THE ASTRONOMICAL JOURNAL VOLUME 83, NUMBER 12 DECEMBER 1978

A STUDY OF FIELD GALAXIES. I. REDSHIFTS AND PHOTOMETRY OF A COMPLETE SAMPLE OF GALAXIES

ROBERT P. KIRSHNER[a)]
Department of Astronomy, University of Michigan, Ann Arbor, Michigan 48109

AUGUSTUS OEMLER JR.[a)]
Yale University Observatory, New Haven, Connecticut 06520

PAUL L. SCHECHTER[a)]
Steward Observatory, University of Arizona, Tucson, Arizona 85721

Received 17 July 1978; revised 8 September 1978

ABSTRACT

As a first step towards a redetermination of the luminosity function and space distribution of field galaxies, we present data on a magnitude limited sample of galaxies in eight fields in the north and south galactic polar caps. Redshifts, accurate to about 100 km s^{-1} have been obtained for 164 of 184 galaxies brighter than $J = 15.0$ ($B \approx 15.5$) We have also measured magnitudes and colors for a large sample of 807 galaxies, complete to $J \approx 15.7$.

I. INTRODUCTION

During the last few years, there has been increasing interest in the characteristics of the population of field galaxies. There have been several redeterminations (Christensen 1975; Schechter 1976) of the luminosity function and space density of field galaxies, and Felten (1977) has recently published an admirable critical survey of papers on the subject. Also, the application of new techniques such as angular covariance function analyses (see Groth and Peebles 1977 and references therein) and redshift surveys (e.g., Gregory and Thompson 1978) has led to considerable progress in our understanding of the distribution of galaxies in space.

Unfortunately, practical limitations have meant that much of this work has been done with less than ideal sets of data. Most covariance function analyses have been of the angular positions of galaxies on the sky, as obtained from the available galaxy catalogs, from which the spatial covariance function must be deduced by deprojection. Also the data used in the past to obtain the luminosity function of field galaxies, essentially the contents of the Shapley–Ames catalog, covers too small and inhomogeneous a volume of space to be a fair sample of the universe.

Because of these problems, we have undertaken a reanalysis of the characteristics of the field galaxy population, using new data obtained for this study. These data form a sample with well-defined completeness limits and provide positions and luminosities of galaxies over a volume of space which we hoped would be large enough to be representative of the mean properties of the universe as a whole. We shall use these data to determine the mean galaxy density of the universe and the characteristics of galaxy clustering in space, and to compare the luminosity function of field galaxies with that of galaxies in clusters. In this paper, we describe how the sample was defined and how the data were obtained; and we present the results of our observations. The analysis of these data is contained in our next paper.

II. OBSERVATIONS

a) Field Selection

The first point to be considered in constructing our sample concerns the definition of a field galaxy. The studies of the space distribution of galaxies mentioned above have demonstrated how inaccurate was the old idea that clusters and groups of galaxies are lumps embedded in a smooth medium called the "field." Rather, all galaxies appear to be strongly clustered on all scales up to perhaps 10 Mpc, and there is no identifiable smoothly distributed component. Thus, any use of the term "field galaxy" is to some extent a misnomer. There are however, recognizable differences between the populations of galaxies in the cores of rich clusters (Oemler 1974), where most luminosity functions have been determined, and the galaxy populations elsewhere in the universe. It is convenient to call the latter population "field galaxies." Furthermore, since only a very small fraction of all galaxies lie in the cores of clusters, we may, without significant error, extend the term "field galaxy" to mean the general galaxy population of the universe. It is in this sense that we shall use the term in this paper.

An ideal sample might consist of information on the luminosities and space positions of all galaxies within a specified volume of space. This is impractical over a large volume for many reasons. The requirements of detectability set a lower limit to the surface brightness of gal-

---

[a)] Visiting Astronomers, Kitt Peak National Observatory, which is operated by the Association of Universities for Research in Astronomy under contract with the National Science Foundation.

0004-6256/78/8312-1549$00.90

TABLE I. Survey fields.

Field	α	δ	b	Area	Width	Height	$n_{\min}$	S_J
NP4	$12^{h}06.1$	+26°47	+81°	14.90	3.73	3.99	15	23.1
NP5	$13^{h}37.1$	+26°56	+79°	13.79	3.73	3.73	14	23.3
NP6	$8^{h}27.3$	+66°03	+35°	18.11	3.73	4.85	15	23.7
NP7	$15^{h}59.7$	+41°56	+49°	13.93	3.73	3.73	15	24.0
SP3	$0^{h}31.2$	−29°50	−85°	13.93	3.73	3.73	15	24.2
SP4	$0^{h}45.5$	−21°52	−84°	15.76	3.73	4.25	10	22.9
SP5	$22^{h}32.0$	−20°58	−32°	15.88	3.73	4.25	15	23.1
SP6	$2^{h}59.5$	−10°09	−55°	15.50	3.73	4.25	15	23.4

axies which can be included in any sample. Also, the way in which galaxies are found makes the only practical sample one that is complete to a specified limiting apparent magnitude rather than within a specified volume. Also, the only practical distance indicator is the galaxy's recessional velocity. When this velocity is comparable to the dispersion about the Hubble flow, however large that may be, it becomes an unreliable indicator. Fortunately, the bulk of our sample will be distant enough ($v > 2000$ km s^{-1}) to avoid this problem.

Although our sample should, ideally, cover the entire sky, practical limits on the number of redshifts which can be measured require some trade off between sky coverage and the depth of the survey. The Shapley–Ames survey used in most previous studies of the field luminosity function covers the entire sky, but at the price of a very limited depth—scarcely beyond the local supercluster. Since we could not hope to measure more than the several hundred velocities in that sample, we have only been able to obtain a much deeper sample by restricting it to eight rather small fields in the two galactic polar caps.

In attempting to obtain a fair sample of the universe, we have been constrained by the available plate material. While choosing our fields from among those which had been photographed, we considered any field to be admissible if the plates had been obtained for reasons completely unrelated to the occurrence of bright galaxies in the field. For example, one field is centered on the cluster of galaxies Abell 665. Although this is the richest known cluster in the sky, its brightest galaxies are considerably fainter than the limit of our survey, and we do not think that selection of this field will bias our survey. Five of the eight fields were part of a set of plates of fields spaced regularly about the two galactic poles, taken for other purposes. Our only deliberately biased act was the exclusion of a sixth member of this set, centered on the North Galactic Pole and including the Coma Cluster. Since Coma is a very atypical object, being the richest cluster of galaxies within 500 Mpc, and since, if included, it would have completely dominated the sample, we felt its exclusion was justified. One measure of the fairness of our sample is the density of galaxies in our fields. Within the four northern fields, and brighter than $m_{pg} = 15.0$, Zwicky *et al.* (1961–1968) (hereafter CGCG) find 35 galaxies, for a mean density of 1806 ± 300 sterad^{-1}. Over the entire sky above galactic latitude +40°, they find a density of 1960 galaxy sterad^{-1}, insignificantly different. Thus our fields seem to be perfectly representative.

Our eight chosen fields are listed in Table I. The first seven columns of the table give the field designation, the coordinates (epoch 1950) and galactic latitude of the field center, the area of the field, in square degrees, and the field's EW width and NS height, in degrees. The field area is often less than the product of these last two numbers, because of small areas which were excluded. In NP5 a 22′ square area was excluded around the globular cluster M3. In SP4 an area 3′ high and 142′ wide, centered on the south edge of the field, was eliminated because of an intruding calibration wedge on the plates, and in SP6 an area 27′ high and 50′ wide at the southwest corner was eliminated for the same reason.

Red/blue plate pairs were taken of all fields with the Palomar 48-in. Schmidt telescope. An additional blue plate of SP3 was obtained on the Michigan Curtis Schmidt. In order that the selection criteria be well defined, objects were found, and stars distinguished from galaxies by an automatic procedure similar to that described in Oemler (1974). One plate of each field (the blue one except in SP3 and NP7) was scanned on the Kitt Peak PDS microdensitometer with a 50×50-μ (3.4 arcsec^2) aperture. Objects were selected for photometry if they contained at least $n_{\min}$ contiguous points of surface brightness above sky greater than S_J. The values of S_J (which were known only approximately until the calibration described below) and $n_{\min}$ were chosen for each plate to produce an adequately deep sample; they are listed in the last two columns of Table I. Galaxies were separated from stars by the surface brightness of their images. The plates were then inspected by eye to find a few objects which had been missed by the automatic search procedure, and to reject objects such as close double stars and plate defects erroneously included among the galaxies.

b) *Photometry*

The galaxies found by the search routines were remeasured on the microdensitometer by scanning their images in an array of 25×25-μ points. The density arrays were inspected on the KPNO interactive graphics terminal and portions of the data containing neighboring stars, galaxies and plate defects were removed. Then, using the sensitometer spots on each plate to convert density to intensity, the luminosity of each galaxy was integrated in squares outwards from its center until it converged to a constant value, the approximate total luminosity of the object. The internal accuracy of these photographic magnitudes was estimated by measuring two red plates of NP7. The rms differences between pairs of magnitudes was 0.085 mag, implying a standard deviation for single measurements of 0.06 mag.

The photometric system used in this study has been described by Oemler (1974). The blue band, denoted J, is defined by the response of a IIIaJ plate behind a Wratten 4 filter, and the red band, denoted F, is defined by the response of a 127 or, in our case, 098 plate behind a RG610 filter. This system is identical to that described by Thuan and Gunn (1976) except for a difference in the zero point and in the designation of the bands, J and F being called g and r. With the help of the galaxy scans in Wells (1972) we calculate the following relations, good for all galaxy types, between our system and the *UBV* system.

$$J = V + 0.35(B - V), \tag{1}$$

$$J - F = 1.04(B - V). \tag{2}$$

In NP5, the blue plate consists of a 103aO emulsion behind a GG385 filter. In this field we have constructed J magnitudes and $J - F$ colors using the above relations.

