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Miscellaneous spectroscopic observations of quasars and quasar candidates*

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Abstract. — We report about new spectroscopic observations of 11 quasar candidates, 19 quasars with uncertain redshift and three BL Lac candidates, and 11 objects located within few arcseconds from a quasar.

Key words: BL Lacertae objects — Quasars : individual — Quasars : redshifts of.

1. Introduction.

In the course of a search for gravitational lensing (Surdej *et al.*, 1988 ; Djorgovski and Meylan, 1989), we have found, in addition to three new cases of gravitationally lensed quasars : UM673 (Surdej *et al.*, 1987), H 1413+117 (Magain *et al.*, 1988) and UM 425 (Meyland and Djorgovski, 1989) and two pairs of quasars at similar redshifts : PKS 1145-071 (Djorgovski *et al.*, 1987) and PHL 1222 (Meylan *et al.*, 1990), interesting starlike objects located within a few arcsecond from eleven bright quasars. Spectra obtained for these companions indicate that nine of them are stars and that two cases consist of low redshift galaxies. We report here about observations of theses objects.

Moreover when, during an observing run at a large telescope, the atmospheric conditions are not optimal and that weak objects cannot be observed, one usually observes brighter objects. We have thus made spectroscopic observations of 33 quasar candidates, quasars with uncertain redshift or BL Lac candidates. We have confirmed 8 redshifts, obtained 15 new or revised redshifts and found 10 stars.

The list of all the observed objects is given in table 1 together with the name of the observer, the telescope used and the date of observation.

* Party based on observations made at the European Southern Observatory, La Silla, Chile.

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2. Remarks on individual objects.

KPNO 1: Gaston (1983) has found this object on a KPNO 4 m telescope grens plate and suggested $z = 2.63$ based on a single emission line at λ 4393 identified as Lyα. Our spectrum, shown in Figure 1a, has three emission lines at 4639, 5337 and 5891 Å, identified with Lyα, O IV] λ 1402 and C IV λ 1550 respectively, giving $z = 2.803$.

CFHT 2: Gaston (1983) has discovered this object on a CFHT grens plate and suggested $z = 2.62$ based on two emission lines observed at λ 3741 and λ 4413 identified with O VI λ 1034 and Lyα respectively. Our spectrum (Fig. 1a) shows three narrow emission lines at 6586, 6716 and 6776 Å which, identified with Hβ and [O III] $\lambda\lambda$4959, 5007 lead to a redshift $z = 0.354$. This object is therefore an emission line galaxy rather than a quasar. It is likely that the emission line seen by Gaston at 3741 Å is due to Mg II.

Q 0010+023: Zhan and Chen (1987) have found this 15.5 mag. object on a UK Schmidt objective prism plate and suggested a redshift $z = 2.27$. However, it looks definitely diffuse on direct R CCD frames obtained with the ESO/MPI 2.2 m telescope. A spectrum taken with EFOSC at the ESO 3.6 m telescope (Fig. 1a) shows that it is an emission-line galaxy with a redshift $z = 0.06885$ with narrow emission lines due to Hβ, Hγ, [OIII] $\lambda\lambda$4959, 5007, [O II] $\lambda\lambda$3726, 3729, and [Ne III]λ3869.

UM 232: This 18.9 mag. object has been discovered using slitless spectroscopy by MacAlpine *et al.* (1977b) ; it has been discovered independently by Berger and Fringant (1980) as an UV excess object called PB 5901 ; it is a broad absorption line quasar with $z = 2.121$ (Lewis *et al.*, 1979 ; Turnshek *et al.*, 1980 ; Hartig and Baldwin, 1986).

TABLE 1.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
KPNO 1	00 00+01	9	2.63	9	2.803	25.10.86	PV	ESO	a
CFHT 2	00 01-00	9	2.62	9	0.354	25.10.86	PV	ESO	a
Q0010+023	00 10+02	37	2.27	37	0.089	10.11.88	JS	ESO	a
UM232	00 19+01	17	2.134	32	2.125	10.11.88	JS	ESO	
0155-527A,B	01 55-52	6			star	27.11.89	SD	LCO	
Q0205-379	02 05-37	19	2.42	19	2.404	13.11.87	PM	ESO	
PKS 0237-23	02 37-23	1	2.219	18	2.220	13.11.87	PM	ESO	
Q0254-404	02 54-40	19	2.29	21	2.280	10.11.88	JS	ESO	a
PKS 0254-671	02 54-67	25	2.23	25	star	25.10.86	PV	ESO	
PKS 0405-385	04 05-38	22	2.04	25	1.285	26.10.86	PV	ESO	b
PKS 0738-674	07 38-67	34			1.663	18.02.88	GM	ESO	g
KP 0805.4+04.7	08 05+04	28	2.06	29	2.055	27.10.86	PV	ESO	b
PKS 0823-223	08 23-22	7	C	31	>0.910	10.05.89	MV	ESO	b
PKS 0846-572	08 46-57	34			star	08.12.88	GM	ESO	
PKS 0850-03	08 50-03	35			star	03.01.87	SD	MMT	
4C 02.31	10 52+02	35			star	03.01.87	SD	MMT	
UM 473	12 01-01	15	2.26	15	2.165	12.05.89	MV	ESO	b
PKS 1301-192	13 01-19	24	C	11	star	26.07.89	PV	ESO	
WEE 124	13 09+28	33	0.06	33	star	27.11.89	SD	PAL	
PKS 1311-270	13 11-27	3	2.195	4	2.188	10.05.89	MV	ESO	
Q1346-036	13 46-03	20	2.345	36	2.339	10.05.89	MV	ESO	
UM 644	14 08-00	15			1.496?	17.05.88	GM	ESO	c
UM 651	14 12+00	15			1.931	16.05.88	GM	ESO	c
PKS 1514+197	15 14+19	26	C	30	C	27.07.89	PV	ESO	c
PKS 1549-79	15 49-79	34			0.149	17.02.88	GM	ESO	c
PKS 1619-680	16 19-68	34			1.354	17.02.88	GM	ESO	d
MC3 1639+155	16 39+15	10	C	27	0.871	11.05.89	MV	ESO	d
PKS 2012-017	20 12-01	23	C	2	C	11.05.89	MV	ESO	
PKS 2021-330	20 21-33	23	1.47	5	1.465	17.11.87	JS	ESO	d
PKS 2047-655	20 47-65	25	2.32	25	1.145	10.05.89	MV	ESO	d
PKS 2109-69	21 09-69	25	2.91	25	2.10	10.05.89	MV	ESO	e
PKS 2126-15	21 26-15	7	3.270	12	3.27	09.05.89	MV	ESO	e
2127.1-1577	21 27-15	-	3.2	8	star	26.10.86	PV	ESO	
2142.8-1566	21 42-15	-	2.1	8	2.050	26.10.86	PV	ESO	e
2143.0-1529	21 43-15	-	1.9	8	1.866	26.10.86	PV	ESO	e
ESO 289G?19	22 18-44	-			0.032	12.06.78	JS	ESO	
PKS 2259-37	22 59-37	13			star	27.11.89	SD	LCO	
Q2319-38	23 19-38	21	0.37	21	0.370	27.07.89	PV	ESO	f
WEE 180	23 48-01	33	2.04	33	1.997	25.10.86	PV	ESO	f
WEE 182	23 49-01	33	2.36	33	2.362	25.10.86	PV	ESO	f
WEE 185	23 50-01	33	3.23	33	3.131	25.10.86	PV	ESO	f
UM195	23 59-02	16	0.86	14	0.867	13.11.87	PM	ESO	g

