The Astrophysical Journal Supplement Series, 199:26 (22pp), 2012 April doi:10.1088/0067-0049/199/2/26
© 2012. The American Astronomical Society. All rights reserved. Printed in the U.S.A.

THE 2MASS REDSHIFT SURVEY—DESCRIPTION AND DATA RELEASE

John P. Huchra[1,15], Lucas M. Macri[2], Karen L. Masters[3,4], Thomas H. Jarrett[5], Perry Berlind[1], Michael Calkins[1], Aidan C. Crook[6], Roc Cutri[4], Pirin Erdoğdu[7], Emilio Falco[1], Teddy George[8], Conrad M. Hutcheson[9], Ofer Lahav[7], Jeff Mader[10], Jessica D. Mink[1], Nathalie Martimbeau[11], Stephen Schneider[12], Michael Skrutskie[13], Susan Tokarz[1], and Michael Westover[14]

[1] Harvard-Smithsonian Center for Astrophysics, 60 Garden Street, Cambridge, MA 02138, USA
[2] George P. and Cynthia Woods Mitchell Institute for Fundamental Physics and Astronomy, Department of Physics and Astronomy, Texas A&M University, 4242 TAMU, College Station, TX 77843, USA; lmacri@tamu.edu
[3] Institute for Cosmology and Gravitation, University of Portsmouth, Dennis Sciama Building, Burnaby Road, Portsmouth, PO1 3FX, UK; karen.masters@port.ac.uk
[4] SEPNet (South East Physics Network), UK
[5] Infrared Processing and Analysis Center, California Institute of Technology, 770 S Wilson Ave., Pasadena, CA 91125, USA
[6] Microsoft Corp., 1 Microsoft Way, Redmond, WA 98052, USA
[7] Department of Physics and Astronomy, University College London, London WC1E 6BT, UK
[8] Canada–France–Hawaii Telescope, 65-1238 Mamalahoa Hwy, Kamuela, HI 96743, USA
[9] Kavli Institute for Particle Astrophysics and Cosmology, Stanford University, Stanford, CA 94309, USA
[10] Keck Observatory, 65-1120 Mamalahoa Hwy, Kamuela, HI 96743, USA
[11] Planétarium de Montréal, 1000 rue Saint-Jacques, Montréal, Québec H3C 1G7, Canada
[12] Department of Astronomy, University of Massachusetts, Amherst, MA 01003, USA
[13] Department of Astronomy, University of Virginia, Charlottesville, VA 22904, USA
[14] McKinsey & Co., 1420 Fifth Ave., Ste 3100, Seattle, WA 98101, USA
Received 2011 July 29; accepted 2011 December 17; published 2012 March 14

ABSTRACT

We present the results of the 2MASS Redshift Survey (2MRS), a ten-year project to map the full three-dimensional distribution of galaxies in the nearby universe. The Two Micron All Sky Survey (2MASS) was completed in 2003 and its final data products, including an extended source catalog (XSC), are available online. The 2MASS XSC contains nearly a million galaxies with $K_s \leqslant 13.5$ mag and is essentially complete and mostly unaffected by interstellar extinction and stellar confusion down to a galactic latitude of $|b| = 5°$ for bright galaxies. Near-infrared wavelengths are sensitive to the old stellar populations that dominate galaxy masses, making 2MASS an excellent starting point to study the distribution of matter in the nearby universe. We selected a sample of 44,599 2MASS galaxies with $K_s \leqslant 11.75$ mag and $|b| \geqslant 5°$ ($\geqslant 8°$ toward the Galactic bulge) as the input catalog for our survey. We obtained spectroscopic observations for 11,000 galaxies and used previously obtained velocities for the remainder of the sample to generate a redshift catalog that is 97.6% complete to well-defined limits and covers 91% of the sky. This provides an unprecedented census of galaxy (baryonic mass) concentrations within 300 Mpc. Earlier versions of our survey have been used in a number of publications that have studied the bulk motion of the Local Group, mapped the density and peculiar velocity fields out to 50 h^{-1} Mpc, detected galaxy groups, and estimated the values of several cosmological parameters. Additionally, we present morphological types for a nearly complete sub-sample of 20,860 galaxies with $K_s \leqslant 11.25$ mag and $|b| \geqslant 10°$.

Key words: catalogs – galaxies: distances and redshifts – surveys

Online-only material: color figures, machine-readable tables

1. INTRODUCTION

Between the mid-1970s and the early 1980s, several discoveries were made based on innovations in detector technology and better understanding of galaxies that substantially changed our view of the nearby universe. The cosmic microwave background (CMB) dipole was convincingly measured (Corey & Wilkinson 1976; Smoot et al. 1977; Cheng et al. 1979), the first large redshift surveys were begun (cf. Davis et al. 1982), and Virgo Infall was both convincingly predicted and measured (de Vaucouleurs 1956; Silk 1974; Peebles 1976; Aaronson et al. 1982). The kinematics of the Local Universe became a cosmological test and tool, and—with the realization that the Virgo supercluster was insufficient to explain the CMB dipole—the search for the source of the flow (astronomy's Nile) became a major cosmological quest.

In the 1980s, this quest led to the discovery of even larger mass concentrations such as the Great Attractor (Burstein et al. 1986; Lynden-Bell et al. 1988) and the Shapley Supercluster (Tully & Shaya 1984; Tammann & Sandage 1985), and the initiation of several very large scale redshift surveys based on IR and optical catalogs (e.g., Strauss et al. 1992; Santiago et al. 1995; Saunders et al. 2000). Perforce then followed advanced distance surveys and catalogs (Mould et al. 1993; Willick et al. 1997). Sophisticated techniques were developed to analyze these surveys (Dekel et al. 1990; Zaroubi et al. 1995), but despite reasonable data and thorough analyses, the source of the CMB dipole was not convincingly identified and there remained very significant conflicts between the results of different surveys (e.g., Schmoldt et al. 1999).

Near the end of the 1990s, a conflict remained between Ω_M on all measured scales and the $\Omega_M = 1$ strongly predicted from inflation and cold dark matter models. Was the discrepancy real or were there problems with the data and/or the theory? Most of the community realized that *all* extant maps were tremendously

[15] This paper is mostly based on the text written by John Huchra before his death in 2010 October.

biased, either by extinction or by wavelength (read "young star formation," which dominates *both* blue and far-infrared light). This was the explanation advocated by the theorists—the galaxies being measured were not really tracing the mass.

Fortunately, the overall Ω problem was solved soon thereafter with the discovery of dark energy (Riess et al. 1998; Perlmutter et al. 1999) coupled with the accurate determination of the Hubble constant (Freedman et al. 2001) and the measurement of the large-scale geometry of the universe through observations of fluctuations in the CMB (Spergel et al. 2003). Still, several very significant questions remain. Can we accurately (to a few percent) observationally account for the matter density in the nearby universe? How is matter distributed? In particular, can we explain gravitationally the motion of the Milky Way with respect to the CMB? Do we understand the differences, if any, in the distribution of ordinary baryonic matter and dark matter (i.e., the bias function)? These questions are yet unanswered and clearly drive the detailed understanding of galaxy and large-scale structure formation and evolution.

Despite all of the aforementioned work, even the galaxy density field of the Local Supercluster (LSC) is not in good shape. Despite high-quality data on the flow field, Tonry et al. (2000) found there are many missing elements to the model of the LSC, including possible local sources of the observed quadrupole field and the "Local Anomaly."

2. THE TWO MICRON ALL SKY SURVEY

The Two Micron All Sky Survey (2MASS; Skrutskie et al. 2006) had its origins in a proposal to NASA for a "Near InfraRed Astronomical Satellite" by G. Fazio, J. Huchra, J. Mould, and collaborators in 1988. The survey was eventually carried out by a team led by astronomers at the University of Massachusetts (UMass) using twin 1.3 m telescopes located at Mount Hopkins, AZ (starting in 1997) and Cerro Tololo, Chile (starting in 1998). Scans were completed by 2001 and the final data release was made available in 2003 through IPAC.[16]

2MASS mapped the entire sky in the J, H, and K_s bands, avoiding many of the observational biases that affected previous optical and far-infrared all-sky surveys. The effects of interstellar extinction are reduced by 10× relative to the B band and the spectral energy distributions of most galaxies peak at near-infrared wavelengths. Moreover, K-band luminosities are a useful proxy for baryonic mass as the stellar mass-to-light ratio is fairly constant across galaxy types at this wavelength (e.g., within a factor of two; Bell & de Jong 2001). This makes the near-infrared the spectral region of choice to map the distribution of matter in the nearby universe.

The 2MASS photometric pipeline produced a complete and reliable extended source catalog (XSC; Jarrett et al. 2000; Jarrett 2004) of $\sim 10^6$ objects with $K_s \leqslant 13.5$ mag and a mean photometric accuracy better than 0.1 mag. Moreover, the database included information on the photometric structure of the galaxies (photometric profiles, axis ratios, etc.). 2MASS provided the first modern, all-sky, highly accurate catalog of galaxies. A few years later, the Sloan Digital Sky Survey (SDSS; York et al. 2000) started to provide overlapping deeper optical data which eventually covered ∼35% of the sky (Aihara et al. 2011), but 2MASS remains the only modern survey which can be used to construct a uniform, all-sky, three-dimensional map of the Local Universe.

[16] http://www.ipac.caltech.edu/2mass/

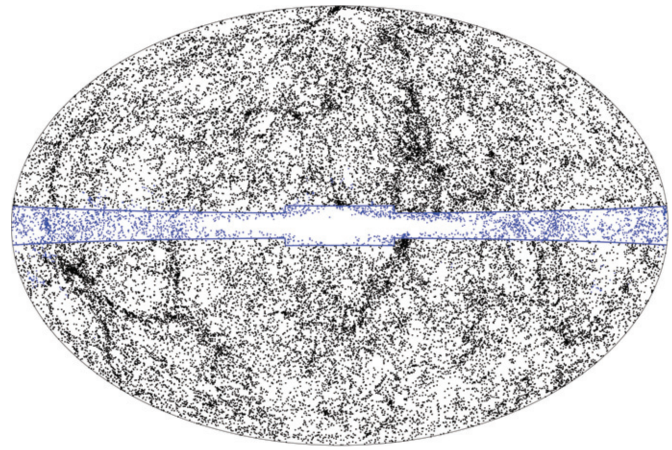

Figure 1. Distribution of 2MASS galaxies with $K_s \leqslant 11.75$ mag in Galactic coordinates (Aitoff projection). Blue dots represent galaxies outside our survey area. Note that due to stellar confusion we cannot cover, even to this bright magnitude limit, the very central region of the galaxy, but we do cover ∼91% of the sky.

(A color version of this figure is available in the online journal.)

Two decades before 2MASS, the first flux-limited all-sky galaxy catalog was created from observations by the *IRAS* satellite at 60 μm (Strauss et al. 1990). Since galaxies were unresolved by *IRAS*, the point source catalog formed the basis of a redshift survey (PSCz; Fisher et al. 1995; Saunders et al. 2000). Among other problems, the PSCz catalog gave little weight to ellipticals (which are dim at 60 μm because this wavelength is dominated by dusty star formation) and suffered from severe confusion in regions of high density. However, the uniform full-sky coverage was unique at the time.

2.1. The Zone of Avoidance

2MASS is an excellent probe of the zone of avoidance for bright galaxies, as was discussed in depth by Huchra et al. (2005). Figure 1 is an updated version of Figure 8 from Huchra et al. (2005) showing the 2MASS XSC coverage at $K_s \leqslant 11.75$ mag, limited only by confusion near the galactic center. Figure 2 is an updated version of Figure 7 from Huchra et al. (2005) and shows the galaxy surface density versus galactic latitude for several magnitude limits. At the bright magnitudes surveyed by 2MRS, the catalog is essentially complete to very low latitudes.

3. THE 2MASS REDSHIFT SURVEY

The primary extragalactic goal of 2MASS was to feed the next generation of all-redshift surveys to fully map the nearby universe. To this end, we started a program in 1997 September to obtain the required spectroscopic data for a magnitude-limited sample of galaxies: the 2MASS Redshift Survey (2MRS). Our initial survey limits of $K_s = 11.25$ mag and $|b| = 10°$ (20,860 galaxies; hereafter 2MRS11.25) were progressively increased to final values of $K_s = 11.75$ mag and $|b| = 5°$–$8°$ (44,599 galaxies; the full 2MRS), allowing us to steadily complete our view of the Local Universe.

2MRS builds and improves on the previous generation of local surveys (see Table 1) and is complementary to contemporaneous larger, deeper surveys, notably 2dF (Colless et al. 2001), SDSS (Aihara et al. 2011), and specially 6dFGS (Jones et al. 2004, 2005, 2009) which also used the 2MASS XSC as its input catalog and provided a large number of redshifts for our survey.

Table 1
Large Redshift Surveys of the Nearby Universe to Date

Survey	Sky Coverage (% 4π sr)	Depth[a] (z)	Selection (band, flux)	No. of Gals. ($\times10^3$)	Reference
CfA1	30%	0.03	$B = 14.5$ mag	2.4	de Lapparent et al. (1986)
ORS	60%	0.03	$B = 14.0$ mag	8.5	Santiago et al. (1995)
SSRS2+ CfA2	60%	0.04	$B = 15.5$ mag	23.6	da Costa et al. (1998) and Huchra et al. (1999)
IRAS PSCz	85%	0.08	60 μm = 0.6 Jy	16.1	Saunders et al. (2000)
LCRS	1%	0.17	$R = 17.5$ mag	25.3	Shectman et al. (1996)
2dF	8%	0.19	$b_J = 19.5$ mag	245.6	Colless et al. (2001)
SDSS[b]	35%	0.33	$r = 17.5$ mag	943.6	Aihara et al. (2011)
6dFGS	40%	0.10	$K_s = 12.65$ mag	124.6	Jones et al. (2004, 2005, 2009)
2MRS11.25	83%	0.04	$K_s = 11.25$ mag	20.6	Huchra et al. (2005)
2MRS	91%	0.05	$K_s = 11.75$ mag	43.5	This work

Notes.
[a] 90 percentile redshift value in catalog.
[b] DR8 main galaxy sample.

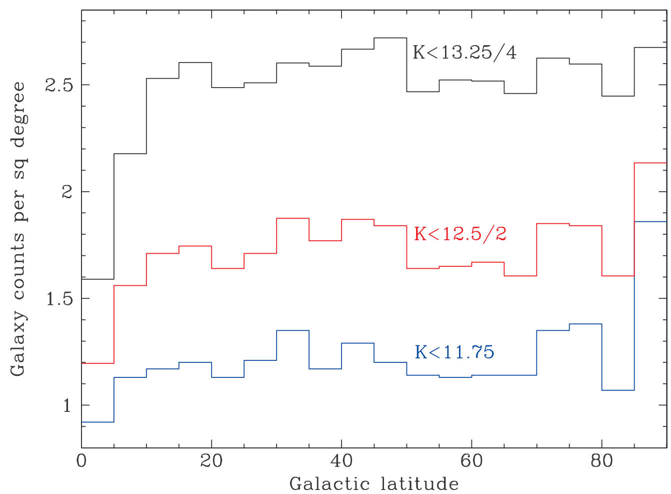

Figure 2. Surface number density vs. galactic latitude for three cuts in the 2MASS XSC at $K_s = 11.75$, 12.5, and 13.25 mag. While the number counts drop sharply in the $5° \leqslant |b| \leqslant 10°$ bin for the 13.25 mag sample, the incompleteness is reduced for the 12.5 mag sample and it is essentially zero for the 11.75 mag sample. The upturn in all samples at 90° is due to the Coma supercluster.

(A color version of this figure is available in the online journal.)

These larger surveys have not attempted to be complete over the whole sky, since many cosmological measurements do not require this level of completeness and tradeoffs must be made between depth and sky coverage given available telescope time and resources.

3.1. Sample Selection

The initial selection of sources was based on the 2MASS XSC. The 2MASS photometric pipeline performed a variety of magnitude measurements for each extended source in each band. We selected as our primary set of magnitudes the isophotal magnitudes measured in an elliptical aperture defined at the $K_s = 20$ mag/□″ isophote. We also include in our data tables the "total extrapolated magnitudes" derived by the pipeline, but do not use them for our sample selection. In the case of galaxies with angular sizes much greater than the width of a single 2MASS scan, we used the photometry presented in the 2MASS Large Galaxy Atlas (LGA) by Jarrett et al. (2003). We applied a modest extinction correction to the 2MASS XSC or LGA magnitudes using the maps of Schlegel et al. (1998).

We selected 45,086 sources which met the following criteria.

1. $K_s \leqslant 11.75$ mag and detected at H.
2. $E(B - V) \leqslant 1$ mag.
3. $|b| \geqslant 5°$ for $30° \leqslant l \leqslant 330°$; $|b| \geqslant 8°$ otherwise.

We rejected 324 sources of galactic origin (multiple stars, planetary nebulae, and H II regions) or pieces of galaxies detected as separate sources by the 2MASS pipeline. Additionally, we flagged 314 bona fide galaxies with compromised photometry for reprocessing at a future date. Some of these galaxies have bright stars very close to their nuclei which were not detected by the pipeline. Others are in regions of high stellar density and their center positions and/or isophotal radii have been incorrectly measured by the pipeline. Lastly, some are close pairs or multiples but the pipeline only identified a single object. A detailed explanation of the steps taken to reject and reprocess the flagged galaxies is given in the Appendix.

In summary, the final input catalog contains 44,599 entries which are plotted using black symbols in Figure 1. Galaxies outside the survey area are plotted in blue and outline the "zone of avoidance" described previously. In this work, we present redshifts for 43,533 of the selected galaxies, or 97.6% of the sample.

3.2. Observations, Data Reduction, and Analysis

We obtained spectra for 11,000 galaxies that met the selection criteria listed above, plus an additional 2,898 galaxies beyond the catalog limits. Observations were carried out between 1997 September and 2011 January using a variety of facilities which are listed in Table 2. The majority of the spectra obtained for this survey were acquired at the Fred L. Whipple Observatory (FLWO) 1.5 m telescope, which mostly targeted galaxies in the northern hemisphere. In the southern hemisphere, we relied heavily on observations by the 6dFGS project (Jones et al. 2004, 2005, 2009) but also carried out our own observations using the Cerro Tololo Interamerican Observatory (CTIO) 1.5 m telescope. We initially targeted $K_s < 11.25$ mag galaxies to obtain a complete all-sky sample (Huchra et al. 2005) while 6dFGS observations were still ongoing. Later, we targeted galaxies below the Galactic latitude limit of 6dFGS and filled gaps in their coverage.

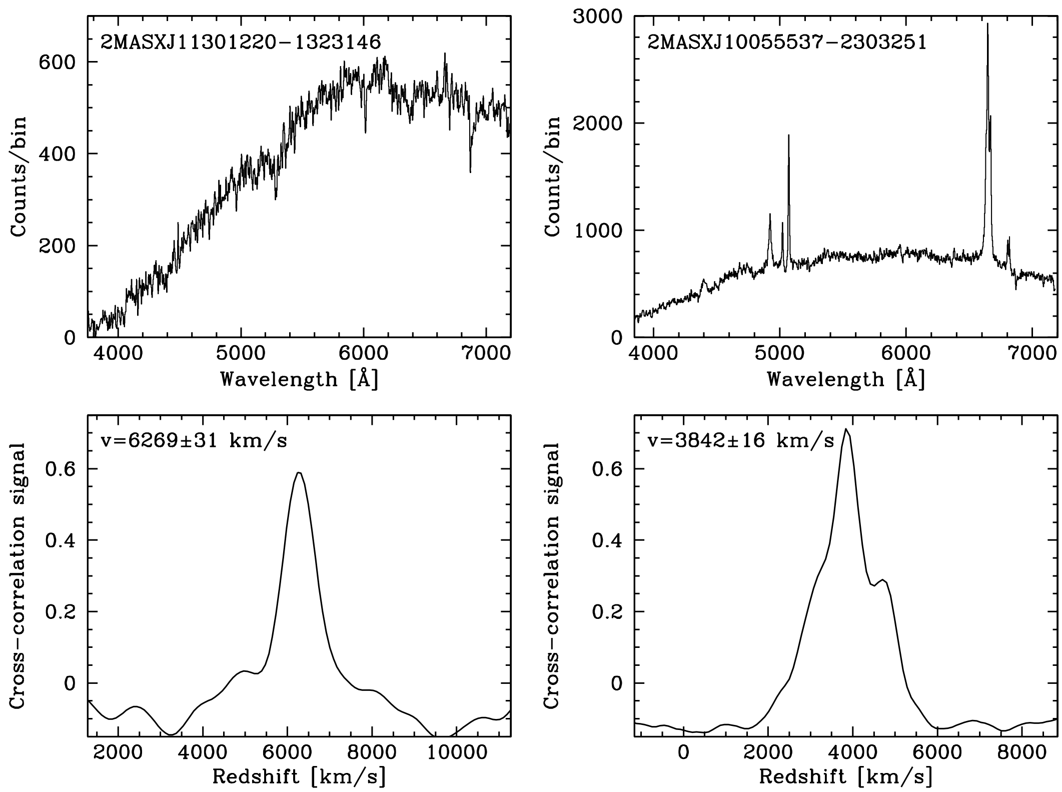

Figure 3. Top panels: typical spectra obtained in this project. Left: absorption-line spectrum obtained at the FLWO 1.5 m telescope. Right: emission-line spectrum obtained at the CTIO 1.5 m telescope. Bottom panels: results of the cross-correlation technique used to measure the redshifts.