To calibrate our plates we obtained photoelectric photometry of five to ten galaxies in each field using the filter-photomultiplier combination described in Oemler (1974). Photometry was done through 25″, 41″, and 69″ apertures on the KPNO 0.9-m telescope and through a 35″ aperture on the McGraw Hill 1.3-m telescope.

The zero points of the photographic photometry were set by comparing these photoelectric magnitudes with the photographic magnitudes within square pseudoapertures of the same area. The rms scatter in each field of photographic minus photoelectric magnitudes was typically 0.05–0.12 mag. This error is due to a combination of errors in the photographic photometry, errors in the photoelectric photometry ($\sigma \approx 0.04$ mag), and differences in the centering of photoelectric and photographic apertures. The zero point on each plate should then be accurate to at least 0.05 mag.

The parameter determining whether an object was selected for photographic photometry was n, the number of pixels over the threshold surface brightness S_J. We determine the degree of completeness in each field by studying the distribution in each magnitude interval of the values of n of the galaxies and estimating what fraction of the distribution is below the cutoff $n_{\min}$. These estimates are presented in Table II.

The results of our galaxy photometry are presented in Table III. In each field the list extends to that magnitude at which the estimated incompleteness reaches 50%. Columns 1–3 contain the object's designation, if it has one, and its coordinates at the epoch 1950. Columns 5 and 6 contain the J magnitude and $J - F$ color; in a few cases, where the photographic photometry was bad, the magnitude is estimated to 0.1 mag and no color is given. In NP6 our red plate was too small to cover the entire region surveyed in J. Galaxies without colors are those beyond the red field.

TABLE II. Estimated completeness.

Field	m_J 15.3	15.5	15.7	15.9	16.1
NP4	1.0	1.0	1.0	0.9	0.6
NP5	1.0	1.0	0.9	0.8	0.6
NP6	1.0	1.0	1.0	0.9	0.7
NP7	1.0	1.0	1.0	0.9	0.7
SP3	1.0	1.0	1.0	0.9	0.7
SP4	1.0	0.9	0.8	0.6	...
SP5	1.0	1.0	1.0	0.9	0.7
SP6	1.0	0.8	0.5	...	...

It is of some interest to relate our photometry to that in other widely used systems. The only photometry which appreciably overlaps our own is that in the CGCG, which contains 98 galaxies which we have also measured. Unfortunately, the CGCG has problems of internal consistency. The accuracy of its magnitudes has been discussed by Huchra (1976) and by Kron and Shane (1976), who found volume-to-volume differences in the magnitude scale. We have reanalyzed the CGCG photometry by comparing it with that in the *Second Reference Catalog* (de Vaucouleurs, de Vaucouleurs, and Corwin 1976, hereafter SRC). This analysis, contained in Appendix A, agrees fairly well with that of Kron and Shane. The fields NP4, NP5, and NP7 are all covered in Vol. 2 of the CGCG. In these three fields we find that our photometry, when converted to the B band using Eqs. (1) and 2, is related to the CGCG photometry by

$$M_{\mathrm{CGCG}} = M_B + 0.14 \pm 0.05 \tag{3}$$

with a rms scatter of 0.28. In field NP6, the relation between the two magnitude systems differs by several tenths of a magnitude. The field NP6 is covered by Vol. 4 of the CGCG, but the results of Appendix A do not predict this difference. We suspect that it is due to a combination of small number statistics and small scale errors within the CGCG.

We cannot directly compare our photometry with that in the SRC because of the lack of overlapping galaxies. However, if we use the CGCG as an intermediary, Eq. (3) and the results in Appendix A suggest

$$m_B = B_T + 0.10. \tag{4}$$

c) Classification

The brighter galaxies in each field have been classified

TABLE III

GALAXY	R.A.	DEC	TYPE	J	J-F	VEL		COMMENTS
		NP4.						
N 4104	12 4 5.8	+28 27 11	E	12.79	0.92	8379.		BGM,V=8471 (SRC),S0 (SRC)
N 4146	12 7 46.0	+26 42 35	SB	13.43	0.87	6580.		MEM-CL#2= ZWCL 1205.4+2515,V=6461 (CR)
N 4080	12 2 18.3	+27 16 19	SC	13.46	0.57	534.		MEM-TG53?,V=722 (CR)
N 4211A	12 13 4.4	+28 27 18	EL	13.60	0.81	6396.		STRONGLY INTERRACTING, V=6560 (SRC)
	12 5 32.6	+25 30 56	E	13.65	0.89	7023.		MEM-CL#2
N 4101	12 3 37.2	+25 50 8	S0	13.90	1.13	6711.	-	V=6089 (GT),MEM-CL#2
	12 7 42.3	+25 35 14	S0	14.01	1.12	5776.		"
	12 1 19.6	+25 42 43	SC	14.04	0.33	3117.		MEM-TG53?
	12 5 32.1	+25 52 7	E	14.18	1.02	6829.		MEM-CL#2
	12 7 14.3	+25 18 16	IRR	14.24	0.66	2545.		MEM-TG53?
	12 6 45.4	+25 14 45	S0	14.29	1.07	6720.	+	MEM-CL#2
	12 3 32.7	+28 31 2	S0	14.32	0.85	8106.		MEM-N4104 GROUP
	12 8 1.9	+25 42 21	E/S0	14.33	1.03	7012.	+	MEM-CL#2
	12 13 27.4	+27 43 17	S+	14.37	0.64	7833.		MEM-CL#1
	12 13 23.1	+26 56 30	PEC	14.39	0.55	7699.	+	"
	12 6 56.4	+26 30 17	SC	14.42	0.49	11050.		2 VEL
	12 3 1.7	+25 22 31	S-	14.43	1.02	6817.		MEM-CL#2
	12 5 40.2	+25 13 16	S0	14.43	1.22	7024.		"
I 763	12 5 42.4	+26 5 24	S0	14.44	1.01	7047.		"
	12 8 2.4	+26 12 22	S+	14.45	0.76	6526.		"
	11 57 14.6	+28 8 2	E	14.46	1.00	5637.		
I 762	12 5 39.0	+26 2 9	S-	14.46	0.85	7421.	+	MEM-CL#2
	12 13 37.5	+28 24 32	S+	14.49	0.55	7947.		MEM-CL#1
	12 5 26.5	+25 49 47	S0	14.49	0.81	10151.	+	
N 4211B	12 13 5	+28 26 48	E	14.5		6642.		VEL FROM SRC
	12 6 22.8	+25 28 12	E/S0	14.53	1.14	6852.		MEM-CL#2
	12 6 13.7	+25 13 29	S0	14.57	1.11	6708.		"
	12 13 5.3	+27 17 28	E	14.60	0.76	7853.		MEM-CL#1
	12 3 57.8	+28 25 2	E	14.61	1.10	9003.		MEM-N4104 GROUP
	12 9 24.5	+27 55 22	S0	14.65	1.08	4247.		
	12 1 31.4	+28 26 38	S0	14.68	1.15	9061.		MEM-N4104 GROUP, 3 VEL
	12 12 51.3	+27 9 51	S0	14.72	0.88	7360.	-	MEM-CL#1, 2 VEL
	12 0 18.4	+26 31 54	E	14.79	0.96	9601.		
	12 5 36.1	+25 21 27	E	14.83	1.02	6927.	-	MEM-CL#2
	12 4 0.9	+28 25 23	E	14.85	1.09	9181.	-	MEM-N4104 GROUP
	12 3 56.6	+28 13 45	E	14.89	1.07			
	12 7 21.7	+25 35 23	S0	14.92	1.12	6889.		MEM-CL#2
	12 6 58.5	+28 16 28	S0	14.93	0.67			
	11 58 9.9	+25 8 5	SC	14.94	0.51			
	12 3 49.4	+28 14 39	S0	14.94	1.00			
	11 58 10.2	+28 36 30	SA	14.96	0.64			
	12 4 36.0	+25 55 11	PEC	14.96	0.68			
	12 3 33.5	+28 32 9	S0	14.99	1.15			
	12 13 3.0	+26 22 31	E	15.01	0.74			
	12 4 5.9	+26 1 48	E+E	15.10	0.91			INTERRACTING PAIR, MAG FOR BRIGHTER
	12 10 28.2	+25 33 37	S-	15.11	0.75			
	12 4 27.9	+25 59 58	PEC	15.11	0.41			
	12 4 45.5	+28 31 33	E	15.19	0.99			
	12 4 7.9	+25 31 0	EL	15.23	0.92			
	12 4 13.9	+28 11 21	S0	15.24	1.13			
	12 5 25.3	+25 35 59	S0	15.25	0.99			
	11 57 5.9	+26 49 33	SC	15.25	0.44			
	12 4 16.3	+25 16 54	S+	15.25	0.62			
	12 4 49.5	+28 7 48	S+	15.27	0.67			
	12 12 1.4	+28 34 37	E	15.32	0.72			
	12 4 19.0	+25 16 34	SP	15.40	0.36			
	12 3 5.1	+28 8 53	S0	15.44	0.93			
	12 2 59.9	+26 51 53	EL	15.44	0.97			
	12 6 29.5	+25 14 0	E	15.44	0.98			
	12 1 58.1	+28 25 52	EL	15.44	0.70			
	12 4 36.7	+25 7 22	E	15.45	0.67			
	12 10 29.6	+26 9 0	S+	15.46	0.69			
	11 57 16.5	+27 5 31	S+	15.46	0.51			
	12 10 16.3	+27 46 49	S0	15.47	1.12			
	12 7 55.9	+27 47 49	S0	15.48	0.89			
	12 12 11.4	+28 7 47	S0	15.50	0.77			
	12 10 4.9	+25 58 31	S0	15.53	0.87			
	12 11 45.5	+28 8 10	S+	15.54	0.58			
	12 12 10.7	+25 15 31	S0	15.54	1.05			V. COMPACT
	12 6 41.1	+27 9 23	SP	15.54	0.80			
	11 57 5.0	+28 26 40	S-	15.54	0.83			
	12 14 27.8	+27 22 30	S0	15.54	0.85			
	12 6 29.0	+26 15 0	EL	15.55	0.80			V. COMPACT
	11 59 37.4	+28 1 17	S0	15.59	0.84			
	12 4 39.2	+28 37 47	S0	15.59	0.88			
	12 11 54.2	+28 20 17	E	15.60	0.81			
	12 6 34.5	+25 30 56	EL	15.64	0.84			
	12 3 22.0	+25 32 49	E	15.68	0.85			
	12 4 47.4	+25 53 25	S0	15.69	0.88			
	12 4 26.0	+25 59 28		15.70	0.96			
	12 0 27.2	+27 57 25		15.74	0.64			
	12 1 42.5	+28 28 57		15.74	0.72			
	12 8 58.7	+25 23 59		15.74	0.84			
	12 6 48.4	+26 29 29		15.74	0.52			
	12 6 5.6	+27 14 14		15.79	0.38			
	12 5 47.6	+25 36 48		15.79	0.81			

1978AJ.....83.1549K

TABLE III (CONT.)

