A Photometric Study of the Bright Cloud B in Sagittarius: IV. 17 New Diffuse Objects

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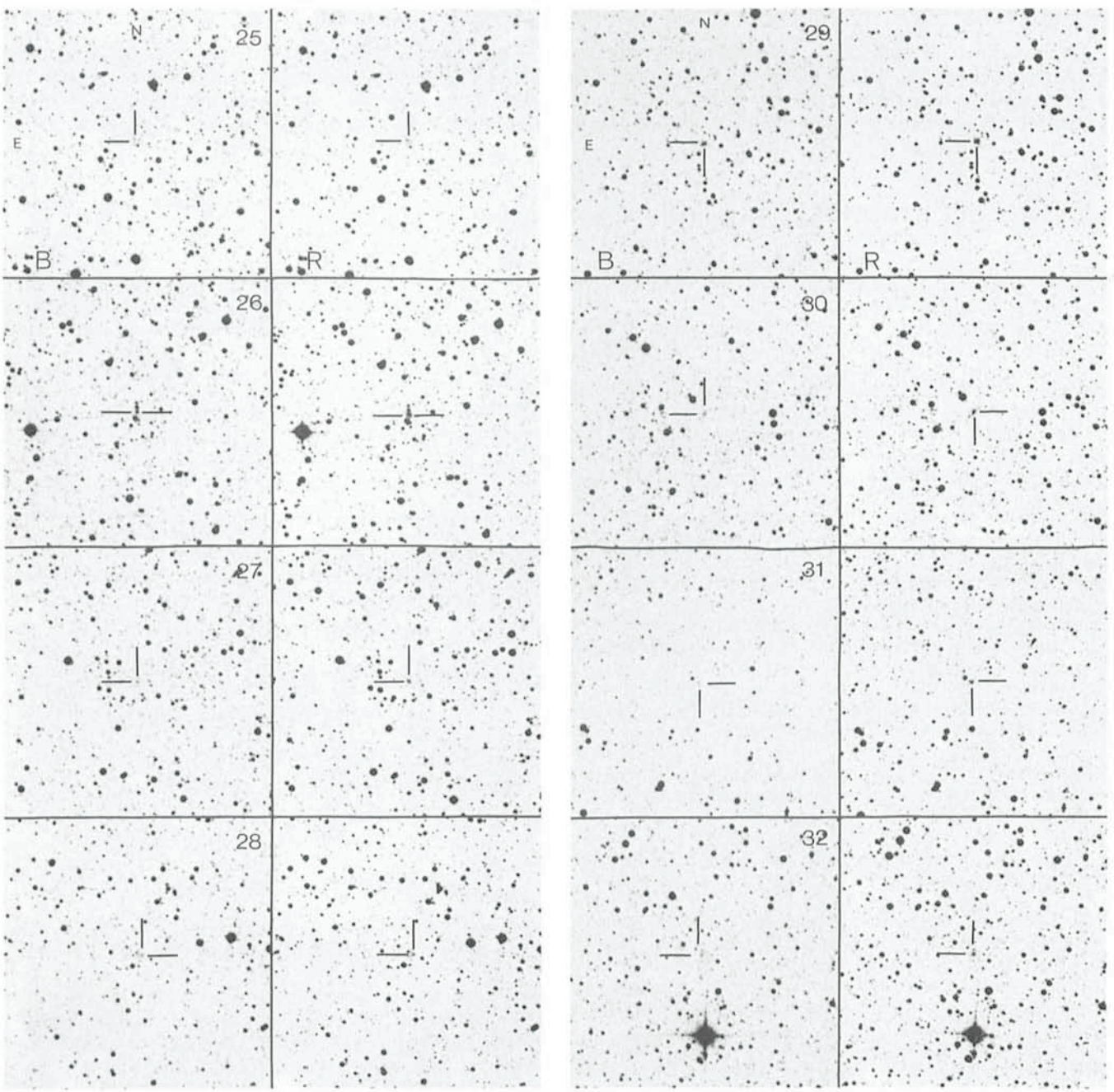
In 1976, we started a photometric study of the bright cloud B in Sagittarius in the direction of the galactic centre (*The Messenger* No. 10, September 1977).

Since then, our work has been greatly enriched by systematically surveying a large number of U, B, V, R plates, taken by H.E. Schuster and his collaborators with the 1 m Schmidt telescope, and the photometric measurement of several hundred stars with the 1 m and 61 cm Bochum telescopes at La Silla, Chile (Terzan and Bernard, 1981).