Table 2
Telescopes and Instruments Used in the Survey

Observatory/Telescope		Camera	Grating ($l\ mm^{-1}$)	Coverage (Å)	Res. (Å)	No. of Gals. with K_s <11.75	No. of Gals. with K_s >11.75
Fred L. Whipple	1.5 m	FAST	300	3500–7400	5	7590	2596
Cerro Tololo	1.5 m	RCSpec	300	3700–7200	7	3245	238
McDonald	2.1 m	es2	600	3700–6400	4	114	50
Cerro Tololo	4 m	RCSpec	527	3700–7400	3	48	
Hobby–Eberly	9.2 m	LRS	300	4300–10800	9	3	

At FLWO, most observations were carried out by P. Berlind and M. Calkins, with additional observations by J. Huchra, L. Macri, A. Crook, and E. Falco. Additional spectra were obtained in queue mode by other CfA-affiliated observers. At CTIO, observations were carried out by J. Huchra, L. Macri, and the SMARTS consortium queue operators. At McDonald, observations were carried out by J. Mader, T. George, and resident astronomers. Exposure times ranged from 120 s to 2400 s with an average value of 550 s. Some galaxies were observed on multiple nights (sometimes with increased exposure times relative to the first exposure) to improve the quality of the redshift measurement. The total "open shutter" time for the observations was approximately 2100 hr. Bias and flat frames (dome or internal quartz lamp) were obtained daily. Comparison spectra were obtained before or after each science exposure using a variety of He, Ne, and Ar lamps. Stellar and galaxy radial velocity standards were observed nightly.

The spectra were reduced and analyzed in a uniform manner using IRAF.[17] Images were debiased and flat-fielded using routines in the CCDRED package and one-dimensional spectra were extracted using routines in the APEXTRACT package. Dispersion functions were derived from the comparison lamp spectra and applied to the observations using routines in the ONEDSPEC package. The spectra obtained at FLWO were processed by S. Tokarz and N. Martimbeau using the automated pipeline described in Tokarz & Roll (1997). Two typical spectra are shown in the top panels of Figure 3.

Radial velocities were measured by the usual technique of cross-correlating spectra against templates (Tonry & Davis 1979) using the XCSAO task in the RVSAO package (Kurtz & Mink 1998). We used a variety of templates developed at the Harvard-Smithsonian Center for Astrophysics. The bottom panels of Figure 3 show the results of the cross-correlation technique for the two representative spectra. Figure 4 shows histograms of internal velocity uncertainties for the galaxies observed at FLWO and CTIO. The median uncertainty values for spectra that only contain absorption lines are 29 and 41 km s^{-1} for FLWO and CTIO, respectively, while the corresponding values for emission-line spectra are 12 and 24 km s^{-1}.

The reduced spectra are available for further analysis at the Smithsonian Astrophysical Observatory Telescope Data

[17] IRAF is distributed by the National Optical Astronomy Observatory, which is operated by the Association of Universities for Research in Astronomy (AURA) under cooperative agreement with the National Science Foundation.

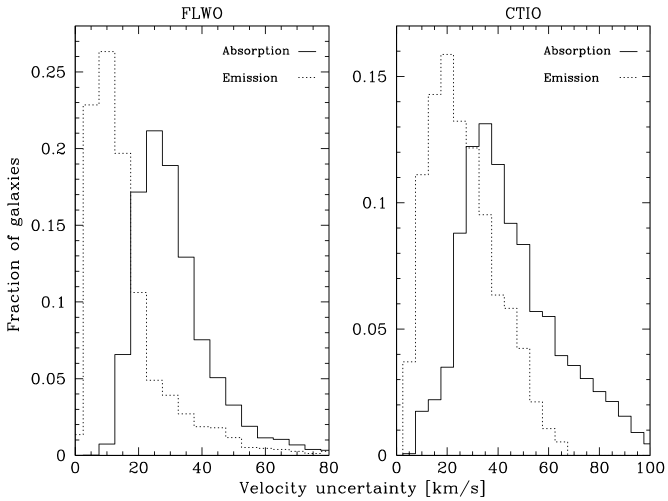

Figure 4. Distribution of velocity uncertainties for the galaxies observed at FLWO (left) and CTIO (right). The samples are further divided according to the absence or presence of emission lines.

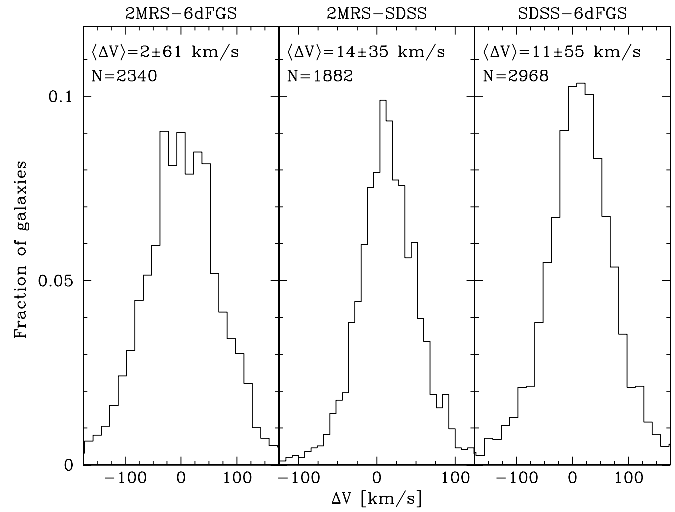

Figure 5. Histogram of velocity differences for galaxies observed by any two of 2MRS, 6dFGS, or SDSS.

Center[18] (hereafter, the 2MRS Web site). For example, a list of galaxies with emission-line features is available for those interested in searching for nearby active galactic nucleus (AGN).

3.3. Matching with Previous Redshift Catalogs

We retrieved the SDSS-DR8 spectroscopic catalog[19] and searched for counterparts to 2MASS sources using a tolerance radius of 2″.5. We found 7069 matches to galaxies without 2MRS redshifts (including 390 galaxies with multiple SDSS observations for which we calculated a weighted mean redshift). These are identified with the catalog code "S."

We retrieved the 6dFGS-DR3 spectroscopic catalog[20] and searched for counterparts to 2MASS sources using a tolerance radius of 10″. We only selected redshifts measured with the 6dF instrument (code = 126 in column 17 of their catalog), with velocity quality 3 or 4 (equivalent to velocity uncertainties of 55 and 45 km s^{-1}, respectively). We obtained 11,763 matches to galaxies without 2MRS redshifts. These are identified with the catalog code "6."

We performed a literature search for galaxies without 2MRS, 6dF, or SDSS redshifts using the NASA Extragalactic Database (NED). First, we carried out a "Search by Name" query using the 2MASS IDs of the galaxies as input. This returned 12,694 redshifts that were incorporated into our catalog. We refer to these redshifts as the "NED default" set, and they are identified with the catalog code "N." Next, we performed a "Search near Position" query using the 2MASS coordinates of the galaxies for which no redshift information had been returned by the previous query. We used a tolerance radius of 1′.3 for the search, which resulted in an additional 226 redshifts. These are galaxies where the difference in coordinates between 2MASS and previous catalogs is sufficiently large that NED has two or more entries for the same object, in most cases "associated" (in NED terms) with one another but no redshift information is returned when querying by 2MASS ID. In the case of an additional 32 galaxies, we did not use the default redshift returned by NED but instead adopted an alternative redshift listed in NED. These 258 "alternative NED redshifts" are identified with the catalog code "M."

Lastly, we matched the 2MASS XSC against J. Huchra's personal compilation of redshifts (ZCAT) and found velocities for an additional 749 galaxies which had no corresponding information in NED, including 455 galaxies observed by J. Huchra or collaborators prior to the start of 2MRS but were never published. We also identified 77 galaxies for which the ZCAT and NED redshifts were in disagreement and we gave preference to the ZCAT values. Detailed information on these galaxies and those for which we assigned alternative NED redshifts (see preceding paragraph) is provided in the Appendix. Galaxies with ZCAT redshifts are identified with catalog code "O."

Our catalog gives preference to 2MRS redshifts over any previously published SDSS or 6dF value, to SDSS over 6dF, to 6dF over NED, and to NED over ZCAT, except for the cases described above. We list the additional redshifts for galaxies with multiple measurements in the Appendix, to allow interested readers to assign a different set of precedences or to compute weighted mean redshifts.

Figure 5 shows a comparison of redshifts for all 2MASS galaxies observed by us and by 6dFGS or SDSS. The average redshift difference for galaxies in common between each pair of catalogs is the following: 2 ± 61 km s^{-1} for $N = 2511$ galaxies in 2MRS and 6dFGS; 14 ± 35 km s^{-1} for $N = 1940$ galaxies in 2MRS and SDSS; 11 ± 55 km s^{-1} for $N = 3187$ galaxies in 6dFGS and SDSS. The dispersions are consistent with the typical velocity uncertainties of each survey (30–40 km s^{-1} for 2MRS, 45–55 km s^{-1} for 6dFGS, and 5 km s^{-1} for SDSS).

3.4. The 2MRS Catalog

The 2MRS catalog is presented in Table 3 and is also available at the 2MRS Web site. It contains 29 columns that are described below, including the original 2MASS XSC column names in square brackets when applicable.

1. ID: 2MASS ID [designation]
2. R.A.: right ascension (deg, J2000.0) [sup_ra]
3. Decl.: declination (deg, J2000.0) [sup_dec]
4. *l*: Galactic longitude

[18] http://tdc-www.cfa.harvard.edu/2mrs/
[19] http://data.sdss3.org/sas/dr8/common/sdss-spectro/redux/galSpecInfo-dr8.fits
[20] http://www-wfau.roe.ac.uk/6dFGS/6dFGSzDR3.txt.gz

Table 3
2MRS Catalog

(1) 2MASS ID	(2) R.A.	(3) Dec.	(4) l	(5) b	(6) K_s^0	(7) H^0	(8) J^0	(9) $K_{s,t}^0$	(10) H_t^0	(11) J_t^0	(12) $\sigma(K_s^0)$	(13) $\sigma(H^0)$	(14) $\sigma(J^0)$	(15) $\sigma(K_{s,t}^0)$	(16) $\sigma(H_t^0)$	(17) $\sigma(J_t^0)$	(18) E_{BV}	(19) $r_{\rm iso}$	(20) $r_{\rm ext}$	(21) b/a	(22) flags	(23) Type	(24) t_src	(25) v	(26) $\sigma(v)$	(27) cat	(28) Bibcode	(29) Catalog ID
	(deg)		(deg)		(mag)								(mag)				(mag)	($\log_{10}{}''$)						(km/s)				
00424433 + 4116074	10.68471	41.26875	121.17430	−21.57319	0.797	0.929	1.552	0.743	0.881	1.497	0.016	0.016	0.015	0.017	0.017	0.016	0.683	3.208	3.491	0.473	Z111	3A2s	ZC	−300	4	N	1991RC3.9.C...0000d	MESSIER 031
00473313 − 2517196	11.88806	−25.28880	97.36301	−87.96452	3.815	4.132	4.858	3.765	4.077	4.798	0.016	0.015	0.015	0.017	0.016	0.016	0.019	2.799	2.965	0.264	Z111	5X s	ZC	243	2	N	2004AJ....128...16K	NGC 0253
09553318 + 6903549	148.88826	69.06526	142.09190	40.90022	3.898	4.131	4.784	3.803	4.043	4.690	0.016	0.016	0.015	0.018	0.018	0.016	0.080	2.688	2.878	0.517	Z111	2A2s	ZC	−34	4	N	1991RC3.9.C...0000d	MESSIER 081
13252775 − 4301073	201.36565	−43.01871	309.51639	19.41761	3.948	4.244	4.931	3.901	4.203	4.876	0.015	0.016	0.015	0.016	0.017	0.016	0.115	2.445	2.613	0.957	Z111	−2 P	ZC	547	5	N	1978PASP...90..237G	NGC 5128
13052727 − 4928044	196.36366	−49.46790	305.27151	13.34017	4.471	4.790	5.508	4.421	4.735	5.444	0.016	0.016	0.015	0.017	0.017	0.016	0.176	2.627	2.772	0.308	Z111	6B s	ZC	563	3	N	2004AJ....128...16K	NGC 4945
01335090 + 3039357	23.46210	30.65994	133.61024	−31.33081	4.477	4.697	5.346	4.087	4.329	5.003	0.020	0.018	0.017	0.044	0.038	0.029	0.041	2.699	3.032	0.792	Z111	5A4s	ZC	−179	3	N	1991RC3.9.C...0000d	MESSIER 033
09555243 + 6940469	148.96846	69.67970	141.40953	40.56710	4.636	5.003	5.744	4.610	4.973	5.704	0.015	0.015	0.015	0.015	0.015	0.015	0.156	2.357	2.542	0.396	Z111	0	ZC	203	4	N	1991RC3.9.C...0000d	MESSIER 082
03464851 + 6805459	56.70214	68.09611	138.17259	10.57999	4.682	4.952	5.494	4.362	4.682	5.169	0.020	0.019	0.018	0.043	0.040	0.033	0.558	2.571	2.876	0.858	Z111	6X2T	ZC	31	3	N	1999PASP..111..438F	IC 0342
13370091 − 2951567	204.25383	−29.86576	314.58353	31.97269	4.721	4.951	5.594	4.595	4.832	5.480	0.017	0.016	0.016	0.025	0.019	0.018	0.067	2.495	2.709	0.825	Z111	5X2s	ZC	513	2	N	2004AJ....128...16K	MESSIER 083
12395949 − 1137230	189.99789	−11.62307	298.46094	51.14923	4.991	5.228	5.897	4.944	5.177	5.841	0.015	0.015	0.015	0.017	0.015	0.015	0.051	2.305	2.473	0.682	Z111	1A P	ZC	1024	5	N	2000MNRAS.313..469S	MESSIER 104
00424182 + 4051546	10.67427	40.86517	121.14999	−21.97622	5.084	5.301	6.171	5.040	5.275	6.142	0.015	0.015	0.015	0.017	0.016	0.016	0.155	2.168	2.360	0.913	Z111	−6	ZC	−200	6	N	2000UZC...C......0F	MESSIER 032
12505314 + 4107125	192.72145	41.12015	123.36211	76.00777	5.163	5.408	6.068	5.100	5.344	6.010	0.015	0.015	0.015	0.016	0.016	0.015	0.018	2.236	2.414	0.847	Z111	2A3R	ZC	308	1	N	1993A&A...272...63M	MESSIER 094
12564369 + 2140575	194.18207	21.68266	315.68127	84.42287	5.381	5.623	6.300	5.315	5.558	6.231	0.016	0.015	0.015	0.017	0.016	0.016	0.041	2.332	2.490	0.583	Z111	2A T	ZC	408	4	N	1991RC3.9.C...0000d	MESSIER 064
20345233 + 6009132	308.71805	60.15368	95.71873	11.67289	5.424	5.921	6.147	5.248	5.711	5.971	0.018	0.017	0.017	0.034	0.029	0.025	0.342	2.402	2.680	0.770	Z111	6X1T	ZC	40	2	N	2008MNRAS.388..500E	NGC 6946
12294679 + 0800014	187.44499	8.00041	286.92224	70.19597	5.498	5.732	6.370	5.388	5.622	6.254	0.017	0.016	0.016	0.025	0.021	0.019	0.022	2.253	2.496	0.913	Z333	−5	ZC	997	7	N	2000MNRAS.313..469S	MESSIER 049
13295269 + 4711429	202.46957	47.19526	104.85159	68.56084	5.589	5.796	6.486	5.484	5.632	6.370	0.017	0.016	0.016	0.025	0.020	0.019	0.035	2.296	2.549	0.902	Z111	4A1P	ZC	463	3	N	1991RC3.9.C...0000d	MESSIER 051a
12185761 + 4718133	184.74008	47.30372	138.31985	68.84251	5.592	5.831	6.498	5.458	5.706	6.361	0.016	0.016	0.016	0.022	0.021	0.018	0.016	2.421	2.662	0.495	Z333	4X s	ZC	448	3	N	1991RC3.9.C...0000d	MESSIER 106
03224178 − 3712295	50.67412	−37.20820	240.16275	−56.68984	5.681	5.947	6.547	5.580	5.860	6.427	0.016	0.015	0.015	0.019	0.018	0.017	0.021	2.220	2.470	0.792	Z133	−2X P	ZC	1760	10	N	1998A&AS..130..267L	NGC 1316
13154932 + 4201454	198.95554	42.02929	105.99706	74.28773	5.722	5.947	6.682	5.602	5.818	6.554	0.016	0.016	0.016	0.021	0.020	0.018	0.018	2.310	2.541	0.660	Z000	4A3T	ZC	484	1	N	2008MNRAS.388..500E	MESSIER 063
02424077 − 0000478	40.66988	−0.01329	172.10397	−51.93358	5.800	6.266	6.985	5.776	6.238	6.937	0.015	0.015	0.015	0.016	0.015	0.015	0.033	1.978	2.162	0.880	Z111	3A T	ZC	1137	3	N	1999ApJS..121..287H	MESSIER 077
12434000 + 1133093	190.91670	11.55261	295.87354	74.31767	5.816	6.064	6.740	5.730	5.984	6.647	0.016	0.016	0.015	0.021	0.017	0.017	0.026	2.166	2.383	0.891	Z111	−5	ZC	1117	6	N	2000AJ....119.1645T	MESSIER 060
03171859 − 4106290	49.32750	−41.10807	247.52402	−57.04243	5.847	6.093	6.731	5.653	5.958	6.512	0.016	0.015	0.015	0.024	0.021	0.019	0.013	2.157	2.513	0.891	Z111	0B s	ZC	788	45	6	20096dF...C...0000J	g0317186-410629
11054859 − 0002092	166.45247	−0.03590	255.53194	52.82921	5.848	6.094	6.781	5.763	5.994	6.686	0.016	0.016	0.015	0.021	0.018	0.017	0.057	2.216	2.432	0.693	Z111	4X3T	ZC	801	3	N	2004AJ....128...16K	NGC 3521
00402207 + 4141070	10.09198	41.68530	120.71631	−21.13871	5.866	6.099	6.662	5.557	5.815	6.374	0.020	0.019	0.017	0.045	0.040	0.029	0.085	2.450	2.760	0.594	Z111	−5	ZC	−241	3	N	1991A&A...246..349B	MESSIER 110
12304942 + 1223279	187.70593	12.39110	283.77777	74.49104	5.896	6.144	6.806	5.804	6.060	6.699	0.016	0.016	0.015	0.019	0.018	0.017	0.023	2.134	2.368	0.990	Z111	−4 P	ZC	1307	7	N	2000MNRAS.313..469S	MESSIER 087

Notes. Codes for Column 27: [C]TIO, Mc[D]onald, [F]LWO, [N]ED 2MASS ID match, NED position [M]atch, [O]ther sources in ZCAT, [S]DSS-DR8, and [6]dFGS.