GALAXY	R.A.	DEC	TYPE	J	J-F	VEL	COMMENTS
	12 5 13.2	+25 47 55		15.80	0.81		
	12 5 35.3	+25 18 40		15.80	0.79		
	12 9 44.5	+28 34 59		15.82	1.14		
	12 11 58.8	+27 13 13		15.84	0.76		
	12 5 0.4	+25 35 42		15.85	0.92		
	12 1 30.2	+28 31 34		15.87	0.68		
	12 12 59.1	+27 47 4		15.89	0.78		
	12 1 29.1	+28 27 46		15.89	0.77		
	12 6 35.0	+26 16 37		15.89	0.88		
	12 0 10.7	+25 4 10		15.89	1.05		
	12 4 6.8	+28 18 17		15.89	0.92		BRIGHTER OF TWO
	12 12 3.8	+28 36 23		15.89	0.53		
	12 11 26.0	+28 2 45		15.91	0.92		
	12 5 36.9	+25 53 31		15.93	0.55		
	12 5 34.7	+25 39 5		15.94	0.66		
	12 4 19.6	+25 28 32		15.94	0.81		
	12 7 55.6	+25 27 38		15.95	0.71		
	12 10 9.7	+26 16 29		15.96	0.84		
	12 1 26.8	+28 31 45		15.98	0.42		
	12 7 54.2	+26 38 47		15.98	0.57		
	12 1 43.1	+26 25 39		15.99	0.59		
	12 3 1.1	+28 30 43		16.00	0.22		
	12 1 47.8	+26 11 16		16.02	0.87		
	12 5 42.4	+25 18 50		16.02	0.98		
	12 4 46.1	+25 55 51		16.02	0.74		
	12 4 15.6	+25 12 13		16.03	0.53		
	12 1 11.1	+26 20 29		16.05	1.11		
	12 2 43.3	+28 30 17		16.05	0.37		
	12 4 20.1	+26 42 18		16.07	0.78		
	12 5 15.4	+25 48 13		16.07	0.50		
	12 0 41.4	+25 4 29		16.08	0.62		
	12 11 22.4	+25 26 49		16.09	0.84		
	11 59 51.0	+27 48 29		16.09	0.89		
	12 3 25.3	+27 59 38		16.11	0.92		
	12 3 50.6	+26 47 23		16.11	0.69		
	11 56 26.8	+28 37 6		16.12	0.52		
	12 1 18.5	+28 24 5		16.12	0.65		
	12 8 13.0	+26 7 23		16.13	0.61		
	12 4 54.9	+25 52 53		16.15	0.72		
	12 5 22.9	+25 46 19		16.17	0.72		
	12 4 39.6	+27 14 25		16.19	1.06		
	12 4 49.1	+25 7 5		16.19	0.64		
	11 56 55.9	+28 12 41		16.21	0.70		
	12 5 34.2	+25 4 7		16.21	0.80		
	12 13 59.7	+27 22 57		16.21	0.82		
	12 2 56.9	+27 43 50		16.21	0.83		
	12 5 36.7	+24 57 18		16.22	0.62		
	12 2 14.9	+28 28 41		16.24	0.98		
	11 56 58.9	+28 23 39		16.24	0.99		
	12 0 34.1	+25 42 27		16.25	0.73		
	11 57 4.0	+28 3 14		16.27	0.87		
	12 5 2.5	+26 3 2		16.28	0.65		
	12 12 49.3	+28 27 34		16.29	0.60		
	12 9 34.6	+25 35 15		16.29	0.32		
	12 9 20.7	+25 43 16		16.29	0.67		
	12 14 13.0	+25 58 12		16.29	0.38		
		NP5.					
N 5263	13 37 37.0	+28 39 11	S+	13.69	0.90	4969.	2 VEL
N 5251	13 35 5.2	+27 40 25	SP	14.09	0.94	11161.	"
	13 38 26.8	+26 8 55	S	14.28	1.02	8903. +	
	13 32 33.3	+26 27 42	S0	14.29	0.98	7982.	
I 4314	13 36 5.1	+26 59 46	EL	14.31	0.99	8749. +	
	13 41 23.9	+25 38 31	EL	14.63	0.97	8211. +	
	13 39 29.5	+26 37 28	EL	14.63	1.20	22517.	BCM-ABELL 1775,V=22324 (CR)
	13 37 25.1	+28 1 47	SP	14.65	0.76	8575. +	
	13 39 25.9	+27 15 25	S+	14.68	0.90	8622.	
	13 39 30.8	+26 37 16	EL	14.70	1.12	20652.	MEM-ABELL 1775,V=20755 (CR)
I 4307	13 34 16.3	+27 29 49	E	14.73	1.01	10754. +	
	13 36 11.3	+26 21 30	S0	14.75	1.07	8479.	
I 4297	13 32 58.5	+26 40 47	SP	14.84	0.85	7415.	
	13 36 36.3	+25 13 58	S-	14.85	1.00	8010.	
	13 30 17.4	+25 41 49	S	14.87	0.97	10236.	
	13 29 0.1	+25 52 34	S+	14.90	0.73	7577.	
	13 33 17.4	+26 7 47	S-	14.95	0.90	8046. -	
	13 42 53.7	+27 8 9	?	14.97	1.04		
	13 36 23.9	+26 34 53	SP	14.99	1.02	4022. -	
	13 37 58.0	+26 36 6	SP	15.02	0.92	8360. -	
	13 41 44.1	+25 54 47	SB	15.06	0.99	5831. -	
	13 37 13.4	+28 10 55	S	15.11	1.00		
	13 29 50.9	+28 38 51	S-	15.18	0.84	8892. -	
	13 40 12.2	+26 44 12	S+	15.19	0.97	19788. -	MEM-ABELL 1775?
	13 43 34.1	+27 1 29	SP	15.19	0.83	8665. -	
	13 34 22.9	+25 14 0	EL	15.19	1.06		

TABLE III (CONT.)

GALAXY	R.A.	DEC	TYPE	J	J-F	VEL	COMMENTS
	13 37 14.0	+28 10 28	E	15.22	0.98		
	13 44 44.4	+25 14 38	SP	15.23	0.71	3217. -	
	13 33 4.4	+28 10 4	S-	15.23	0.96		
	13 37 19.6	+27 39 28	EL	15.24	1.04		
	13 32 53.3	+25 17 57	SP	15.29	0.90		
	13 40 22.2	+26 29 23	?	15.32	1.10		MULTIPLE SYSTEM
	13 33 36.4	+26 57 59	SP	15.33	0.94		
	13 40 12.8	+25 35 43	?	15.41	1.07		
	13 36 22.5	+27 59 45	S+	15.42	0.93		
	13 38 36.9	+26 44 18	?	15.43	1.10		
	13 31 12.0	+26 31 40	SP	15.45	0.95		
	13 36 0.7	+27 0 49	EL	15.46	1.01		
	13 32 13.9	+28 12 19	?	15.46	0.96		
	13 35 27.8	+28 4 57	S+	15.47	0.85		
	13 42 1.0	+26 20 1	SP	15.48	1.00		
	13 42 26.4	+27 23 15	S+	15.49	0.82		
	13 35 23.1	+28 15 10		15.50	0.79		
	13 35 57.6	+28 1 32		15.51	0.78		
	13 32 0.7	+27 32 6		15.52	0.78		
	13 39 26.6	+27 21 30		15.55	0.83		
	13 33 23.9	+27 39 54		15.58	0.71		
	13 33 35.0	+26 17 27		15.59	1.05		
	13 40 12.8	+26 29 0		15.59	0.96		
	13 38 57.2	+26 31 25		15.61	1.00		
	13 29 52.9	+27 12 26		15.61	0.91		
	13 33 25.4	+28 7 24		15.63	0.94		
	13 37 13.2	+25 48 30		15.63	1.04		
	13 40 5.9	+26 27 47		15.67	1.07		
	13 41 43.2	+26 21 34		15.70	0.93		
	13 38 25.2	+26 12 27		15.71	0.96		
	13 45 3.7	+26 37 43		15.71	1.05		
	13 33 32.0	+28 7 21		15.71	0.91		
	13 40 39.4	+26 30 50		15.73	1.03		
	13 31 51.7	+27 15 35		15.76	1.00		
	13 29 55.4	+26 31 37		15.76	0.85		
	13 39 31.9	+26 21 0		15.78	0.97		
	13 44 11.7	+26 27 4		15.78	1.00		
	13 45 17.8	+28 32 21		15.79	0.84		
	13 38 24.2	+26 28 51		15.79	1.00		
	13 36 58.5	+28 17 20		15.80	0.89		
	13 31 6.7	+25 48 3		15.81	1.06		
	13 36 4.8	+26 19 33		15.83	0.98		
	13 30 37.6	+27 58 30		15.83	0.98		
	13 31 34.7	+27 19 3		15.83	0.81		
	13 33 25.7	+26 21 23		15.83	0.99		
	13 40 55.8	+26 25 1		15.85	0.88		
	13 39 25.0	+25 5 2		15.92	0.98		
	13 37 18.5	+28 9 48		15.94	1.04		
	13 37 12.5	+27 1 50		15.94	1.00		
	13 43 16.2	+26 35 48		15.96	0.95		
	13 30 31.6	+25 57 18		15.98	1.08		
	13 41 22.2	+28 34 36		15.99	1.04		
	13 29 6.6	+25 27 39		15.99	0.87		
	13 31 19.1	+26 4 54		15.99	1.14		
	13 34 22.7	+25 7 47		15.99	1.07		
	13 41 49.4	+27 31 13		15.99	0.91		
	13 37 32.8	+28 17 53		16.04	0.68		
	13 41 42.2	+26 11 27		16.06	0.86		
	13 41 49.3	+26 35 55		16.08	0.90		
	13 29 59.9	+28 34 29		16.10	0.93		
	13 39 12.6	+25 33 47		16.11	0.68		BRIGHTER OF TWO
	13 43 12.6	+25 45 10		16.11	0.98		
	13 30 8.7	+26 10 15		16.12	0.82		
	13 36 49.8	+27 51 7		16.13	0.81		
	13 32 53.6	+27 53 8		16.13	0.73		
	13 30 8.6	+25 22 47		16.18	0.81		
	13 32 33.8	+27 39 41		16.19	0.73		
	13 38 11.1	+26 33 34		16.19	0.98		
	13 38 41.3	+25 43 37		16.20	1.06		
	13 29 37.7	+27 16 41		16.23	0.82		
	13 38 45.2	+27 56 47		16.24	0.73		
	13 38 27.9	+26 26 49		16.25	0.94		
	13 32 13.2	+26 57 7		16.25	0.93		
	13 38 28.8	+26 19 23		16.26	0.79		
	13 40 20.4	+25 48 54		16.28	0.86		
		NP6.					
	8 15 35.9	+67 8 20	E	13.29	1.00	4073.	
	8 24 50.9	+63 30 15	E	13.75		7030.	
	8 20 11.7	+67 1 50	S0	13.90	0.56	4346.	NEAR BRT STAR, MAG UNCERTAIN
	8 39 32.5	+67 8 32	SBC	14.00	0.61	4030.	
	8 23 31.1	+63 26 34	SA	14.10		6937.	
	8 39 16.6	+65 21 59	SB	14.12	0.96	7503.	2 VEL
	8 33 57.3	+65 17 45	PEC	14.16	1.27	5728.	
	8 12 56.0	+64 41 57	SC	14.19	0.87	11084. +	
	8 23 10.1	+64 23 34	SB	14.21	0.60	11377.	3 VEL