We have detected so far:

- 24 diffuse objects: 3 of which are planetary nebulae (Nos. 14, 18, 21); 2 possible globular clusters (Nos. 5 and 23) which are situated in, or projected within, the error boxes of X-ray sources 17065-273 and 17437-316; 1 possible galactic open cluster (No. 20) (Terzan et al., 1978a, b; Terzan and Bernard, 1978; Terzan and Ju, 1980).
- 621 red variable stars (Terzan et al., 1982).
- 42 proper-motion stars (Terzan et al., 1980).

After recently completing our blink survey of all U, B, V, R plates taken for field No. 4 (located south-east of 45 Oph; see *The Messenger* No. 10, September 1977), our list of peculiar objects has lengthened: 567 new red variables have been discovered and 175 stars with annual proper motion larger than 0".2 have been observed.



Figs. 1–4: *Finding charts for objects Terzan 25–41, reproduced from the Blue and Red ESO/Schmidt plates. North is at top, east to the left.*

A catalogue, with parameters: α; δ (1950.0), l; b, m_B, m_R, m_{max}, m_{min}, A_{obs} (observed amplitude for variable stars), μ''; $\theta°$ (for proper-motion stars) and an atlas with identification charts – essential for the publication of these results – are under preparation.

Our current research is concentrated on field No. 1 (located north-east of 45 Oph) where, after having blinked the first two pairs of R plates, we have just discovered several hundred other red variables. Their confirmation, however, requires further study of at least other couples of plates.

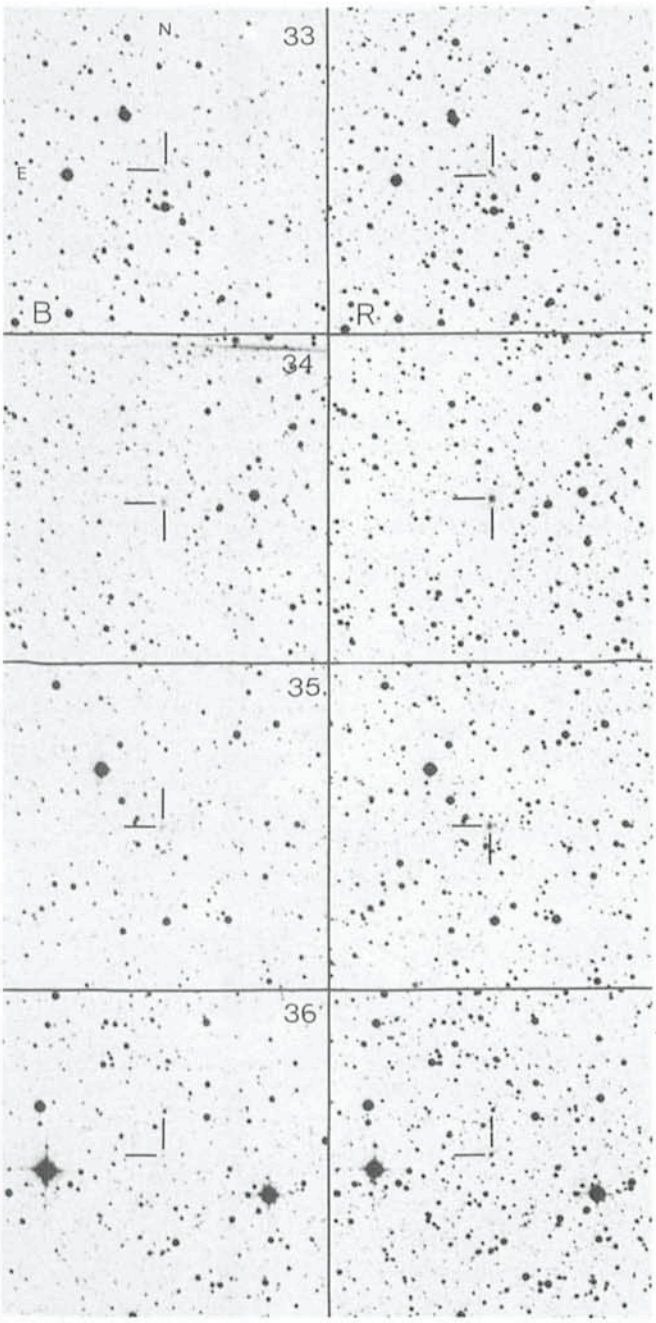
Also, during the analysis of these 2 first pairs of R plates and 1 pair of B plates, we found 17 new diffuse objects.