(This table is available in its entirety in a machine-readable form in the online journal. A portion is shown here for guidance regarding its form and content.)

Table 4
2MRS Catalog—Bibliographic References

ADS Bibcode	Reference
1969MSAIt..40..559B	Barbon (1969)
1970ApJ...160..405S	Sargent (1970)
1970ApJ...160L..33B	Burbidge (1970)
1971ApJ...168..321C	Chincarini & Rood (1971)
1971CGPG..C...0000Z	Zwicky & Zwicky (1971)
1972ApJ...172L..37B	Burbidge & Strittmatter (1972)
1972ApJ...173..247S	Stockton (1972)
1972AuJPh..25..233W	Whiteoak (1972)
1972IAUS...44..376L	Lynds (1972)
1972MNRAS.158..277T	Tritton (1972)

(This table is available in its entirety in a machine-readable form in the online journal. A portion is shown here for guidance regarding its form and content.)

5. b: Galactic latitude
6. K_s^0: extinction-corrected K_s isophotal magnitude [k_m_k20fe]
7. H^0: same for H [h_m_k20fe]
8. J^0: same for J [j_m_k20fe]
9. $K_{s,t}^0$: extinction-corrected "total" extrapolated K_s magnitude [k_m_ext]
10. H_t^0: same for H [h_m_ext]
11. J_t^0: same for J [j_m_ext]
12. $\sigma(K_s^0)$: uncertainty in K_s^0 [k_msig_k20fe]
13. $\sigma(H^0)$: same for H^0 [h_msig_k20fe]
14. $\sigma(J^0)$: same for J^0 [j_msig_k20fe]
15. $\sigma(K_{s,t}^0)$: same for K_t^0 [k_msig_ext]
16. $\sigma(H_t^0)$: same for H_t^0 [h_msig_ext]
17. $\sigma(J_t^0)$: same for J_t^0 [j_msig_ext]
18. $E(B-V)$: from Schlegel et al. (1998)
19. $r_{\rm iso}$: $\log_{10}$ of the $K_s = 20$ mag/sq. arcsec isophotal radius (in arcseconds) [r_k20fe]
20. $r_{\rm ext}$: same as $r_{\rm iso}$ but for "total magnitude" extrapolation radius [r_ext]
21. b/a: axial ratio from co-added JHK_s images [sup_ba]
22. flags: photometry confusion flags from 2MASS XSC database. "Z" in the first column indicates magnitudes from the 2MASS LGA. [cc_flg, k_flg_k20fe, h_flg_k20fe, j_flg_k20fe].
23. type: galaxy type (see Section 5 and Table 5)
24. t_src: source of galaxy type (JH = John Huchra; ZC = ZCAT; NN = not available)
25. v: redshift (km s^{-1}, barycentric)
26. $\sigma(v)$: uncertainty in redshift (km s^{-1})
27. cat: code for redshift catalog (see notes for details).
28. v_src: NED bibliographic code for source of redshift (see Table 4 for references)
29. Catalog ID: galaxy ID in redshift catalog

In addition to our measurements, Table 3 contains redshifts from 578 publications which are referenced in the catalog using ADS/NED bibliographic codes (see Table 4). We strongly encourage proper citation of the original publications when making use of any of these values.

Table 6 lists 4291 redshifts for 2MASS galaxies which lie beyond the limits of our main catalog; 2884 were observed as part of this project while 1407 had been previously targeted by J. Huchra and collaborators for other projects. Lastly, Table 7 presents redshifts for 14 galaxies that are not in the 2MASS XSC but which were observed serendipitously due to their proximity to our targets.

Table 5
Morphological Type Codes used in 2MRS

Code	Comment
	Types
−9	QSO/AGN
−7	Unclassified Elliptical
−6	Compact Elliptical
−5	E, and dwarf E
−4	E/SO
−3	L-, SO-
−2	L, SO
−1	L+, SO+
0	SO/a, SO-a
1	Sa
2	Sab
3	Sb
4	Sbc
5	Sc
6	Scd
7	Sd
8	Sdm
9	Sm
10	Im, Irr I, Magellanic Irregular, Dwarf Irregular
11	Compact Irregular, Extragalactic H II Region
12	Extragalactic H I cloud (no galaxy visible)
15	Peculiar, Unclassifiable
16	Irr II
19	Unclassified galaxy (visually confirmed to be a galaxy, but not typed)
20	S..., Sc-Irr, Unclassified Spiral
98	Galaxy that has never been visually examined.
	Bar types
A	unbarred (A)
X	mixed type (AB)
B	barred (B)
	Peculiarities
D	Double or Multiple
P	Peculiar
R	Outer Ring
r	Inner Ring
s	S-shaped
t	Mixed (Inner ring/S-shaped)
T	Pseudo outer ring
/	Spindle
	Luminosity classes (for spirals & irregulars)
1	I
2	I–II
3	II
4	II–II
5	III
6	III–IV
7	IV
8	IV–V
9	V

Notes. The morphological information is encoded in Table 3 following the ZCAT convention. It is a five digit code (I2, A1, I1, and A1). The first two digits are the numerically coded T type, the next letter (if present) is the Bar type, the next digit (if present) is the numerically coded luminosity class, and the final letter (if present) denotes morphological perculiarities.

Figure 6 shows the distribution of galaxies as a function of redshift for the 2MRS main sample and selected surveys from Table 1.

Table 6
Redshifts for Galaxies in the 2MASS XSC Beyond the Main 2MRS Catalog Limits

2MASS ID	R.A.	Decl.	v	$\sigma(v)$	Vel	Bibliographic
	(deg)		(km s^{-1})		src.	Code
00000256+0817537	0.01063	8.29817	11721	37	O	20112MRS.MMT..0000H
00000896+0817338	0.03729	8.29272	12280	36	O	20112MRS.MMT..0000H
00001215+0205503	0.05069	2.09740	6506	35	O	20112MRS.JPH..0000H
00005299+0803392	0.22079	8.06090	11917	35	O	20112MRS.JPH..0000H
00005467+0803442	0.22779	8.06231	11952	10	O	20112MRS.JPH..0000H
00015848+1203580	0.49370	12.06618	60938	55	O	20112MRS.JPH..0000H
00021610−2926230	0.56700	−29.43970	18213	40	C	20112MRS.CTIO.0000H
00023474−2948240	0.64483	−29.80667	17766	31	C	20112MRS.CTIO.0000H
00032067−3008493	0.83607	−30.14699	20407	38	C	20112MRS.CTIO.0000H
00033524+1700158	0.89692	17.00435	16512	42	O	20112MRS.JPH..0000H
00033886+1129529	0.91189	11.49804	17339	27	O	20112MRS.JPH..0000H
00042025+3120313	1.08443	31.34198	5073	31	O	20112MRS.JPH..0000H
00052335−0810122	1.34734	−8.17015	9099	46	O	20112MRS.MMT..0000H

Note. Codes for Column 6: [C]TIO, Mc[D]onald, and [F]LWO.

(This table is available in its entirety in a machine-readable form in the online journal. A portion is shown here for guidance regarding its form and content.)

Table 7
Redshifts for Galaxies not in the 2MASS XSC which were Observed Serendipitously

2MASS ID[a]	R.A.	Decl.	v	$\sigma(v)$	Vel	Bibliographic
	(deg)		(km s^{-1})		src.	Code
13294821−2340551	202.45088	−23.68197	5029	52	C	20112MRS.CTIO.0000H
10245589−1726331	156.23289	−17.44251	7811	43	C	20112MRS.CTIO.0000H
10104329−1530289	152.68038	−15.50803	8388	29	C	20112MRS.CTIO.0000H
01574403−0649389	29.43346	−6.82746	8434	21	C	20112MRS.CTIO.0000H
10324638−1238045	158.19324	−12.63459	8491	45	C	20112MRS.CTIO.0000H
10324555−1238140	158.18977	−12.63721	8579	43	C	20112MRS.CTIO.0000H
11111075−0628055	167.79479	−6.46819	8676	14	C	20112MRS.CTIO.0000H
03452702−0728392	56.36260	−7.47756	10504	31	C	20112MRS.CTIO.0000H
16265144−7709323	246.71447	−77.15896	13333	41	C	20112MRS.CTIO.0000H
16311208−2615525	247.80033	−26.26458	13380	55	C	20112MRS.CTIO.0000H
03190550−2140362	49.77291	−21.67673	15624	32	C	20112MRS.CTIO.0000H
01135502−3659473	18.47924	−36.99647	15814	56	C	20112MRS.CTIO.0000H
16385916−6421059	249.74644	−64.35169	16320	46	C	20112MRS.CTIO.0000H
23342933−6921154	353.62221	−69.35433	25413	49	C	20112MRS.CTIO.0000H

Note. [a] Pseudo-2MASS ID generated from the celestial coordinates of the object.

(This table is available in its entirety in a machine-readable form in the online journal. A portion is shown here for guidance regarding its form and content.)

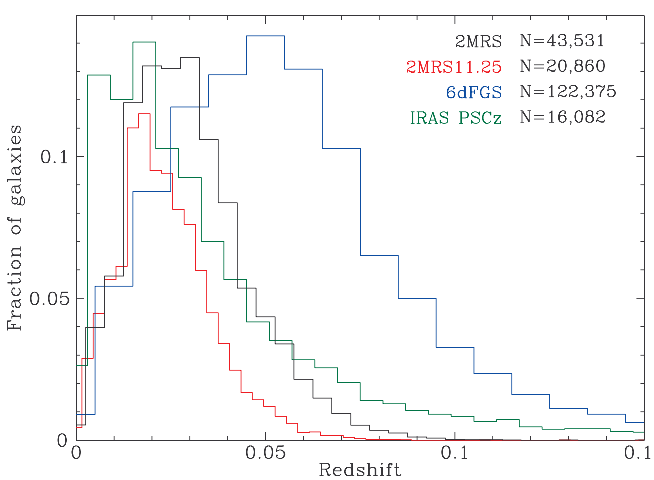

Figure 6. Distribution of galaxies as a function of redshift for 2MRS and for some of the redshift surveys listed in Table 1.

(A color version of this figure is available in the online journal.)

4. COSMIC CARTOGRAPHY

Some initial qualitative results from this survey are shown below via two visualization techniques: Hockey Pucks and Onion Skins.

4.1. Hockey Pucks

An all-sky survey allows us to make plots of the nearby galaxy distribution that are more representative than simple strip surveys (de Lapparent et al. 1986). The angular nature of strips around the sky, when projected onto a plane, are somewhat deceptive of real structure. They are thin at the center and thick at the edge. While this partially makes up for the normal decrease in the selection efficiency as a function of redshift in a flux-limited sample, it provides a representation of structure that varies quite strongly from the center to edge. With full-sky coverage, it is possible to project actual cylinders of redshift space. Given the long-term association of redshift surveys with the Harvard-Smithsonian CfA, we naturally call these "Hockey Puck" plots. Code to generate these plots is available as part of the 2MRS data release.

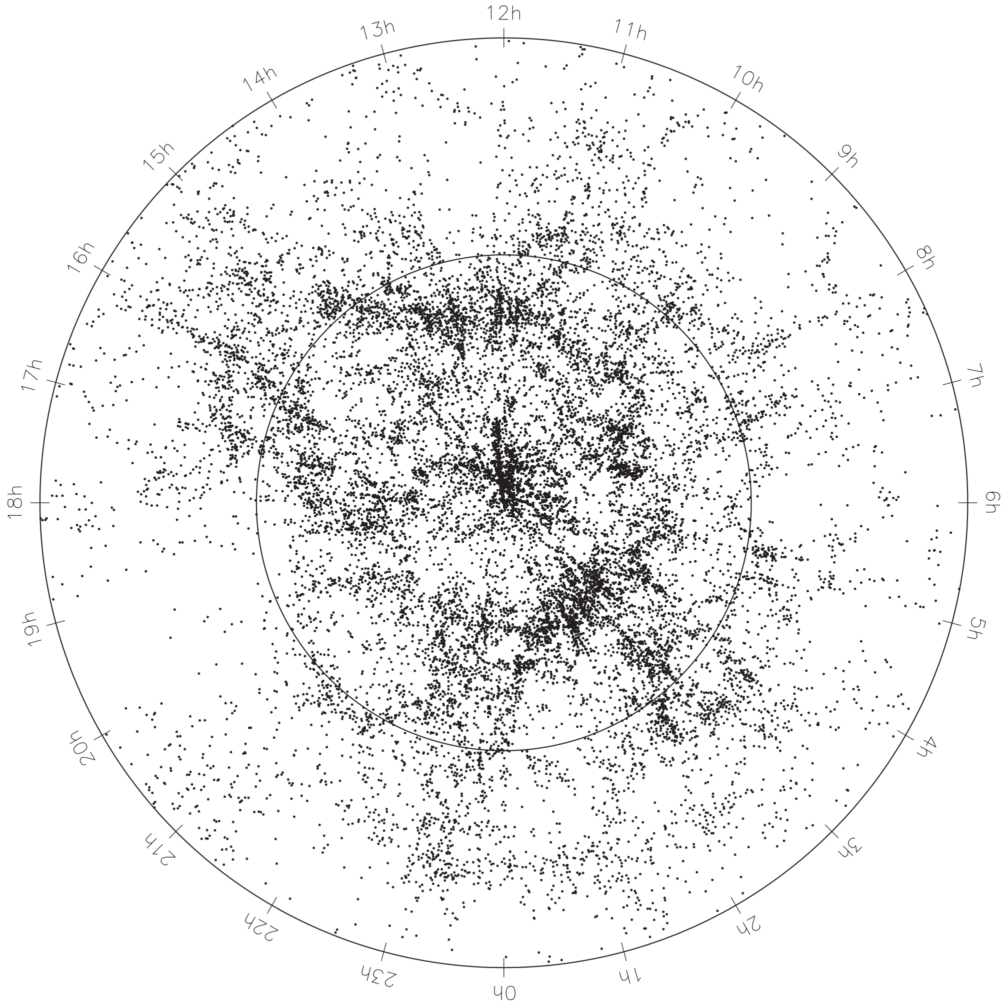

Figure 7. Hockey Puck plot—a full cylinder section—of 2MRS in the north celestial cap. The view is looking downward from the NCP, the thickness of the "puck" is 8000 km s^{-1}, and its radius is 15,000 km s^{-1}.

Two "Hockey Puck" diagrams shown in Figures 7 and 8 highlight the vast improvement in coverage through the galactic plane afforded by 2MRS as compared to even CfA2, the densest survey of the nearby universe (Huchra et al. 1995, 1999). Plotted are top-down views of cylindrical volumes with a radius of 15,000 km s^{-1} and thickness of 8000 km s^{-1}, yielding an aspect ratio of about 3.5–1. The pucks show the galaxies in the northern and southern celestial hemispheres, respectively—i.e., all galaxies above and below the celestial equator with redshifts placing them in the cylinder and with $K_s \leqslant 11.75$ mag. Many of our favorite structures and several prominent voids are easily seen in these plots.

The northern puck is dominated by the LSC at the center, the Great Wall (now straight in this cylindrical projection) at 10–14.5 hr, and Pisces-Perseus at 0–5 hr. In addition, there are several new but smaller structures such as the one at 19 hr and 4000 km s^{-1}, probably best associated with the Cygnus Cluster (Huchra et al. 1977).

The southern celestial hemisphere is more amorphous. There is the well-known Cetus Wall (Fairall et al. 1998) between 0 and 4 hr, the southern part of the LSC at the center, and the Hydra-Centaurus region, but also a large and diffuse overdensity between 19 and 22 hr, a region hitherto not mapped because of its proximity to the galactic plane. This structure appears to be both large and rich and should have a large effect on the local velocity field.

4.2. Onion Skins

Another projection that can highlight the properties of nearby structures are surface maps of the galaxy distribution as a function of redshift. Since these are conceptually like peeling an onion, they are best called "Onion Skins." Figures 9–11 show three sets of these skins, moving progressively outward in redshift, while Figure 12 shows the entire 2MRS catalog with the major structures of the Local Universe labeled. These figures use Galactic coordinate projections; the corresponding equatorial coordinate projections are shown in Figures 15–18.

Figure 9 shows the distribution on the sky of all galaxies in the survey inside 3000 km s^{-1} color coded by redshift in 1000 km s^{-1} skins. The plane of the LSC dominates the map, but there is also a diffuse component between 2000 and 3000 km s^{-1} and 6–13 hr in the south. The next two figures again show some familiar structures but with a few surprises. The Great Wall, Pisces-Perseus, and the Great Attractor dominate the mid ranges. The overdensity of galaxies in the direction of A3627 is high, and the comparison of Figure 10 with 11 clearly shows why we are moving with respect to the CMB toward a point around $l = 270°$ and $b = 30°$.

5. GALAXY MORPHOLOGIES

Morphological types are listed in Table 3 for all of the 20,860 galaxies in 2MRS11.25. We used the classifications listed in

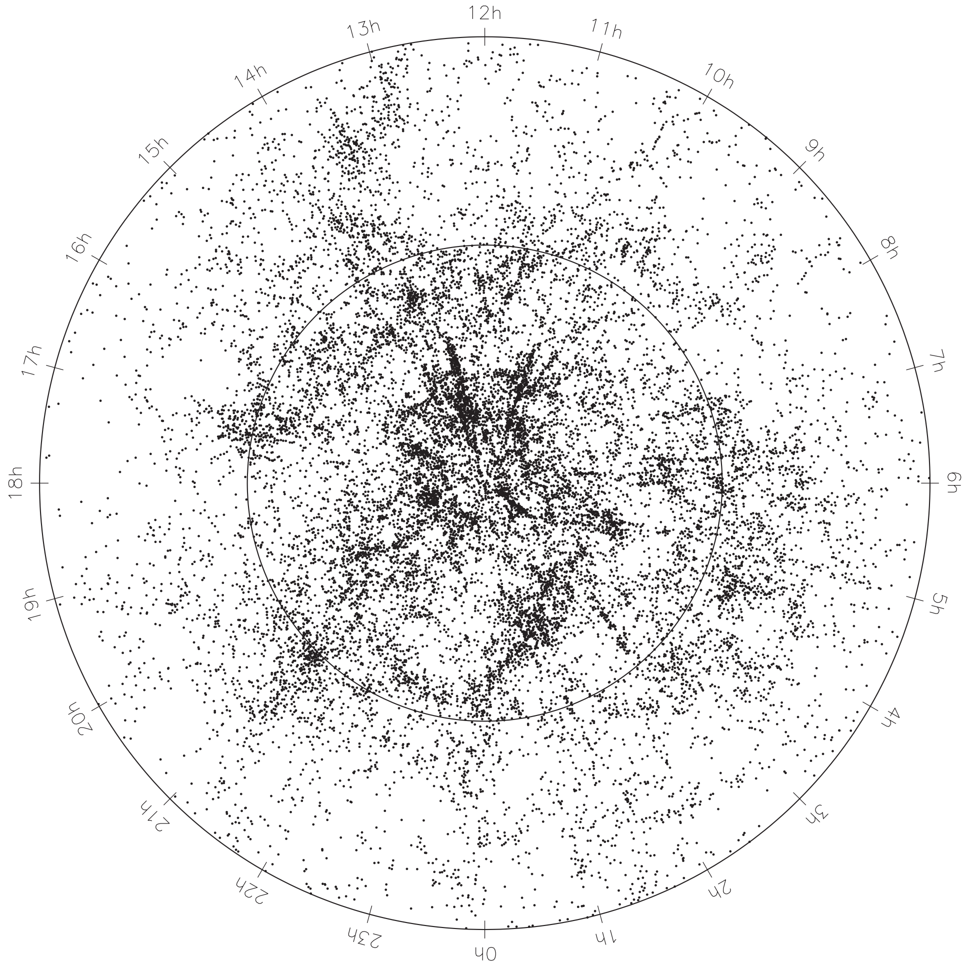

Figure 8. Same as Figure 7 but for the south celestial cap.

