

UV GALAXIES AND SUPERASSOCIATIONS

E. Ye. Khachikian
Byurakan Astrophysical Observatory
Yerevan State University
Armenia, USSR

1. INTRODUCTION

I will talk about the UV galaxies discovered on plates of the 1-m Schmidt telescope of the Byurakan Observatory by Markarian and his collaborators and by Kazarian. Up to now the number of UV galaxies is more than 2000.

It is well known that more than 85% of UV galaxies show emission spectra. Among them there have been discovered QSO's, Seyfert galaxies and galaxies with active nuclei with narrow emission lines. It turns out also that some UV galaxies show spectra typical of superassociations (SA). Some of them really turn out to be SA, connected with nearby galaxies, for example, Markarian 94 (Arp & Khachikian 1974), Markarian 5, 59, 71, 256 (Khachikian & Sahakian 1975). Altogether, in the first six lists of Markarian it has been found about 40 of these types of objects. Contrary to QSO's, Seyferts and narrow emission line galaxies, which have starlike nuclei, the central regions of some other UV galaxies entirely consist of several SA: Markarian 7 (Casini, Heidmann and Tarengi 1979), Markarian 8 (Khachikian 1972), Markarian 325 (Coupinot, Hecquet and Heidmann 1982), Kazarian 5 (Kazarian & Khachikian 1977). In many cases UV galaxies themselves contain one or more SA: Markarian 12, 38, 307, 848, 984 (Khachikian, Petrossian & Sahakian 1983a). There are case when one or both components of double nucleus UV galaxies have the characteristics of SA: Markarian 104, 306, 111, 710, 739 (Khachikian, Petrossian & Sahakian 1979, 1980a,b; Khachikian, Korovyakovskiy, Petrossian & Sahakian 1981). It is necessary to note just one more type of SA often called 'isolated giant HII regions': Markarian 116 = I Zw 18 (Searle & Sargent 1972). Apparently, among UV galaxies there are quite a number of isolated SA. Actually, they are a particular type of compact galaxies which mainly consist of hot stars and diffuse matter.

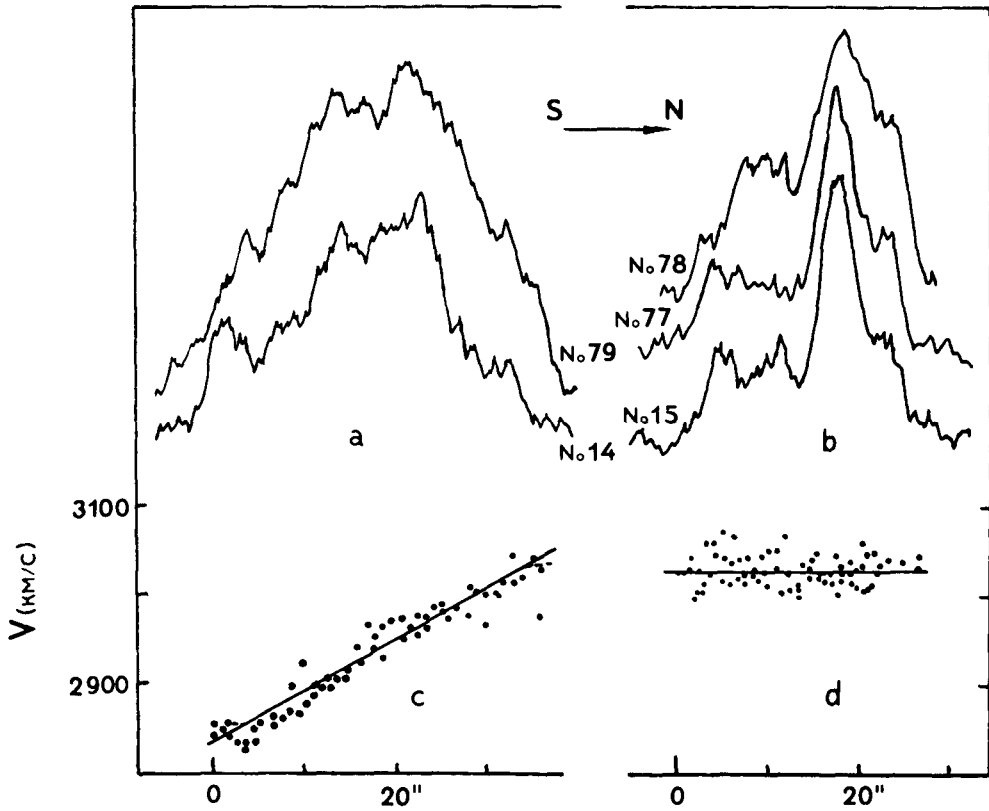


Figure 1. Upper: tracings of H α along the slit (a, western side, b, east-side). Lower: rotation curves for the (c) western and (b) eastern sides.

Summarizing, we can conclude that among UV galaxies there are objects which are anyhow connected with SA, namely:

1. SA as a part of the nearby galaxy;
2. Galaxies whose central parts consist of several SA;
3. Galaxies containing one or more SA;
4. Double nucleus galaxies in which one or both nuclei resemble SA;
5. Isolated SA.

From the point of view of spectroscopy and photometry, there are no principal differences among these different types of SA. They differ nevertheless by sizes, luminosities and sometime by chemical composition (Petrossian 1983).