References to Table 1 (col. 3 and 5) :

1 – Arp *et al.*, 1967
2 – Baldwin *et al.*, 1989
3 – Bolton and Savage, 1977
4 – Browne and Savage, 1977
5 – Browne *et al.*, 1975
6 – Chen, 1984
7 – Condon *et al.* 1977
8 – Crampton *et al.* 1985
9 – Gaston, 1983
10 – Hazard and Murdoch, 1977
11 – Jauncey *et al.*, 1978a
12 – Jauncey *et al.*, 1978b
13 – Lü, 1970
14 – MacAlpine and Feldman, 1982
15 – MacAlpine and Williams, 1981
16 – MacAlpine *et al.* 1977a
17 – MacAlpine *et al.* 1977b
18 – Osmer, 1977
19 – Osmer and Smith, 1977a
20 – Osmer and Smith, 1977b
21 – Osmer and Smith, 1980
22 – Peterson and Bolton, 1972
23 – Peterson and Bolton, 1973
24 – Peterson *et al.* 1973
25 – Savage and Wright, 1981
26 – Shimmins *et al.*, 1975
27 – Smith *et al.*, 1977
28 – Sramek and Weedman, 1978
29 – Sramek and Weedman, 1980
30 – Strittmatter *et al.*, 1974
31 – Tanzi *et al.*, 1988
32 – Turnshek *et al.*, 1980
33 – Weedman, 1985
34 – White *et al.*, 1987
35 – Wills *et al.*, 1973
36 – Young *et al.*, 1982
37 – Zhan and Chen, 1987

Notes to Table 1 :

Column 1 gives the name of the objects, while col. 2 gives the short position. Col. 3 gives the references to a published finding chart, col. 4 the published value of the redshift (with a C for a continuous spectrum) and col. 5 the corresponding references. Col. 6 gives our measured value for the redshift (with a C for a continuous redshift and "star" for a galactic star. Col. 7 indicates the date of the observations, col. 8 the initials of the observer (GM : G, Meylan, JS : J. Surdej, MV : M.-P. Véron-Cetty, PM : P. Magain, PV : P. Véron and SD : S. Djorgovski), and col. 9 the telescope used for the observation (ESO : European Southern Observatory 3,60m telescope ; LCO : Las Campanas Observatory 100-inch telescope ; MMT : Multi Mirror Telescope ; PAL Palomar Observatory 200-inch telescope). Col. 10 shows in which panel of figure 1 is the spectrum displayed.

A star-like object located 4″ SE from the position of UM 232 has been found on direct *B* and *R* CCD frames taken with the ESO/MPI2.2 m telescope. It is approximately 4 mag. fainter than the quasar and has very similar *B-R* color. Spectra of this companion taken with EFOSC at the ESO 3.6 m telescope show that there is only a faint continuum with no evidence for the presence of BAL-like features or broad emission-lines. Whereas it is now almost certain that this companoin is not a quasar, better signal-to-noise data are still needed in order to correctly identify its true nature.

0155-527 A,B: This pair of objects separated by 6″ has been found by Chen (1984) on a UK Schmidt prism plate. Our spectrum shows that both are stars.

Q 0205-379: Osmer and Smith (1980) have found this 17.4 mag. object on a Curtis Schmidt objective prism plate (a finding chart is given by Osmer and Smith, 1977a) ; they have measured a redshift $z = 2.42$ which has been confirmed by Ulrich (1989).

A star-like companion, located 2.3″ NNW from the QSO has been found on *B, V, R* and *I* CCD frames taken with the ESO/MPI 2.2 m telescope. A spectrum recorded for this object indicates that it is a late-type star.

PKS 0237-23: PKS 0237-23 (Bolton and Ekers, 1967 ; Wall *et al.*, 1976) or OD-263 (Ehman *et al.*, 1970) has been identified with a 17 mag. starlike object by Bolton and Ekers (1979) and by Arp *et al.* (1967) who noted its identity with PHL 8462 (Haro and Luyten, 1962).

The redshift was first measured by Arp *et al.*, but Osmer (1977) gave a more accurate value as $z = 2.219$. We have obtained a spectrum of the bright star-like object located 15.5″ SE of the quasar. This companion turns out to be a F or G type star.

Q 0254-404: Osmer and Smith (1980) have found this 17.4 mag. object on a Curtis Schmidt objective prism plate ; they have measured a redshift $z = 2.29$ which has been confirmed by Ulrich (1989). A finding chart is given by Osmer and Smith (1977a). Emission lines due Lyα, N V, O IV], C IV and C III] are seen at $z = 2.280$ in our spectrum (Fig. 1a).

A companion has been identified on *B, R* and *I* direct CCD frames at 2.5″ NW from the position of the quasar. The *R* brightness of this object is approximately 3.1 mag. fainter than that of the QSO. It appears to be somewhat extended (1.7″) on the I frame and, unlike the quasar image, it has not been detected on a long exposure CCD frame taken through a narrow band filter centered near Lyα (i.e. at $\lambda/\Delta\lambda$ = 4000/100 Å/Å). No emission lines are seen in a long integration but low S/N spectrum of this companion, indicating that it is probably not a quasar or a lensed QSO image.

PKS 0254-671: PKS 0254-671 (Bolton and Butler, 1975) has been identified with a 18.5 mag. starlike object by Savage and Wright (1981) who, from an objective prism spectrum obtained with the United Kingdom Schmidt telescope, have classifed this object as a QSS with $z = 2.23$. Our spectrum shows it to be an A type star.

PKS 0405-385: PKS 0405-385 (Bolton and Schimmins, 1973) has been identified with a 17.5 mag. starlike object by Peterson and Bolton (1972). Savage and Wright (1981) have observed three emission lines in the spectrum of this object, at $\lambda\lambda$ 3783, 4261 and 4696 which, if identified as Lyα, O IV] and C IV, lead to $z = 2.04$. Our spectrum (Fig. 1b) possibly shows one of these lines at λ 4263 and a second one at λ 6398, which, identified with C III] λ 1909 and Mg II λ 2798, lead to $z = 1.285$. The line observed by Savage and Wright at 3783 Å could be due to He II λ 1640. Our spectrum shows a number of absorption lines ; the strongest of them at least seems to be real ; but the resolution is to small to attempt identification.

PKS 0738-674: The radiosource PKS 0738-674 (Bolton and Butler, 1975) at $b = -20°.6$ has been identified with a 19.8 mag. stellar object (Savage, 1976 ; White *et al.*, 1987). Our spectrum (Fig. 1g) shows it to be indeed a quasar with $z = 1.663$.

