THE ASTROPHYSICAL JOURNAL SUPPLEMENT SERIES, 96:343–358, 1995 February

REDSHIFTS OF 165 ABELL AND SOUTHERN RICH CLUSTERS OF GALAXIES

H. QUINTANA[1] AND A. RAMÍREZ[2]
Astrophysics Group, Physics Faculty, Universidad Católica de Chile, Casilla 104, Santiago 22, Chile; hquintana@astro.puc.cl
Received 1994 April 4; accepted 1994 July 8

ABSTRACT

We present spectroscopic observations and accurate positions for 286 galaxies in clusters taken over several observing sessions, mostly with the DuPont telescope at Las Campanas Observatory. We derive 165 redshifts of rich clusters of which 130 are apparently new values. Redshifts encompass a wide range out to $z = 0.27$.

Subject headings: galaxies: clusters: general—galaxies: distances and redshifts

1. INTRODUCTION

Recent years have witnessed a rapid increase in the interest in southern clusters of galaxies. The availability of large telescopes and the completion of the southern extension of the Abell catalog (Abell, Corwin, & Olowin 1989, hereafter ACO), giving a convenient, if not totally complete, database and a much needed set of standard names, have meant that optical data on southern clusters can be more readily and systematically obtained and compared. Redshifts of clusters are basic data useful in many types of studies, and for southern clusters they are sparse. The largest compilation is by Struble & Rood (1991, hereafter SR91). Also, the galaxy catalog by Fairall & Jones (1991) is very useful, and we use it extensively.

As backups or by-products of several observational programs carried out from telescopes in Chile, we have obtained a number of spectroscopic observations of one or more galaxies in a number of Abell and miscellaneous northern and southern clusters. Most of these are new galaxy redshifts, which we present here with details of the observational and reduction procedures. When velocities are available we compare our results to previous redshifts measurements, as indicated below. As can be expected, in a few cases we find redshifts discordant with those in the literature and indicate, if possible, sources of discrepancies. We point out that redshifts in clusters in the general direction of the Shapley 8 supercluster (approximate R.A. = 13^h30^m and Decl. = $-31°$) are being reported elsewhere (Quintana et al. 1994b).

Most clusters observed are Abell clusters of Bautz-Morgan types I, I–II, and II, where these types have been taken from ACO. A small number of clusters come from the Quintana & White (1990) catalog (hereafter QW90), for which we use QW numbers. In that list we gave preliminary redshifts now superseded by the present values. Finally, a few clusters are from the Zwicky catalog, observed because either they were detected as X-ray sources (by the *Einstein Observatory*) or because they contain central dumbbell galaxies. In fact, many Abell clusters were also observed because they have central dumbbells.

2. SPECTROSCOPIC OBSERVATIONS

The spectroscopic observations were carried out using several telescopes and detectors, over a period of several years. In most clusters we observed the obvious brightest cluster member (BCM, for short), when its appearance showed it to be a cD, dumbbell BCM, gE, or D galaxy, normally close to the cluster center or at a high galaxy density enhancement in the cluster. If two such galaxies were present, we measured both, observing time and conditions permitting. Most of the observations reported here used either the intensified Reticon or the intensified "2D-FRUTTI" detector at Las Campanas Observatory (LCO). Both are photon-counting devices so that the observer can display the spectra as the observation proceeds and estimate a rough velocity, deciding to observe more galaxies if different redshifts were obtained in any cluster. Thus, occasionally three or more velocities were observed in a cluster.

The telescopes, dates, instrumental setups, and observational parameters are shown in Table 1, which identifies the several observing sessions, as follows.

2.1. *Group A, Session 1: LCO Modular Spectrograph*

The Dupont 2.5 m telescope at LCO was used on two nights in 1991 February, with the Modular spectrograph attached. A 600-line grating, blazed at 5000 Å, gave of dispersion of 2.4 Å mm^{-1} covering the spectral range 4400–6850 Å. The detector was a 1024 × 1024 thick 12 μm pixel CRAF CCD, giving a 2 pixel resolution of 3–4 Å at the center of the spectrum. A 185 μm–wide slit, or 2″ on the sky, was used for all the observations, providing a 6 pixel resolution along the slit and an approximate useable field of 10′. The dispersion axis, showing small distortions, was carefully aligned along the columns. However, on the CCD the slit shape showed a noticeable distortion due to the transfer lens. To correct for pixel-to-pixel sensitivity and large-scale detector and illumination variations we obtained flat fields off the dome and exposures of the twilight sky on both nights. To correct for the slit-image geometrical distortions, we also took long exposures of both helium and hollow cathode comparison lamps. To calibrate each exposure in wavelength we recorded comparison exposures

[1] Guest Observer, Las Campanas Observatory of the Carnegie Institution of Washington; Visiting Astronomer, Cerro Tololo Inter-American Observatory which is operated by the Association of Universities for Research in Astronomy, Inc., under contract with the National Science Foundation.

[2] Present address: Instituto Astronômico e Geofísico, Universidade de São Paulo, Caixa Postal 9638, São Paulo, SP 01065, Brazil; aramirez@vax.iagusp.usp.br.

TABLE 1

SUMMARY OF OBSERVING SESSIONS

Group and Session	Dates	Telescope	Instrument[a]	Grating Line/Blaze (Å)	Range (Å)	Resolution (Å)	Image (pixels)	E-W Rotator Angle
A:								
1	1991 Feb 22–23	LCO 2.5 m	Modular	600/5000	4400–6850	4	1024 × 1024	180
B:								
2	1989 Jan 01–06		2DF + B&C	600/5000	3600–7000	4–7	1520 × 256	
3	1988 Oct 10–11							
4	1987 Jun 01–04							
5	1987 Jan 02–07						3040 × 256	
6	1986 Dec 19–24					5–6	3040 × 256	
7	1986 Jul 26–31						3040 × 256	
8	1985 Dec 18–21			1200/5000	3870–5950	3–4	3040 × 256	
C:								
9	1984 Mar 07–10		I.Reticon + B&C	600/5000	3400–7000	5	3744 × 2	
10	1983 Feb 12–17							
11	1982 Dec 20–23							
12	1982 Apr 27–31							
D:								
13	1983 Jan 19–23	CTIO 4 m	SIT Vidicon + B&C	KPGL No. 1	3700–5540	3.5	1024 × 250	90
14	1982 Jul 26–29				3850–5790	3	1300 × 140	

[a] 2DF: 2D-FRUTTI detector. B&C: Boller & Chivens spectrograph. I. Reticon: intensified Reticon detector.

with both lamps before and immediately after each object exposure. Below, we give the rotator angle of the slit, which in the DuPont telescope is measured from north to west (clockwise), with 90° taken in the north–south orientation. The standard position angle is then equal to 270 minus the rotator angle.

To calibrate the zero point of the velocity scale and to secure suitable templates, a number of standard velocity stars were observed, of spectral types G8 to K2 (HD 55229, HD 55434, and HD 71370), as were a few nearby galaxies, particularly with known internal velocity dispersions (NGC 2217, NGC 2784, and NGC 2775). In order to calibrate the system response we also observed a few spectrophotometric standards (LTT 2415, LTT 2511, LTT 1788, LTT 3218, and L745-46A). The observations were carried out under photometric conditions the first night. However, on the second night conditions deteriorated from clear skies at sunset to heavy clouds in the last hours of the night. We had a quarter moon in the first halves of both nights.

2.2. *Group B, Sessions 2–8: LCO 2D-FRUTTI Detector*

The 2D-FRUTTI detector (Shectman 1989) was used on the 2.5 m Dupont telescope, in all the sessions at LCO between 1985 and 1989. The Boller & Chivens spectrograph was fitted with the same 600 line/5000 Å grating and the angle adjusted to give a spectral coverage between 3600 and 7000 Å, approximately, in all the runs but the first. The image size on the detector was chosen to be either 1520 or 3040 pixels along the dispersion axis and 256 or 128 pixels along the single slit direction, depending on the session (as indicated in Table 1), corresponding to a spectral resolution of 9 or 5 Å and a spatial resolution of 5″ along the slit, which had a useful projected length on the sky between 4ʹ.5 and 9ʹ. in the first of these sessions, a grating with 1200 lines blazed at 5000 Å was used, providing a wavelength coverage from 3870 to 5960 Å and a resolution of 5 Å on the 1520 pixel–long image.

Calibration of the sensitivity variations of the 2D-FRUTTI was achieved by exposures of a low-intensity quartz lamp off the inside of the dome taken every other day, using several grating angles to secure a fairly even illumination of the whole detector (up to 500–1000 counts pixel^{-1}). Similarly, to map the distortions along the dispersion direction, exposures of the same lamp, with several grating angles, were taken through a hole pattern of the slit. On some nights, when there was a fair amount of moon, we also took spectra of stars, placing them at regular intervals along the slit. In this way it was confirmed that no change in the spectra shape, along the dispersion, occurred between different grating angles. To correct for any illumination effects due to slit imperfections, field vignetting, or other causes, exposures of the twilight sky were taken every night.

Objects were observed until the display of their spectrum showed signs of several absorption or, occasionally, emission lines. Usually, the H and K lines and the G band appear first on the early-type galaxies. If the observed galaxy appeared on the finding chart to be clearly a BCM and a rough screen estimate of the redshift agreed with the range corresponding to the distance class and cluster appearance, no other galaxy was observed in the Abell clusters. When a second BCM was present, particularly at a separate density enhancement, then a second spectra was normally taken. In a few cases, these were clearly discrepant, which led us to observe further galaxies. Typical exposures were from 10 to 60 minutes. Most clusters observed have Abell distance classes 5 and 6, so long exposures are needed to get an adequate signal-to-noise spectrum. Then the above procedure was not always feasible, because we run out of time, or because of clouds. Helium and argon comparison lamp exposures were taken immediately before and after an object exposure, unless we observed other galaxies in the same cluster, in which case comparison lamps were taken before and after the first and last exposures. Between both no more than 2 hr elapsed. To calibrate the zero point of the velocity scale and secure templates, a number of standard velocity stars were observed, of spectra types G8 to K2, as well as a number of nearby galaxies with well-known internal velocity dispersions, selected from the catalog of Whitmore, McElroy, & Tonry (1985).

2.3. *Group C, Sessions 9–12: LCO Shectograph Detector*

These sessions were mainly devoted to obtaining galaxy velocities in a few rich clusters in an effort to determine cluster dispersions. However, at times we observed a number of additional galaxies. The Dupont telescope was used with the Boller & Chivens spectrograph fitted with the Reticon spectrometer two-channel detector (Shectman 1981). The same 600-line grating as above was used in the spectrograph, giving a similar spectral range and resolution in the 3744 pixel-long channels. Further details of the observational technique and instrumental setup are given in Quintana & Ramírez (1990, hereafter QR90). A few of these new redshifts were quoted in QW90, without details of observations and galaxy identifications, which we give here, together with a new reduction and cross-correlation measurement of the data.

