

FURTHER IDENTIFICATIONS OF RADIO SOURCES BETWEEN DECLINATIONS 0° AND 20° *

By J. G. BOLTON† and JENNIFER EKKERS†

Clarke, Bolton, and Shimmins (1966) have recently suggested identifications for 138 of the radio sources listed in the Parkes catalogue for declinations 0° to $+20^\circ$ (Day, Shimmins, Ekers, and Cole 1966). The identifications were made from inspection of the Palomar Sky Survey plates in areas $2'$ arc square centred on the catalogue positions. In general, identifications were suggested only for galaxies or possible quasi-stellar objects brighter than $17^m.5$, in order to avoid the possibility of chance coincidences. Where objects fainter than $17^m.5$ were suggested, position data of higher accuracy were available, due principally to unpublished measurements by Shimmins, Clarke, and Ekers with the 210 ft telescope.

Precise positions due to Shimmins, Clarke, and Ekers are now available for a further 71 sources in this zone for which no identifications could be suggested on the basis of the catalogue positions. These positions have average uncertainties of only $0'.2$ arc, and they permit identifications to be suggested with galaxies as faint as $m_{pg} = 19.5$. The prints of the Palomar Sky Survey have been re-examined in the 71 positions, and 24 additional identifications are proposed. Thirteen of the objects are galaxies and 11 quasi-stellar objects, although one of the latter may be a galaxy with an abnormally blue nucleus. Two of the identifications have been proposed previously by other writers; references to the original publications are given in the notes to Table 1.

The identifications are listed in Table 1. The first column contains the Parkes catalogue number; the 3C or MSH catalogue numbers, where they exist, are given in the final column. The positions given are optical positions estimated from the Sky Survey prints with the aid of a transparent overlay containing the source position and the positions of reference stars from the Yale catalogue. These positions are given to $0''.5$ in right ascension and $0'.1$ arc in declination; however, the uncertainty of measurement may be twice as great.

Flux densities at 1410 Mc/s and spectral indices for the frequency range 410–2650 Mc/s are taken from the Parkes catalogue. Sources whose spectra cannot be represented by a power law are noted as “curved spectrum” in the Remarks column. Galaxies are classified as E (elliptical), D (elliptical with extended diffuse envelope), db. (dumbbell or double system), or g (the image is too faint or affected by poor seeing to permit classification). QSO denotes a quasi-stellar object where identification has been confirmed by photometric observation of an ultraviolet excess, and QSO? denotes a possible quasi-stellar object. Magnitudes (photographic for galaxies and

* Manuscript received February 24, 1966.

† Division of Radiophysics, CSIRO, University Grounds, Chippendale, N.S.W.

TABLE I
LIST OF IDENTIFICATIONS

Parkes Catalogue Number	Position (1950)		Flux Density at 1410 Mc/s (flux units)*	Spectral Index	Type	Magni- tude	Galactic Coordinates		Remarks	Other Catalogue Number
	R. A. h m s	Dec. ° ' "					l°	b°		
0002+12	00 02 17.5	12 32.1	2.4	-1.0	g	19.5	106	-48	See note (1)	01+05
0124+09	01 24 46.5	08 58.8	1.8	-0.8	g	19	138	-53		3C 64
0219+08	02 19 19.0	08 13.3	2.4	-0.8	g	19.5	158	-48		3C 90
0333+12	03 33 41.2	12 53.0	2.3	-0.7	QSO?	18	173	-33	Curved spectrum	3C 124
0439+01	04 39 23.5	01 14.9	1.0	-1.0	E	19.5	196	-28		04+012
0454+06	04 54 20.5	06 40.0	0.8		QSO?	17.5	193	-22		
0530+04	05 30 25.5	04 03.8	2.1	-0.8	D	19	200	-15	See note (2)	3C 181
0725+14	07 25 20.0	14 43.9	2.1	-0.9	QSO	19	204	15		
0736+01	07 36 42.0	01 44.1	2.9		QSO?	18	217	11		
0909+16	09 09 15.0	16 30.8	1.1	-0.9	E	18.5	213	38	Curved spectrum	3C 230
0949+00	09 49 25.5	00 12.8	3.2	-1.0	QSO?	18.5	238	39		3C 237
1005+07	10 05 21.5	07 44.6	6.2		g	19.5	232	47		
1354+19	13 54 41.5	19 33.6	2.3	-0.7	QSO?	16.5	9	73	Heavily obscured, probably brighter	3C 313
1508+08	15 08 32.5	08 03.0	3.8	-1.0	E	19.5	9	52		15+013
1523+03	15 23 17.2	03 19.1	2.2	-0.8	E	19.5	7	46		
1543+02	15 43 03.7	01 59.2	0.9	-0.9	E	18.5	9	41	Curved spectrum	3C 435
1708+00	17 08 02.0	00 40.2	1.2	-0.4	db.	20	21	23		21+014
2126+07	21 26 37.5	07 19.7	2.4	-0.9	QSO?	20	61	-30		
2145+06	21 45 36.0	06 43.7	3.0		QSO?	17.5	64	-34	See note (3)	3C 456
2159+04	21 59 29.0	04 20.8	1.9	-0.7	E	19.5	64	-38		
2251+11	22 51 40.5	11 20.6	1.6	-0.8	QSO?	17	83	-42		
2309+09	23 09 56.5	09 03.2	2.6	-0.9	E	19.5	86	-46	See note (4)	
2344+09	23 44 04.0	09 14.0	2.1	-0.5	QSO?	17.5	98	-50		
2354+14	23 54 44.0	14 29.6	1.4	-1.1	QSO?	18.5	104	-46		