PKS 0823-223: The low galactic latitude ($b = 8°.9$) radiosource PKS 0823-223 (Bolton *et al.*, 1975) has been identified by Condon *et al.* (1977) with a 17.5 mag. starlike object later shown to have a continuous spectrum (Wright *et al.*, 1979) ; the discovery of a 9% optical polarization (Impey and Tapia, 1988) has confirmed the BL Lacertae nature of this object.

The recent discovery (Falomo, 1990) of a Mg II $\lambda\lambda$2796, 2803 doublet in absorption at $z = 0.910$ in the spectrum prompted one of us (J.S.) to look for possible multiple images due to gravitational lensing. Indeed, an R image obtained with the CFH 3.6m telescope showed a companion 1″.5 W of the BL Lac object and about 2.5 mag. fainter. A spectrum of this companion shows it to be a star with several absorption lines at zero redshift (G, Hβ, Mg I, Ca+Fe λ5269, Na I D and Hα).

In the spectrum of the BL Lac object, we see, in addition to the Mg II absoption doublet, Fe II $\lambda\lambda$ 2373.7, 2382.0, Fe II $\lambda\lambda$ 2585.9, 2599.4 and Mg I λ 2852.1 at $z = 0.910$ and H, K and D at $z = 0$(fig. 1b).

PKS 0846-572: This low galactic latitude source ($b = -8°.7$) has been tentatively identified by White *et al.* (1987) with a 19.3 mag. starlike object. Our spectrum shows it to be a star. White *et al.* call it PKS 0846-572 ; however we have not been able to find it in any of the Parkes survey installements.

PKS 0850-03: The radiosource PKS 0850-03 (Shimmins *et al.*, 1966 ; Wright *et al.*, 1982), 4C-03.34 (Gower *et al.*, 1967) or OJ-084 (Ehmann *et al.*, 1970) has been tentatively identified with a 16.5 mag. red stellar object (Wills *et al.*, 1973) ; Wills (1974) has obtained photoelectric photometry of this object ($V = 17.78$, $B\text{-}V = 1.20$, $U\text{-}B = 0.67$) suggesting that it is a galaxy, while Wills and Wills (1976) have obtained an inconclusive, low S/N spectrum. Our own spectrum shows it to be a star.

4C 02.31: The radiosource PKS 1052 + 023 (Wall *et al.*, 1971; Wright *et al.*, 1982) or 4C 02.31 (Gower *et al.*, 1967) has been tentatively identified with a close pair of 16 mag.

starlike objects separated by 3".6 (Wills *et al.*, 1973 ; Singal *et al.*, 1979). An optical spectrum obtained by Nebelitskii *et al.* (1981) was inconclusive. A spectrum of the SE member of the pair shows it to be a star.

UM 473: This 18 mag. object has been discovered using slitless spectroscopy by MacAlpine and Williams (1981) who gave a problable redshift $z = 2.26$. Our spectrum (Fig. 1b) leads to $z = 2.165$ confirming the original estimate.

PKS 1301-192: The radiosource PKS 1301-192 (Bolton *et al.*, 1975 ; Savage *et al.*, 1977) , MC 1301-192 (Large *et al.*, 1981) or OP-103 (Ehman *et al,* 1970) has been identified with a 18 mag. starlike object by Peterson *et al.*, (1973) ; according to Savage *et al.* (1976) and Jauncey *et al.* (1978a), this object has a continuous spectrum. The best published radioposition (Large *et al.*, 1981) has an accuracy of only ± 3 arcsec ; but an accurate position of the optical candidate suggests that the identification is probably wrong (Falomo and Treves, 1990) . Our spectrum shows it to be an F type star. The radiosource wich has a steep radiospectrum (Large *et al.*, 1981 ; Bolton *et al.*, 1975 ; Ehman *et al.*, 1970) remains thus unidentified at optical wavelengths.

WEE 124: This 21.5 mag. object has been found using slitless spectroscopy at the CFHT 3.6 m telescope by Weedman (1985) ; a possible line observed at λ5290 has been identified with [O III] λ5007 at $z = 0.06$. A spectrum obtained with the Palomar 200-inch telescope shows that it is a star ; this confirms the classification by Huchra (private communication) based on a spectrum obtained with the MMT.

PKS1311-270: PKS1311-270 (Savage *et al.*, 1977) has been identified with a 18.0 mag. starlike object (Bolton and Savage (1977). Browne and Savage (1977) and Wilkes *et al.* (1983) have measured its redshift as $z = 2.195$ and 2.26 respectively ; our spectrum gives $z = 2.188$. A compact red object located 4" NNW from the quasar is a galaxy for which we derived $z = 0.201$ from the absorption lines (Ca II H and K, G, Mg I).

Q1346-036: this 17.4 mag. object has been discovered on a Curtis Schmidt objective prism plate by Osmer and Smith (1977b) who gave $z = 2.344$. Young *et al.* (1982) have obtained from an high dispersion spectrum $z = 2.345$. An object has been detected about 10" NNW from the quasar. It is a star.

UM 644: This object, fainter than 18 mag. has been discovered using slitless spectroscopy by MacAlpine and Williams (1981) who report a possible emission line near λ3950. Our spectrum (Fig. 1c) shows a single broad emission line at λ 4760 which, if identified with Mg II λ 2798, leads to $z = 0.701$. However, it could also possibly be C III] λ 1909, with C IV at the extreme blue end of the spectrum, in wich case the redshift would be $z = 1.496$. This is our prefered value ; however, we could not convince ourself without any doubt that it si not an artifact due to a calibration problem.

UM 651: This 18 mag. object has been discovered using slitless spectroscopy by MacAlpine and Williams (1981) who report a possible emission line near λ3600. Our spectrum (fig. 1c) leads to $z = 1.931$; the line observed by MacAlpine and Williams is Lyα.

PKS 1514+197: The radiosource PKS 1514+197 (Shimmins *et al.*, 1975), TEX 1514+197 (Douglas *et al.*, 1980) or S3 1514+19 (or GC 1514+19) (Pauliny-Toth and Kellermann, 1972) has been identified with a 17 mag. starlike object (Browne *et al.*, 1973 ; Shimmins *et al.*, 1975). Inconclusive spectra have been obtained by Strittmatter *et al.* (1974) and by Wilkes *et al.* (1983), but a strong (7-9%) optical polarization has been measured (Kinman, 1976) suggesting that it is a BL Lac object. The radiosource is compact (Antonucci and Ulvestad, 1985 ; Preston *et al.*, 1985) ; its radiospectrum is flat (Pauliny-Toth and Kellerman, 1972, Shimmins *et al.*, 1975 ; Condon *et al.*, 1977 ; Altschuler, 1983 ; Douglas *et al.*, 1983) ; accurate radio and optical positions agree (Condon *et al.*, 1977 ; Argue and Sullivan, 1980). Our spectrum (Fig. 1c), covering the spectral range λλ 3700-7100, is somewhat noisy ; however an emission line with the strength observed in all other quasars would have been easily seen. We therefore conclude that this is indeed a BL Lac object.

