from the linear fit. The curved line indicates the deviation of Serkowski's proposed curved reddening line from this linear fit. The $U - B$ rms deviations of the observational points from the mean line are 0.008 mag. if the linear law is used and 0.012 mag. for the curved law.

The observational data shown in Figures 1 and 2 do not confirm the curved reddening lines predicted by theoretical calculations and used by Serkowski. The discrepancy between the calculated and observed values for Y may have explanations other than that of insufficient observational data. There has been concern over the published *UBV* filter responses (Johnson 1962; Matthews and Sandage 1963) and, perhaps more important, concern that those applying a theoretical approach have ignored the observational procedures which depend on standard stars for the calibration of a relative system. Since the observational data does not indicate that pronounced curvature is present, it would appear that the use of curved *UBV* reddening lines for the earliest-type stars is unnecessary.

The value of $(U - B)_0$ obtained with a linear reddening line is approximately 0.05 mag. bluer than that adopted by Serkowski. Therefore the intrinsic colors of early-type stars and the variations of X with galactic longitude or spectral type are subject to rather large systematic errors until the question of the curvature of the reddening line is settled.

E. JOSEPH WAMPLER

May 23, 1964
MILLER INSTITUTE FOR BASIC RESEARCH
LICK OBSERVATORY
UNIVERSITY OF CALIFORNIA
MOUNT HAMILTON, CALIFORNIA

REFERENCES

Blanco, V. M. 1956, *Ap. J.*, **123**, 64.
Hiltner, W. A. 1956, *Ap. J. Suppl.*, **2**, 389.
Hiltner, W. A., and Johnson, H. L. 1956, *Ap. J.*, **124**, 367.
Johnson, H. L 1962, *Ap. J.*, **135**, 975.
Matthews, T A., and Sandage, A. R. 1963, *Ap. J.*, **138**, 30.
Rozis-Saulgeot, A. M. 1956, *Ann. d'ap.*, **19**, 274.
Schmitt, K. H. 1957, *Mitt. Univ.-Sternw. Jena*, No. 27.
Serkowski, K. 1963, *Ap. J.*, **138**, 1035.
Wampler, E. J. 1961, *Ap. J.*, **134**, 861.
———. 1962, *ibid.*, **136**, 100.

THE STRANGE EXTRAGALACTIC SYSTEMS MAYALL'S OBJECT AND IC 883

In a number of investigations in recent years (Burbidge and Burbidge 1959*a*, *b*, 1961, 1964; Burbidge, Burbidge, and Hoyle 1963), G. R. Burbidge, F. Hoyle, and I have given an account of the physical properties of some of the strange extragalactic objects first brought to our attention by Vorontsov-Velyaminov (1959). In this note I briefly describe recent observations of two further remarkable systems, Mayall's Object and IC 883.

MAYALL'S OBJECT

The galaxy known as Mayall's Object (Smith 1941) is unique, with no known counterpart even among the highly asymmetrical systems in Vorontsov-Velyaminov's *Atlas* *and Catalogue* (1959), in which it is No. 32. Figure 1 shows a print from a plate taken in May, 1961, at the prime focus of the Lick 120-inch telescope. Previously a plate was published by Baade and Minkowski (1954) with a brief mention that at one time they had thought it a possible identification with a radio source in one of the early lists from Cambridge.

The Lick plate shows more detail than the one published by Baade and Minkowski. In particular, we note that (1) there is a connection between the end of the bright cigar-shaped main body and one side of the ring; (2) there is considerable structure in the ring, particularly on the brighter side; (3) the intensity dip in the middle of the cigar-shaped part may be due to a separation of it into two parts, or it may be due to obscuration passing in front of it; the inset in Figure 1 is a dark print from the same plate in which this detail is seen a little more clearly.

The redshift of Mayall's Object is given by Humason, Mayall, and Sandage (1956) as +10346 km/sec or +10355 km/sec corrected for rotation of our Galaxy. The spectrum is described as "peculiar, emission," and a note states that it was observed by Minkowski as a possible radio source.