I will present some results of: 2) spectroscopy of Markarian 7 which falls under group 2, and 3) a statistical investigation of SA belonging to the group 3.

2. MARKARIAN 7

Markarian 7 consists of two almost rectilinear segments in a figure resembling the upside-down letter 'V'. Each segment consists of SA. The size of the western segment is equal to 35" or 7.1 Kpc, the eastern 25" or 5.1 Kpc. Twelve spectra were obtained with the 6-m telescope in the spectral interval from 3700 to 7000 Å. The slit of the spectrograph was directed along the segments.

Both segments show approximately the same spectra: continuum and emission lines [SII] 6731/17, [NII] 6584/48, H α , N₁, N₂, H β , H γ , and [OII] 3727. The intensities of the continuum and the lines are changing along the slit. In Figs 1a and 1b the tracings of H α (along the slit) for the western (two tracings) and the eastern (three tracings) segments are presented. The rotation curves of the two segments are also plotted in Figs 1c and 1d. They are superposed with the structural tracings of H α .

The western segment shows a solid body rotation with a radial velocity difference of 180 km/s between the two ends. The eastern one does not show any appreciable rotation effect relative to us. However it is very important that at the point where the two segments intersect the radial velocities are the same, about 3000 km/s. This fact speaks in favour of a common physical nature of both segments. In other words, Markarian 7 is rather a single galaxy with a complex kinematical structure than a double system.

3. SA IN UV GALAXIES (Fig. 2)

Recently about 150 SA in 57 spiral UV galaxies were found by the author and coworkers (Khachikian, Petrossian & Sahakian 1983a). Some physical parameters of these SA (size, color, absolute magnitude, distance from the nucleus) were estimated.

The statistical investigation of these data leads to the following conclusions (Khachikian, Petrossian & Sahakian 1983b):

1. The average linear dimension of SA is 1 Kpc, the mean absolute magnitude is $M = -15^m$.
2. SA are found in dwarf, giant as well as supergiant UV galaxies (mainly in barred galaxies) on the arms and at the end of the bars
3. The number of SA is higher in barred spirals and they are distributed farther from nucleus than in normal spirals. SA are found frequently in the late type spirals; they have smaller sizes and are situated closer to the nucleus.
4. In the distribution of SA as function of the distance from the nucleus two maxima are noticeable: the first strong one appears at the distance of 0.4 Rgal, the second at 0.8 Rgal.
5. About 10% of UV galaxies containing SA are Seyfert galaxies, about 12% multinucleus galaxies. More than 30% of the galaxies of our sample are radio sources with the threshold intensity of 10 mJy.

The above mentioned data allow us to conclude that SA are closely connected with manifestation of activity in UV galaxies.

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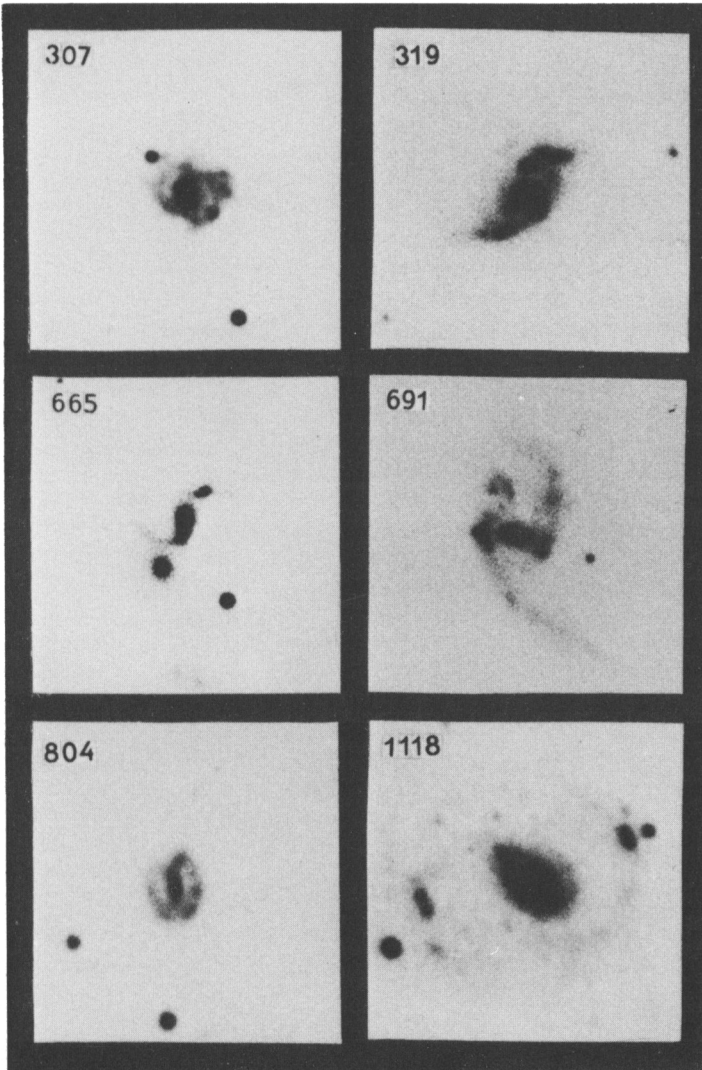


Figure 2. Photographs of UV galaxies containing SA, all obtained with the 6-m telescope except Markarian 1118 (2.6-m Byurakan telescope). Each field is about $1'.5 \times 1'.5$.