 2 6 36.91 | 77 0 26.9 | 12.0 | 53 | 1 36 8.19 | 75 13 24.3 | 12.0 |
| 18 | 2 7 38.15 | 76 56 18.4 | 13.5 | 54 | 1 37 27.03 | 75 22 34.1 | 12.0 |
| 19 | 2 4 31.57 | 76 53 56.8 | 12.0 | 55 | 1 56 20.70 | 74 57 3.4 | 12.0 |
| 20 | 2 5 6.40 | 76 51 54.7 | 12.7 | 56 | 1 56 29.94 | 75 15 1.5 | 12.5 |
| 21 | 2 5 42.42 | 76 47 13.0 | 13.5 | 57 | 1 57 47.43 | 75 10 32.7 | 12.5 |
| 22 | 2 7 37.24 | 76 33 9.5 | 14.5 | 58 | 1 56 15.27 | 74 57 3.4 | 12.0 |
| 23 | 2 8 17.95 | 76 20 55.5 | 12.7 | 59 | 1 59 28.55 | 75 23 52.8 | 11.5 |
| 24 | 2 6 40.79 | 76 20 31.1 | 14.0 | 60 | 2 3 13.39 | 75 20 56.3 | 12.0 |
| 25 | 2 0 32.11 | 77 2 7.2 | 12.7 | 61 | 2 6 31.27 | 75 32 37.8 | 12.0 |
| 26 | 1 59 56.93 | 76 51 22.7 | 15.2 | 62 | 2 4 31.13 | 74 59 32.5 | 12.0 |
| 27 | 1 58 32.70 | 76 45 37.1 | 11.5 | 63 | 2 5 50.12 | 74 55 21.1 | 12.0 |
| 28 | 1 59 4.66 | 76 36 37.3 | 11.5 | 64 | 2 7 23.85 | 74 49 34.4 | 12.5 |
| 29 | 1 58 47.97 | 76 25 14.8 | 12.0 | 65 | 1 49 33.72 | 73 45 32.0 | 13.5 |
| 30 | 1 57 57.89 | 76 14 10.8 | 12.0 | 66 | 1 53 23.82 | 73 29 12.2 | 12.0 |
| 31 | 1 59 18.53 | 76 13 26.7 | 12.0 | 67 | 1 59 7.78 | 73 1 5.4 | 12.5 |
| 32 | 1 58 29.66 | 76 11 30.8 | 15.2 | 68 | 1 59 22.52 | 73 0 8.2 | 12.5 |
| 33 | 1 50 34.19 | 76 27 43.5 | 13.0 | 69 | 2 2 59.79 | 73 28 2.7 | 13.0 |
| 34 | 1 50 38.57 | 76 20 15.7 | 12.7 | 70 | 2 5 21.45 | 73 1 43.7 | 13.5 |
| 35 | 1 52 57.66 | 76 16 4.3 | 13.5 | 71 | 2 13 40.97 | 73 3 10.6 | 12.5 |
| 36 | 1 53 46.77 | 76 13 41.7 | 12.7 | 72 | 2 15 45.56 | 74 0 53.9 | 14.0 |


