LETTERS TO THE EDITOR

PHYSICAL SCIENCES

On the Optical Identification of 3C 230

In 1966 we listed[1] the positions of radio sources determined by the interferometer at the Royal Radar Establishment[2] operating at a frequency of 610 MHz. Since then the interferometer has been converted to operate at 2,695 MHz, to give both increased sensitivity and greater accuracy. During 1968 and January 1969, observations were made on about sixty selected radio sources to investigate phase stability, to determine the interferometer constants and to obtain accurate source positions. Each source was observed on at least four different days and a mean phase taken: this ensured that atmospheric phase variations had at most a small effect on the measurement precision of the interferometer.

Of the sixty sources observed, twenty-five were credited with good optical positions and diameters less than 2 arc s; in most cases the standard error of the optical positions was 1 arc s. It was found that an interferometer calibration curve of the correct form could be chosen such that the root mean square deviation of the twenty-five optical positions from the curve was close to 1 arc s, indicating that radio positions were being obtained with a standard error approximately the same as the optical.

The interferometer could then be used to obtain radio positions of other sources and thus make new optical identifications or check previously claimed identifications. One such source of particular interest is 3*C* 230, because in this case the radio position disagrees with that of a previously suggested optical identification and supports an alternative optical candidate.

The radio position obtained for 3*C* 230 (a weighted mean of the 1968 and 1969 determinations) is right ascension (1950·0), 09 h 49 m 24·99 s; declination (1950·0), 00°12′40·3″.

This position is shown in Fig. 1 together with other radio positions[3–7] and the optical positions of three objects given by Veron[8] and Wyndham[9]. Wyndham[9] gives the magnitude 17·5 stellar object (presumed to be a quasar) as the probable identification, and this identification is quoted by Burbidge and Burbidge[10], although no spectrum of the object is available. The optical object is 15 arc s from the present radio position, and the radio diameter has been shown[11] to be less than 2·5 arc s in position angle 65°. It is thus most unlikely that 3*C* 230 could be associated with Wyndham's object.

The position given by Veron[8] for his object "d" is right ascension (1950·0), 09 h 49 m 24·89 s; declination (1950·0), 00° 12′ 39·8″, which differs by 1·6 arc s from the radio position. This difference approximately equals one standard deviation of the combined radio and optical errors. Spectra of "d" have been taken by Schmidt, who informs us in a private communication that it is a zero-redshift galactic star of intermediate to late spectral type. We have here a close coincidence between a radio source and an apparently normal star.

Other possible coincidences between radio sources and stars have been discussed by Wlerick and Veron[12], who believe that they are significant, and by Mackay[13], who believes that they are due to chance. Statistical calculations similar to those of Mackay tend to show that such coincidence between the radio source and a 13·8 magnitude star at galactic latitude 39° is improbable, but these calculations rest on an uncertain basis. Unless other similar identifications of radio sources with optical stars are obtained we must assume that the agreement is none the less due to chance. The new radio position, however, makes it clear that 3*C* 230 should be removed from the list of identified quasars.

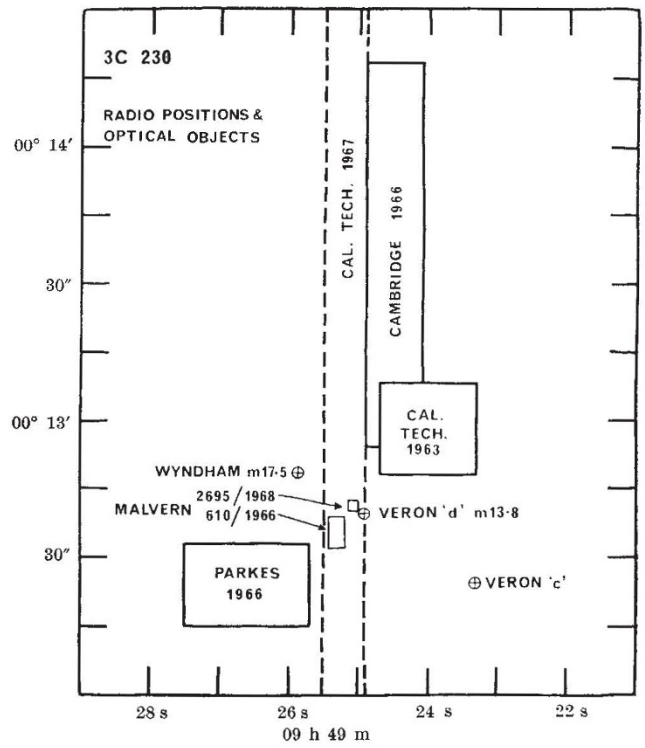

Fig. 1. Radio positions of 3*C* 230 and optical objects in its field.

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[1] Adgie, R. L., and Gent, H., *Nature*, **209**, 549 (1966).
[2] Hey, J. S., *Nature*, **190**, 1150 (1961).
[3] Read, R. B., *Astrophys. J.*, **138**, 1 (1963).
[4] Fomalont, E. B., Matthews, T. A., Morris, D., and Wyndham, J. D., *Astron. J.*, **69**, 772 (1964).
[5] Shimmins, A. J., Clarke, M. E., and Ekers, R. D., *Austral. J. Phys.*, **19**, 649 (1966).
[6] Wills, D., and Parker, E. A., *Mon. Not. Roy. Astron. Soc.*, **131**, 503 (1966).
[7] Fomalont, E. B., *Astrophys. J. Supp. Ser.*, XV, No. 138 (1967).
[8] Veron, P., *Astrophys. J.*, **144**, 861 (1966).
[9] Wyndham, J. D., *Astrophys. J.*, **144**, 459 (1966).
[10] Burbidge, G. R., and Burbidge, E. M., in *Quasi-stellar Objects* (W. H. Freeman, San Francisco and London, 1967).
[11] Clark, B. G., and Hogg, D. E., *Astrophys. J.*, **145**, 21 (1966).
[12] Wlerick, G., and Veron, P., *Ann. Astrophys.*, **30**, 341 (1967).
[13] Mackay, C. D., *Nature*, **216**, 1091 (1967).

Stars that do not twinkle outside the Earth's Atmosphere

It was observed on Apollo 7 and 8 (ref. 1) that stars observed by the human eye outside the Earth's atmosphere show no obvious time variations of their visible light intensity for time lapses from tenths of seconds up