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THE 2MASS REDSHIFT SURVEY - DESCRIPTION AND DATA RELEASE

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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 2 Micron All-Sky Survey (2MASS) was completed in 2003 and its final data products, including an extended source catalog (XSC), are available on-line. The 2MASS XSC contains nearly a million galaxies with $K_s \leq 13.5$ 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 $K_s \leq 11.75$ mag and $|b| \geq 5°$ ($\geq 8°$ towards 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 $K_s \leq 11.25$ mag and $|b| \geq 10°$.

Subject headings: Galaxies: distances and redshifts – Catalogs – Surveys

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 started (c.f. 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. 1992a; Santiago et al. 1995; Saunders et al. 2000a). 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, there remained a conflict between Ω_M on all measured scales and the $\Omega_M = 1$

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

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TABLE 1
LARGE REDSHIFT SURVEYS OF THE NEARBY UNIVERSE TO DATE

Survey	Sky coverage % 4π sr	Depth[a] (z)	Selection (band, flux)	# gals. ($\times 10^3$)	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+	60%	0.04	B=15.5 mag	23.6	da Costa et al. (1998a) &
CfA2					Huchra et al. (1999a)
IRAS PSCz	85%	0.08	60μm=0.6 Jy	16.1	Saunders et al. (2000a)
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**

NOTE. — (a): 90%-ile redshift value in catalog. (b): DR8 main galaxy sample.

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 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, Arizona (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$\times$ 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 2; 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. 2000b; Jarrett 2004) of $\sim 10^6$ objects with $K_s \leq 13.5$ 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 (York et al. 2000) started to provide overlapping deeper optical data which eventually covered $\sim 35\%$ 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.

Two decades before 2MASS, the first flux-limited all-sky galaxy catalog was created from observations by the IRAS satellite at 60μm (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. 1995a; Saunders et al. 2000a). Among other problems, the PSCz catalog gave little weight to ellipticals (which are dim at 60μm 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 update of Fig. 8 from Huchra et al. (2005) showing the 2MASS XSC coverage at $K_s \leq 11.75$ mag, limited only by confusion near

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

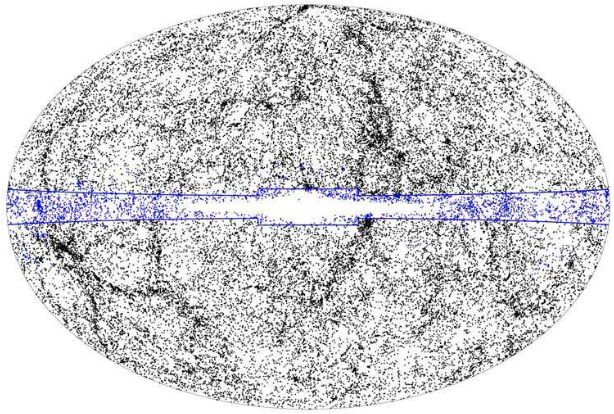

FIG. 1.— Distribution of 2MASS galaxies with $K_s \leq 11.75$ mag in Galactic coordinates (Aitoff projection). Blue dots represent galaxies outside our survey area. Note that due to stellar confusion we cannot cover, even to this bright magnitude limit, the very central region of the galaxy but we do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

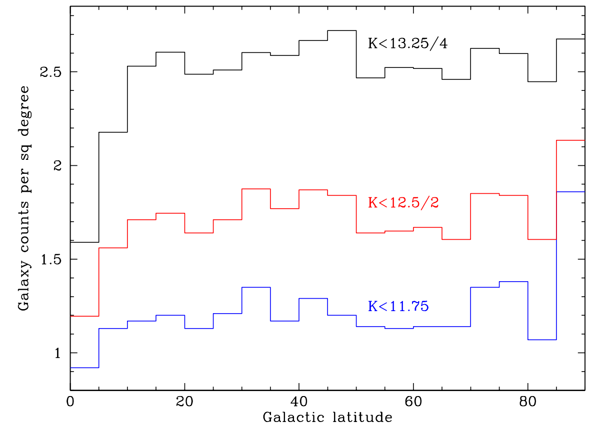

FIG. 2.— Surface number density vs galactic latitude for three cuts in the 2MASS XSC at K_s =11.75, 12.5 and 13.25 mag. While the number counts drop sharply in the $5^\circ \leq |b| \leq 10^\circ$ bin for the 13.25 mag sample, the incompleteness is reduced for the 12.5 mag sample and it is essentially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

the galactic center. Figure 2 is an update of Fig. 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-sky redshift surveys to fully map the nearby Universe. To this end, we started a program in September 1997 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 $|b| = 10^\circ$ (20,860 galaxies; hereafter 2MRS11.25) were progressively increased to final values of $K_s = 11.75$ mag and $|b| = 5 - 8^\circ$ (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. 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 trade-offs 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 Extended Source Catalog (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:

- $K_s \leq 11.75$ mag and detected at H
- $E(B-V) \leq 1$ mag
- $|b| \geq 5^\circ$ for $30^\circ \leq l \leq 330^\circ$; $|b| \geq 8^\circ$ otherwise.

We rejected 324 sources of galactic origin (multiple stars, planetary nebulae, H II regions) or pieces of galaxies detected as separate sources by the 2MASS pipeline. These rejected objects are listed in Table A1. 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 isohpotal radii have been incorrectly measured by the pipeline. Lastly, some are close pairs or multiples but the pipeline only identified a single object.

Tom 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 A2. The remaining 242 flagged galaxies are separated in two categories. Table A3 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 not been removed from the catalog. Table A4 contains 165 galaxies with seriously compromised photometry, which have been removed from the catalog.

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.

TABLE 2
Telescopes and instruments used in the survey

Observatory/Telescope		Camera	Grating (l/mm)	Coverage (Å)	Res. (Å)	N gal with K_s < 11.75	> 11.75
Fred L. Whipple	1.5-m	FAST	300	3500-7400	5	7,590	2,596
Cerro Tololo	1.5-m	RCSpec	300	3700-7200	7	3,245	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	

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 September 1997 and January 2011 using a variety of facilities, listed in Table 2. The majority of the spectra obtained for this survey were acquired at the Fred L. Whipple Observatory 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 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.

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 120s to 2,400s with an average value of 550s. 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 2,100 hours. 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 for FLWO and CTIO, respectively, while the corresponding values for emission-line spectra are 12 and 24 km/s.

The reduced spectra are available for further analysis at the Smithsonian Astrophysical Observatory Telescope Data Center[18] (hereafter, "2MRS web site"). For example, a list of galaxies with emission-line features is available for those interested in searching for nearby 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 7,069 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, 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

[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.

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

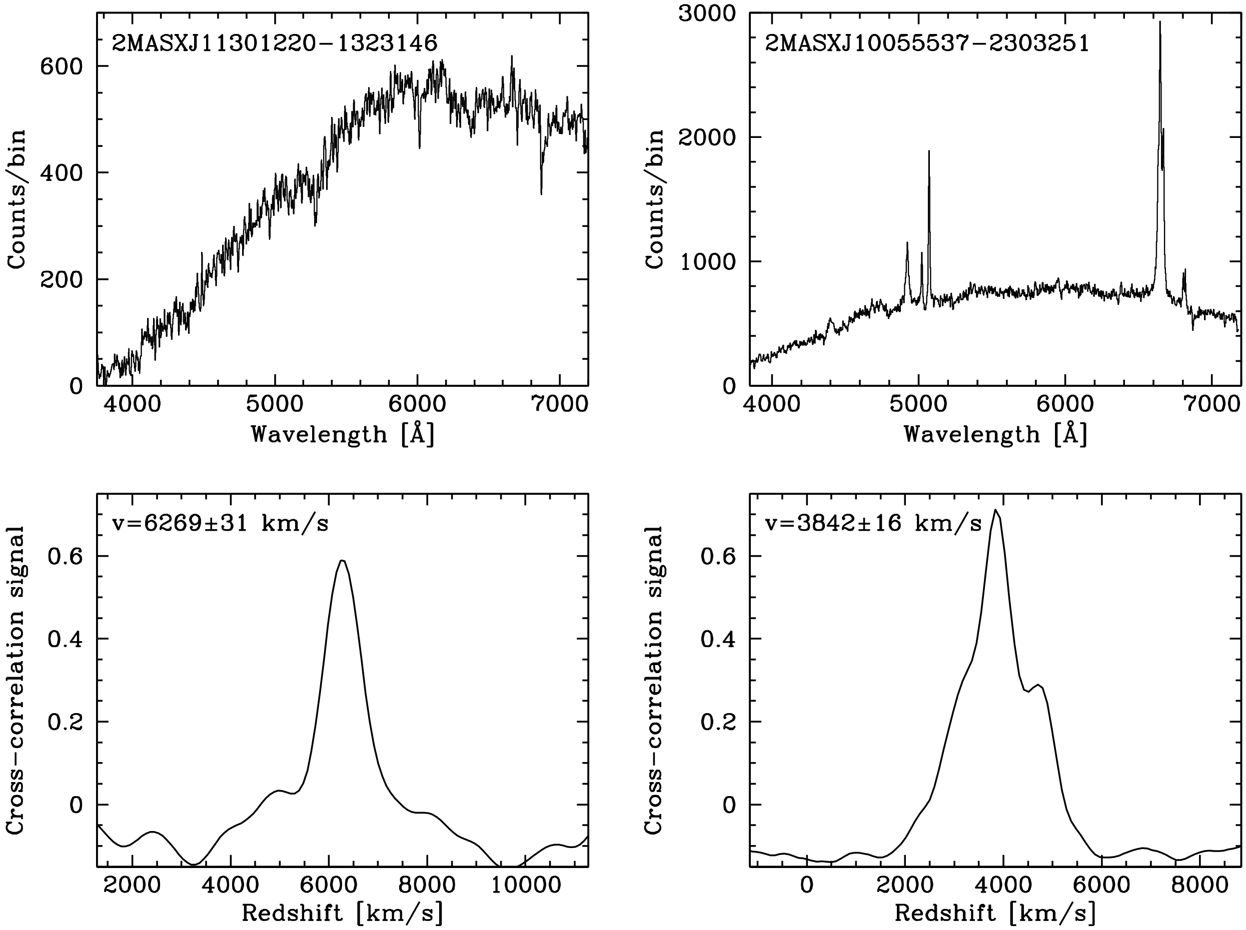

FIG. 3.— Top panels: Typical spectra obtained in this project. Left: absorption-line spectrum obtained at the FLWO 1.5-m telescope. Right: emission-line spectrum obtained at the CTIO 1.5-m telescope. Bottom panels: results of the cross-correlation technique used to measure the redshifts.

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

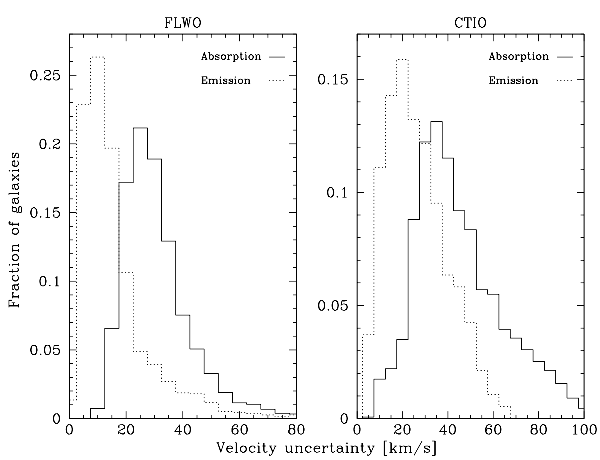

FIG. 4.— Distribution of velocity uncertainties for the galaxies observed at FLWO (left) and CTIO (right). The samples are further divided according to the absence or presence of emission lines.

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 John 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 John Huchra or collaborators prior to the start of 2MRS but 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 Table A5. 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 Table A6, to allow interested readers to assign a dif-

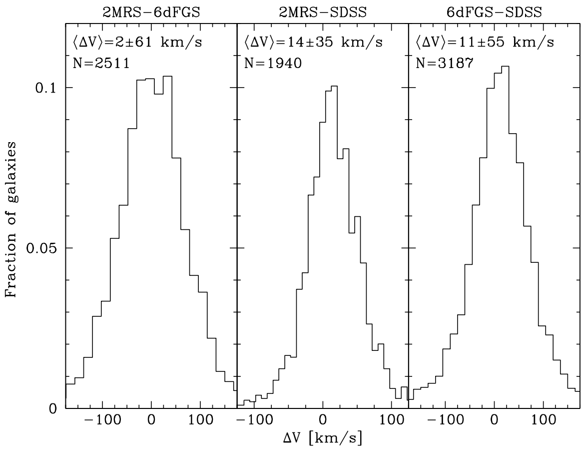

FIG. 5.— Histogram of velocity differences for galaxies observed by any two of 2MRS, 6dFGS or SDSS.