TABLE III (CONT.)

GALAXY	R.A.	DEC	TYPE	J	J-F	VEL		COMMENTS
	8 39 29.8	+65 9 0	E	14.26	1.12	7067.	+	
	8 36 42.6	+67 2 18	S+	14.41	0.50	3992.		
	8 18 7.4	+67 7 48	SB	14.45	0.63	4433.	-	
	8 24 38.7	+67 20 55	S+	14.48	0.80	11249.		
	8 17 16.9	+66 41 25	E	14.54	0.99	11219.		
	8 41 42.8	+64 18 13	E	14.56	1.06	10701.	-	
	8 39 39.9	+65 9 19	S0	14.63	1.13	7074.	+	
	8 37 3.6	+66 37 30	E/S0	14.64	1.17	11729.	+	2 VEL
	8 25 29.3	+67 11 49	S0/A	14.70	1.06	4256.		
VII ZW238	8 29 33.3	+66 21 8	IRR	14.79	0.44	131.	+	D53
	8 38 36.0	+64 47 31	E	14.79	0.77	11500.	-	
	8 22 27.5	+65 24 34	IRR	14.88	0.91	14129.		
	8 39 15.5	+64 26 17	SB	14.90	0.81	11716.		
	8 15 19.1	+67 35 34	E	14.95	0.85	8121.	-	MANY COMPANIONS
	8 33 26.8	+66 18 40	S0	14.97	1.08	8051.	-	
	8 33 34.1	+66 42 9	SC	15.00	0.78	9140.	+	2 VEL
	8 17 35.8	+63 7 5	S-	15.00		6340.		
	8 15 24.2	+65 29 31	SB	15.00	0.68	7575.		
	8 39 21.3	+65 13 23	SB	15.02	0.86			
	8 19 15.4	+64 30 33	PEC	15.10	0.77	11404.	+	
	8 19 51.8	+65 46 1	SC	15.10	0.78	13950.		
	8 12 38.1	+64 40 35	SC	15.16	0.98			
	8 30 36.6	+66 21 5	S-	15.19	1.11			
	8 38 59.0	+64 51 20	E	15.24	0.88			
	8 21 46.8	+63 56 51	SB	15.28				
	8 31 24.4	+63 46 51	SA	15.36				
	8 39 18.2	+65 58 24	SC	15.37	0.79			
VII ZW235	8 27 23.6	+65 27 38		15.37	1.03			
	8 15 1.1	+63 46 47	E	15.39				
	8 11 4.8	+65 59 33	SP	15.39	0.84			
	8 12 28.3	+64 29 17	E	15.40	0.92			
	8 39 5.5	+64 51 30	PEC	15.41	0.83			
	8 25 43.9	+63 37 58	S-	15.42				
	8 30 50.4	+63 45 21	S0	15.42				
	8 27 3.6	+66 57 1	SC	15.45	0.54			
	8 39 36.1	+65 44 38	E	15.45	0.99			
	8 38 47.9	+68 8 16	SP	15.46				
	8 18 49.0	+67 36 49	S-	15.47	1.18			
	8 46 4.2	+66 40 24	S0	15.49	0.85			
	8 14 47.9	+64 39 0		15.52	1.16			
	8 17 41.7	+66 40 51		15.53	1.08			
	8 17 6.3	+66 37 2		15.53	1.05			
	8 24 43.2	+63 27 46		15.58				
	8 18 59.3	+64 22 28		15.59	0.69			
MK 93	8 32 9.6	+66 24 21		15.61	1.19	5296.		V=5388 (SRC)
VII ZW229	8 18 58.1	+64 6 26		15.61				
	8 25 7.7	+63 25 35		15.64				
	8 16 56.1	+66 58 7		15.64	0.61			
	8 38 25.5	+63 59 4		15.67				
	8 38 51.1	+65 8 59		15.67	1.17			
	8 25 28.9	+63 7 36		15.68				
	8 30 57.7	+66 27 33		15.69	0.19			
	8 32 8.1	+63 10 44		15.71				
	8 39 36.1	+64 41 31		15.71	0.40			
	8 30 4.4	+64 17 22		15.72	0.70			
	8 37 15.0	+66 39 25		15.72	0.68			
	8 38 21.7	+68 7 16		15.75				
	8 20 17.8	+67 28 41		15.76	0.82			
	8 11 29.2	+64 33 30		15.76				
	8 39 5.7	+64 6 58		15.77				
	8 34 10.1	+67 32 28		15.77	0.60			
	8 26 20.1	+66 33 12		15.79	1.19			
	8 14 37.3	+63 50 32		15.79				
	8 25 4.1	+66 34 40		15.79	1.14			
	8 33 18.5	+63 7 36		15.85				
	8 40 32.7	+65 6 3		15.88	0.78			
	8 27 58.9	+68 14 10		15.89				
	8 29 13.4	+64 45 9		15.90	0.93			
	8 39 6.4	+64 17 34		15.91	1.03			
	8 37 19.5	+65 30 45		15.94	1.75			
	8 13 1.2	+66 47 34		16.01	0.51			
	8 14 15.6	+67 47 51		16.02	0.71			
	8 31 19.8	+66 46 18		16.04	0.95			
	8 35 8.5	+63 19 32		16.04				
	8 11 12.7	+63 23 17		16.08				
	8 34 57.5	+64 27 58		16.09	0.45			
	8 35 11.9	+65 9 33		16.09	1.09			
	8 38 42.0	+67 51 11		16.10	1.19			
	8 25 41.3	+63 22 54		16.10				
	8 33 21.9	+68 14 2		16.15				
	8 42 10.6	+67 41 44		16.16	1.13			
	8 34 29.8	+65 48 2		16.17	1.26			
	8 30 12.1	+66 10 43		16.18	0.40			
	8 12 17.6	+65 48 43		16.19	0.72			
	8 31 39.9	+66 9 58		16.20	0.69			
	8 20 59.4	+67 8 2		16.21	0.49			
	8 42 31.3	+64 13 57		16.22	0.66			
	8 18 5.1	+63 13 27		16.22				
	8 40 8.8	+68 1 49		16.22				
	8 14 48.5	+66 50 9		16.25	1.07			
	8 38 0.6	+65 12 1		16.29	0.95			

TABLE III (CONT.)

