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Optical Corrections to the Véron-Cetty and Véron Quasar Catalogue

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Abstract

Fixes are presented to be applied to the Véron-Cetty and Véron Quasar Catalogue, 13th edition. These are comprised of 39 de-duplications, 380 astrometric moves of 8 + arcsec of which 31 are over 10 arcmin, and 30 indicated de-listings.

Keywords: catalogues, quasars: general

1 INTRODUCTION

Quasars have been catalogued into complete collections from the earliest days of quasar surveys. The two most prominent such catalogues have been the Véron-Cetty and Véron (VCV) Catalogue of Quasars and Active Nuclei (Véron-Cetty & Véron 2010), published in 13 editions from 1984 to 2010, and the Hewitt and Burbidge catalogue, which published its last edition in 1993 (Hewitt & Burbidge 1993). These catalogues recorded quasar positions based on optical or radio or X-ray surveys in which optical positions were not always published or were often approximated into tiles of sky specified by the quasar names, e.g. '0450−132' referred to a tile of sky bounded by the corners B1950 04h50m–13d12m and 04h51m–13d18m (the last digit of the name being tenths of a degree).

With the advent of large optical quasar surveys such as 2df QSO Redshift Survey (Croom et al. 2004) and Sloan Digital Sky Survey (Abazajian et al. 2009), we have moved to an optical standard of quasar cataloguing where optical photometry and arcsecond-accurate astrometry are the norm. To complete the transition to this new standard, there is accordingly a need to bring the older 1970s–1990s data into conformity. Most of the old data already bear arcsecond-accurate astrometry, by which red–blue photometry can be sourced from optical catalogues such as that of the Cambridge Automatic Plate Measuring (APM) machine (McMahon & Irwin 1992) and the United States Naval Observatory (USNO-B; Monet et al. 2003). In their recent releases, VCV have fixed considerable old data up to the optical standard, but a residue remains of quasars with only approximately known or mistaken positions. Of course, the latter of these are elusive to identify without some indicator to select them.

I have recently developed an unpublished but publicly available quasar catalogue, the 'Million Quasars' (Milliquas; Flesch 2012) catalogue, as a by-product of the recently published 'Atlas of Radio/X-ray Associations' (ARXA; Flesch 2010). It is serving as a platform in support of ongoing development, and as a resource for bulk querying of quasars and quasar candidates. It is built to be an optical catalogue of arcsecond accuracy, and I have relied on the VCV 13th edition as the authority on the early quasars. Nevertheless, the process of merging the VCV data with optical APM/USNO-B data has highlighted some hundreds of quasars which either match to no optical signature or to an untypical signature; this thus serves as the aforementioned indicator of quasar data which are poorly or mistakenly sited. Investigation of these has led me to identify in the VCV data:

- Thirty-nine duplicate objects where a correctly sited quasar is matched by another, poorly sited, object which arose through either error or inexactitude by the original author (OA) in the discovery paper, or as a result of a cataloguing error.
- Three hundred and eighty objects for which I find that the VCV position is offset at least 8 arcsec from the true optical position which I present. Thirty-one of these quasars require a move of at least 10 arcmin.
- Thirty objects for which I recommend de-listing, as I have found, by a careful inspection of all evidence, either are not quasars or have information of such poor quality that the object is lost beyond any mechanism of recovery, i.e. even if the object were re-found, it could not be recognised as being the previous object.

These 449 objects represent all those where VCV objects were not well supported by optical data, and found to require a fix. For most of these objects, the diagnosis and

Table 1. Objects Found for Q 1233 + 4749.

No.	J2000	Type	Name	*R* mag	*B* mag	*z*	Radio	X-ray
1	12 35 22.9 + 47 32 29	QSO	Q 1233 + 4749			1.669		
2	12 36 14.2 + 47 32 59	R/X		20.1	21.2		FIRST J123614.2 + 473258	1RXS J123614.8 + 473245

correction have been clear. However, completeness requires me to include a few puzzling objects where the true identification is still unclear, for which I provide a 'best' available optical object only, rather than something certain. I flag such cases.

2 THE METHOD

The recent publications of the Nonparametric Bayes Classifier Kernel Density Estimate (NBCKDE: Richards et al. 2009) and SDSS-Extreme-Deconvolution QSOs (XDQSO: Bovy et al. 2011) photometric quasar candidate catalogues, plus the radio-/X-ray-associated candidates published in ARXA, now highlight good optical candidates for quasar searches which hitherto would have been too hard. These and other tools are as follows.

- Radio/X-ray associations to optical objects as presented in ARXA, and similarly in Milliquas which has updated versions of these. This is especially useful for originally X-ray-selected quasars, such as from the *Einstein* satellite, which are thus also expected to be X-ray associated in ARXA.
- The photometric quasars published by NBCKDE and XDQSO. NBCKDE provides reliable photometric redshifts, and some needed XDQSO redshifts were kindly provided by Adam Myers.
- Optical magnitudes and colours to match to the original paper, although the systematic offsets of that paper need to be ascertained; see the 'personal equation' paragraph of Section A5 in Flesch & Hardcastle (2004).
- Recently surveyed quasars/galaxies of matching magnitude and redshift, especially those which are offset by right ascension only or declination only, as such errors do happen but rarely in both simultaneously.
- Finding charts and positional information given by the OAs, which later can have been overlooked or wrongly superseded.
- Online optical look-ups, being the SDSS-DR7[1] and DR8[2] finding charts and the Digitised Sky Survey.[3]

Sometimes these tools immediately yield a strong candidate. An example is my search for the optical object for Q 1233 + 4749, an approximately sited quasar found serendipitously in the search for 'primeval galaxies' by Thompson & Djorgovski (1995), who presented no astrometry or photometry for this object, but their search was for objects of $19.5 \leq R < 24$ and $B - R \approx 1.5$. This object should be within the tile of sky bounded by the corners B1233 + 4749 and B1234 + 4750; VCV placed it at the B1233 + 4749 corner. Inspection of all available quasars and radio-/x-ray-associated objects and photometric quasar candidates within this tile of sky yielded only the two objects displayed in Table 1. The first of these is the VCV-catalogued object which has no photometry and, being approximately located, matches to no optical object. The second object, offset 521 arcsec from the first, has $R = 20.1$, $B = 21.2$ at J123614.2 + 473259, i.e. B123351.6 + 474930, with both radio and X-ray associations—the X-ray association is a *ROSAT* All-Sky Survey, from Voges, W., et al. 2000, on http://www.xray.mpe.mpg.de/rosat/survey/rass-bsc/ and ../rass-fsc/ source with a 30-arcsec error circle. ARXA assigns this object an 80% likelihood of being a quasar based on the radio association and stellar point spread function. This object has the right photometry for the discovery paper, and is clearly the true Q 1233 + 4749.

Of course, many searches for approximately sited quasars are not so straightforward and yield multiple candidates including some slightly outside the B1950 sky tile, but usually one candidate is found to be the clearly best match. A typical example is the search for Q 1510 + 155, from Sargent, Boksenberg, & Steidel (1988), which gives no photometry or astrometry, but states this is one of Cyril Hazard's quasars, which is typically a bluish $v = 17.5$–18.5. Hazard had a large collection of unpublished quasars which he lent out to researchers, and this paper states that 'the accurate positions of these objects will be reported (in) Sargent, Hazard, and McMahon (1988)', which, however, never appeared. The list of all quasars and candidates in the tile of sky bounded by B1510 + 155 and B1511 + 156 is displayed in Table 2. There, we first see the VCV object sited at the B1510 + 155 corner (although VCV usually positioned their approximate objects at the tile centres) with redshift of 2.106, then the third object is an SDSS quasar of redshift 2.110 which is a very strong candidate for duplication. Next is an NBCKDE candidate with photometric redshift of 2.225, also a good match, and the remaining objects have non-matching redshift. To select between the SDSS quasar and the NBCKDE candidate, we look at the object magnitudes: the SDSS quasar fits the Hazard profile of $v \approx 18$ and the NBCKDE candidate is two magnitudes too faint, so the SDSS quasar is selected as the true Q 1510 + 115. This quasar is catalogued in VCV as 'SDSS J15128 + 1119', so we have now found a duplication in VCV. The Q 1510 + 115 row needs to be deleted, but I

[1] http://cas.sdss.org/dr7/en/tools/chart/chart.asp
[2] http://skyserver.sdss3.org/dr8/en/tools/chart/chart.asp
[3] DSS: http://archive.stsci.edu/cgi-bin/dss_form

Table 2. Objects Found for Q1510 + 115.

No.	J2000	Type	Name	*R* mag	*B* mag	*z*	Radio
1	15 12 23.8 + 11 18 47	QSO	Q 1510 + 115			2.106	
2	15 12 37.2 + 11 21 02	photo-qso	NBCK J151237.20 + 112101.6	19.7	19.7	1.625	
3	15 12 49.2 + 11 19 29	QSO	SDSS J151249.29 + 111929.3	17.4	17.5	2.110	
4	15 12 58.6 + 11 18 49	photo-qso	NBCK J151258.62 + 111849.0	19.6	20.5	2.225	
5	15 13 01.1 + 11 23 23	Galaxy	SDSS J151301.10 + 112322.4	18.2	21.0	0.399	FIRST J151301.0 + 112322
6	15 13 03.8 + 11 20 49	QSO	SDSS J151303.83 + 112048.6	19.7	21.1	0.400	
7	15 13 15.0 + 11 19 07	photo-qso	NBCK J151314.97 + 111906.6	20.6	20.9	1.465	

recommend renaming 'SDSS J15128 + 1119' as 'Q 1510 + 115' in order to retain the original name.

Sometimes there is no help from the radio/X-ray data, and no photometric-redshift. For only nine such approximately sited cases only optical matching is available, and for them I designate the best bluish object with magnitudes consistent with the discovery paper. I flag these objects (in column 10 of Tables 5–7) according to how confident the selection is, and it is likely that I have missed the true object for some of these nine cases.

Some objects are corrected by identification of simple offsets, such as IXO 15 which is at the true location J033311.3−361137 (Woo 2008), but recorded in VCV at J033311.9−371135, i.e. offset 1° to the south. Such simple transcription errors account for ≈50 of the fixes presented here.

A few quasar discovery papers could be termed 'treasure hunt' papers because the presented astrometry is not of quasars, but of radio/X-ray sources or galaxies with offsets supplied, so that the reader must follow the trail to find the promised quasars. Notable among these is Appenzeller et al. (1998), which lists 674 X-ray sources with offsets to objects which VCV diligently followed but ultimately missed 76 quasar positions which I present here. Also notable is Arp (1981), which presents central galaxies with offsets provided to 'companion' galaxies, and from there, further offsets to the described quasars. Arp's treasure hunt was made doable by his arcsecond-accurate offsets, and I present the search for his first object, 'NGC 157#1', as an example. Arp's Table 1 lists the secondary galaxy as offset 30 arcmin north of NGC 157—this will be MCG -1-02-034, which is 29.7 arcmin due north of NGC 157. Arp now specifies a quasar of $V = 19.0$ at a distance of 119 arcsec from the secondary galaxy, and I show, in Table 3, the list of photometric candidates within 250 arcsec of that galaxy. There are three objects, the bottom of which is the galaxy, and the middle line shows a BOSS candidate at exactly 119 arcsec offset from the galaxy, $R = 18.8$ and $B = 19.1$, which is undoubtedly Arp's quasar. In this way, I have identified seven object positions which VCV recorded only as 'approximate'. SDSS has since resurveyed these objects, finding one confirmed quasar, five photometric quasars, and one star.

Many discovery papers present finding charts for their objects, which I have used in tandem with STScI Digitised Sky Survey to secure the exact astrometry. The cut-off for inclusion in this paper is a move of 8 arcsec. Smaller moves are not always trivial and are provided in the online Milliquas catalogue.

3 DUPLICATES

Thirty-nine duplicates in the VCV 13th edition are presented in Table 4. Each duplication consists of a master object which has accurate optical astrometry, and the duplicate to be removed, which is typically positioned onto blank sky. The offsets range from 48 arcsec to across the sky. I find that 13 of these duplications arose because the original published astrometry was approximate only, 6 other cases were due to astrometric error by the OAs, and 20 cases were cataloguing errors, of which 11 were simple transcription errors causing an N/S or E/W offset. Table 4 lists the duplicate first and then the master. Columns are (1) line number; (2) VCV name of the duplicate object; (3) duplicate object J2000; (4) VCV redshift; (5) VCV *V* magnitude; (6) VCV table number (1 = QSOs, 2 = Bl Lacs, 3 = active galactic nebulae, AGNe); (7) VCV reference number for the original paper; (8) astrometric offset from the duplicate to the master; (9) VCV name of the master object; (10) master object J2000; (11) master object redshift; (12) optical red magnitude; (13) optical blue magnitude; and (14) a comment explaining the original error and/or fix. For 12 of these objects, I recommend reassigning the duplicate name to the master because the duplicate name is the original historic name.

Table 3. NGC 157#1: Objects Within 250 arcsec from MCG -1-02-034.

No.	Dist	J2000	Name	Type	*z*	*R* mag	*B* mag
1	210	00 34 27.7 − 07 55 18	XDQ J003427.73 − 075517.5	photo-qso		22.4	22.3
2	119	00 34 33.9 − 07 55 03	BOSS J003433.95 − 075503.3	photo-qso		18.8	19.1
3	0	00 34 41.0 − 07 54 09	MCG -1-02-034	Galaxy	0.018	9.00	10.9

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Table 4. Thirty-Nine Duplications in VCV.