2.4. *Group D, Sessions 13 and 14: CTIO 4 m Telescope*

The 4 m telescope at CTIO was used with the SIT Vidicon detector on the sessions indicated. The main objects observed were central dumbbell galaxies in clusters. Some of these velocities provide new cluster redshifts and are included here for completeness. The Boller & Chivens spectrograph was fitted with the KPGL No. 1 grating, giving a wavelength coverage between 3700 and 5540 Å. The slit was set at 225 μm. The image sizes were 1024 and 1300 pixels along the dispersion axis, and 140 or 250 pixels across, giving a resolution of approximately 3.5–3 Å in wavelength and a projected spatial resolution of 1".2 pixel^{-1}, along the slit. A white spot was used to obtain flat fields to correct for detector small-scale variations. Exposures taken through a decker with a hole pattern served to correct for S-distortions in the image tube. Long zenith exposures were used to correct for distortions along the slit. Helium-argon lamps were taken before and after each exposure at the position angle adjusted to record both dumbbell components. Session 14 was heavily affected by clouds, and a further session in April 1983 with this instrument was completely wiped by clouds. At the CTIO 4 m telescope, the rotator angle of the slit directly indicates the position angle, from 0° in the north-south orientation, measured from north to east (counterclockwise).

3. POSITIONS OF OBSERVED GALAXIES

Some of the positions given in the literature for Abell clusters (north and, to a lesser extent, in the south) can differ somewhat from the positions of the central galaxies or are rough averages of the general cluster regions. For identification purposes we provide for each of the observed galaxies their 1950.0 epoch coordinates. When available, these positions were taken from the literature as indicated in the Table below. A number of them were measured from the SRC/ESO (B or J) or PSS glass copies, using the Optronics machine at ESO, Garching, with reference to some 20–30 SAO or Perth astrometric standards. Many of the values from the literature were measured with this same machine. For a large majority, positions were measured from PSS prints or ESO/SRC J or R films, with a simple digitized x-y light table at Santiago, with reference to 12–15 SAO stars in the vicinity of each cluster. In the first case the external error is estimated to be 1"–2", while in later cases this value is estimated at 6"–10". In Table 3 we indicate the source of the given positions. Some of these are from the ESO/Uppsala catalog (Lauberts 1982) or are Parkes radio source positions.

4. REDUCTION PROCEDURES AND VELOCITY MEASUREMENTS

All reductions were done within the IRAF[3] environment, ver. 2.9 and 2.10.2. Some preliminary work has been done using other reduction packages, but for homogeneity all the data was later reduced again with IRAF.

4.1. *Modular Spectrograph Data*

The CCD image has little distortions, with the spectra running along the columns. The spectra was extracted using the task APSUM, fixing the apertures to be 2–3 pixels by selecting the peaks of the fiber images from a cut across the dispersion axis. Object, sky, and comparison spectra were extracted following third-order Legendre functions. Spline-3, order-7 functions were used for wavelength calibrations, resulting in rms errors of 0.2 Å. We checked the calibration with the 5577.35 Å night-sky line, which showed errors no larger than 0.5 Å.

4.2. *2D-FRUTTI Spectra*

Due to the nature of the 2D-FRUTTI system we have the typical S-shaped distortions inherent to this instrument. Therefore the first step was to transform our curved spectra to straight via the transform algorithm in the LONGSLIT package, using the multihole frames and a zenith long comparison lamp exposure. The response along the slit was normalized using the frames of sky taken at twilight. Sky subtraction was done extracting two parallel 8 pixel apertures on each side of the galaxy spectrum, all three following an order-3, spline-3 curve, to catch discontinuities that are caused by the microchannel and image intensifiers of the 2D-FRUTTI. The mode of both sky spectra was retained to check wavelength calibration from the positions of sky lines. Comparison spectra were extracted following curves with the same parameters as object spectra. The wavelength solutions for 24–30 points using a fourth- or fifth-order Legendre typically yielded residual values less than 0.3 rms Å.

4.3. *Intensified Reticon (Shectograph) Data*

The two channels were switched on and off between galaxy (object + sky) and sky several times during the exposures. Sky subtraction is straightforward. Together with wavelength cali-

[3] IRAF is distributed by NOAO, which is operated by the Association of Universities for Research in Astronomy, Inc., under contract with the National Science Foundation.

bration procedures, comparison with other data is described by QR90.

4.4. *SIT Vidicon Data*

The image has similar distortions, but much milder, than the 2D-FRUTTI two-dimensional spectra. Thus the same methods were used to extract the one-dimensional spectra from the image and perform sky substraction and wavelength calibration.

4.5. *Velocity Measurements*

For most of the data (excepting the older Vidicon spectra for which no cross-correlation method was applied) three different methods were used to measure the redshift of the objects. The first method applied was a line-by-line Gaussian fitting to the strongest lines, such as the H and K Ca II bands, G band, Mg I, and/or Balmer jump. For normal early-type spectra we were able to use two different cross-correlation algorithms now currently supported inside of IRAF (RV and RVSAO), with correlation peak fitting done by a parabolic adjustment. However, for non–early-type spectra (i.e., emission lines, E + A, etc.) we resorted to the line-by-line Gaussian fit. Additionally, when a low Tonry & Davis (1979) R-value ($R \leq 4$) was obtained, this would indicate that the cross-correlation result was acceptable only if it agreed with the Gaussian line fitting. If the fitting method showed credible lines and the R number was particularly low or, on occassion, extremely poor (i.e., below 2 or 2.5), we kept those values derived from at least five lines. However, in Table 3 we quote all R-values.

To apply the correlation algorithms, spectra were continuum-subtracted and filtered with a ramp function in Fourier space, to remove high-frequency noise and low-frequency trends that persisted after the continuum subtraction. The Shectograph data were rebinned in log-linear scale with resolution 1.4 Å pixel^{-1}, the 2D-FRUTTI spectra had a resolution of 2 Å pixel^{-1} (with the exception of session 8 which had 2.4 Å pixel^{-1}), and the corresponding value for the Modular data was 2.4 Å pixel^{-1}. For object and template Shectograph spectra, initial and ending wavelengths were 3510 and 6800 Å, respectively. For the 2D-FRUTTI corresponding values were 3890 and 5900 Å, while for the Modular they were 4000 and 6850 Å, respectively. As templates, we used stars and galaxies which had high signal-to-noise ratios (S/N). For the Shectograph data, we used the spectra of HD 22663 and HD 23319, of types K0 and K2, while for the 2D-FRUTTI data we used spectra of 21 stars of types K0, K2, and G5. The template stars and galaxies used for the Modular data included HD 55229, HD 55434, and HD 71370 and NGC 2217, NGC 2775, and NGC 2784.

Similarly, spectra of galaxies NGC 1700, NGC 596, and NGC 1426 and 13 galaxies of types E0, E2, E4, E6, SB0 nuclei, and S0 were used as templates. All templates were correlated between them and were retained only if consistent solutions were found. Also, a synthetic spectrum, constructed from the library of stellar spectra of Jacoby, Hunter, & Christian (1984), was used (details in Quintana, Ramírez, & Way 1994c, hereafter QRW94). Different combinations of radial velocity templates served to derive Shectograph, 2D-FRUTTI, and Modular velocities. Cross-correlation of the Shectograph data was performed with six templates, retaining the velocity produced by the correlation with the highest R-value if the velocities from all templates were consistent, had dispersions lower than individual errors, and agreed with the traditional line-fitting procedure, done previously. If there was no complete consistency, usually for $R \leq 4$ values, the cross-correlation procedures were performed interactively, searching for a peak at the position suggested by the line-fitting value. When no clear peak was present (very low values of R), the original line-fitting velocity was adopted. For the 2D-FRUTTI and Modular data we used all available templates running the XCSAO program in batch mode. If most templates (30 or more) gave consistent results, in the sense described, we adopted as final velocities the mean of the three values with highest R numbers. Otherwise, the interactive procedure was followed and we adopted the velocity corresponding to the highest R-value.

A detailed comparison of both cross-correlation and line-fitting procedures, using more than 400 velocities with $R > 5$ values, showed consistent results between all methods. However, the velocity values of both correlations have a mutual dispersion which is smaller by a factor of 2 than the dispersion of any of the correlation results with the line-fitting velocities (further details in QRW94). On this basis we decided to retain the velocities obtained from the XCSAO program within RVSAO, which allows greater flexibility in its use and is likely to be more widely used. These are the values given in Table 3.

We could check the accuracy of our results by comparing the derived velocities with those known velocities for the template galaxies and dispersion calibrators, as well as the velocities of the star templates. Additionally, there is a large number of observed galaxies in some clusters that have numerous published velocities. These comparisons are presented in the papers quoted above (QRW94, QR90, Quintana et al. 1994b), and they will not be repeated here. Overall, they show that our errors are consistent with those published. Moreover, we discuss below our data consistency and give a comparison with values in the literature.

5. RESULTS

The heliocentric redshifts of 165 clusters are given in Table 2, where we show their positions from the ACO, QW90, or Zwicky catalogs, respectively, Bautz-Morgan types (BM), Abell richness (R) and distance (D) classes, the adopted z, and the number of measured velocities retained in its calculation (N_g). Cluster numbers within parentheses are used to indicate redshift values for galaxy concentrations some distance from the main cluster density enhancement. Finally, in column (9), we give a comment concerning uncertainties of membership, either of our measured galaxies or the literature values. These are mostly taken from the compilation of SR91, which are corrected to the centroid of the Local Group. We also give other names given to these clusters and references for galaxy velocities, when these were different from ours. We have not included in Table 2 those clusters for which a sizeable number of galaxy velocities are known already, but we give in Table 3 below a few additional velocities from our data.