GALAXY	R.A.	DEC	TYPE	J	J-F	VEL		COMMENTS
		NP7.						
N 6013	15 51 7.8	+40 47 37	SC	13.87	0.74	4664.		
	15 53 18.9	+41 43 24	E	13.92	0.96	10136.		BCM-CL#1=ZWCL 1555.1+4146
	16 4 3.7	+41 28 41	PEC	13.96	1.01	2212.	+	2 VEL, V STRONG EM LINES, SEYFERT?
	16 2 7.1	+40 7 13	SB	14.20	1.04	9497.		DOUBLE, MAG FOR BRIGHTER
	16 9 11.7	+42 0 49	S0	14.22	1.13	11109.	-	
	16 1 0.3	+41 20 5	SC	14.46	0.75	10135.		DOUBLE, MAG FOR BRIGHTER
	15 49 41.6	+43 34 0	S0/A	14.47	1.15	12059.	-	2 VEL
	15 52 21.4	+41 45 51	SC	14.51	0.34	7159.		
	16 9 1.8	+41 16 36	SA	14.57	1.19	9855.	-	
	15 51 45.7	+41 43 38	E	14.58	1.09	10072.		MEM-CL#1
	16 0 37.0	+43 3 15	S0	14.59	0.94	7485.		2 VEL
	16 2 8.2	+41 39 27	S0/A	14.62	0.83	10392.	-	
	15 53 53.2	+42 45 27	SC	14.67	0.60			
	15 56 12.4	+42 4 45	SBC	14.71	0.67	10566.		
	16 8 39.9	+41 59 0	E/S0	14.75	1.13	12233.		
	16 3 49.1	+42 45 40	SB	14.76	0.89	11734.		
	16 8 8.6	+42 27 47	SC	14.81	0.59			
	15 56 15.7	+41 56 9	SC	14.81	0.74			
	15 57 5.6	+42 4 45	SB	14.82	0.74	11765.		
I ZW134	16 7 35.6	+41 52 32	S0	14.83	1.20	7680.		V=7896 (SRC)
I ZW129	15 54 54.1	+42 1 27	SA	14.84	1.23	10578.		V=10573 (SRC)
	16 4 4.8	+41 27 6	PEC	14.89	0.41	14293.		
	15 54 50.8	+42 2 31	SB	14.95	0.70	11028.		
	16 5 35.8	+41 32 7	SC	14.99	0.61			
	15 54 45.6	+42 14 39	E	15.00	1.08			
	16 8 17.2	+43 15 28	S	15.02	1.32			
	15 58 14.5	+41 37 3	SB	15.07	0.85			
	15 54 43.2	+42 32 22	PEC	15.07	0.74			
	16 4 27.8	+40 32 43	S0	15.08	0.96			
	16 1 56.2	+41 17 20	S0	15.08	1.15			
	15 53 48.7	+42 5 41	S0	15.10	1.19			
	15 55 14.0	+40 10 32	SP	15.11	0.81			
	15 53 44.0	+41 42 11	E	15.15	0.74			
	15 57 44.4	+42 24 14	E	15.20	1.01			
	15 59 45.0	+43 13 19	E	15.24	0.53			
	15 51 15.7	+42 42 19	SB	15.24	0.90			
	15 59 47.1	+42 31 36	SC	15.24	0.63			
	15 53 41.4	+41 42 43	S0	15.24	0.57			
	15 52 16.6	+41 45 43	S-	15.24	0.67			
	15 58 20.9	+41 37 7	S0	15.27	1.38			
	16 3 45.0	+40 51 19	S0	15.28	0.79			
	15 50 19.1	+42 52 32	S+	15.36	0.63			
	16 2 36.4	+42 9 48	SB	15.36	0.53			
	15 58 35.5	+43 14 57	E	15.36	0.96			
	15 55 7.6	+41 52 52	E	15.39	0.81			
	15 55 42.1	+42 2 43	SB	15.47	0.71			
	15 53 11.3	+41 39 58	S	15.48	0.36			
	16 2 29.6	+43 1 28	S	15.51	0.58			
	16 7 32.6	+40 16 11		15.53	0.84			
	15 53 56.0	+41 41 2		15.58	1.04			
	16 6 26.2	+43 17 40		15.59	0.88			
	15 54 13.0	+41 34 18		15.60	0.78			
	16 5 41.9	+41 50 26		15.61	0.86			
	15 52 21.2	+42 38 43		15.63	0.81			
	15 54 23.4	+42 16 15		15.63	0.51			
	15 54 8.0	+42 3 34		15.65	0.50			
I ZW131	15 56 2.3	+41 51 6		15.65	0.88			
	15 57 29.7	+40 14 52		15.68	0.79			
	15 54 39.0	+43 33 21		15.71	0.65			
	15 53 57.1	+41 38 57		15.71	0.91			
	16 6 13.0	+42 40 32		15.74	0.91			
	16 0 1.4	+41 0 38		15.75	1.15			
	16 6 23.8	+43 8 3		15.76	0.48			
	16 2 34.4	+43 34 34		15.77	0.87			
	16 3 20.8	+41 24 33		15.77	0.64			
	16 3 42.0	+42 37 20		15.84	0.37			
	16 2 24.2	+40 42 11		15.85	0.84			
	16 3 25.9	+42 10 13		15.88	0.35			
	16 3 20.2	+40 14 7		15.88	0.82			
	15 52 2.0	+41 32 12		15.89	0.95			
	15 58 30.5	+43 41 29		15.91	0.63			
	16 3 46.3	+41 47 0		15.91	0.78			
	15 53 17.1	+42 15 2		15.93	0.56			
	15 58 25.8	+40 14 32		15.93	0.79			
	16 2 13.3	+40 10 6		15.95	2.26			
	15 55 6.3	+42 26 28		15.96	1.10			
	15 53 30.8	+41 43 36		15.96	1.05			
	16 7 47.9	+40 11 33		15.96	0.48			
	15 52 30.7	+41 33 38		15.97	0.40			
	15 54 1.1	+42 3 13		16.01	0.28			
	15 57 37.8	+43 3 40		16.01	0.77			
	16 6 13.8	+43 2 44		16.03	0.86			
	15 53 26.2	+41 35 37		16.05	0.61			
	16 6 29.4	+40 26 56		16.06	1.05			
	15 59 22.5	+40 4 45		16.07	0.58			
	16 1 38.4	+40 7 18		16.07	0.77			

TABLE III (CONT.)

GALAXY	R.A.	DEC	TYPE	J	J-F	VEL	COMMENTS
	15 51 43.7	+42 32 59		16.08	0.33		
	16 0 39.5	+43 29 12		16.10	0.62		
	15 52 55.7	+41 18 11		16.11	0.51		
	16 3 55.1	+40 48 38		16.13	1.79		
	15 59 20.6	+40 26 36		16.14	0.99		
	15 52 9.5	+41 38 38		16.15	0.89		
	15 52 44.7	+42 2 58		16.15	0.96		
	15 52 59.1	+41 42 7		16.17	0.83		
	15 57 .1	+42 35 41		16.18	1.05		
	16 0 47.2	+40 4 32		16.20	1.03		
	16 4 2.9	+42 58 49		16.20	0.45		
	15 57 30.5	+42 16 35		16.22	0.50		
	16 5 8.4	+40 40 55		16.26	0.57		
	15 56 44.0	+41 48 55		16.33	0.51		
	15 53 49.7	+40 10 37		16.35	0.72		
	16 8 41.9	+43 8 17		16.37	1.01		
	15 58 56.9	+40 33 47		16.38	0.55		
	15 52 23.1	+41 12 18		16.39	0.81		
		SP3.					
N 150	0 31 48.4	-28 4 54	SC	11.2		1530. +	SB(SRC), V=1470 (DGH)
N 174	0 34 31.3	-29 45 8	SB	13.24	0.79	3469. +	
	0 32 5.0	-30 17 32	SB	13.97	0.50	1573. +	
D 224	0 31 43.0	-31 2 54	SC	14.00	0.37	1614.	V=1581 (SRC), SDM (SRC)
	0 26 35.1	-31 6 57	EL	14.06	0.87	7241.	
	0 34 23.5	-28 38 34	SC	14.09	0.70	7068.	
	0 33 59.7	-28 3 40	S0	14.19	1.10	10432.	
	0 28 12.0	-28 59 21	S0	14.59	0.92	7309.	
	0 35 27.7	-29 11 52	S	14.68	0.71	3604.	
	0 37 37.3	-30 52 11	SBC	14.78	0.63	14546.	
	0 28 17.4	-29 37 10	SB	14.83	0.65	7218.	
	0 28 45.2	-28 41 21	S0	14.93	0.91	6885.	
	0 34 9.6	-28 3 53	SP	14.97	0.55	6911.	
	0 33 18.5	-28 45 36	S	14.99	0.87	7059.	
	0 36 51.6	-30 13 6	S+	15.02	1.04		
	0 34 4.4	-30 51 6	EL	15.19	0.59		
	0 32 38.6	-28 32 53	SP	15.24	0.75		
	0 32 51.7	-30 16 44	SB	15.25	0.70		
	0 33 26.9	-31 25 20	E	15.26	0.83		
	0 36 14.0	-29 55 22	S0	15.32	0.79		
	0 39 42.0	-28 48 33	E	15.34	1.18		BCM-D4R3 CL
	0 33 58.5	-28 34 19	SB	15.42	0.56		
	0 26 34.2	-31 6 30	S0	15.44	0.77		
	0 35 12.4	-31 4 18	E	15.48	0.80		BCM-D2R1 CL
	0 38 40.3	-30 6 54	EL	15.54	1.01		
	0 37 7.6	-30 36 51	S-	15.55	0.53		
	0 24 9.4	-30 49 35	PEC	15.56	0.71		
	0 33 25.6	-29 50 29	E	15.57	1.17		V COMPACT
	0 34 31.5	-29 49 27	S0	15.62	0.34		
	0 35 3.1	-28 48 15	E	15.62	1.36		BCM-D4R3 CL#2,DOUBLE
	0 31 30.9	-30 20 41	EL	15.67	0.97		
	0 34 41.3	-28 32 45	E	15.67	0.77		
	0 36 3.7	-29 21 21	E	15.70	1.13		BCM-D4R2 CL
	0 36 11.1	-28 17 35	SB	15.72	0.88		
	0 28 9.5	-29 48 33		15.72	0.48		
	0 34 17.8	-30 52 58		15.73	0.53		
	0 36 27.1	-30 39 35		15.74	0.61		
	0 36 22.2	-31 5 31		15.81	0.68		
	0 35 6.3	-28 48 36	E	15.82	0.93		MEM-CL#2
	0 37 10.7	-29 10 48	E	15.83	1.32		MEM-CL#1
	0 24 30.0	-28 3 23		15.84	0.99		
	0 34 14.5	-28 5 36		15.85	0.89		
	0 33 35.1	-30 1 41		15.85	0.45		
	0 31 10.2	-28 4 24		15.93	0.26		
	0 33 47.2	-30 34 32		15.95	0.81		
	0 31 4.4	-28 3 24		15.97	0.90		
	0 38 10.8	-28 16 12		15.97	0.78		
	0 36 33.1	-31 4 39		15.97	0.70		
	0 35 19.6	-31 4 57		15.97	0.65		
	0 27 44.8	-29 53 30		16.00	1.08		
	0 33 46.3	-28 58 44		16.04	0.23		
	0 38 20.1	-30 42 58		16.04	0.81		
	0 31 29.8	-28 26 50		16.08	1.38		
	0 31 39.0	-29 42 52		16.09	0.45		
	0 31 7.8	-27 58 22		16.10	0.73		
	0 29 59.0	-29 16 31		16.11	0.99		
	0 33 34.1	-30 25 25		16.11	1.01		
	0 37 29.5	-29 11 0	E	16.11	1.02		BCM-D4R3 CL#1
	0 35 36.8	-31 8 22		16.12	0.81		
	0 38 7.0	-31 1 40		16.13	0.85		
	0 28 52.5	-29 25 31		16.15	0.95		
	0 25 19.6	-31 0 40		16.18	0.91		
	0 35 9.3	-28 50 41		16.27	0.95		MEM-CL#2
	0 31 43.7	-28 52 40		16.27	1.26		
	0 35 46.5	-29 12 10		16.29	0.92		

TABLE III (CONT.)