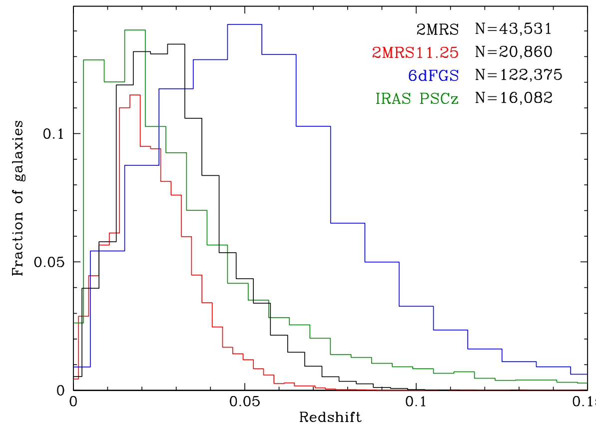

FIG. 6.— Distribution of galaxies as a function of redshift for 2MRS and for some of the redshift surveys listed in Table 1.

ferent 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 for $N = 2,511$ galaxies in 2MRS and 6dFGS; 14 ± 35 km/s for $N = 1,940$ galaxies in 2MRS and SDSS; 11 ± 55 km/s for $N = 3,187$ galaxies in 6dFGS and SDSS. The dispersions are consistent with the typical velocity uncertainties of each survey ($30 - 40$ km/s for 2MRS, $45 - 55$ km/s for 6dFGS and 5 km/s 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. Dec.: Declination (deg, J2000.0) [sup_dec]
4. l: Galactic longitude
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 §5 and Table A8)
24. t_src: source of galaxy type (JH=John Huchra; ZC=ZCAT; NN=not available)
25. v: redshift (km/s, barycentric)
26. $\sigma(v)$: uncertainty in redshift (km/s)
27. cat: code for redshift catalog (see notes for details).
28. v_src: NED bibliographic code for source of redshift (see Table A7 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 A7). We strongly encourage proper citation of the original publications when making use of any of these values.

Table A9 lists 4,291 redshifts for 2MASS galaxies which lie beyond the limits of our main catalog. 2,884 were observed as part of this project while 1,407 had been previously targeted by Huchra and collaborators for other

TABLE 3
2MRS Catalog (columns 1-13)

(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) $\sigma(H^0)$
	(deg)		(deg)					(mag)				
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
10051397−0743068	151.30824	-7.71858	247.78252	36.78094	5.921	6.148	6.810	5.867	6.092	6.748	0.016	0.015
11201502+1259286	170.06261	12.99129	241.96164	64.41846	5.939	6.195	6.881	5.869	6.126	6.806	0.016	0.016
14031258+5420555	210.80243	54.34875	102.03697	59.77156	5.940	6.204	6.894	5.509	5.800	6.510	0.021	0.019
02223290+4220539	35.63711	42.34832	140.38223	-17.41514	5.971	6.396	7.279	5.915	6.324	7.199	0.016	0.016
04074690+6948447	61.94545	69.81243	138.46324	13.11032	5.995	6.190	6.902	5.890	6.080	6.793	0.017	0.017
22370410+3424573	339.26709	34.41592	93.72210	-20.72380	6.081	6.332	7.077	5.996	6.240	6.978	0.016	0.015
09321011+2130029	143.04213	21.50083	208.71164	44.54013	6.089	6.376	7.003	6.025	6.314	6.924	0.016	0.016
11185595+1305319	169.73315	13.09221	241.33185	64.22169	6.104	6.342	7.018	6.057	6.294	6.967	0.016	0.016
12362080+2559146	189.08669	25.98739	230.76158	86.43781	6.125	6.408	7.225	6.055	6.305	7.148	0.015	0.015
09220265+5058353	140.51106	50.97648	166.94218	44.15141	6.153	6.381	7.084	6.057	6.286	6.993	0.016	0.016
19094609−6351271	287.44208	-63.85754	332.22400	-26.14640	6.182	6.434	6.971	5.920	6.179	6.689	0.020	0.018
11201701+1335221	170.07091	13.58949	240.85176	64.78079	6.211	6.528	7.351	6.064	6.361	7.150	0.016	0.016
12252405+1811278	186.35022	18.19108	267.71216	79.23713	6.249	6.496	7.146	6.134	6.399	7.033	0.016	0.016
09423326−0341568	145.63867	-3.69914	239.51228	35.01418	6.250	6.846	7.210	6.236	6.829	7.199	0.004	0.004
12261181+1256454	186.54922	12.94597	279.08353	74.63677	6.273	6.489	7.165	6.093	6.310	6.981	0.017	0.016
02402401+3903477	40.10005	39.06325	145.02322	-19.08913	6.311	6.546	7.208	6.217	6.452	7.105	0.016	0.016
12315921+1425134	187.99673	14.42041	282.32941	76.50777	6.321	6.604	7.257	6.254	6.538	7.178	0.016	0.016
09121949−2410213	138.08124	-24.17260	251.97076	16.35375	6.322	6.538	7.215	6.248	6.469	7.137	0.016	0.016
12250377+1253130	186.26575	12.88696	278.20502	74.47830	6.333	6.563	7.224	6.208	6.445	7.088	0.016	0.016
04161046−5546485	64.04361	-55.78014	265.63147	-43.69118	6.345	6.569	7.244	6.276	6.490	7.168	0.016	0.015
10474959+1234538	161.95667	12.58163	233.49026	57.63276	6.353	6.573	7.247	6.261	6.475	7.147	0.016	0.015
08524134+3325184	133.17227	33.42180	190.45485	38.76088	6.375	6.645	7.350	6.316	6.579	7.282	0.016	0.015
12502661+2530027	192.61089	25.50076	295.07944	88.35722	6.380	6.550	7.342	6.168	6.301	7.150	0.017	0.016
13295958+4715580	202.49829	47.26613	104.88158	68.48817	6.389	6.620	7.330	6.238	6.440	7.179	0.017	0.016
10464574+1149117	161.69060	11.81994	234.43549	57.01038	6.394	6.633	7.324	6.311	6.553	7.214	0.016	0.016
02461905−3016296	41.57941	-30.27491	226.91473	-64.68055	6.430	6.701	7.373	6.243	6.491	7.157	0.018	0.016
03382908−3527026	54.62118	-35.45074	236.71642	-53.63563	6.436	6.690	7.353	6.302	6.552	7.195	0.017	0.016
07365139+6536091	114.21415	65.60255	150.56915	29.18593	6.440	6.652	7.214	6.177	6.396	6.946	0.019	0.017
12483590−0548030	192.14961	-5.80085	301.63284	57.06368	6.492	6.712	7.356	6.357	6.577	7.209	0.017	0.016
13105631+3703321	197.73463	37.05894	101.61243	79.24929	6.496	6.782	7.505	6.439	6.724	7.444	0.015	0.015
12490218−0839514	192.25911	-8.66435	301.91714	54.20262	6.529	6.777	7.424	6.489	6.726	7.367	0.013	0.008
12340302+0741569	188.51262	7.69914	290.15945	70.13844	6.544	6.774	7.527	6.465	6.688	7.435	0.016	0.016
00145360−3911478	3.72334	-39.19663	332.88217	-75.73088	6.557	6.809	7.328	6.244	6.538	6.964	0.021	0.018
12155444+1308578	183.97685	13.14940	270.45587	73.73785	6.576	6.828	7.560	6.513	6.764	7.497	0.016	0.016
03333645−3608263	53.40191	-36.14066	237.95654	-54.59778	6.592	6.922	7.582	6.366	6.725	7.345	0.018	0.017
09453879−3111279	146.41164	-31.19109	262.57877	16.76339	6.604	6.838	7.465	6.374	6.608	7.238	0.020	0.018
12374359+1149051	189.43166	11.81809	290.39795	74.35513	6.608	6.834	7.469	6.472	6.683	7.336	0.018	0.017
11510178−2848223	177.75743	-28.80621	287.27591	32.22239	6.613	6.841	7.503	6.471	6.708	7.349	0.017	0.016
12420800+3232294	190.53337	32.54151	142.80600	84.22353	6.615	6.967	7.701	6.459	6.816	7.510	0.017	0.017
12424986+0241160	190.70778	2.68778	297.74844	65.47279	6.618	6.821	7.498	6.412	6.578	7.284	0.019	0.017
03385213−2620162	54.71721	-26.33784	221.53658	-52.78390	6.687	6.950	7.591	6.490	6.769	7.386	0.017	0.016
05074234−3730469	76.92643	-37.51305	241.21202	-35.90158	6.721	7.038	7.704	6.645	6.965	7.614	0.016	0.016
12364981+1309463	189.20757	13.16287	288.46741	75.62270	6.746	6.957	7.645	6.565	6.761	7.462	0.017	0.016
11181630−3248453	169.56792	-32.81260	281.21283	26.09979	6.765	6.970	7.621	6.570	6.754	7.387	0.018	0.016
08372462−5507254	129.35260	-55.12374	271.77490	-8.45706	6.781	7.005	7.658	6.610	6.833	7.458	0.018	0.017
11131710−2645179	168.32129	-26.75499	277.24646	31.17530	6.789	7.013	7.672	6.680	6.900	7.554	0.017	0.016
12242822+0719030	186.11761	7.31752	283.80698	69.18179	6.792	7.015	7.689	6.632	6.852	7.523	0.018	0.016

Note. — This table is presented in its entirety in the online version of the paper.

TABLE 3
2MRS Catalog (columns 14-26)