No	Name of Duplicate	J2000	z	V mag	Table	OA Ref	Offset (arcsec)	Name of Master Optical Object	Optical J2000	z	R mag	B mag	Comment
1	XMM J00005−2554	00 00 31.7 −25 54 59	0.283		2	1806	3 602	XMM J00005−2454	00 00 31.8 −24 54 57	0.284	15.6	17.4	1° N/S, original author (OA) error
2	TGS893Z369	00 23 20.1 −00 34 19	2.630	18.7	1	1421	144 000	2GZ J002320−4034	00 23 20.0 −40 34 18	2.550	18.6	18.6	40° N/S offset, OA correct
3	IGR J00335 + 6126	00 33 34.8 + 61 26 50	0.105		3	1745	124	IGR J00333 + 6122	00 33 18.4 + 61 27 43	0.105	18.7	20.6	master is the publication of the dup
4	Q J0033−7546	00 33 49.3 −75 46 24	0.364	18.1	1	2311	19 232	MC4 0031-70	00 34 05.2 −70 25 52	0.363	17.1	16.9	OA mis-positioned to empty sky, but stated dup to 'MC40031-707'
5	BR 0035-25	00 37 58.7 −25 13 31	4.150	18.9	1	1106	8 849	BRI J0048−2442	00 48 34.5 −24 42 05	4.150	19.0	21.5	OA typo, communication Mike Irwin
6	PSS J0052 + 2405	00 52 30.0 + 24 05 30	1.900	17.4	1	1777	320	PSS J0052 + 2405	00 52 06.6 + 24 05 38	2.451	17.7	20.6	approx pos dup of same name
7	SGP4:37	00 57 52.4 −27 45 17	1.691	21.0	1	283	794	2QZ J005852−2745	00 58 52.2 −27 45 18	1.689	20.6	20.6	1 time min offset, orig name SGP4:37
8	SDSS J0112 + 0053	01 12 30.0 + 00 53 29	4.566	20.2	1	1893	54 9147	SDSSp J11228 + 0053	11 22 53.4 + 00 53 31	4.560		23.4	approx, VCV read J11228 as J011228
9	TEX 0121 + 035	01 24 35.3 + 03 47 31	0.221	19.6	3	90	1 786	MS 01200 + 0328	01 22 36.8 + 03 43 54	0.221	17.9	19.0	dup has coords of NGC 520, FC Arp & Duhalde (1985), 'NGC 520.46'
10	1H 0150−535	01 52 23.6 −53 20 34	1.560	17.0	1	306	1 944	H 0147−537	01 48 52.8 −53 28 29	1.568	17.1	17.9	dup was approx located, dup identified by Remillard et al. (1993), Table 1, top row
11	EIS J03325−2745	03 32 26.0 −27 45 30	1.221	21.3	1	538	53	CDFS J03325−2745B	03 32 30.0 −27 45 30	1.218	18.5	22.3	4 time seconds offset, OA 'KX4' correct
12	CDFS 24	03 32 52.0 −27 52 04	3.590		1	819	135	ECDF-S 475	03 32 41.8 −27 52 02	3.588			10 time seconds offset, OA correct
13	AX J0342.3-4412	03 42 19.4 −44 02 38	1.091		1	811	612	XSF3:57	03 42 18.4 −44 12 50	1.091		21.5	double transcription error, OA correct
14	SDSS J03464 + 0037	03 46 29.0 + 00 37 00	2.770	19.1	1	2380	802	SDSS J03464 + 0023	03 46 29.0 + 00 23 37	2.747	18.7	19.6	decl truncation error
15	Q 0428−136	04 30 19.1 −13 29 32	3.244	20.8	1	616	476	Q 0428−13	04 30 38.8 −13 35 52	3.249	17.2	18.7	dup approx pos, master exactly loc
16	Q 0450−132	04 52 18.9 −13 05 03	2.253	17.5	1	1996	800	H 0450−1310	04 53 13.6 −13 05 55	2.250	17.2	17.7	duplicate was approximately positioned, new loc confirmed by Tytler et al. (2004)
17	SDSS J07464 + 2449	07 46 25.8 + 24 49 01	2.979	15.5	1	1957	3 601	SDSS J07464 + 2549	07 46 25.8 + 25 49 02	2.979	19.2	19.9	1° N/S, transcription error
18	Q 0837 + 109	08 39 43.6 + 10 43 21	3.326		1	1996	734	SDSS J08402 + 1034	08 40 17.8 + 10 34 29	3.331	18.2	18.9	dup approx pos, orig name Q 0837 + 109
19	LB 8814	08 53 14.5 + 18 47 37	0.183	18.6	3	1016	115	SDSS J08533 + 1847	08 53 22.4 + 18 47 14	0.182	18.7	19.3	dup approx pos, orig name LB 8814
20	NGC 2693 UB1	08 56 58.8 + 51 20 45	2.310	19.5	1	84	192	SDSS J08571 + 5123	08 57 11.1 + 51 23 18	2.319	18.8	19.2	Arp (1981) treasure hunt and original name
21	FIRST J09510 + 2210	09 12 03.8 + 22 10 51	0.220	17.6	1	2528	33 281	SDSS J09520 + 2209	09 52 00.0 + 22 09 06	0.220	17.4	17.3	no such FBQS object, intended name was 'FIRST J09520 + 2209', evidently
22	SDSS J10479 + 0739	10 46 56.0 + 07 39 52	0.168	19.3	3	1112	891	SDSS J10479 + 0739	10 47 55.9 + 07 39 52	0.168	19.5	20.5	same object offset 1 time-min W
23	RX J11062 + 0237	11 06 13.7 + 02 37 58	0.564	17.1	1	2417	8 001	SDSS J11151 + 0237	11 15 07.6 + 02 37 58	0.567	17.3	17.1	E/W offset, OA correct at SDSS loc

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Table 4. Continued.

No	Name of Duplicate	J2000	z	V mag	Table	OA Ref	Offset (arcsec)	Name of Master Optical Object	Optical J2000	z	R mag	B mag	Comment
24	2MASS J11178 + 2432	11 17 51.1 + 24 32 08	0.088	17.9	3	1089	8 187	SDSS J11278 + 2432	11 27 51.1 + 24 32 08	0.137	15.9	17.7	10 time-min E/W, OA loc correct
25	PSS J1118 + 3702	11 18 56.2 + 37 02 00	4.030	18.8	1	620	56	SDSS J11189 + 3702	11 18 56.1 + 37 02 56	4.025	19.2	21.4	VCV omitted decl arcsecs, OA correct
26	Q 1144 + 115	11 47 04.6 + 11 16 20	2.438		1	2604	88	SDSS J11469 + 1116	11 46 58.6 + 11 16 19	2.512	18.3	19.0	approx pos, Wolfe et al. (1986) say $z = 2.51$
27	Q 1159 + 01	12 01 33.8 + 00 43 18	3.269		1	1384	1 980	SDSS J12017 + 0116	12 01 44.4 + 01 16 12	3.233	17.7	18.8	dup approx pos, orig name Q 1159 + 01
28	Q 1211−1056	12 13 46.0 −11 13 14	1.626	19.0	1	1694	883	TEX 1212−109	12 14 46.0 −11 13 13	1.626	19.3	19.7	1 time-min E/W, OA correct, 'Q 1212−1056'
29	KP 1229.8 + 07.7	12 32 22.1 + 07 30 35	2.760	19.5	1	2179	48	SDSS J12323 + 0731	12 32 19.7 + 07 31 07	2.748	19.9	20.2	OA finding chart and original name
30	Q 1333.3 + 2736	13 35 35.9 + 27 27 18	0.783	19.0	1	515	354	SDSS J13356 + 2721	13 35 36.0 + 27 21 24	0.782	18.6	19.0	6 arcmin N/S, orig name Q 1333.3 + 2736
31	RXS J14194 + 4518	14 19 25.0 + 45 18 32	0.076	16.7	3	2078	6 330	SDSS J14294 + 4518	14 29 25.0 + 45 18 32	0.075	14.4	16.0	10 time-min E/W, transcription error
32	Q 1440−232	14 43 00.5 −23 29 15	2.221	18.0	1	355	6 631	PKS 1448−232	14 51 02.5 −23 29 31	2.221	17.2	17.5	OA cited 1440-232 'in preparation', but when published, it was 1448-232
33	RX J14462 + 2541	14 46 15.5 + 25 41 43	0.188	17.3	1	2417	97 107	SDSS J16462 + 2541	16 46 15.5 + 25 41 43	0.189	16.9	17.2	2 time hours E/W, OA correct
34	NGC 5866#1	15 06 28.4 + 55 45 30	0.706	18.1	1	79	449	SDSS J15057 + 5549	15 05 43.9 + 55 49 37	0.709	18.4	18.7	dup approx pos, orig name NGC 5866#1
35	Q 1510 + 115	15 12 23.8 + 11 18 47	2.106		1	1996	377	SDSS J15128 + 1119	15 12 49.2 + 11 19 29	2.110	17.4	17.5	dup approx pos, orig name Q 1510 + 115
36	Q 1511 + 091	15 13 25.9 + 08 54 50	2.878		1	1996	400	SDSS J15138 + 0855	15 13 52.5 + 08 55 56	2.904	17.2	17.9	dup approx pos, orig name Q 1511 + 091
37	SDSSp J1517 + 0101	15 17 30.0 + 01 01 29	2.004	19.2	1	1893	335	SDSS J15171 + 0101	15 17 07.6 + 01 01 13	2.007	19.6	18.1	dup approx pos, superseded
38	TGS185Z206	23 00 37.7 + 23 00 36	1.750	19.4	1	1421	179 111	2GZ J230037−2644	23 00 37.7 −26 44 35	2.413	18.6	19.6	Too far north for 2dF, VCV positioned this object at RA–RA instead of RA–Dec.
39	E 2352 + 073	23 55 20.5 + 07 32 57	0.277	19.3	3	1872	5 324	RX J00013 + 0728	00 01 18.0 + 07 28 28	0.270	18.3	18.5	double transcription error by OA[a]

[a]This *Einstein* HRI-detected object was evidently misplaced and lost in preparation by the original authors, Reichert et al. (1982). It was presented out of sequence in their RA-ordered Table 4, as '2352 + 073' between '2353 + 283' and '2353 + 072', by which it is seen that the RA was originally inscribed as '2353'. The *Einstein* position presented was (B1950) 23 52 47 + 07 16 15, which is, however, only a 3σ detection without any eligible optical counterpart—so the original optical object was not recovered. The authors knew that they had lost this object, for on their page 440, line 12, they wrote: 'Four ... (HRI) counterparts' followed by only three names *sans* this object. An X-ray-associated *doppelganger* of the same redshift and similar magnitude, RX J00013 + 0728, is at (B1950) 23 58 44 + 07 11 45, which would have been written as '2358 + 072'. If that was the original object, then a double transcription error is indicated, causing the loss.

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Table 5. One Hundred and Five Moves of 30 + arcsec.

