BLUE OBJECTS NEAR M 31 AND OPTICAL IDENTIFICATIONS OF 5C3 SOURCES

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1. INTRODUCTION

Blinking several pairs of U and B Tautenburg Schmidt plates (area ≈ 90□°) 1131 UV excess objects (B≲21, U-B≲0.0) were found with projected distances R ≳ 15 kpc from the M 31 centre. The objects were investigated by U,B,V,r,i photometry and partly by Tautenburg objective prism plates and by image tube spectrographs (Tautenburg, Zelenchukskaya) with Drs. AFANAS'EV, KOPYLOV, NOTNI, LORENZ.

2. OPTICAL IDENTIFICATIONS OF RADIO SOURCES

The M 31 field is covered by the 5C3 area. A statistical analysis of 139 radio sources showed an identification rate of about 47% up to B≈21.7. Four starlike and very blue optical identifications proved to be variable (A>0.4 mag): 2 QSO's, 1 possible QSO, 1 BL Lac object. Because of positional errors, the identifications are only of a statistical nature, but the reliability of each optical identification could be estimated using a method described in Astron. Nachr. 296,65. The objects are distributed over the following classes:

- galaxies	17
- blue star-like objects (U-B≲-0.4; QSO's ?)	8
- slightly blue star-like objects (-0.4≲U-B≲0.0; QSO's ?)	5
- uncoloured star-like objects (0.0≲U-B≲0.24; QSO's ?)	3
- red star-like objects (U-B≳0.24)	0
- faint objects (>$20^m.5$), unmeasurable, probably galaxies	31
- H II regions	1

3. STATISTICS OF BLUE OBJECTS

The 1131 UV excess objects are distributed over the following classes (percentages in parentheses): galaxies and probable galaxies (10), OB stars (6), subdwarfs (57), QSO's (16:), white dwarfs (11:). For objects with B≲20.5 and U-B≲-0.4 the following cumulative numbers N_B were obtained after correction for incompleteness:

E. Ye. Khachikian et al. (eds.), Observational Evidence of Activity in Galaxies, 103–105.

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$$\log N_B = (0.74 \pm 0.04)B - (13.5 \pm 0.8), \text{ see Fig. 1}$$

The slope is steeper than in the case of constant space density (0.60, see Astron. Nachr. 295, 27).