(1) 2MASS ID	(14) $\sigma(J^0)$	(15) $\sigma(K_t^0)$	(16) $\sigma(H_t^0)$ (mag)	(17) $\sigma(J_t^0)$	(18) E_{BV} (mag)	(19) $r_{\rm iso}$	(20) $r_{\rm ext}$ ($\log_{10}{}''$)	(21) b/a	(22) flags	(23) Type	(24) t_src	(25) v	(26) $\sigma(v)$ (km/s)
00424433 + 4116074	0.015	0.017	0.017	0.016	0.683	3.208	3.491	0.473	Z111	3A2s	ZC	-300	4
00473313 − 2517196	0.015	0.017	0.016	0.016	0.019	2.799	2.965	0.264	Z111	5X_s	ZC	243	2
09553318 + 6903549	0.015	0.018	0.018	0.016	0.080	2.688	2.878	0.517	Z111	2A2s	ZC	-34	4
13252775 − 4301073	0.015	0.016	0.017	0.016	0.115	2.445	2.613	0.957	Z111	-2__P	ZC	547	5
13052727 − 4928044	0.015	0.017	0.017	0.016	0.176	2.627	2.772	0.308	Z111	6B_s	ZC	563	3
01335090 + 3039357	0.017	0.044	0.038	0.029	0.041	2.699	3.032	0.792	Z111	5A4s	ZC	-179	3
09555243 + 6940469	0.015	0.015	0.015	0.015	0.156	2.357	2.542	0.396	Z111	0	ZC	203	4
03464851 + 6805459	0.018	0.043	0.040	0.033	0.558	2.571	2.876	0.858	Z111	6X2T	ZC	31	3
13370091 − 2951567	0.016	0.025	0.019	0.018	0.067	2.495	2.709	0.825	Z111	5X2s	ZC	513	2
12395949 − 1137230	0.015	0.017	0.015	0.015	0.051	2.305	2.473	0.682	Z111	1A_P	ZC	1024	5
00424182 + 4051546	0.015	0.017	0.016	0.016	0.155	2.168	2.360	0.913	Z111	-6	ZC	-200	6
12505314 + 4107125	0.015	0.016	0.016	0.015	0.018	2.236	2.414	0.847	Z111	2A3R	ZC	308	1
12564369 + 2140575	0.015	0.017	0.016	0.016	0.041	2.332	2.490	0.583	Z111	2A_T	ZC	408	4
20345233 + 6009132	0.017	0.034	0.029	0.025	0.342	2.402	2.680	0.770	Z111	6X1T	ZC	40	2
12294679 + 0800014	0.016	0.025	0.021	0.019	0.022	2.253	2.496	0.913	Z333	-5	ZC	997	7
13295269 + 4711429	0.016	0.025	0.020	0.019	0.035	2.296	2.549	0.902	Z111	4A1P	ZC	463	3
12185761 + 4718133	0.016	0.022	0.021	0.018	0.016	2.421	2.662	0.495	Z333	4X_s	ZC	448	3
03224178 − 3712295	0.015	0.019	0.018	0.017	0.021	2.220	2.470	0.792	Z133	-2X_P	ZC	1760	10
13154932 + 4201454	0.016	0.021	0.020	0.018	0.018	2.310	2.541	0.660	Z000	4A3T	ZC	484	1
02424077 − 0000478	0.015	0.016	0.015	0.015	0.033	1.978	2.162	0.880	Z111	3A_T	ZC	1137	3
12434000 + 1133093	0.015	0.021	0.017	0.017	0.026	2.166	2.383	0.891	Z111	-5	ZC	1117	6
03171859 − 4106290	0.015	0.024	0.021	0.019	0.013	2.157	2.513	0.891	Z111	0B_s	ZC	788	45
11054859 − 0002092	0.015	0.021	0.018	0.017	0.057	2.216	2.432	0.693	Z111	4X3T	ZC	801	3
00402207 + 4141070	0.017	0.045	0.040	0.029	0.085	2.450	2.760	0.594	Z111	-5	ZC	-241	3
12304942 + 1223279	0.015	0.019	0.018	0.017	0.023	2.134	2.368	0.990	Z111	-4__P	ZC	1307	7
10051397 − 0743068	0.015	0.017	0.016	0.016	0.046	2.216	2.397	0.451	Z111	-3	ZC	663	4
11201502 + 1259286	0.015	0.018	0.017	0.016	0.033	2.267	2.447	0.539	Z111	3X3s	ZC	727	3
14031258 + 5420555	0.017	0.050	0.042	0.032	0.009	2.373	2.721	0.979	Z111	6X1T	ZC	246	4
02223290 + 4220539	0.016	0.017	0.017	0.017	0.065	2.353	2.523	0.264	Z111	5A_s	ZC	528	4
04074690 + 6948447	0.016	0.019	0.019	0.017	0.421	2.200	2.355	0.803	Z111	2A_s	ZC	895	1
22370410 + 3424573	0.015	0.018	0.017	0.016	0.091	2.193	2.425	0.539	Z111	4A2s	ZC	816	1
09321011 + 2130029	0.015	0.018	0.017	0.016	0.031	2.212	2.393	0.616	Z133	4X2T	ZC	556	1
11185595 + 1305319	0.015	0.017	0.017	0.016	0.025	2.326	2.457	0.308	Z111	1X3T	ZC	807	3
12362080 + 2559146	0.015	0.017	0.017	0.016	0.015	2.281	2.513	0.330	Z111	3A1s	ZC	1230	5
09220265 + 5058353	0.015	0.019	0.017	0.016	0.015	2.258	2.459	0.495	Z111	3A1R	ZC	638	3
19094609 − 6351271	0.017	0.047	0.039	0.028	0.043	2.337	2.663	0.726	Z111	4X3R	ZC	841	2
11201701 + 1335221	0.016	0.023	0.023	0.020	0.027	2.403	2.680	0.286	Z111	3__P	ZC	825	2
12252405 + 1811278	0.015	0.021	0.020	0.017	0.030	2.170	2.399	0.781	Z111	-1A_P	ZC	729	2
09423326 − 0341568	0.002	0.005	0.004	0.002	0.054	1.852	1.997	0.560	0000	-5	ZC	1919	13
12261181 + 1256454	0.016	0.028	0.026	0.021	0.029	2.180	2.486	0.825	Z113	-5	ZC	-244	5
02402401 + 3903477	0.015	0.021	0.018	0.017	0.061	2.258	2.494	0.374	Z111	-2B_T	ZC	637	4
12315921 + 1425134	0.015	0.017	0.017	0.016	0.038	2.191	2.363	0.506	Z111	3A1T	ZC	2281	3
09121949 − 2410213	0.015	0.018	0.017	0.016	0.210	2.170	2.331	0.484	Z111	-2A_s	ZC	686	45
12250377 + 1253130	0.015	0.023	0.022	0.018	0.041	2.061	2.358	1.000	Z111	-5	ZC	1060	6
04161046 − 5546485	0.015	0.018	0.017	0.016	0.015	2.066	2.242	0.748	Z111	-2A_R	ZC	1201	16
10474959 + 1234538	0.015	0.018	0.017	0.016	0.025	2.033	2.283	0.979	Z111	-5	ZC	911	2
08524134 + 3325184	0.015	0.017	0.016	0.016	0.033	2.185	2.362	0.396	Z111	3A3t	ZC	411	1
12502661 + 2530027	0.016	0.031	0.026	0.024	0.012	2.242	2.562	0.704	Z111	2X1R	ZC	1206	3
13295958 + 4715580	0.016	0.030	0.023	0.021	0.035	2.094	2.416	0.990	Z111	0__P	ZC	465	10
10464574 + 1149117	0.015	0.023	0.019	0.018	0.025	2.086	2.336	0.726	Z111	2X_T	ZC	897	4
02461905 − 3016296	0.016	0.034	0.025	0.022	0.027	2.198	2.513	0.605	Z111	3B2s	ZC	1271	3
03382908 − 3527026	0.015	0.027	0.021	0.019	0.013	2.055	2.343	1.000	Z111	-5	ZC	1425	4
07365139 + 6536091	0.016	0.039	0.028	0.023	0.040	2.262	2.576	0.781	Z111	6X5s	ZC	131	3
12483590 − 0548030	0.015	0.027	0.020	0.019	0.029	2.093	2.381	0.803	Z111	-5	ZC	1241	2
13105631 + 3703321	0.015	0.016	0.016	0.016	0.014	2.117	2.296	0.484	Z111	3A3s	ZC	946	5
12490218 − 0839514	0.007	0.013	0.008	0.007	0.034	2.004	2.139	0.800	0000	3X_T	ZC	1277	45
12340302 + 0741569	0.016	0.020	0.018	0.017	0.022	2.179	2.395	0.385	Z000	-2X_s	ZC	448	8
00145360 − 3911478	0.016	0.049	0.036	0.025	0.013	2.437	2.760	0.330	Z111	9B_s	ZC	129	2
12155444 + 1308578	0.015	0.018	0.017	0.016	0.032	2.338	2.502	0.198	Z111	3X3s	ZC	131	4
03333645 − 3608263	0.017	0.036	0.031	0.026	0.020	2.132	2.441	0.825	Z111	3B2s	ZC	1664	45
09453879 − 3111279	0.017	0.043	0.031	0.029	0.108	2.234	2.530	0.726	Z111	5X1T	ZC	1088	2
12374359 + 1149051	0.016	0.031	0.025	0.021	0.041	2.079	2.358	0.946	Z111	3X_T	ZC	1517	1
11510178 − 2848223	0.016	0.030	0.022	0.021	0.081	2.078	2.363	0.814	Z111	-5	ZC	1807	45
12420800 + 3232294	0.016	0.024	0.025	0.020	0.017	2.348	2.617	0.264	Z113	7B5/	JH	606	3
12424986 + 0241160	0.016	0.035	0.027	0.023	0.029	2.130	2.416	0.836	Z111	-5	ZC	938	4
03385213 − 2620162	0.016	0.034	0.026	0.022	0.013	2.054	2.381	0.990	Z111	2B1R	ZC	1297	45
05074234 − 3730469	0.015	0.021	0.018	0.017	0.030	2.118	2.341	0.484	Z111	1X_s	ZC	968	45
12364981 + 1309463	0.016	0.027	0.024	0.020	0.047	2.218	2.524	0.484	Z000	2X_T	ZC	-235	4
11181630 − 3248453	0.016	0.036	0.024	0.023	0.081	2.213	2.513	0.528	Z111	7A6s	ZC	720	45
08372462 − 5507254	0.016	0.027	0.023	0.021	0.298	2.034	2.289	0.880	Z111	-2	ZC	1051	32
11131710 − 2645179	0.016	0.021	0.018	0.017	0.064	2.045	2.261	0.693	Z111	-5	ZC	1367	45
12242822 + 0719030	0.016	0.029	0.022	0.020	0.021	2.053	2.312	0.836	Z000	-5	ZC	1243	6

Note. — This table is presented in its entirety in the online version of the paper.

TABLE 3
2MRS Catalog (columns 27-29)

(1) 2MASS ID	(27) cat	(28) Bibcode	(29) Catalog ID
00424433 + 4116074	N	1991RC3.9.C...0000d	MESSIER 031
00473313 − 2517196	N	2004AJ....128...16K	NGC 0253
09553318 + 6903549	N	1991RC3.9.C...0000d	MESSIER 081
13252775 − 4301073	N	1978PASP...90..237G	NGC 5128
13052727 − 4928044	N	2004AJ....128...16K	NGC 4945
01335090 + 3039357	N	1991RC3.9.C...0000d	MESSIER 033
09555243 + 6940469	N	1991RC3.9.C...0000d	MESSIER 082
03464851 + 6805459	N	1999PASP..111..438F	IC 0342
13370091 − 2951567	N	2004AJ....128...16K	MESSIER 083
12395949 − 1137230	N	2000MNRAS.313..469S	MESSIER 104
00424182 + 4051546	N	2000UZC...C......0F	MESSIER 032
12505314 + 4107125	N	1993A&A...272...63M	MESSIER 094
12564369 + 2140575	N	1991RC3.9.C...0000d	MESSIER 064
20345233 + 6009132	N	2008MNRAS.388..500E	NGC 6946
12294679 + 0800014	N	2000MNRAS.313..469S	MESSIER 049
13295269 + 4711429	N	1991RC3.9.C...0000d	MESSIER 051a
12185761 + 4718133	N	1991RC3.9.C...0000d	MESSIER 106
03224178 − 3712295	N	1998A&AS..130..267L	NGC 1316
13154932 + 4201454	N	2008MNRAS.388..500E	MESSIER 063
02424077 − 0000478	N	1999ApJS..121..287H	MESSIER 077
12434000 + 1133093	N	2000AJ....119.1645T	MESSIER 060
03171859 − 4106290	6	20096dF...C...0000J	g0317186-410629
11054859 − 0002092	N	2004AJ....128...16K	NGC 3521
00402207 + 4141070	N	1991A&A...246..349B	MESSIER 110
12304942 + 1223279	N	2000MNRAS.313..469S	MESSIER 087
10051397 − 0743068	N	2006MNRAS.367..815N	NGC 3115
11201502 + 1259286	N	1991RC3.9.C...0000d	MESSIER 066
14031258 + 5420555	S	2011SDSS8.C...0000:	14031253+5420561
02223290 + 4220539	N	1991RC3.9.C...0000d	NGC 0891
04074690 + 6948447	N	1988ApJS...67....1T	IC 0356
22370410 + 3424573	N	1998AJ....115...62H	NGC 7331
09321011 + 2130029	N	1998AJ....115...62H	NGC 2903
11185595 + 1305319	N	1991RC3.9.C...0000d	MESSIER 065
12362080 + 2559146	N	1994PASJ...46..147S	NGC 4565
09220265 + 5058353	N	1991RC3.9.C...0000d	NGC 2841
19094609 − 6351271	N	2004AJ....128...16K	NGC 6744
11201701 + 1335221	S	2011SDSS8.C...0000:	11201701+1335228
12252405 + 1811278	N	2000MNRAS.313..469S	MESSIER 085
09423326 − 0341568	N	2008AJ....135.2424O	NGC 2974
12261181 + 1256454	N	2000MNRAS.313..469S	MESSIER 086
02402401 + 3903477	N	1991RC3.9.C...0000d	NGC 1023
12315921 + 1425134	N	1985AJ.....90.1681B	MESSIER 088
09121949 − 2410213	6	20096dF...C...0000J	g0912194-241021
12250377 + 1253130	N	2000AJ....119.1645T	MESSIER 084
04161046 − 5546485	C	20112MRS.CTIO.0000H	04161030-5546510
10474959 + 1234538	N	2000MNRAS.313..469S	MESSIER 105
08524134 + 3325184	N	1998AJ....115...62H	NGC 2683
12502661 + 2530027	N	1991RC3.9.C...0000d	NGC 4725
13295958 + 4715580	N	1991RC3.9.C...0000d	MESSIER 051b
10464574 + 1149117	N	1991RC3.9.C...0000d	MESSIER 096
02461905 − 3016296	N	2004AJ....128...16K	NGC 1097
03382908 − 3527026	N	1998A&AS..133..325G	NGC 1399
07365139 + 6536091	N	1991RC3.9.C...0000d	NGC 2403
12483590 − 0548030	N	2000MNRAS.313..469S	NGC 4697
13105631 + 3703321	N	1991RC3.9.C...0000d	NGC 5005
12490218 − 0839514	6	20096dF...C...0000J	g1249022-083952
12340302 + 0741569	N	1991RC3.9.C...0000d	NGC 4526
00145360 − 3911478	N	2004AJ....128...16K	NGC 0055
12155444 + 1308578	N	1991RC3.9.C...0000d	NGC 4216
03333645 − 3608263	6	20096dF...C...0000J	g0333364-360826
09453879 − 3111279	N	2004AJ....128...16K	NGC 2997
12374359 + 1149051	N	2008AJ....136..713K	MESSIER 058
11510178 − 2848223	6	20096dF...C...0000J	g1151017-284821
12420800 + 3232294	N	1991RC3.9.C...0000d	NGC 4631
12424986 + 0241160	N	2000MNRAS.313..469S	NGC 4636
03385213 − 2620162	6	20096dF...C...0000J	g0338521-262016
05074234 − 3730469	6	20096dF...C...0000J	g0507423-373046
12364981 + 1309463	N	1991RC3.9.C...0000d	MESSIER 090
11181630 − 3248453	6	20096dF...C...0000J	g1118165-324851
08372462 − 5507254	N	1992ApJS...83...29S	NGC 2640
11131710 − 2645179	6	20096dF...C...0000J	g1113171-264518
12242822 + 0719030	N	2000MNRAS.313..469S	NGC 4365

Note. — This table is presented in its entirety in the online version of the paper.
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, [6]dFGS.

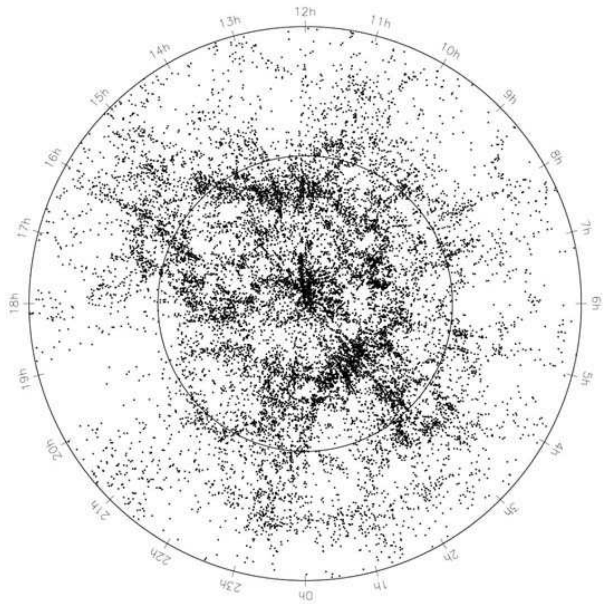

FIG. 7.— Hockey Puck plot — a full cylinder section — of 2MRS in the north celestial cap. The view is looking downwards from the NCP, the thickness of the "puck" is 8,000 km/s and its radius is 15,000 km/s.