PKS 1549-79: The radiosource PKS 1549-79 (Price and Milne, 1965) at $b = -19°.5$ has been identified with an 18.5 mag. galaxy (White *et al.*, 1987) ; our spectrum shows it to be a Seyfert 2 galaxy at $z = 0.1494$ (Fig. 1c).

PKS 1619-680: The radiosource PKS 1619-680 (Bolton and Butler, 1975) at $b = 13°.0$ has been identified with a 18 mag. starlike object (White *et al.*, 1987) ; our spectrum shows it to be quasar at $z = 1.354$ (Fig. 1d).

MC3 1639+155: The radiosource MC3 1639+155 (Sutton *et al.*, 1974), TEX 1639+155 (Douglas *et al.*, 1980) or 4C 15.58 (Gower *et al.*, 1967) has been identified with a 19 mag. starlike object by Wills and Bolton (1969), Hazard and Murdoch (1977) and Bolton *et al.* (1981). The optical object has a continuum spectrum in the range λλ 4000-8600 according to Smith *et al.* (1977) ; it is a star according to Wills and Lynds (1978). Our spectrum shows that the optical candidate is indeed a star ; however a starlike object, 1.3 mag fainter, located 2".9 SE ($\Delta\delta = 2".4$, $\Delta\alpha = 0^s.12$)is a quasar with Mg II λ 2798 and [O II] λ 3727 at $z = 0.871$ (Fig. 1d). The best published (1950.0) radioposition is :

$\alpha = 16^h39^m42^s.58 \pm 0^s.02$ $\delta = 15^0 31' 10".1 \pm 0".2$ (Douglas *et al.*, 1980)

the optical position of the star is :

$\alpha = 16^h39^m42^s.38 \pm 0^s.03$ $\delta = 15^0 31' 11".5 \pm 0".4$

(Murdoch and Sanitt, 1979)

while the optical position of the quasar measured with respect to the preceeding star position is :

$\alpha = 16^h39^m42^s.50 \pm 0^s.03$ $\delta = 15^0 31' 09".1 \pm 0".4$

Therefore the radioposition and the quasar optical position are in agreement.

PKS 2012-017: The low galactic latitude ($b = -19°.3$) radiosource PKS 2012-017 (Wright *et al.*, 1982) or OW-021 (Ehman *et al.*,1970) has been identified by Peterson and Bolton (1973) with a 19 mag. starlike object which has

a continuous spectrum (White *et al.*,1988 ; Baldwin *et al.*, 1989 ; Dunlop *et al.*, 1989). The radiosource is variable (Wright *et al.*, 1982) ; its angular size is smaller than 0".1 (Bentley *et al.*, 1976) and its spectrum is flat (Wall, 1972) ; there is therefore no doubt that it is a BL Lac object. Our own spectrum also shows a continuous spectrum except for a narrow absorption line at λ5891 probably due to Na I D at zero redshift.

We have obtained *B* and *R* images of the field ; the BL Lac object has two companions ; one 10".5 E, 1.6 mag. fainter in *R*, is a star ; the second, 5".8 NE has colors rather similar to that of the BL with $\Delta B = 2.58$ mag. and $\Delta R = 2.46$ mag., but no spectrum has yet been obtained for it.

PKS 2021-330: The radiosource PKS 2021-330 (Shimmins and Bolton, 1974) has been identified with a 17.5 mag. UV excess object (Peterson and Bolton, 1973). Browne *et al.* (1975) have suggested a redshift $z = 1.47$, but they have pointed out that this value was doubtful ; however, we have obtained a more accurate, but similar, value $z = 1.465$ based on several broad emission lines seen in our spectrum : C IV, He II, O III] λ16664, C III] and Mg II (Fig. 1d).

Furthermore, we have detected on direct CCD frames a star-like companion 1.8" SE from the quasar image and 1.7 mag. fainter in R than the quasar. Spectra have shown that it is an early-type star.

PKS 2047-655: The radiosource PKS 2047-655 (Bolton and Butler, 1975) has been identified with a 17.5 mag. starlike object by Savage and Wright (1981) who have observed on an UK Schmidt telescope objective prism spectrum two emission lines at λλ 4070 and 5140 which, identified with Lyα and C IV, lead to a redshift $z = 2.32$. Our spectrum shows instead two emission lines at λλ 4130 and 6005 which correspond to C III] and Mg II at $z = 1.145$ (fig. 1d).

PKS 2109-690: The radiosource PKS 2109-690 (Bolton and Butler, 1975) or MC 2109-690 (Large *et al.*, 1981) has been identified with a 19.0 mag. starlike object by Savage and Wright (1981) who have observed, on an objective prism spectrum, one emission line at λ 4750, corresponding to a redshift of 0.70 or 2.91 if identified with Mg II or Lyα. Our own spectrum (Fig. 1e) shows, in addition to a strong line at λ 4810, two weaker lines at λλ 4390 and 5910. These three lines can be identified with O IV], C IV, and C III] at $z = 2.10$.

PKS 2126-15: PKS 2126-15 (Schimmins *et al.*, 1966) or OX-146 (Ehman *et al.*, 1970) has been identified with a 17.5 mag. starlike object (Condon *et al.*, 1977) ; its redshift is $z = 3.270$ (Jauncey *et al.*, 1978b). This quasar has been found independently by Crampton *et al.* (1985) on a 3.6m CFHT blue grens plate. It is an intrinsically very bright object with $M_v \sim -30$ ($H_0 = 50 \mathrm{kms}^{-1}\mathrm{Mpc}^{-1}$; $q_0 = 0$).

R CCD frames obtained with EFOSC at the 3.6m ESO telescope show several objects within 15" from the quasar (Fig.2) ; the two brightest, C1 and C2, are located respectively 5".4 and 9".7 W from the quasar. These two objects have been seen by Sargent *et al.* (1990). The *R* magnitudes for the quasar, C1 and C2 are 16.9, 20.8 and 20.9 respectively. C2 is an emission line galaxy ([OII] λ 3727, Hβ, [OIII] λλ4959, 5007) at $z = 0.210$ (Fig. 1e) ; our spectrum of C1 shows no emission line and is inconclusive.

2127.1-1577: This 16.5 mag. object has been discovered by Crampton *et al.* (1985) in the course of a grens survey with the CFH 3.6m telescope ; it has a red continuum with a possible emission line at λ 5075 corresponding to $z = 3.2$ if Lyα. Our spectrum shows it to be an M type star.

ESO 289-G?19: This object has been classifed by Holmberg *et al.* (1975) as a compact galaxy or a planetary nebula from its appearance on the ESO (B) sky atlas. Direct photographs obtained at the prime focus of the ESO 3.6m telescope and B& C spectroscopy clearly indicate that it is a ring-like galaxy at a redshift $z = 0.0321$. Emission-lines due to [O II], Hγ, Hβ, [O III] λλ4959,5007, [N II] λλ6548, 6584 and Hα are seen in the spectrum of the galaxy nucleus.