TABLE 2

CLUSTER REDSHIFTS

Abell (1)	α(1950) (2)	δ(1950) (3)	BM (4)	R D (5) (6)	z (7)	N_g (8)	References and Comments (9)
2	00^h05^m9	-19°55'	II	1 6	0.1225	1	
3	00 06.7	03 45	II:	1 5	0.1012	1	
13	00 11.1	-19 47	II:	2 5	0.0949	2	
17	00 14.4	08 31	I-II	1 6	0.0882	1	
34	00 24.7	-09 05	I-II	2 6	0.1315	1	Schneider83: 0.041
37	00 25.4	-10 48	II	1 6	0.1668	1	
38	00 25.8	13 39	II:	1 6	0.1408	1	
44	00 27.0	11 45	II	1 5	0.1394	1	SR: 0.0559 (0); foregr., Sp
47	00 28.1	-24 26	II	1 6	0.1381	1	
49	00 28.9	-11 42	II	1 6	0.1571	1	
50	00 28.9	-22 30	II:	2 6	0.0882:	1	likely foregr.
67	00 34.4	18 59	II	2 6	0.1367	1	foregr. gal at z=0.0584
91	00 40.7	-10 54	II	1 6	0.1275	1	
101	00 45.0	-01 11	II:	2 5	0.1172	1	
102	00 46.1	01 06	III	0 3	0.0631	1	SR: 0.0632 (2)
122	00 55.0	-26 33	I:	1 5	0.1127	1	
123	00 55.9	-14 40	II:	1 5	0.0957	2	
126	00 57.3	-14 29	I-II:	1 5	0.0555	2	
129	00 58.5	-10 14	II	2 6	0.1507	1	
144	01 03.9	-21 08	II	1 6	0.2046	1	
145	01 04.2	-02 43	II	2 6	0.1909	1	
146	01 05.0	-11 31	I	1 6	0.1876	1	
153	01 07.1	04 58	II:	2 6	0.1262	1	
172	01 14.4	02 59	II:	1 5	0.1247	1	
178	01 19.1	19 49	II:	1 5	0.1930	1	
192	01 21.7	04 13	I:	2 6	0.1215	1	
211	01 30.3	-04 16	II:	2 5	0.1382	1	
214	01 32.0	-26 21	I	1 6	0.1598	1	
227	01 37.1	17 56	II	1 6	0.1763	1	
242	01 39.5	-14 34	I-II	1 6	0.2495	1	
261	01 48.9	-02 29	I	1 5	0.0477	2	SR: 0.0467 (1)
289	01 58.4	-24 52	II	1 6	0.2048	2	
294	01 59.6	05 10	I-II	1 6	0.0780:	1	possible foregr.
295	01 59.9	-01 19	II:	1 5	0.0428:	3	probable foregr.(3 gal)
306	02 04.7	-12 02	II	1 6	0.2165	1	
319	02 09.4	-12 20	I-II:	1 6	0.1446	1	foregr. gal at z=0.076
326	02 11.2	-07 21	II:	0 5	0.0558	3	db comp. vel. from VC88 and Schneider83
353	02 25.2	-22 17	II:	1 6	0.1638	1	
360	02 28.7	06 46	I	2 6	0.2203	1	
371	02 38.7	-11 26	II:	1 5	0.0962	2	
374	02 40.9	04 02	II:	2 6	0.0757:	1	possible foregr.
389	02 49.1	-25 07	II	2 4	0.1139	2	SR: 0.1160 (1)
394	02 51.5	-14 51	I	1 6	0.2062	1	
395	02 52.1	-10 35	II:	2 6	0.1479	2	
411	03 02.0	00 49	II	1 6	0.1567	1	
432	03 21.6	-05 59	II	2 6	0.2027	2	
438	03 26.2	-10 01	I-II:	1 5	0.1763	1	foregr. gal at z=0.031
447	03 35.5	-05 17	I	1 6	0.1124	1	
464	03 47.2	-17 58	II:	2 6	0.1465	1?	
510	04 44.6	-21 06	I	1 6	0.1818	2	another at z=0.199
(514)	04 45.5	-20 31	II-III:	1 3	(0.0646)	2	SR: 0.0731 (2); here extention to E?
516	04 47.7	-08 54	II:	1 6	0.1411	2	SR: 0.1407 (2); 1 Ciardullo85
543	05 28.5	-22 27	II	1 5	0.1754	3	
548	05 45.0	-25 38	III	1 1	0.0408	6	...
658	08 21.0	15 50	III	1 5	0.0921	2	
720	08 52.3	15 49	I-II	1 6	0.1334	1	foregr. group at z=0.0747 (3 gal)
734	08 57.8	16 28	I	1 6	0.0723	2	
775	09 13.7	06 05	II:	1 6	0.1340	1	
830	09 32.8	07 44	II	1 6	0.2160	1	
838	09 34.6	-04 47	III	0 3	0.0511	2	SR: 0.0498 (3)
882	09 48.6	08 29	I	0 5	0.1412	2	SR: 0.1408 (2); 2 spectr ea.
883	09 48.7	05 44	II:	1 5	0.0745	2	2 spectra ea.

TABLE 2—*Continued*

Abell (1)	α(1950) (2)	δ(1950) (3)	BM (4)	R D (5) (6)	z (7)	N_g (8)	References and Comments (9)
919	10 02.4	-00 27	II:	1 5	0.0961:	2	2nd at z=0.085
941	10 07.1	03 56	II	1 5	0.1049	1	
994	10 20.1	19 35	I:	1 6	(0.0395)	1:	foregr.
1024	10 25.7	04 01	II:	1 5	0.0743	2	
1038	10 30.4	02 30	I-II	1 6	0.1246	1	
1047	10 32.2	04 40	II	1 5	0.1524	1	foregr. at z=0.0969
1113	10 48.4	08 54	II:	1 6	0.0839:	1	likely foregr. (another at z=0.0657)
1119	10 50.1	10 58	II	1 6	0.0879	1	
1126	10 51.3	17 07	I-II:	1 4	0.0850	3	SR: 0.0852 (3), 1 Smith85
1142	10 58.3	10 49	II-III:	0 3	0.0364	3	
1205	11 10.8	02 47	II:	1 5	0.0759	3	
1206	11 11.0	-05 20	II	1 6	0.1446	1	
1271	11 26.4	-09 19	II	1 6	0.1711	2	
1277	11 27.4	13 11	I	0 6	0.2435	2	
1307	11 30.2	14 48	II	1 5	0.0831	3	2 Rhee88
1317	11 32.6	-13 15	I-II:	2 5	0.0702	4	2 Rhee88
1358	11 40.2	08 30	II:	1 5	0.0813	2	
1386	11 45.8	-01 40	I-II:	1 5	0.1023	1	
1391	11 47.2	-12 01	I	2 6	0.1555	1	
1407	11 51.0	-01 28	II	1 5	0.1363	1	
1505	12 13.1	18 58	I-II:	1 6	0.1798	1	another cluster at z=0.112
1508	12 13.6	17 46	I	1 5	0.0968	1	
1583	12 37.9	-15 41	I-II:	1 6	0.1389	1	
1584	12 38.2	-18 18	II:	1 5	0.1199	2	
1595	12 40.0	-16 09	II:	1 6	0.1388	1	
1601	12 41.0	09 15	II	1 5	0.1639	1	
1662	12 60.0	08 35	II	1 5	0.0928	1	
1663	13 00.2	-02 15	II:	1 5	0.0847	1	
1668	13 01.4	19 32	II	1 5	0.0644	2	SR: 0.0649 (1); 1 Rhee88
1853	14 02.8	-19 32		1 6	0.1379:	1	
1864	14 05.8	05 41	II	1 5	0.0871	2	
1924	14 28.7	-22 09		2 5	0.1118	2	SR: 0.1110 (0); (3 spectra, em+abs)
1950	14 38.1	13 17	II:	1 5	0.1955	1	foregr. at z=0.064
1964	14 44.1	-08 34		0 5	0.0712	2	
2023	15 03.3	03 03	I-II:	1 5	0.0547	2	
2026	15 06.0	-00 05	II:	1 5	0.0876	4	SR: 0.0874 (4); 2 Rhee88
2030	15 08.7	00 06	I-II	1 5	0.0919	1	
2128	15 46.3	-02 54	I-II	0 5	0.1019	1	PHG92: 0.1005 (2); another at z=0.0574
2333	20 58.0	-19 26	II	1 5	0.1119	1	
2334	21 01.3	-25 27	III	1 6	0.1852	1	
2357	21 33.8	-23 28	II	1 5	0.1232	1	
2362	21 38.0	-14 30	II	1 5	0.0610	2	SR: 0.0609 (2); 1 Kirshner87, another backgr?
2364	21 39.2	-20 32	I:	1 6	0.1469	1	
2376	21 43.2	-09 40	I-II	1 5	0.0891	1	
2381	21 48.4	02 03	I:	1 5	0.0719	1	
2394	21 52.9	-19 28	I-II:	1 5	0.0811	1	
2401	21 56.1	-20 20	II	1 5	0.0563	1	PHG92: 0.0576 (2)
2416	22 02.2	-25 28	I	1 6	0.2130	1	
2428	22 13.6	-09 36	II:	1 5	0.0846	1	another at z=0.0385
2452	22 31.1	-09 03	II	1 6	0.1337	1	
2456	22 32.4	-15 33	I	1 5	0.0762	1	
2457	22 33.2	01 13	I-II:	1 4	0.0591	1	SR: 0.0597 (1)
2462	22 36.4	-17 37	I-II:	0 4	0.0749	1	SR: 0.0698 (3)
2468	22 38.0	07 57	II:	1 6	0.1414	1	
2480	22 43.4	-17 57	II	1 5	0.0711	1	
2490	22 46.7	-04 03	II	1 5	0.0694	2	
2512	22 57.1	09 50	II	1 5	0.1596	1	another at z=0.1001
2516	22 57.5	18 15	II	1 5	0.0785	1	
2522	22 59.4	13 47	I-II	1 6	0.1554	1	
2529	23 03.7	-13 31	II:	2 5	0.1101	1	
2533	23 04.6	-15 29	I	1 5	0.1110	1	
2543	23 07.4	-15 11	II:	1 5	0.1063	2	