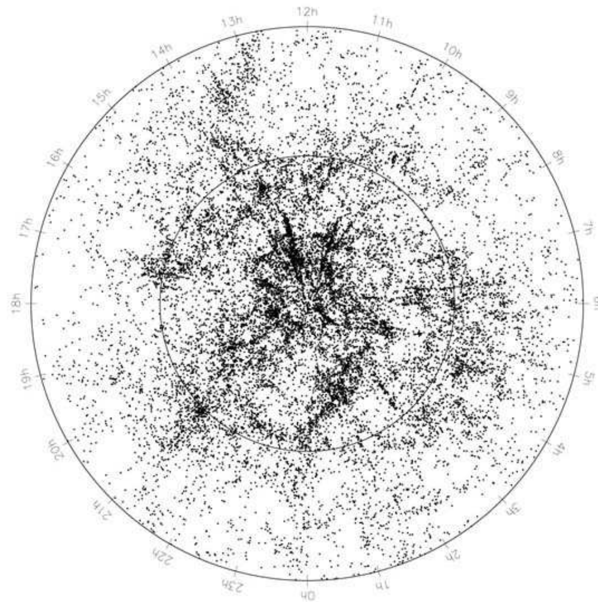

FIG. 8.— Same as Fig. 7 but for the south celestial cap.

projects. Lastly, Table A10 presents redshifts for 14 galaxies that are not in the 2MASS XSC but which were observed serendipitously due to their proximity to our targets.

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

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.

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. 1995a, 1999a). Plotted are top-down views of cylindrical volumes with a radius of 15000 km/s and thickness of 8000 km/s, yielding an aspect ratio of about 3.5 to 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 $K_s \leq 11.75$ mag. Many of our favorite structures and several prominent voids are easily seen in these plots.

The northern puck is dominated by the Local Supercluster at the center, the Great Wall (now straight in this cylindrical projection!) at 10-14.5 hours and Pisces-Perseus at 0-5 hours. In addition, there are several new but smaller structures such as the one at 19 hours and 4,000 km/s, 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. 1998a) between 0 and 4 hours, the southern part of the Local Supercluster at the center, and the Hydra-Centaurus region, but also a large and diffuse overdensity between 19 and 22 hours, 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 the Appendix.

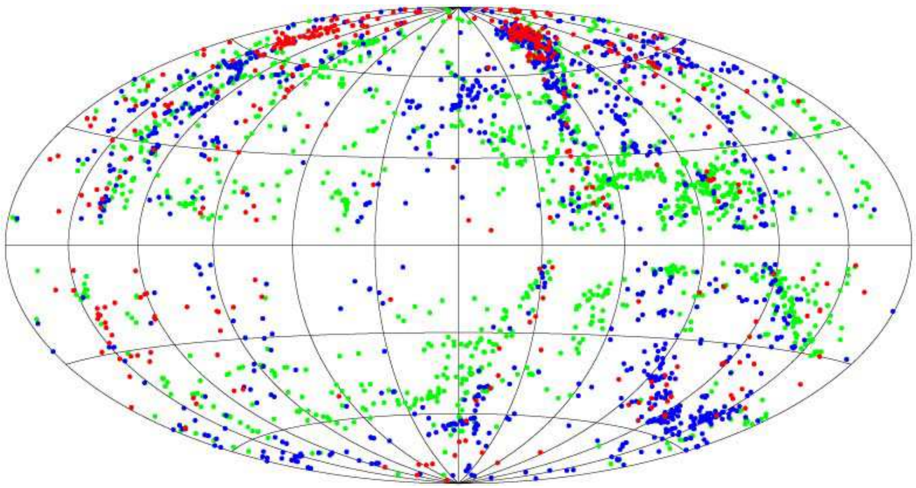

FIG. 9.— 2MASS galaxies inside the 3,000 km/s sphere in Galactic coordinates (centered at $l = 0°$ and following the convention of l increasing to the left). Heliocentric velocities are color coded with red, blue & green representing bins of increasing redshift/distance. Red for $V_h < 1,000$ km/s, blue for $1,000 < V_h < 2,000$ km/s, and green for $2,000 < V_h < 3,000$ km/s.

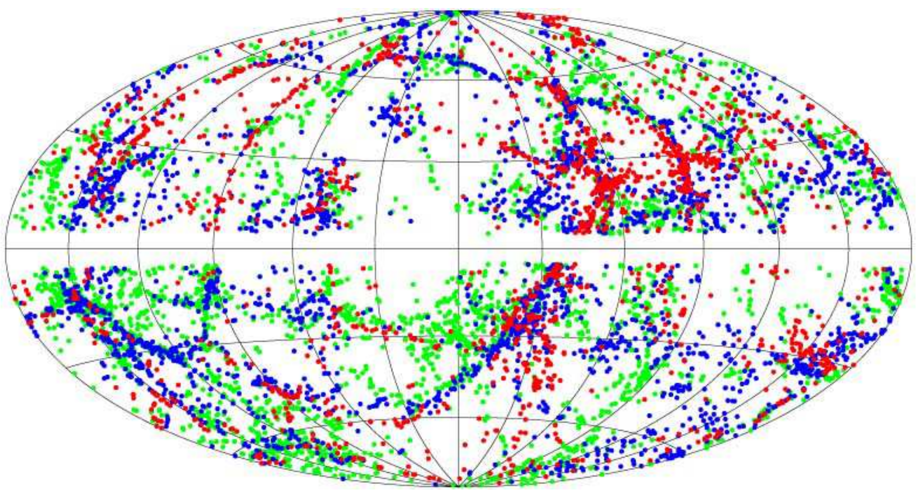

FIG. 10.— Same as Fig. 9, but for velocities between 3,000 and 6,000 km/s.

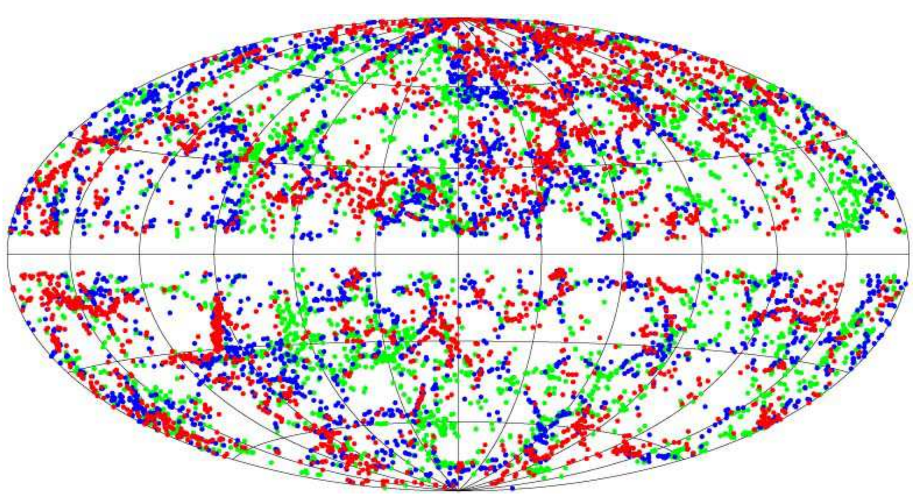

FIG. 11.— Same as Fig. 9, but for velocities between 6,000 and 9,000 km/s.

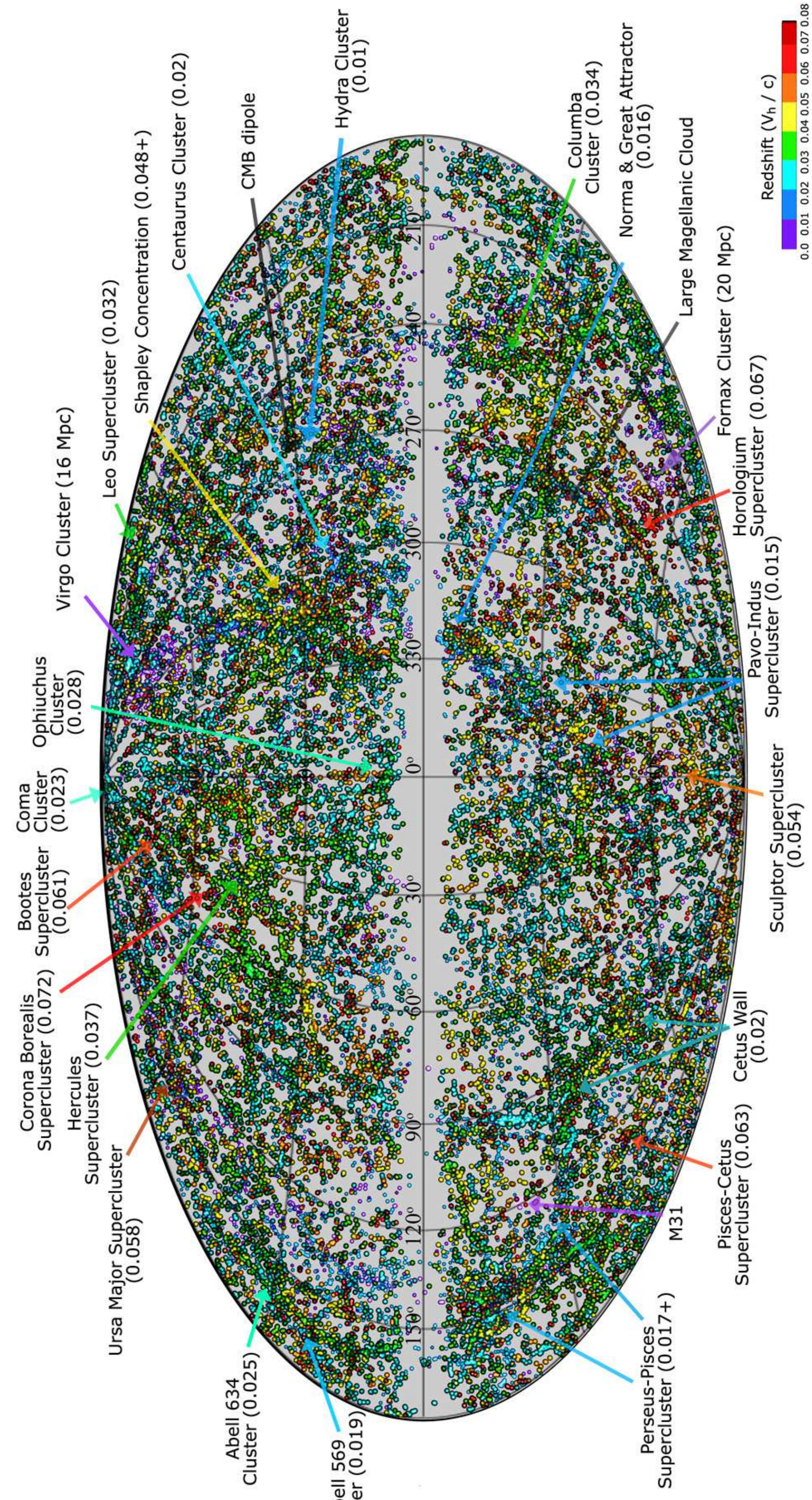

FIG. 12.— Same as Fig. 9 but for all 2MRS galaxies, spanning the entire redshift range covered by the survey (from $z = 0$ in purple to $z = 0.08$ in red).

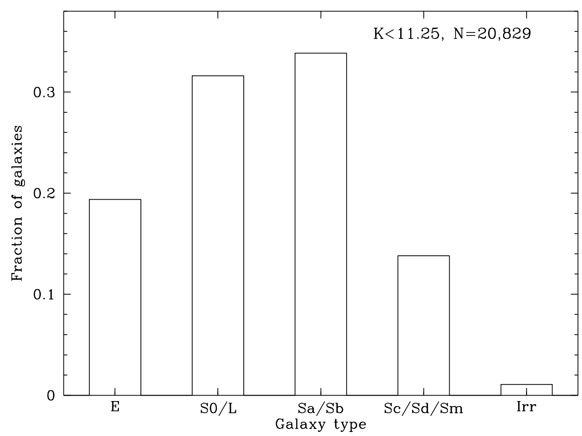

FIG. 13.— Histogram of the distribution of galaxy types for the $K_s < 11.25$ mag, $|b| > 10°$ sample.

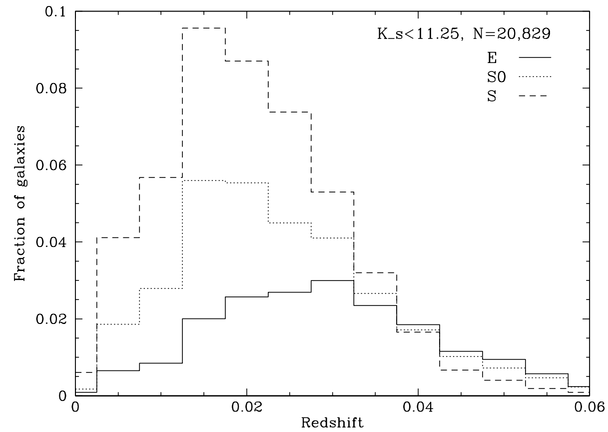

FIG. 14.— Histogram of 2MRS11.25 galaxies as a function of redshift for the three main morphological classes.