TABLE 1

VELOCITIES IN MAYALL'S OBJECT, CORRECTED FOR ROTATION OF OUR GALAXY

Distance along Slit (sec of arc)	Velocity (km/sec)	Distance along Slit (sec of arc)	Velocity (km/sec)
L409 P A 6°, across Ring		L772, P A 87 5°, along Main Body	
SW. 0 (strong).	+10679	W. −2 4 .	+10485
NE. 14 5 (faint)	10545	0 .	10387
		+2 1.	10343
		E. +3 6 .	10281

In order to investigate the relation between the main body and the attached ring, two spectra were obtained with the prime-focus spectrograph on the Lick 120-inch telescope. Both were of the red spectral region with a slit 2′ long. In the first, the slit was aligned in position angle 6°, through the center of the bright side of the ring and through the brightest part of the faint side of the ring. The slit did not pass through the main body at all. The thick Schmidt camera and grating II were used, giving a dispersion of 375 Å/mm and a scale of 84″/mm perpendicular to the dispersion. The exposure time was 3^h38^m.

In the second spectrum, the slit was aligned along the main body, in position angle 87.5°; the thick Schmidt camera and grating III were used, giving a dispersion of 193 Å/mm and the same scale perpendicular to the dispersion as in the first spectrum. The exposure time of this spectrum was 60^m (ended by cloud).

In the first spectrum, a strong Hα line appeared in the more luminous side of the ring, but no [N II] λ 6583 line was seen. Since [N II] quite generally accompanies Hα in the spectra of extragalactic objects, this is rather surprising. An extremely faint continuum could just be seen from this part of the ring. From the other side of the ring, only a weak Hα line appeared.