PKS 2259-37: The radiosource PKS 2259-37 (Bolton *et al.*, 1964 ; Bolton and Shimmins, 1973) has been tentatively identified with a 15 mag. starlike object (Lü, 1970) which is a star as shown by our spectrum.

Q2319-38: Osmer and Smith (1980) have found this 17.3 mag. object on a Curtis Schmidt objective prism plate and derived a redshift $z = 0.37$ on the basis of a single emission line identified as Mg II λ 2798. Our spectrum (Fig. 1f) shows in addition to Mg II, [O III] λ 5007, Hβ and Hγ at $z = 0.370$.

WEE 185: This 20.7 mag. object has been found using slitless spectroscopy at the CFHT 3.6m telescope by Weedman (1985) who has derived for it $z = 3.23$. We have measured $z = 3.131$ on our spectrum which shows that it is probably a broad absorption line quasar (Fig. 1f).

UM 195: This 18.6 mag. object has been discovered using slitless spectroscopy by MacAlpine *et al.* (1977a). MacAlpine and Feldman (1982) have measured its redshift as $z = 0.86$. In addition to the only bright Mg II emission line, our spectrum (Fig. 1g) shows faint ones due to He II λ3203 and [Ne V] λλ3346, 3426 ; from the Mg II line, we get $z = 0.867$. A faint star-like companion has been identified on direct R CCD frames 4.5" W from the QSO image. It appears to be very red, about 3.2 mag. fainter in *R* than the quasar. However, we have not been able to classify this object on the basis of a 90 min. exposure spectrum (5 Å resolution).

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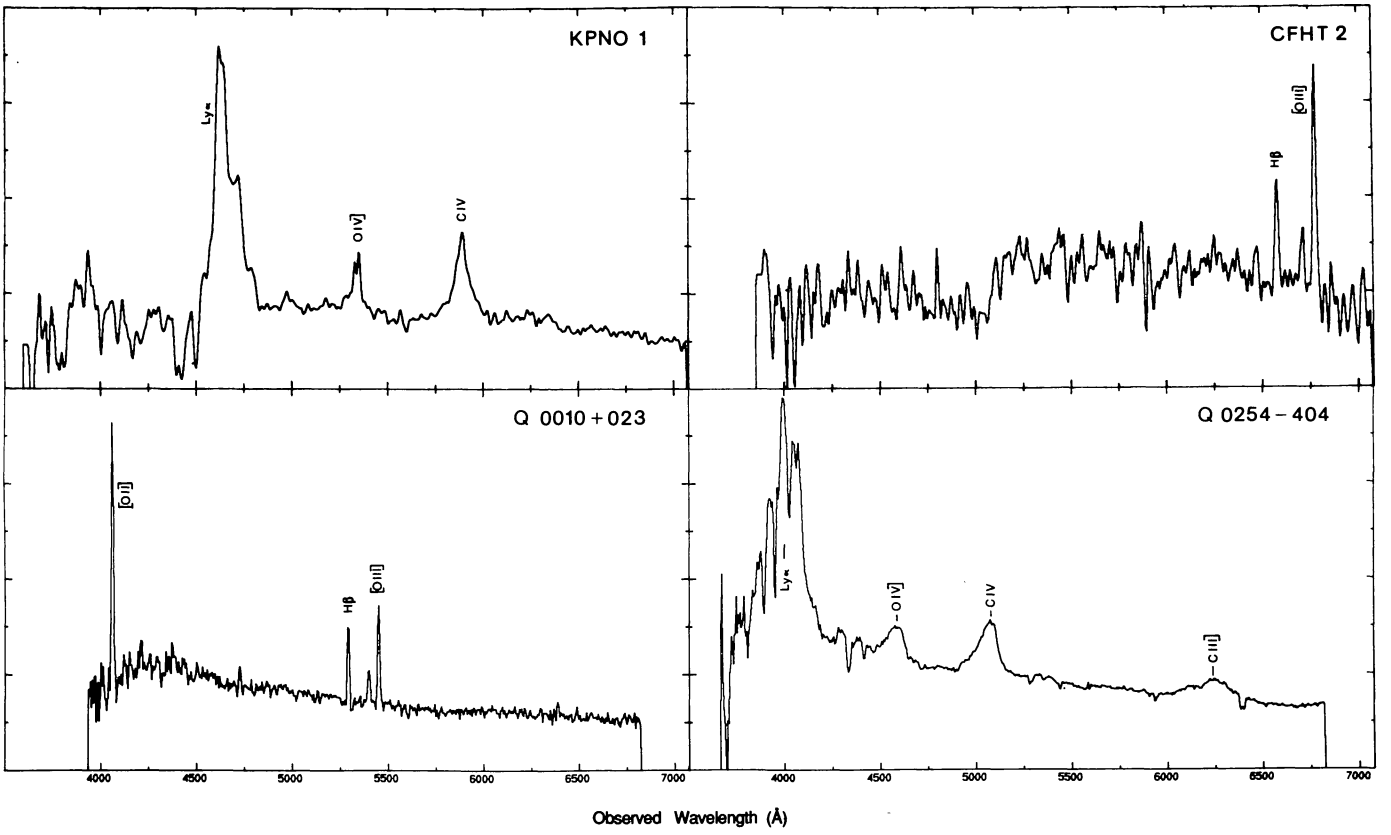


FIGURE 1a.