Figure 9 shows the distribution on the sky of all galaxies in the survey inside 3000 km/s color coded by redshift in 1000 km/s skins. The plane of the Local Supercluster dominates the map, but there is also a diffuse component between 2000 and 3000 km/s and 6 to 13 hours 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 towards a point around $l = 270°, b = 30°$.

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 ZCAT (based on RC3, NED and other catalogs) when available, but 5,682 of these galaxies had no type information. They were visually examined and classified by one of us (J.P.H.) 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 A8.

The distribution of the galaxies in 2MRS11.25 by morphological type is shown in Fig. 13, while Fig. 14 shows histograms by redshift for the three broad morphological classes described above. While the histograms show the same pattern as Fig. 6, spirals dominate the dataset 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:

- Erdoğdu et al. (2006a) calculated the acceleration on the Local Group (LG). Their estimate of the dipole seems to converge to the cosmic microwave background (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.

- Erdoğdu et al. (2006b) calculated density and velocity fields. All major local superclusters and voids were successfully identified, and backside infall on to the "Great Attractor" region (at 50 h^{-1} Mpc) was detected.

- 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.

- 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).

- Erdoğdu & Lahav (2009) predicted the acceleration of the Local Group 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 concentrations to explain the misalignment between the CMB velocity vector and the 2MRS dipole.

- Lavaux et al. (2010) derived the peculiar velocity field for 2MRS11.25 using an orbit-reconstruction algorithm and estimated the mean matter density within 3,000 km/s 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.

- Davis et al. (2011) compared 2MRS11.25 to the SFI++ peculiar velocity survey (Masters et al. 2006; Springob et al. 2007a) 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 and extremely uniform, deep and unbiased survey of the nearby Universe. The 2MASS Redshift Survey 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.

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- the VizieR catalog access tool operated at the CDS, Strasbourg, France.

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- NASA's Astrophysics Data System at the Harvard-Smithsonian Center for Astrophysics.

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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, Jr., J. E., Anderson, S. F., Annis, J., Bahcall, N. A., & 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
Zaroubi, S., Hoffman, Y., Fisher, K. B., & Lahav, O. 1995, ApJ, 449, 446
Zwaan, M. A., Briggs, F. H., Sprayberry, D., & Sorar, E. 1997, ApJ, 490, 173
Zwicky, F. & Zwicky, M. A. 1971, Catalogue of selected compact galaxies and of post-eruptive galaxies (Guemligen: Zwicky)

APPENDIX

In this Appendix, we present all-sky plots of the 2MRS data set in equatorial coordinates as well as ancillary tables.

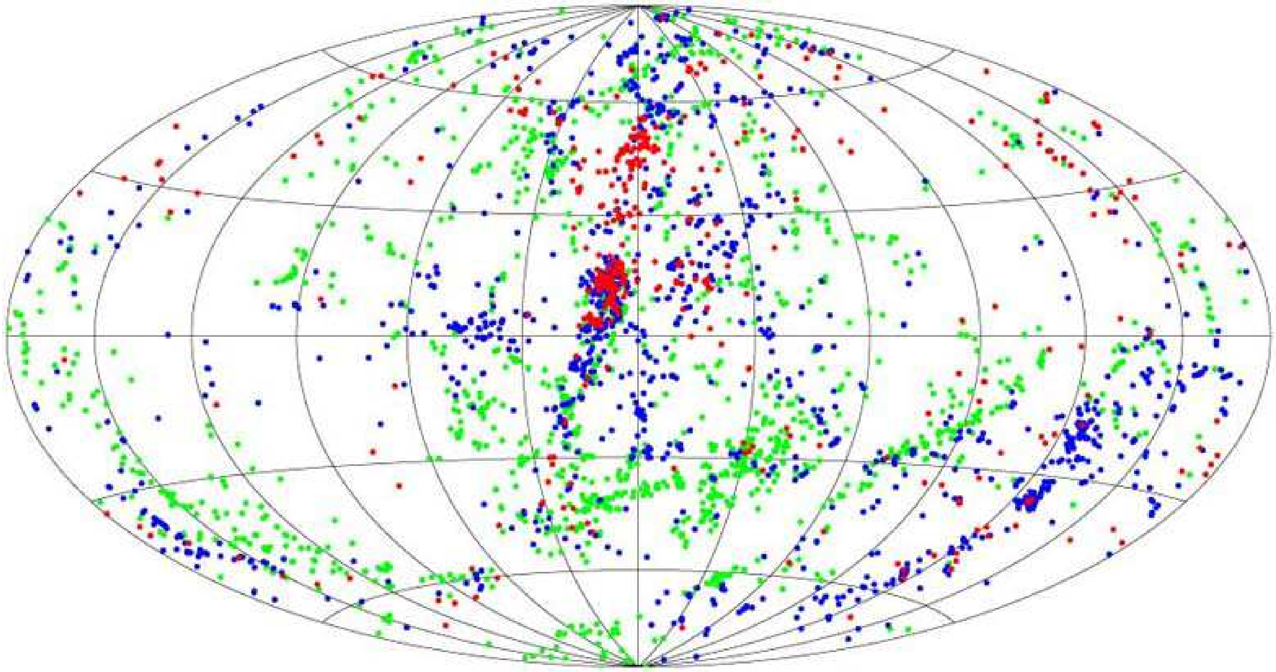

FIG. A1.— 2MASS galaxies inside the 3,000 km/s sphere in equatorial coordinates (centered at R.A.= 0° and following the convention of R.A. increasing to the left). Heliocentric velocities are color coded with red, blue & green representing bins of increasing redshift/distance. Red for $V_h < 1,000$ km/s, blue for $1,000 < V_h < 2,000$ km/s, and green for $2,000 < V_h < 3,000$ km/s.

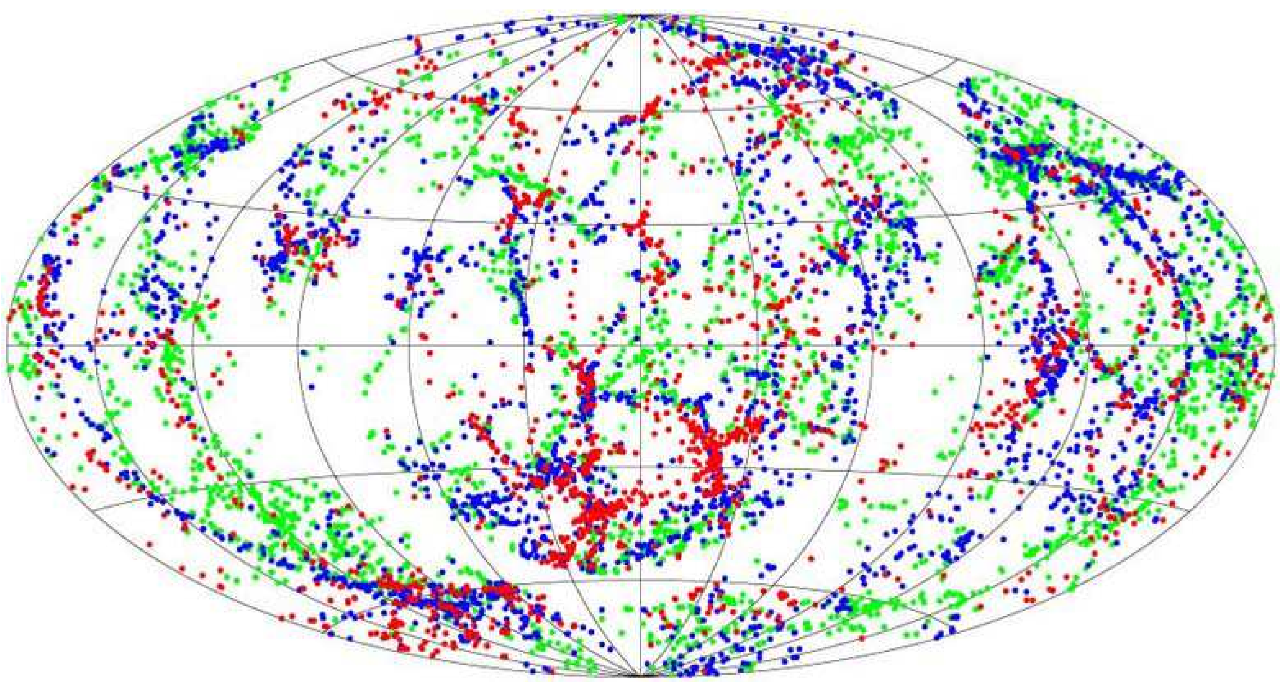

FIG. A2.— Same as Fig. A1, but for velocities between 3,000 and 6,000 km/s.

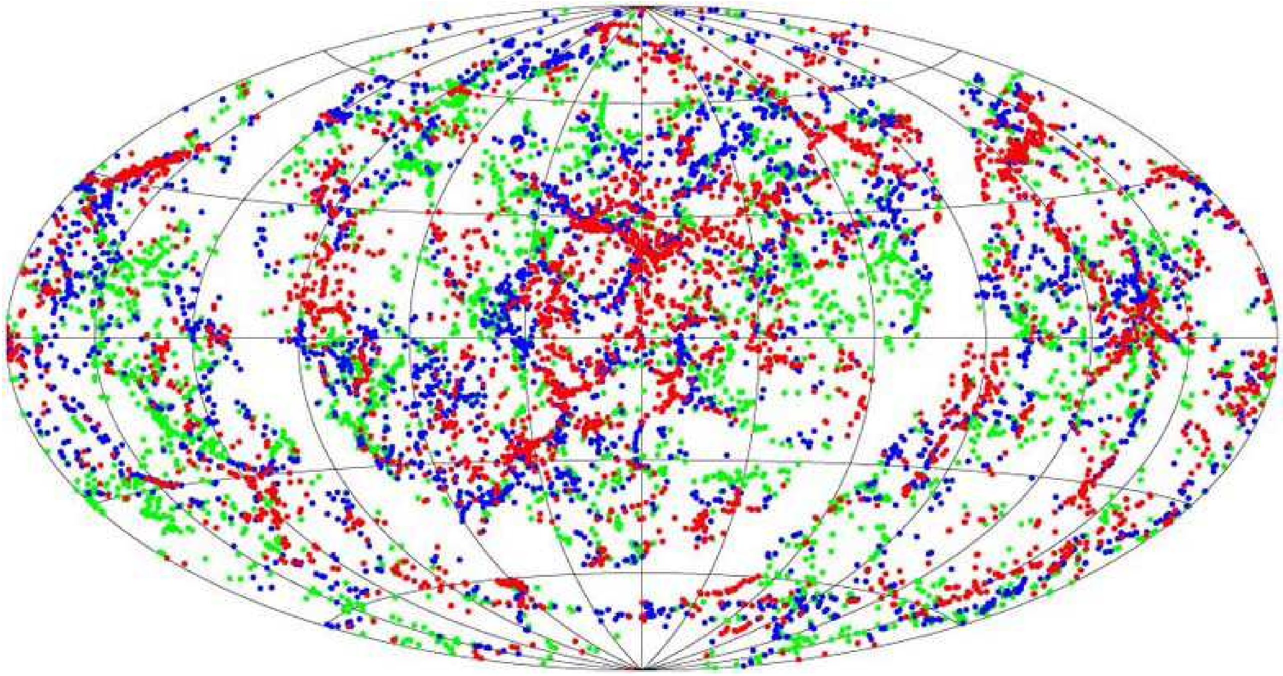

FIG. A3.— Same as Fig. A2, but for velocities between 6,000 and 9,000 km/s.