No	Name	VCV J2000	z	V mag	Table	OA Ref	Move (arcsec)	Optical J2000	Opt Typ	R mag	B mag	Comment
1	PSS J0002 + 3732	00 02 46.1 + 37 32 00	4.210	19.0	1	620	37	00 02 46.0 + 37 32 37	r	18.8	21.8	VCV omitted decl arcsecs
2	PKS 0018−19	00 21 13.2 −19 10 44	0.095	17.0	3	1246	89	00 21 07.5 −19 10 06	rx	13.6	16.0	is galaxy PGC 1348, OA error, SIMBAD agrees
3	Q 0020−369	00 22 36.1 −36 40 22	2.005	19.2	1	88	54	00 22 37.9 −36 41 11		18.1	18.1	FC of spectra
4	NGC 157#1	00 34 46.3 −08 23 47	0.756	19.0	1	84	1 734	00 34 33.9 −07 55 03	p	18.8	19.1	approx pos, Arp treasure hunt ok, BOSS cand
5	CS 47	00 49 30.2 −26 05 35	2.290	19.9	1	438	30	00 49 29.8 −26 05 05		19.1	20.1	finding chart
6	Q 0047−2326	00 49 57.7 −23 09 40	3.422		1	1318	68	00 49 52.8 −23 09 49	!	19.3	20.3	approx pos, only good optical obj in B0047-2326
7	Q 0112 + 029	01 14 34.9 + 03 09 51	2.819	18.6	1	2341	410	01 14 53.2 + 03 14 57		17.9	18.2	approx pos, true pos courtesy of C. Ledoux, ESO
8	Q 0112−4556	01 14 49.2 −45 40 51	1.837	20.0	1	807	629	01 13 49.2 −45 40 51		19.6	20.3	OA correct, VCV off by 1 time-min E
9	Q 0112−27	01 14 52.8 −27 14 09	2.896		1	1318	694	01 14 33.1 −27 24 52	??	18.2	19.0	approx pos, bright Hazard, best opt only
10	Q 0112−381	01 15 08.4 −37 51 06	2.280	19.0	1	2015	150	01 15 08.2 −37 53 36		19.0	18.7	hard-to-read FC (OA, plate 13), 150 arcsec S
11	Q 0128−367	01 30 41.8 −36 31 33	2.169	17.4	1	1261	33	01 30 42.2 −36 31 00		17.0	17.9	move to 6dF J013042.3−363101, $z = 2.158$
12	Q 0129−369	01 32 13.4 −36 38 36	2.245	19.1	1	88	30	01 32 12.9 −36 39 05		18.3	18.3	FC of spectra, standout in OA circled area
13	NGC 615 UB1	01 35 05.7 −07 20 29	1.640	18.5	1	84	249	01 34 52.1 −07 22 55	prx	19.7	19.8	approx pos, Arp treasure hunt ok, BOSS z ok
14	Q 0138−339	01 40 31.0 −33 40 51	2.356	18.5	1	88	58	01 40 30.2 −33 41 48		17.2	17.5	FC of spectra
15	Q 0138−342	01 40 48.7 −33 57 51	2.074	18.3	1	88	68	01 40 50.2 −33 58 56		17.2	17.7	FC of spectra
16	Q 0154−500	01 56 07.0 −49 45 31	2.460	18.7	1	2004	68	01 56 06.8 −49 44 23		19.1	19.3	finding chart
17	NGC 772#2	01 59 21.0 + 19 00 32	2.612	19.4	1	101	338	01 59 39.2 + 19 04 11	p	19.3	19.6	approx pos, opt pos redshift confirmed A. Myers
18	Q 0229 + 0656	02 32 04.5 + 07 09 54	0.903		1	44	972	02 32 04.8 + 07 26 06	rx	17.8	18.0	PKS 0229 + 072, OA given name was 0229 + 0712
19	2E 0237 + 3953	02 41 00.7 + 40 07 21	0.528	18.3	1	2209	102	02 40 54.7 + 40 06 06	x	18.4	18.7	*Einstein*, only X-ray object in vicinity
20	CFSM035	03 08 09.0 −55 09 07	0.590		1	1753	40	03 08 11.4 −55 09 41		18.4	19.1	finding chart
21	IXO 15	03 33 11.9 −37 11 35	1.321	20.1	1	2613	3 598	03 33 11.3 −36 11 37	x	19.5	19.8	FC, VCV wrote −37 instead of −36
22	Q 0334−3554	03 36 37.2 −35 44 32	1.859	19.7	1	1566	2 400	03 36 37.1 −35 04 32	x	19.4	19.6	OA correct, VCV off by 40 arcmin decl
23	Q 0336−3603	03 38 43.6 −35 53 49	0.741	19.6	1	1566	1 200	03 38 43.5 −35 33 49	x	19.3	19.3	OA correct, VCV off by 20 arcmin decl
24	Q 0336−3507	03 38 53.0 −34 57 54	0.610	19.4	1	1566	1 200	03 38 53.0 −34 37 54	x	19.1	19.3	OA correct, VCV off by 20 arcmin decl
25	Q 0337−3456	03 39 27.5 −34 47 07	1.364	19.7	1	1566	600	03 39 27.4 −34 37 07	x	19.0	19.6	OA correct, VCV off by 10 arcmin decl
26	XSF3:42	03 41 14.5 −44 05 27	2.277	21.9	1	2090	35	03 41 12.7 −44 05 56	x		21.7	2RXP J034112.5−440601
27	XSF3:20	03 41 38.8 −43 53 28	0.564	19.7	1	2090	621	03 42 36.2 −43 53 16	x	18.9	19.2	1 time-min E, SIMBAD: 1AXG J034236−4352, X-ray 2RXP J034235.6−435316
28	RXS J03499 + 0640	03 49 59.7 + 06 40 56		19.1	2	62	42	03 49 57.8 + 06 41 27	r	18.3	19.5	Appenzeller treasure hunt ok
29	RXS J04173 + 0347	04 17 20.8 + 03 47 01	0.082	17.3	3	62	34	04 17 18.6 + 03 46 53	r	16.8	17.6	NVSS J041719.5 + 034650
30	SDSSp J04375−0045	04 37 32.8 −00 45 18	2.818	22.8	1	936	150	04 37 42.8 −00 45 18		21.3	22.6	10 time seconds E, OA ok, SDSS J043742.81−004517.6
31	HE 0435-1223	04 38 14.8 −12 23 14	1.689	17.2	1	1622	359	04 38 14.8 −12 17 15	x	16.4	16.2	FC, VCV did not convert decl to J2000
32	Q 0440−168	04 42 14.8 −16 42 22	2.679	18.0	1	1996	705	04 43 03.4 −16 43 55	?	18.2	18.7	approx pos, bright Hazard, best optical
33	RXS J06511 + 6842	06 51 06.8 + 68 42 37	0.698	18.9	1	62	35	06 51 12.6 + 68 42 51	x	19.0	18.6	Appenzeller treasure hunt ok
34	RXS J07181 + 6005	07 18 06.8 + 60 05 33	1.018	20.4	1	62	38	07 18 09.8 + 60 06 04	x	19.7	20.8	Appenzeller treasure hunt ok
35	RXS J07309 + 6343	07 30 50.6 + 63 44 17	0.098	19.4	3	62	33	07 30 55.4 + 63 44 09	x	18.9	21.3	1RXS J073055.1 + 634405
36	MCG + 09.13.070	07 50 32.3 + 56 29 02	0.019	18.0	3	1766	3 600	07 50 28.9 + 55 29 02		13.4	15.6	1° S
37	Q 0752 + 617	07 56 22.4 + 61 34 01	1.892		1	20	65	07 56 31.4 + 61 33 52	?	17.5	18.3	approx pos, best optical fit
38	RXS J07587 + 6334	07 58 44.8 + 63 34 16	0.446	16.7	1	62	56	07 58 51.4 + 63 33 41	x	17.0	17.5	Appenzeller treasure hunt ok
39	1H 0828−706	08 28 17.2 −70 48 59	0.239	16.7	1	306	180	08 28 44.0 −70 51 02	??	16.3	17.1	approx pos, best optical only
40	NGC 2639 C2.4	08 44 49.6 + 54 23 06	2.630		1	352	14 413	08 44 45.2 + 50 22 53	r	19.3	20.1	OA correct, VCV off by 4° decl
41	WEE 16	08 45 39.9 + 44 42 31	2.360	21.8	1	2488	56	08 45 35.6 + 44 43 02		20.3	21.3	finding chart
42	Q J08495 + 1150	08 49 35.4 + 11 50 27	1.200		1	1750	35	08 49 36.6 + 11 50 57	p	19.0	19.7	OA correct, VCV off by 30 arcsec decl

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Table 5. Continued.

No	Name	VCV J2000	z	V mag	Table	OA Ref	Move (arcsec)	Optical J2000	Opt Typ	R mag	B mag	Comment
43	Q 0856 + 406	08 59 14.6 + 40 28 19	2.290		1	2306	400	08 59 45.2 + 40 25 05	p	19.7	20.8	approx pos, NBCKDE z ok, standout obj
44	NGC 2859 U3	09 24 54.2 + 34 16 48	1.460	20.3	1	82	742	09 25 54.0 + 34 16 45	p	19.4	19.7	FC, 1 time-min
45	NGC 2859 U2	09 24 57.8 + 34 39 52	2.250	19.7	1	82	739	09 25 57.6 + 34 39 50	p	19.0	19.5	FC, 1 time-min, but NBCKDE photo-z = 0.735
46	TB 0948 + 722	09 52 24.6 + 71 57 55	0.529		1	18	138	09 52 54.2 + 71 58 03	x	17.2	17.2	approx pos, standout X-ray obj
47	TB 0958 + 735	10 02 25.4 + 73 15 32	2.067	17.0	1	17	227	10 03 17.6 + 73 15 59	rx	17.0	17.4	approx pos, standout radio/X-ray obj
48	Q 1013 + 1126	10 16 09.7 + 11 11 02	2.220	17.6	1	2238	416	10 16 37.9 + 11 11 26	!	17.6	18.2	approx pos, standout optical match
49	SDSS J10292 + 2623A	10 29 15.9 + 29 16 40	2.197	18.8	1	1100	10 380	10 29 14.2 + 26 23 40	rx	18.4	18.6	FC, lens component, 'A' and 'B' switched around, unfinished entry?
50	TOL 1036.7−27.2	10 38 49.0 −27 29 19	3.084	21.5	1	231	85	10 38 42.6 −27 29 12		18.7	20.6	finding chart
51	NGC 3338 UB2	10 42 09.4 + 13 45 53	2.140	19.7	1	84	1 008	10 42 45.8 + 13 31 37	pr	19.9	19.9	approx pos, Arp treasure hunt ok, NBCKDE z ok
52	NGC 3338 UB1	10 42 19.3 + 13 44 53	2.040	20.4	1	84	1 209	10 41 04.9 + 13 53 48	p	19.6	20.2	approx pos, Arp treasure hunt ok, NBCKDE z ok
53	RXS J10478−0113	10 47 50.0 −01 12 43	0.435	18.9	1	62	41	10 47 51.6 −01 13 16	x	16.9	18.6	Appenzeller treasure hunt ok
54	RX J10509 + 5706	10 50 56.2 + 57 06 48	0.550	20.5	3	2047	32	10 50 56.6 + 57 07 20	x	20.0	20.4	OA object 67B 'group'
55	RXS J10529−0736	10 52 59.6 −07 36 19	0.134	18.3	3	62	36	10 53 00.8 −07 35 48		17.3	18.2	Appenzeller treasure hunt ok
56	NGC 3516 U2	11 03 57.4 + 72 37 50	1.710	18.6	1	2238	58	11 03 45.4 + 72 38 12	x	18.3	19.2	approx pos, standout object
57	Zw 011.012	11 09 42.9 −03 49 03	0.039	15.4	3	1246	576	11 09 41.5 −03 39 27	x	12.0	13.8	10 arcmin S
58	LEDA 93604	11 26 02.4 + 27 59 56	0.105	17.6	3	1169	17 436	11 04 05.8 + 28 00 15		15.6	16.8	offset 22 time-min from true location
59	IXO 40	11 50 57.9 −29 00 43	0.789	19.1	1	922	1 002	11 50 57.8 −28 44 01	x	20.0	19.6	FC, 1000 arcsec N, transcription error
60	Q 1159 + 00	12 02 03.8 + 00 13 18	2.580		1	1318	615	12 02 20.0 + 00 22 42		17.2	17.6	approx pos, move to Q120220.06 + 002242.1, z = 2.58, Crighton et al. (2011)
61	KP 1209.9 + 10.9	12 12 29.8 + 10 41 23	2.100	21.0	1	2179	59	12 12 25.8 + 10 41 30		20.2	20.5	finding chart
62	KP 1227.8 + 07.4	12 30 22.7 + 07 10 11	3.000	20.5	1	2179	68	12 30 27.0 + 07 09 46		20.1	20.3	finding chart
63	M 87.1524	12 31 02.2 + 12 27 57	2.230	21.1	1	1635	468	12 30 30.8 + 12 26 30	px		19.7	Strom treasure hunt *extraordinaire* ok, Strom et al. (1981), NBCKDE photo-qso, X-ray
64	KP 1229.6 + 07.8	12 32 10.3 + 07 33 44	1.510	20.0	1	2179	47	12 32 07.5 + 07 34 05	p	20.0	20.7	finding chart
65	2XMM J12321 + 2152	12 32 54.9 + 21 52 55	1.870		1	580	696	12 32 04.9 + 21 52 55	x			50 time seconds offset, transcription error
66	Q 1233 + 4749	12 35 22.9 + 47 32 29	1.669		1	2306	521	12 36 14.2 + 47 32 59	rx	20.1	21.2	approx pos, standout obj, radio/X-ray, only eligible object in narrow-decl tile of sky
67	2MASS J13030−2447	13 03 02.0 −24 47 02	0.125	17.8	3	777	136	13 03 12.0 −24 47 02		18.0	19.6	10 time seconds E to location given by OA
68	KP 1300.8 + 34.7	13 03 11.9 + 34 27 09	1.900	21.0	1	2179	32	13 03 11.0 + 34 26 39	p	20.6	20.8	finding chart
69	KP 1307.6 + 18.1	13 10 03.9 + 17 53 42	1.900	21.0	1	2179	39	13 10 05.6 + 17 53 11	p	20.7	21.1	finding chart
70	KP 1308.9 + 18.3	13 11 25.1 + 18 08 04	1.710	20.0	1	2179	31	13 11 23.0 + 18 08 13	p	19.1	20.9	finding chart
71	TOL 1313−309	13 16 28.7 −31 11 49	0.048	18.0	3	2146	57	13 16 32.6 −31 12 18	r	14.6	16.6	finding chart
72	VPM J13459 + 2741	13 45 44.5 + 27 41 01	1.038	19.1	1	1563	135	13 45 54.6 + 27 41 02	p	18.9	18.9	10 time seconds E
73	RX J13522−3228	13 52 16.0 −32 28 20	0.134	19.1	3	120	38	13 52 16.2 −32 28 58	x	18.0	19.2	1RXS J135216.0−322850 is here, OA pos error
74	SMM J14010 + 0252	14 01 14.9 + 02 52 23	2.565		1	2294	150	14 01 04.9 + 02 52 24		21.0	22.0	10 time seconds W
75	SBS 1401 + 566	14 02 42.7 + 56 21 37	2.580		1	1480	107	14 02 55.4 + 56 21 51	!	17.0	18.1	approx pos, best optical match in B1401 + 566, OA says vmag 17.0-17.5
76	3C 295.0	14 11 20.5 + 52 11 10	0.461	19.8	3	1579	60	14 11 20.4 + 52 12 10	rx	18.0	20.8	1 arcmin N, FIRST J141120.5 + 521209, CXO also
77	KP 1423.5 + 20.2	14 25 52.7 + 20 02 43	2.190	20.5	1	2179	35	14 25 51.3 + 20 03 12	p	20.1	22.0	finding chart
78	KP 1423.5 + 20.1	14 25 52.8 + 19 56 34	1.840	20.5	1	2179	35	14 25 52.3 + 19 57 08	p		22.0	finding chart
79	KP 1423.8 + 20.1	14 26 07.3 + 19 57 48	2.300	20.5	1	2179	46	14 26 05.9 + 19 58 30		20.3	21.1	finding chart
80	NDWFS J14275 + 3522	14 27 39.7 + 35 22 09	5.530		1	489	122	14 27 29.7 + 35 22 09				10 time seconds W to OA location

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Table 5. Continued.

