The Astronomical Journal, 123:2002–2009, 2002 April

THE SOLAR NEIGHBORHOOD. VI. NEW SOUTHERN NEARBY STARS IDENTIFIED BY OPTICAL SPECTROSCOPY

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Received 2001 November 21; accepted 2001 December 19

ABSTRACT

Broadband optical spectra are presented for 34 known and candidate nearby stars in the southern sky. Spectral types are determined using a new method that compares the entire spectrum with spectra of more than 100 standard stars. We estimate distances to 13 candidate nearby stars using our spectra and new or published photometry. Six of these stars are probably within 25 pc, and two are likely to be within the Research Consortium on Nearby Stars (RECONS) horizon of 10 pc.

Key words: stars: distances — stars: low-mass, brown dwarfs — surveys — white dwarfs

1. INTRODUCTION

The nearest stars have received renewed scrutiny because of their importance to fundamental astrophysics (e.g., stellar atmospheres, the mass content of the Galaxy) and because of their potential for harboring planetary systems and life (e.g., the NASA Origins and Astrobiology initiatives). The smallest stars, the M dwarfs, account for at least 70% of all stars in the solar neighborhood and make up nearly half of the Galaxy's total stellar mass (Henry et al. 1997, hereafter H97). Their slightly lesser cousins, the brown dwarfs, may lurk in comparable numbers, yet many of the nearest red, brown, and white dwarfs remain unrecognized because of their low luminosities. H97 estimate that more than 30% of stellar systems within 10 pc of the Sun are currently missing from compendia of nearby stars.

The number of "missing" stars within 25 pc of the Sun is estimated to be twice the fraction missing within 10 pc. The NASA/NSF NStars Project is a new effort to foster research on all stars within 25 pc, with special emphasis on the development of a comprehensive NStars Database. All systems with trigonometric parallaxes greater than or equal to 0.″04000 from the Yale Catalog of Stellar Parallaxes (YPC; van Altena, Lee, & Hoffleit 1995) and the *Hipparcos* Catalogue (HIP; ESA 1997) have been included in the database. The weighted means of the YPC and HIP parallaxes have been determined, including the combination of all trigonometric parallax values for stellar systems in which widely separated components have had separate parallax measurements. Table 1 lists the numbers of known and predicted stellar systems within 25 pc, and their distributions within equal regions of the sky, obtained from the NStars Database as of 2001 July 1. The predicted number of 1375 systems in each region is based on the assumptions that (1) the density of stellar systems within 5 pc (0.084 systems pc^{-3}) extends to 25 pc and (2) the distribution of the systems is isotropic. Table 1 clearly shows that more stars are missing in the southern sky than in the northern sky: we predict that more than two-thirds of the systems are undiscovered in the south. Furthermore, new systems within 5 pc are still being found (H97), so the total number predicted within 25 pc is a lower limit.

In a concerted effort to discover and characterize the nearest stars, the Research Consortium on Nearby Stars (RECONS) team has been conducting astrometric, photometric, spectroscopic, and multiplicity surveys of known and candidate stars within 10 pc (for more information about RECONS see H97). In this paper, the sixth in a series on the solar neighborhood, we present optical spectra of 34 known or suspected nearby southern red and white dwarfs, including 10 known members of the RECONS sample and 16 stars for which no spectral types have been previously published. We report spectral types for all the stars in our sample using a method that will define the spectral types used in the NStars Database. We supplement the spectral data with *VRI* photometry for five stars. Our analysis has revealed two new stars that are probably closer than the 10 pc RECONS horizon and four others that are probably closer than the 25 pc NStars horizon.

2. SAMPLE

The 34 stars for which we obtained optical spectra are grouped into four categories:

1. Twelve stars that lie within, or close to, the 10 pc RECONS horizon for which no broadband spectra are published. These stars have well-known distances, so they are good standards for calibrating spectroscopic parallaxes.