GALAXY	R.A.	DEC	TYPE	J	J-F	VEL		COMMENTS
	0 32 17.0	-28 5 32		16.31	1.01			
	0 30 45.0	-30 32 57		16.31	0.62			
	0 34 50.6	-29 12 15		16.32	1.09			
	0 34 26.9	-29 53 19		16.32	0.87			
	0 37 34.4	-29 56 4		16.33	0.84			
	0 25 44.6	-30 29 11		16.33	1.20			
	0 33 7.6	-28 45 57		16.34	0.71			
	0 33 58.4	-29 49 12		16.36	0.60			
	0 24 20.3	-29 23 27		16.36	0.91			
	0 25 33.0	-28 39 1		16.37	0.70			
	0 35 59.6	-28 47 27		16.38	0.79			
	0 23 36.3	-29 3 36		16.38	1.19			
	0 33 9.0	-29 45 36		16.39	0.78			
		SP4.						
N 247	0 44 39.6	-21 2 0	SC	9.0		180.		VEL FROM SRC
N 216	0 38 57.3	-21 19 11	S-	13.21	0.63	1489.	+	V=1597 (SRC)
	0 45 6.1	-20 42 10	S+	14.16	0.69	5988.	+	V=6238 (SRC)
	0 45 8.9	-20 47 42	SC	14.46	0.54	6382.		V=6382 (SRC)
	0 37 35.5	-20 20 16	IRR	14.51	0.61	3992.	+	
	0 45 12.2	-21 45 57	S-	14.56	0.96	6429.	+	
I 1574	0 40 34.8	-22 31 1	IRR	14.56	0.49	395.		D226,VEL FROM SRC
	0 50 18.3	-23 14 51	S0	14.66	0.96	15979.		
	0 51 52.9	-23 49 30	PEC	14.66	0.97	20169.	-	V. PEC., BCM-CL#1?
	0 51 39.8	-21 59 12	E	14.71	1.14	16980.		BCM-ABELL 114
	0 54 41.4	-22 11 34	EL	14.76	1.23	15906.		
	0 44 28.1	-22 7 11	SB	14.77	0.76	6590.	+	2 VEL
	0 43 28.3	-20 53 1	IRR	14.86	0.45	4145.	+	
	0 50 50.3	-20 37 28	S+	14.86	0.95	14115.		
	0 37 36.4	-23 5 51	EL	14.90	1.16			
	0 38 29.0	-22 21 18	SC	14.91	0.80			
	0 45 6.4	-23 4 20	S+	14.94	0.62			
	0 48 18.4	-21 51 35	E	14.96	1.02			
	0 38 41.9	-21 24 22	S+	15.01	0.67			
	0 52 5.3	-23 46 3	SP	15.06	0.98			
	0 40 13.1	-22 2 48	EL	15.10		18283.		BCM-ABELL 86
	0 49 38.6	-22 57 10	SBC	15.16	0.92			
	0 52 36.8	-23 47 51	SC	15.16	0.87			
	0 40 4.2	-23 8 18	EL	15.19	0.92			
	0 40 58.0	-22 27 42	E	15.25	0.96			
	0 40 10.8	-22 4 20	EL	15.26	1.08			MEM-ABELL 86
	0 42 0.6	-23 34 9	E	15.27	0.88			MEM-CL#1?
	0 44 59.7	-23 17 43	S0	15.29	0.96			
	0 46 55.6	-20 42 13	SC	15.31	0.63			
	0 43 29.3	-21 54 49	SC	15.36	0.83			
	0 46 1.6	-21 37 58	E	15.36	0.94			MEM-CL#2
	0 37 28.8	-22 45 45	?	15.42	0.64			
	0 38 51.9	-23 22 4	S+	15.42	0.11			
	0 36 44.1	-22 22 27	EL	15.45	1.02			
	0 37 4.3	-20 39 27	S-	15.46	0.56			
	0 48 29.5	-20 31 6	S-	15.46	0.78			
	0 52 38.0	-21 58 9	E	15.46	1.00			MEM-ABELL 114
	0 39 47.4	-22 2 46	S0	15.49	0.97			MEM-ABELL 86
	0 44 43.4	-22 14 56		15.51	0.55			
	0 37 11.3	-22 28 6		15.51	1.02			
	0 45 54.8	-21 34 17		15.52	0.90			MEM-CL#2
	0 46 7.7	-21 38 14		15.55	0.94			
	0 53 1.6	-21 52 0		15.56	0.96			MEM-ABELL 114
	0 37 15.8	-22 23 6		15.61	1.14			
	0 50 57.9	-22 0 34		15.66	1.14			
	0 39 34.2	-21 38 45		15.66	1.09			
	0 45 8.0	-20 45 37		15.66	0.65			
	0 48 25.6	-22 10 20		15.66	0.87			
	0 43 5.1	-20 36 19		15.66	0.92			
	0 45 48.1	-21 48 18		15.67	0.90			MEM-CL#2
	0 45 11.3	-22 9 17		15.67	0.93			
	0 46 9.0	-21 32 50		15.68	0.96			MEM-CL#2
	0 38 17.5	-22 11 53		15.68	0.86			
	0 48 1.9	-21 31 47		15.72	0.73			
	0 50 50.8	-21 58 3		15.76	1.09			MEM-ABELL 114
	0 39 2.8	-22 54 57		15.80	0.80			
	0 36 29.5	-22 36 14		15.81	1.19			
	0 46 0.6	-22 25 12		15.86	0.88			
	0 54 24.0	-22 22 30		15.86	0.95			
	0 40 38.8	-20 11 24		15.86	1.01			
	0 37 0.2	-23 5 8		15.89	0.65			
	0 47 54.3	-20 28 0		15.92	1.05			
	0 47 21.1	-21 47 6		15.93	0.89			
	0 51 48.3	-23 48 28		15.96	0.90			MEM-CL#1?
	0 41 10.3	-21 56 1		15.96	0.83			MEM-ABELL 114
	0 51 32.1	-21 57 0		15.96	0.65			"
	0 38 24.5	-20 48 58		15.96	0.82			
	0 51 49.4	-23 49 31		15.96	0.53			MEM-CL#1
	0 43 29.9	-22 12 55		15.97	0.82			
	0 39 47.5	-22 5 54		15.98	0.95			MEM-ABELL 86

TABLE III (CONT.)