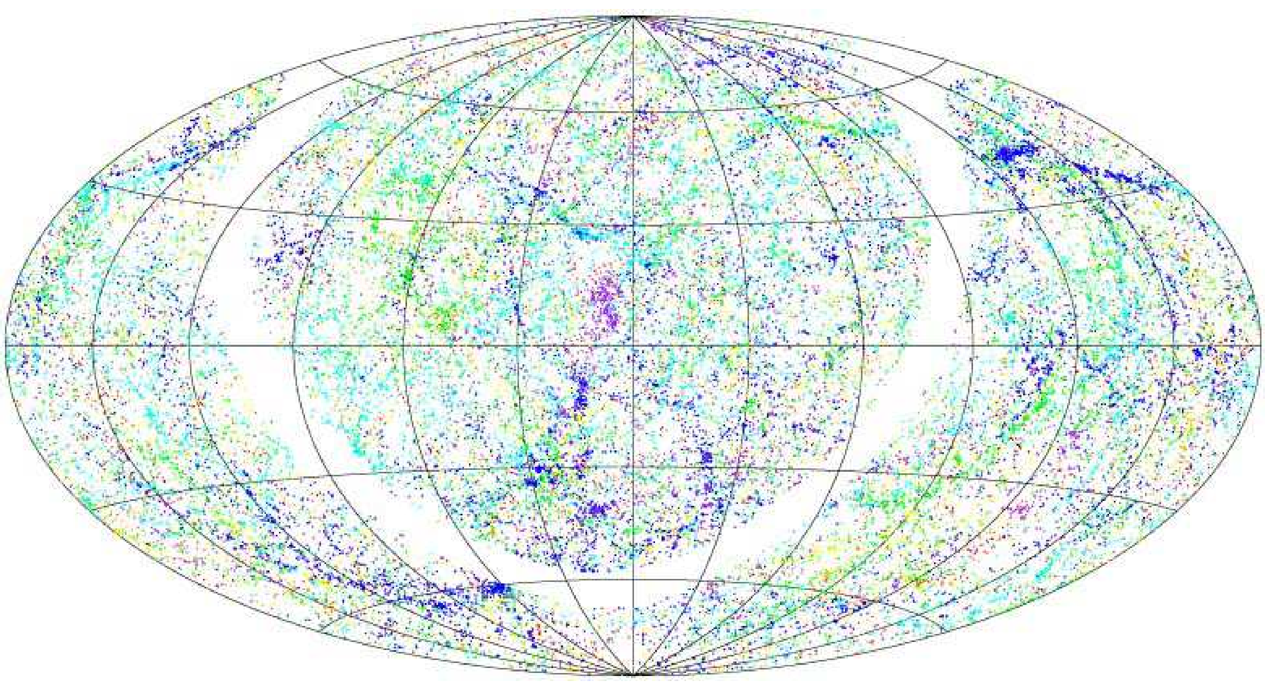

FIG. A4.— Same as Fig. 12, but in equatorial co-ordinates (centered at R.A.= 0° and following the convention of R.A. increasing to the left).

TABLE A1
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	HII region in SMC
01244565 + 0959356	Piece of galaxy 01244588+0959403
01244585 + 0959406	Piece of galaxy 01244588+0959403
01500012 + 5354469	Image flaw
01533610 + 4357488	Piece of galaxy 01533629+4357558
01550198 − 2600581	Piece of galaxy 01545983-2601101
02041855 + 2839171	Piece of galaxy 02041854+2839224
02115327 + 7026364	Piece of galaxy 02115039+7026384
02175760 + 1433128	Piece of galaxy 02175963+1432387
02213358 + 7038115	Piece of galaxy 02213090+7038118
02224353 + 4225299	Piece of galaxy 02223290+4220539

Note. — This table is presented in its entirety in the online version of the paper.

TABLE A2
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
03574256 − 4854409	10.099	1.895	0.360	03574243 − 4854305	10.422	1.623	0.610
03593974 − 6738201	8.473	1.964	0.260	03593747 − 6738062	8.657	2.022	0.360
04042675 − 0211464	9.952	2.041	0.120	04042714 − 0211210	9.912	1.771	0.320
06054172 − 8637550	8.142	1.951	0.220	06054236 − 8637553	8.145	1.945	0.200
06455492 − 1812493	10.121	1.617	1.000	06455279 − 1812389	9.032	1.734	0.860
07213023 + 5545416	10.124	1.484	0.580	07213034 + 5545413	10.483	1.459	0.960
08173227 − 4537124	10.422	1.380	0.600	08173216 − 4537115	10.460	1.418	0.580
08533273 + 5118493	7.553	1.906	0.840	08533275 + 5118489	7.587	1.884	0.840
09102011 + 0702165	7.098	1.988	0.760	09102015 + 0702160	7.134	1.973	0.750
09134303 + 7628312	8.836	1.790	0.400	09134319 + 7628311	8.813	1.761	0.390
09135561 − 6939089	8.816	1.822	0.520	09135049 − 6938420	7.886	1.870	0.610

Note. — This table is presented in its entirety in the online version of the paper. 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.

TABLE A3
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
03504306 + 7407352
03582336 − 4428024
04055073 + 3043032
04222904 − 5620157
04531024 + 3423105
05100496 − 1456598
05453957 + 5836099
05495771 + 5023330
06100970 − 3406499
06413093 + 4010268
07114179 + 4952003
07351844 − 5014596

Note. — This table is presented in its entirety in the online version of the paper. 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.

TABLE A4
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
01115336 + 2743193
01422276 − 1317152
01551704 + 5507250
01564822 + 3559412
02021375 − 6926541
02113146 + 5112023
02142526 + 4934260
02210796 − 0259054
02213090 + 7038118
02343012 + 1935176
02575308 + 1301508
03154885 + 4820359
03175766 − 4414175
03372681 + 0336579

Note. — This table is presented in its entirety in the online version of the paper. 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.

TABLE A5
Alternative redshifts chosen over default NED redshifts (columns 1-10)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
2MASS ID	NED				Alternative				
	v (km/s)	σ_v	Qual	Bibcode	v (km/s)	σ_v	cat	sep ′	Bibcode
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
00135592 + 0342508	...	...	...	...	11802	32	M	0.0	1999ApJS..121..287H
00150718 − 2912377	...	...	...	...	7675	64	M	0.0	20032dF...C...0000C
00181767 + 1714511	...	...	...	...	5757	10	M	0.0	2003A&A...412...57P
00253146 − 3302458	...	...	...	...	14900	64	M	0.0	20032dF...C...0000C
00284573 − 3224236	...	...	...	...	13761	27	M	0.0	1991ApJS...75..935d
00315278 − 8120574	...	...	...	...	8394	300	M	0.0	1991MNRAS.248..528A
00324503 − 3310151	...	...	...	...	14810	64	M	0.0	20032dF...C...0000C
00354637 − 2829042	...	...	...	...	7075	64	M	0.0	20032dF...C...0000C
00380733 − 2504033	...	...	...	...	19952	15	M	0.0	2005AJ....130.2012W
00383973 + 1724113	...	...	...	...	5428	7	M	0.1	1993A&AS..102...57B
00391373 − 2206079	...	...	...	...	19726	78	M	0.0	1989A&AS...79..147V
00494204 − 3017431	...	...	...	...	14090	89	M	0.0	20032dF...C...0000C
00540394 + 7305052	...	...	...	...	4706	22	M	0.1	1992ApJS...83...29S
00593601 + 1259106	...	...	...	...	12090	33	M	0.0	1999MNRAS.305..259W
01120089 − 3334066	...	...	...	...	9923	89	M	0.0	20032dF...C...0000C
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
01155764 + 0510435	5827	1	...	2006AJ....131..185R	5294	17	M	0.0	2003AJ....126.2268W
01194146 − 3306209	9286	8	...	2003A&A...412...57P	5813	35	M	0.0	1998AJ....116....1D
02471331 + 1631590	8517	20	...	1995ApJ...449..527L	11794	36	M	0.0	1995ApJS..100...69F
03153355 − 1552455	34674	39	...	1993AJ....105.1637H	24977	51	M	0.0	1993AJ....105.1637H
04045553 + 2049474	5204	10	...	1991RC3.9.C...0000d	6163	1	M	0.0	2005ApJS..160..149S
04385474 + 1850204	3290	34	...	1992ZCAT..M...0000H	3255	30	M	0.0	1997MNRAS.291..461S
04462945 − 5636343	12411	...	...	1992NED11.R......1N	12418	29	M	0.0	1985LCS.......0000D
05593646 − 5519555	11002	...	...	1992NED11.R......1N	11000	44	M	0.0	1988MNRAS.235..813C
06473579 − 6542012	11002	...	...	1992NED11.R......1N	11005	38	M	0.0	1985LCS.......0000D
07012902 + 2313260	27581	...	...	1992NED11.R......1N	27570	...	M	0.0	1973ApJ...182L..13S
07112302 + 3010040	6547	27	...	1998A&AS..130..333T	7555	29	M	0.0	1996AJ....112.1803M
07142032 + 7328242	2728	...	...	1979AJ.....84.1811D	2707	1	M	0.0	2005ApJS..160..149S
07142057 + 7328502	2735	...	...	1992NED11.R......1N	2707	1	M	0.0	2005ApJS..160..149S
07253739 + 1907403	5354	30	...	1988PASP..100.1423M	8351	38	M	0.0	1991RC3.9.C...0000d
09592102 + 0117518	29799	...	PRED	2009ApJ...692..511W	29260	64	M	0.1	20032dF...C...0000C
13482179 + 2540313	11086	41	...	1995A&AS..110...19D	15381	41	M	0.0	1999PASP..111..438F
13495692 + 7109522	9000	43	...	1991RC3.9.C...0000d	10276	27	M	0.0	1983ApJS...52...89H
14245369 + 1702165	14775	...	...	1992CORV..C...0000F	16033	64	M	0.0	1999PASP..111..438F
15375345 + 5923304	1764	46		1991RC3.9.C...0000d	2527	9	M	0.0	2005ApJS..160..149S
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
00544855 + 1150280	11425	408	...	1995A&AS..109..537H	11852	51	O	0.0	20112MRS.MMT..0000H
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
01532586 + 7115067	6595	300	...	1996MNRAS.281..425M	6838	38	O	0.0	20112MRS.JPH..0000H
01541714 + 3418581	25752	60	...	2001ApJS..134..355M	25033	22	O	0.0	20112MRS.FLWO.0000H
02051713 + 3447192	4419	4	...	1997AJ....113.1197H	11909	48	O	0.0	20112MRS.ZMA..0000H
02080351 + 2021204	8244	...	...	1992NED11.R......1N	8231	...	O	0.0	1980Ap.....16....1M
02254561 + 2713160	4399	20	...	1999PASP..111..438F	9666	25	O	0.0	1999PASP..111..438F
02422903 + 1809528	9508	5	...	1993AJ....105.1271G	7770	35	O	0.0	20112MRS.ZMA..0000H
02462037 + 4457078	5603	11	...	1998A&AS..130..333T	7338	50	O	0.0	20112MRS.ZMA..0000H
02503539 + 1603253	15331	20	...	1993AJ....105.1271G	9603	48	O	0.0	20112MRS.ZMA..0000H
02520181 + 1354119	14869	68	...	1997AJ....114..122G	9849	80	O	0.0	20112MRS.MMT..0000H
02555624 + 1558224	10394	20	...	1993AJ....105.1271G	8947	33	O	0.0	20112MRS.ZMA..0000H
03163058 + 1527499	10793	...	...	2007CBET.1026A...1:	11833	35	O	0.0	20112MRS.MMT..0000H
03500758 + 1741041	10057	20	...	1993AJ....105.1271G	8086	29	O	0.0	20112MRS.JPH..0000H
04471879 − 4440538	10433	...	...	1992NED11.R......1N	10419	...	O	0.0	1987AJ.....94..563S
05002077 + 0916555	10822	...	...	1995ApJ...449..527L	11511	44	O	0.0	20112MRS.ZMA..0000H
05155246 + 0618143	8574	30	...	1988AJ.....96.1775O	9209	17	O	0.0	1995MNRAS.276.1341J
05162271 + 1927112	6342	50	...	1994A&AS..104..529T	5620	39	O	0.0	2000MNRAS.317...55S

Note. — This table is presented in its entirety in the online version of the paper. A few representative lines are provided here for guidance on its format and contents. Code for column 8: NED position [M]atch, [O]ther sources in ZCAT.

TABLE A5
Alternative redshifts chosen over default NED redshifts (column 11)

(1) 2MASS ID	(11) Comments
No redshift in NED for 2MASS XSC ID, but redshift exists under another ID	
00014401 − 3025082	
00062997 − 3218179	
00072080 − 2807072	
00084652 − 3100399	
00105717 − 3512292	
00135592 + 0342508	
00141513 − 2816502	
00150718 − 2912377	
00181767 + 1714511	
00253146 − 3302458	
00284573 − 3224236	
00315278 − 8120574	
00324503 − 3310151	
00354637 − 2829042	
00380733 − 2504033	
00383973 + 1724113	
00391373 − 2206079	
00494204 − 3017431	
00540394 + 7305052	
00593601 + 1259106	
Several discrepant redshifts in NED; alternative value given preference over default one	
00570857 − 2155112	only z in NED with known provenance
01155764 + 0510435	agrees with SAO/TDC spectral archive #T00843
01194146 − 3306209	agrees with 1998MNRAS.300..417R & 20032dF...C...0000C
02471331 + 1631590	give preference to optical over HI measurement
03153355 − 1552455	yields more reasonable M_K
04462945 − 5636343	in RC3, use proper bibcode
05593646 − 5519555	in RC3, use proper bibcode
06473579 − 6542012	in RC3, use proper bibcode
07012902 + 2313260	
07112302 + 3010040	agrees with 2005ApJS..160..149S
07142032 + 7328242	use *cz* for GPair
07142057 + 7328502	NED value has unknown provenance; use *cz* for GPair
07253739 + 1907403	typo in 1988PASP..100.1423M? RC3 value agrees with UZC
09592102 + 0117518	double-nucleus, single object in 2MASS XSC
13482179 + 2540313	agrees with SDSS *cz* for VV191b
13495692 + 7109522	SAO/TDC spectral archive #T01644
14245369 + 1702165	prefer UZC over older measurement
15375345 + 5923304	agrees with UZC value already listed in NED
Disagreement between NED and ZCAT redshifts; latter value given preference	
00344891 + 0727013	SAO/TDC spectral archive #T26890
00544855 + 1150280	SAO/TDC spectral archive #M09249
01193495 + 3210495	
01465644 + 3206354	SAO/TDC spectral archive #T26803
01532586 + 7115067	
01541714 + 3418581	Observed for another project on 1994-01-19
02051713 + 3447192	SAO/TDC spectral archive #T21575
02080351 + 2021204	
02254561 + 2713160	Typo when entering *cz* in NED?
02422903 + 1809528	SAO/TDC spectral archive #T17131
02462037 + 4457078	SAO/TDC spectral archive #T24859
02503539 + 1603253	SAO/TDC spectral archive #T24777
02520181 + 1354119	SAO/TDC spectral archive #M10067
02555624 + 1558224	SAO/TDC spectral archive #T16941
03163058 + 1527499	SAO/TDC spectral archive #M09259
03500758 + 1741041	
04471879 − 4440538	
05002077 + 0916555	SAO/TDC spectral archive #T17873
05155246 + 0618143	
05162271 + 1927112	in HyperLEDA

Note. — This table is presented in its entirety in the online version of the paper. A few representative lines are provided here for guidance on its format and contents.