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TABLE 1
NUMBER OF STELLAR SYSTEMS WITHIN 25 pc[a]

Region of Sky	Number of Systems Known	Total Predicted	Fraction Missing (%)
+90 to +30.......	575	1375	58
+30 to +00.......	578	1375	58
−00 to −30.......	463	1375	66
−30 to −90.......	395	1375	71
Total	2011	5500	63

[a] In NStars Database as of 2001 July 1.

2. Fourteen recently discovered stars having high proper motions. Because nearer stars appear to move faster than more distant ones, high proper motion is a good indicator of stars in the solar neighborhood. Between 1989 and 1997, Wroblewski and collaborators identified 2055 new stars lying south of -5° declination with proper motions, $\mu \geq 0''.15$ yr^{-1} (Wroblewski & Torres 1997 and references therein). In 1998 February we observed 12 of the 52 stars from this collection that have $\mu \geq 0''.50$ yr^{-1}. We also observed two high proper motion stars selected from the Calan-ESO survey of Ruiz and collaborators (Ruiz et al. 1993). Between our observing run and the end of 2000, Wroblewski and collaborators identified an additional 293 new stars with $\mu \geq 0''.15$ yr^{-1}, only one of which has $\mu \geq 0''.50$ yr^{-1} (Wroblewski & Costa 1999).

3. Four stars whose *Hipparcos* parallaxes have suspiciously high errors. Nine targets in eight systems were reported by the *Hipparcos* mission to have parallaxes larger than $0''.100$ with errors larger than $0''.020$ (i.e., 14%–56% errors, enormous for *Hipparcos*). In every case, the targets are near bright stars that corrupted the parallax measurements. In two cases, HIP 114110 and HIP 114176, there is no star at all. In 1998 February we observed two of the remaining seven targets, HIP 15689 and HIP 20698, as well as two of the neighboring bright stars.

4. Four stars for which available photometry implies a distance less than 25 pc. These stars come from an extensive list of possible nearby stars maintained by the first author.

3. OBSERVATIONS

A total of 34 targets were observed during the nights of UT 1998 February 8 and 9 using the Blanco 4 m telescope at Cerro Tololo Inter-American Observatory (CTIO). The Ritchey-Chrétien Spectrograph with a Loral 3K × 1K CCD was used with grating 181 at tilt $58^\circ.77$, order blocking filter OG-515, and a gain setting of 4 ($2.07e^-$ ADU^{-1}). The wavelength coverage was 5500–10000 Å, with a resolution of 6 Å. This broad spectral range includes the TiO absorption bands characteristic of red dwarfs, the Hα emission line used to measure activity, and the K I, Na I, and Ca II absorption features used to discriminate dwarfs from giants.

Bias frames and dome flats were taken at the beginning of each night. An HeAr arc lamp spectrum was recorded after each target spectrum to permit accurate dispersion correction throughout the night. Observations were conducted through clouds for 4 hr on 1998 February 8 and for 8 hr through increasing clouds on 1998 February 9. Several of the program stars were observed on both nights, thereby allowing confirmation of the spectral types.

Photometric observations were carried out in the V_J, R_C, and I_C bands for five stars at the CTIO 0.9 m telescope during our NOAO Surveys Program, CTIO Parallax Investigation (CTIOPI), on the nights of UT 1999 November 27–December 1. Standards from Landolt (1992) and Bessell (1990) were observed for the purpose of deriving extinction coefficients and transformation equations for each night.

4. DATA REDUCTION

4.1. *Photometry Reduction*

Reduction of the photometric data was done using the Interactive Reduction and Analysis Facility (IRAF). Bias subtraction and flat-fielding of the *VRI* frames were accomplished using the *ccdred* package, and instrumental magnitudes were obtained using the *apphot* package. The *photcal* package was then used to perform fits to the extinction and transformation equations and to transform the magnitudes to the standard Cousins system. An aperture of $3''$ was used to extract counts for the program stars, and aperture corrections were used to match the methodology of Landolt (1992). Errors in the final photometry are estimated to be 0.03 mag.