No	Name	VCV J2000	z	V mag	Table	OA Ref	Move (arcsec)	Optical J2000	Opt Typ	R mag	B mag	Comment
81	XBS J14496-0908	14 49 36.6 −09 08 29	1.260	19.3	1	372	65 819	14 49 36.6 + 09 08 30	x	19.2	19.6	into NH, change '−' to ' + ', OA pos error
82	KP 1504.0 + 21.7	15 06 16.2 + 21 30 31	1.160	18.5	1	2179	30	15 06 18.0 + 21 30 45	p	20.2	20.6	finding chart
83	Q 1532 + 2332	15 34 38.1 + 23 22 30	1.249	19.8	1	106	137	15 34 48.0 + 23 22 32	px	20.0	21.1	OA Table 1, object 'Arp 9', 10 time seconds E
84	KISSR 854	15 45 26.8 + 28 32 07	0.083	17.3	3	1127	3 601	15 45 26.7 + 29 32 08		15.6	17.3	1° N to AGN SDSS J154526.76 + 293207.7
85	E 1550 + 721	15 49 40.6 + 72 00 57	0.177	19.9	3	1872	36	15 49 45.6 + 72 01 24	x	17.6	18.7	*Einstein* detected, this is the only X-ray object in the vicinity, 2RXP J154945.3 + 720121
86	RXS J16198 + 6926	16 19 51.8 + 69 26 26	0.291	16.7	1	62	46	16 19 43.6 + 69 26 41	x	16.8	17.2	Appenzeller treasure hunt ok
87	Q 1636 + 7403	16 35 16.2 + 73 57 51	0.603		1	62	60	16 35 28.0 + 73 57 17		18.2	18.5	Appenzeller treasure hunt ok
88	RXS J16544 + 7007	16 54 24.0 + 70 07 14	2.077	18.2	1	62	43	16 54 22.8 + 70 06 31	r	18.5	18.5	Appenzeller treasure hunt ok
89	RXS J16596 + 7036	16 59 40.6 + 70 36 32	0.835	18.9	1	62	39	16 59 39.6 + 70 35 53		18.8	19.6	Appenzeller treasure hunt ok
90	RXS J17196 + 7443	17 19 41.0 + 74 43 00	1.500	19.1	2	62	36	17 19 39.8 + 74 43 36	pr	19.4	20.1	Appenzeller treasure hunt ok
91	Q 1809 + 63	18 10 17.0 + 63 29 14	1.091		1	825	59	18 10 17.0 + 63 28 15		20.3	21.0	OA error, wrote 63 29 14, is 63 28 14, i.e. 1 arcmin S
92	RX J18103 + 6328	18 10 23.6 + 63 28 08	0.838		1	825	50	18 10 31.0 + 63 28 09	p	19.6	19.9	OA Section 6 gives opt pos, BOSS z ok
93	Pavo 1#4	21 15 59.0 −67 57 15	0.408	19.8	3	895	360	21 15 58.4 −67 51 15	x	18.1	19.7	OA correct, VCV off by 6 arcmin decl
94	2E 2141 + 0400	21 44 07.8 + 04 13 25	0.401	20.6	3	2237	61	21 44 08.0 + 04 14 26	px	19.5	18.9	FC, OA position restored, 1 arcmin N
95	MS 21432 + 1429	21 45 42.2 + 14 42 55	1.387	20.4	1	1403	62	21 45 42.0 + 14 43 57	p	19.7	20.6	FC, 1 arcmin S
96	Q 2217 + 0844	22 20 08.7 + 09 00 02	0.228	17.6	1	955	60	22 20 08.6 + 08 59 02	r	17.6	18.4	1 arcmin S
97	Q 2239−386	22 42 21.7 −38 20 17	3.554		1	1318	183	22 42 37.0 −38 20 49	x	19.5	20.7	approx pos, Hazard hi-z, standout X-ray
98	B3 2311 + 396A	23 13 50.2 + 40 03 03		18.5	2	2431	600	23 13 50.4 + 39 53 03		19.1	20.2	FC given but no position published, 10 arcmin S
99	NGC 7585 UB1	23 17 58.8 −04 39 54	1.410	18.7	1	84	558	23 18 16.6 −04 31 44	px	18.1	18.5	approx pos, Arp treasure hunt ok, BOSS z ok
100	Q 2334 + 10	23 37 02.5 + 10 46 36	2.243		1	1318	800	23 37 30.6 + 10 58 00	p	17.9	18.1	approx pos, bright Hazard, BOSS z ok
101	Q 2342 + 089	23 44 33.0 + 09 10 39	2.784		1	1996	864	23 45 31.0 + 09 09 06	x	18.1	18.4	approx pos, standout obj but 90 arcsec outside tile
102	PSS J2344 + 3409	23 44 47.1 + 34 09 00	3.960	19.0	1	620	41	23 44 47.0 + 34 09 41		18.8	20.6	VCV omitted decl arcsecs
103	Q 2345−358	23 47 52.2 −35 32 01	2.386	17.9	1	88	48	23 47 51.1 −35 32 47	x	17.8	18.0	move to 6dF J234750.9−353248, $z = 2.387$
104	Q 2351 + 10	23 54 03.4 + 10 46 42	2.379		1	1318	833	23 53 41.0 + 10 59 27	p	18.4	18.4	approx pos, bright Hazard, BOSS z ok, standout
105	Q 2351−406	23 54 05.2 −40 23 38	2.100	21.5	1	1699	34	23 54 03.8 −40 24 08		19.7	20.4	finding chart

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Table 6. Eighty-Nine Moves of 15–29 arcsec.

No	Name	VCV J2000	z	V mag	Table	OA Ref	Move (arcsec)	Optical J2000	Opt Typ	R mag	B mag	Comment
1	PC 0027 + 0520	00 30 30.6 + 05 37 12	1.334	21.5	3	2061	15	00 30 29.6 + 05 37 06		19.8	20.6	Finding chart
2	PC 0028 + 0453	00 31 10.1 + 05 10 02	3.396	21.6	1	2061	15	00 31 09.6 + 05 09 49		20.8	21.2	Finding chart
3	PC 00289 + 0451	00 31 12.1 + 05 07 51	0.280	22.9	3	2061	15	00 31 11.6 + 05 07 38		22.5	23.0	Finding chart
4	1WGA J0057.3−2212	00 57 18.8 −22 12 34		20.6	2	1776	16	00 57 19.9 −22 12 38	rx	21.0	21.6	VCV gave X-ray position only
5	Q 0124−360	01 26 27.7 −35 45 19	1.560		1	2015	19	01 26 27.4 −35 45 00		17.8	18.3	Finding chart
6	Q 0127−371	01 29 40.8 −36 51 25	0.200	20.5	3	2015	16	01 29 40.6 −36 51 41	r	18.8	19.1	Finding chart
7	Q 0149−3908	01 51 17.4 −38 53 48	2.250	19.5	1	1104	19	01 51 15.8 −38 53 41	!	19.3	19.7	Standout optical match
8	Q 02031 + 151	02 05 50.5 + 15 23 25	2.000	20.3	1	45	16	02 05 50.4 + 15 23 41	p	19.7	20.7	Finding chart
9	FSM011	03 12 53.0 −55 09 28	0.658		1	1753	16	03 12 52.2 −55 09 42			21.4	Finding chart
10	XSF3:61	03 41 08.2 −44 15 26	1.730	21.9	1	2090	26	03 41 10.5 −44 15 32	x	21.0	22.0	2RXP J034110.8−441533
11	RXS J03411−3635	03 41 08.8 −36 34 59	0.347		3	2396	16	03 41 08.5 −36 35 15	x	18.5	18.6	Corrected to OA position
12	XSF3:29	03 41 14.8 −43 57 27	0.660	22.3	3	2090	25	03 41 15.5 −43 57 03	?		22.3	Good optical, but near plate limit
13	XSF3:71	03 41 55.9 −44 22 29	1.080	21.5	1	2090	17	03 41 56.9 −44 22 16	x		21.2	2RXP J034156.1−442214, SIMBAD agrees
14	XSF3:23	03 42 20.7 −43 55 30	2.551	22.1	1	2090	16	03 42 19.8 −43 55 17	x		21.8	2RXP J034219.4−435519
15	XSF3:56	03 43 55.9 −44 11 36	2.210	22.0	1	2090	18	03 43 56.1 −44 11 54	?		22.1	Best opt, 2RXP J034354.4−441203 nearby
16	H 0450−1310	04 53 12.8 −13 05 46	2.250	16.5	1	2344	15	04 53 13.6 −13 05 55	x	17.2	17.7	Approx OA pos, standout X-ray
17	KP 0456.4 + 02.5	04 58 58.9 + 02 35 44	1.430	17.5	1	2179	27	04 59 00.1 + 02 35 24		18.2	18.9	Finding chart
18	RX J04598 + 1808	04 59 50.8 + 18 08 38	0.157	19.5	3	1634	15	04 59 51.8 + 18 08 40	x	18.6	19.5	Only optical for 1RXS J045952.1 + 180831
19	RXS J07161 + 5746	07 16 07.3 + 57 46 03	0.488	19.6	3	62	20	07 16 07.2 + 57 46 23		19.6	19.5	Appenzeller treasure hunt ok
20	RXS J07177 + 6835	07 17 47.8 + 68 35 37	1.115	17.7	1	62	19	07 17 46.8 + 68 35 19	x	17.7	17.9	Appenzeller treasure hunt ok
21	RXS J07206 + 6338	07 20 39.0 + 63 38 44	0.279	19.6	3	62	25	07 20 37.6 + 63 39 07		19.3	20.3	Appenzeller treasure hunt ok
22	RXS J07576 + 6557	07 57 36.4 + 65 57 51	0.383	17.1	1	62	26	07 57 32.8 + 65 58 04		20.1	21.0	Appenzeller treasure hunt ok
23	1WGA J0827.1 + 0841	08 27 06.0 + 08 41 18		20.4	2	369	16	08 27 07.0 + 08 41 21	r	18.9	20.8	Standout radio Bl Lac cand
24	WEE 33	09 34 08.6 + 21 29 08	2.310	21.1	1	2488	22	09 34 08.0 + 21 29 28	p	20.4	21.0	Finding chart
25	1WGA J0953.9 + 4617	09 53 59.2 + 46 17 18	0.612	19.8	1	1600	17	09 53 59.0 + 46 17 01	px	19.6	19.5	Standout photometric–X-ray
26	BOL 105	09 57 37.0 + 69 38 12	2.240	21.4	1	237	19	09 57 40.2 + 69 38 22		18.2	20.3	Finding chart
27	RXS J10304−0834	10 30 29.8 −08 34 05	0.207	16.6	1	62	22	10 30 30.9 −08 33 51	x	18.1	18.7	Appenzeller treasure hunt ok
28	TOL 1033.1−27.3	10 35 25.8 −27 33 42	1.610	21.8	1	231	19	10 35 25.6 −27 34 01		20.7	20.8	Finding chart
29	RXS J10384−0806	10 38 28.0 −08 06 13	0.216	15.7	1	62	22	10 38 28.4 −08 06 34		17.6	17.5	Appenzeller treasure hunt ok
30	RXS J10478−0715	10 47 52.5 −07 15 10	0.095	18.3	3	62	24	10 47 51.4 −07 15 28		17.0	17.8	Appenzeller treasure hunt ok
31	A4/22	11 02 05.8 + 30 02 33	1.045	20.0	1	2027	22	11 02 07.2 + 30 02 46		19.8	20.9	Only available optical obj, OA Table 2 stated 20-arcsec uncertainty
32	RXS J11028−0148	11 02 52.0 −01 48 51		21.7	2	62	23	11 02 53.0 −01 49 07	prx	19.6	20.0	Appenzeller treasure hunt ok
33	RXS J11054 + 0205	11 05 28.5 + 02 05 19	0.247		3	62	16	11 05 29.5 + 02 05 24	x	18.2	19.6	2dF galaxy TGN435Z108, 1RXS J110528.6 + 020526
34	WEE 43	11 16 07.6 + 13 57 56	3.033	19.8	1	2488	21	11 16 06.4 + 13 58 08		19.4	20.9	Finding chart
35	RXS J11167−1711	11 16 44.8 −17 11 27	0.375	17.5	1	120	24	11 16 43.5 −17 11 42	!	16.9	17.7	Nearest optical, v ok
36	KP 1127.9 + 07.4	11 30 32.9 + 07 12 32	2.000	20.5	1	2179	17	11 30 32.2 + 07 12 46		18.7	19.1	Finding chart
37	KP 1128.7 + 07.4	11 31 18.5 + 07 12 43	2.310	19.5	1	2179	28	11 31 16.8 + 07 12 55	p	19.6	20.1	Finding chart
38	1E 1137 + 6555	11 40 16.6 + 65 38 46	0.397	19.5	3	675	15	11 40 18.0 + 65 38 34	x	19.2	20.1	Finding chart

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Table 6. Continued.