TABLE A6
Redshifts from 6dFGS, SDSS or NED for galaxies also observed by 2MRS

2MASS ID	v (km/s)	$\sigma(v)$ (km/s)	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
00073223 − 4849360	10583	45	6	20096dF...C...0000J
00091024 − 2647012	19139	45	6	20096dF...C...0000J
00102524 − 5659209	9640	45	6	20096dF...C...0000J
00112290 − 5657264	9775	45	6	20096dF...C...0000J
00112521 − 4844004	20622	45	6	20096dF...C...0000J
00115036 − 2518433	19380	45	6	20096dF...C...0000J
00154647 − 5913412	9277	45	6	20096dF...C...0000J
00163965 + 0136383	13407	20	N	1996ApJS..105..209I
00164632 + 0112373	13207	3	S	2011SDSS8.C...0000:
00172425 − 3449344	19389	45	6	20096dF...C...0000J
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00213137 + 3804367	10463	300	N	1998A&AS..127..521W
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00351120 − 4359058	7592	45	6	20096dF...C...0000J
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00362002 − 5911113	8991	45	6	20096dF...C...0000J
00373410 + 0933247	12033	...	N	2005ApJS..160..149S
00385919 − 2219519	19413	45	6	20096dF...C...0000J
00395598 + 0650550	11998	12	N	2000MNRAS.313..469S
00395695 − 3417088	11643	45	6	20096dF...C...0000J
00402804 + 0643114	11346	10	N	2000MNRAS.313..469S
00413983 − 4219154	5964	31	6	20096dF...C...0000J
00425124 − 7958572	4163	250	N	2006MNRAS.366..267F
00464070 − 2753545	18080	45	6	20096dF...C...0000J
00504184 − 5213116	7763	45	6	20096dF...C...0000J
00504652 − 2135137	17267	45	6	20096dF...C...0000J
00510924 − 4606335	9945	45	6	20096dF...C...0000J
00524107 − 8351185	4689	20	N	2003AJ....126.2268W
00524245 − 5531260	7167	45	6	20096dF...C...0000J
00530553 − 0337456	15493	27	N	2003AJ....126.2152R
00541843 − 6153345	8306	45	6	20096dF...C...0000J
00543280 − 2329415	9900	45	6	20096dF...C...0000J
00544941 + 1032160	11923	102	N	1995A&AS..109..537H
00553570 − 6018078	8253	45	6	20096dF...C...0000J
00560140 − 7430406	10369	...	N	2001A&A...371..895D
00562074 + 1351434	11934	5	S	2011SDSS8.C...0000:
00574786 − 0506435	5487	4	N	2005AJ....130.1037C
00585613 − 1652072	10945	45	6	20096dF...C...0000J
00591354 − 0222413	13353	27	N	2003AJ....126.2152R
00591534 + 1334327	12099	3	S	2011SDSS8.C...0000:

Note. — This table is presented in its entirety in the online version of the paper. Code for column 4: [N]ED 2MASS ID match, [S]DSS-DR8, [6]dFGS.

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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)
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1972MNRAS.158..277T	Tritton (1972)
1973AISAO...8....3K	Karachentseva (1973)
1973ApJ...182..351G	Gregory & Connolly (1973)
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1975A&A....41..375K	Karachentsev et al. (1975)
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1985BICDS..29...87K	Karachentsev et al. (1985)
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1994A&A...291...57R	Reshetnikov & Combes (1994)
1994A&AS..104..259A	Augarde et al. (1994)
1994A&AS..104..529T	Takata et al. (1994b)
1994A&AS..107..265G	Garcia et al. (1994)
1994ApJ...435...79B	Borne et al. (1994)
1994MNRAS.267..665B	Bardelli et al. (1994)
1994MNRAS.269..151D	Dalton et al. (1994)
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1994PASJ...46..147S	Sofue & Nakai (1994)
1994PASJ...46..343T	Takata et al. (1994a)
1995AJ....109...14O	Owen et al. (1995)
1995AJ....109..874B	Beers et al. (1995)
1995AJ....109.1458R	Ramella et al. (1995)
1995AJ....109.2368T	Thorstensen et al. (1995)
1995AJ....109.2376S	Salzer et al. (1995)
1995AJ....109.2444R	Rand (1995)
1995AJ....110...32O	Oegerle et al. (1995)
1995AJ....110..116K	Kobulnicky et al. (1995)
1995AJ....110..463Q	Quintana et al. (1995)
1995AJ....110.1032M	Muriel et al. (1995)
1995AJ....110.1993S	Sanders et al. (1995)
1995A&A...297...28B	Bonfanti et al. (1995)
1995A&A...297..617K	Kraan-Korteweg et al. (1995)
1995A&A...299..347C	Chamaraux et al. (1995)
1995A&A...300..675H	Huchtmeier et al. (1995)
1995A&AS..109..147B	Brinkmann et al. (1995)
1995A&AS..109..537H	Hopp et al. (1995)
1995A&AS..110...19D	Davoust & Considere (1995)
1995A&AS..110..131R	Rampazzo et al. (1995)
1995A&AS..110..469B	Bade et al. (1995)
1995A&AS..112..429F	Freudling (1995)
1995A&AS..113..151D	di Nella et al. (1995)
1995A&AS..114..565P	Proust et al. (1995)
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1996AJ....112..388L	Ledlow et al. (1996)
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1996A&AS..117..487M	Maia et al. (1996)
1996A&AS..118....7V	Vitores et al. (1996)

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1996ApJ...470..724M	Mohr et al. (1996)
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1996ApJS..106...27K	Keel (1996a)
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1996PASJ...48..679R	Roman et al. (1996)
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1997MNRAS.292..273W	Winkler (1997)
1998AJ....115....6B	Barmby & Huchra (1998b)
1998AJ....115...62H	Haynes et al. (1998)
1998AJ....115..418D	Dale et al. (1998)
1998AJ....115..928C	Carilli et al. (1998)
1998AJ....115.1253P	Perlman et al. (1998)
1998AJ....115.2250C	Cappi et al. (1998)
1998AJ....116....1D	da Costa et al. (1998b)
1998AJ....116.1094C	Cabanela & Aldering (1998)
1998AJ....116.1508B	Barmby & Huchra (1998a)
1998AJ....116.1529H	Hill & Oegerle (1998)
1998AJ....116.1573B	Barton et al. (1998)
1998AJ....116.2108K	Koranyi et al. (1998)
1998AN....319..347F	Fischer et al. (1998)
1998A&A...333...48P	Pietsch et al. (1998)
1998A&A...339...34D	de Ruiter et al. (1998)
1998A&AS..127..101S	Seeberger & Saurer (1998)
1998A&AS..127..463F	Fairall et al. (1998b)
1998A&AS..129..399K	Katgert et al. (1998)
1998A&AS..130..251L	Longhetti et al. (1998a)
1998A&AS..130..267L	Longhetti et al. (1998b)
1998A&AS..130..323V	Vettolani et al. (1998)
1998A&AS..130..333T	Theureau et al. (1998)
1998A&AS..131..287S	Simien & Prugniel (1998)

TABLE A7 — *Continued*

ADS bibcode	Reference
1998A&AS..132..341M	Motch et al. (1998)
1998A&AS..133..317H	Héraudeau & Simien (1998)
1998A&AS..133..325G	Graham et al. (1998)
1998ApJ...494...47F	Falco et al. (1998)
1998ApJ...496...39Z	Zabludoff & Mulchaey (1998)
1998ApJ...497..163S	Shier & Fischer (1998)
1998ApJ...500..188I	Izotov & Thuan (1998)
1998ApJ...508..200T	Tripp et al. (1998)
1998ApJS..115....1S	Slinglend et al. (1998)
1998ApJS..117..319A	Appenzeller et al. (1998)
1998ApJS..118..127L	Laurent-Muehleisen et al. (1998)
1998ApJS..119...41K	Kim & Sanders (1998)
1998ApJS..119..159S	Spitzak & Schneider (1998)
1998ApJS..119..277G	Grogin et al. (1998)
1998MNRAS.299...24L	Lahav et al. (1998)
1998MNRAS.300..417R	Ratcliffe et al. (1998)
1998PASJ...50...47R	Roman et al. (1998)
1999AJ....117..778B	Buta et al. (1999)
1999AJ....117.2039H	Haynes et al. (1999)
1999AJ....118...46C	Cabanela & Dickey (1999)
1999AJ....118.1468D	Dale et al. (1999)
1999AJ....118.2014W	White et al. (1999)
1999AJ....118.2561G	Grogin & Geller (1999)
1999A&A...348..113H	Heidt et al. (1999)
1999A&A...351.1051T	Thoraval et al. (1999)
1999A&A...352...39W	Woudt et al. (1999)
1999A&AS..136..509H	Héraudeau et al. (1999)
1999A&AS..139....1T	Thuan et al. (1999)
1999A&AS..139..141B	Brunzendorf & Meusinger (1999)
1999A&AS..139..525D	Durret et al. (1999)
1999A&AS..140..327M	Müller et al. (1999)
1999Afz....42..149C	Comte et al. (1999)
1999ApJ...520..491B	Batuski et al. (1999)
1999ApJ...523...87T	Tovmassian et al. (1999)
1999ApJ...524..612B	Banks et al. (1999)
1999ApJ...524..684G	Gallimore et al. (1999)
1999ApJS..121..287H	Huchra et al. (1999b)
1999MNRAS.305..259W	Wegner et al. (1999)
1999MNRAS.306..857C	Crawford et al. (1999)
1999MNRAS.306L..55F	Fiore et al. (1999)
1999MNRAS.307..236C	Chamaraux et al. (1999)
1999MNRAS.307..722W	Werner et al. (1999)
1999MNRAS.308..897L	Lawrence et al. (1999)
1999MNRAS.309..641B	Barnes et al. (1999)
1999PASA...16..113D	Drinkwater et al. (1999)
1999PASP..111..438F	Falco et al. (1999)
1999hxra.conf..226B	Bischoff et al. (1999)
2000AJ....119...32G	Grogin & Geller (2000)
2000AJ....119...44K	Koranyi & Geller (2000)
2000AJ....119..545G	Gregory et al. (2000)
2000AJ....119.1180S	Sadler et al. (2000)
2000AJ....119.1645T	Trager et al. (2000)
2000AJ....120..298J	Jarrett et al. (2000a)
2000AJ....120..630E	Elmegreen et al. (2000)
2000AJ....120.1691N	Nishiura et al. (2000)
2000AJ....120.2269P	Pinkney et al. (2000)
2000AJ....120.2338R	Rines et al. (2000)
2000A&AS..142..417H	Hopp et al. (2000)
2000A&AS..142..433S	Schindler (2000)
2000A&AS..143..421M	Matthews & van Driel (2000)
2000A&AS..145..263S	Simien & Prugniel (2000)
2000A&AS..146..259G	Gavazzi et al. (2000)
2000ApJ...545..171D	Domingue et al. (2000)
2000ApJS..126...63R	Rodríguez-Ardila et al. (2000)
2000ApJS..126..209R	Romer et al. (2000)
2000ApJS..129..547B	Bauer et al. (2000)
2000MNRAS.312..540B	Bardelli et al. (2000)
2000MNRAS.313..469S	Smith et al. (2000)
2000MNRAS.313..515I	Iwasawa et al. (2000)
2000MNRAS.316..326H	Hasegawa et al. (2000)
2000MNRAS.317...55S	Saunders et al. (2000b)
2000MNRAS.317..105W	Werner et al. (2000)
2000UZC...C......0F	Falco et al. (1999)
20012dF...C...0000C	Colless et al. (2001)
2001AJ....122.1289T	Tustin et al. (2001)