GALAXY	R.A.	DEC	TYPE	J	J-F	VEL		COMMENTS
	0 41 41.6	-22 37 11		16.02	0.97			
	0 45 36.5	-22 47 19		16.06	1.19			
	0 48 5.3	-23 17 21		16.06	0.99			
	0 54 27.8	-21 23 18		16.06	1.05			
	0 52 16.1	-23 47 37		16.06	0.75			
	0 49 50.4	-22 6 12		16.06	1.01			
	0 50 44.6	-21 47 40		16.06	0.67			MEM-ABELL 114
	0 51 51.6	-23 50 27		16.06	1.43			
	0 40 31.0	-22 32 5	E	16.17	1.11	19477.		MEM-ABELL 867
		SP5.						
	22 28 42.8	-19 17 26	SC	14.10	1.09	7367.		
	22 34 8.7	-20 3 58	SC	14.11	0.64	2450.	+	2 VEL, STRONG EM LINES
N 7287	22 25 32.2	-22 41 27	S0	14.13	1.06	6090.	+	
	22 34 11.5	-22 28 46	SB	14.19	0.89	10188.		
	22 40 4.7	-21 25 43	S+	14.21	0.86	3160.		V. PEC. SPIRAL
	22 26 55.8	-20 0 19	E	14.37	1.05	7487.	+	
	22 36 23.7	-19 55 25	SB	14.38	1.10	9526.		
	22 26 50.1	-20 4 40	SA	14.45	0.86	7690.	+	
N 7310	22 31 52.0	-22 44 35	SC	14.50	0.88	9772.		
	22 30 16.6	-20 21 3	SC	14.63	0.80	5804.	+	
	22 30 21.3	-22 29 50	EL	14.64	0.89	15788.		
	22 38 31.1	-22 3 31	S+	14.75	0.72	4727.		
	22 28 13.1	-21 32 32	SC	14.85	0.19			
	22 40 51.1	-21 19 42	EL	14.92	0.96			
	22 26 3.7	-22 27 23	SP	15.00	0.76			
	22 38 45.9	-19 44 51	SP	15.10	0.85			
	22 28 25.8	-21 26 4	SC	15.13	0.85			
	22 25 41.0	-22 16 38	S0	15.16	1.08			
	22 34 52.8	-22 20 16	SC	15.18	0.35			
	22 32 1.3	-19 15 5	SB	15.19	0.99			
	22 34 9.1	-21 42 6	S-	15.25	0.90			
	22 24 34.1	-20 40 3	SC	15.26	0.89			
	22 25 29.3	-22 32 37	S	15.27	1.40			
	22 35 57.7	-22 38 42	E	15.45	1.07			
	22 26 19.1	-20 25 26	SB	15.47	0.77			
	22 26 20.6	-19 24 34		15.50	0.62			
	22 35 3.9	-19 15 29		15.53	0.88			
	22 34 54.9	-22 30 43		15.59	0.88			
	22 34 36.8	-22 12 42		15.59	0.76			
	22 36 6.3	-20 20 27		15.65	0.93			
	22 31 40.9	-20 33 53		15.71	0.77			
	22 32 38.2	-22 40 23		15.75	0.98			
	22 30 24.0	-22 42 0		15.76	0.90			
	22 36 43.5	-20 37 52		15.76	0.88			
	22 29 0.0	-21 52 24		15.79	1.16			
	22 25 34.9	-20 43 40		15.81	0.91			
	22 25 43.8	-22 14 24		15.81	1.00			
	22 36 15.5	-22 33 46		15.83	1.40			
	22 31 26.1	-19 29 35		15.85	0.87			
	22 28 56.6	-20 3 8		15.86	1.04			
	22 35 45.7	-21 18 6		15.89	0.96			
	22 30 58.5	-22 43 56		15.90	1.00			
	22 39 41.1	-22 37 58		15.90	1.11			
	22 23 25.5	-20 36 33		15.90	1.20			
	22 23 38.1	-21 16 13		15.91	1.03			
	22 36 27.7	-22 40 21		15.97	0.87			
	22 36 14.8	-19 40 28		16.00	1.06			
	22 32 23.0	-20 0 15		16.05	1.26			
	22 37 50.4	-22 7 0		16.05	0.56			
	22 25 59.1	-22 27 2		16.07	1.00			
	22 35 47.0	-21 54 8		16.08	0.62			
	22 23 46.1	-22 47 10		16.10	0.37			
	22 26 59.3	-21 50 11		16.13	0.75			
	22 36 4.4	-22 31 43		16.15	1.02			
	22 33 20.7	-19 15 20		16.15	0.93			
	22 33 51.9	-20 48 47		16.15	0.97			
	22 34 19.3	-19 31 39		16.16	0.79			
	22 34 20.5	-19 14 55		16.18	0.82			
	22 33 59.4	-19 50 36		16.20	1.13			
	22 28 50.1	-21 49 31		16.30	0.80			
	22 37 7.9	-21 59 3		16.31	0.83			
	22 35 21.0	-21 34 54		16.31	0.50			
	22 34 50.4	-19 40 3		16.32	0.86			
	22 27 13.9	-22 17 25		16.35	1.05			
	22 33 15.4	-22 41 50		16.35	1.12			

1978AJ.....83.1549K

TABLE III (CONT.)

GALAXY	R.A.	DEC	TYPE	J	J-F	VEL	COMMENTS
		SP6.					
N 1214	3 3 46.5	- 9 44 9	S0	12.44	0.84	4575. +	
N 1140	2 52 7.0	-10 13 43	IRR	12.46	0.21	1462.	2 VEL, V=1503 (DGH)
N 1216	3 4 44.2	- 9 47 12	SB	13.45	0.91	4983.	
N 1215	3 4 30.6	- 9 44 18	S0	13.52	0.86	5104. +	
	2 55 23.6	-10 21 58	SAB	13.68	1.12	4475.	
	3 4 3.3	- 9 55 33	EL	13.72	1.36	10206.	
	2 51 47.5	- 8 40 44	E	13.83	0.92	5344.	
N 1155	2 55 47.1	-10 32 56	EL	13.89	0.79	4632.	
N 1154	2 55 41.8	-10 33 43	SB	13.98	0.85	4606.	
	2 59 26.0	-10 49 4	E	14.12	1.03	10020.	
	2 58 18.6	-11 1 13	EL	14.24	0.75	10094.	
	3 6 44.4	-10 29 13	S+	14.27	1.13	3209.	
	2 58 5.7	-11 36 50	SP	14.32	1.02	9012. +	
	3 7 27.8	-10 14 35	S-	14.38	1.18	3981.	
N 1185	3 0 33.5	- 9 19 42	S-	14.40	1.36	4785. +	2 VEL
	2 59 9.6	-10 6 35	E	14.53	0.91	9682.	
	2 58 46.8	-11 5 52	EL	14.59	0.96	9244.	
	3 7 8.5	-10 0 36	E/S0	14.59	1.06	4280.	
	2 53 15.0	-10 41 23	E	14.64	1.03	9861.	
	3 3 43.8	- 9 1 39	E	14.68	1.24	10222.	
	2 54 53.4	-11 11 15	E	14.69	0.85	7656.	
	2 53 9.5	-10 20 26	EL	14.77	0.96	9709.	
	2 55 13.1	-10 40 33	E	14.92	0.94	10045.	
	3 7 52.0	-10 56 14	S-	14.95	1.25	5107.	
N 1182	3 1 3.0	- 9 52 0	S-	14.95	1.15	3218. +	
N 1208	3 3 23.0	- 9 44 27	EL	14.96	1.10		
	2 57 38.9	-11 1 22	S-	14.99	1.26		
	3 4 30.0	- 9 49 24	SP	15.00	0.33		
	2 52 41.0	-10 57 15	S-	15.09	1.19		
	3 0 3.0	-11 14 48	E	15.09	0.84		
	2 53 3.9	-11 32 1	E	15.14	0.98		
	2 59 16.2	-11 6 33	SP	15.20	1.26		
	2 55 57.2	-11 32 41	SP	15.21	0.97		
	2 58 16.9	-11 4 41	S-	15.27	1.27		
	2 56 25.0	-10 49 14	S0	15.31	1.08		
	2 53 10.2	-10 11 35	S+	15.33	1.08		
	3 8 7.3	-11 44 53	S0	15.39	1.32		
	2 58 11.9	-11 0 35	E	15.41	1.02		
	2 53 41.6	-10 9 40	E	15.43	1.24		
	2 58 1.2	-11 5 53	E	15.45	1.29		
	2 57 3.4	-10 48 35		15.50	1.19		
	2 58 50.7	-11 5 18		15.53	1.18		
	3 4 58.7	-10 35 58		15.60	1.39		
	3 1 19.5	-11 0 6		15.63	1.20		
	3 6 58.9	- 9 18 14		15.64	1.38		
	2 57 49.7	-11 0 12		15.71	1.06		
	2 55 55.1	-11 36 57		15.72	1.20		
	3 3 36.8	- 9 46 19		15.73	1.47		
	2 56 4.1	-11 39 11		15.75	1.16		
	2 52 40.7	-10 45 41		15.78	1.08		
	2 53 19.1	- 8 36 25		15.79	1.21		
	3 4 18.8	-10 9 23		15.79	1.24		

NOTES TO TABLE III

BGM/BCM=BRIGHTEST GROUP/CLUSTER MEMBER
CR=CHINCARINI AND ROOD (1972)
DGH=DAVIS,GELLER, AND HUCHRA (1978)
SRC=SECOND REFERENCE CATALOGUE (DE VAUCOULEURS ET. AL. 1976)
GT=GREGORY AND THOMPSON (1978)

on the Hubble system by at least two of us independently. Since it may be useful for some purposes to have a complete sample, we have extended our classification down to at least $J = 15.5$ in every field. Classifying was always done using the blue plates, which, with one exception, are IIIaJs. Although the quality of these plates ranged from fair to excellent, many of the fainter galaxies are too poorly resolved to assign accurately a Hubble type. Rather than leave them unclassified, or assign them a morphological type of greater precision than the material warranted, we have elaborated the Hubble system so that the type given a galaxy will reflect the precision with which it is known. This scheme is presented in Table IV, where each parallel system represents a greater degree of uncertainty than the one to its left. The morphological types of our galaxies in this system are presented in the fourth column of Table III. The SRC contains classifications of 12 of our galaxies.

TABLE IV. Classification scheme.

E	EL		
E/SO			
SO			
SO/a	S−	SP	S
Sa			
Sab			
Sb	S+		
Sbc			
Sc			
Irr			
Pec			

In general, the two classifications agree to within one morphological type.

d) *Velocities*

We have tried to obtain recessional velocities for the 184 galaxies in our sample brighter than $J = 15.0$, and have succeeded in all but 20 cases. Velocities were measured using the cassegrain image tube spectrographs on the Kitt Peak 0.9- and 2.1-m telescopes and the Yale 1-m telescope at Cerro Tololo, and with the 2000-channel intensified Reticon scanner on the McGraw Hill 1.3-m telescope. The spectrograms were obtained at dispersions of 100 and 200 Å mm^{-1} and were reduced by standard techniques. Scanner spectra were obtained at a resolution of 9 Å and typical integration times of 1500 s on the galaxy and comparable integrations on the sky. Observations were reduced to absolute fluxes using Oke's (1974) observations of white dwarfs.

The velocities obtained, reduced to the galactocentric frame of reference following the precepts in the SRC, are presented in column 7 of Table III. The rms estimated error of these velocities, as determined from the scatter in velocity determinations from indivudual lines is 100 km s^{-1}. Velocities that have internal accuracies at least a factor of 2 better than the mean are indicated by a plus sign those that are a factor of 2 worse than the mean are indicated by a minus sign.

Sixteen of our galaxies have previous velocity determinations in the literature, as cited in column 8. Our velocity for NGC 4101 differs from that of Gregory and Thompson (1978) by over 600 km s^{-1}; one of the velocity determinations is clearly faulty. Using the other 15 galaxies, we find ours differ in the mean from the published values by -57 ± 33 km s^{-1}, with an rms scatter about the mean of 125 km s^{-1}. This scatter compares favorably with a predicted dispersion of 147 km s^{-1} calculated from our internal error estimates and those cited for the published velocities.