The second spectrum was rather underexposed. Only the bright end of the main

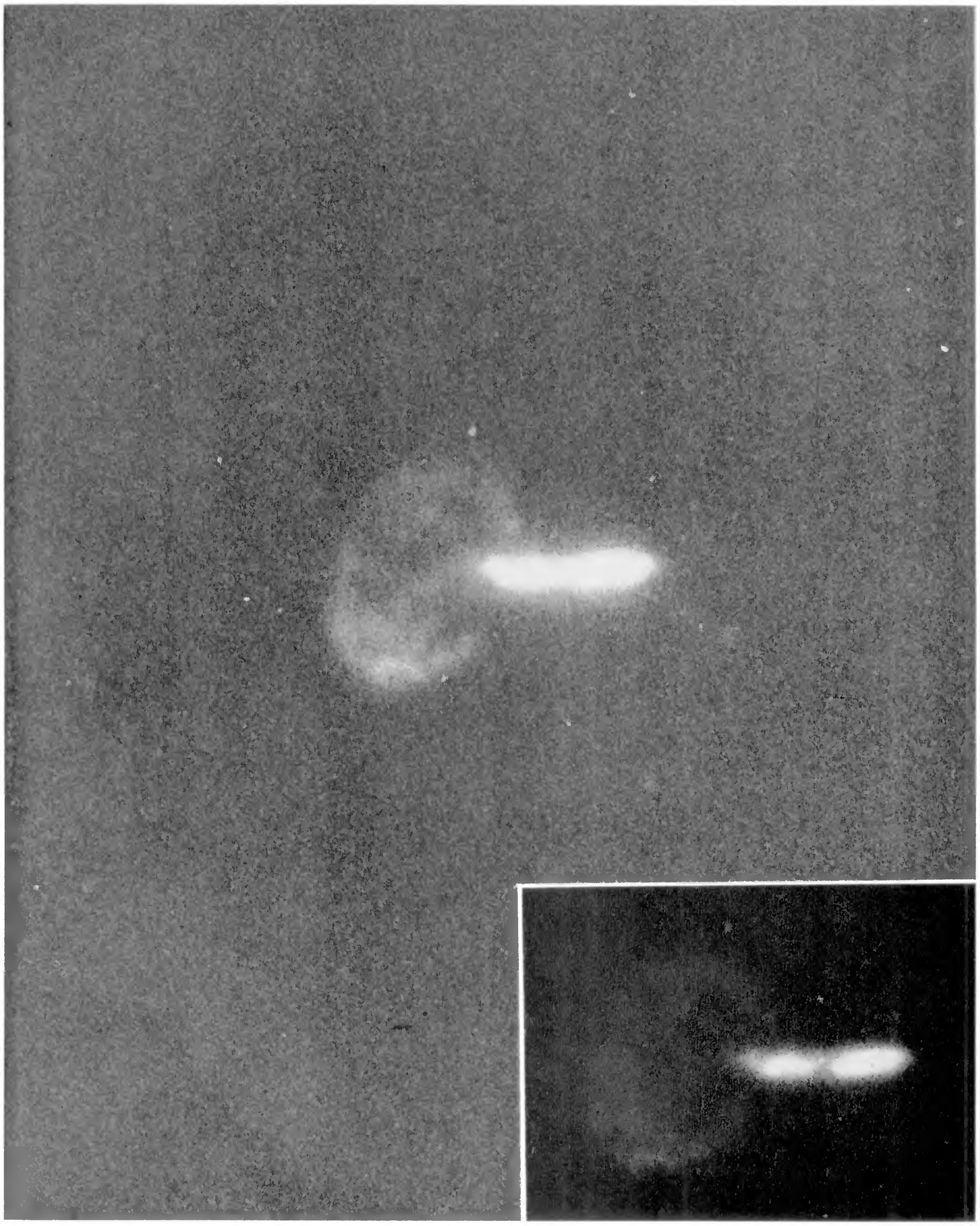

FIG. 1.—Mayall's Object, photographed at prime focus of Lick 120-inch telescope. Baked Eastman Kodak IIa-O plate, GG 13 filter. North is at top, west at left. Scale: 1 mm = 0.73″. Inset is darker print from same plate, showing detail in main body.