TABLE 2—*Continued*

Abell (1)	α(1950) (2)	δ(1950) (3)	BM (4)	R D (5) (6)	z (7)	N_g (8)	References and Comments (9)
2553	23 09.7	-25 13	I-II:	1 6	0.1494	2	
2571	23 16.0	-02 32	II	1 6	0.1080	1	
2577	23 18.1	-23 14	I	1 6	0.1249	1	
2579	23 18.5	-21 50	I:	1 5	0.1115	1	
2590	23 21.8	01 49	II:	1 6	0.0784	1	
2613	23 28.6	-13 13	II	2 5	0.1166	1	
2708	00 04.0	-17 12	II:	0 6	0.1467	1	
2710	00 04.1	-15 39	I-II:	0 5	0.1001	2	
2789	00 31.2	-69 32	I	0 5	0.0956	2	
3151	03 38.4	-28 52	I-II	1 4	0.0677	2	
3157	03 41.5	-30 06	I-II?	2 6	0.2128	1	
3158	03 41.7	-53 48	I-II	2 4	0.0602	10	
3165	03 44.8	-29 11	III	0 5	0.1404	2	
3186	03 53.1	-74 09	I-II	1 5	0.1281	2	
3323	05 09.4	-29 03	I	0 4	0.0640	2	
3342	05 24.0	-30 38	I-II	2 5	0.1994	1	
3392	06 25.3	-35 27	I	1 3	0.0546	1	
3667	20 08.5	-56 58	I-II	2 3	0.0554	8	
3695	20 31.6	-36 00	I	2 4	0.8888	2	
3744	21 04.3	-25 41	II-III	1 2	0.0385	4	
0191S	01 44.1	-73 12	II	0 4	0.0780	2	
0393S	03 46.7	-45 42	I	0 4	0.0671	8	Peterson86 (7)
0463S	04 28.0	-53 56	I-II	0 3	0.0399	2	
0535S	05 31.6	-36 23	II	0 3	0.0473	2	
0546S	05 46.7	-32 41	II	0 5	0.0703	3	
0574S	06 11.1	-45 03	I	0 3	0.0461	2	
0639S	10 38.1	-46 04	I-II	0 2	0.0191	2	
(0726S)	13 12.4	-33 23	II	0 5	0.0500	2	uncertain gal. membership
0820S	19 30.0	-39 47	I	0 5	0.0771	2	
cl0017	00 17.1	-20 43			0.2720	1	
Zw#0802-01	08 02.7	-01 03			0.0879	2	
Zw#1006+12	10 06.1	12 02			0.2245	1	
QW#64S	20 59.2	-24 44			0.1899	1	

REFERENCES.—Ciardullo85 = Ciardullo, Ford, & Harms 1985. Kirshner87 = Kirshner, Feigelson, & Newberry 1987. Peterson86 = Peterson et al. 1986. PHG92 = Postman, Huchra, & Geller 1992. Rhee88 = Rhee & Katgert 1988. Schneider83 = Schneider et al. 1983. Smith85 = Smith et al. 1985. SR = Struble & Rood 1987 (SR1) or 1991 (SR2). VC88 = Valentijn & Casertano 1988.

Velocities for the individual galaxies and details concerning each observation are given in Table 3. Here we include galaxies for a number of clusters with well-known redshifts, though some galaxies observed have no previous velocities measured. Columns (2), (3), and (4) show the 1950.0 epoch equatorial coordinates of each measured galaxy and a code (P) indicating their sources, as described in § 3 and listed in the notes to this table. Usually, we give only one position for close dumbbells, identifying each component by its relative orientation. Columns (5), (6), and (7) show the independently measured heliocentric velocities of each galaxy, their errors, and Tonry-Davis R numbers or, if an integer appears, number of lines measured (the latter for sessions 13 and 14). Uncertain values are preceded by a colon. An asterisk in front of a velocity indicates an entry from the literature, as emphasized by the entry "lit" in column (8). In columns (8), (9), and (10) we give information concerning the observations: our identification code for galaxies, session and telescope code S (according to Table 1), and exposure times t in minutes. Finally, column (11) shows comments and slit rotator position (r), as used in each telescope and described in § 2. Rotator values corresponding to the standard east-west orientation are not indicated (values 180° at LCO 2.5 m and 90° at CTIO 4 m). The comment also may include other common names for clusters or galaxies, comments on the galaxy rank or position within the cluster, presence of emission lines, or other characteristics. Also, in brackets we note observing conditions, in particular moon phase, clouds, and seeing, with the following conventions: No comment is given if an observation was performed in dark and clear skies, with good seeing (between 1″–1″5), taken as default condition. We indicate as excellent seeing below 1″ (es), fair seeing 1″5–2″ (fs), bad seeing 2″–3″ (bs), and very bad seeing worse than 3″ (vbs). Presence of varying amounts of moonlight (m) and clouds (cld or cirrus) are marked. Comments for literature velocity lines indicate references listed in the notes (some authors give velocities corrected for galactic rotation, as marked). We stress that we quote literature values if we think these are for the same galaxy (other velocities in the clusters are reflected in the redshifts of Table 2). However, it is not unusual that galaxy identifications are given without exact positions (or without their accuracies) or no finding charts instead. This leaves, at times, some uncer-

TABLE 3

GALAXY VELOCITIES: ABELL CLUSTERS

Abell (1)	α(1950) (2)	δ(1950) (3)	P (4)	Vel.[a] (5)	Error[a] (6)	R (7)	Gal. (8)	S (9)	t^b (10)	Comment (11)
2	$00^h05^m45^s0$	-19°55'51"		36720	57	3.7	1	3	8	1st db (es)
3	00 06 52.5	03 42 41		30337	46	5.4	1	6	25	member
				43031	100	1.6	1w	6	25	backgr. group; same slit
13	00 11 06.4	-19 46 45		29761	65	3.5	1	6	11	(es)
	00 11 01.6	-19 45 46		27140	47	5.9	2	6	10	(es)
17	00 14 31.1	08 33 02		26440	61	5.1	1	6	20	
34	00 25 00.4	-09 09 46		39422	52	4.1	2	3	13	(es)
37	00 25 13.4	-10 49 08		50011	48	3.4	1	6	15	(es)
38	00 25 43.9	13 38 20		42217	64	4.1	1	3	20	(es)
44	00 27 11.4	11 47 32		:41782	105	1.6	1	6	15	z lit 0.0559 foregr. Sp: Shectman85
47	00 28 05.1	-24 27 46		41389	40	2.8	1	2	22	(cld)
49	00 28 54.6	-11 41 15		47100	87	3.2	1	2	15	(cld)
50	00 28 55.6	-22 28 22		26430	55	3.5	1	2	15	likely foregr.
67	00 34 21.3	19 00 32		40989	91	2.4	2	3	7	D gal in cl dens. center (es)
	00 34 14.9	18 57 28		17525	38	3.6	1	3	7	foregr. Sp (es)
				17517	63	3.8	1	3	7	(es) independent exposure
91	00 40 40.6	-10 56 23		38226	51	5.0	1	6	12	(es)
101	00 44 57.8	-01 09 16		35135	51	4.7	2	7	20	cl. center (bit m, fs)
102	00 45 55.6	01 04 57		18914	49	4.7	E	8	40	r193; db; UGC 00496, K18 (strong m)
				*19003	65		lit			Tifft82 (galactocentric v, E comp.)
				*19021	50		lit			Shectman85 (no position)
122	00 54 56.8	-26 33 07		33787	31	7.7	S	7	30	(bit m, fs)
123	00 55 56.6	-14 40 44		28492	44	6.6	1	7	17	(some m)
				28504	42	5.9	1	6	10	(cld)
	00 55 52.5	-14 41 54		29089	50	3.5	2	6	10	(cld)
126	00 57 08.4	-14 28 06		16840	37	6.4	2	2	30	seems member (cirrus, bs)
	00 57 23.5	-14 30 45		16462	35	7.7	1	2	20	seems member (cirrus, bs)
129	00 58 30.4	-10 13 25		45175	81	3.3	1	2	20	diffuse (bs)
144	01 03 51.4	-21 10 09		61323	57		1	2	30	(bs)
145	01 04 19.9	-02 44 58		57236	78	3.0	2	2	30	cluster center (bs)
	01 03 58.5	-02 43 33		20013	49	5.3	1	2	5	foregr. group (bs)
146	01 04 45.6	-11 33 37		56255	66	2.2	1	3	13	(es)
151	01 06 22.2	-15 40 29	a	15392	44	7.4	S	7	40	db; E gals. (m, cld, v bs)
				*15432	37		lit			Proust92(1.5m)
				*15447	63		lit			Proust92 (Optopus)
				*15445	60		lit			Proust88, Note
				*15404	21		lit			Smith85
	01 06 22.8	-15 40 20	a	15922	23	12.6	N	7	60	db; D gal; IC0077 (m, cld,v bs)
				*16046	36		lit			Proust92(1.5m)
				*15963	73		lit			Proust92 (Optopus)
				*15980	60		lit			Proust88, Note
				*15954	30		lit			Smith85
	01 06 21.3	-15 41 21	a	16175	52	5.7	1	2	10	(cirrus)
				*16094	51		lit			Proust92 (Optopus)
				*16166	100		lit			Proust88
	01 06 25.1	-15 42 55		14347	100	3.0	2	2	15	(cirrus)
153	01 06 54.4	04 58 28		37842	59	3.6	1	3	20	D gal? (es)
172	01 14 31.1	02 56 21		37384	92	2.9	1	3	25	cluster center (es)
178	01 18 58.8	19 49 56		:57864	114	1.1	1	3	20	cluster center (es)
192	01 21 42.5	04 11 55		36436	100	2.1	1	3	10	(es)
211	01 30 07.1	-04 15 57		41428	74	3.8	1	3	15	(es)
214	01 32 01.8	-26 21 39		47910	114	3.2	NW	6	30	db (m, cld)
227	01 37 11.8	17 54 57		52839	150	2.5	1	3	13	(es)
242	01 39 23.7	-14 33 39		:74785	47	3.4	1	2	50	cl. center
	01 39 28.4	-14 31 44		12128	92	2.9	F	2	5	foregr. Sp, em
261	01 48 54.3	-02 30 19		14010	47	6.9	1	2	4	cl. center; ok low z 0.0467 lit?
				*14010	50		lit			Malumuth85 (BCM in cluster)
289	01 58 30.4	-24 52 23		61340	123		1s	5	40	S comp. of binary
				61460	145	2.6	1	3	25	(es)
294	01 59 42.0	05 10 45		23377	34	4.2	1	5	20	low z for D=6: poss. foregr. (strong m)
295	02 00 11.4	-01 20 19		12848	35	6.7	3	6	10	poss. foregr. (es)
	02 00 04.4	-01 20 24		12747	29	4.3	4	6	10	poss. foregr. (strong m, es)
	01 59 43.7	-01 22 06		12858	43	7.0	1	6	10	MCG+00-06-025; poss. foregr. (strong m,es)
				*12837	50		lit			Shectman85 (no position)