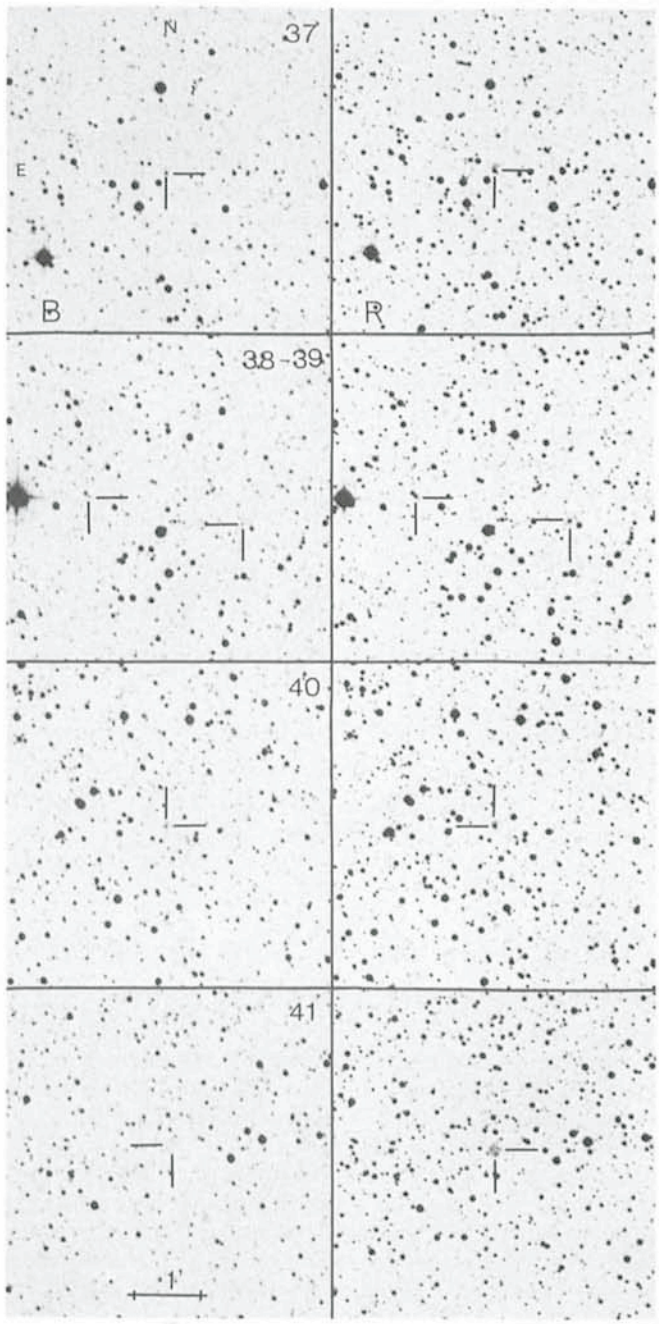
Galactic and equatorial coordinates (1950.0) and their X; Y (in mm) positions on the Palomar Observatory Sky Survey (POSS) of these 17 new diffuse objects are given in Table 1. The identification charts–B and R–are reproduced as figures 1–4. We unfortunately do not have a photometric sequence for faint objects ($m_B > 19$ mag; $m_R > 17.5$ mag) within this field, therefore we cannot estimate their m_B and m_R.

Thorough search in the literature and different catalogues leads us to conclude that none of these 17 diffuse objects have been described or catalogued, either as planetary nebulae (Acker, 1985) or known galaxies (Paturel, 1985) nor among van den Bergh's uniform survey of clusters in this area of the southern Milky Way (van den Bergh and Hagen, 1975).

However, it should be pointed out that Johnston et al. (1981), during their search for an optical counterpart of the extended X-ray source detected with the HEAO 1 Scanning Modulation Collimator near 4U1708-23 ($l = 0\overset{\circ}{.}5$; $b = 9\overset{\circ}{.}4$), found an anonymous $z = 0.03$ cluster of galaxies (CL 1709-233), Ophiuchus Cluster) which falls outside the northern limit of our field, subject of the present paper.

Within a $2\overset{\circ}{.}1 \times 2\overset{\circ}{.}6$ rectangle centered on their so-called "dominant central galaxy" ($17^h09^m25\overset{s}{.}6$; $-23°18'35''$, 1950.0) Johnston et al. have found 108 galaxies and they suggest that the steep-spectrum radio source MSH 17-023 is associated with this cluster.





All charts have the same scale.