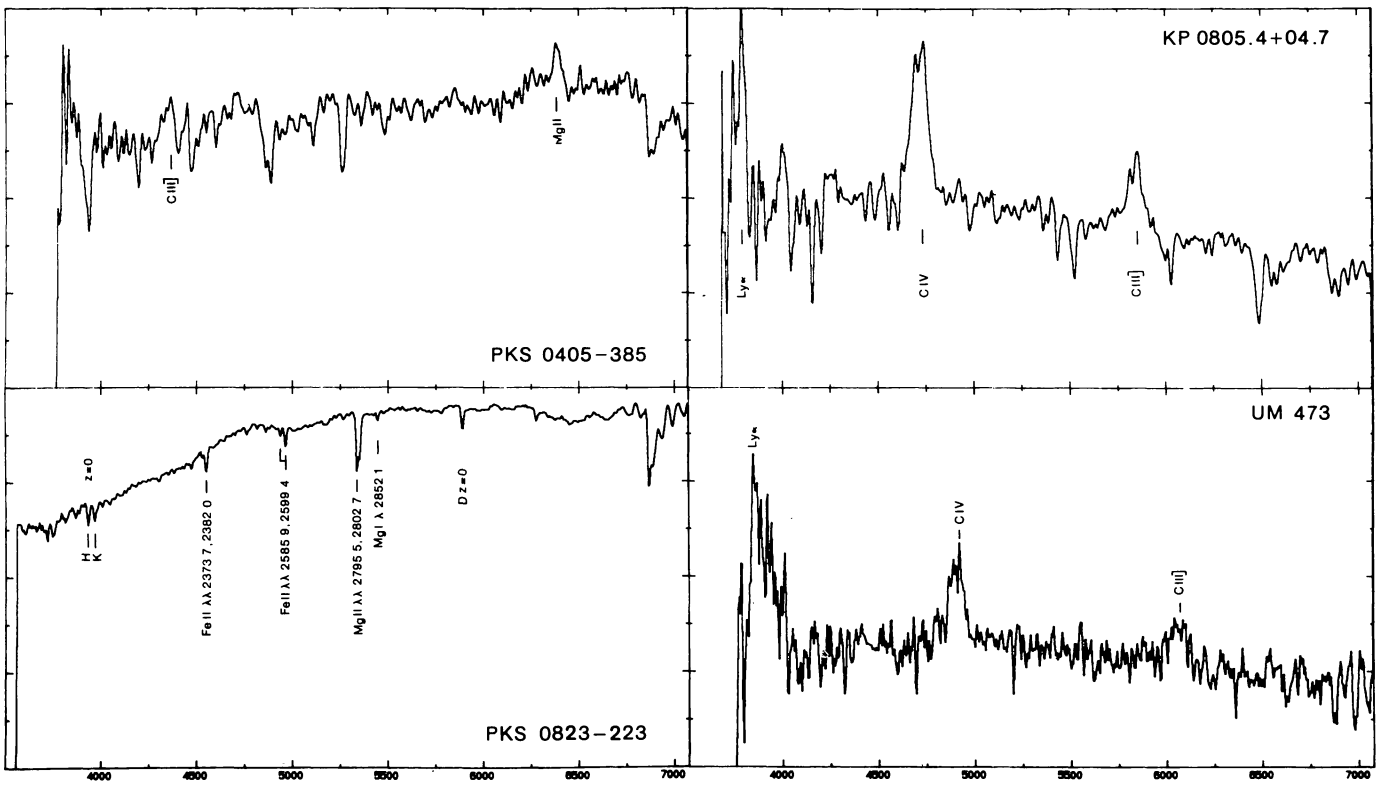


FIGURE 1b.

FIGURE 1a to 1g. Flux corrected spectra (F_λ) of the most interesting objects in Table 1.

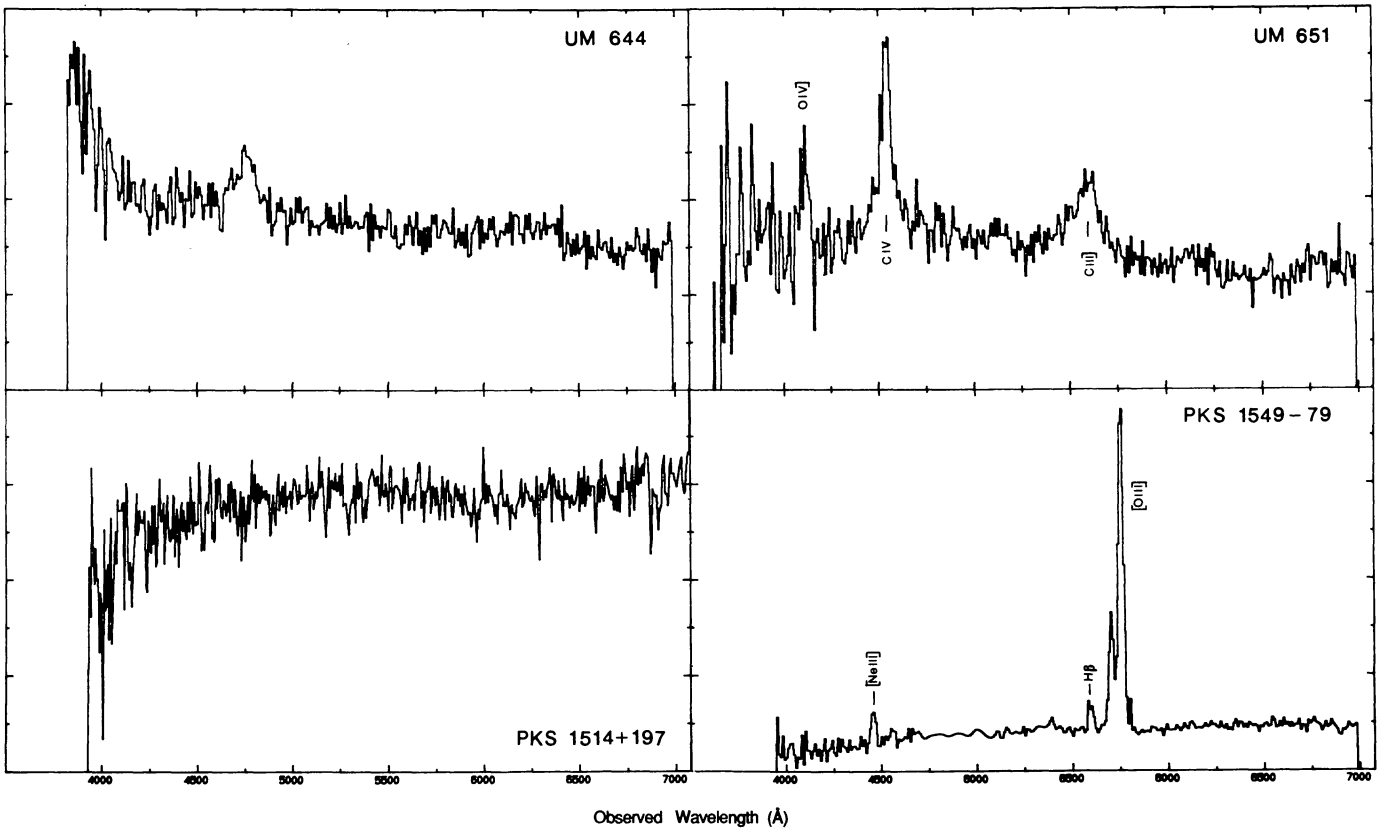


FIGURE 1c.