Abell (1)	α(1950) (2)	δ(1950) (3)	P (4)	Vel.[a] (5)	Error[a] (6)	R (7)	Gal. (8)	S (9)	t^b (10)	Comment (11)
306	02 04 45.7	-12 01 25		:64920	69	2.0	2	3	22	(es)
319	02 09 07.3	-12 17 19		43356	44	5.0	1	5	30	member (m)
	02 09 32.0	-12 21 16		22897	105	2.0	2	5	30	(m) foregr.
326	02 11 23.6	-07 25 07		16893	38	3.9	3	2	20	(bs) z consistent with db BCM z (VC88)
353	02 25 00.2	-22 19 32		49105	63	3.6	1	5	20	
360	02 28 48.9	06 45 41		66038	79	1.7	cD	3	20	(es)
371	02 38 42.3	-11 25 32		29027	45	4.8	W	6	20	db; center db,W comp(strong m,es)
	02 38 42.9	-11 25 32		28716	40	7.0	E			close db comps.
				28743	73	3.1	E	6	30	(es) indep. exposure
374	02 40 59.5	04 02 57		22703	66	3.7	1	5	20	1st E: member? (m)
389	02 49 11.8	-25 08 59		33931	79	3.1	1	2	11	central D gal; em
	02 49 19.6	-25 16 40		34346	82	3.9	S	2	10	bright, far from center
394	02 51 25.5	-14 52 15		61830	153	1.8	1	2	50	cluster center (cirrus, fs)
395	02 51 52.4	-10 34 10		44269	39	2.0	1	3	10	gE gal (es)
				44435	37	4.0	2	3	13	(es)
411	03 01 51.1	00 51 08		46986	50	1.6	1e	6	25	unequal db, brightest E comp.(fs)
432	03 21 40.3	-05 58 35		60999	89	1.8	C	2	40	cluster center
				60529	92	2.5	n	6	30	N comp of triple (cld)
438	03 25 51.2	-10 01 31		52847	63	1.7	2	3	23	(es)
	03 25 55.6	-10 01 14		9272	40	5.0	1	6	20	foregr. (m)
447	03 35 25.0	-05 17 21		33648	91	3.7	NE	5	20	r257; db; brightest NE comp (m)
				33661	34		NE	13	40	r62 (strong m, cld, bs)
				33818	84	3.5	NE	9	20	(bs). Note
	03 35 28.2	-05 09 44		10741	44	7.1	1st	2	5	foregr. to N, far from center
				10772	38	8.0	1st	5	5	r257 (m)
458	03 43 50.1	-24 27 10		31806	45	4.4	1	2	10	D gal (cld)
				*31621	50	6.0	lit			Colless87 (39)
	03 43 58.9	-24 28 13		31354	38	4.9	3	2	15	(cld)
				*31368	47	6.5	lit			Colless87 (34)
464	03 47 00.5	-17 58 44		43947	42	6.3	1	6	15	(strong m, cld), D gal (cld,bs)
510	04 44 14.1	-21 07 14		54604	54	4.5	3	2	33	(cirrus, fs)
				54385	45	6.4	2	6	25	1st of cluster:group at W (cld,bs)
				59781	45	4.1	4	2	30	likely backgr.
				21073	52	4.7	1	2	20	foregr.
				21102	50	5.6	1	6	15	(quarter m, cirrus)
(514)	04 45 28.4	-20 29 30		19632	33	9.8	W	6	30	r200; Note: db in extention (m,cirrus)
				19113	66	4.3	E	6	30	r200; W strong, E weak
516	04 47 16.4	-08 51 51		42359	57	3.5	2	2	15	
				*41880	100			lit		Ciardullo85
	04 47 58.9	-08 49 36		8102	67	2.0	1	2	15	foregr., em diffuse
543	05 28 28.8	-22 29 06		52030	53	3.5	W	6	22	db/D (m,cld)
	05 28 29.3	-22 29 08		52911	63	1.3	E	6	22	(second in slit)
	05 28 21.5	-22 26 10		52781	61	2.6	2	5	15	(es)
548	05 46 36.6	-25 29 38	a	11878	37	6.1	W	8	30	r183; db; ESO488-G27 (cld, bs)
				11856	68	4.2	W	6	15	MGC04-14-033 (es); slit E-W
				*12000	50		lit			DS88
	05 46 41.6	-25 29 34	a	11991	25	10.9	E	8	30	r183 (same slit); db
				12024	31	8.2	E	6	15	MCG 04-14-035
				*12150	50		lit			DS88
	05 46 43.1	-25 34 29	a	12405	21	9.9	SpE	8	60	r232 (cld, bs)
				*12345	50		lit			DS88
	05 46 42.2	-25 34 31	a	11089	43	3.0	SpW	8	60	r232 (same slit)
				*11338	50		lit			DS88
	05 43 26.2	-25 57 02	a	13165	35		W	13	35	r101; ESO488-g7; VV162A,B,C
	05 43 28.0	-25 57 06	a	13371	20		E	13	35	r101; ESO488-g9; (strong m, fs)
				*13341	50		lit			DS88
658	08 21 12.4	15 44 37	b	27595	64	1.8	E	6	30	db; PKS0821+157 (strong m, cirrus)
				27607	74	1.8	W	6	30	(6 arcmin diff. with Abell position)
720	08 52 20.5	15 48 46		40462	163	2.2	3	5	15	
				39511	67	2.0	3	5	20	(es) (spectrum in different night)
	08 52 30.3	15 48 37		21353	52	5.5	2	5	30	foregr.
	08 52 44.9	15 45 59		23415	55	4.5	1	5	15	foregr. 1st
	08 52 30.3	15 47 55		20356	150	2.1	4	5	30	foregr.
734	08 57 43.4	16 26 12		21565	40	5.0	cD	5	12	(cirrus)

TABLE 3—*Continued*

Abell (1)	α(1950) (2)	δ(1950) (3)	P (4)	Vel.[a] (5)	Error[a] (6)	R (7)	Gal. (8)	S (9)	t^b (10)	Comment (11)
				21771	37	3.4	2	5	15	close to cD to SE (cirrus)
775	09 13 46.1	06 05 47		40170	69	2.0	1	5	20	
830	09 32 48.0	07 43 47		64755	44	3.9	cD	5	30	
838	09 34 39.4	-04 48 41	a	15674	32	6.0	W	8	60	db; 2x30 exp (vbs); East is Ep in D80
				*15160			lit			Batuski84
	09 34 38.4	-04 48 43	a	14990	29	4.5	E	8	60	
				*14860			lit			Batuski84
882	09 48 42.5	08 33 20		42901	27		W	13	40	r99; central db (night 1)
				42803	59		W	13	45	r94 (cld, bs night 2)
				*42290	100		lit			Schneider83
				41923	35		E	13	45	r99, 10" East
				41916	55		E	13	45	r94
				*42210	100		lit			Schneider83
883	09 48 37.6	05 43 29		21727	47	5.2	NE	5	20	r176; central db (es)
				22148	14		NE	5	20	r22
	09 48 37.4	05 43 18		22722	57	5.1	SW	5	10	r176; db comp, bright nucleus (es)
				22725	28		SW	13	40	r22; (m, fs)
919	10 02 21.9	-00 27 56		25397	43	6.5	1	5	15	
	10 02 18.9	-00 26 00		28810	64	5.2	2	5	20	
941	10 07 07.2	03 52 07		31454	124		cD	5	15	
994	10 20 21.4	19 37 32		36917	71	3.7	1	8	30	foregr., D=6 (vbs)
				11854	43	6.2	7	5	12	
1024	10 25 47.4	04 00 54		21916	46	6.5	1	5	15	r112; D gal
	10 25 46.5	04 01 15		22677	51	3.8	2	5	15	r112; N to D gal
1038	10 30 22.2	02 30 13		37384	54	3.8	cD	5	20	
1047	10 32 12.2	04 39 52		45717	47	3.4	1	5	20	r186; gE in cluster
	10 31 33.1	04 37 01		29070	58	4.2	W	5	30	r178; 2nd cluster W to A1047: foregr.
1060	10 34 15.0	-27 15 30	c	4083	26	13.6	09	11	6	NGC3309 (twilight)
				4077	27	13.4	09	10	6	(twilight)
				4088	21	17.2	09	9	6	(bs)
				4068	29	12.6	09	9	10	(es)
				4100	16		lit			RC3
	10 34 22.0	-27 16 06	c	3792	36	9.0	11	9	10	NGC3311 (bs)
				3785	20		lit			RC3
1066	10 36 44.0	05 23 49		20684	55	5.3	2	5	7	(fs)
				*21180	30		lit			Owen88:
	10 36 30.6	05 28 13		20310	68	5.0	3	5	6	(fs)
				*20370	90		lit			Owen88
	10 37 02.5	05 26 12		20946	97	4.3	4	5	6	db, density center (fs)
				*21450	90		lit			Owen88:
	10 36 55.6	05 22 07		8163	53	4.3	1	5	6	foregr. (fs)
1113	10 48 32.2	08 59 27		25161	45	5.9	1	5	10	likely foregr. group (es)
	10 48 19.8	08 53 30		19717	54	4.7	2	5	10	Sp?; likely foregr. group (es)
1119	10 50 10.3	10 57 29		26344	69	4.0	1	5	10	
1126	10 51 10.4	17 07 02		25133	63		W	13	30	r120; central db (cld, vbs)
				*25303	100		lit			Hu85
				*25031	28		lit			Smith85
				26642	51		E	13	30	r120
				*26693	100		lit			Hu85
				*26330	40		lit			Smith85
1142	10 58 20.4	10 46 22	a	11116	63		SW	13	10	r66; Note; db+3rd (triple),Geller84
	10 58 20.9	10 46 27	a	10433	19		SE	13	10	r66; (twilight)
				10392	45		SE	13	10	r169; (vbs)
				*11000	33		lit			Geller84
	10 58 20.9	10 46 34	a	11065	35		N	13	10	r169; NGC492
				*10970	46		lit			Geller84
1205	11 10 45.7	02 49 07		22219	87	4.3	W	5	30	r156;VV145 ABC;db(with 3rd to N),(fs)
				22179	46	7.0	W	9	20	(es) MGC +01-29-019
				22363	24		W	13	30	r115 (cld, vbs)
	11 10 46.7	02 48 59		23380	59	7.2	SE	5	30	r156; db component (2x15min)
				23218	38	8.8	SE	9	12	(es)
				23370	35		SE	13	30	r115 (same slit with W)
				23374	66	5.5	E	5	15	r107 (same slit with E)
	11 10 45.9	02 49 31		23251	40	5.5	N	5	15	r107; 3rd in central group