ZCAT (based on RC3, NED, and other catalogs) when available, but 5682 of these galaxies had no type information. They were visually examined and classified by J. Huchra using blue plates from the Digitized Sky Surveys. These new morphological types are identified by code "JH" in column 24 of the catalog. We also list morphological types from the literature for fainter galaxies in the catalog, when available.

Morphological typing in 2MRS uses the modified Hubble sequence (de Vaucouleurs 1963; de Vaucouleurs et al. 1976). Elliptical galaxies have integer types −7 through −5. S0 galaxies range from integer type −4 (E/S0) through 0 (S0/a), in a sequence from least to most pronounced disks. Spirals are assigned integer types 1 (Sa) through 9 (Sm), without distinction between barred, unbarred or mixed-type. Irregular and peculiar galaxies are assigned integer types 10 and above. The format for the morphological type designations is described in detail in Table 5.

The distribution of the galaxies in 2MRS11.25 by morphological type is shown in Figure 13, while Figure 14 shows histograms by redshift for the three broad morphological classes described above. While the histograms show the same pattern as Figure 6, spirals dominate the data set at lower redshifts, while ellipticals flatten near $z \approx 0.03$ and extend to higher redshifts, as expected given their higher luminosity.

6. PREVIOUS RESULTS FROM 2MRS

The 2MRS11.25 sample has been used in several publications.

1. Erdoğdu et al. (2006a) calculated the acceleration on the Local Group (LG). Their estimate of the dipole seems to converge to the CMB result within 60 h^{-1} Mpc, suggesting that the bulk of the motion of the LG comes from structures within that distance. They also carried out an analysis of the dipole weighting the sample by its luminosity (rather than the counts) and found relatively minor changes.
2. Erdoğdu et al. (2006b) calculated density and velocity fields. All major LSCs and voids were successfully identified, and backside infall on to the "Great Attractor" region (at 50 h^{-1} Mpc) was detected.
3. Westover (2007) measured the correlation function and found a steeper relationship between galaxy bias and luminosity than previously determined for optical samples, implying that near-infrared luminosities may be better mass tracers than optical ones. The relative biasing between early- and late-type galaxies was best fit by a power law with no improvement when stochasticity was added, leaving open the possibility that populations of galaxies may evolve between one another.
4. Crook et al. (2007) produced a catalog of galaxy groups, which was later used to model the local velocity field in Crook et al. (2010).
5. Erdoğdu & Lahav (2009) predicted the acceleration of the LG generated by 2MRS in the framework of ΛCDM and the halo model of galaxies. Their analysis suggested that it is not necessary to invoke additional unknown mass

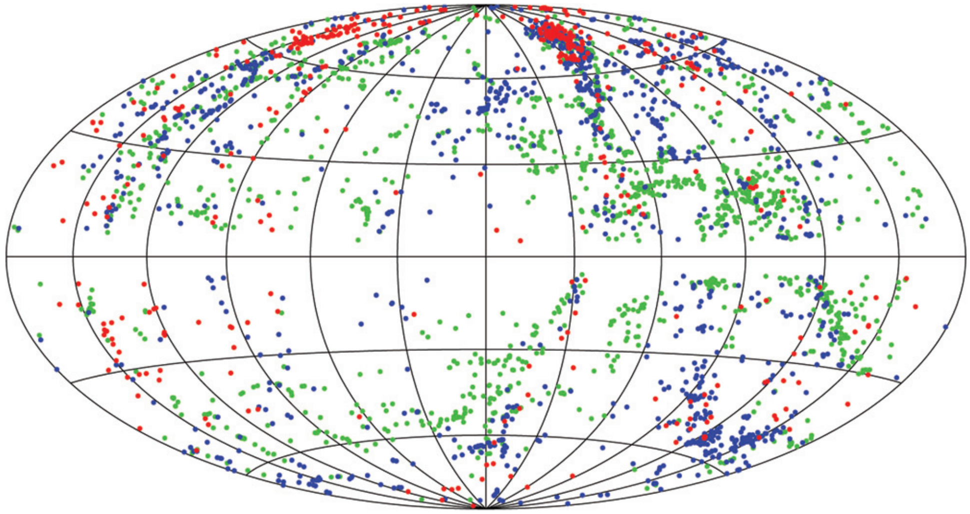

Figure 9. 2MASS galaxies inside the 3000 km s^{-1} sphere in Galactic coordinates (centered at $l = 0^\circ$ and following the convention of l increasing to the left). Heliocentric velocities are color coded with red, blue, and green representing bins of increasing redshift/distance. Red for $V_h < 1000$ km s^{-1}, blue for $1000 < V_h < 2000$ km s^{-1}, and green for $2000 < V_h < 3000$ km s^{-1}.

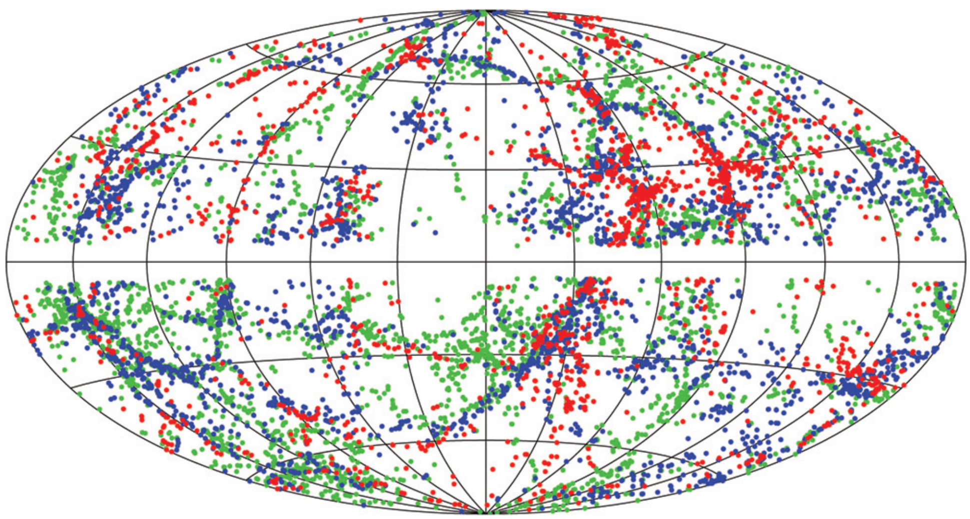

Figure 10. Same as Figure 9, but for velocities between 3000 and 6000 km s^{-1}.

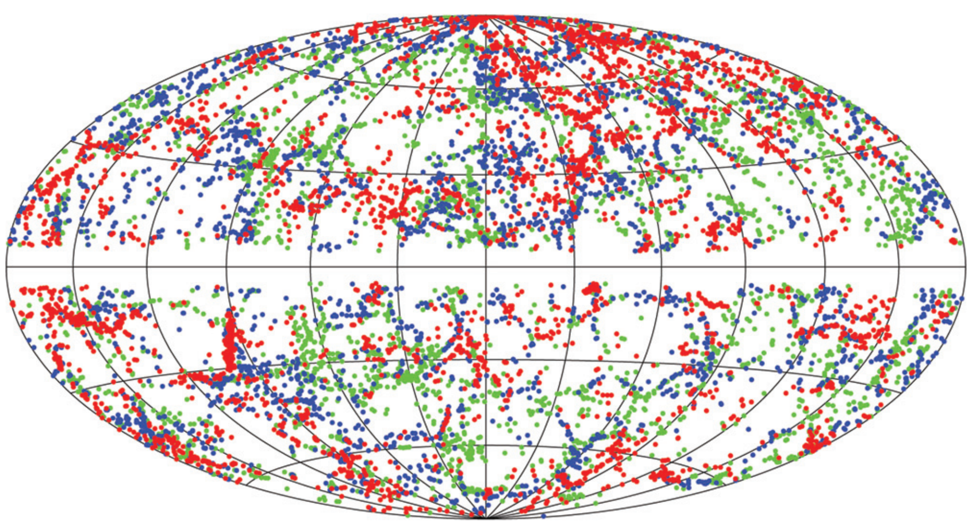

Figure 11. Same as Figure 9, but for velocities between 6000 and 9000 km s^{-1}.

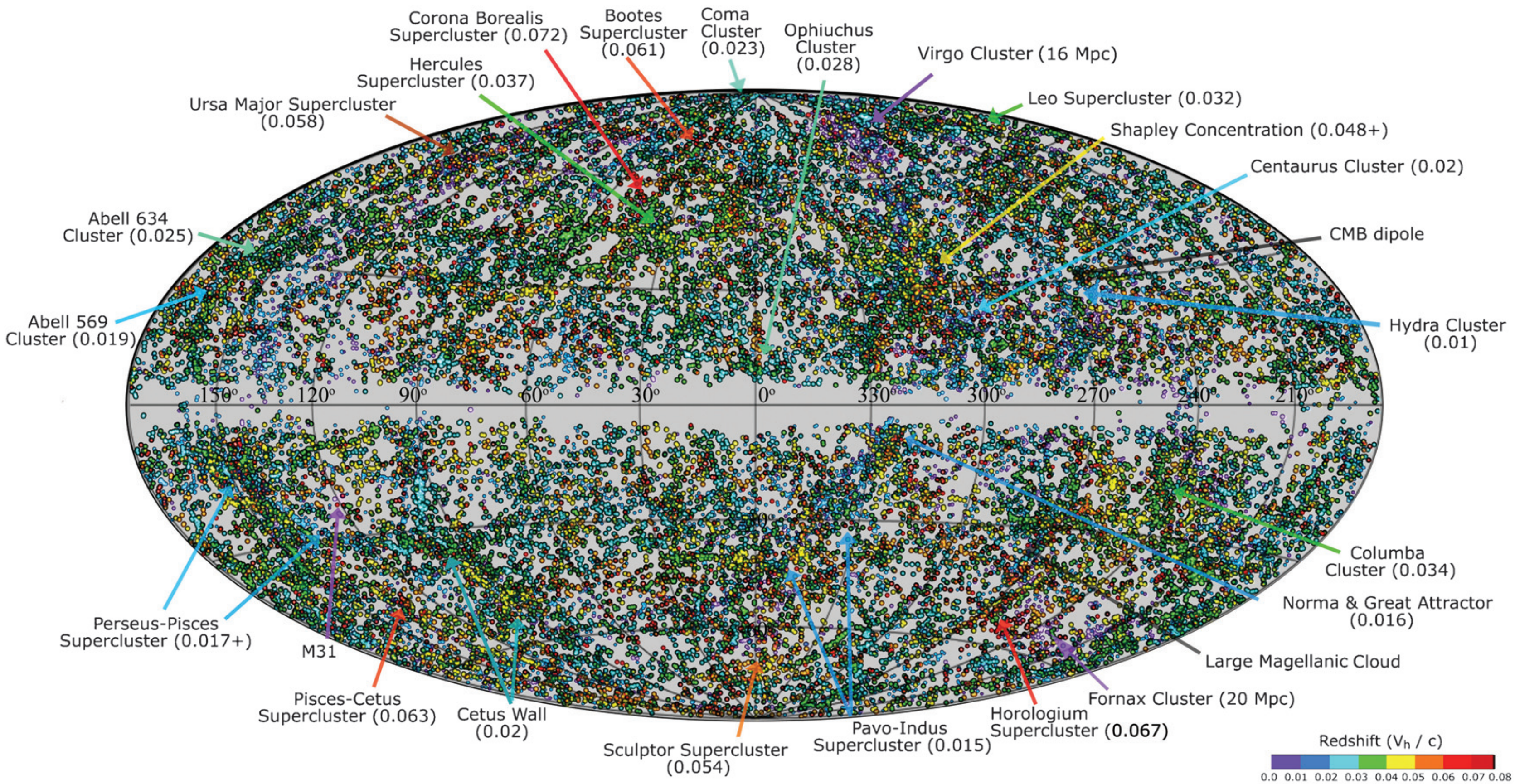

Figure 12. Same as Figure 9 but for all 2MRS galaxies, spanning the entire redshift range covered by the survey (from $z = 0$ in purple to $z = 0.08$ in red).

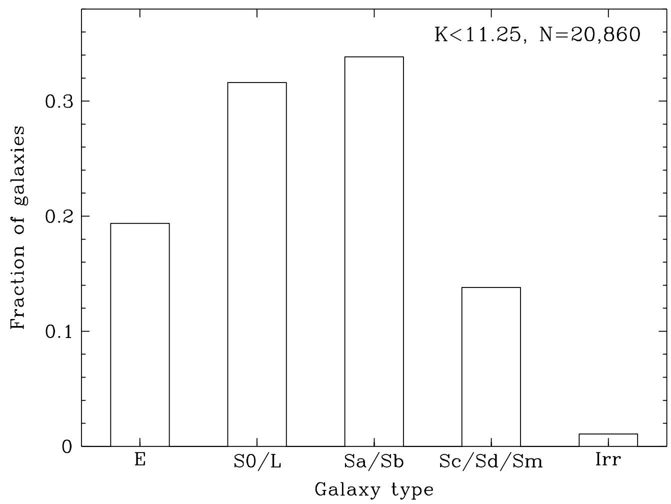

Figure 13. Histogram of the distribution of galaxy types for the $K_s < 11.25$ mag, $|b| > 10°$ sample.

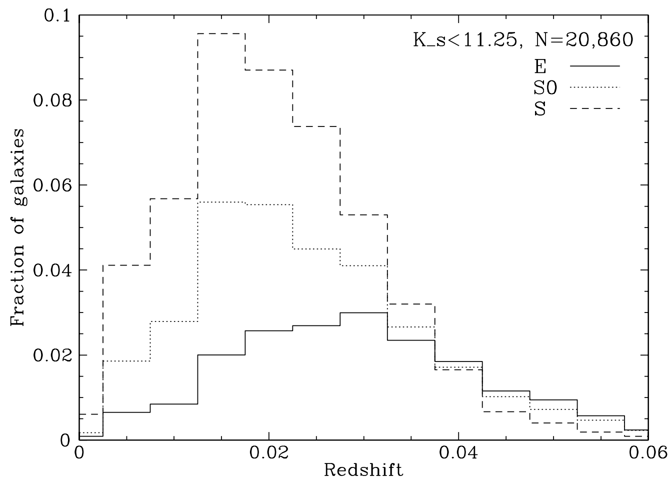

Figure 14. Histogram of 2MRS11.25 galaxies as a function of redshift for the three main morphological classes.

concentrations to explain the misalignment between the CMB velocity vector and the 2MRS dipole.

6. Lavaux et al. (2010) derived the peculiar velocity field for 2MRS11.25 using an orbit-reconstruction algorithm and estimated the mean matter density within 3000 km s^{-1} to be $\Omega_m = 0.31 \pm 0.05$. They also studied the convergence toward the CMB dipole and found that less than half of the amplitude is generated within 40 h^{-1} Mpc.
7. Davis et al. (2011) compared 2MRS11.25 to the SFI++ peculiar velocity survey (Masters et al. 2006; Springob et al. 2007) to place constraints on the bias between galaxies and dark matter halos, as well as $\beta = f(\Omega)/b$ (where f is the rate of growth of structure and b is the bias factor) and σ_8 (which measures the amplitude of the linear power spectrum on the scale of 8 h^{-1} Mpc).

7. SUMMARY

2MASS has fulfilled its goal of providing an extremely uniform, deep, and unbiased survey of the nearby universe. The 2MRS is 97.6% complete to a limiting magnitude of $K_s = 11.75$ mag over 91% of the sky, and its catalog contains redshifts for 43,533 galaxies.

2MRS has produced an essentially complete map of the Local Universe out to $z \sim 0.08$. While the characteristics of the structures are similar to what has been seen before, we now have a nearly full view of the nearby universe. Now we need to measure not only the redshifts, but also real distances (e.g., Masters et al. 2008) to extract the full measure of cosmological information.

This paper was written in part while J.P.H. was a Sackler visitor at the Institute of Astronomy, Cambridge, UK. We also thank the staff at the Fred. L. Whipple, Cerro Tololo, and McDonald Observatories, and the entire 2MASS team.

J.P.H., K.L.M., and A.C.C. acknowledge support by the National Science Foundation under grant AST-0406906 and by the Smithsonian Institution.

L.M.M. acknowledges support by the Smithsonian Institution Visiting Scholar program, by NASA through Hubble Fellowship Grant HST-HF-01153 from the Space Telescope Science Institute, by the National Science Foundation through a Goldberg Fellowship from the National Optical Astronomy Observatory, and by the Texas A&M University Mitchell-Heep-Munnerlyn Endowed Career Enhancement Professorship in Physics or Astronomy.

K.L.M. acknowledges funding from the Leverhulme Trust as a 2010 Early Career Fellow and from the Peter and Patricia Gruber Foundation as the 2008 IAU Fellow.

C.M.H. was supported in part by the National Science Foundation Research Experience for Undergraduates under grant No. 9731923.

O.L. acknowledges support from a Royal Society Wolfson Research Merit Award.

J.P.H. and L.M.M. were visiting astronomers at Cerro Tololo Inter-American Observatory, operated by the Association of Universities for Research in Astronomy under contract with the National Science Foundation.

This publication has made use of the following resources.

1. Data products from the Two Micron All Sky Survey, which is a joint project of the University of Massachusetts and the Infrared Processing and Analysis Center at the California Institute of Technology, funded by the National Aeronautics and Space Administration and the National Science Foundation.
2. The NASA/IPAC Extragalactic Database (NED) which is operated by the Jet Propulsion Laboratory at the California Institute of Technology, under contract with the National Aeronautics and Space Administration.
3. The 6dF Galaxy Survey (DR3), supported by Australian Research Council Discovery Projects Grant (DP-0208876). The 6dFGS web site is http://www.aao.gov.au/local/www/6df/.
4. The Sloan Digital Sky Survey III (DR8). Funding for SDSS-III has been provided by the Alfred P. Sloan Foundation, the Participating Institutions, the National Science Foundation, and the U.S. Department of Energy. The SDSS-III Web site is http://www.sdss3.org/. SDSS-III is managed by the Astrophysical Research Consortium for the Participating Institutions of the SDSS-III Collaboration including the University of Arizona, the Brazilian Participation Group, the Brookhaven National Laboratory, the University of Cambridge, the University of Florida, the French Participation Group, the German Participation Group, the Instituto de Astrofisica de Canarias, the Michigan State/Notre Dame/

JINA Participation Group, Johns Hopkins University, the Lawrence Berkeley National Laboratory, the Max Planck Institute for Astrophysics, New Mexico State University, New York University, The Ohio State University, Pennsylvania State University, the University of Portsmouth, Princeton University, the Spanish Participation Group, the University of Tokyo, the University of Utah, Vanderbilt University, the University of Virginia, the University of Washington, and Yale University.
5. The VizieR catalog access tool operated at the CDS, Strasbourg, France.
6. The Digitized Sky Surveys, produced at the Space Telescope Science Institute under U.S. Government Grant NAG W-2166. The images of these surveys are based on photographic data obtained using the Oschin Schmidt Telescope on Palomar Mountain and the UK Schmidt Telescope.
7. NASA's Astrophysics Data System at the Harvard-Smithsonian Center for Astrophysics.

Typing services provided by Fang, Inc.

Facilities: FLWO:1.5m (FAST), CTIO:1.5m (RCSpec), Blanco (RCSPec), Struve (es2), HET (LRS)

APPENDIX

In this appendix, we present all-sky plots of the 2MRS data set in the equatorial coordinates in Figures 15 through 18 as well as supplementary tables 8 through 13. Table 8 lists 324 sources of galactic origin which were removed from the catalog. T.