III. DISCUSSION

Most of the analysis of these data will be presented in our next paper. Here we wish only to make a few comments about some obvious characteristics of the galaxy distributions in our fields. Figure 1 presents the distribution of velocities in each field. It is obvious that the galaxies are very strongly clustered, and we discuss below the properties of this clustering.

Field NP4. This is the only one of our fields contained within the bounds of what Gregory and Thompson (1978) call the Coma/A1367 supercluster and most galaxies in this field are at the supercluster velocity of 6000–8000 km s^{-1}. Indeed, the velocity histogram at first suggests that these galaxies belong to the halo of the Coma Cluster. However, a closer look reveals three main groups, none of which can be considered part of Coma.

(1) The NGC 4104 group. This group contains at least five galaxies, noted in the comments column of Table III. The mean velocity, $\langle v \rangle = 8746$ km s^{-1} and $\sigma_v = 474$ km s^{-1}. In addition to this fairly tight group, there are a few galaxies at this velocity several degrees away to the north, including NGC 4272, NGC 4295, and NGC 4375.

(2) ZwCl 1205.4 + 2514. This group, denoted cluster No. 2 in the comments, dominates the southern part of NP4. Although at the velocity of Coma, it seems to be contained entirely within this field and is apparently not part of the Coma Cluster. It is an open, unconcentrated cluster consisting almost entirely of E and SO galaxies, and is centered at $12^{\mathrm{h}}5^{\mathrm{m}}32^{\mathrm{s}}.4 + 25°52'7''$. For the 14 measured members, $\langle v \rangle = 6893$ km s^{-1} and $\sigma_v = 214$ km s^{-1}.

(3) Cl 1212.2 + 2750. This group, denoted cluster No. 1 in the comments, is located in the NE part of NP4 at a velocity of 7750 km s^{-1}. The CGCG includes this group within ZwCl 1217.5 + 2915 = TG53 (Turner and

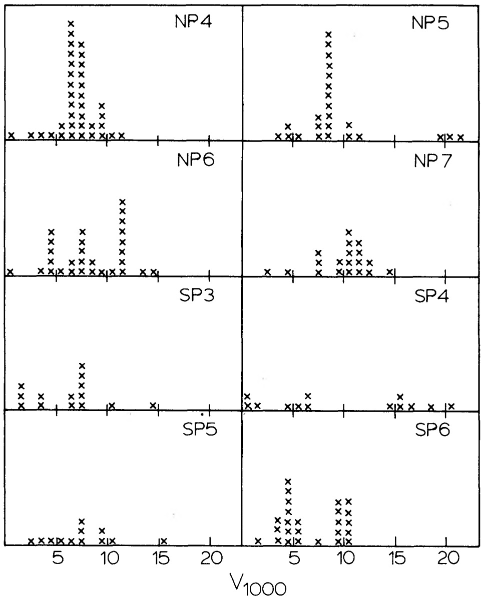

FIG 1. The distribution of measured velocities, in 1000 km s^{-1} bins, of galaxies in each of the eight survey fields.

Gott 1976). However, that group consists of galaxies at velocities of 750 and 4000 km s^{-1} (Tifft and Gregory 1976), so our cluster No. 1 appears to be an isolated small group.

Field NP5. There is a large clustering of galaxies at about 8500 ± 500 km s^{-1}. However, these galaxies are spread over the entire field and do not seem to form a cluster, in the normal sense of the word.

Field NP6. There are prominent groupings at 4000 and 11 000 km s^{-1}. The galaxies in the nearer grouping are loosely clustered, but the 11 000 km s^{-1} galaxies are spread over the entire field.

Field NP7. There are at least ten galaxies grouped at about 11 000 km s^{-1}. Three of them appear to be members of the group ZwCl 1555.1 + 4146. However, most of the galaxies in this velocity range are scattered uniformly over the field.

Field SP3. Again, the 7000 km s^{-1} grouping of galaxies is not spatially clumped. Beyond the limit of our redshift survey there appears to be a supercluster of rich clusters of Abell distance class 4, with Abell richness classes in the range 1–3.

Field SP4. The 6000 km s^{-1} galaxies show no clumping on the sky. This field contains four prominent clusters, including Abell 86 and Abell 114. We denote the other two as cluster Nos. 1 and 2 in the comments.

Field SP5. This field contains no obvious clustering.

Field SP6. The two velocity groups at 4800 and 10 000 km s^{-1} are each spread over the entire field.

Although not entirely unexpected, it is striking how strongly clustered our galaxies are in velocity space. Of particular interest are the many velocity groupings whose scale requires them to be called "superclusters" but which do not appear to be composed of recognizable clusters as subunits. We shall pursue this topic in more quantitative detail in our next paper.

We are indebted to many people for the help which they gave us during the course of this work. We thank Jim Gunn for the loan of several plates and we apologize for dropping one of them. Charlie Kowal, Keith Hegge, and Jim Liebert were very generous in obtaining observations for us. Roger Angel, John Huchra, Richard Gott, and Ed Turner all supplied us with equipment and unpublished data. Most of the velocity reductions were done for us by Phillip Campbell. One of us (P.L.S.) wishes to thank the President's Club of the University of Arizona for the support of the Bart Bok Fellowship. The early part of this investigation was partially supported by the Institute of Advanced Study under NSF grant GP 40768X.

APPENDIX A: CALIBRATION OF PHOTOMETRY IN THE *CATALOG OF GALAXIES AND CLUSTERS OF GALAXIES*

Huchra (1976) compared photometry of several hundred galaxies in the CGCG with that in the first *Reference Catalog of Bright Galaxies* (de Vaucouleurs and de Vaucouleurs 1964) and found the CGCG photometry to have a scale error of 0.1 mag per magnitude. Kron and Shane (1976) compared the CGCG photometry, separated by volume with a collection of photometry from many sources. They found the photometry in Vol. 1 of the CGCG differed from the rest by several tenths of a magnitude.

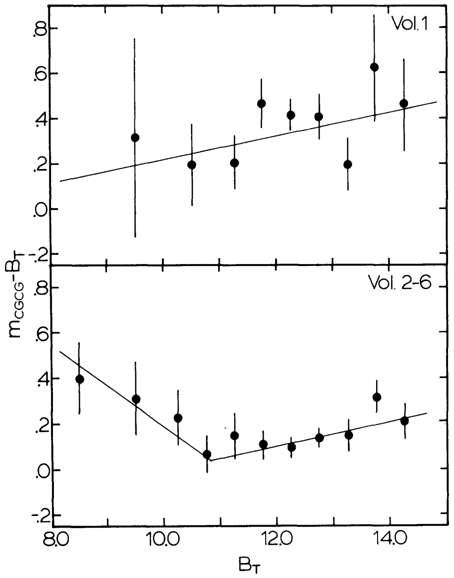

FIG. 2. The systematic differences between magnitudes in the CGCG and those in the SRC. Shown separately are photometry in Vol. 1 of the CGCG and that in the remainder of the catalog. Lines are the best fits to the data.

We have correlated a magnetic tape copy of the *Second Reference Catalog* (SRC) with a magnetic tape copy of the Zwicky Catalog, kindly given to us by Dr. Ed Turner and Dr. Richard Gott. Our own photometry, while extending fainter, does not include enough galaxies over a wide enough brightness range to permit much of a comparison with the CGCG. All positional coincidences between objects in the two lists, within the accuracy of the CGCG positions, were assumed to be due to the same galaxy, unless the magnitude difference was obviously too large. The results, for 660 galaxies, are presented in Fig. 2. With the exception of Vol. 1, the differences between volumes were not statistically significant, and we have combined the data from Vols. 2–6.

The trends in Fig. 2 are reasonably close to those found by Kron and Shane (1976). Within the errors, the results may be represented as

$$\text{Vol. 1:}\quad M_{\text{CGCG}} = B_T + 0.05(B_T - 5.5), \tag{5}$$

Vol. 2–6:

$$M_{\text{CGCG}} = B_T - 0.15(B_T - 11.5), \quad B_T < 11, \tag{6}$$

$$M_{\text{CGCG}} = B_T + 0.04(B_T - 9.0), \quad B_T \geq 11. \tag{7}$$

REFERENCES

Chincarini, G., and Rood, H. J. (1972). Astron. J., **77,** 4.

Christensen, C. G. (1975). Astron J. **80,** 282.

Davis, M., Geller, M. J., and Huchra, J. (1978). Astrophys. J. **221,** 1.

Felten, J. E. (1977). Astron. J. **82,** 861.

Gregory, S. A., and Thompson, L. A. (1978). Astrophys. J. **222,** 784.

Groth, E. J., and Peebles, P. J. E. (1977). Astrophys. J. **217,** 385.

Huchra, J. (1976). Astron. J. **81,** 952.

Kron, G. E., and Shane, C. D. (1976). Astrophys. Space Sci. **39,** 401.

Oemler, A. (1974). Astrophys. J. **194,** 1.

Oke, J. B. (1974). Astrophys. J. Suppl., **27,** 27.

Schechter, P. L. (1976). Astrophys. J. **203,** 297.

Thuan, T. X., and Gunn, J. E. (1976). Publ. Astron. Soc. Pac. **88,** 543.

Tifft, W. G., and Gregory, S. A. (1976). Astrophys. J. **205,** 696.

Turner, E. L., and Gott, J. R. (1976), Astrophys. J. Suppl. **32,** 409.

Vaucouleurs, G. de, and Vaucouleurs, A. de (1974). *Reference Catalog of Bright Galaxies* (Univ. Texas P., Austin).

Vaucouleurs, G. de, Vaucouleurs, A. de, and Corwin, H. G. (1976) *Second Reference Catalogue of Bright Galaxies* (Univ. Texas P., Austin).

Wells, D. (1972). Ph.D. thesis, Univ. Texas, Austin.

Zwicky, F., Herzog, E., Wild, P., Karpowicz, M., and Kowal, C. T. (1961–1968). *Catalogue of Galaxies and Clusters of Galaxies* (California Inst. Tech., Pasadena).