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Fig. 1a


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Fig. 1b

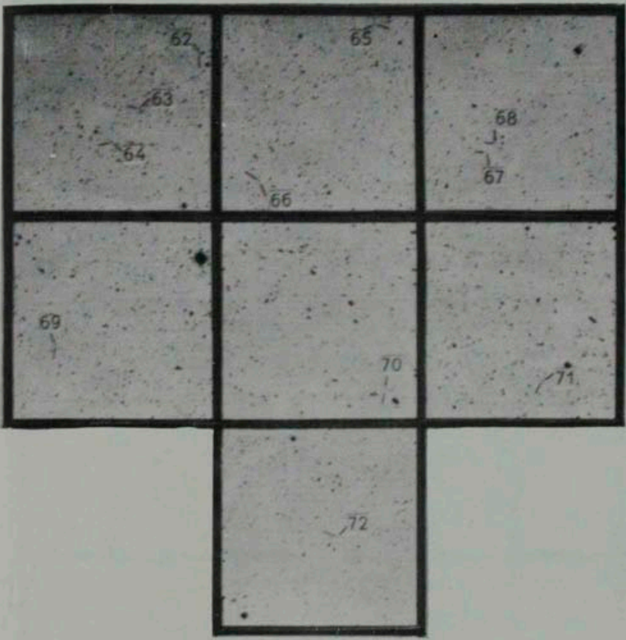


Fig. 1c


Fig. 2a

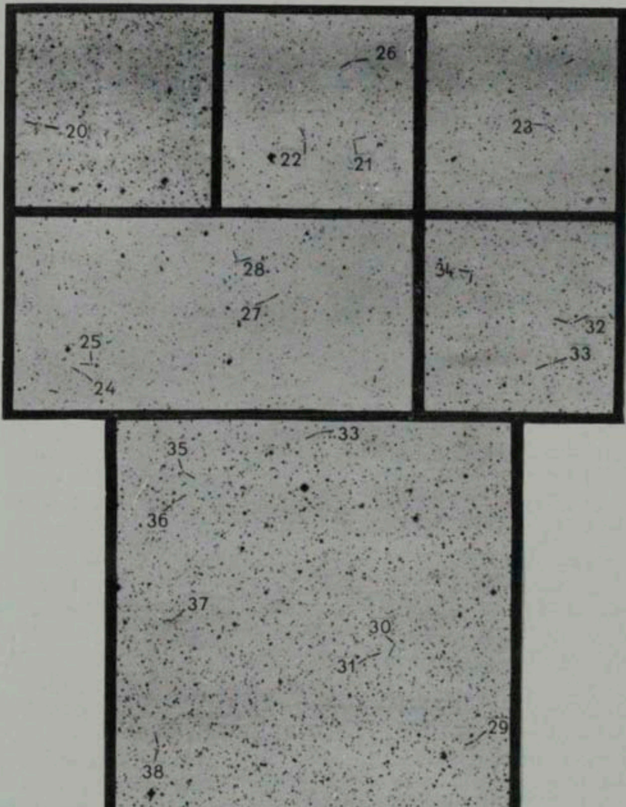


Fig. 2b

Maria Kun

*Table 2*

| No. | $\alpha_{1950}$ | $\delta_{1950}$ | $m_R$ | No. | $\alpha_{1950}$ | $\delta_{1950}$ | $m_R$ |
|---|---|---|---|---|---|---|---|
| 1 | $22^h33^m11^s.03$ | $+75°\ 2'44''.4$ | $12^m.0$ | 20 | $22^h45^m14^s.08$ | $+73°39'24''.7$ | $15^m.2$ |
| 2 | 22 35 2.76 | 75 3 1.9 | 15.2 | 21 | 22 45 5.72 | 74 56 11.6 | 12.7 |
| 3 | 22 36 43.64 | 74 48 34.2 | 12.7 | 22 | 22 47 35.81 | 74 56 8.6 | 15.2 |
| 4 | 22 38 29.92 | 74 40 23.3 | 14.0 | 23 | 22 56 32.89 | 74 41 55.2 | 12.7 |
| 5 | 22 25 17.08 | 74 56 37.3 | 14.0 | 24 | 22 52 4.33 | 74 57 6.3 | 15.2 |
| 6 | 22 23 45.30 | 74 57 7.4 | 15.2 | 25 | 22 52 1.44 | 75 17 9.5 | 14.0 |
| 7 | 22 24 11.96 | 74 32 39.4 | 12.0 | 26 | 22 45 53.74 | 75 8 48.3 | 14.0 |
| 8 | 22 13 43.40 | 74 38 49.7 | 13.2 | 27 | 22 46 33.84 | 75 25 8.8 | 12.7 |
| 9 | 22 8 3.19 | 76 8 32.9 | 12.5 | 28 | 22 47 45.93 | 75 27 31.1 | 14.0 |
| 10 | 22 6 59.16 | 75 24 55.1 | 14.0 | 29 | 22 40 13.96 | 75 54 0.8 | 12.5 |
| 11 | 21 59 47.69 | 75 10 35.8 | 14.0 | 30 | 22 42 49.08 | 76 5 41.8 | 12.5 |
| 12 | 22 0 32.57 | 74 59 9.5 | 12.7 | 31 | 22 43 40.24 | 76 4 27.0 | 13.0 |
| 13 | 22 7 38.48 | 74 14 23.2 | 16.2 | 32 | 22 45 8. 4 | 76 30 53.4 | 12.5 |
| 14 | 22 7 43.60 | 74 14 42.9 | 15.2 | 33 | 22 45 52.71 | 76 29 43.1 | 15.0 |
| 15 | 22 12 7.39 | 74 27 2.2 | 12.7 | 34 | 22 47 41.29 | 76 42 28.9 | 12.0 |
| 16 | 22 12 28.32 | 74 27 33.1 | 12.0 | 35 | 22 49 41.99 | 76 25 13.3 | 11.0 |
| 17 | 22 23 42.39 | 73 35 18.9 | 13.8 | 36 | 22 50 36.84 | 76 23 17.9 | 11.5 |
| 18 | 22 27 20.33 | 73 47 32.8 | 14.0 | 37 | 22 48 51.71 | 76 8 1.2 | 11.5 |
| 19 | 22 26 47.05 | 73 50 16.6 | 15.2 | 38 | 22 49 16.85 | 75 58 17.3 | 12.5 |