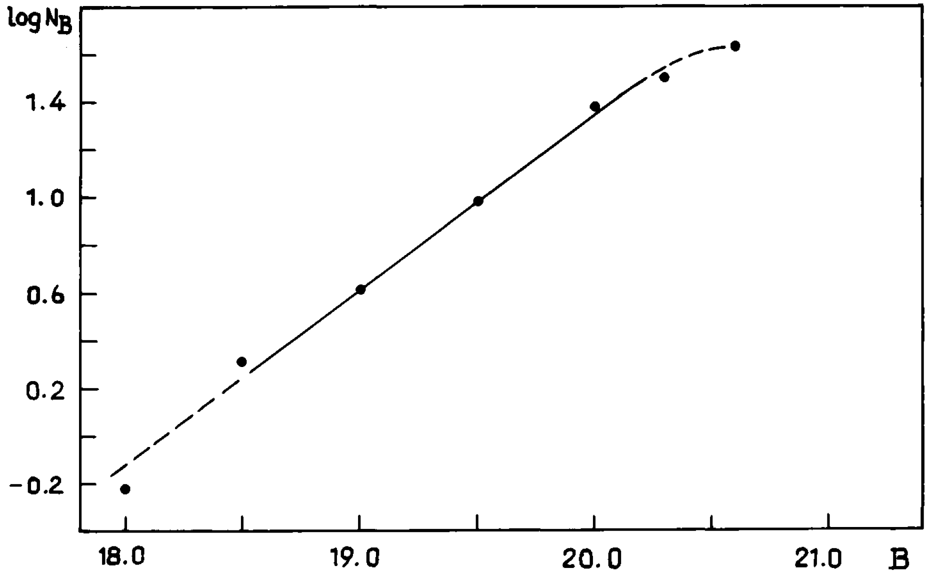

Fig. 1 Cumulative number of blue objects as a function of B magnitude

4. OB STARS IN THE OUTER PARTS OF THE ANDROMEDA GALAXY

Most galaxies have extremely extensive halos which gradually fade into the space. But how is the behaviour of the population I objects? Fig. 2 shows the number of suspected OB stars per $\square^\circ$ as a function of R. The inclination angle of M 31 was assumed $12\overset{\circ}{.}3$, and m - M = 24.2. Obviously there is a break in the curve at R = 30 kpc indicating a sharp boundary of the disk. All objects with R>30 kpc are foreground objects of our Galaxy (blue stragglers and blue horizontal branch stars with an admixture of misidentified subdwarfs and white dwarfs). Fig. 3 shows the distribution of single OB stars (dots) together with the known OB associations (rings), 188 of which are discovered by VAN DEN BERGH, and 7 by myself. As can be seen, the single OB stars fit into the spiral arm pattern. Some uncertain spiral arms are drawn as dotted lines.- Presumably the sharp boundary of the disk is caused by a hydrogen density too small for star formation. It appears from Fig. 3 that there is an asymmetry in the distribution of OB stars in the sense that the disk is much more extended towards the SW (30 kpc) than towards the NE (20 kpc). This asymmetry may be caused by gravitational action of M 32. A very good survey summarizing the comparisons of the distributions of various optical features of population I objects in M 31 (open clusters, H I gas, H II regions, OB associations inclusive of our Sonneberg results) give NAKAI and SOFUE (Publ. Astron. Soc. Japan 34, 199).

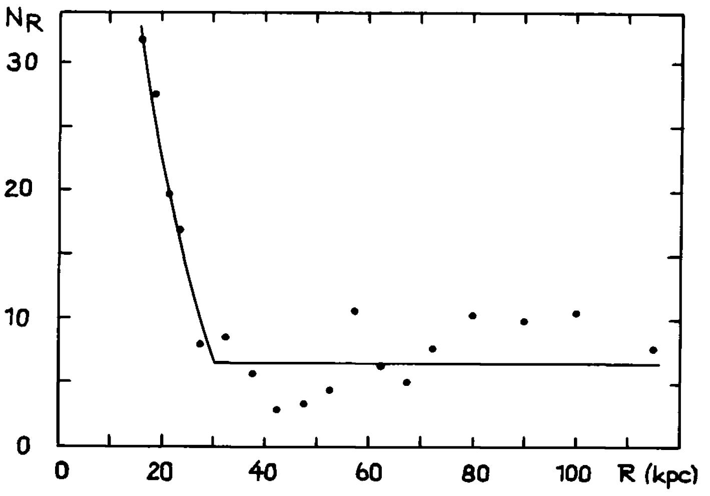

Fig. 2 Number of suspected OB stars per square degree as a function of the projected distance R from the centre of M 31.

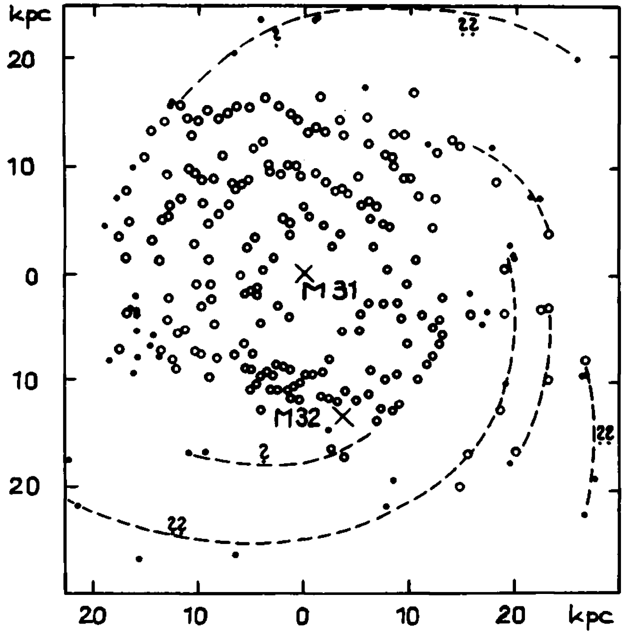

Fig. 3 Distribution of OB associations (rings) and suspected single OB stars (dots) in M 31.

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