4.2. *Extraction of Spectra*

The long-slit spectra were reduced and extracted using IRAF. Bias levels were removed by subtracting a median bias frame scaled to match the overscan signal of each image. The images were flattened by dividing by a normalized, median dome flat from which the spectral response of the illuminating quartz lamp had been removed. After the removal of night-sky emission lines, the target spectra were distortion corrected and wavelength calibrated using the consecutively recorded HeAr arc spectra. One-dimensional spectra were extracted from summed apertures of 10–14 pixel width centered on the spectra. Correction for atmospheric extinction was performed using the default IRAF extinction tables for CTIO, but telluric features (which can be seen in the white dwarf spectra of Fig. 2) were not removed. Finally, the extracted spectra were flux calibrated using a recorded spectrum of the spectrophotometric standard star GJ 440 and the appropriate IRAF flux table.

4.3. *Assignment of Spectral Types*

We have developed a software program, called ALLSTAR, that matches a target spectrum to one from a database of 106 standard spectra of K and M dwarfs previously published by RECONS (see Table 2). When expanded to include the complete range of spectral types, ALLSTAR will likely become the standard algorithm for assigning spectral types in the NStars Database.

For each target and standard spectrum, ALLSTAR interpolates flux values at 1 Å intervals between 6500 and 9000 Å, regardless of the original spectral resolution. The spectra are normalized at 7500 Å, a wavelength that lies in a region that is relatively free of opacity sources in red dwarfs (and most stars). To account for possible spurious normalization of the target spectrum caused by noisy data, an array of 21 spectra is created by multiplying the normalized spectrum by integral percentages between 90% and 110%. These 21 spectra are subtracted from each of the standard spectra over the entire 6500–9000 Å range, and the rms deviation of each difference spectrum is then computed. Pixels offset by