the basis of the curve published by Dorschner et al. [1]. Then the brightnesses of the continuous spectra of these calibrated stars were compared by eye with ihe continua of the emission stars. If the magnitudes found by this method are compared with those estimated from the image on Palomar prints many of the objects appear to be variable. The accuracy of this magnitude estimate is about $\pm 1^m$.

Positions of the emission stars were measured by an ASCOIRIS instrument and were transformed into equatorial coordinates. The transformation was made on the basis of coordinates and measured positions of 18 stars of the AGK 2 catalogue. The accuracy of the equatorial coordinates is about $\pm 3''$.

The first region was observed in September 1974. It contains at least two dark clouds; Lynds 1333 at $\alpha_{1950} = 2^h21^m$, $\delta_{1950} = +75°$, and a cloud found by Cudaback and Heiles [2] during their OH-survey at $\alpha_{1950} = 2^h04^m30^s$, $\delta_{1950} = +75°54'$. 72 emission stars were found in this field. Table 1 contains the list of their equatorial coordinates and the approximate red magnitudes. Figure 1 gives the identification charts.

The field centred on $\alpha_{1950} = 22^h35^m$, $\delta_{1950} = +75^\circ$ was observed in July 1977. It contains the dark cloud Lynds 1251, which was searched for OH and $H_2CO$ with positive result by Myers [3], as well as two clouds of lesser opacity: Lynds 1243 and 1247. 38 new $H_\alpha$ emission stars were found in this region. Their coordinates and red magnitudes are listed in Table 2. Figure 2 presents the finding charts.

Most of the emission stars appear to be near the edges of the dark regions. This fact allows us to assume that they are associated with the dark clouds.

Konkoly Observatory,
Budapest

## НОВЫЕ $H_\alpha$ ЭМИССИОННЫЕ ЗВЕЗДЫ В ОБЛАСТЯХ ГАЛАКТИЧЕСКИХ ТЕМНЫХ ТУМАННОСТЕЙ

МАРИЯ КУН

110 новых $H_\alpha$ эмиссионных звезд были обнаружены в двух областях, содержащих темные туманности, в Астрономической обсерватории им. Конколи на 60/90/180 см телескопе системы Шмидта. Центры исследованных областей имеют координаты $\alpha_{1950} = 2^h04^m$, $\delta_{1950} = +75^\circ$ и $\alpha_{1950} = 22^h35^m$, $\delta_{1950} = +75^\circ$. Видимые красные звездные величины эмиссионных звезд находятся в интервале $11^m-16^m$.

### REFERENCES

1. *D. D. Cudaback, C. Heiles*, Ap. J. Lett. 155, L21, 1969.
2. *J. Dorschner, J. Gürtner, R. Schielicke, K. H. Schmidt*. A. N. 289, 53, 1967.
3. *P. C. Myers*, Ap. J., Suppl. ser., 26, 83, 1973.