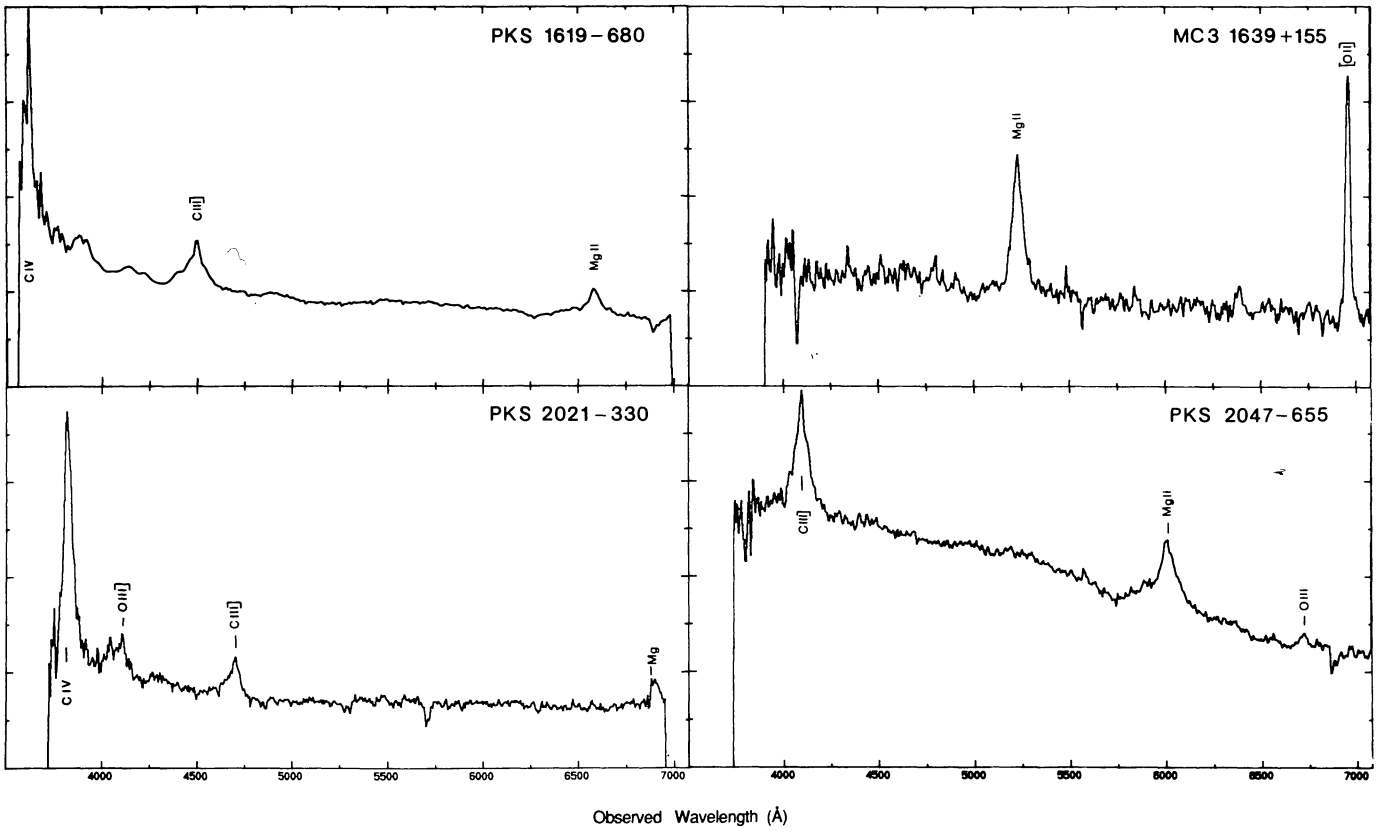


FIGURE 1d.

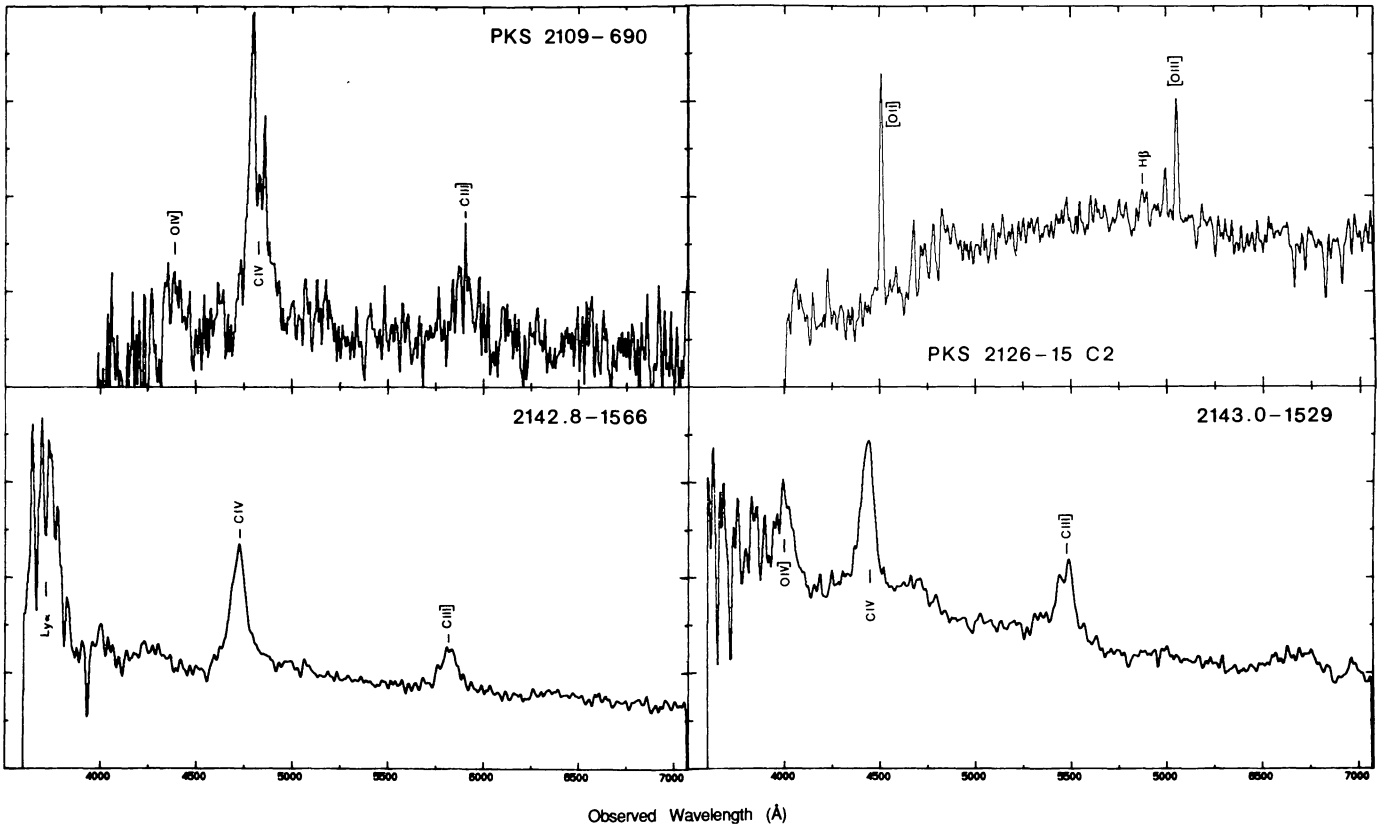


FIGURE 1e.