TABLE 2
LIST OF SPECTRAL STANDARDS

Name	Component	R.A. (J2000.0)	Decl. (J2000.0)	Spectral Type	Reference
GJ 1002	...	00 06 43.8	−07 32 22	M5.5 V	1
GJ 1005	AB	00 15 28.1	−16 08 02	M4.0 VJ	1
GJ 15	A	00 18 22.9	44 01 23	M1.5 V	1
GJ 15	B	00 18 22.9	44 01 23	M3.5 V	1
GJ 2005	ABCD	00 24 42.0	−27 08 52	M5.5 VJ	2
GJ 22	AC	00 32 26.0	67 14 00	M2.0 VJ	3
GJ 22	B	00 32 26.0	67 14 00	M3.0 V	3
GJ 34	B	00 49 06.3	57 48 55	K7.0 V	1
GJ 51	...	01 03 18.0	62 22 00	M5.0 V	4
GJ 54.1	...	01 12 30.6	−16 59 57	M4.5 V	1
GJ 65	A	01 39 01.3	−17 57 01	M5.5 V	4
GJ 65	B	01 39 01.3	−17 57 01	M6.0 V	4
GJ 83.1	...	02 00 13.2	13 03 08	M4.5 V	4
GJ 105	B	02 36 16.0	06 52 12	M3.5 V	1
GJ 109	...	02 44 15.5	25 31 24	M3.0 V	1
GJ 1061	...	03 36 00.0	−44 30 46	M5.5 V	5
LP 944-020	...	03 39 35.2	−35 25 41	> M9.0 V	6
GJ 185	AB	05 02 28.4	−21 15 24	K7.0V J	1
GJ 205	...	05 31 27.4	−03 40 38	M1.5 V	4
GJ 213	...	05 42 09.3	12 29 22	M4.0 V	4
G099-049	...	06 00 03.6	02 42 20	M3.5 V	1
LHS 1805	...	06 01 09.7	59 35 54	M3.5 V	1
GJ 226	...	06 10 19.8	82 06 24	M2.5 V	4
GJ 229	A	06 10 34.6	−21 51 53	M1.0 V	4
GJ 232	...	06 24 41.6	23 25 59	M4.0 V	4
GJ 234	AB	06 29 23.4	−02 48 50	M4.5 VJ	4
GJ 250	B	06 52 18.1	−05 11 25	M2.5 V	4
GJ 251	...	06 54 49.0	33 16 05	M3.0 V	4
GJ 1093	...	06 59 28.4	19 20 52	M5.0 V	1
GJ 268	AB	07 10 01.8	38 31 46	M4.5 VJ	4
GJ 273	...	07 27 24.5	05 13 33	M3.5 V	4
GJ 283	B	07 40 20.7	−17 24 52	M6.0 V	1
GJ 285	...	07 44 40.2	03 33 09	M4.0 V	1
GJ 299	...	08 11 57.5	08 46 28	M4.0 V	1
GJ 300	...	08 12 40.8	−21 33 10	M3.5 V	1
GJ 1111	...	08 29 49.5	26 46 37	M6.5 V	1
LHS 2065	...	08 53 36.0	−03 29 28	M9.0 V	4
GJ 1116	AB	08 58 14.9	19 45 43	M5.5 VJ	1
GJ 338	A	09 14 22.8	52 41 12	M0.0 V	4
GJ 338	B	09 14 24.7	52 41 11	K7.0 V	4
GJ 352	AB	09 31 19.4	−13 29 19	M3.0 VJ	4
GJ 380	...	10 11 22.1	49 27 15	K7.0 V	4
GJ 381	...	10 12 05.0	−02 41 12	M2.5 V	4
GJ 382	...	10 12 17.7	−03 44 44	M2.0 V	4
GJ 393	...	10 28 55.5	00 50 28	M2.0 V	1
LHS 292	...	10 48 12.6	−11 20 14	M6.5 V	1
GJ 402	...	10 50 52.1	06 48 29	M4.0 V	4
GJ 406	...	10 56 29.2	07 00 53	M6.0 V	4
GJ 411	...	11 03 20.2	35 58 12	M2.0 V	4
GJ 412	A	11 05 28.6	43 31 36	M1.0 V	1
GJ 412	B	11 05 30.4	43 31 18	M5.5 V	1
GJ 436	...	11 42 09.0	26 42 24	M3.0 V	4
GJ 445	...	11 47 41.4	78 41 28	M3.5 V	1
GJ 447	...	11 47 44.4	00 48 16	M4.0 V	1
GJ 1156	...	12 19 00.3	11 07 31	M5.0 V	1
GJ 473	AB	12 33 17.2	09 01 15	M5.5 VJ	7
GJ 514	...	13 29 59.8	10 22 38	M1.0 V	1
GJ 526	...	13 45 43.8	14 53 29	M1.5 V	1
GJ 551	...	14 29 43.0	−62 40 46	M5.5 V	5
GJ 555	...	14 34 16.8	−12 31 10	M3.5 V	1
LHS 3003	...	14 56 38.5	−28 09 51	M7.0 V	8
GJ 570	BC	14 57 26.5	−21 24 41	M1.0 VJ	1
TVLM 513-46546	...	15 01 07.9	22 50 02	M8.5 V	8
GJ 581	...	15 19 26.8	−07 43 20	M2.5 V	1