No	Name	VCV J2000	z	V mag	Table	OA Ref	Move (arcsec)	Optical J2000	Opt Typ	R mag	B mag	Comment
39	RXS J12124 + 2723	12 12 28.1 + 27 23 43	0.376	18.9	1	62	19	12 12 28.7 + 27 23 26	x	18.7	19.3	Appenzeller treasure hunt ok
40	4C 26.37	12 24 33.0 + 26 13 00	0.687	21.3	3	1776	15	12 24 33.2 + 26 13 15	pr	19.7	21.1	Standout photometric, radio lobes
41	KP 1229.0 + 07.8	12 31 35.8 + 07 34 42	1.930	20.5	1	2179	27	12 31 34.0 + 07 34 41		19.0	20.9	Finding chart
42	KP 1243.7 + 34.6	12 46 10.1 + 34 21 02	2.290	20.0	1	2179	15	12 46 11.2 + 34 21 08	p	18.6	19.0	Finding chart
43	KP 1244.1 + 34.6	12 46 33.5 + 34 24 42	1.900	20.0	1	2179	19	12 46 34.3 + 34 24 58	p	20.4	20.7	Finding chart
44	KP 1245.3 + 34.3	12 47 45.0 + 34 02 06	1.820	20.0	1	2179	15	12 47 44.0 + 34 02 15	px	19.0	19.4	Finding chart
45	KP 1245.6 + 34.2	12 48 03.9 + 34 00 13	2.070	20.5	1	2179	21	12 48 02.6 + 34 00 26	px	19.2	20.1	Finding chart
46	KP 1300.2 + 34.3	13 02 36.5 + 34 04 57	1.800	20.5	1	2179	15	13 02 35.3 + 34 04 56		19.6	21.6	Finding chart
47	KP 1300.5 + 34.6	13 02 53.4 + 34 25 10	1.930	20.0	1	2179	19	13 02 53.2 + 34 24 51	p	20.6	20.6	Finding chart
48	AH 1	13 06 11.0 + 29 30 02	0.710	19.0	1	798	15	13 06 11.0 + 29 29 47	!	18.9	19.4	Nearest optical, v ok
49	B8/19	13 09 58.7 + 30 15 51	3.300	22.5	1	2027	19	13 09 58.0 + 30 16 08		22.2	22.9	Only eligible object, $u = 25.7$, OA Table 2 stated 20-arcsec uncertainty
50	WEE 120	13 11 43.0 + 28 29 17	2.000	22.0	1	2488	26	13 11 43.2 + 28 29 43	p	20.2	20.8	Finding chart
51	PKS 1330−14	13 33 23.8 −14 36 21		19.0	2	1113	22	13 33 24.8 −14 36 06		19.1	20.7	Finding chart
52	IRAS 14054−1958	14 08 09.9 −20 12 15	0.161	22.0	3	2393	27	14 08 11.5 −20 12 29	r	17.1	19.3	OA gave right location and name
53	RX J14136−1538	14 13 40.3 −15 38 33	0.226	17.8	1	120	20	14 13 41.0 −15 38 15	rx	17.1	18.0	Standout radio/X-ray object
54	87GB 14208 + 2255	14 23 08.0 + 22 42 19	4.316	18.7	1	191	21	14 23 08.2 + 22 41 58	prx	18.8		Standout photometric radio/X-ray
55	KP 1422.9 + 20.0	14 25 18.4 + 19 48 20	2.000	20.0	1	2179	29	14 25 19.9 + 19 48 40	p		20.2	Finding chart
56	IRAS F14481 + 4454	14 49 56.3 + 44 41 56	0.660		1	2572	29	14 49 53.6 + 44 41 50	pr	19.6	20.6	Standout photometric radio object, OA says no X-ray
57	KP 1504.8 + 21.9	15 07 07.0 + 21 48 07	2.140	20.5	1	2179	16	15 07 07.9 + 21 47 58	p	20.3	20.3	Finding chart
58	Q 15100−089	15 12 42.2 −09 09 01	2.100	20.4	1	45	29	15 12 42.4 −09 09 30		20.8	20.5	Finding chart
59	KP 1544.4 + 21.2	15 46 38.4 + 21 02 58	2.000	20.5	1	2179	28	15 46 40.4 + 21 02 54	x	19.2	20.2	Finding chart
60	KP 1606.6 + 28.9	16 08 39.8 + 28 51 46	2.560	19.0	1	2179	23	16 08 39.6 + 28 51 23		19.6	19.9	Finding chart
61	KP 1607.3 + 28.8	16 09 21.4 + 28 41 11	2.290	20.0	1	2179	28	16 09 19.8 + 28 40 51	p	19.3	20.0	Finding chart
62	KP 1622.0 + 26.8	16 24 08.4 + 26 41 34	2.160	21.0	1	2179	29	16 24 10.4 + 26 41 43	px	20.0	20.9	Finding chart
63	RXS J16248 + 7039	16 24 48.4 + 70 39 28	0.361	17.5	1	62	15	16 24 51.4 + 70 39 25	x	17.5	17.8	Appenzeller treasure hunt ok
64	KP 1623.2 + 27.0	16 25 20.1 + 26 53 34	2.300	20.0	1	2179	17	16 25 21.0 + 26 53 22	pr	20.2	20.8	Finding chart
65	RXS J16350 + 7009	16 35 02.2 + 70 09 40	0.234	17.7	1	62	19	16 34 58.4 + 70 09 40	x	17.9	18.0	Appenzeller treasure hunt ok
66	KP 1635.5 + 63.1	16 36 04.0 + 62 59 06	1.920	20.0	1	2179	23	16 36 04.4 + 62 58 43	p	19.3	20.4	Finding chart
67	RXS J16362 + 7204	16 36 17.2 + 72 04 57	0.187	16.8	1	62	18	16 36 15.2 + 72 05 13	x	16.2	17.8	Appenzeller treasure hunt ok

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Table 6. Continued.

No	Name	VCV J2000	z	V mag	Table	OA Ref	Move (arcsec)	Optical J2000	Opt Typ	R mag	B mag	Comment
68	KP 1635.5 + 26.6	16 37 37.2 + 26 34 21	1.950	20.5	1	2179	27	16 37 35.2 + 26 34 30	px	19.9	20.8	Finding chart
69	RXS J16408 + 7448	16 40 49.4 + 74 48 37	0.776		1	62	18	16 40 47.8 + 74 48 20		18.7	17.8	Appenzeller treasure hunt ok
70	RXS J17028 + 7222	17 02 51.2 + 72 22 26	0.271	17.1	1	62	23	17 02 54.2 + 72 22 45	x	16.8	17.7	Appenzeller treasure hunt ok
71	RXS J17070 + 7349	17 07 04.8 + 73 49 31	0.916	18.2	1	62	18	17 07 01.0 + 73 49 22	pr	18.3	18.7	Appenzeller treasure hunt ok
72	RXS J17190 + 7443	17 19 06.0 + 74 42 59	1.530	17.9	1	62	16	17 19 05.8 + 74 43 15	p	18.6	18.2	Appenzeller treasure hunt ok
73	Q 17257 + 503	17 26 57.6 + 50 15 48	2.100	20.4	1	45	20	17 26 58.9 + 50 16 04	x		21.7	Finding chart
74	RX J18112 + 6543	18 11 09.6 + 65 43 39	0.489	16.7	1	825	15	18 11 11.6 + 65 43 48	x	18.3	18.7	Galaxy NPM 1G + 65.0166 is here, OA correct
75	KP 1826.8 + 48.5	18 28 06.9 + 48 33 20	2.170	18.5	1	2179	27	18 28 08.2 + 48 33 43		19.0	20.2	Finding chart
76	Q 1922 + 4748	19 23 26.0 + 47 54 26	1.520		1	1609	16	19 23 27.2 + 47 54 17		18.7	19.4	MG4 J192325 + 4754
77	RXS J20175−4114	20 17 31.2 −41 14 51		17.0	2	1246	28	20 17 30.0 −41 15 16	r	18.6	20.6	Standout radio, VCV loc is X-ray loc, *RASS* 1RXS J201731.2−411452 nearby
78	87GB 20451 + 2632	20 47 19.3 + 26 43 40	1.280	20.6	1	736	27	20 47 20.3 + 26 44 03		22.0		lens, VCV did not report OA-given position
79	Q 2121 + 2459	21 23 34.4 + 25 12 20	1.250		1	1609	19	21 23 34.7 + 25 12 38	rx	18.5	19.2	Standout radio/X-ray
80	Q 21265−150	21 29 18.9 −14 49 29	2.100	20.3	1	45	19	21 29 18.9 −14 49 48		19.4	20.0	Finding chart
81	Q 2142.8−1566	21 45 30.7 −15 25 41	2.050	21.2	1	2425	15	21 45 29.7 −15 25 44	!	20.3	20.2	Best and nearest optical
82	RXS J22103 + 0546	22 10 19.4 + 05 46 58	0.150		3	62	18	22 10 18.6 + 05 46 44	r	16.2	18.3	Appenzeller treasure hunt ok
83	RXS J22122 + 0351	22 12 16.2 + 03 51 00	0.214	18.6	3	62	23	22 12 17.0 + 03 50 41	r	18.3	20.0	Appenzeller treasure hunt ok
84	RXS J22179 + 0835	22 17 56.9 + 08 35 43	0.206	19.2	3	62	16	22 17 55.8 + 08 35 46		18.6	20.2	Appenzeller treasure hunt ok
85	RXS J22211 + 1441	22 21 07.5 + 14 41 04	0.894	18.3	1	62	19	22 21 08.0 + 14 40 47	px	18.2	18.1	Appenzeller ok, BOSS z ok
86	RXS J22251 + 1136	22 25 11.2 + 11 36 01		19.9	2	62	22	22 25 12.6 + 11 36 02	pr	19.6	20.3	Appenzeller treasure hunt ok
87	Q 2226−3905	22 29 50.0 −38 50 00	1.133	18.6	1	857	19	22 29 51.4 −38 50 03	!	17.6	18.5	OA pos approx only, best optical
88	RXS J22321 + 0912	22 32 10.5 + 09 12 18	0.383	17.5	1	62	15	22 32 11.4 + 09 12 11	x	17.7	17.7	Appenzeller treasure hunt ok
89	RXS J22363 + 0756	22 36 20.7 + 07 56 32	0.486	19.2	1	62	18	22 36 21.8 + 07 56 38	x	19.2	19.6	Appenzeller treasure hunt ok

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Table 7. One Hundred and Four Moves of 8–14 arcsec.

No	Name	VCV J2000	z	V mag	Table	OA Ref	Move (arcsec)	Optical J2000	Opt Typ	R mag	B mag	Comment
1	Q 0004−019	00 07 22.5 −01 41 10	2.220	19.5	1	2673	8	00 07 22.0 −01 41 13		19.2	19.6	Finding chart
2	Q 0009 + 026B	00 12 32.3 + 02 57 16	0.510	18.0	1	2672	10	00 12 32.4 + 02 57 06		19.7	19.5	Finding chart
3	Q 0010 + 017	00 12 58.4 + 02 03 07	2.240	18.0	1	2672	10	00 12 58.6 + 02 02 57		18.8	19.3	Finding chart
4	TEX 0015 + 160	00 18 31.2 + 16 20 44	1.333		1	2577	12	00 18 31.6 + 16 20 55	x	19.1	20.4	Finding chart
5	Q 0016−357	00 18 40.6 −35 29 13	3.190	19.1	1	1701	12	00 18 40.0 −35 29 04	r	18.4	20.2	Standout radio
6	PC 0026 + 0501	00 28 40.0 + 05 18 18	1.467	19.1	1	2061	8	00 28 40.3 + 05 18 12	x	18.6	19.0	Finding chart
7	PC 0028 + 0519	00 31 12.2 + 05 35 47	0.080	19.3	3	2061	12	00 31 11.6 + 05 35 39		19.4	20.1	Finding chart
8	PC 0028 + 0521	00 31 13.9 + 05 38 08	0.331	21.9	3	2061	11	00 31 13.3 + 05 38 01		21.8	22.5	Finding chart
9	Q J0035−7201	00 35 29.8 −72 01 23	0.666	19.4	1	2311	12	00 35 30.2 −72 01 35	x	18.5	20.8	Finding chart
10	PKS 0041−395	00 43 37.6 −39 14 15	1.690	20.0	1	2003	9	00 43 36.8 −39 14 15		18.7	19.4	Finding chart
11	Q 0100−346	01 02 52.1 −34 25 17	0.800		1	2015	9	01 02 52.8 −34 25 14		18.1	18.4	Finding chart
12	Q 0126−330	01 29 15.5 −32 46 25	1.950	18.0	1	2015	9	01 29 14.9 −32 46 29		18.2	18.0	Finding chart
13	Q 0133−4122	01 35 23.2 −41 06 57	2.520	17.6	1	1104	12	01 35 22.1 −41 07 00	?	17.2	19.9	Best stellar object
14	H 0143−0050	01 46 12.4 −00 35 39	3.100	17.0	1	1141	9	01 46 11.9 −00 35 33		16.4	18.1	Nearby bright
15	Q 0205−486U	02 07 47.5 −48 34 55	2.010	19.1	1	2004	9	02 07 47.6 −48 34 46		19.4	19.5	Finding chart
16	PC 0227 + 0018	02 30 11.3 + 00 31 27	3.005	21.2	1	2061	9	02 30 11.0 + 00 31 34		22.0	22.4	Finding chart
17	PC 0227 + 0029B	02 30 29.8 + 00 42 57	2.576	20.7	1	2061	9	02 30 29.6 + 00 43 05	px		21.5	Finding chart
18	PC 0227 + 0053	02 30 31.6 + 01 06 54	0.970	20.4	1	2061	12	02 30 31.2 + 01 07 05		19.8	21.8	Finding chart
19	PC 0227 + 0024	02 30 31.7 + 00 37 31	2.351	20.7	1	2061	8	02 30 31.6 + 00 37 39	px	19.6	20.2	Finding chart
20	PC 0227 + 0042	02 30 33.6 + 00 56 15	3.892	20.7	1	2061	10	02 30 33.4 + 00 56 25		21.4	23.0	Finding chart
21	PC 0228 + 0026	02 30 37.8 + 00 39 40	1.346	19.8	1	2061	9	02 30 37.6 + 00 39 48	px	19.8	20.8	Finding chart
22	PC 0228 + 0114	02 30 41.2 + 01 27 39	0.083	20.6	3	2061	14	02 30 40.9 + 01 27 52		20.7	20.9	Finding chart
23	RXS J03313 + 0654	03 31 19.4 + 06 54 28		19.2	2	62	11	03 31 19.1 + 06 54 38	px	18.8	19.3	Appenzeller treasure hunt ok
24	RXS J04011 + 0004	04 01 10.8 + 00 04 13	0.474	18.0	1	62	14	04 01 10.2 + 00 04 02		18.2	18.7	Appenzeller treasure hunt ok
25	MS 04200-3838	04 21 49.7 −38 31 26	0.831	21.1	3	1403	10	04 21 48.8 −38 31 25	x	20.3	21.4	Finding chart
26	2E 0438−1635	04 40 41.1 −16 29 51	0.520	19.8	3	675	11	04 40 41.8 −16 29 50	x	18.9	20.5	Finding chart
27	H 0446−1440	04 48 36.2 −14 35 15	1.600	17.0	1	1141	8	04 48 36.7 −14 35 18		17.3	17.8	Standout v ok
28	1ES 0446 + 449	04 50 07.3 + 45 03 12		18.5	2	1775	10	04 50 06.6 + 45 03 06	x	13.5	20.3	Finding chart
29	H 0449−1325	04 51 42.6 −13 20 33	3.093	18.2	1	1997	14	04 51 42.7 −13 20 47	?	17.6	18.9	Good v but OA position is approx, alternative J045202.2−132049, $r = 17.7$, $b = 19.3$
30	H 0449−1645	04 52 13.6 −16 40 12	2.600	17.0	1	1141	10	04 52 14.2 −16 40 16		17.4	17.1	Standout v ok
31	PKS 0524−433	05 25 54.5 −43 18 11	2.164	18.0	1	1790	12	05 25 55.0 −43 18 00	r	18.0	19.1	Finding chart
32	1E 0540 + 4935	05 43 56.0 + 49 37 11	0.080	17.2	3	1008	10	05 43 56.8 + 49 37 05		15.9	17.6	Finding chart
33	NGC 2403 S	07 34 57.2 + 65 55 38	1.760	19.2	1	520	12	07 34 55.2 + 65 55 39	p	19.0	18.9	Finding chart
34	1WGA J0814.3 + 0858	08 14 21.0 + 08 57 00	0.240	19.9	2	369	12	08 14 21.5 + 08 57 06	r	19.3	20.0	VCV pos is approx radio pos only, Bl Lac behind galaxy, double lobes
35	AX J08362 + 5538	08 36 22.9 + 55 38 53	1.290	21.4	1	1654	12	08 36 22.6 + 55 38 41	x	19.9	20.6	X-ray obj, 2XMM J083622.6 + 553840
36	WEE 20	08 46 19.9 + 44 21 49	1.870	21.1	1	2488	8	08 46 20.2 + 44 21 42	p	19.2	19.3	Finding chart
37	KP 0847.2 + 15.5	08 50 02.4 + 15 18 49	2.180	21.0	1	2179	8	08 50 02.1 + 15 18 56	p	19.9	20.7	Finding chart
38	KP 0847.6 + 15.6B	08 50 28.0 + 15 28 22	2.200	19.0	1	2179	9	08 50 27.4 + 15 28 21	p	19.6	19.9	Finding chart
39	E 0907-091	09 09 36.2 −09 18 19	0.253	18.0	1	1447	9	09 09 36.1 −09 18 28	x	18.1	18.4	Finding chart

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Table 7. Continued.