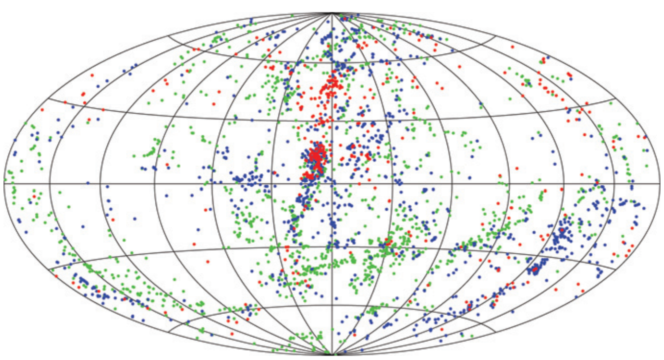

Figure 15. 2MASS galaxies inside the 3000 km s^{-1} sphere in equatorial coordinates (centered at R.A. = 0° and following the convention of R.A. increasing to the left). Heliocentric velocities are color coded with red, blue, and green representing bins of increasing redshift/distance. Red for V_h < 1000 km s^{-1}, blue for 1000 < V_h < 2000 km s^{-1}, and green for 2000 < V_h < 3000 km s^{-1}.

(A color version of this figure is available in the online journal.)

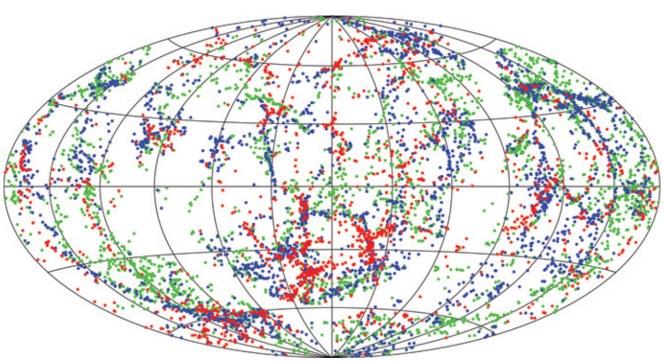

Figure 16. Same as Figure 15, but for velocities between 3000 and 6000 km s^{-1}.

(A color version of this figure is available in the online journal.)

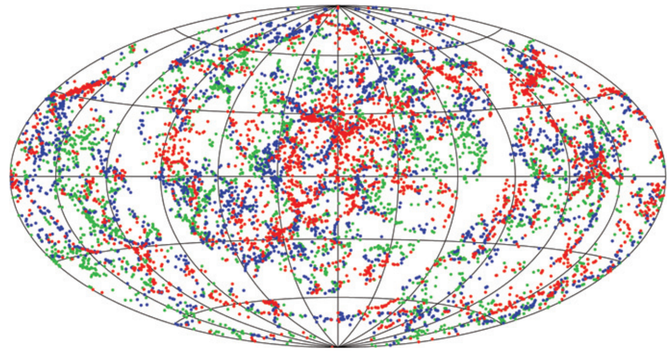

Figure 17. Same as Figure 16, but for velocities between 6000 and 9000 km s^{-1}.

(A color version of this figure is available in the online journal.)

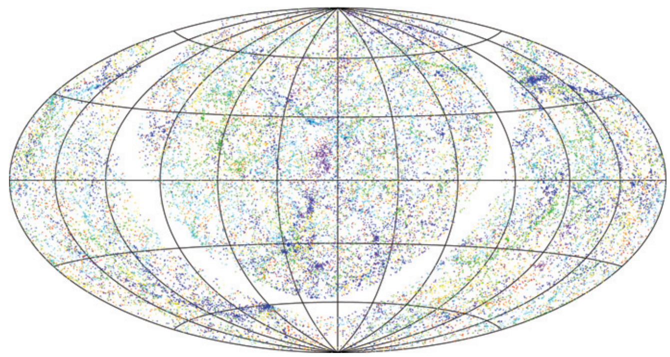

Figure 18. Same as Figure 12, but in equatorial coordinates (centered at R.A. = 0° and following the convention of R.A. increasing to the left).

(A color version of this figure is available in the online journal.)

Table 8
2MASS XSC or LGA Objects Removed from Input Catalog

2MASS ID	Reason for Rejection
00031127−5444588	Piece of galaxy 00031064 − 5444562
00240535−7204531	Globular cluster in SMC
00255209−0939420	Piece of galaxy 00255246 − 0939427
00265282−7132113	Globular cluster in SMC
00364578+2134078	Piece of galaxy 00364500 + 2133594
00460635−0143434	Piece of galaxy 00460539 − 0143242
00520075+6821243	Image flaw
00523957−2637338	Star cluster (NGC 288)
00524844−2637078	Star cluster (NGC 288)
00525061−2635148	Star cluster (NGC 288)
00525389−2635418	Star cluster (NGC 288)
00584209+5628334	Image flaw
01024864−0624482	Piece of galaxy 01024825 − 0624419
01081982−7252599	Star cluster in SMC (NGC 419)
01240782−7309037	H II region in SMC

(This table is available in its entirety in a machine-readable form in the online journal. A portion is shown here for guidance regarding its form and content.)

Jarrett used the original 2MASS LGA pipeline to reprocess 72 of the flagged galaxies by the date this paper was submitted for publication. These galaxies are listed in Table 9. The remaining 242 flagged galaxies are separated in two categories. Table 10 lists 87 objects for which the photometric parameters are expected to exhibit little change after reprocessing, but would still benefit from such a procedure. These galaxies have

Table 9
2MASS XSC Objects with Reprocessed Photometry

Original				Reprocessed			
2MASS ID	K_s^0 (mag)	$r_{\rm iso}$ ($\log_{10}$ ″)	b/a	2MASS ID	K_s^0 (mag)	$r_{\rm iso}$ ($\log_{10}$ ″)	b/a
00143065−0710028	10.150	1.524	0.880	00143062−0710026	9.976	1.529	0.810
00144455−0720423	8.771	1.721	0.700	00144460−0720430	8.758	1.721	0.680
00424581−2333406	9.956	1.394	0.740	00424586−2333418	9.959	1.338	0.780
00510187−0703247	9.317	1.531	0.400	00510186−0703249	9.401	1.486	1.000
00545028+2914482	10.405	1.332	0.560	00545031+2914474	10.392	1.318	0.570
00564266−0954500	9.588	1.695	0.860	00564267−0954507	9.620	1.659	0.810
01025144−6536359	9.107	2.040	0.140	01025152−6536366	9.145	1.989	0.154
01243377+0143532	8.801	1.818	0.980	01243380+0143522	8.772	1.756	0.950
01253143+0145335	8.598	1.793	0.760	01253140+0145325	8.692	1.775	0.710
02251418−4025268	10.955	1.243	0.320	02251422−4025268	10.978	1.199	0.720
02383270−0640386	8.630	1.751	0.780	02383278−0640392	8.645	1.718	0.890
03011222+4454285	7.721	1.748	1.000	03011417+4453500	7.469	1.801	0.850
03053084+4250076	8.548	1.859	0.360	03053091+4250075	8.525	1.881	0.380
03422928−1329168	8.577	1.989	0.240	03422931−1329174	8.563	1.985	0.242

Notes. All properties of the reprocessed galaxies are listed in Table 3 under their respective 2MASS IDs. The contents of this table are intended to provide an overview of the changes due to the reprocessed photometry.

(This table is available in its entirety in a machine-readable form in the online journal. A portion is shown here for guidance regarding its form and content.)

Table 10
2MASS XSC Galaxies with Suspect Photometry Flagged for Reprocessing at a Later Date

2MASS ID
00364500+2133594
01310193+4903364
01595247−0705233
02353199−0709366
02352772−0921216
02542739+4134467
02594211+3602171
03050558+4403167
03235400−3730449
03252491−1613594
03261474+3803504
03284660+3633226
03392830+1323417

Notes. All properties of the flagged galaxies are listed in Table 3 under their respective 2MASS IDs. This table is only intended to provide an index of the galaxies with suspect photometry.

(This table is available in its entirety in a machine-readable form in the online journal. A portion is shown here for guidance regarding its form and content.)

Table 11
2MASS XSC Galaxies with Compromised Photometry Flagged for Reprocessing and Removed from Catalog

2MASS ID
00093966+5301008
00112204+0623372
00151096−2352551
00203715+2839334
00244982−4021070
00271148+5103476
00293249+5150575
00350737+4929082
00385467+0703458
00452378+5353203
00580474−8140329
01074777+7312247

Notes. These galaxies are not part of our catalog and therefore we do not list their photometric properties. This table is only intended to provide other users of the 2MASS XSC an index of galaxies that we consider to have compromised photometry.

(This table is available in its entirety in a machine-readable form in the online journal. A portion is shown here for guidance regarding its form and content.)

not been removed from the catalog. Table 11 contains 165 galaxies with seriously compromised photometry, which have been removed from the catalog. Table 12 lists 77 galaxies for which the ZCAT and NED redshifts were in disagreement and preference was given to the former, as well as 258 galaxies for which we assigned alternative NED redshifts. Table 13 lists additional redshifts for galaxies with multiple measurements from our survey, 6dF and/or SDSS.

Table 12
Alternative Redshifts Chosen over Default NED Redshifts

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
2MASS ID	NED				Alternative					
	v	σ_v	Qual	Bibcode	v	σ_v	cat	sep	Bibcode	Comments
	(km s^{-1})				(km s^{-1})			′		
No redshift in NED for 2MASS XSC ID, but redshift exists under another ID										
00014401−3025082	...	...	...	...	8604	64	M	0.0	20032dF...C...0000C	
00062997−3218179	...	...	...	...	13531	150	M	0.0	1998MNRAS.300..417R	
00072080−2807072	...	...	...	...	18048	54	M	0.2	1998AJ....116....1D	
00084652−3100399	...	...	...	...	16609	89	M	0.0	20032dF...C...0000C	
00105717−3512292	...	...	...	...	14910	30	M	0.0	1986MNRAS.220..901P	
Several discrepant redshifts in NED; alternative value given preference over default one										
00570857−2155112	19307	...	...	1992NED11.R......1N	15660	100	M	0.0	1978AJ.....83.1549K	Only z in NED with known provenance
01155764+0510435	5827	1	...	2006AJ....131..185R	5294	17	M	0.0	2003AJ....126.2268W	Agrees with SAO/TDC spectral archive #T00843
01194146−3306209	9286	8	...	2003A&A...412...57P	5813	35	M	0.0	1998AJ....116....1D	Agrees with 1998MNRAS.300..417R & 20032dF...C...0000C
02471331+1631590	8517	20	...	1995ApJ...449..527L	11794	36	M	0.0	1995ApJS..100...69F	Give preference to optical over H I measurement
03153355−1552455	34674	39	...	1993AJ....105.1637H	24977	51	M	0.0	1993AJ....105.1637H	Yields more reasonable M_K
Disagreement between NED and ZCAT redshifts; latter value given preference										
00344891+0727013	555	10	...	1993ApJS...88..383L	5205	28	O	0.0	20112MRS.ZMA..0000H	SAO/TDC spectral archive #T26890
00544855+1150280	11425	408	...	1995A&AS..109..537H	11852	51	O	0.0	20112MRS.MMT..0000H	SAO/TDC spectral archive #M09249
01193495+3210495	17568	210	...	1970PASP...82.1374v	17902	40	O	0.0	20112MRS.JPH..0000H	
01465644+3206354	10505	10	...	1991RC3.9.C...0000d	14700	43	O	0.0	20112MRS.ZMA..0000H	SAO/TDC spectral archive #T26803
01532586+7115067	6595	300	...	1996MNRAS.281..425M	6838	38	O	0.0	20112MRS.JPH..0000H	

Notes. A few representative lines are provided here for guidance on its format and contents. Code for Column 8: NED position [M]atch and [O]ther sources in ZCAT.

(This table is available in its entirety in a machine-readable form in the online journal. A portion is shown here for guidance regarding its form and content.)

Table 13
Redshifts from 6dFGS, SDSS, or NED for Galaxies also Observed by 2MRS

2MASS ID	v (km s^{-1})	$\sigma(v)$ (km s^{-1})	Vel src	Bibcode
00010597−5359303	9415	45	6	20096dF...C...0000J
00021610−2926230	18334	45	6	20096dF...C...0000J
00023474−2948240	17753	45	6	20096dF...C...0000J
00023794+1638377	6350	19	N	1999PASP..111..438F
00031064−5444562	9790	45	6	20096dF...C...0000J
00032067−3008493	20304	45	6	20096dF...C...0000J
00034964+0203594	29320	...	N	2000ApJS..129..547B
00042463−5257316	9851	45	6	20096dF...C...0000J
00043594−4528463	11794	45	6	20096dF...C...0000J
00045169−5429144	10879	45	6	20096dF...C...0000J
00053994−5349010	11028	45	6	20096dF...C...0000J
00055690−1359448	5730	45	6	20096dF...C...0000J
00062990−5350042	10768	45	6	20096dF...C...0000J
00065396+0821027	11596	52	N	1999PASP..111..438F
00070925−2550122	19118	45	6	20096dF...C...0000J

Notes. Code for Column 4: [N]ED 2MASS ID match, [S]DSS-DR8, and [6]dFGS.

(This table is available in its entirety in a machine-readable form in the online journal. A portion is shown here for guidance regarding its form and content.)

REFERENCES

Aaronson, M., Huchra, J., Mould, J., Schechter, P. L., & Tully, R. B. 1982, ApJ, 258, 64
Acker, A., Stenholm, B., & Veron, P. 1991, A&AS, 87, 499
Agüero, E. L., Paolantonio, S., & Suarez, F. 1996, PASP, 108, 1117
Agüero, E. L., Suarez, F., & Paolantonio, S. 1995, PASP, 107, 959
Aihara, H., Allende Prieto, C., An, D., et al. 2011, ApJS, 193, 29
Allen, D. A., Norris, R. P., Meadows, V. S., & Roche, P. F. 1991, MNRAS, 248, 528
Allen, D. A., Roche, P. F., & Norris, R. P. 1985, MNRAS, 213, 67P
Alloin, D., Barvainis, R., Gordon, M. A., & Antonucci, R. R. J. 1992, A&A, 265, 429
Anton, K. 1993, A&A, 270, 60
Appenzeller, I., Thiering, I., Zickgraf, F.-J., et al. 1998, ApJS, 117, 319
Arakelyan, M. A., Dibaj, E. A., & Esipov, V. F. 1975, Astrofizika, 11, 15
Arakelyan, M. A., Dibaj, E. A., & Esipov, V. F. 1976, Astrofizika, 12, 683
Arp, H. 1981, ApJS, 46, 75
Augarde, R., Chalabaev, A., Comte, G., Kunth, D., & Maehara, H. 1994, A&AS, 104, 259
Bade, N., Fink, H. H., Engels, D., Voges, W., Hagen, H.-J., Wisotzki, L., & Reimers, D. 1995, A&AS, 110, 469
Banks, G. D., Disney, M. J., Knezek, P. M., et al. 1999, ApJ, 524, 612
Barbon, R. 1969, Mem. Soc. Astron. Ital., 40, 559
Bardelli, S., Zucca, E., & Baldi, A. 2001, MNRAS, 320, 387
Bardelli, S., Zucca, E., Vettolani, G., et al. 1994, MNRAS, 267, 665
Bardelli, S., Zucca, E., Zamorani, G., Moscardini, L., & Scaramella, R. 2000, MNRAS, 312, 540
Barmby, P., & Huchra, J. P. 1998a, AJ, 116, 1508
Barmby, P., & Huchra, J. P. 1998b, AJ, 115, 6
Barnes, D. G., Webster, R. L., Schmidt, R. W., & Hughes, A. 1999, MNRAS, 309, 641
Barton, E. J., de Carvalho, R. R., & Geller, M. J. 1998, AJ, 116, 1573
Bassani, L., Molina, M., Malizia, A., et al. 2006, ApJ, 636, L65
Batuski, D. J., & Burns, J. O. 1985, ApJ, 299, 5
Batuski, D. J., Miller, C. J., Slinglend, K. A., et al. 1999, ApJ, 520, 491
Bauer, F. E., Condon, J. J., Thuan, T. X., & Broderick, J. J. 2000, ApJS, 129, 547
Beers, T. C., Gebhardt, K., Forman, W., Huchra, J. P., & Jones, C. 1991, AJ, 102, 1581
Beers, T. C., Gebhardt, K., Huchra, J. P., et al. 1992, ApJ, 400, 410
Beers, T. C., Kriessler, J. R., Bird, C. M., & Huchra, J. P. 1995, AJ, 109, 874
Bell, E. F., & de Jong, R. S. 2001, ApJ, 550, 212
Bender, R., Paquet, A., & Nieto, J.-L. 1991, A&A, 246, 349
Benedict, F. G., Smith, B. J., & Kenney, J. D. P. 1996, AJ, 111, 1861
Bergvall, N., Laurikainen, E., & Aalto, S. 2003, A&A, 405, 31
Bergwall, N. A. S., Ekman, A. B. G., Lauberts, A., et al. 1978, A&AS, 33, 243
Bernardi, M., Alonso, M. V., da Costa, L. N., et al. 2002, AJ, 123, 2990
Berrington, R. C., Lugger, P. M., & Cohn, H. N. 2002, AJ, 123, 2261
Bettoni, D., & Galletta, G. 1994, A&A, 281, 1
Bettoni, D., Moles, M., Kjærgaard, P., Fasano, G., & Varela, J. 2006, A&A, 452, 811
Binggeli, B., Popescu, C. C., & Tammann, G. A. 1993, A&AS, 98, 275
Binggeli, B., Sandage, A., & Tammann, G. A. 1985, AJ, 90, 1681
Bird, C. M., Dickey, J. M., & Salpeter, E. E. 1993, ApJ, 404, 81
Bischoff, K., Pietsch, W., Boller, T., et al. 1999, in Highlights in X-ray Astronomy, ed. B. Aschenbach & M. J. Freyberg, 226
Bondi, M., Gregorini, L., Padrielli, L., & Parma, P. 1993, A&AS, 101, 431
Bonfanti, P., Rampazzo, R., Combes, F., Prugniel, P., & Sulentic, J. W. 1995, A&A, 297, 28
Borchkhadze, T. M., Breysacher, J., Laustsen, S., Schuster, H.-E., & West, R. M. 1977, A&AS, 30, 35
Borne, K. D., Balcells, M., Hoessel, J. G., & McMaster, M. 1994, ApJ, 435, 79
Boselli, A., Mendes de Oliveira, C., Balkowski, C., Cayatte, V., & Casoli, F. 1996, A&A, 314, 738
Bosma, A., & Freeman, K. C. 1993, AJ, 106, 1394
Bothun, G. D., & Schombert, J. M. 1988, ApJ, 335, 617
Bottinelli, L., Durand, N., Fouque, P., et al. 1993, A&AS, 102, 57
Bottinelli, L., Gouguenheim, L., Fouque, P., & Paturel, G. 1990, A&AS, 82, 391
Bowen, D. V., Blades, J. C., & Pettini, M. 1995, ApJ, 448, 634
Braine, J., & Dupraz, C. 1994, A&A, 283, 407
Brinkmann, W., Siebert, J., Reich, W., et al. 1995, A&AS, 109, 147
Brookes, M. H., Best, P. N., Peacock, J. A., Röttgering, H. J. A., & Dunlop, J. S. 2008, MNRAS, 385, 1297
Brunzendorf, J., & Meusinger, H. 1999, A&AS, 139, 141
Burbidge, E. M. 1970, ApJ, 160, L33
Burbidge, E. M., & Strittmatter, P. A. 1972, ApJ, 172, L37
Burstein, D., Davies, R. L., Dressler, A., Faber, S. M., & Lynden-Bell, D. 1986, in NATO ASIC Proc. 180, Galaxy Distances and Deviations from Universal Expansion, ed. B. F. Madore & R. B. Tully (Dordrecht: Reidel), 123
Buta, R., Purcell, G. B., Cobb, M. L., Crocker, D. A., Rautiainen, P., & Salo, H. 1999, AJ, 117, 778
Cabanela, J. E., & Aldering, G. 1998, AJ, 116, 1094
Cabanela, J. E., & Dickey, J. M. 1999, AJ, 118, 46
Caldwell, N., & Rose, J. A. 1997, AJ, 113, 492
Caldwell, N., Rose, J. A., & Concannon, K. D. 2003, AJ, 125, 2891
Canzian, B., Allen, R. J., & Tilanus, R. P. J. 1993, ApJ, 406, 457
Cappi, A., Benoist, C., da Costa, L. N., & Maurogordato, S. 2003, A&A, 408, 905
Cappi, A., da Costa, L. N., Benoist, C., Maurogordato, S., & Pellegrini, P. S. 1998, AJ, 115, 2250
Carballo, R., Warwick, R. S., Barcons, X., et al. 1995, MNRAS, 277, 1312
Carilli, C. L., Wrobel, J. M., & Ulvestad, J. S. 1998, AJ, 115, 928
Carrasco, L., Serrano, A., Tovmassian, H. M., et al. 1997, AJ, 113, 1527
Carter, D., Inglis, I., Ellis, R. S., Efstathiou, G., & Godwin, J. G. 1985, MNRAS, 212, 471