TABLE 1

Object (Terzan No.)	(1950.0)		POSS		
	α	δ	Charts	X_{mm}	Y_{mm}
25	$17^h03^m08^s.5$	$-24°46'44''.6$	$-24°\ 16^h54^m$	117.6	139.4
26	$17^h04^m41^s.4$	$-24°59'47''.4$	$-24°\ 16^h54^m$	99.0	127.5
27	$17^h04^m52^s.6$	$-24°48'30''.1$	$-24°\ 16^h54^m$	96.5	137.6
28	$17^h05^m04^s.1$	$-25°15'03''.0$	$-24°\ 16^h54^m$	94.5	113.7
29	$17^h05^m15^s.4$	$-25°09'51''.3$	$-24°\ 16^h54^m$	92.2	118.2
30	$17^h06^m09^s.6$	$-24°55'21''.1$	$-24°\ 16^h54^m$	81.0	131.2
31	$17^h08^m20^s.2$	$-24°52'10''.5$	$-24°\ 16^h54^m$	54.2	135.7
32	$17^h09^m27^s.2$	$-25°08'34''.7$	$-24°\ 16^h54^m$	41.4	118.8
33	$17^h09^m31^s.9$	$-25°03'10''.8$	$-24°\ 16^h54^m$	40.5	123.4
34	$17^h10^m11^s.2$	$-24°58'58''.0$	$-24°\ 16^h54^m$	32.3	127.0
35	$17^h10^m57^s.6$	$-24°45'30''.2$	$-24°\ 16^h54^m$	23.0	138.8
36	$17^h12^m31^s.1$	$-24°55'40''.7$	$-24°\ 17^h20^m$	316.0	126.3
37	$17^h12^m35^s.5$	$-25°15'55''.9$	$-24°\ 17^h20^m$	315.0	108.5
38	$17^h13^m03^s.9$	$-24°55'53''.3$	$-24°\ 17^h20^m$	309.5	126.3
39	$17^h13^m13^s.9$	$-24°55'42''.4$	$-24°\ 17^h20^m$	307.8	126.5
40	$17^h13^m42^s.5$	$-24°55'55''.9$	$-24°\ 17^h20^m$	302.0	126.5
41	$17^h17^m17^s.9$	$-24°48'53''.8$	$-24°\ 17^h20^m$	258.8	134.0

It is highly probable that some of our 17 diffuse objects are galaxies belonging to this cluster.

At any rate, none of the descriptions or hypotheses (globular cluster, planetary nebula, galaxy, star surrounded by nebulosity) given under "Description of Objects" should be regarded as definite. They can only help toward future talks based on deeper studies (photometry, spectrophotometry) which we propose to undertake later on with a large telescope.

Addenda: After writing the above paper (May 1985) we have found other diffuse objects, quite close to this Ophiuchus Cluster. This fact leads us to believe that:

1. The total number of galaxies belonging to this cluster must be clearly in excess of 108;

2. The entire cluster must actually extend far beyond a $2.^\circ1 \times 2.^\circ6$ field.

Description of Objects

Terzan 25 – nebulosity, surrounding a center, well defined on the R plates
Terzan 26 – planetary nebula?
Terzan 27 – nucleus of galaxy or a star surrounded by nebulosity
Terzan 28 – nebulosity
Terzan 29 – planetary nebula or a red star surrounded by nebulosity
Terzan 30 – galaxy?
Terzan 31 – galaxy?
Terzan 32 – probably a spiral galaxy judging from B plates
Terzan 33 – center of a globular cluster? nebulosity is evenly distributed on R plates
Terzan 34 – probably a globular cluster with a strong central concentration on R plates
Terzan 35 – globular cluster or planetary nebula?
Terzan 36 – nucleus of galaxy?
Terzan 37 – nebulosity
Terzan 38 – nucleus of galaxy or a star surrounded by an elongated nebulosity
Terzan 39 – galaxy?
Terzan 40 – planetary nebula?
Terzan 41 – nebulosity of an almost spherical form

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A Catalogue of Dwarf Galaxies South of $\delta = -17.^\circ5$

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The first systematic search for dwarf galaxies was undertaken by van den Bergh (1959) and resulted in a catalogue which contained 222 objects north of $\delta = -23°$ (in 1966 the list was expanded to 243 dwarfs north of $-33°$). Nilson (1973) noted in his "Uppsala General Catalogue of Galaxies" 687 dwarf systems north of $-2.^\circ5$. Both catalogues were produced with the aid of the "Palomar Observatory Sky Survey". The publication of two photographic surveys of the southern hemisphere ($\delta < -17.^\circ5$), namely the ESO(B) and the SRC(J) Atlas, available in Bochum as plate and film copy respectively, permitted a systematic search for dwarf galaxies in that region.

As a basis for the present survey served the "ESO/Uppsala Catalogue" (Lauberts 1982), from which we chose as possible "dwarf candidates":

- all spiral galaxies which were classified as Sc and later or as S . . .,
- all elliptical galaxies,
- all irregular galaxies,
- all dwarf galaxies,
- all peculiar objects,

as far as their major axis had a minimum of 1′.