No	Name	VCV J2000	z	V mag	Table	OA Ref	Move (arcsec)	Optical J2000	Opt Typ	R mag	B mag	Comment
40	IXO 32	09 10 19.9 + 07 06 00	2.784	18.6	1	922	12	09 10 20.2 + 07 05 49	x	15.1	14.8	Finding chart
41	PC 0910 + 5625	09 14 37.9 + 56 13 22	4.035	20.9	1	2045	12	09 14 39.3 + 56 13 21	x	20.8	22.9	Finding chart
42	RX J09553 + 4733	09 55 19.1 + 47 34 25	1.730	20.0	1	2679	9	09 55 19.0 + 47 34 16	px	19.5	19.8	Finding chart
43	HOAG 2	09 57 19.8 + 69 38 01	2.054	20.3	1	348	9	09 57 21.2 + 69 37 55	px	20.1	20.4	Finding chart
44	NGC 3031 U4	09 57 20.2 + 69 35 37	0.850	20.1	1	86	12	09 57 22.4 + 69 35 39	x		20.6	OA designated as 'M82 #4'
45	Q 1001−033	10 04 11.5 −03 36 42	0.458	19.5	3	1605	10	10 04 11.1 −03 36 50	x	17.9	18.6	Finding chart
46	RXS J10336−1436	10 33 35.0 −14 36 24	0.367	20.2	2	369	12	10 33 35.8 −14 36 28	rx	18.6	20.2	Standout radio/X-ray
47	TOL 1038.2−27.1	10 40 33.5 −27 22 58	1.937	20.1	1	231	11	10 40 33.2 −27 23 08		18.1	19.9	Finding chart
48	RXS J10422−0715	10 42 14.8 −07 15 00	0.121	17.5	3	62	9	10 42 15.0 −07 15 09	x	16.5	17.8	Appenzeller treasure hunt ok
49	Q 1043 + 0539	10 45 46.7 + 05 23 55	2.622	18.3	1	445	14	10 45 45.8 + 05 23 56		18.3	19.5	OA correct, VCV off by 1 time second
50	RXS J10491−0647	10 49 07.2 −06 47 33	0.441	18.5	1	62	12	10 49 07.9 −06 47 38		18.2	18.2	Appenzeller treasure hunt ok
51	RXS J10573−0805	10 57 18.6 −08 05 44	0.223	17.1	1	62	13	10 57 19.4 −08 05 40	x	17.2	17.8	Appenzeller treasure hunt ok
52	KP 1128.2 + 07.2	11 30 49.1 + 07 00 49	2.120	19.0	1	2179	10	11 30 49.8 + 07 00 47	p	19.8	19.8	Finding chart
53	Q 1147 + 084	11 50 23.6 + 08 08 56	2.627		1	2604	8	11 50 23.6 + 08 08 48	p	18.7	19.2	Photometric QSO
54	KP 1209.2 + 10.7	12 11 45.4 + 10 25 42	1.900	20.5	1	2179	9	12 11 45.0 + 10 25 34	p	20.3	20.9	Finding chart
55	MS 12152 + 2847	12 17 46.1 + 28 31 19	2.830	20.0	1	1403	8	12 17 45.7 + 28 31 25		20.1	20.6	Finding chart
56	Q 1217 + 085	12 20 04.8 + 08 14 02	2.160		1	972	10	12 20 05.4 + 08 14 02	p	19.0	19.7	NBCKDE photo-$z = 2.165$
57	1E 1227 + 024	12 29 52.8 + 02 08 09	0.570	20.0	3	900	9	12 29 53.3 + 02 08 12	x	19.5	19.6	Matching X-ray object
58	14A2	12 37 13.3 + 01 23 00	0.722	19.4	1	282	9	12 37 13.2 + 01 22 51	p	18.7	18.8	Finding chart
59	KP 1244.0 + 34.5	12 46 30.1 + 34 16 43	1.940	20.0	1	2179	8	12 46 30.4 + 34 16 50	p	18.9	19.3	Finding chart
60	KP 1258.4 + 34.2	13 00 52.4 + 34 01 04	1.800	19.5	1	2179	12	13 00 52.8 + 34 01 15	p	20.4	20.6	Finding chart
61	KP 1259.4 + 34.7	13 01 46.5 + 34 26 34	2.080	18.5	1	2179	12	13 01 47.1 + 34 26 24	p	19.2	19.5	Finding chart
62	1RXS J13038−3950	13 03 50.6 −39 50 42	0.121	16.5	3	1814	9	13 03 50.5 −39 50 33	rx	16.2	16.4	Standout radio/X-ray
63	TEX 1307 + 087	13 09 37.1 + 08 28 19		17.9	2	1943	13	13 09 36.2 + 08 28 15	rx	19.4	20.8	True radio/X-ray source, lobes, OA evidently had J130941.1 + 082815, $r = 18.0$, which has X-ray but not radio, lobe nearby
64	IRAS 13155−0949	13 18 09.0 −10 05 08	0.104		3	1714	13	13 18 09.8 −10 05 12	r	15.3	16.7	NVSS J131809.7−100514
65	Q 1339.1 + 2752	13 41 23.5 + 27 37 02	0.463	20.0	3	516	11	13 41 24.1 + 27 37 09	x	19.7	20.0	X-ray, v ok
66	Q 1339.9 + 2617	13 42 12.4 + 26 01 56	2.504	20.1	1	516	9	13 42 12.2 + 26 02 05	p	19.8	20.8	NBCKDE photo-$z = 2.3$
67	Q 1402 + 2853	14 05 00.0 + 28 39 04	1.430	20.1	1	956	11	14 05 00.1 + 28 38 53	px	18.7	19.6	Finding chart
68	Q 1407.3 + 2685	14 09 31.5 + 26 36 38	1.900	20.9	1	511	11	14 09 31.5 + 26 36 27	p	19.9	21.0	NBCKDE photo-$z = 1.8$
69	Q J14172 + 2534	14 17 10.1 + 25 34 39	0.852	18.4	1	347	9	14 17 10.0 + 25 34 30	px	18.7	19.4	X-ray, NBCKDE photo-$z = 0.855$
70	RXS J15002 + 1044	15 00 17.0 + 10 44 41	0.114	17.7	3	2638	12	15 00 17.8 + 10 44 41	px	17.1	17.7	
71	KP 1528.9 + 14.4	15 31 16.8 + 14 16 15	1.940	21.5	1	2179	13	15 31 16.2 + 14 16 25	p	20.3	20.1	Finding chart
72	MS 16011 + 4119	16 02 52.2 + 41 11 50	0.534	19.7	1	1403	10	16 02 52.7 + 41 11 58	x	20.1	20.8	Finding chart
73	TEX 1615−040	16 18 37.4 −04 09 43	0.213	18.1	3	647	14	16 18 36.4 −04 09 43	r	17.7	18.7	FC, 1 time second offset
74	RXS J16224 + 7038	16 22 28.4 + 70 38 43	0.378	17.1	1	62	12	16 22 26.4 + 70 38 36	rx	17.1	17.6	Appenzeller treasure hunt ok
75	KP 1623.4 + 26.9	16 25 28.3 + 26 47 55	1.900	21.0	1	2179	12	16 25 28.8 + 26 47 45			20.9	Finding chart
76	PC 1628 + 4948	16 29 26.6 + 49 41 44	2.662	20.2	1	2042	11	16 29 27.5 + 49 41 37		19.5	20.4	Finding chart
77	RXS J16299 + 7201	16 29 56.8 + 72 01 24	0.609	18.2	1	62	9	16 29 54.8 + 72 01 24	rx	18.2	17.7	Appenzeller treasure hunt ok
78	RXS J16315 + 7322	16 31 34.2 + 73 22 22	1.001	18.9	1	62	11	16 31 36.4 + 73 22 17	x	19.0	19.4	Appenzeller treasure hunt ok
79	RXS J16386 + 7040	16 38 39.2 + 70 40 16	0.369	17.3	1	62	11	16 38 37.4 + 70 40 23	x	17.4	17.8	Appenzeller treasure hunt ok

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Table 7. Continued.

No	Name	VCV J2000	z	V mag	Table	OA Ref	Move (arcsec)	Optical J2000	Opt Typ	R mag	B mag	Comment
80	RXS J16427 + 7413	16 42 46.8 + 74 13 48	0.664	19.1	1	62	8	16 42 47.2 + 74 13 56	x	19.2	19.5	Appenzeller treasure hunt ok
81	RXS J16496 + 7442	16 49 41.4 + 74 42 55	1.378	17.9	1	62	10	16 49 41.0 + 74 42 45	prx	18.4	18.4	Appenzeller treasure hunt ok
82	RXS J16569 + 7110	16 56 55.4 + 71 10 30	0.259	17.3	1	62	9	16 56 53.8 + 71 10 34	x	17.2	17.4	Appenzeller treasure hunt ok
83	RXS J17125 + 7218	17 12 30.8 + 72 18 33	0.241	19.6	3	62	8	17 12 29.8 + 72 18 27	x	18.3	20.5	Appenzeller treasure hunt ok
84	PSS J1715 + 3809	17 15 39.6 + 38 09 00	4.520	18.6	1	1837	10	17 15 39.4 + 38 09 10		19.1	21.5	VCV omitted decl arcsecs
85	Q 1715 + 535	17 16 35.2 + 53 28 49	0.890	21.2	3	1659	13	17 16 36.6 + 53 28 45		19.3	20.0	Finding chart
86	Q 1722.0 + 3474	17 23 47.9 + 34 41 56	2.200	18.5	1	511	9	17 23 47.5 + 34 41 48	p	18.8	19.0	Only good v, but photo-$z = 0.765$
87	RXS J17282 + 7253	17 28 17.6 + 72 53 23	0.229	15.9	1	62	9	17 28 19.2 + 72 53 28	x	16.6	18.3	Appenzeller treasure hunt ok
88	RXS J17349 + 7340	17 34 56.2 + 73 40 03	1.131	17.8	1	62	10	17 34 54.6 + 73 39 55	x	17.9	18.0	Appenzeller treasure hunt ok
89	1WGA J1826.1−3650	18 26 08.1 −36 50 49	0.888	18.8	1	1312	9	18 26 08.3 −36 50 40	x	16.3	17.8	OA right, VCV off by 8 arcsec decl
90	Q 2111−4030	21 14 39.0 −40 17 43	1.750	20.9	1	1039	9	21 14 39.6 −40 17 48		20.4	20.6	Finding chart
91	1E 21150 + 6027	21 16 19.0 + 60 39 45	0.060	18.2	3	1008	20	21 16 16.4 + 60 39 41		16.6	19.4	Finding chart
92	Q 2130−0527	21 33 03.3 −05 14 02	0.329		3	1609	9	21 33 03.9 −05 14 03	pr	17.2	18.0	BOSS z ok
93	Q 2144.0−1589	21 46 43.4 −15 39 34	2.300	21.2	1	511	13	21 46 43.4 −15 39 21	!	21.0	20.6	Standout nearest optical
94	RXS J21549 + 0720	21 54 59.5 + 07 20 02	0.352		3	62	14	21 55 00.0 + 07 19 50	rx	16.2	16.9	Appenzeller treasure hunt ok
95	RXS J22204 + 0658	22 20 28.2 + 06 58 11	0.116	17.7	3	62	11	22 20 27.6 + 06 58 03	x	17.3	18.5	Appenzeller treasure hunt ok
96	MS 22225 + 2114	22 24 53.7 + 21 30 01	0.617	17.2	1	1403	10	22 24 53.2 + 21 30 09	x	13.4	14.2	Finding chart
97	Q 2239.4 + 0045	22 42 00.0 + 00 42 26	2.100	21.0	1	511	10	22 42 00.1 + 00 42 36	p	20.1	20.4	NBCKDE photo-$z = 2.185$
98	PB 7348	22 55 38.6 −11 14 53	1.330	17.5	1	1865	11	22 55 37.8 −11 14 52		16.8	17.6	Fits OA description of doublet
99	PC 2301 + 0021	23 04 14.6 + 00 37 39	2.647	22.5	1	2042	9	23 04 15.1 + 00 37 43	p		22.2	Finding chart
100	Q 2320−035W	23 23 26.4 −03 17 12	2.041	20.6	1	1790	9	23 23 27.0 −03 17 13	p	19.2	19.5	Finding chart
101	MS 23365 + 0517	23 39 07.0 + 05 34 36	0.740	20.3	2	2149	11	23 39 07.4 + 05 34 27	prx	20.5	21.4	Finding chart
102	BG CFH 56	23 49 54.7 + 00 49 49	0.420	20.8	3	675	8	23 49 54.8 + 00 49 57		20.5	20.9	FC of 2347 + 005 in Ellingson, Yee, & Green (1991) marks wrong object (correct B1950 in their Table 3)
103	WEE 182	23 52 12.8 −01 20 21	2.362	20.3	1	2488	8	23 52 12.8 −01 20 29		18.0	18.0	Finding chart
104	Q 2354−029	23 57 26.6 −02 42 08	2.170	19.6	1	2677	14	23 57 27.5 −02 42 09		19.2	18.7	Finding chart

4 ASTROMETRIC MOVES

A total of 380 VCV objects are found to be positioned 8 + arcsec from their true optical positions. I present these in four tables: Table 5 shows offsets of 30 + arcsec, Table 6 shows offsets of 15–29 arcsec, Table 7 shows offsets of 8–14 arcsec, and Table 8 shows 82 objects which came late to hand, mostly from VCV Table 3 of AGNe. Columns are as follows: (1) line number; (2) VCV object name; (3) VCV J2000; (4) VCV redshift; (5) VCV *V* magnitude; (6) VCV table number (1 = QSOs, 2 = Bl Lacs, and 3 = AGNe); (7) VCV reference number for the original paper; (8) astrometric move required, in arcsec; (9) optical object J2000; (10) flag on optical object: p = a photometric quasar from NBCKDE/XDQSO, r = radio-associated, x = X-ray-associated, ! = a standout optical-only fit with no other good candidates; ? = best optical-only fit but other candidates present; ?? = good optical-only fit but other good candidates present; (11) optical red magnitude; (12) optical blue magnitude; and (13) a comment explaining the original error and/or fix.