Abell (1)	α(1950) (2)	δ(1950) (3)	P (4)	Vel.[a] (5)	Error[a] (6)	R (7)	Gal. (8)	S (9)	t^b (10)	Comment (11)
				23337	25	11.7	N	9	24	(es)
				21834	61	4.4	3	5	24	
				21698	62	3.8	4	5	24	
1206	11 11 03.5	05 16 33		43345	173	1.5	1	5	25	(bit twilight, es)
1271	11 26 29.1	-09 19 56	d	50558	26		W	13	45	r79; db (fs)
				50731	37	6.0	W	1	90	r184
	11 26 29.8	-09 19 55	d	51862	45		E	13	45	r79
				52036	58	4.8	E	1	90	r184
1277	11 27 24.0	13 10 06		72660	164	3	W	13	30	r43; db (fs)
				73326	250	3	NE	13	30	r43 (fs)
1307	11 30 13.7	14 47 47		24509	71	4.7	D	5	10	D gal (Note)
1317	11 32 41.6	-13 16 26		21624	38		W	13	30	r75 ; db; central very close db (fs to bs)
				21769	35		E	13	30	r75
				*21646	100		lit			Rhee88 (position within 6")
1358	11 40 12.2	08 29 33		24281	49	6.6	NW	5	17	r146; db
				24476	57	6.0	SE	5	17	r146
1386	11 45 40.5	-01 42 17		30655	93	3.0	1n	5	6	N db comp of BCM
1391	11 47 12.2	-12 02 07		46614	31	2.0	1s	4	30	S db comp of BCM (moon, clouds)
1407	11 50 56.8	-01 27 21		40852	52	3.8	1	4	30	central D gal (some m)
1505	12 12 59.7	18 59 28		53909	84	3.0	2	4	30	2 cls in CCD- Sp in N group (some m)
	12 12 55.1	18 53 35		33607	39	5.8	1	4	20	(some m)
1508	12 13 17.9	17 54 11		29025	50	6.3	1	1	30	(cld)
1541	12 24 57.5	09 06 09		26834	64		W	13	20	r98 ; central db BCM (fs)
				*26760	100		lit	13		Hoessel80 (W db comp.?)
				27246	25		E		20	r98
1583	12 37 46.0	-15 42 51		41655	52	5.9	1	1	40	D gal, double (cld)
1584	12 38 08.7	-18 16 37		36677	37	8.0	E	1	60	r120; db E comp
				35202	53	5.5	W	1	60	r120; db W comp.
1595	12 39 53.7	-16 09 19		41611	45	6.3	1	1	60	
1601	12 40 50.4	09 16 16		49130	42	6.3	1	1	60	
1662	13 00 01.3	08 34 43		27822	44	5.7	1	4	30	central gal
1663	13 00 19.4	-02 15 31		25386	36	9.4	1	1	20	
1668	13 01 24.9	19 32 05		19170	38	9.2	1	1	20	agrees with Rhee88 close z (diff. gal)
1853	14 02 48.0	-19 32 00		41336	61	3.9	1	10	6	QW1402-195=ipc9091 (es)
1864	14 05 35.1	05 39 59		26032	52	4.9	1	4	16	central gal (cld)
				26190	33	10.6	1	1	30	
1924	14 28 44.4	-22 10 07	e	33157	55	5.4	C	10	6	QW1428-221=ipc9093 (es)
				33908	20	3	ser5	12	16	vel from absorp.: quasi-stellar image
				33882	20	6	ser5	12	16	vel from very strong em. (same spectrum)
				33729	70	6	ser5	12	20	abs.; differ. night (cirrus,fs)
				33880	20	9	ser5	12	20	em.; (same spectrum)
				7248	34	8.2	D	12	20	Sp foregr. (cirrus,fs)
1950	14 38 13.4	13 15 43		58607	49	4.6	2	4	30	E: cluster center
	14 37 54.6	13 14 48		19223	40	5.9	1	4	15	foregr.
1964	14 43 55.0	-08 33 42		21421	51	6.5	N	7	20	central db BCM: PKS1443-085
				21274	67	4.9	S	7	30	
2023	15 03 18.8	03 04 37		16651	41	6.7	1	4	10	
	15 03 22.5	03 04 23		16149	48	5.5	2	4	15	
2026	15 05 50.9	-00 04 34		26401	57	5.6	1W	4	30	r213
				*26323	100		lit			Rhee88, West
				27104	42	6.3	1E	4	30	r213
				*27042	100		lit			Rhee88, East
2030	15 08 49.2	00 07 43		27536	36	7.0	1	4	15	r213; PA to avoid star in slit (cld)
2128	15 46 08.6	-03 00 18		30551	86	3.1	2	4	30	cluster or backgr.? (cld)
	15 46 05.9	-02 50 27		17215	59	5.2	1	4	25	cD/D if in cl (cld)
2333	20 58 02.9	-19 27 10		33532	76	2.5	1	7	40	(m)
2334	21 01 17.9	-25 28 02	e	:55516	73	2.7	1	12	20	QW2101-255=ipc3452; central (es)
2357	21 33 54.0	-23 28 37		36920	41	5.9	1	7	30	
2362	21 38 22.1	-14 34 41		22467	59	4.1	2	7	25	poss. member, E of cluster (m)
	21 37 30.3	-14 27 31		18342	46	6.6	1	7	15	brightest (m)
2364	21 39 12.9	-20 32 55		44051	58	4.2	1	7	30	em 3727
2376	21 43 23.9	-09 40 57		26725	39	6.6	1	7	25	
2381	21 48 45.5	02 04 05		21549	34	7.8	1	7	30	(m)
2394	21 52 45.5	-19 29 12		24307	35	7.8	1	7	25	

TABLE 3—*Continued*

Abell (1)	α(1950) (2)	δ(1950) (3)	P (4)	Vel.[a] (5)	Error[a] (6)	R (7)	Gal. (8)	S (9)	t[b] (10)	Comment (11)
2401	21 56 02.0	-20 21 06		16902	41	7.1	2	7	15	
2416	22 02 02.9	-25 29 05		63860	78	3.3	1	7	30	D gal
2428	22 13 27.5	-09 35 59		11554	30	8.6	2	7	15	foregr. (CCD) (fs)
	22 13 36.3	-09 34 56		25368	50	5.8	1	7	15	cD (fs)
				*25363	150		lit			Allen91
2452	22 31 06.5	-09 05 35		40096	61	2.4	1	3	15	(es)
2456	22 32 32.8	-15 33 43		22859	28	8.0	1	7	20	
2457	22 33 06.3	01 15 25		17529	68	4.9	cD	7	10	
				*17910	100		lit			Hoessel80
2462	22 36 30.1	-17 36 07		22294	37	7.6	1	7	20	(some m)
				*22635	200		lit			Schneider83 (galatocentric v)
2468	22 38 08.3	07 54 04		42378	50	4.6	1	7	30	(some m)
2480	22 43 19.0	-17 57 08		21318	41	6.4	1	3	6	2nd brightest (es)
2490	22 46 45.6	-04 07 41		21025	41	3.8	1	3	5	(es)
	22 46 43.3	-04 02 54		20563	145	1.7	2	3	6	(es)
2512	22 57 07.9	09 49 52		30036	46	4.5	1e	3	10	(es)
	22 57 01.7	09 50 30		47851	76	2.6	2	3	15	(es)
2516	22 57 45.7	18 18 56		23530	96	2.1	1	3	8	(es)
2522	22 59 30.5	13 45 41		46593	111	2.5	NE	3	10	db; (es)
2529	23 03 43.0	-13 32 04		33015	80	2.2	1	3	12	(es)
2533	23 04 35.6	-15 29 42		33270	63	4.4	cD	3	10	soft (es)
2543	23 07 24.1	-15 14 15		31709	118	1.6	S	3	7	db; (es)
				32010	46	4.1	N	3	10	(es)
2553	23 09 44.2	-25 13 29		44826	57	3.3	1E	3	15	CCD shows pair SO's in contact (es)
				44760	63	3.3	1W	3	15	
2571	23 15 58.8	-02 32 59		32411	94	2.4	1	3	5	r172; Rot to avoid star in slit(es)
				*32336	50		lit			Shectman85 (no position)
2577	23 18 07.2	-23 15 55		37447	52	5.4	1	3	8	(es)
2579	23 18 36.6	-21 51 31		33422	57	5.2	S	7	30	db-S (some m, fs)
2590	23 21 28.2	01 49 06		23490	95	2.3	1	3	10	3rd brightest (es)
2613	23 28 09.1	-13 15 39		34946	72	3.4	1	3	7	D gal (+faints?) (es)
2708	00 04 00.2	-17 13 00		43990	69	3.7	1	2	40	(fs)
2710	00 04 06.8	-15 36 57		30066	80	3.2	1	2	10	(cld)
	00 04 09.4	-15 39 25		29953	107	2.3	2	2	12	(cld)
2789	00 31 11.4	-69 31 48		29284	83	2.9	D	11	10	QW0031-695, ipc9088; D gal soft n (m)
	00 31 03.7	-69 31 09		28031	76	4.7	2	11	10	(m)
3151	03 38 21.5	-28 50 17		20342	37	8.6	W	9	20	db; QW0338-285 (strong m,fs)
				20418	32		W	13	60	r86; (m)
				*20287			lit			Cappi91
	03 38 23.2	-28 50 15		20368	44		E	13	60	r86
				*20127			lit			Cappi91
3157	03 41 34.5	-30 04 37	e	63788	74	3.4	1	10	30	QW0341-300,ipc3450, N gal in nest(cirrus)
3158	03 41 59.2	-53 51 22	d	18204	33	8.7	LC1	10	14	SC0340-53 cluster
	03 41 41.1	-53 50 43	d	17875	52	4.8	LC2	10	10	
	03 41 41.5	-53 48 43	d	17278	78	4.0	LC3	10	16	
	03 41 58.4	-53 46 36	d	17529	53	5.3	LC4	10	14	
	03 42 11.2	-53 50 55	d	18762	60	5.4	HQ1	10	6	
				*18433	160		lit			Havlen78 HQ#1
				*18683	130		lit			Chincarini81 CH#26
	03 41 58.0	-53 46 56	d	16500	57	4.9	HQ19	10	12	
				*16438	37		lit			Havlen78 HQ#19
	03 42 6.9	-53 49 21	d	19452	48	5.1	HQ21	10	12	
				*19562	121		lit			Havlen78 HQ#21
	03 41 56.1	-53 50 29	d	20143	37	6.3	CH22	10	12	
				*20544	130		lit			Chincarini81 CH#22
	03 41 33.7	-53 47 18	d	17400	65		W	13	30	r110; db W; 2x15 exp (strong m, fs)
				*17227	56		lit			Havlen78 HQ#3
				*17210	130		lit			Chincarini81 CH#38
	03 41 41.7	-53 47 43	d	17690	30		E	13	30	r110; db E
				*17239	200		lit			Havlen78 HQ#2
				*17512	130		lit			Chincarini81 CH#37
3165	03 44 57.9	-29 09 43		42548	41	5.4	E	6	50	db BCM; QW0345-291 (cirrus, fs)
				*42652	115	3.6	lit			Metcalfe89 (GSP040, assumed east)