TABLE A7 — *Continued*

ADS bibcode	Reference
2001AJ....122.2893W	Wegner et al. (2001)
2001ARep...45...79C	Chavushyan et al. (2001)
2001A&A...366..428K	Karachentsev et al. (2001)
2001A&A...370..409L	Lara et al. (2001)
2001A&A...370..765V	Verheijen & Sancisi (2001)
2001A&A...371..895D	Dutra et al. (2001)
2001A&A...374...92V	Véron-Cetty & Véron (2001)
2001A&A...374..861S	Schoenmakers et al. (2001)
2001A&A...377..801H	Huchtmeier et al. (2001)
2001A&A...378..370V	van Driel et al. (2001)
2001ApJ...548..550N	Neill et al. (2001)
2001ApJ...560..566K	Kochanek et al. (2001)
2001ApJ...561L..41R	Rines et al. (2001)
2001ApJ...562..254D	Donnelly et al. (2001)
2001ApJS..134..355M	Miller & Owen (2001)
2001AstL...27..213M	Makarov et al. (2001)
2001MNRAS.320..387B	Bardelli et al. (2001)
2001MNRAS.322..689R	Reshetnikov et al. (2001)
2001MNRAS.323..757L	Landt et al. (2001)
2001MNRAS.326.1076D	Drinkwater et al. (2001)
2001PASA...18..232M	Mamon et al. (2001)
2002AJ....123..100K	Koranyi & Geller (2002)
2002AJ....123.2261B	Berrington et al. (2002)
2002AJ....123.2976R	Ramella et al. (2002)
2002AJ....123.2990B	Bernardi et al. (2002)
2002AJ....123.3018M	Miller et al. (2002b)
2002AJ....124.1266R	Rines et al. (2002)
2002AJ....124.1918M	Miller et al. (2002a)
2002A&A...384..371S	Simien & Prugniel (2002)
2002A&A...386..140V	van Driel et al. (2002)
2002A&A...391...35F	Focardi & Kelm (2002)
2002A&A...391..887K	Kraan-Korteweg et al. (2002)
2002IAUC.7916B...1M	Matheson et al. (2002)
20032dF...C...0000C	Colless et al. (2003)
2003AJ....125.2891C	Caldwell et al. (2003)
2003AJ....126.1245T	Tanvuia et al. (2003)
2003AJ....126.2152R	Rines et al. (2003)
2003AJ....126.2268W	Wegner et al. (2003)
2003A&A...399...51G	Garrido et al. (2003)
2003A&A...399..511M	Morganti et al. (2003)
2003A&A...400...95N	Nilsson et al. (2003)
2003A&A...405...31B	Bergvall et al. (2003)
2003A&A...405..951M	Makarov et al. (2003)
2003A&A...407...31P	Proust et al. (2003)
2003A&A...408...67M	Monnier Ragaigne et al. (2003a)
2003A&A...408..287D	Dutra et al. (2003)
2003A&A...408..465M	Monnier Ragaigne et al. (2003b)
2003A&A...408..873C	Corsini et al. (2003)
2003A&A...408..905C	Cappi et al. (2003)
2003A&A...412...57P	Paturel et al. (2003)
2003IAUC.8146B...1M	Matheson & Berlind (2003)
2003IAUC.8246B...1F	Filippenko & Chornock (2003)
2003MNRAS.339..652K	Kaldare et al. (2003)
2003MNRAS.342..939G	Gordon et al. (2003)
2003MNRAS.344..181C	Coziol (2003)
20046dF...C...0000J	Jones et al. (2004)
2004AJ....127.1336S	Stocke et al. (2004)
2004AJ....128...16K	Koribalski et al. (2004)
2004AJ....128.1078R	Rines et al. (2004)
2004AJ....128.1558S	Smith et al. (2004)
2004AJ....128.2080O	O'Neil (2004)
2004A&A...415....9W	Woudt et al. (2004)
2004A&A...415...27P	Pott et al. (2004)
2004A&A...415..487P	Peng et al. (2004)
2004A&A...416..515D	Davoust & Contini (2004)
2004A&A...420..873V	Varela et al. (2004)
2004ApJ...607..202M	Mahdavi & Geller (2004)
2004MNRAS.349..225G	Garrido et al. (2004)
2004MNRAS.352..768K	Kregel et al. (2004)
2004MNRAS.353.1055H	Hagiwara et al. (2004)
20056dF...C...0000J	Jones et al. (2005)
2005AJ....129...73R	Ruiz et al. (2005)
2005AJ....130.1037C	Catinella et al. (2005)
2005AJ....130.2012W	Way et al. (2005)
2005AJ....130.2613G	Giovanelli et al. (2005)

TABLE A7 — *Continued*

ADS bibcode	Reference
2005A&A...430..373T	Theureau et al. (2005)
2005A&A...432..475D	Dahlem et al. (2005)
2005A&A...435..459H	Huchtmeier et al. (2005)
2005A&A...436..443V	Verdes-Montenegro et al. (2005)
2005ApJ...624..714G	Garland et al. (2005)
2005ApJS..160..149S	Springob et al. (2005)
2005MNRAS.356.1440D	Denicoló et al. (2005)
2006AJ....131..185R	Rothberg & Joseph (2006)
2006AJ....131.1280F	Fleenor et al. (2006)
2006AJ....132..197W	Woods et al. (2006)
2006AJ....132.1426S	Spekkens & Giovanelli (2006)
2006AJ....132.2243G	Geller et al. (2006)
2006A&A...446..447R	Reshetnikov et al. (2006)
2006A&A...449..929G	Gavazzi et al. (2006)
2006A&A...452..811B	Bettoni et al. (2006)
2006A&A...454..453D	Della Valle et al. (2006)
2006A&A...457..425C	Couto da Silva & de Souza (2006)
2006A&A...459...21M	Masetti et al. (2006)
2006ApJ...636L..65B	Bassani et al. (2006)
2006ApJ...639...37K	Koulouridis et al. (2006)
2006HIPAS.C...0000:	Wong et al. (2006)
2006MNRAS.366..267F	Fairall & Woudt (2006)
2006MNRAS.367..815N	Norris et al. (2006)
2006MNRAS.368..461K	Khachikian et al. (2006)
2006MNRAS.369.1131R	Radburn-Smith et al. (2006)
2006MNRAS.370.1213C	Collobert et al. (2006)
2006MNRAS.372.1856F	Firth et al. (2006)
2007AJ....134.1729M	Maybhate et al. (2007)
2007A&A...462...57S	Sazonov et al. (2007)
2007A&A...465...71T	Theureau et al. (2007)
2007ApJ...664..761M	Martini et al. (2007)
2007ApJS..170...33P	Petrosian et al. (2007)
2007ApJS..172..599S	Springob et al. (2007b)
2007MNRAS.375..931M	Mauch & Sadler (2007)
2008AJ....135..588S	Saintonge et al. (2008)
2008AJ....135.2424O	Ogando et al. (2008)
2008AJ....136..713K	Kent et al. (2008)
2008A&A...482..113M	Masetti et al. (2008)
2008A&A...486..697M	Misgeld et al. (2008)
2008ApJ...685..752G	Gallagher et al. (2008)
2008MNRAS.383..247P	Penny & Conselice (2008)
2008MNRAS.383..445W	Woudt et al. (2008)
2008MNRAS.383.1519C	Cortese et al. (2008)
2008MNRAS.385.1297B	Brookes et al. (2008)
2008MNRAS.386..715T	Trager et al. (2008)
2008MNRAS.386.2311S	Smith Castelli et al. (2008)
2008MNRAS.388..500E	Epinat et al. (2008)
2008MNRAS.389..749M	Mendel et al. (2008)
2008MNRAS.389.1593K	Krabbe et al. (2008)
20096dF...C...0000J	Jones et al. (2009)
2009A&A...495..707C	Cava et al. (2009)
2009ApJS..183..214M	Martin et al. (2009)
2009ApJS..184..398H	Ho & Kim (2009)
2011SDSS8.C...0000:	Aihara et al. (2011)
20112MRS.DaSt.0000H	Davis & Strauss (1991)
20112MRS.JRM..0000H	Mould (1991)
20112MRS.ORS..0000H	Strauss (1997)
20112MRS.SAAO.0000H	Fairall (1990)
20112MRS.Stra.0000H	Strauss (1991)
20112MRS.ThWB.0000H	Thorstensen et al. (2001)

TABLE A8
Morphological Type Codes used in 2MRS

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 HII Region
12	Extragalactic HI 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

Note. — The morphological information is encoded in Table 3 following the ZCAT convention. It is a 5 digit code (I2, A1, I1, 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 numericaly coded luminosity class, and the final letter (if present) denotes morphological perculiarities.

TABLE A9
Redshifts for galaxies in the 2MASS XSC beyond the main 2MRS catalog limits

2MASS ID	R.A. (deg)	Dec. (deg)	v (km/s)	$\sigma(v)$ (km/s)	Vel src.	Bibliographic 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
00054562 + 1827412	1.44009	18.46141	26000	56	F	20112MRS.FLWO.0000H
00062026 + 1051516	1.58448	10.86434	50389	45	O	20112MRS.MMT..0000H
00065010 + 1804578	1.70879	18.08274	9237	41	F	20112MRS.FLWO.0000H
00070925 − 2550122	1.78851	-25.83667	18975	77	C	20112MRS.CTIO.0000H
00074137 + 2217368	1.92249	22.29355	10350	26	F	20112MRS.FLWO.0000H
00081890 + 0807157	2.07883	8.12107	5107	36	O	20112MRS.JPH..0000H
00082316 + 2027518	2.09662	20.46434	17653	29	F	20112MRS.FLWO.0000H
00090458 + 1033561	2.26909	10.56557	10974	33	O	20112MRS.JPH..0000H
00091024 − 2647012	2.29268	-26.78369	18982	38	C	20112MRS.CTIO.0000H
00095314 + 2817184	2.47136	28.28849	8018	24	F	20112MRS.FLWO.0000H
00102176 + 1208291	2.59076	12.14140	11505	38	O	20112MRS.JPH..0000H
00113144 + 1330446	2.88102	13.51241	11379	55	O	20112MRS.JPH..0000H
00115036 − 2518433	2.95980	-25.31208	19421	41	C	20112MRS.CTIO.0000H
00120741 + 2508562	3.03086	25.14894	15177	26	F	20112MRS.FLWO.0000H
00122761 + 3245095	3.11505	32.75272	12637	20	F	20112MRS.FLWO.0000H
00125428 + 1830249	3.22624	18.50701	20442	41	O	20112MRS.MMT..0000H
00131982 + 3518311	3.33265	35.30861	13995	31	F	20112MRS.FLWO.0000H
00135736 + 1758471	3.48902	17.97971	5448	89	O	20112MRS.MMT..0000H
00141253 + 7036448	3.55229	70.61240	6973	43	F	20112MRS.FLWO.0000H
00142292 + 1948250	3.59550	19.80692	17805	49	O	20112MRS.MMT..0000H
00142788 − 3812322	3.61608	-38.20894	15643	0	O	20112MRS.Stra.0000H
00150176 + 1743517	3.75734	17.73107	21169	59	O	20112MRS.MMT..0000H
00151039 + 2009070	3.79333	20.15198	27493	35	O	20112MRS.MMT..0000H
00160679 + 1703341	4.02829	17.05954	28689	79	O	20112MRS.MMT..0000H
00161395 + 0227163	4.05807	2.45445	17492	32	O	20112MRS.JPH..0000H
00161822 + 3359362	4.07584	33.99350	14279	32	F	20112MRS.FLWO.0000H
00165361 + 0647158	4.22336	6.78777	25256	34	O	20112MRS.MMT..0000H
00170461 + 3516216	4.26929	35.27267	19700	34	F	20112MRS.FLWO.0000H
00172425 − 3449344	4.35115	-34.82626	19307	33	C	20112MRS.CTIO.0000H
00175326 + 1907158	4.47193	19.12105	17960	39	O	20112MRS.MMT..0000H
00184852 + 3452566	4.70209	34.88241	19623	42	F	20112MRS.FLWO.0000H
00193179 + 2515537	4.88251	25.26499	18966	51	O	20112MRS.MMT..0000H
00193946 + 2516477	4.91434	25.27987	40962	31	O	20112MRS.MMT..0000H
00194090 + 2634038	4.92053	26.56767	11682	26	F	20112MRS.FLWO.0000H
00203791 + 3131262	5.15788	31.52387	14551	30	F	20112MRS.FLWO.0000H
00204987 + 0648273	5.20774	6.80759	16432	46	O	20112MRS.JPH..0000H
00210248 + 0625448	5.26034	6.42917	12128	0	O	20112MRS.KPPA.0000H
00215355 − 7910077	5.47338	-79.16875	21697	38	O	20112MRS.DaSt.0000H
00220910 + 0715387	5.53787	7.26077	21171	24	O	20112MRS.JPH..0000H
00231311 + 0632545	5.80467	6.54844	8615	18	O	20112MRS.JPH..0000H
00240995 + 2757027	6.04149	27.95078	8682	31	F	20112MRS.FLWO.0000H
00243276 + 3312261	6.13660	33.20720	67745	57	O	20112MRS.MMT..0000H
00252496 + 0642232	6.35401	6.70643	8969	20	O	20112MRS.JPH..0000H
00252887 + 2016318	6.37027	20.27546	17668	32	F	20112MRS.FLWO.0000H
00253292 + 6821442	6.38694	68.36229	3729	54	F	20112MRS.FLWO.0000H
00253552 + 1723371	6.39799	17.39370	7969	24	O	20112MRS.JPH..0000H
00254209 + 0838102	6.42532	8.63612	13077	25	O	20112MRS.JPH..0000H
00254424 − 3321158	6.43436	-33.35439	12500	50	O	20112MRS.SAAO.0000H

Note. — This table is presented in its entirety in the online version of the paper. Codes for column 6: [C]TIO, Mc[D]onald, [F]LWO.

TABLE A10
Redshifts for galaxies not in the 2MASS XSC which were observed serendipitously

2MASS ID†	R.A. (deg)	Dec.	v (km/s)	$\sigma(v)$	Vel src.	Bibliographic 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. — †: pseudo-2MASS ID generated from the celestial coordinates of the object.