5 DELETIONS

I recommend de-listing 30 VCV-catalogued objects because they are either not quasars or are so poorly described that recognition is excluded. It is not suitable to make a table out of these objects because there are so many different circumstances to describe, so a simple list follows. One paper accounts for 11 of these objects, which I will discuss at the end.

1. NGC 3726 B1 is a star. Approximately located in VCV at J113448.1 + 470025, $z = 1.13$, it is an Arp (1981) treasure hunt object, as discussed above. Arp placed it at 100 arcsec from MCG 8-21-061, and it is seen exactly there, but SDSS-DR8 finds it to be a star, SDSS J113456.62 + 470014.8, $r = 17.9$, $b = 18.5$.

2. WEE 140 from Weedman (1985), putatively $z = 2.27$, is found to be a star by SDSS-DR5, SDSS J160250.34 + 280541.4. Weedman did say in his Table 2 notes that the lines for this object were weak.

3. Q 1052 + 04 from Lanzetta et al. (1991), approximately located in VCV at J105505.2 + 041400, $v = 18.1$, $z = 3.391$, does not exist. NED[4] identifies it with SDSS J105433.04 + 040027.4, $z = 3.301$, but that object is 34 arcsec outside of the B1052 + 04 sky tile, and the redshift offset of 0.09 is large. Another candidate is NBCK J105510.14 + 034730.0, $v = 18.5$, which, however, has a photometric redshift of 0.535. VCV's catalogue paper explains (illustrated by its Figure 2) that old $z = 3.3$ redshifts were often wrong because low-z Mg II −2800 Å lines were mistaken for Lyman alpha. In either scenario, this object was wrongly presented. No other good candidates are seen, and the original paper gives no help, so I recommend de-listing.

4. Q 0124−365 from Savage et al. (1984) is lost. It was presented on an object-poor finding chart which I could not place anywhere in or near B0124-365, nor could VCV. Perhaps there was a typo in the name, or maybe it was the wrong finding chart. No astrometry was stated in the paper, so there is no means of recovering this object.

5. MC 1227 + 120 never existed. It was catalogued in Burbidge, Crowne, & Smith (1977) with reference to a paper 'in press', that paper being Smith et al. (1977), in which however it did not appear. This object is only an artefact of the literature.

6. 1ES 1249 + 174W is lost, if it ever existed. It was presented as one of two optical candidates for a single *Einstein* source by Perlman et al. (1996). The E object is an SDSS-DR7 quasar, this W object, a 'BL candidate', had no redshift presented—the VCV-listed redshift belonged to the E object. This W object was not measured and is unseen.

7. 2E 1510 + 3902, an *Einstein* X-ray source at J151230.7 + 385051 with optical attributes of $v = 19.0$ and $z = 0.228$, appears to be SDSS J151224.30 + 385112.7 of $v = 18.2$ and $z = 0.202$; there are no other eligible objects. The redshift is a poor match, and the discovery paper Reichert et al. (1982), which presented spectra for its new AGNe, stated problems with this object (Table 5, footnote b) and presented no spectrum. Recommend de-listing due to poor fit and no other candidate.

8. X404-23, from Zamorani et al. (1999), is an X-ray source without an optical object. The finding chart presents a marked object which is, however, 30 arcsec outside the X-ray error circle. As Zamorani et al. state, 'None of them is a convincing identification'.

9. Q 0411−789, approximately located in VCV Table 3 with $V = 16.0$ and $z = 0.019$, is the only catalogued object from Campusano & Pedreros (1978). At such high latitude, the B1950 tile of sky is quite small, 3 × 1 arcmin, and no $v = 16$ galaxy is seen there. It is meant to be a radio-detected object, but the nearest SUMSS Sydney University Molonglo Sky Survey, from Murphy, T., Mauch, T., Green, A., Hunstead, R. W., Piestrzynska, B., Kels, A. P., Sztajer, P. 2007, MNRAS, 382, 382 radio detection is 2 arcmin beyond the box.

10 and 11. Two nameless Table 3 entries, row 6 502 (J081121.6 + 631943) and row 12 235 (J101805.6 + 004318), are from Appenzeller et al. (1998), but they were identified as stars in that paper.

12 and 13. Two objects from Brissenden et al. (1987), approximately sited in VCV, are not seen at all. They are 1H 0217 − 639 (J021906.4 − 634428, $z = 0.073$) and 1H 2044−032 (J204711.6−030400, $z = 0.015$). These objects should be bright, $V < 18$, but no photometry is presented in a paper which does give photometry for its other objects. 1H 2044−032 was also presented with a 69-mJy radio detection, but the nearest NVSS NRAO VLA Sky Survey catalog, from Condon, J. J., Cotton, W. D., Greisen, E. W., Yin, Q. F., Perley, R. A., Taylor, G. B., Broderick, J. J. 1998, AJ, 115, 1693 source (5 + mJy) is 2 arcmin outside the box.

[4] NASA/IPAC Extragalactic Database, http://ned.ipac.caltech.edu

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Table 8. Eighty-Two Additional Objects

No	Name	VCV J2000	z	V mag	Table	OA Ref	Move (arcsec)	Optical J2000	Opt Typ	R mag	B mag	Comment
1	PC 0026 + 0522	00 28 58.8 + 05 39 09	0.101	20.7	3	2061	8	00 28 59.2 + 05 39 06		19.6	20.9	Finding chart
2	PC 0026 + 0457	00 29 02.7 + 05 14 18	0.300	20.5	3	2061	9	00 29 03.2 + 05 14 12		19.8	20.9	Finding chart
3	PC 0026 + 0455	00 29 12.7 + 05 11 54	0.435	21.5	3	2061	8	00 29 13.1 + 05 11 49		22.3	23.0	Finding chart
4	PC 0027 + 0532	00 29 44.7 + 05 49 13	0.069	21.2	3	2061	11	00 29 44.6 + 05 49 24		20.1	21.9	Finding chart
5	PC 0027 + 0459A	00 29 59.2 + 05 15 47	0.153	19.9	3	2061	8	00 29 59.2 + 05 15 55		19.5	19.7	Finding chart
6	PC 0027 + 0456	00 30 20.8 + 05 12 52	0.079	21.2	3	2061	17	00 30 19.8 + 05 12 43		19.6	21.1	Finding chart
7	PC 0028 + 0529	00 30 40.1 + 05 46 03	0.327	21.0	3	2061	13	00 30 39.4 + 05 45 56		19.6	20.9	Finding chart
8	PC 0028 + 0522	00 31 02.8 + 05 38 52	0.046	18.5	3	2061	12	00 31 02.0 + 05 38 47		17.8	18.3	Finding chart
9	PC 0028 + 0505	00 31 07.2 + 05 22 21	0.430	22.7	3	2061	14	00 31 06.6 + 05 22 10		22.7	23.3	Finding chart
10	PC 0028 + 0512	00 31 10.5 + 05 28 46	0.171	22.4	3	2061	13	00 31 09.9 + 05 28 36			21.7	Finding chart
11	PC 0028 + 0519	00 31 12.2 + 05 35 47	0.080	19.3	3	2061	12	00 31 11.6 + 05 35 39		19.4	20.1	Finding chart
12	PC 0028 + 0455	00 31 14.7 + 05 12 10	0.228	21.2	3	2061	14	00 31 14.2 + 05 11 58		20.4	21.9	Finding chart
13	MS 00387 + 3251	00 41 26.2 + 33 07 49	0.225	18.5	3	823	17	00 41 25.5 + 33 08 04	x	17.3	18.4	Finding chart
14	1WGA J0057.6 + 3022	00 57 38.5 + 30 22 39	0.180	21.6	3	1230	8	00 57 38.6 + 30 22 47	x	19.8	20.7	Standout X-ray
15	TGS132Z079	01 53 34.3 −25 52 16	1.070	20.5	1	1421	96 961	23 53 34.4 −25 52 14		18.6	19.8	VCV off by 2 time hours, to 2dF position
16	PC 0227 + 0056	02 30 09.5 + 01 09 50	0.186	20.1	3	2061	13	02 30 09.2 + 01 10 02		19.4	20.2	Finding chart
17	PC 0227 + 0100A	02 30 10.5 + 01 14 13	0.167	22.2	3	2061	13	02 30 10.0 + 01 14 24			21.9	Finding chart
18	PC 0227 + 0104	02 30 14.7 + 01 17 27	0.074	20.4	3	2061	14	02 30 14.3 + 01 17 40		20.3	20.7	Finding chart
19	PC 0227 + 0012	02 30 14.9 + 00 26 05	0.071	19.2	3	2061	8	02 30 14.6 + 00 26 12		18.5	19.8	Finding chart
20	PC 0227 + 0011	02 30 16.5 + 00 24 34	0.149	19.4	3	2061	8	02 30 16.2 + 00 24 41		19.2	20.0	Finding chart
21	PC 0227 + 0034	02 30 18.5 + 00 47 52	0.025	20.9	3	2061	10	02 30 18.2 + 00 48 01		20.6	21.1	Finding chart
22	PC 0227 + 0029A	02 30 24.4 + 00 42 43	0.081	17.9	3	2061	11	02 30 24.0 + 00 42 53		16.8	17.3	Finding chart
23	PC 0227 + 0109	02 30 27.5 + 01 23 13	0.178	20.4	3	2061	14	02 30 27.2 + 01 23 26		19.8	20.7	Finding chart
24	RXS J02325 + 3404	02 32 33.1 + 34 04 28	0.079	16.3	3	170	11	02 32 32.3 + 34 04 23	x	15.6	16.0	Finding chart
25	MS 03403 + 0446	03 43 04.8 + 04 55 45	0.190	20.0	3	1403	10	03 43 05.4 + 04 55 45		19.0	20.1	Finding chart
26	RXS J03535 + 0204	03 53 34.1 + 02 04 37	0.247	18.4	3	62	21	03 53 34.4 + 02 04 57	x	18.1	18.5	Appenzeller treasure hunt ok
27	RXS J04027 + 0159	04 02 42.0 + 01 59 54	0.151	17.7	3	62	13	04 02 42.2 + 02 00 07	x	17.2	18.5	Appenzeller treasure hunt ok
28	B2 0402 + 37	04 05 49.3 + 38 03 32	0.054	18.5	3	2560	15	04 05 48.1 + 38 03 26	x	17.4	20.0	Finding chart
29	RXS J04173 + 0347	04 17 20.8 + 03 47 01	0.082	17.3	3	62	17	04 17 19.8 + 03 46 53	r	16.8	17.6	Appenzeller treasure hunt ok
30	IRAS 04413 + 2608	04 44 28.6 + 26 14 04	0.171		3	362	31	04 44 30.8 + 26 14 10	r	17.7	19.9	Finding chart
31	IRAS 04493−6441	04 49 40.8 −64 36 11	0.060	15.4	3	575	10	04 49 40.8 −64 36 21		15.3	14.7	Finding chart
32	RC J0457 + 0452	04 57 54.3 + 04 53 48	0.186	19.2	3	628	9	04 57 53.8 + 04 53 54	r	18.5	21.2	Standout radio, SIMBAD agrees
33	RXS J07157 + 5912	07 15 46.3 + 59 12 33	0.288	19.1	3	62	31	07 15 44.2 + 59 12 59		17.5	19.9	Appenzeller treasure hunt ok
34	RXS J07207 + 6543	07 20 44.2 + 65 43 47	0.483	19.7	3	62	35	07 20 49.0 + 65 44 05	r	19.5	20.1	Appenzeller treasure hunt ok
35	RXS J07281 + 6718	07 28 11.4 + 67 18 14	0.135	18.0	3	62	8	07 28 12.8 + 67 18 15	x	17.1	18.8	Appenzeller treasure hunt ok
36	IRAS 07246 + 6125	07 29 09.4 + 61 18 53	0.137	19.2	3	1327	20	07 29 12.2 + 61 18 53	r	17.7	18.9	3 time seconds E, Sargsyan et al. (2008)
37	RXS J08111 + 5730	08 11 09.1 + 57 30 03	0.082	19.3	3	62	22	08 11 08.3 + 57 30 24	rx	18.3	20.1	Appenzeller treasure hunt ok
38	RXS J08162 + 6600	08 16 17.8 + 66 00 52	0.251	19.0	3	62	21	08 16 21.2 + 66 00 50	rx	18.3	20.1	Appenzeller treasure hunt ok
39	RXS J08244 + 6249	08 24 26.8 + 62 49 27	0.097	18.1	3	62	13	08 24 27.8 + 62 49 38	rx	18.4	19.5	Appenzeller treasure hunt ok
40	Zw 064.024	09 59 46.8 + 11 28 20	0.077	15.7	3	1246	59	09 59 46.8 + 11 29 19	x	10.6	12.4	1 arcmin S
41	RXS J10197−0016	10 19 44.3 −00 16 29	0.075	19.4	3	62	11	10 19 45.0 −00 16 34	x	19.7	20.8	Appenzeller treasure hunt ok
42	RXS J10244−0143	10 24 26.9 −01 43 01	0.093		3	62	23	10 24 28.2 −01 42 50	x	15.9	17.0	Appenzeller treasure hunt ok
43	RXS J10288 + 0139	10 28 48.6 + 01 39 02	0.139	19.7	3	62	14	10 28 49.1 + 01 38 50	r	18.4	21.1	Appenzeller treasure hunt ok
44	RXS J10359−0713	10 35 54.9 −07 13 07	0.223	19.7	3	62	37	10 35 55.8 −07 13 42		19.1	19.9	Appenzeller treasure hunt ok

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Table 8. Continued.

