

# 15. ON THE STRUCTURE OF GALAXIES ACCORDING TO PHOTOMETRIC STUDIES

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(Abstract)

The colours and brightnesses of various details about  $12''$  or larger in diameter were measured on photographs taken in the two wave-lengths  $4360 \text{ \AA}$  and  $6100 \text{ \AA}$ , of the spiral galaxies: NGC 224, 598, 3031, 3623, 3627, 3628, 4192, 4217, 4254, 4258, 4321, 4565, 4631, 5194, and 5457. The plates were taken with the 500 mm meniscus astrograph at the Kazakhstan High Altitude Observatory near Alma-Ata. Extra-focal stellar images taken with a 'two storied plate holder' were used for standardizing.

These studies show that all nebulae have a bright continuous background which decreases in intensity with the increase of the distance from the nucleus. In Sc galaxies in which the arms are well developed, the arm itself always contributes less than half of the yellow light. In blue light, the arm emission can equal the background, but it exceeds it only in the outermost regions of the nebula. The same is true to an even greater degree in the Sb galaxies.

The colour of the background, which is similar in all regions and nearly that of the nucleus, coincides with the predicted colour for stars in the spherical sub-system (type II). The spiral arms, if the background is excluded, are much bluer (up to  $-0^m.1$ ), corresponding to the colour of stars belonging to flat sub-systems (type I). This colour is caused, to a considerable extent, by the numerous blue condensations located in these arms. The brightest of them are always the bluest ones. Many are similar to O-associations in brightness (up to 20 m/sq sec).

Thus photometric measures indicate some structural features common to all spiral galaxies which have already been found for our Galaxy by other methods:

- (1) The largest part of the light and mass is contributed by the yellow stars of the spherical and intermediate sub-systems.
- (2) Spiral arms are formed by blue stars which belong to the flat sub-system.
- (3) The concentration of the absorbing matter toward the galactic

plane is smaller than for type I stars but larger than for the background stars.

It is usually assumed that the darker, redder side of a galaxy is the more distant one. However, if the largest part of the light in the spiral galaxies is contributed by stars belonging to the spherical and intermediate subsystems located outside the layer of the absorbing matter, the more distant part of the Galaxy will appear brighter, while the darker side, with a well-outlined spiral structure and which absorbs the light of the majority of stars to a considerable extent will be the nearer side. In this case, the spiral arms will be 'trailing'.