

11. OB STARS ON THE OUTERMOST BORDERS OF M 31

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Van den Bergh (1964) has selected and mapped OB associations in M 31 on the basis of plates taken with the Tautenburg 52 inch Schmidt camera. The selection was done by the blinking method. The task of the present investigation is to find if there exist OB stars (single or in association) on the outermost borders of this stellar system. For this purpose we measured the brightness of all stellar objects in UBV down to the magnitude 20^m0 (B) on Tautenburg plates in a special test field (Figure 1).

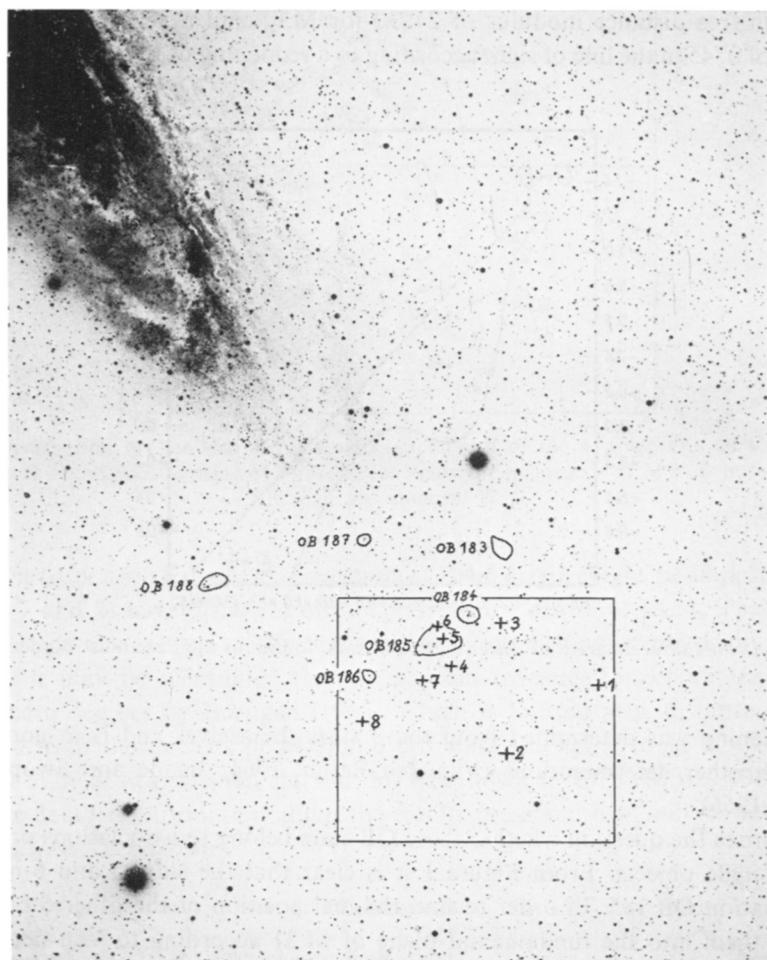


Fig. 1. The test field and the associations OB 183 to OB 188 in the SW-section of M 31. The single OB stars discovered in the field are crosses.

It includes 0.26 square degrees and its centre has a distance of $104' = 22$ kpc from the centre of M 31. This test field includes too Baade's field IV with the photoelectric standards in UBV observed by Arp (Baade and Swope, 1963) and the OB associations OB 184, OB 185 and OB 186 of Van den Bergh. The total number of stars brighter than 20^m0 (B) was 996. The stars within the associations OB 184 and OB 185 are not included in these statistics. From this number, 704 objects could be measured in all 3 colours. We found among them 23 blue objects with $U-B \leq -0^m25$. The mean error of the brightness on the basis of 4 plates in each colour does not exceed $\pm 0^m07$ for stars of 19^m0 (B).

By plotting these 23 blue objects in a two-colour diagram it was found, that at least 8 of them must be OB stars belonging to M 31. Figure 2 shows the position of these stars in a two-colour diagram. In Table I the magnitude (V) and colour indices of these objects are compiled. Their absolute magnitudes were determined assuming an absorption free distance modulus of 24^m30 for M 31 and a general interstellar absorption of 0^m45 in the line of sight according to a reddening of $E(B-V) = 0^m15 \pm 0^m06$.

