THREE DOUBLE EMISSION NEBULAE

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SUMMARY

Low dispersion spectra have been taken of three nebulae which are misclassified as Be stars. Two of these appear to be peculiar galaxies, the third a planetary nebula.

The principal surveys of emission-line stars in the Southern Hemisphere are still those made by Henize in the 1950's and subsequently by Wray using the same plate material. Both surveys were included in Wackerling's (1970) compendium of Be stars. Very little work has been done on these stars, many of which cannot even be unambiguously identified from the coordinates given by Wackerling. This communication is to draw attention to three Henize–Wray objects which are not Be stars but emission nebulae. Spectra of the three were taken on the Radcliffe 74-in. telescope with a Carnegie image tube; a dispersion of 140 Å mm⁻¹ was employed.

HEN 424 = WRAY 579 = NGC 3256 (1950: 10h 25m 43°—43° 39′·2)

NGC 3256 is a peculiar interacting galaxy noted by Sérsic (1959) and Vorontsov-Velyaminov (1959). The nucleus is resolved into several components, and long streamers can be traced for a considerable distance. The de Vaucouleurs (1961) described NGC 3256 as colliding galaxies, and secured a spectrum showing emission lines of Hβ, Hγ, Hδ and λ 3727 [O III], and absorption at H and K. They quoted a radial velocity of 2828 km s⁻¹.

The Radcliffe spectrogram indicates a change over the last 14 yr, for the [O III] lines N₁ and N₂ are present with sufficient intensity to have been recorded on the de Vaucouleurs’s published spectrum. Emission in the Balmer series is also traced as far as Hδ; other prominent emission lines are: [N II] λλ 6548, 6584; weak He i; strong [O III]. A distinct line at 5308 Å is probably [Ca v]. A similar line at 5337 Å cannot be identified; [Fe VI] is unlikely because of the absence of stronger lines. The radial velocity, from the identified lines, is 2800 ± 20 km s⁻¹; there is a range of about 80 km s⁻¹ across the centre of the galaxy. The lines are not resolved.

A measurement at 2·2 μm of the central 25" arc was made with the 40-in. Elizabeth II telescope of the South African Astronomical Observatory and yielded K = 8·9. This is in agreement with the value found by Glass (1973). V–K for the core therefore exceeds 3·0, and this is probably slightly larger than the typical colours of normal galaxies (Penston 1973). Glass’ data also suggest an abnormally red continuum. For H = 50 km s⁻¹ Mpc⁻¹, M_V = −22, placing NGC 3256 among the most luminous galaxies. The radio luminosity is also high without being exceptional for so bright a galaxy (Wright 1974). NGC 3256 is better described as extreme than exceptional.
HEN 959 = NGC 5408 (1950: $14^h00^m2.3$ — $41^\circ08'$)

This isolated, small, irregular nebula resembles an H II region on the Palomar Observatory Sky Survey red print (no blue print is available at this declination). Through the eyepiece this impression is heightened by the presence of a few 14–16 mag stars either involved in or superimposed on the nebula.

The spectrum is also that of a typical H II region. The continuum is weak or absent; the Balmer series can be traced to H$_{18}$, beyond which it is swamped by strong [O II]; [O III] is present with $N_1 > N_2$—H$\beta$ and $\lambda 4363$ weak; [Ne III] is strong, [S II] weak and [N II] absent; He I is also present. The brightest star is of spectral type G or K and is almost certainly a foreground object. The next brightest star seems to share the spectrum of the nebula and has a weak continuum; a comparison of the visual appearance and the Palomar Sky Survey print suggests that this may be a knot of nebulosity rather than a star.

It is the radial velocity of NGC 5408 which is surprising. Using the ten strongest lines yields $497 \pm 10$ km s$^{-1}$: this is remarkably high for any galactic object. The galactic latitude is $+20^\circ$ so we must conclude that if NGC 5408 is associated with our own galaxy it is a runaway H II region. More likely NGC 5408 is extragalactic. To have so low a radial velocity it must be very local, however, and therefore intrinsically faint. We can estimate $M_V$ by assuming that its distance is given by the Hubble relation, though this is obviously a poor assumption for so nearby a galaxy. Using $V \sim 14$ mag gives $M_V \sim -16$, and this becomes $-15$ if the galactic rotation correction is applied. Again using the Hubble distance, the largest dimension of NGC 5408 is approximately 1 kpc. These figures are appropriate to galaxies at the lower end of the luminosity function.

Since NGC 5408 is an isolated system it is tempting to assume that it belongs to the Local Group. For an appropriate distance $M_V$ becomes $-11$ and the dimensions are reduced to about 100 pc; if this assumption is correct NGC 5408 is no more than an intergalactic H II region of the sort described by Sargent & Searle (1970).

WRAY 1876 (1950: $18^h31^m47^s$ — $27^\circ08'8$)

I drew attention to Wray 1876 last year (Allen 1973), suspecting it to be a planetary nebula. Through the Radcliffe 74-in. telescope this nebula was barely visible and there was no sign of a central star brighter than about magnitude 18. The spectrograms are weak, but show the $N_1$ and $N_2$ lines of [O III] to be much stronger than H$\beta$. [O II], if present, is not strong. The radial velocity is small. This information, taken with the sharp elliptical profile on the Palomar Sky Survey prints, suggests that its classification as a planetary nebula is correct.

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