Carter, D., Prieur, J. L., Wilkinson, A., Sparks, W. B., & Malin, D. F. 1988, MNRAS, 235, 813
Casoli, F., Dickey, J., Kazes, I., et al. 1996, A&AS, 116, 193
Catinella, B., Haynes, M. P., & Giovanelli, R. 2005, AJ, 130, 1037
Cava, A., Bettoni, D., Poggianti, B. M., et al. 2009, A&A, 495, 707
Chamaraux, P., Cayatte, V., Balkowski, C., & Fontanelli, P. 1990, A&A, 229, 340
16 Huchra et al.
Chamaraux, P., Kazes, I., Saito, M., Yamada, T., & Takata, T. 1995, A&A, 299, 347
Chamaraux, P., Masnou, J.-L., Kazés, I., et al. 1999, MNRAS, 307, 236
Chapman, G. N. F., Geller, M. J., & Huchra, J. P. 1988, AJ, 95, 999
Charmandaris, V., & Appleton, P. N. 1996, ApJ, 460, 686
Chavushyan, V., Mujica, R., Gorshkov, A. G., et al. 2001, Astronomy Reports, 45, 79
Cheng, E. S., Saulson, P. R., Wilkinson, D. T., & Corey, B. E. 1979, ApJ, 232, L139
Chengalur, J. N., Salpeter, E. E., & Terzian, Y. 1993, ApJ, 419, 30
Chincarini, G., & Rood, H. J. 1971, ApJ, 168, 321
Chincarini, G., Tarenghi, M., Sol, H., et al. 1984, A&AS, 57, 1
Colless, M., Dalton, G., Maddox, S., et al. 2001, MNRAS, 328, 1039
Colless, M., & Hewett, P. 1987, MNRAS, 224, 453
Colless, M., Peterson, B. A., Jackson, C., et al. 2003, ArXiv Astrophysics e-prints
Collins, C. A., Guzzo, L., Nichol, R. C., & Lumsden, S. L. 1995, MNRAS, 274, 1071
Collobert, M., Sarzi, M., Davies, R. L., Kuntschner, H., & Colless, M. 2006, MNRAS, 370, 1213
Comte, G., Petrosian, A. R., Ohanian, G. A., & Stepanian, J. A. 1999, Astrofizika, 42, 149
Corey, B. E., & Wilkinson, D. T. 1976, BAAS, 8, 351
Corsini, E. M., Pizzella, A., Coccato, L., & Bertola, F. 2003, A&A, 408, 873
Cortese, L., Minchin, R. F., Auld, R. R., et al. 2008, MNRAS, 383, 1519
Corwin, H. G., Jr., & Emerson, D. 1982, MNRAS, 200, 621
Couto da Silva, T. C., & de Souza, R. E. 2006, A&A, 457, 425
Coziol, R. 2003, MNRAS, 344, 181
Craine, E. R., & Warner, J. W. 1976, ApJ, 206, 359
Crampton, D., Gussie, G., Cowley, A. P., & Schmidtke, P. C. 1997, AJ, 114, 2353
Crawford, C. S., Allen, S. W., Ebeling, H., Edge, A. C., & Fabian, A. C. 1999, MNRAS, 306, 857
Crawford, C. S., Edge, A. C., Fabian, A. C., et al. 1995, MNRAS, 274, 75
Crawford, T., Marr, J., Partridge, B., & Strauss, M. A. 1996, ApJ, 460, 225
Crook, A. C., Huchra, J. P., Martimbeau, N., et al. 2007, ApJ, 655, 790
Crook, A. C., Silvestri, A., & Zukin, P. 2010, MNRAS, 401, 1219
da Costa, L. N., Pellegrini, P. S., Davis, M., et al. 1991, ApJS, 75, 935
da Costa, L. N., Pellegrini, P. S., Willmer, C., et al. 1989, AJ, 97, 315
da Costa, L. N., Willmer, C. N. A., Pellegrini, P. S., et al. 1998, AJ, 116, 1
Dahlem, M., Ehle, M., Ryder, S. D., Vlajić, M., & Haynes, R. F. 2005, A&A, 432, 475
Dale, D. A., Giovanelli, R., Haynes, M. P., Hardy, E., & Campusano, L. E. 1999, AJ, 118, 1468
Dale, D. A., Giovanelli, R., Haynes, M. P., et al. 1997, AJ, 114, 455
Dale, D. A., Giovanelli, R., Haynes, M. P., et al. 1998, AJ, 115, 418
Dalton, G. B. 1992, A survey of rich clusters of galaxies (Boston Spa: British Library Document Supply Centre)
Dalton, G. B., Efstathiou, G., Maddox, S. J., & Sutherland, W. J. 1994, MNRAS, 269, 151
Davis, M., Huchra, J., Latham, D. W., & Tonry, J. 1982, ApJ, 253, 423
Davis, M., Nusser, A., Masters, K. L., et al. 2011, MNRAS, 413, 2906
Davis, M., Sargent, W., & Tonry, J. 1985, Las Campanas Survey, private communication
Davis, M., & Strauss, M. 1991, private communication
Davoust, E., & Considere, S. 1995, A&AS, 110, 19
Davoust, E., & Contini, T. 2004, A&A, 416, 515
de Carvalho, R. R., Ribeiro, A. L. B., Capelato, H. V., & Zepf, S. E. 1997, ApJS, 110, 1
de Grijp, M. H. K., Keel, W. C., Miley, G. K., Goudfrooij, P., & Lub, J. 1992, A&AS, 96, 389
de Grijp, M. H. K., Miley, G. K., Lub, J., & de Jong, T. 1985, Nature, 314, 240
de Ruiter, H. R., Parma, P., Stirpe, G. M., et al. 1998, A&A, 339, 34
de Souza, R. E., de Mello, D. F., & Dos Anjos, S. 1997, A&AS, 125, 329
de Vaucouleurs, G, de Vaucouleurs, A., Corwin, H. G., Jr., et al. 1991, Third Reference Catalogue of Bright Galaxies (Berlin Heidelberg New York: Springer-Verlag)
Dekel, A., Bertschinger, E., & Faber, S. M. 1990, ApJ, 364, 349
Della Valle, A, Mazzei, P., Bettoni, D., Aussel, H., & de Zotti, G. 2006, A&A, 454, 453
dell'Antonio, I. P., Bothun, G. D., & Geller, M. J. 1996, AJ, 112, 1759
dell'Antonio, I. P., Geller, M. J., & Fabricant, D. G. 1994, AJ, 107, 427
Denicoló, G., Terlevich, R., Terlevich, E., et al. 2005, MNRAS, 356, 1440
de Lapparent, V., Geller, M. J., & Huchra, J. P. 1986, ApJ, 302, L1
de Vaucouleurs, G. 1956, Vistas Astron., 2, 1584
de Vaucouleurs, G. 1963, ApJS, 8, 31
de Vaucouleurs, G., de Vaucouleurs, A., & Corwin, H. G., Jr. 1976, Second Reference Catalogue of Bright Galaxies (Austin, TX: Univ. Texas Press)
Dennefeld, M., & Sevre, F. 1984, A&AS, 57, 253
di Nella, H, Couch, W. J., Parker, Q. A., & Paturel, G. 1997, MNRAS, 287, 472
di Nella, H, Couch, W. J., Paturel, G., & Parker, Q. A. 1996a, MNRAS, 283, 367
di Nella, H., Garcia, A. M., Garnier, R., & Paturel, G. 1995, A&AS, 113, 151
di Nella, H, Paturel, G., & Walsh, A. J. 1996b, A&AS, 118, 311
Dickens, R. J., Currie, M. J., & Lucey, J. R. 1986, MNRAS, 220, 679
Djorgovski, S., Thompson, D. J., de Carvalho, R. R., & Mould, J. R. 1990, AJ, 100, 599
Djorgovski, S. G., Thompson, D., Maxfield, L., Vigotti, M., & Grueff, G. 1995, ApJS, 101, 255
Domingue, D. L., Keel, W. C., & White, R. E., III 2000, ApJ, 545, 171
Donnelly, R. H., Forman, W., Jones, C., et al. 2001, ApJ, 562, 254
Donzelli, C. J., & Pastoriza, M. G. 1997, ApJS, 111, 181
Downes, D., Solomon, P. M., & Radford, S. J. E. 1993, ApJ, 414, L13
Dressler, A. 1991, ApJS, 75, 241
Dressler, A., & Shectman, S. A. 1988, AJ, 95, 284
Drinkwater, M. J., Gregg, M. D., Holman, B. A., & Brown, M. J. I. 2001, MNRAS, 326, 1076
Drinkwater, M. J., Proust, D., Parker, Q. A., Quintana, H., & Slezak, E. 1999, Pub. Astron. Soc. Australia, 16, 113
Durret, F., Felenbok, P., Lobo, C., & Slezak, E. 1999, A&AS, 139, 525
2MASS Redshift Survey 17,
Dutra, C. M., Ahumada, A. V., Claría, J. J., Bica, E., & Barbuy, B. 2003, A&A, 408, 287
Dutra, C. M., Bica, E., Claría, J. J., Piatti, A. E., & Ahumada, A. V. 2001, A&A, 371, 895
Eisenhardt, P. R. M., & Lebofsky, M. J. 1987, ApJ, 316, 70
Elmegreen, B. G., Kaufman, M., Struck, C., et al. 2000, AJ, 120, 630
Epinat, B., Amram, P., Marcelin, M., et al. 2008, MNRAS, 388, 500
Erdoğdu, P., Huchra, J. P., Lahav, O., et al. 2006a, MNRAS, 368, 1515
Erdoğdu, P., & Lahav, O. 2009, Phys. Rev. D, 80, 043005
Erdoğdu, P., Lahav, O., Huchra, J. P., et al. 2006b, MNRAS, 373, 45
Ettori, S., Guzzo, L., & Tarenghi, M. 1995, MNRAS, 276, 689
Faber, S. M., & Dressler, A. 1977, AJ, 82, 187
Fabricant, D. G., Kent, S. M., & Kurtz, M. J. 1989, ApJ, 336, 77
Fairall, A. 1990, private communication
Fairall, A. P. 1979, MNRAS, 188, 349
Fairall, A. P. 1980, MNRAS, 192, 389
Fairall, A. P. 1981, MNRAS, 196, 417
Fairall, A. P. 1983, MNRAS, 203, 47
Fairall, A. P. 1984, MNRAS, 210, 69
Fairall, A. P. 1988a, MNRAS, 230, 69
Fairall, A. P. 1988b, MNRAS, 233, 691
Fairall, A. P., & Jones, A. 1988a, Publ. Dept. Astr. Univ. Capetown, 10, 1 (1988), 10, 1
Fairall, A. P., & Jones, A. 1988b, Monthly Notes of the Astronomical Society of South Africa, 47, 25
Fairall, A. P., & Jones, A. 1991, Publ. Dept. Astr. Univ. Capetown, 11, 1 (1991), 11, 1
Fairall, A. P., Willmer, C. N. A., Calderon, J. H., et al. 1992, AJ, 103, 11
Fairall, A. P., & Woudt, P. A. 2006, MNRAS, 366, 267
Fairall, A. P., Woudt, P. A., & Kraan-Korteweg, R. C. 1998b, A&AS, 127, 463
Fairall, A. P., Woudt, P. A., & Kraan-Korteweg, R. C. 1998, A&AS, 127, 463
Falco, E. E., Kochanek, C. S., & Munoz, J. A. 1998, ApJ, 494, 47
Falco, E. E., Kurtz, M. J., Geller, M. J., et al. 1999, PASP, 111, 438
Fanti, R., Gioia, I., Lari, C., & Ulrich, M. H. 1978, A&AS, 34, 341
Few, J. M. A., Arp, H. C., & Madore, B. F. 1982, MNRAS, 199, 633
Filippenko, A. V., & Chornock, R. 2003, IAU Circ., 8246, 4
Fiore, F., La Franca, F., Giommi, P., et al. 1999, MNRAS, 306, L55
Firth, P., Evstigneeva, E. A., Jones, J. B., et al. 2006, MNRAS, 372, 1856
Fischer, J.-U., Hasinger, G., Schwope, A. D., et al. 1998, Astronomische Nachrichten, 319, 347
Fisher, K. B., Huchra, J. P., Strauss, M. A., et al. 1995, ApJS, 100, 69
Fleenor, M. C., Rose, J. A., Christiansen, W. A., et al. 2006, AJ, 131, 1280
Focardi, P., & Kelm, B. 2002, A&A, 391, 35

Fosbury, R. A. E., Mebold, U., Goss, W. M., & van Woerden, H. 1977, MNRAS, 179, 89
Fouque, P., Durand, N., Bottinelli, L., Gouguenheim, L., & Paturel, G. 1990, A&AS, 86, 473
Fouque, P., Proust, D., Quintana, H., & Ramirez, A. 1993, A&AS, 100, 493
Freedman, W. L., Madore, B. F., Gibson, B. K., et al. 2001, ApJ, 553, 47
Freudling, W. 1995, A&AS, 112, 429
Freudling, W., Haynes, M. P., & Giovanelli, R. 1992, ApJS, 79, 157
Fruscione, A., & Griffiths, R. E. 1991, ApJ, 380, L13
Gallagher, J. S., Garnavich, P. M., Caldwell, N., et al. 2008, ApJ, 685, 752
Gallego, J., Zamorano, J., Rego, M., Alonso, O., & Vitores, A. G. 1996, A&AS, 120, 323
Galletta, G., Sage, L. J., & Sparke, L. S. 1997, MNRAS, 284, 773
Galli, M., Cappi, A., Focardi, P., Gregorini, L., & Vettolani, G. 1993, A&AS, 101, 259
Gallimore, J. F., Baum, S. A., O'Dea, C. P., Pedlar, A., & Brinks, E. 1999, ApJ, 524, 684
Garay, G., Mardones, D., & Mirabel, I. F. 1993, A&A, 277, 405
Garcia, A. M., Bottinelli, L., Garnier, R., Gouguenheim, L., & Paturel, G. 1992, A&AS, 96, 435
Garcia, A. M., Bottinelli, L., Garnier, R., Gouguenheim, L., & Paturel, G. 1994, A&AS, 107, 265
Garilli, B., Maccagni, D., & Tarenghi, M. 1993, A&AS, 100, 33
Garland, C. A., Williams, J. P., Pisano, D. J., et al. 2005, ApJ, 624, 714
Garrido, O., Marcelin, M., & Amram, P. 2004, MNRAS, 349, 225
Garrido, O., Marcelin, M., Amram, P., & Boissin, O. 2003, A&A, 399, 51
Gavazzi, G., Bonfanti, C., Pedotti, P., Boselli, A., & Carrasco, L. 2000, A&AS, 146, 259
Gavazzi, G., O'Neil, K., Boselli, A., & van Driel, W. 2006, A&A, 449, 929
Geller, M. J., Beers, T. C., Bothun, G. D., & Huchra, J. P. 1984, AJ, 89, 319
Geller, M. J., & Huchra, J. P. 1983, ApJS, 52, 61
Geller, M. J., Kenyon, S. J., Barton, E. J., Jarrett, T. H., & Kewley, L. J. 2006, AJ, 132, 2243
Giovanardi, C., & Salpeter, E. E. 1985, ApJS, 58, 623
Giovanelli, R., Avera, E., & Karachentsev, I. D. 1997, AJ, 114, 122
Giovanelli, R., & Haynes, M. P. 1993, AJ, 105, 1271
Giovanelli, R., Haynes, M. P., Kent, B. R., et al. 2005, AJ, 130, 2613
Giovannini, G., Feretti, L., Gregorini, L., & Parma, P. 1988, A&A, 199, 73
Gordon, S., Koribalski, B., & Jones, K. 2003, MNRAS, 342, 939
Graham, A. W., Colless, M. M., Busarello, G., Zaggia, S., & Longo, G. 1998, A&AS, 133, 325
Graham, J. A. 1978, PASP, 90, 237
Green, M. R., Godwin, J. G., & Peach, J. V. 1988, MNRAS, 234, 1051
Gregory, S. A., & Burns, J. O. 1982, ApJ, 255, 373
Gregory, S. A., & Connolly, L. P. 1973, ApJ, 182, 351
Gregory, S. A., Tifft, W. G., Moody, J. W., Newberry, M. V., & Hall, S. M. 2000, AJ, 119, 545
Grogin, N. A., & Geller, M. J. 1999, AJ, 118, 2561
Grogin, N. A., & Geller, M. J. 2000, AJ, 119, 32
Grogin, N. A., Geller, M. J., & Huchra, J. P. 1998, ApJS, 119, 277
Hagiwara, Y., Klöckner, H.-R., & Baan, W. 2004, MNRAS, 353, 1055
Hamuy, M., Phillips, M. M., Suntzeff, N. B., et al. 1996, AJ, 112, 2408
Hamwey, R. M. 1989, PhD thesis, Dartmouth College
Hasegawa, T., Wakamatsu, K.-i., Malkan, M., et al. 2000, MNRAS, 316, 326
Haynes, M. P., Giovanelli, R., Chamaraux, P., et al. 1999, AJ, 117, 2039
Haynes, M. P., Giovanelli, R., Herter, T., et al. 1997, AJ, 113, 1197
Haynes, M. P., Magri, C., Giovanelli, R., & Starosta, B. M. 1988, AJ, 95, 607
Haynes, M. P., van Zee, L., Hogg, D. E., Roberts, M. S., & Maddalena, R. J. 1998, AJ, 115, 62
Heidt, J., Nilsson, K., Fried, J. W., Takalo, L. O., & Sillanpäa, A. 1999, A&A, 348, 113
18 Huchra et al.
Henry, J. P., Gioia, I. M., Huchra, J. P., et al. 1995, ApJ, 449, 422
Héraudeau, P., & Simien, F. 1998, A&AS, 133, 317
Héraudeau, P., Simien, F., Maubon, G., & Prugniel, P. 1999, A&AS, 136, 509
Hewitt, A., & Burbidge, G. 1991, ApJS, 75, 297
Hickson, P., Mendes de Oliveira, C., Huchra, J. P., & Palumbo, G. G. 1992, ApJ, 399, 353
Hill, J. M., & Oegerle, W. R. 1993, AJ, 106, 831
Hill, J. M., & Oegerle, W. R. 1998, AJ, 116, 1529
Hintzen, P., Oegerle, W. R., & Scott, J. S. 1978, AJ, 83, 478
Ho, L. C., & Kim, M. 2009, ApJS, 184, 398
Hoessel, J. G., Gunn, J. E., & Thuan, T. X. 1980, ApJ, 241, 486
Hoffman, G. L., Lewis, B. M., & Salpeter, E. E. 1995, ApJ, 441, 28
Hopp, U., Engels, D., Green, R. F., et al. 2000, A&AS, 142, 417
Hopp, U., Kuhn, B., Thiele, U., et al. 1995, A&AS, 109, 537
Huchra, J., Davis, M., Latham, D., & Tonry, J. 1983, ApJS, 52, 89
Huchra, J., Hoessel, J., & Elias, J. 1977, AJ, 82, 674
Huchra, J., Latham, D. W., da Costa, L. N., Pellegrini, P. S., & Willmer, C. N. A. 1993, AJ, 105, 1637
Huchra, J. P., Geller, M. J., de Lapparent, V., & Corwin, H. G., Jr. 1990a, ApJS, 72, 433
Huchra, J., Jarrett, T., Skrutskie, M., et al. 2005, in ASP Conf. Ser. 329, Nearby Large-Scale Structures and the Zone of Avoidance, ed. A. P. Fairall & P. A. Woudt (San Francisco, CA: ASP), 135
Huchra, J. P., Geller, M. J., & Corwin, H. G., Jr. 1995, ApJS, 99, 391
Huchra, J. P., Henry, J. P., Postman, M., & Geller, J. M. 1990b, ApJ, 365, 66
Huchra, J. P., Vogeley, M. S., & Geller, M. J. 1999, ApJS, 121, 287
Huchtmeier, W. K. 1994, A&A, 286, 389
Huchtmeier, W. K., Hopp, U., & Kuhn, B. 1997, A&A, 319, 67
Huchtmeier, W. K., Karachentsev, I. D., & Karachentseva, V. E. 2001, A&A, 377, 801
Huchtmeier, W. K., Karachentsev, I. D., Karachentseva, V. E., Kudrya, Y. N., & Mitronova, S. N. 2005, A&A, 435, 459
Huchtmeier, W. K., & Richter, O.-G. 1985, A&A, 149, 118
Huchtmeier, W. K., Sage, L. J., & Henkel, C. 1995, A&A, 300, 675
Impey, C. D., Sprayberry, D., Irwin, M. J., & Bothun, G. D. 1996, ApJS, 105, 209
Iwasawa, K., Ettori, S., Fabian, A. C., Edge, A. C., & Ebeling, H. 2000, MNRAS, 313, 515
Izotov, Y. I., & Thuan, T. X. 1998, ApJ, 500, 188
Jarrett, T. 2004, PASA, 21, 396
Jarrett, T.-H., Chester, T., Cutri, R., et al. 2000a, AJ, 120, 298
Jarrett, T. H., Chester, T., Cutri, R., Schneider, S. E., & Huchra, J. P. 2003, AJ, 125, 525
Jarrett, T. H., Chester, T., Cutri, R., et al. 2000, AJ, 119, 2498
Jones, P. A., & McAdam, W. B. 1992, ApJS, 80, 137
Jones, D. H., Read, M. A., Saunders, W., et al. 2009, MNRAS, 399, 683
Jones, D. H., Saunders, W., Colless, M., et al. 2004, MNRAS, 355, 747
Jones, D. H., Saunders, W., Read, M., & Colless, M. 2005, PASA, 22, 277
Jore, K. P., Broeils, A. H., & Haynes, M. P. 1996, AJ, 112, 438
Jorgensen, I., Franx, M., & Kjaergaard, P. 1995, MNRAS, 276, 1341
Kaldare, R., Colless, M., Raychaudhury, S., & Peterson, B. A. 2003, MNRAS, 339, 652
Kamphuis, J. J., Sijbring, D., & van Albada, T. S. 1996, A&AS, 116, 15
Karachentsev, I., Lebedev, V., & Shcherbanovski, A. 1985, Bulletin d'Information du Centre de Donnees Stellaires, 29, 87
Karachentsev, I. D. 1980, ApJS, 44, 137
Karachentsev, I. D., & Karachentseva, V. E. 1981, Astrofizika, 17, 5
Karachentsev, I. D., Karachentseva, V. E., & Huchtmeier, W. K. 2001, A&A, 366, 428
Karachentsev, I. D., Karachentseva, V. E., & Shcherbanovskii, A. L. 1978, Pis ma Astronomicheskii Zhurnal, 4, 483
Karachentsev, I. D., & Kopylov, A. I. 1990, MNRAS, 243, 390
Karachentsev, I. D., Pronik, V. I., & Chuvaev, K. K. 1975, A&A, 41, 375
Karachentseva, V. E. 1973, Astrofizicheskie Issledovaniia Izvestiya Spetsial'noj Astrofizicheskoj Observatorii, 8, 3
Katgert, P., Mazure, A., den Hartog, R., et al. 1998, A&AS, 129, 399
Kazarian, M. A. 1987, Astrofizika, 27, 399
Kazarian, M. A., & Kazarian, E. S. 1987, Astrofizika, 26, 5
Keel, W. C. 1996a, ApJS, 106, 27
Keel, W. C. 1996b, AJ, 111, 696
Kenney, J. D. P., Rubin, V. C., Planesas, P., & Young, J. S. 1995, ApJ, 438, 135
Kent, B. R., Giovanelli, R., Haynes, M. P., et al. 2008, AJ, 136, 713
Kent, S. M., & Sargent, W. L. W. 1983, AJ, 88, 697
Khachikian, E., Ter-Kazarian, G., Sargsyan, L., Yerknapetyan, K., & Terzian, Y. 2006, MNRAS, 368, 461
Kim, D.-C., & Sanders, D. B. 1998, ApJS, 119, 41
Kim, D.-C., Sanders, D. B., Veilleux, S., Mazzarella, J. M., & Soifer, B. T. 1995, ApJS, 98, 129
Kirhakos, S. D., & Steiner, J. E. 1990, AJ, 99, 1722
Kirshner, R. P., Oemler, A., Jr., & Schechter, P. L. 1978, AJ, 83, 1549
Kirshner, R. P., Oemler, A., Jr., Schechter, P. L., & Shectman, S. A. 1990, AJ, 100, 1409
Klaas, U., & Elsaesser, H. 1993, A&AS, 99, 71
Kobulnicky, H. A., Dickey, J. M., Sargent, A. I., Hogg, D. E., & Conti, P. S. 1995, AJ, 110, 116
Kochanek, C. S., Pahre, M. A., Falco, E. E., et al. 2001, ApJ, 560, 566
Koranyi, D. M., & Geller, M. J. 2000, AJ, 119, 44
Koranyi, D. M., & Geller, M. J. 2002, AJ, 123, 100
Koranyi, D. M., Geller, M. J., Mohr, J. J., & Wegner, G. 1998, AJ, 116, 2108
Koribalski, B. S., Staveley-Smith, L., Kilborn, V. A., et al. 2004, AJ, 128, 16
Koulouridis, E., Plionis, M., Chavushyan, V., et al. 2006, ApJ, 639, 37
Kowalski, M. P., Ulmer, M. P., & Hintzen, P. 1987, AJ, 93, 1350