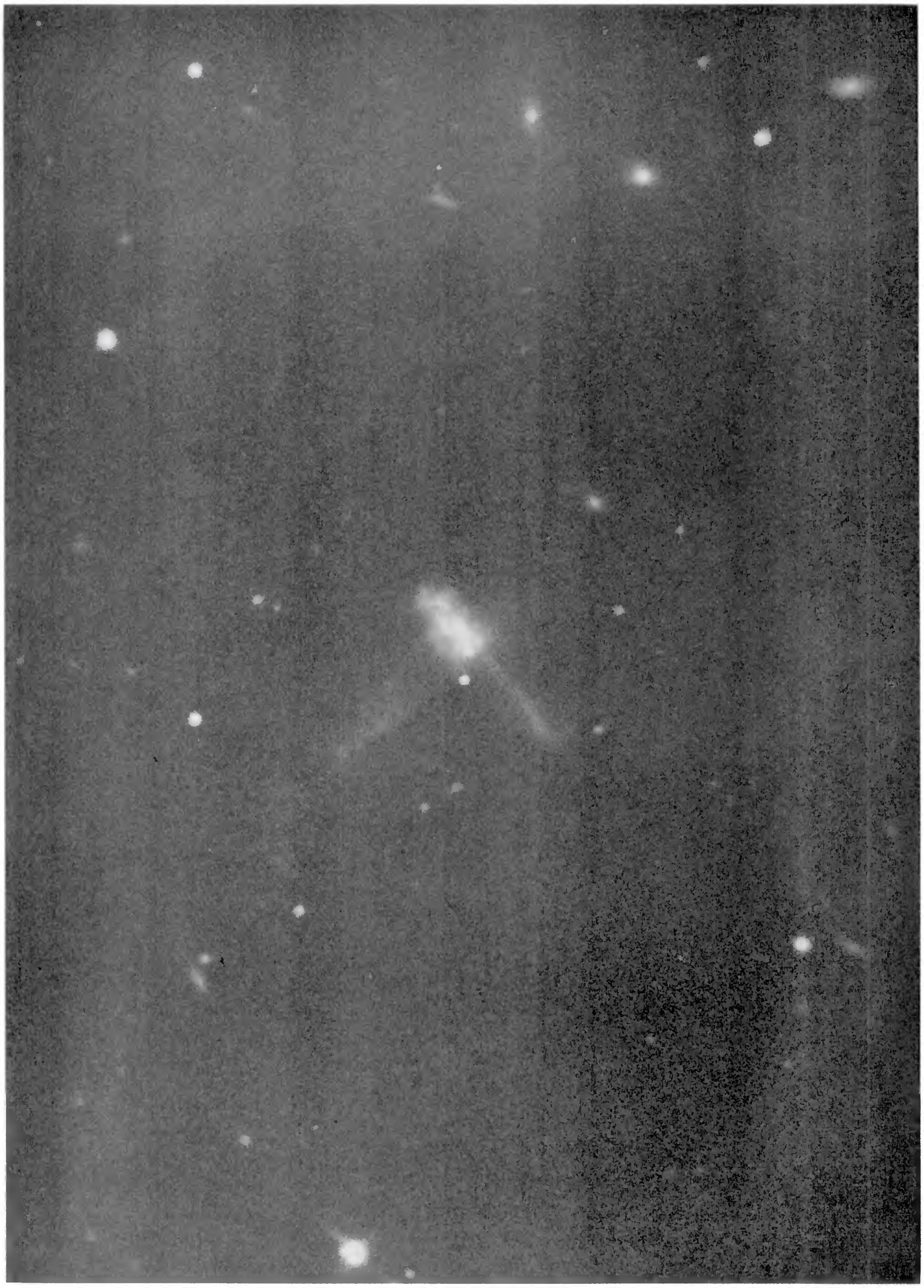

FIG. 2.—IC 883, photographed at prime focus of McDonald 82-inch telescope. Baked Eastman Kodak IIa-O plate, no filter. North is at top, west at left. Scale: 1 mm = 2.6″.

body registered, i.e., the end east of the intensity dip in the middle. Both Hα and [N II] λ 6583 could be seen, but only Hα was measured as it was stronger.

The velocities, corrected to the local standard of rest (Vyssotsky and Janssen 1951) and for a rotation of 250 km/sec in our own Galaxy, are listed in Table 1. In the lower-dispersion spectrum, L409, the night sky line [O I] λ 6300.23 was measured at eight points along the 2′ slit as a check on the systematic accuracy. There was no trend in the measured wavelength along the slit (a check on the applied curvature correction); the mean measured wavelength was 6300.51 $\pm$0.33 Å (average deviation), giving an error of only +0.28 Å.

The higher-dispersion spectrum, along the main body, was presumably aligned in the same way as was Minkowski's spectrum. The mean of the four measures here is +10374 km/sec, in very good agreement with the value listed by Humason *et al.* of 10355 km/sec. If we take the Hubble constant to be 75 km/sec per Mpc, this redshift gives a distance of 138 Mpc; at this distance 1″ = 670 pc.

The run of the measures in Table 1 shows that there are fairly large velocity differences in this object. At the east end of the main body, the velocity is lowest. Over 6″, i.e., over 4020 pc, the velocity increases by 200 km/sec. In the ring, the faint end which is closest to the main body has a velocity 60 km/sec greater than the closest measure in the main body, while the other brighter side of the ring has a velocity some 130 km/sec greater than the faint side. The total range of velocities is 400 km/sec, and the difference between the mean velocity in the main body and the mean in the ring is 240 km/sec.

This is the magnitude of the velocity difference which is found in physically connected pairs of galaxies, yet Mayall's Object obviously is not an ordinary double galaxy. The ring has no nucleus, no spiral structure, and hardly a trace of continuous spectrum. The lack of [N II] emission in it while Hα is strong, although not conclusive, suggests that the ring may have a lower than normal N/H abundance. The bright cigar-shaped component could be an ordinary S0 galaxy seen edge-on, but its spectrum suggests that it is not.

I would like to propose tentatively that this object is an example of an interaction between a galaxy and the intergalactic medium. The connection between one end of the main body and the ring could, on this hypothesis, be interpreted as a channel along which gaseous matter is either being ejected from the galaxy, or is entering the galaxy after capture. The sequence of velocities from the side of the ring that is farthest from the main body, through the near side of the ring, and along the main body might imply that there is a continuous flow of gas along this path. However, the symmetrical form of the ring suggests that it may be rotating and the velocity difference which is found from one side to the other could be interpreted as being due to such rotation. Finally, the suggestion of a lower than normal N/H abundance might indicate that capture from, rather than injection into, the intergalactic medium is occurring.

IC 883

The curious galaxy IC 883 was brought to my attention by F. Hoyle. Figure 2 shows a plate taken at the prime focus of the McDonald 82-inch telescope. The main body is irregular, and two jets emerge at right angles from one end.

A spectrum was recently obtained with the prime-focus spectrograph of the Lick 120-inch telescope (red spectral region, thick Schmidt camera and grating III, giving a dispersion of 193 Å/mm and scale perpendicular to the dispersion of 84″ mm). The slit (2′ long) was in position angle 140.5°, through the main body and along the brighter of the two jets. Emission lines of Hα and [N II] λ 6583 appeared in the main body, but no spectrum was registered along the jet. The velocities, corrected to the local standard of rest and for a rotation of 250 km/sec in our own Galaxy, are listed in Table 2; they show a small gradient along the object.