TABLE 3—*Continued*

Abell (1)	α(1950) (2)	δ(1950) (3)	P (4)	Vel.[a] (5)	Error[a] (6)	R (7)	Gal. (8)	S (9)	t^b (10)	Comment (11)
				41554	54	5.8	W	6	50	(slit E-W)
3186	03 53 16.3	-74 10 52	e	37322	73	4.1	1	11	20	QW0352-741, ipc8385 (strong m,cld)
	03 53 2.2	-74 08 45		39463	61	3.9	F	10	10	(es)
3266	04 30 32.4	-61 33 35	d	17865	70		W	13	30	r68; db BCM; Sersic 40/6 (strong m, bs)
				17884	62	3.8	W	8	20	r110 (bs); v lit: Note
				17639	49	4.9	W	5	15	r92
	04 30 33.6	-61 33 32	d	18240	50		E	13	30	r68 ; db BCM; v lit: Note
				18191	39	7.2	E	8	20	r110
				18080	37	8.7	E	5	15	r92
	04 30 37.2	-61 36 26	d	15776	43	6.2	3	8	20	(bs); 5 v in lit: QRW94 #25746
	04 29 42.5	-61 38 24	d	16659	44	6.1	4	8	20	(bs); 3 v in lit: QRW94 #25822
3323	05 09 25.0	-29 03 12	c	19235	40	6.9	E	6	30	db; ESO422-G43 (m, cld)
				19125	38	8.1	W	6	30	(slit E-W)
3342	05 23 55.8	-30 38 30		59774	55	2.8	E	5	30	r131;BCM db 0524-30 east comp.
3392	06 25 18	-35 27 00		16367	42	6.9	E	6	15	r159; Culgoora 0625-36 (m, cirrus)
3571	13 44 35.5	-32 36 57	d	11653	128	5	cD	14	90	r5; soft n, 3x30 exps (m,cld)
				*11410	100		lit			QdS93 (Optopus 3.6 m) ESO383-g76
				*11380	120		lit			QdS93 (CTIO 4 m)
				*11679	50		lit			da Costa86
				*11285	100		lit			Dressler91a (Modular)
				*11440	40		lit			Fairall89
3667	20 08 27.3	-56 58 36	f	16542	68	5.7	1=D	12	5	SC2008-56, D = IC4965 (cirrus)
				16725	40	7.5	1	3	6	(cld)
				16590	62	4.5	1	4	7	
				*16490	150		lit			Melnick81 MQ#1
	20 08 21.9	-56 57 10	f	16566	48	8.5	4b	12	12	(cirrus)
				*18040	90		lit			Sodre92 #106
	20 09 8.1	-56 57 32	f	18045	54	8.0	6	12	13	(cirrus)
				*17909	89		lit			Sodre92 #142
	20 08 33.4	-56 51 49	f	15665	46	6.9	43	12	.15	(cirrus)
				*15664	60		lit			Sodre92 #118
	20 08 40.6	-56 58 49	f	17094	53	7.1	72	12	10	
				*17240	70		lit			Sodre92 #124
	20 08 15.8	-57 07 02	f	17328	63	4.9	73	12	15	
				*17350	80		lit			Sodre92 #102
	20 08 22.7	-56 59 24	f	14703	42	6.3	12	4	10	(cld)
				* 7010	50		lit			Melnick81 MQ#12
	20 08 23.2	-56 59 18	f	14878	92	3.5	13	4	20	(cld)
				*16820	120		lit			Melnick81 MQ#13
	20 08 11.3	-56 59 59	f	15217	52	4.9	101	4	20	(cld)
	20 07 59.0	-56 59 00	f	15810	129	2.7	102	4	20	(cld)
	20 07 56.1	-56 53 31	f	17100	32	5.6	103	4	19	(cld)
				*17176	53		lit			Sodre92 #85
3695	20 31 33.7	-35 59 49	d	26590	123	4	S	14	120	r160; db; QW2031-360 (m,cld,bs)
	20 31 32.9	-35 59 23	d	26765	250	5	N	14	120	r160
				26500	72		lit			Vettolani89
3744	21 04 24.5	-25 41 22	g	10387	23	13.7	W	7	20	r177; db; ESO529-ig26 (f.ch.=db2)
				*10329	150		lit			Garilli93 #C ;
	21 04 25.3	-25 41 23	g	12892	28	7.9	E	7	20	r177; (ESO529-ig26) NGC7017
				*12895	150		lit			Garilli93 #D
	21 04 29.1	-25 37 51	g	11694	21	14.9	1W	7	30	r186; ESO529-ig27 (f.ch.=db1)
				*11258	150		lit			Garilli93 #F
	21 04 29.9	-25 37 50	g	11517	21	14.3	1E	7	30	r186; (ESO529-ig27: contact)
				*11387	150		lit			Garilli93 #G; NGC7018
0191S	01 43 12.8	-73 10 04		23417	60	3.8	S	8	60	r233; db; QW0144-731 (m)
				23339	37	5.4	N	8	60	r233
0393S	03 46 39.0	-45 23 47	e	20605	53	6.6	D	11	12	QW0346-454;ipc8384 serend.(m,cld)
0463S	04 27 58.6	-53 56 07	a	11970	25		NW	13	30	r112; db BCM IC2082; PKS0428-53
				*11812	100		lit			Carter81
				*11869	95	4.1	lit			Ellis84
				*11768	100		lit			DS88
	04 27 59.8	-53 56 11	a	12100	25		SE	13	30	r112; 2 x 15 exp (strong m, cld, bs)
				*12051	95	17.1	lit			Ellis84
				*12005	50		lit			DS88

TABLE 3—*Continued*

Abell (1)	α(1950) (2)	δ(1950) (3)	P (4)	Vel.[a] (5)	Error[a] (6)	R (7)	Gal. (8)	S (9)	t[b] (10)	Comment (11)
0535S	05 31 3.06	-36 23 00		14076	35	7.2	S	8	40	r245; db; db0531-3623
				14297	25	8.4	N	8	40	r245
0546S	05 46 43.2	-32 40 26		20749	40		N	13	30	r156; db0546-3240 (strong m, cld, bs)
				20711	57	4.2	N	5	40	r93
	05 46 44.3	-32 40 55		21615	26		S	13	30	r156, both comp. in slit
				20923	71	4.6	knot	9	16	2x2 slit, knot between comp.(strong m)
				20782	35	8.3	knot	5	40	r93 (exp with N in slit)
0574S	06 11 06.0	-45 03 36	c	14181	38	8.7	W	4	15	r156; ESO254-ig37 (m,cirrus)
				*4467	366		lit			Lauberts82 (E?, W?), discrepant
				13454	26	12.1	E	4	15	r156
0639S	10 38 07.0	-46 03 54	c	6105	32	8.9	W	4	30	db; ESO264-ig30 (m, cld)
				*5929	250		lit			Lauberts82 (Fairall91 v=6190)
				*6214	150		lit			Garilli93 #A
				5373	40	6.6	E	4	30	(same slit)
				5422	34	7.2	E	4	20	centered in slit (cld)
				*5261	150		lit			Garilli93 #B
0726S:	13 11 19.0	-33 35 00		14909	235		E	14	45	r70; db; SC1311.2-3337 (m)
				15068	90		W	14	45	r70
0805S	18 42 34.6	-63 23 04	a	4495	92	6	D	14	145	r120; D gal (m,cld)
				4535	29	12.1	D	3	4	IC4765; ESO104-g6
				*4440	65		lit			Proust88
				*4400	300		lit			Quintana75
				*4790	210		lit			Fairall79
				*4467	100		lit			Dressler91b
				*4465	50		lit			Lucey88 (mean of two)
				*4551	40		lit			Sadler84
0820S	19 29 59.0	-39 47 00	b	22504	27	10.9	SE	7	90	r225; db BCM; ESO338-ig11 PKS1929-39 (m)
				22557	32	9.0	SE	7	60	r225 (bs)
				22545	30	9.6	SE	7	50	r225 (bs)
				23611	41	5.0	NW	7	60	r225 (m)
				23733	50	5.9	NW	7	30	r225 (bs)
				23665	37	6.4	NW	7	30	r225 (bs)
CL0017	00 17 08.0	-20 43 03		81624	55	3.0	W	3	60	nucleus of nest of galaxies
				84010	82	1.5	E			
Zw0802-01	08 02 42.4	-01 02 35		26199	13		S	13	40	r6; db; Zw 0802.6-0104
				26502	34		N	13	40	r6; db; PKS0802-01 (fs)
Zw1006+12	10 06 07.0	12 02 23		67300	48	4	1	12	45	BCM, Zw 1006.1+1201(cirrus,fs)
QW64S	20 59 14.6	-24 43 53	d	56918	97	3.7	cD	12	20	QW2059-247 (cirrus,fs)

NOTE.—A151: E and W components interchanged in Proust88. A447: Central complex, has db with E bright nuclei, W lsb extended component, together with two stars. Clear view of complex structure with CCD image (Quintana et al. 1994a). Three spectra of same galaxy. A514: We give data for central db of concentration to E of main cluster (SR1 quotes $z = 0.0646$). A1142: Triple galaxy, positions from Dressler 1980. Velocities in literature from Geller et al. 1984: they quote AD42 a lsb galaxy with no velocity. For AD40 they give 11,000 km s^{-1}, while we have that velocity for AD42. For AD41, N component we agree. A1205: Triple at the center, well separated even when they have bridge between SW and SE components: db. 0546S: Two compact nuclei in a common long lsb N-S envelope, that shows a higher brightness hot spot or knot between them. Spectra are from the three components, taken in pairs. A3266: Literature velocities reviewed in QR90 and QRW94.

[a] Units are km s^{-1}.

[b] Units are minutes.

REFERENCES FOR POSITION (P).—a: Positions and numbers from D80 catalogue. b: Parkes Radio Source catalog. c: Position and identification from ESO/Uppsala Catalogue (Lauberts 1982). d: Optronic measurements. e: *Einstein* IPC positions. f: Positions from Sodre 1992. g: Positions from Garilli 1993.