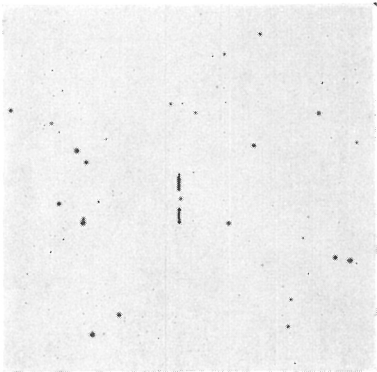
* 1 flux unit = 10^{-26} W m $^{-2}$ (c/s) $^{-1}$.

Notes. (1) The combined errors in the radio and optical positions do not exclude the galaxy 0° 4' south preceding.

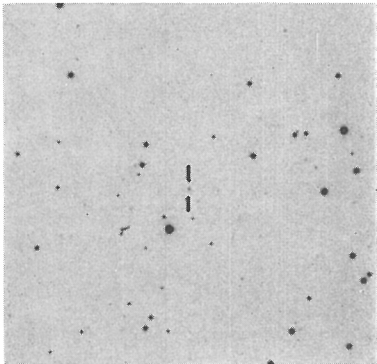
(2) Identification suggested and ultraviolet excess confirmed by Sandage (1965).

(3) Identification suggested by Matthews (unpublished); quoted by Schmidt (1965), who gives $z = 0.23$.

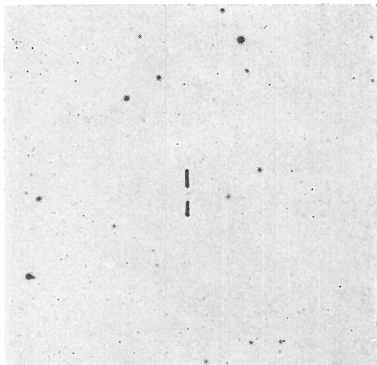
(4) Extremely blue; red print has slightly nebulous image, so may be N type galaxy.