No	Name	VCV J2000	z	V mag	Table	OA Ref	Move (arcsec)	Optical J2000	Opt Typ	R mag	B mag	Comment
45	RXS J10397 + 0232	10 39 47.3 + 02 32 02	0.155	19.8	3	62	29	10 39 47.9 + 02 31 34	x	18.0	20.2	Appenzeller treasure hunt ok
46	RXS J10453−0346	10 45 23.7 −03 46 43	0.211	18.1	3	62	12	10 45 24.5 −03 46 46	x	17.2	19.9	Appenzeller treasure hunt ok
47	PC 1044 + 4719	10 47 13.2 + 47 03 35	0.247	19.4	3	2043	9	10 47 13.2 + 47 03 26	r	17.8	19.5	Finding chart
48	RX J11125−1238	11 12 32.8 −12 38 30	0.142	17.6	3	120	16	11 12 32.6 −12 38 14	x	16.3	17.5	Standout v ok, 1RXS J111233.1−123811
49	IRAS11223−1244	11 24 50.0 −13 01 13	0.199		3	1214	11	11 24 50.7 −13 01 17	r	16.6	18.5	Standout radio NVSS J112450.7−130118
50	RXS J12212 + 3522	12 21 12.8 + 35 22 54	0.299	18.9	3	62	13	12 21 13.6 + 35 23 01	x	19.1	19.9	Appenzeller treasure hunt ok
51	IRAS 12202 + 1646	12 22 46.6 + 16 29 43	0.181	18.0	3	1327	22	12 22 47.1 + 16 29 30		16.8	18.3	
52	Q 1246 + 4636	12 49 03.4 + 46 20 30	0.089	21.4	3	2058	11	12 49 04.0 + 46 20 39		20.0	20.4	Finding chart
53	PKS 1304−215	13 06 42.2 −21 48 12	0.127	17.5	3	258	21	13 06 42.0 −21 47 51	r	16.1	18.4	Finding chart
54	IRAS 13305−1739	13 33 16.5 −17 55 00	0.148	17.2	3	1605	10	13 33 16.5 −17 55 10	r	15.0	16.4	Finding chart
55	Q 1339.8 + 265	13 42 10.9 + 26 13 10	0.148	20.1	3	512	9	13 42 10.3 + 26 13 13		19.5	20.6	Obvious nearby
56	IRAS 13550−3142	13 57 55.3 −31 57 11	0.189		3	33	16	13 57 54.6 −31 56 58	r	19.0	22.2	Radio NVSS J135754.6−315702
57	WPVS 85	13 58 24.6 −38 09 17	0.034		3	2462	89	13 58 19.3 −38 10 21		18.2	18.6	Finding chart
58	KISSR 1751	14 16 45.2 + 44 51 12	0.348	20.2	3	1549	7 200	14 16 47.6 + 42 51 13		18.2	20.8	VCV off by 2° N/S
59	IRAS 14207−2002	14 23 33.2 −20 15 56	0.173		3	33	16	14 23 32.1 −20 15 51	r	17.9	19.7	Radio nearby galaxy
60	IRAS 14317−3237	14 34 43.2 −32 50 25	0.025	14.4	3	575	30	14 34 45.5 −32 50 32	rx	13.0	15.9	Finding chart
61	Q 14362−0657	14 38 53.0 −07 10 20	0.087		3	1609	24	14 38 54.4 −07 10 29	x	16.9	18.2	*Einstein*, only X-ray 1RXS J143854.0−071020
62	MS 15325 + 0130	15 35 02.7 + 01 20 58	0.074	18.0	3	1403	54	15 35 03.6 + 01 20 06	x	18.2	18.8	Finding chart
63	Q 1614 + 4635	16 15 50.9 + 46 27 42	0.097	20.6	3	2058	8	16 15 51.4 + 46 27 49		19.1	19.5	Finding chart
64	1RXS J17082−0349	17 08 17.9 −03 49 16	0.180	17.5	3	1814	20	17 08 19.1 −03 49 25		20.2	21.6	Good fit to NVSS ellipse, Piranomonte et al. (2007), OA confused RASS/NVSS/opt columns for 1RXS objects
65	RXS J17179 + 7308	17 17 58.0 + 73 08 43	0.193	18.1	3	62	22	17 18 02.6 + 73 08 52	x	17.3	18.6	Appenzeller treasure hunt ok
66	RXS J17325 + 7428	17 32 35.8 + 74 28 08	0.207	19.6	3	62	27	17 32 39.6 + 74 27 46	x	18.8	20.2	Appenzeller treasure hunt ok
67	RX J18020 + 6629	18 02 04.8 + 66 29 13	0.265		3	825	14	18 02 07.0 + 66 29 07		20.2	20.8	Only X-ray, FC, Bower et al (1996)
68	VA-31032	18 54 01.3 −78 42 23	0.076		3	1067	162	18 54 57.3 −78 43 10		19.0	22.4	Approx, only radio galaxy in B1950 box
69	R021	19 13 00.0 −59 56 55	1.918	21.5	1	1896	495	19 12 23.2 −60 03 53		21.5	21.8	Finding chart, Richer (1978)
70	IRAS 19119−4952	19 15 45.2 −49 47 42	0.049	16.0	3	575	28	19 15 47.9 −49 47 34	r	16.7	16.2	Finding chart
71	IRAS 19186−5748	19 22 50.7 −57 42 35	0.059	15.2	3	575	17	19 22 52.6 −57 42 28		15.0	16.3	Finding chart
72	1ES 2055 + 298	20 58 01.2 + 30 02 44	0.036		3	1775	183	20 58 12.3 + 30 04 36		12.4	15.3	Perlman treasure hunt ok, is IRAS 20561 + 2952
73	OSMER 8	21 02 34.5 −39 49 48	0.246	18.5	3	1693	9	21 02 35.1 −39 49 43		17.0	18.5	Finding chart
74	RXS J21528 + 0523	21 52 50.0 + 05 23 44	0.181	20.2	3	62	59	21 52 46.0 + 05 23 53		20.0	20.7	Appenzeller treasure hunt ok
75	1E 22044 + 468	22 06 25.5 + 47 04 43	0.163	19.7	3	1872	14	22 06 26.8 + 47 04 48		18.8	19.9	Best nearby optical match
76	PKS 2206−251	22 09 24.2 −24 53 26	0.158	18.0	3	1949	25	22 09 22.9 −24 53 32		17.7	19.1	OA states 2dF TGS061Z183
77	RXS J22148 + 1351	22 14 52.9 + 13 51 18	0.153	19.1	3	62	12	22 14 53.7 + 13 51 19		18.8	19.5	Appenzeller treasure hunt ok
78	IRAS 22152−0227	22 17 51.0 −02 22 29	0.093	17.0	3	2390	616	22 17 50.8 −02 12 25	r	14.1	16.4	VCV off 10 arcmin N/S, is NPM 1G-02.0483, NED ok
79	RXS J22367 + 0642	22 36 45.3 + 06 42 16	0.269	20.0	3	62	11	22 36 45.2 + 06 42 27	x	19.6	20.4	Appenzeller treasure hunt ok
80	RXS J22370 + 1235	22 37 00.8 + 12 35 18	0.097	17.7	3	62	11	22 37 00.1 + 12 35 12	x	16.9	18.3	Appenzeller treasure hunt ok
81	PKS 2242−29	22 44 51.8 −29 28 56	0.166	18.5	3	2010	11	22 44 52.6 −29 28 55	r	17.0	19.9	Finding chart
82	IRAS 23515−2917	23 54 05.8 −29 01 00	0.335	19.7	3	33	10	23 54 06.5 −29 01 00		18.6	20.2	Nearest object, v ok

14. IRAS 22040 + 0332 (J220634.2 + 034655, $z = 0.064$, VCV Table 3) from Gu et al. (1995) is not seen in or near the prescribed B1950 tile of sky. No finding chart or optical magnitude was presented. This *IRAS* Infrared Astronomical Satellite source is not found in any *IRAS* source catalogue. No NVSS radio sources are within 5 arcmin.

15 and 16. SDSS J09557 + 2525, $z = 2.262$, and SDSS J10162 + 2649, $z = 0.383$, were removed by SDSS-DR8 as they were satellite streaks, SDSS J095546.30 + 252534 and SDSS J101615.16 + 264902.4.

17. ROTSE J11568 + 5427, $v = 18.1$, $z = 1.02$, was presented on Astronomer's Telegram #1515 (http://www.astronomerstelegram.org) as an optical transient with suspected AGN origin. However, subsequently, Telegram #1644 announced it to be 'an extremely luminous type II supernova at $z = 0.21$'.

18 and 19. Q 0000−029 (J000301.4−024141, $v = 18$, $z = 2.31$) and Q 2355 + 003 (J235803.4 + 004000, $v = 19$, $z = 2.84$) were so-called 'optically violent variables' from Zhan & Chen (1986), which appeared on a single UKST UK Schmidt Telescope Sky survey plate, but were not detected by deeper plates or CCD scans, and are today not seen on the DR8 finding charts. The authors theorised these were AGNe but concluded 'We cannot reject other explanations including galactic nova...'. Also to be considered are plate artefacts, since it is most unlikely to find two such optical transients on a single plate.

20–30. All quasars from Afanas'ev et al. (1990b), namely SA68 #110 ($v = 19.4$, $z = 0.78$), SA68 #105 ($v = 20.6$, $z = 0.71$), SA68 #090 ($v = 21.3$, $z = 1.00$), SA68 #094 ($v = 19.3$, $z = 1.08$), SA68 #143 ($v = 20.7$, $z = 2.11$), SA68 #095 ($v = 21.3$, $z = 1.24$), M82 #95 ($v = 19.4$, $z = 1.01$), M82 #69 ($v = 19.4$, $z = 0.93$), M82 #22 ($v = 19.6$, $z = 0.96$), SA57 #216 ($v = 22.2$, $z = 0.77$), and SA57 #431 ($v = 21.7$, $z = 0.94$). Afanas'ev et al. presented these quasars from three fields, SA68 (i.e. 'selected area 68') to a depth of $B < 22$, M82 to $B < 22.5$, and SA57 to $B < 23.5$. The stated astrometric accuracy is <2 arcsec. All three fields are now covered by the SDSS-DR8 finding charts; thus, we are able to optically investigate Afanas'ev et al.'s three fields to their plate limits. Unfortunately, few, if any, of their quasars are seen.

Field SA68: Afanas'ev et al. present six new quasars in this field, but five of them have no credible optical counterparts in the DR8 finding charts, while one of them, SA68 #95, $b = 21.7$, is offset 6 arcsec from SDSS J001735.30 + 155207.1, $g = 22.7$, and redshift unknown. This near-miss looks random.

Field M82: Seven quasars were presented, consisting of four already-known ones, HOAG 1, HOAG 2, and HOAG 3 from Burbidge et al. (1980) and NGC 3031 U4 (*née* M82 #4) from Arp (1983), and three new ones, M82 #22, M82 #69, and M82 #95. The four known quasars are all present in the DR8 finding charts, but the three Afanas'ev et al. objects are not seen at all.

Field SA57: Seven quasars were presented, consisting of five already-known ones, KKC 30, KKC 36, KKC 37, KKC 41, and KKC 43 from Koo, Kron, & Cudworth (1986), and two new ones, SA57 #216 and SA57 #431. The five KKC quasars are all present in the DR8 finding charts, and here we finally see evidence of Afanas'ev et al. quasars: SA57 #216, $b = 22.6$, matches exactly with SDSS J130841.02 + 291857.4, $g = 22.5$, and redshift unknown. In the case of SA57 #431, Afanas'ev et al. mention that this quasar is near another object, and indeed at that location there is a red object close to a blue object. However, the blue object is bright, $v = 17.3$, while Afanas'ev et al.'s quasar has $v = 21.7$. DSS POSS National Geographic - Palomar Observatory Sky Survey-I confirms that the blue object was also $v = 17$ in the 1950's epoch, so it is unreconcilably bright.

The final outcome is a head-scratcher, but the SDSS-DR8 finding charts are clear: there is only one credible match to Afanas'ev et al.'s 11 objects. Searches at increasing radii turn up nothing useful. With this performance, the one apparent match should be discounted as a possible random artefact; therefore, all of these should be de-listed. Afanas'ev et al. published many other quasars in other papers, and those quasars are seen, confirmed and catalogued.

6 SUMMARY

This paper presents 39 duplication removals, 380 astrometric moves of 8 + arcsec, and 30 de-listings, to be applied to the Véron-Cetty and Véron Quasar Catalogue, 13th edition. This is to bring the VCV data up to the astrometric standard of today's large optical quasar surveys, and so enable accurate inclusion into dynamic databases such as NED and SIMBAD (http://simbad.u-strasbg.fr/simbad).

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