Kraan-Korteweg, R. C., Fairall, A. P., & Balkowski, C. 1995, A&A, 297, 617
Kraan-Korteweg, R. C., Henning, P. A., & Schröder, A. C. 2002, A&A, 391, 887
Kraan-Korteweg, R. C., & Huchtmeier, W. K. 1992, A&A, 266, 150
2MASS Redshift Survey 19
Krabbe, A. C., Pastoriza, M. G., Winge, C., Rodrigues, I., & Ferreiro, D. L. 2008, MNRAS, 389, 1593
Kregel, M., van der Kruit, P. C., & de Blok, W. J. G. 2004, MNRAS, 352, 768
Krumm, N., & Salpeter, E. E. 1980, AJ, 85, 1312
Kunth, D., & Sargent, W. L. W. 1979, A&AS, 36, 259
Kurtz, M. J., & Mink, D. J. 1998, PASP, 110, 934
Lahav, O., Brosch, N., Goldberg, E., et al. 1998, MNRAS, 299, 24
Landt, H., Padovani, P., Perlman, E. S., et al. 2001, MNRAS, 323, 757
Lara, L., Cotton, W. D., Feretti, L., et al. 2001, A&A, 370, 409
Lauberts, A., & Valentijn, E. A. 1989, The surface photometry catalogue of the ESO-Uppsala galaxies (Garching: European Southern Observatory)
Laurent-Muehleisen, S. A., Kollgaard, R. I., Ciardullo, R., et al. 1998, ApJS, 118, 127
Lavaux, G., Tully, R. B., Mohayaee, R., & Colombi, S. 2010, ApJ, 709, 483
Lawrence, A., Rowan-Robinson, M., Ellis, R. S., et al. 1999, MNRAS, 308, 897
Ledlow, M. J., Loken, C., Burns, J. O., Hill, J. M., & White, R. A. 1996, AJ, 112, 388
Lipovetsky, V. A. 1986, Soobshcheniya Spetsial'noj Astrofizicheskoj Observatorii, 50, 12
Longhetti, M., Rampazzo, R., Bressan, A., & Chiosi, C. 1998a, A&AS, 130, 251
Longhetti, M., Rampazzo, R., Bressan, A., & Chiosi, C. 1998b, A&AS, 130, 267
Lonsdale, C. J., & Hacking, P. B. 1989, ApJ, 339, 712
Loveday, J., Peterson, B. A., Maddox, S. J., & Efstathiou, G. 1996, ApJS, 107, 201
Lu, N. Y., Dow, M. W., Houck, J. R., Salpeter, E. E., & Lewis, B. M. 1990, ApJ, 357, 388
Lu, N. Y., & Freudling, W. 1995, ApJ, 449, 527
Lu, N. Y., Hoffman, G. L., Groff, T., Roos, T., & Lamphier, C. 1993, ApJS, 88, 383
Lucey, J. R., Dickens, R. J., Mitchell, R. J., & Dawe, J. A. 1983, MNRAS, 203, 545
Lynden-Bell, D., Faber, S. M., Burstein, D., et al. 1988, ApJ, 326, 19
Lynds, C. R. 1972, in IAU Symp. 44, External Galaxies and Quasi-Stellar Objects, ed. D. S. Evans, D. Wills, & B. J. Wills (Cambridge: Cambridge Univ. Press), 376
Mahdavi, A., & Geller, M. J. 2004, ApJ, 607, 202
Maia, M. A. G., Suzuki, J. A., da Costa, L. N., Willmer, C. N. A., & Rite, C. 1996, A&AS, 117, 487
Makarov, D. I., Burenkov, A. N., & Tyurina, N. V. 2001, Astronomy Letters, 27, 213
Makarov, D. I., Karachentsev, I. D., & Burenkov, A. N. 2003, A&A, 405, 951
Makarov, D. I., Karachentsev, I. D., Burennkov, A. N., Tyurina, N. V., & Korotkova, G. G. 1997, Astronomy Letters, 23, 638
Malumuth, E. M., Kriss, G. A., Dixon, W. V. D., Ferguson, H. C., & Ritchie, C. 1992, AJ, 104, 495
Mamon, G. A., Parker, Q. A., & Proust, D. 2001, Pub. Astron. Soc. Australia, 18, 232
Marcha, M. J. M., Browne, I. W. A., Impey, C. D., & Smith, P. S. 1996, MNRAS, 281, 425
Markaryan, B. E., Lipovetskii, V. A., & Stepanyan, D. A. 1980, Astrophysics, 16, 1
Martin, A. M., Giovanelli, R., Haynes, M. P., et al. 2009, ApJS, 183, 214
Martini, P., Mulchaey, J. S., & Kelson, D. D. 2007, ApJ, 664, 761
Marzke, R. O., Huchra, J. P., & Geller, M. J. 1996, AJ, 112, 1803
Masetti, N., Mason, E., Morelli, L., et al. 2008, A&A, 482, 113
Masters, K. L., Springob, C. M., Haynes, M. P., & Giovanelli, R. 2006, ApJ, 653, 861
Masters, K. L., Springob, C. M., & Huchra, J. P. 2008, AJ, 135, 1738
Masetti, N., Morelli, L., Palazzi, E., et al. 2006, A&A, 459, 21
Matheson, T., & Berlind, P. 2003, IAU Circ., 8146, 2
Matheson, T., Jha, S., Challis, P., Kirshner, R., & Berlind, P. 2002, IAU Circ., 7916, 2
Mathewson, D. S., & Ford, V. L. 1996, ApJS, 107, 97
Mathewson, D. S., Ford, V. L., & Buchhorn, M. 1992, ApJS, 81, 413
Matthews, L. D., & van Driel, W. 2000, A&AS, 143, 421
Mauch, T., & Sadler, E. M. 2007, MNRAS, 375, 931
Maurogordato, S., Proust, D., & Balkowski, C. 1991, A&A, 246, 39
Maurogordato, S., Proust, D., Cappi, A., Slezak, E., & Martin, J. M. 1997, A&AS, 123, 411
Maybhate, A., Goudfrooij, P., Schweizer, F., Puzia, T., & Carter, D. 2007, AJ, 134, 1729
Maza, J., & Ruiz, M. T. 1989, ApJS, 69, 353
Mazzarella, J. M., Graham, J. R., Sanders, D. B., & Djorgovski, S. 1993, ApJ, 409, 170
McCarthy, P. J., Kapahi, V. K., van Breugel, W., et al. 1996, ApJS, 107, 19
Mendel, J. T., Proctor, R. N., Forbes, D. A., & Brough, S. 2008, MNRAS, 389, 749
Menzies, J. W., Coulson, I. M., & Sargent, W. L. W. 1989, AJ, 97, 1576
Merighi, R., Basso, L., Vigotti, M., Lahulla, J. F., & Lopez-Arroyo, M. 1991, A&AS, 89, 225
Metcalfe, N., Fong, R., Shanks, T., & Kilkenny, D. 1989, MNRAS, 236, 207
Michel, A., & Huchra, J. 1988, PASP, 100, 1423
Miller, C. J., Krughoff, K. S., Batuski, D. J., & Hill, J. M. 2002a, AJ, 124, 1918
Miller, N. A., Ledlow, M. J., Owen, F. N., & Hill, J. M. 2002b, AJ, 123, 3018
Miller, N. A., & Owen, F. N. 2001, ApJS, 134, 355
Misgeld, I., Mieske, S., & Hilker, M. 2008, A&A, 486, 697
Mohr, J. J., Geller, M. J., Fabricant, D. G., et al. 1996, ApJ, 470, 724
Mohr, J. J., & Wegner, G. 1997, AJ, 114, 25
Monk, A. S., Penston, M. V., Pettini, M., & Blades, J. C. 1988, MNRAS, 234, 193
Monnier Ragaigne, D, van Driel, W., O'Neil, K., et al. 2003a, A&A, 408, 67
Monnier Ragaigne, D, van Driel, W., Schneider, S. E., Balkowski, C., & Jarrett, T. H. 2003b, A&A, 408, 465
Moody, J. W., & Kirshner, R. P. 1988, AJ, 95, 1629
Moran, E. C., Halpern, J. P., & Helfand, D. J. 1996, ApJS, 106, 341
Morganti, R., Oosterloo, T. A., Capetti, A., et al. 2003, A&A, 399, 511
Motch, C., Guillout, P., Haberl, F., et al. 1998, A&AS, 132, 341
Mould, J. 1991, private communication
Mould, J. R., Staveley-Smith, L., Schommer, R. A., et al. 1991, ApJ, 383, 467
Mould, J. R., Akeson, R. L., Bothun, G. D., et al. 1993, ApJ, 409, 14
Mulder, P. S., & van Driel, W. 1993, A&A, 272, 63
Müller, K. R., Wegner, G., Raychaudhury, S., & Freudling, W. 1999, A&AS, 140, 327
Munn, J. A., Koo, D. C., Kron, R. G., et al. 1997, ApJS, 109, 45
Muriel, H., Nicotra, M. A., & Lambas, D. G. 1995, AJ, 110, 1032
Nakanishi, K., Takata, T., Yamada, T., et al. 1997, ApJS, 112, 245
Neill, J. D., Brodie, J. P., Craig, W. W., Hailey, C. J., & Misch, A. A. 2001, ApJ, 548, 550
Nilsson, K., Pursimo, T., Heidt, J., et al. 2003, A&A, 400, 95
Nishiura, S., Shimada, M., Ohyama, Y., Murayama, T., & Taniguchi, Y. 2000, AJ, 120, 1691
20 Huchra et al.
Nordgren, T. E., Chengalur, J. N., Salpeter, E. E., & Terzian, Y. 1997b, AJ, 114, 913
Nordgren, T. E., Chengalur, J. N., Salpeter, E. E., & Terzian, Y. 1997a, AJ, 114, 77
Norris, M. A., Sharples, R. M., & Kuntschner, H. 2006, MNRAS, 367, 815
Oegerle, W. R., Hill, J. M., & Fitchett, M. J. 1995, AJ, 110, 32
Ogando, R. L. C., Maia, M. A. G., Pellegrini, P. S., & da Costa, L. N. 2008, AJ, 135, 2424
Olling, R. P. 1996, AJ, 112, 457
O'Neil, K. 2004, AJ, 128, 2080
Oosterloo, T., & Shostak, S. 1993, A&AS, 99, 379
Osterbrock, D. E., & De Robertis, M. M. 1985, PASP, 97, 1129
Ostriker, E. C., Huchra, J. P., Geller, M. J., & Kurtz, M. J. 1988, AJ, 96, 1775
Owen, F. N., Ledlow, M. J., & Keel, W. C. 1995, AJ, 109, 14
Owen, F. N., Ledlow, M. J., Morrison, G. E., & Hill, J. M. 1997, ApJ, 488, L15+
Owen, F. N., White, R. A., & Thronson, H. A., Jr. 1988, AJ, 95, 1
Padovani, P., & Giommi, P. 1995, MNRAS, 277, 1477
Palumbo, G. G. C., Tanzella-Nitti, G., & Vettolani, G. 1983, Catalogue of radial velocities of galaxies (New York: Gordon and Breach)
Pantoja, C. A., Altschuler, D. R., Giovanardi, C., & Giovanelli, R. 1997, AJ, 113, 905
Parker, Q. A., MacGillivray, H. T., Hill, P. W., & Dodd, R. J. 1986, MNRAS, 220, 901
Parker, Q. A., & Watson, F. G. 1990, A&AS, 84, 455
Paturel, G., Theureau, G., Bottinelli, L., et al. 2003, A&A, 412, 57
Peebles, P. J. E. 1976, ApJ, 205, 318
Pence, W. D., & Rots, A. H. 1997, ApJ, 478, 107
Peng, B., Strom, R. G., Wei, J., & Zhao, Y. H. 2004, A&A, 415, 487
Penny, S. J., & Conselice, C. J. 2008, MNRAS, 383, 247
Perlmutter, S., Aldering, G., Goldhaber, G., et al. 1999, ApJ, 517, 565
Perlman, E. S., Padovani, P., Giommi, P., et al. 1998, AJ, 115, 1253
Peterson, B. A., Ellis, R. S., Efstathiou, G., et al. 1986, MNRAS, 221, 233