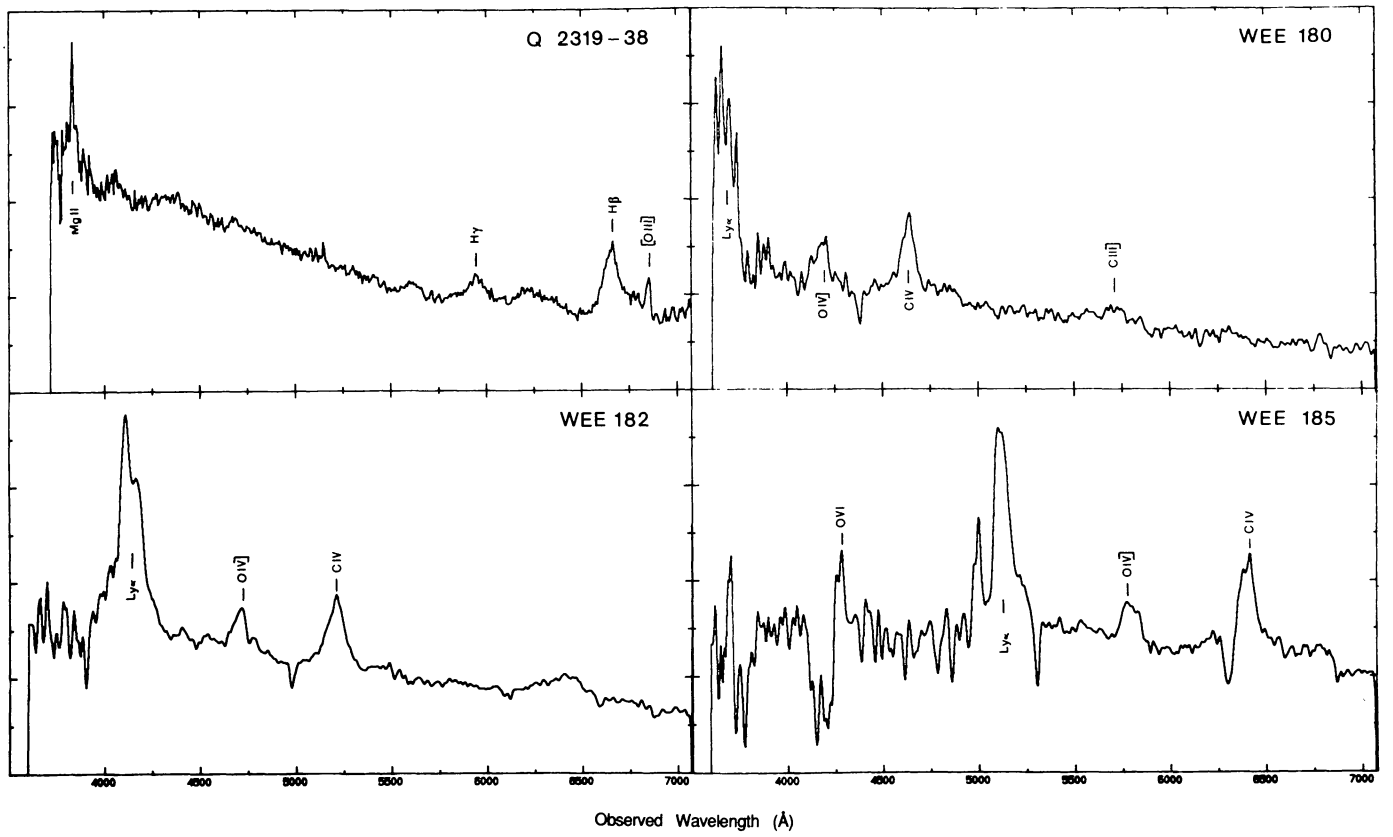
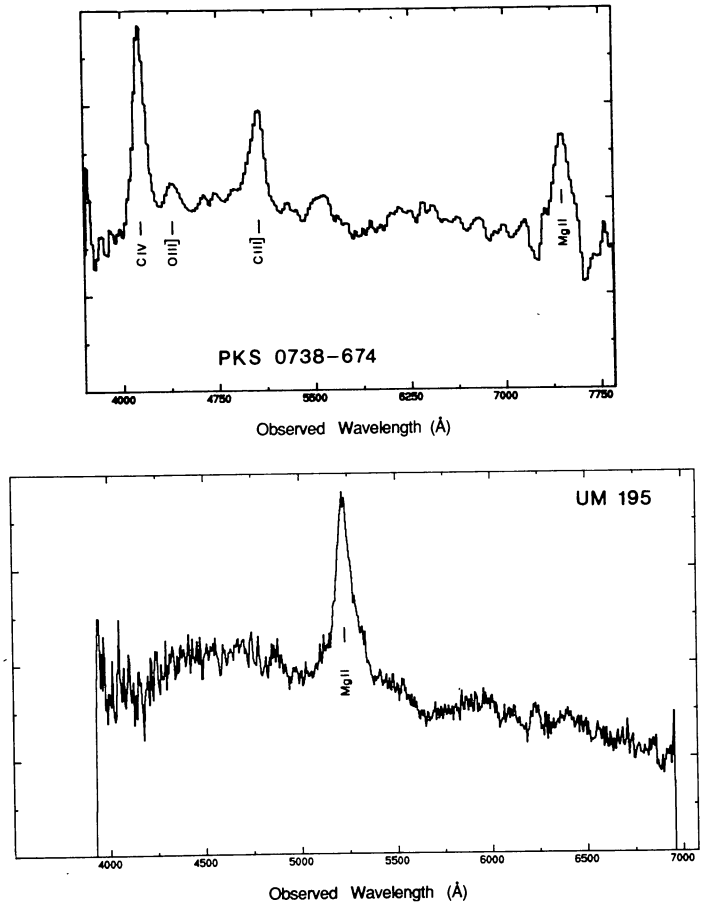


FIGURE 1f.



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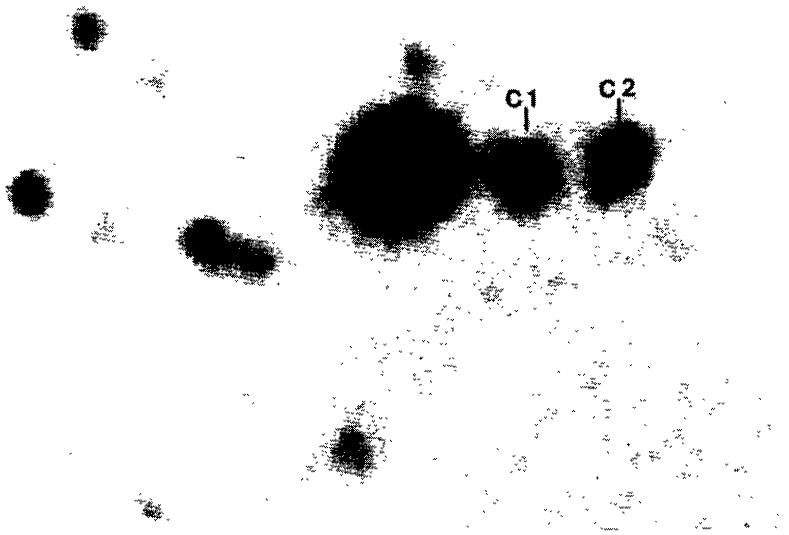

FIGURE 2. PKS 2126-15. Five 2 min CCD R frames obtained with EFOSC at the 3.6 m ESO telescope have been flat-fielded and coadded. The field size is 23" × 23". North is at the top. East to the left.