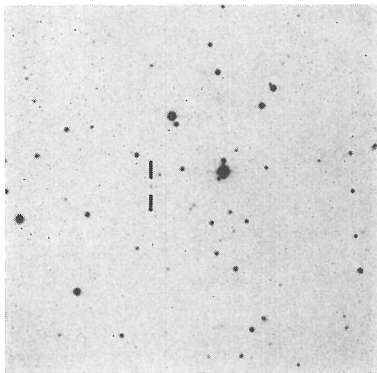
0333+12



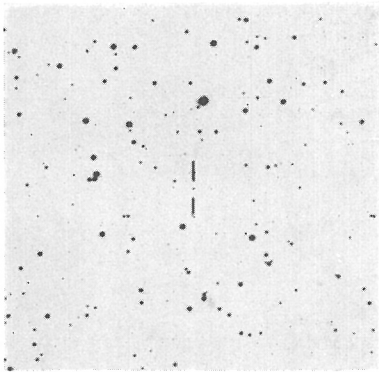
0219+08



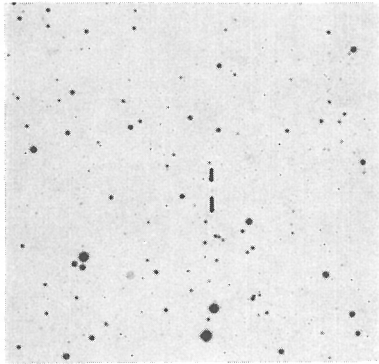
0124+09



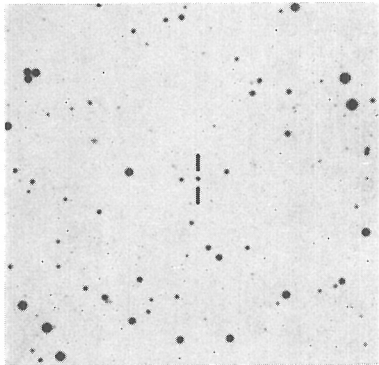
0002+12



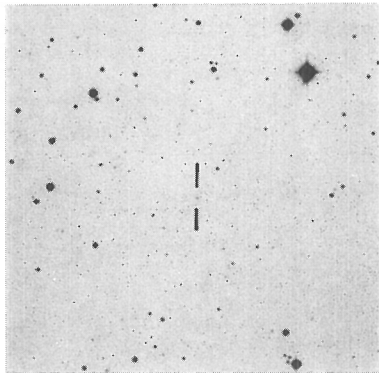
0725+14



0530+04

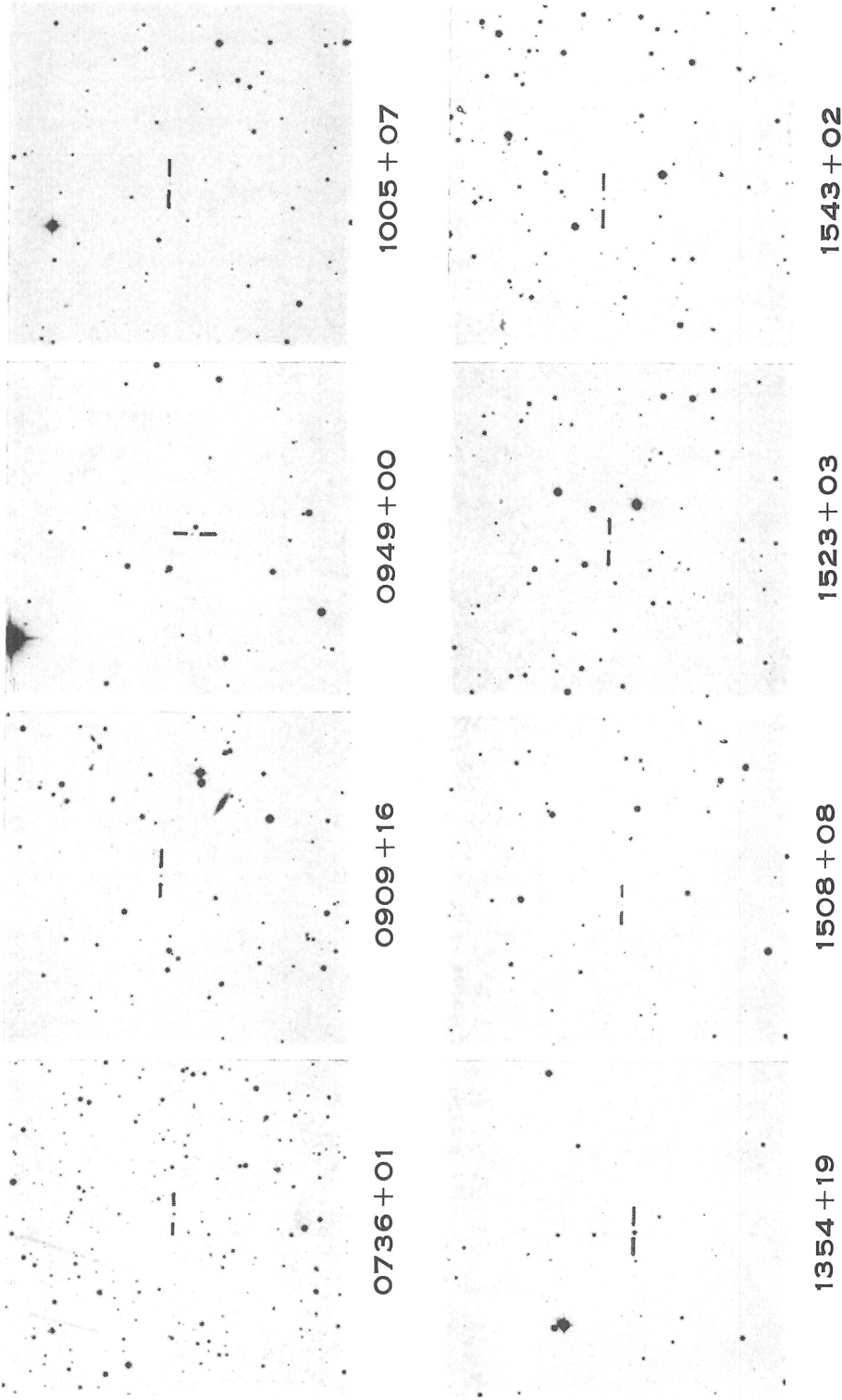


0454+06

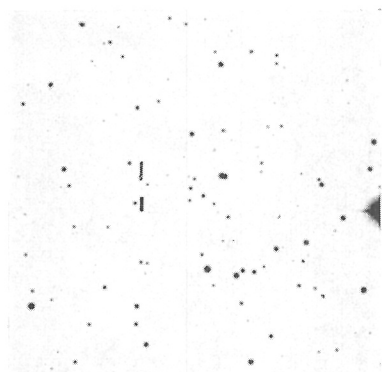


0439+01

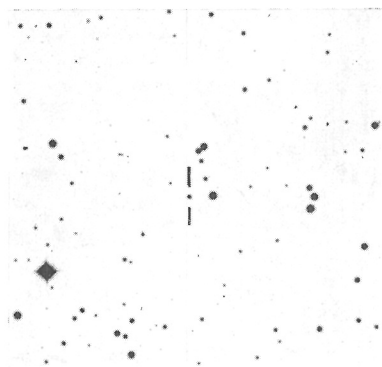
Finding charts for identifications marked between the bars. Scale is 5 mm = 1' arc. North-east is at the top left-hand corner.



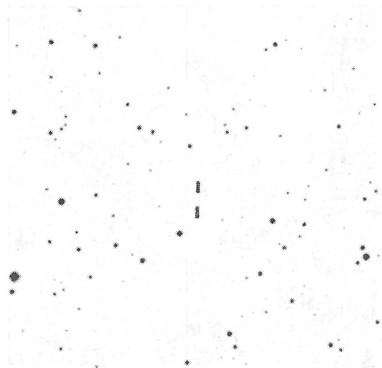
Finding charts for identifications marked between the bars. Scale is 5 mm = 1' arc. North-east is at the top left-hand corner.



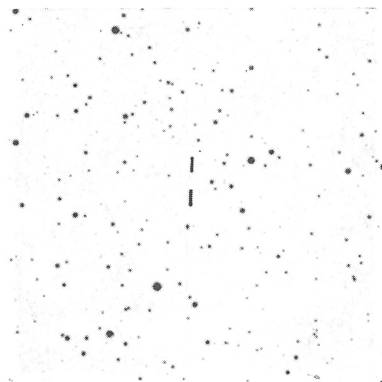
2159 + 04



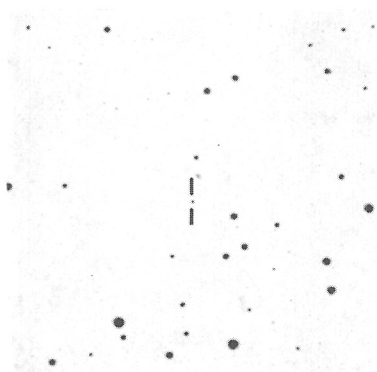
2145 + 06



2126 + 07



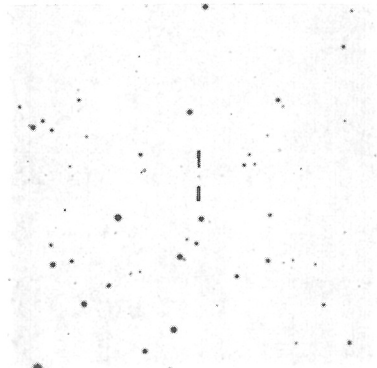
1708 + 00



2354 + 14



2344 + 09



2309 + 09



2251 + 11

Finding charts for identifications marked between the bars. Scale is 5 mm = 1' arc. North-east is at the top left-hand corner.

visual for quasi-stellar objects) have been estimated from a comparison of the images on the Sky Survey prints with those of other identified sources for which magnitudes are known. These estimates may be in error by as much as 1^m .

Finding charts for all the sources, prepared from the Sky Survey prints, are provided in Plates 1-3. The red print was used for galaxies and the blue for quasi-stellar objects, and the contrast has been increased over that of the original prints.

References

- CLARKE, MARGARET E., BOLTON, J. G., and SHIMMINS, A. J. (1966).—*Aust. J. Phys.* **19**: 375.
DAY, G. A., SHIMMINS, A. J., ECKERS, R. D., and COLE, D. S. (1966).—*Aust. J. Phys.* **19**: 35.
SANDAGE, A. R. (1965).—*Astrophys. J.* **141**: 1565.
SCHMIDT, M. (1965).—*Astrophys. J.* **141**: 1.