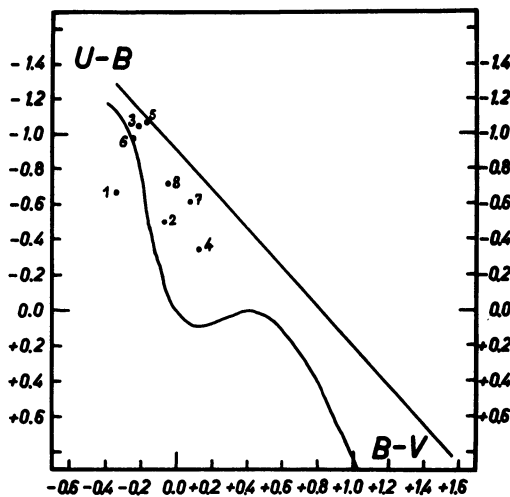


Fig. 2. The two-colour diagram of the 8 single OB stars, found on the outermost borders of M 31.

This reddening was determined from the 8 stars themselves and is in good agreement with other determinations (Van den Bergh, 1964; Baade and Swope, 1963; Börngen, 1966).

There arises the question whether these OB stars belong to associations or whether they are single objects. From Figure 1 it is clear that the stars 5 and 6 belong to the association OB 185. In order to find the real position of the other 6 objects we projected them into the fundamental plane of M 31 according to Van den Bergh's Figure 5 assuming also a tilt angle of $12^{\circ}3$. In our Figure 3 these objects are marked by crosses. There is no indication that these stars are members of any association.

TABLE I
Data for 8 stars attributed to M 31

Star No.	V	U-B	B-V	M _V
1	19 ^m .01	-0 ^m .65	-0 ^m .33	-5 ^m .74
2	18 .34	-0 .50	-0 .07	-6 .41
3	19 .14	-1 .04	-0 .21	-5 .61
4	19 .18	-0 .34	+0 .13	-5 .57
5	19 .31	-1 .07	-0 .17	-5 .44
6	19 .65	-0 .98	-0 .25	-5 .10
7	19 .78	-0 .62	+0 .08	-4 .97
8	19 .51	-0 .71	-0 .04	-5 .24

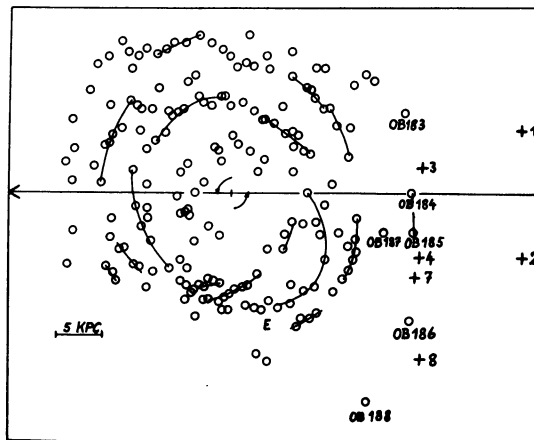


Fig. 3. Distribution of Van den Bergh's associations and of the 6 single OB stars of Table I (crosses) in the fundamental plane of M 31. In the figure the major axis of M 31 is horizontal. The tilt angle was assumed $12^{\circ}.0$.

They seem to be isolated and the question of their origin might be important. Two of them (1 and 2) have distances of 30 kpc from the centre of M 31. These are the largest distances found up to day for starlike objects belonging physically to M 31.

Finally it may be mentioned that in a recent investigation of another field of 0.045 square degrees by Börngen (1966), which is located at a distance of about 45–50 kpc from the nucleus of M 31, no OB stars belonging to M 31 were found. The total number of measured stars in this field down to $20^m.5$ (B) was 301.

A more detailed information about the results presented here will be published in *Astronomische Nachrichten*.

References

- Baade, W. and Swope, H. H.: 1963, *Astron. J.* **68**, 435.
 Börngen, F.: 1966, *Mitt. Karl-Schwarzschild Obs. Tautenburg* Nr. 28.
 Van den Bergh, S.: 1964, *Astrophys. J. Suppl. Ser.* **9**, 65.