Petrosian, A., McLean, B., Allen, R. J., & MacKenty, J. W. 2007, ApJS, 170, 33
Petrosian, A. R., Saakian, K. A., & Khachian, E. E. 1979, Astrofizika, 15, 373
Pietsch, W., Bischoff, K., Boller, T., et al. 1998, A&A, 333, 48
Pinkney, J., Burns, J. O., Ledlow, M. J., Gómez, P. L., & Hill, J. M. 2000, AJ, 120, 2269
Pinkney, J., Rhee, G., Burns, J. O., et al. 1993, ApJ, 416, 36
Pocock, A. S., Penston, M. V., Pettini, M., & Blades, J. C. 1984, MNRAS, 210, 373
Postman, M., Geller, M. J., & Huchra, J. P. 1988, AJ, 95, 267
Postman, M., Huchra, J. P., & Geller, M. J. 1986, AJ, 92, 1238
Postman, M., & Lauer, T. R. 1995, ApJ, 440, 28
Pott, J.-U., Hartwich, M., Eckart, A., et al. 2004, A&A, 415, 27
Poulain, P., Nieto, J.-L., & Davoust, E. 1992, A&AS, 95, 129
Prieur, J.-L. 1988, Etude de galaxies a Coquilles (Toulouse: Universite Sabatier, Observatoire Midi-Pyrenees)
Proust, D., Capelato, H. V., Hickel, G., et al. 2003, A&A, 407, 31
Proust, D., Mazure, A., Vanderriest, C., Sodre, L., Jr., & Capelato, H. V. 1995, A&AS, 114, 565
Qiao, Q. Y., Qiu, Y. L., Li, W. D., et al. 1997, IAU Circ., 6775, 1
Quintana, H., & de Souza, R. 1993, A&AS, 101, 475
Quintana, H., Fouque, P., & Way, M. J. 1994, A&A, 283, 722
Quintana, H., Melnick, J., Proust, D., & Infante, L. 1997, A&AS, 125, 247
Quintana, H., & Ramirez, A. 1990, AJ, 100, 1424
Quintana, H., & Ramirez, A. 1995, ApJS, 96, 343
Quintana, H., Ramirez, A., Melnick, J., Raychaudhury, S., & Slezak, E. 1995, AJ, 110, 463
Quintana, H., Ramirez, A., & Way, M. J. 1996, AJ, 112, 36
Radburn-Smith, D. J., Lucey, J. R., Woudt, P. A., Kraan-Korteweg, R. C., & Watson, F. G. 2006, MNRAS, 369, 1131
Ramella, M., Focardi, P., & Geller, M. J. 1996, A&A, 312, 745
Ramella, M., Geller, M. J., Huchra, J. P., & Thorstensen, J. R. 1995, AJ, 109, 1458
Ramella, M., Geller, M. J., Pisani, A., & da Costa, L. N. 2002, AJ, 123, 2976
Rampazzo, R., Reduzzi, L., Sulentic, J. W., & Madejsky, R. 1995, A&AS, 110, 131
Rand, R. J. 1995, AJ, 109, 2444
Ratcliffe, A., Shanks, T., Parker, Q. A., et al. 1998, MNRAS, 300, 417
Reshetnikov, V., Bournaud, F., Combes, F., Fáundez-Abans, M., & de Oliveira-Abans, M. 2006, A&A, 446, 447
Reshetnikov, V. P., & Combes, F. 1994, A&A, 291, 57
Reshetnikov, V. P., Fáundez-Abans, M., & de Oliveira-Abans, M. 2001, MNRAS, 322, 689
Rhee, G. F. R. N., & Katgert, P. 1988, A&AS, 72, 243
Rhee, M.-H., & van Albada, T. S. 1996, A&AS, 115, 407
Richter, O.-G. 1987a, A&AS, 67, 261
Richter, O.-G. 1987b, A&AS, 67, 237
Richter, O.-G. 1989, A&AS, 77, 237
Richter, O.-G., & Huchtmeier, W. K. 1987, A&AS, 68, 427
Riess, A. G., Filippenko, A. V., Challis, P., et al. 1998, AJ, 116, 1009
Rines, K., Geller, M. J., Diaferio, A., Kurtz, M. J., & Jarrett, T. H. 2004, AJ, 128, 1078
Rines, K., Geller, M. J., Diaferio, A., et al. 2002, AJ, 124, 1266
Rines, K., Geller, M. J., Diaferio, A., Mohr, J. J., & Wegner, G. A. 2000, AJ, 120, 2338
Rines, K., Geller, M. J., Kurtz, M. J., & Diaferio, A. 2003, AJ, 126, 2152
Rines, K., Geller, M. J., Kurtz, M. J., et al. 2001, ApJ, 561, L41
Rodgers, A. W., Peterson, B. A., & Harding, P. 1978, ApJ, 225, 768
Rodrı́guez-Ardila, A., Pastoriza, M. G., & Donzelli, C. J. 2000, ApJS, 126, 63
Roman, A. T., Nakanishi, K., Tomita, A., & Saito, M. 1996, PASJ, 48, 679
Roman, A. T., Takeuchi, T. T., Nakanishi, K., & Saito, M. 1998, PASJ, 50, 47
Romer, A. K., Nichol, R. C., Holden, B. P., et al. 2000, ApJS, 126, 209
Rood, H. I. 1980, Catalog of galaxy redshifts (Princeton: Institute for Advanced Studies)
Rothberg, B., & Joseph, R. D. 2006, AJ, 131, 185
Rubin, V. C., Kenney, J. D. P., & Young, J. S. 1997, AJ, 113, 1250
Ruiz, J. R., Crenshaw, D. M., Kraemer, S. B., et al. 2005, AJ, 129, 73
Sadler, E. M., Oosterloo, T. A., Morganti, R., & Karakas, A. 2000, AJ, 119, 1180
Saintonge, A., Giovanelli, R., Haynes, M. P., et al. 2008, AJ, 135, 588
Sakai, S., Giovanelli, R., & Wegner, G. 1994, AJ, 108, 33
Salzer, J. J., Moody, J. W., Rosenberg, J. L., Gregory, S. A., & Newberry, M. V. 1995, AJ, 109, 2376
Sandage, A., & Tammann, G. A. 1981, in Carnegie Inst. of Washington Publ. 635; Vol. 0; Page 0, 0

Sanders, D. B., Egami, E., Lipari, S., Mirabel, I. F., & Soifer, B. T. 1995, AJ, 110, 1993
Santiago, B. X., Strauss, M. A., Lahav, O., et al. 1995, ApJ, 446, 457
Sarazin, C. L., Baum, S. A., & O'Dea, C. P. 1995, ApJ, 451, 125
Sargent, W. L. W. 1973, ApJ, 182, L13 +
Sargent, W. L. W. 1970, ApJ, 160, 405
Saunders, W., Sutherland, W. J., Maddox, S. J., et al. 2000, MNRAS, 317, 55
Sazonov, S., Revnivtsev, M., Krivonos, R., Churazov, E., & Sunyaev, R. 2007, A&A, 462, 57
Scarpa, R., Falomo, R., & Pesce, J. E. 1996, A&AS, 116, 295
Schachter, J. F., Stocke, J. T., Perlman, E., et al. 1993, ApJ, 412, 541
Schechter, P. L., & Dressler, A. 1987, AJ, 94, 563
Schindler, S. 2000, A&AS, 142, 433
Schmidt, B., Kirshner, R., Huchra, J., & Brodie, J. 1993, IAU Circ., 5882, 3
Schlegel, D. J., Finkbeiner, D. P., & Davis, M. 1998, ApJ, 500, 525
Schmoldt, I., Branchini, E., Teodoro, L., et al. 1999, MNRAS, 304, 893
Schmidt, M., & Green, R. F. 1983, ApJ, 269, 352
Schneider, D. P., & Gunn, J. E. 1982, ApJ, 263, 14
Schneider, S. E., Thuan, T. X., Magri, C., & Wadiak, J. E. 1990, ApJS, 72, 245
Schneider, S. E., Thuan, T. X., Mangum, J. G., & Miller, J. 1992, ApJS, 81, 5
Schoenmakers, A. P., de Bruyn, A. G., Röttgering, H. J. A., & van der Laan, H. 2001, A&A, 374, 861
Schweizer, L. Y. 1987, ApJS, 64, 411
Scodeggio, M., & Gavazzi, G. 1993, ApJ, 409, 110
Scodeggio, M., Solanes, J. M., Giovanelli, R., & Haynes, M. P. 1995, ApJ, 444, 41
Seeberger, R., Huchtmeier, W. K., & Weinberger, R. 1994, A&A, 286, 17
Seeberger, R., & Saurer, W. 1998, A&AS, 127, 101
Sekiguchi, K., & Wolstencroft, R. D. 1992, MNRAS, 255, 581
Sekiguchi, K., & Wolstencroft, R. D. 1993, MNRAS, 263, 349
Shectman, S. A., Landy, S. D., Oemler, A., et al. 1996, ApJ, 470, 172
Shier, L. M., & Fischer, J. 1998, ApJ, 497, 163
Shostak, G. S. 1975, ApJ, 198, 527
Silk, J. 1974, ApJ, 193, 525
Simien, F., & Prugniel, P. 1997a, A&AS, 122, 521
Simien, F., & Prugniel, P. 1997b, A&AS, 126, 15
Simien, F., & Prugniel, P. 1997c, A&AS, 126, 519
Simien, F., & Prugniel, P. 1998, A&AS, 131, 287
Simien, F., & Prugniel, P. 2000, A&AS, 145, 263
Simien, F., & Prugniel, P. 2002, A&A, 384, 371
Simpson, C., Clements, D. L., Rawlings, S., & Ward, M. 1993, MNRAS, 262, 889
Skrutskie, M. F., Cutri, R. M., Stiening, R., et al. 2006, AJ, 131, 1163
Slinglend, K., Batuski, D., Miller, C., et al. 1998, ApJS, 115, 1
Smith, B. J., Kleinmann, S. G., Huchra, J. P., & Low, F. J. 1987, ApJ, 318, 161
Smith, R. J., Hudson, M. J., Nelan, J. E., et al. 2004, AJ, 128, 1558
Smith, R. J., Lucey, J. R., Hudson, M. J., Schlegel, D. J., & Davies, R. L. 2000, MNRAS, 313, 469
Smith, R. J., Lucey, J. R., Steel, J., & Hudson, M. J. 1997, MNRAS, 291, 461
Smith Castelli, A. V., Bassino, L. P., Richtler, T., et al. 2008, MNRAS, 386, 2311
Smoot, G. F., Gorenstein, M. V., & Muller, R. A. 1977, Phys. Rev. Lett., 39, 898
Sodre, L., Jr., Capelato, H. V., Steiner, J. E., Proust, D., & Mazure, A. 1992, MNRAS, 259, 233
Sofue, Y., & Nakai, N. 1994, PASJ, 46, 147
Solomon, P. M., Downes, D., Radford, S. J. E., & Barrett, J. W. 1997, ApJ, 478, 144
Spekkens, K., & Giovanelli, R. 2006, AJ, 132, 1426
Spergel, D. N., Verde, L., Peiris, H. V., et al. 2003, ApJS, 148, 175
Springob, C. M., Masters, K. L., Haynes, M. P., Giovanelli, R., & Marinoni, C. 2007, ApJS, 172, 599
Spinrad, H., Marr, J., Aguilar, L., & Djorgovski, S. 1985, PASP, 97, 932
Spitzak, J. G., & Schneider, S. E. 1998, ApJS, 119, 159
Springob, C. M., Haynes, M. P., Giovanelli, R., & Kent, B. R. 2005, ApJS, 160, 149
Stein, P. 1996, A&AS, 116, 203
Stein, P., Jerjen, H., & Federspiel, M. 1997, A&A, 327, 952
Stickel, M., & Kuehr, H. 1993, A&AS, 100, 395
Stocke, J. T., Keeney, B. A., Lewis, A. D., Epps, H. W., & Schild, R. E. 2004, AJ, 127, 1336
Stocke, J. T., Morris, S. L., Gioia, I. M., et al. 1991, ApJS, 76, 813
Storchi-Bergmann, T., Rodriguez-Ardila, A., Schmitt, H. R., Wilson, A. S., & Baldwin, J. A. 1996, ApJ, 472, 83
Stockton, A. 1972, ApJ, 173, 247
Strauss, M. A., Davis, M., Yahil, A., & Huchra, J. P. 1990, ApJ, 361, 49
Strauss, M. A., Huchra, J. P., Davis, M., et al. 1992, ApJS, 83, 29
Strauss, M. 1991, private communication

Strauss, M. 1997, private communication
Strauss, M. A., & Huchra, J. 1988, AJ, 95, 1602
Szomoru, A., Guhathakurta, P., van Gorkom, J. H., et al. 1994, AJ, 108, 491
Takata, T., Tomita, A., Yamada, T., et al. 1994a, PASJ, 46, 343
Takata, T., Yamada, T., Saito, M., Chamaraux, P., & Kazes, I. 1994b, A&AS, 104, 529
Tammann, G. A., & Sandage, A. 1985, ApJ, 294, 81
Tanvuia, L., Kelm, B., Focardi, P., Rampazzo, R., & Zeilinger, W. W. 2003, AJ, 126, 1245
Tarenghi, M., Garilli, B., & Maccagni, D. 1994, AJ, 107, 1629
Teague, P. F., Carter, D., & Gray, P. M. 1990, ApJS, 72, 715
Theureau, G., Bottinelli, L., Coudreau-Durand, N., et al. 1998, A&AS, 130, 333
Theureau, G., Coudreau, N., Hallet, N., et al. 2005, A&A, 430, 373
Theureau, G., Hanski, M. O., Coudreau, N., Hallet, N., & Martin, J.-M. 2007, A&A, 465, 71
Thompson, D. J., Djorgovski, S., Vigotti, M., & Grueff, G. 1992, ApJS, 81, 1
Thoraval, S., Boissé, P., & Duvert, G. 1999, A&A, 351, 1051
Thorstensen, J., Wegner, G., & Boley, F. 2001, private communication
Thorstensen, J. R., Kurtz, M. J., Geller, M. J., Ringwald, F. A., & Wegner, G. 1995, AJ, 109, 2368
Thorstensen, J. R., Wegner, G. A., Hamwey, R., et al. 1989, AJ, 98, 1143
Thuan, T. X., Lipovetsky, V. A., Martin, J.-M., & Pustilnik, S. A. 1999, A&AS, 139, 1
Tifft, W. G. 1978, ApJ, 222, 54
Tifft, W. G. 1982, ApJS, 50, 319
Tifft, W. G., & Cocke, W. J. 1988, ApJS, 67, 1
Tifft, W. G., & Gregory, S. A. 1988, AJ, 95, 651
22 Huchra et al.
Tokarz, S. P., & Roll, J. 1997, in ASP Conf. Ser. 125, Astronomical Data Analysis Software and Systems VI, ed. G. Hunt & H. Payne (San Francisco, CA: ASP), 140
Tonry, J., & Davis, M. 1979, AJ, 84, 1511
Tonry, J. L., Blakeslee, J. P., Ajhar, E. A., & Dressler, A. 2000, ApJ, 530, 625
Tovmassian, H. M., Chavushyan, V. H., Verkhodanov, O. V., & Tiersch, H. 1999, ApJ, 523, 87
Trager, S. C., Faber, S. M., & Dressler, A. 2008, MNRAS, 386, 715
Trager, S. C., Faber, S. M., Worthey, G., & Gonźalez, J. J. 2000, AJ, 119, 1645
Tripp, T. M., Lu, L., & Savage, B. D. 1998, ApJ, 508, 200
Tritton, K. P. 1972, MNRAS, 158, 277
Tsvetkov, D. Y., & Bartunov, O. S. 1993, Bulletin d'Information du Centre de Donnees Stellaires, 42, 17
Tully, R. B., Verheijen, M. A. W., Pierce, M. J., Huang, J.-S., & Wainscoat, R. J. 1996, AJ, 112, 2471
Tully, R. B., & Shaya, E. J. 1984, ApJ, 281, 31
Tustin, A. W., Geller, M. J., Kenyon, S. J., & Diaferio, A. 2001, AJ, 122, 1289
Ulrich, M.-H. 1976, ApJ, 206, 364
Vader, J. P., & Chaboyer, B. 1992, PASP, 104, 57
Vader, J. P., Frogel, J. A., Terndrup, D. M., & Heisler, C. A. 1993, AJ, 106, 1743
van Driel, W, Combes, F., Arnaboldi, M., & Sparke, L. S. 2002, A&A, 386, 140
van Driel, W, Marcum, P., Gallagher, J. S., III, et al. 2001, A&A, 378, 370
van Driel, W, van den Broek, A. C., & Baan, W. 1995, ApJ, 444, 80
van Zee, L, Haynes, M. P., Salzer, J. J., & Broeils, A. H. 1997, AJ, 113, 1618
Varela, J., Moles, M., Ḿarquez, I., et al. 2004, A&A, 420, 873
Veilleux, S., & Osterbrock, D. E. 1987, ApJS, 63, 295
Verdes-Montenegro, L., Sulentic, J., Lisenfeld, U., et al. 2005, A&A, 436, 443
Verheijen, M. A. W., & Sancisi, R. 2001, A&A, 370, 765
Veron-Cetty, M.-P., & Veron, P. 1993, A&AS, 100, 521
Veron-Cetty, M.-P., & Veron, P. 1996, A Catalogue of quasars and active nuclei (Garching: European Southern Observatory)
Véron-Cetty, M.-P., & Véron, P. 2001, A&A, 374, 92
Vettolani, G., Cappi, A., Chincarini, G., et al. 1989, A&AS, 79, 147
Vettolani, G., Chincarini, G., Scaramella, R., & Zamorani, G. 1990, AJ, 99, 1709
Vettolani, G., Zucca, E., Merighi, R., et al. 1998, A&AS, 130, 323
Visvanathan, N., & van den Bergh, S. 1992, AJ, 103, 1057
Visvanathan, N., & Yamada, T. 1996, ApJS, 107, 521
Vitores, A. G., Zamorano, J., Rego, M., Alonso, O., & Gallego, J. 1996, A&AS, 118, 7
Warner, P. J., Riley, J. M., Eales, S. A., Downes, A. J. B., & Baldwin, J. E. 1983, MNRAS, 204, 1279
Watson, F. G., Oates, A. P., Shanks, T., & Hale-Sutton, D. 1991, MNRAS, 253, 222
Way, M. J., Quintana, H., Infante, L., Lambas, D. G., & Muriel, H. 2005, AJ, 130, 2012
Wegner, G., Bernardi, M., Willmer, C. N. A., et al. 2003, AJ, 126, 2268
Wegner, G., Colless, M., Saglia, R. P., et al. 1999, MNRAS, 305, 259
Wegner, G., Haynes, M. P., & Giovanelli, R. 1993, AJ, 105, 1251
Wegner, G., Thorstensen, J. R., Kurtz, M. J., et al. 2001, AJ, 122, 2893
Wegner, G., Thorstensen, J. R., Kurtz, M. J., Geller, M. J., & Huchra, J. P. 1990, AJ, 100, 1405
Werner, P. N., Worrall, D. M., & Birkinshaw, M. 1999, MNRAS, 307, 722
Werner, P. N., Worrall, D. M., & Birkinshaw, M. 2000, MNRAS, 317, 105
West, R. M. 1976, A&A, 53, 435
West, R. M., Surdej, J., Schuster, H.-E., et al. 1981, A&AS, 46, 57
Westover, M. 2007, PhD thesis, Harvard Univ.
White, R. A., Bliton, M., Bhavsar, S. P., et al. 1999, AJ, 118, 2014
Whiteoak, J. B. 1972, Aust. J. Phys., 25, 233
Willick, J. A., Courteau, S., Faber, S. M., et al. 1997, ApJS, 109, 333
Willick, J. A., Bowyer, S., & Brodie, J. P. 1990, ApJ, 355, 393
Willmer, C. N. A., Focardi, P., Chan, R., Pellegrini, P. S., & da Costa, N. L. 1991, AJ, 101, 57
Wills, D., & Wills, B. J. 1976, ApJS, 31, 143
Winkler, H. 1988, MNRAS, 234, 703
Winkler, H. 1997, MNRAS, 292, 273
Winkler, H., Stirpe, G. M., & Sekiguchi, K. 1992, A&AS, 94, 103
Wong, O. I., Ryan-Weber, E. V., Garcia-Appadoo, D. A., et al. 2006, MNRAS, 371, 1855
Woods, D. F., Geller, M. J., & Barton, E. J 2006, AJ, 132, 197
Woudt, P. A., Kraan-Korteweg, R. C., Cayatte, V., Balkowski, C., & Felenbok, P. 2004, A&A, 415, 9
Woudt, P. A., Kraan-Korteweg, R. C., & Fairall, A. P. 1999, A&A, 352, 39
Woudt, P. A., Kraan-Korteweg, R. C., Lucey, J., Fairall, A. P., & Moore, S. A. W. 2008, MNRAS, 383, 445
Yamada, T., & Saito, M. 1993, PASJ, 45, 25
Yamada, T., Tomita, A., Saito, M., Chamaraux, P., & Kazes, I. 1994, MNRAS, 270, 93
York, D. G., Adelman, J., Anderson, J. E., Jr., et al. 2000, AJ, 120, 1579
Zabludoff, A. I., Geller, M. J., Huchra, J. P., & Vogeley, M. S. 1993, AJ, 106, 1273
Zabludoff, A. I., Huchra, J. P., & Geller, M. J. 1990, ApJS, 74, 1
Zabludoff, A. I., & Mulchaey, J. S. 1998, ApJ, 496, 39
Zwaan, M. A., Briggs, F. H., Sprayberry, D., & Sorar, E. 1997, ApJ, 490, 173
Zaroubi, S., Hoffman, Y., Fisher, K. B., & Lahav, O. 1995, ApJ, 449, 446
Zwicky, F., & Zwicky, M. A. 1971, Catalogue of Selected Compact Galaxies and of Post-eruptive Galaxies (Guemligen: Zwicky)