REFERENCES.—Allen91 = Alen *et al.* 1991. Batuski84 = Batuski *et al.* 1984. Cappi91 = Cappi *et al.* 1991. Carter81 = Carter *et al.* 1981. Chincarini81 = Chincarini, Tarenghy, & Bettis 1981. Ciardullo85 = Ciardullo *et al.* 1985. Colless87 = Colless & Hewett 1987. D80 = Dressler 1980. da Costa86 = da Costa *et al.* 1986. Dressler91a = Dressler 1991. Dressler91b = Dressler, Faber, & Burstein 1991. DS88 = Dressler & Shectman 1988. Ellis84 = Ellis *et al.* 1984. Fairall79 = Fairall 1979. Fairall89 = Fairall, Vettolani, & Chincarini 1989. Fairall91 = Fairall & Jones 1991. Garilli93 = Garilli, Maccagni, & Tarenghi 1993. Geller84 = Geller *et al.* 1984. Havlen78 = Havlen & Quintana 1978. Hoessel80 = Hoessel, Gunn, & Thuan 1980. Hu85 = Hu, Cowie, & Wang 1985. Lauberts82 = ESO = Lauberts 1982. Lucey88 = Lucey & Carter 1988. Malumuth85 = Malumuth & Kirshner 1985. Melnick81 = Melnick & Quintana 1981. Metcalfe89 = Metcalfe *et al.* 1989. Owen88 = Owen, White, & Thronson 1988. Proust88 = Proust *et al.* 1988. Proust92 = Proust *et al.* 1992. QdS93 = Quintana & de Souza 1993. QR90 = Quintana & Ramírez 1990. QRW94 = Quintana *et al.* 1994c. Quintana75 = Quintana & Melnick 1975. RC3 = de Vaucouleurs *et al.* 1991. Rhee88 = Rhee & Katgert 1988. Sadler84 = Sadler 1984. Schneider83 = Schneider *et al.* 1983. Shectman85 = Shectman 1985. Smith85 = Smith *et al.* 1985. Sodre92 = Sodre *et al.* 1992. SR1 = Struble & Rood 1987. SR2 = Struble & Rood 1991. Tifft82 = Tifft 1982. VC88 = Valentijn & Casertano 1988. Vettolani89 = Vettolani *et al.* 1989.

tainty on cross-identifications. Other notes point out special circumstances, galaxy configurations, or discrepancies.

A total of 330 independent velocities were obtained for 286 galaxies. We give two velocities for 22 galaxies, three for eight, and four for two. From these we can evaluate our internal consistency. If we disregard two very discrepant values (of 950 km s^{-1} in A720 and 420 km s^{-1} in A883) we have a rms dispersion of 69 km s^{-1}. This dispersion is similar to the mean of individual velocity errors. Therefore, in spite of different instruments, we feel that the common reduction and measurement procedures give satisfactory values.

The external comparison reflects the varying quality of literature redshifts. There are some large discrepancies, as noted in Table 3. Some of these discrepancies may just reflect very old (and/or weak) spectra (such as some of the ESO/Uppsala values, which have a quoted error of 300 km s^{-1} or larger). If we restrict our comparison to data of similar quality, we have a total of 62 common velocities. From them we derive a mean difference of 10 ± 211 km s^{-1}. Though the scatter is larger than the internally deduced value, this result is consistent with expected errors and there is no zero-point shift of the velocity scale.

6. DISCUSSION

It has become clear that in the direction of some clusters one can expect to find a rich superposition of structures, sometimes at not too dissimilar redshifts. This could be due to the superposition, along the line of sight, of two or more clusters, clusters and groups, or even, several groups that mimic a cluster concentration. Thus, it is no surprise to find a number of examples (i.e., A295, A720, A919, A1505, A2128, and A2512) where it is difficult or impossible, with the present data, to ascertain a definitive cluster redshift, or even, in one or two examples (such as A720), to decide whether there is a cluster at all. However, the majority of this sample have Bautz-Morgan types I, I-II, and II, with one or two dominant galaxies. Thus, in general, we can expect that the derived redshifts will be the actual cluster redshifts in the large majority of cases.

A small number of discrepant velocities for some galaxies remained after the analysis, which could be due to misidentification at the telescope or to other causes. Particularly worrisome are such discrepancies in certain dumbbell components, which should be clarified by further observing.

7. SUMMARY

We give 130 new cluster redshifts, mostly for Abell clusters of Bautz-Morgan types I, I-II, and II. Therefore, most of the velocities reported are of galaxies of type cD, cD/db, or outstanding ellipticals, leaving little room for membership and redshift uncertainties. We also confirm 32 values previously determined. However, two of them seem to be discordant with our values; most likely, they correspond to foreground galaxies superimposed on the clusters. For nine clusters, however, there are two possible redshifts. Only a larger sample of velocities can settle these ambiguities.

We would like to thank the directors of the Observatories of the Carnegie Institution of Washington and the Cerro Tololo Inter-American Observatory for the generous allocation of telescope time at Las Campanas and CTIO, and the staffs of these observatories for friendly support, in particular night assistants F. Peralta and A. Guerra at LCO. We thank A. Fairall and H. Rood for providing their catalogs in computer form, J. Melnick for discussions and help with the first Reticon observations, X. Cardenas for help in handling the Vidicon data, and C. Rios and G. Hertling for measuring some of the galaxy positions. This project was partially supported by FONDECYT grants 88-362, 90-371, and 193-0572 to H. Q.

REFERENCES

Abell, G. O., Corwin, H. G., & Olowin, R. P. 1989, ApJS, 70, 1 (ACO)
Allen, D. A., Norris, R. P., Meadows, V. S., & Roche, P. F. 1991, MNRAS, 248, 528
Batuski, D. J., Burns, J. O., Newberry, M. V., Hill, J. M., Deeg, H., Laubscher, B. E., & Elston, R. J. 1991, AJ, 101, 1983
Cappi, A., Focardi, P., Gregorini, L., & Vettolani, G. 1991, A&AS, 88, 349
Carter, D., Efstathiou, G., Ellis, R. S., Inglis, I., & Godwin, J. 1981, MNRAS, 195, 15p
Chincarini, G., Tarenghi, M., & Bettis, C. 1981, A&A, 96, 106
Ciardullo, R., Ford, H., & Harms, R. 1985, ApJ, 293, 69
Colless, M., & Hewett, P. 1987, MNRAS, 224, 453
da Costa, L. N., Nunes, M. A., Pellegrini, P. S., Willmer, C., Chincarini, G., & Cowan, J. J. 1986, AJ, 91, 6
de Vaucouleurs, G., de Vaucouleurs, A., Corwin, H. G., Jr., Buta, R. J., Paturel, G., & Fouqué, P. 1991, Third Reference Catalogue of Bright Stars (New York: Springer Verlag)
Dressler, A. 1980, ApJS, 42, 565
———. 1991, ApJS, 75, 241
Dressler, A., Faber, S. M., & Burstein, D. 1991, ApJ, 368, 54
Dressler, A., & Shectman, S. A. 1988, AJ, 95, 284 (DS88)
Ellis, R. S., Gray, P. M., Carter, D., & Godwin, J. 1984, MNRAS, 206, 285
Fairall, A. P. 1979, MNRAS, 188, 343
Fairall, A. P., & Jones, A. 1991, Southern Redshifts and Plots, Pub. Dep. Astronomy, Univ. of Cape Town, No. 11
Fairall, A. P., Vettolani, G., & Chincarini, G. 1989, A&AS, 78, 269
Garilli, B., Maccagni, D., & Tarenghi, M. 1993, A&AS, 100, 33
Geller, M. J., Beers, T. C., Bothun, G. D., & Huchra, J. P. 1984, AJ, 89, 319
Havlen, R., & Quintana, H. 1978, ApJ, 220, 14
Hoessel, J. G., Gunn, J. E., & Thuan, T. X., 1980, ApJ, 241, 486
Hu, E. M., Cowie, L. L., & Wang, Z. 1985, ApJS 59, 447
Jacoby, G. H., Hunter, D. A., & Christian, C. A. 1984, ApJS, 56, 257
Kirshner, R. P., Feigelson, E. D., & Newberry, M. V. 1987, PASP, 99, 1261
Lauberts, A. 1982, The ESO/Uppsala Survey of the ESO(B) Atlas (Garching: ESO)
Lucey, J. R., & Carter, D. 1988, MNRAS, 235, 1177
Malumuth, E. M., & Kishner, R. P. 1985, ApJ, 291, 8
Melnick, J., & Quintana, H. 1981, AJ, 86, 1567
Metcalfe, N., Fong, R., Shanks, T., & Kilkenny, D. 1989, MNRAS, 236, 207
Owen, F. N., White, R. A., & Thronson, H. A., Jr. 1988, AJ, 95, 1
Peterson, B. A., Ellis, R. S., Efstathiou, G., Shanks, A., Bean, A. J., Fong, R., & Zen-Long, Z. 1986, MNRAS, 221, 233
Postman, M., Huchra, J. P., & Geller, M. J. 1992, ApJ, 384, 404
Proust, D., Mazure, A., Sodre, L., Capelato, H., & Lund, G. 1988, A&AS, 72, 415
Proust, D., Quintana, H., Mazure, A., da Souza, R., Escalera, E., Sodre, L., Jr., & Capelato, H. V. 1992, A&A, 258, 243
Quintana, H., & de Souza, R. 1993, A&A, 101, 475 (QdS93)

Quintana, H., Infante, L., Fouque, P., Nuñez, I., & Cuevas, H. 1994a, in preparation
Quintana, H., & Melnick, J. 1975, PASP, 87, 863
Quintana, H., & Ramírez, A. 1990, AJ, 100, 1424 (QR90)
Quintana, H., Ramírez, A., Melnick, J., Raychaudhuri, S., & Slezak, E. 1994b, AJ, submitted
Quintana, H., Ramírez, A., & Way, M. 1994c, AJ, submitted (QRW94)
Quintana, H., & White, R. A. 1990, Ap&SS, 173, 265 (QW90)
Rhee, G. F. R. N., & Katgert, P. 1988, A&AS, 72, 243
Sadler, E. 1984, AJ, 89, 23
Schneider, D. P., Gunn, J. E., & Hoessel, J. G. 1983, ApJ, 264, 337
Shectman, S. A. 1981, Carnegie Yrb., 80, 586
———. 1985, ApJS, 57, 77
Shectman, S. A. 1989, Carnegie Yrb, 89, 25
Smith, R. M., Efstathiou, G., Ellis, R. S., Frenk, C. S., & Valentijn, E. A. 1985, MNRAS, 216, 71p
Sodre, L., Jr., Capelato, H. V., Steiner, J. E., Proust, D., & Mazure, A. 1992, MNRAS, 259, 233
Struble, M. F., & Rood, H. J. 1987, ApJS, 63, 543 (SR1)
———. 1991, ApJS, 77, 363 (SR2 or SR91)
Tifft, W. G. 1982, ApJS, 50, 319
Tonry, J. L., & Davis, M. 1979, AJ, 84, 1511
Valentijn, E. A., & Casertano, S. 1988, A&A, 206, 27
Vettolani, G., Cappi, A., Chincarini, G., Focardi, P., Garilli, L., Gregorini, L., & Maccagni, D. 1989, A&AS, 79, 147
Whitmore, B. C., McElroy, D. B., & Tonry, J. L. 1985, ApJS, 59, 1