TABLE 2—*Continued*

Name	Component	R.A. (J2000.0)	Decl. (J2000.0)	Spectral Type	Reference
GJ 623	AB	16 24 09.3	48 21 10	M2.5 VJ	1
GJ 625	...	16 25 24.6	54 18 15	M1.5 V	1
GJ 628	...	16 30 18.1	−12 39 45	M3.0 V	1
GJ 643	...	16 55 25.2	−08 19 21	M3.5 V	4
GJ 644	ABD	16 55 28.8	−08 20 11	M2.5 VJ	1
GJ 644	C	16 55 35.8	−08 23 40	M7.0 V	4
G203-047	AB	17 09 31.5	43 40 53	M3.5 VJ	1
GJ 661	AB	17 12 07.9	45 39 57	M3.0 VJ	1
GJ 673	...	17 25 45.2	02 06 41	K7.0 V	1
GJ 686	...	17 37 53.4	18 35 30	M0.0 V	1
GJ 687	...	17 36 25.9	68 20 21	M3.0 V	1
GJ 699	...	17 57 48.5	04 41 36	M4.0 V	4
GJ 701	...	18 05 07.6	−03 01 53	M0.0 V	1
GJ 1224	...	18 07 32.9	−15 57 51	M4.5 V	1
LHS 3376	...	18 18 57.7	66 11 32	M4.5 V	1
GJ 1230	AC	18 41 09.2	24 47 08	M4.5 VJ	1
GJ 1230	B	18 41 09.2	24 47 15	M4.5 V	1
GJ 725	A	18 42 46.7	59 37 49	M3.0 V	4
GJ 725	B	18 42 46.9	59 37 37	M3.5 V	4
GJ 729	...	18 49 49.4	−23 50 10	M3.5 V	1
GJ 752	A	19 16 55.3	05 10 08	M3.0 V	4
GJ 752	B	19 16 58.3	05 09 01	M8.0 V	4
GJ 1245	AC	19 53 54.2	44 24 55	M5.5 VJ	4
GJ 1245	B	19 53 55.2	44 24 56	M6.0 V	4
GJ 791.2	AB	20 29 48.0	09 41 23	M4.5 VJ	4
GJ 809	...	20 53 19.8	62 09 16	M0.0 V	1
GJ 820	A	21 06 53.9	38 44 58	K5.0 V	4
GJ 820	B	21 06 55.3	38 44 31	K7.0 V	4
GJ 829	AB	21 29 36.8	17 38 36	M3.5 VJ	1
GJ 831	ABC	21 31 18.9	−09 47 22	M4.5 VJ	1
GJ 846	...	22 02 09.0	01 23 54	M0.5 V	4
GJ 860	A	22 27 59.5	57 41 45	M3.0 V	1
GJ 860	B	22 27 59.5	57 41 45	M4.0 V	1
GJ 866	ABC	22 38 33.4	−15 18 07	M5.0 VJ	4
GJ 873	...	22 46 49.7	44 20 02	M3.5 V	1
GJ 876	Ap[a]	22 53 16.7	−14 15 49	M3.5 VJ	1
GJ 880	...	22 56 34.8	16 33 12	M1.5 V	1
GJ 896	AC	23 31 52.2	19 56 14	M3.5 VJ	1
GJ 896	BD	23 31 52.2	19 56 14	M4.5 VJ	1
GJ 1286	...	23 35 10.7	−02 23 25	M5.5 V	1
GJ 905	...	23 41 54.7	44 10 30	M5.5 V	1
GJ 908	...	23 49 12.5	02 24 04	M1.0 V	1

Note.—Units of right ascension are hours, minutes, and seconds, and units of declination are degrees, arcminutes, and arcseconds.

[a] " p " indicates probable planetary companion(s).

References.—(1) Henry et al. 1994. (2) Henry et al. 1999. (3) McCarthy et al. 1991. (4) Kirkpatrick et al. 1991. (5) Henry et al. 1997. (6) Kirkpatrick, Henry, & Irwin 1997. (7) Henry et al. 1992. (8) Kirkpatrick, Henry, & Simons 1995.

more than 2 σ from the rms deviation are set to zero. Trial and error have shown that this threshold effectively rejects unwanted pixels associated with variable telluric absorption features or detector defects. If more than 20% of the difference spectrum is rejected, then the standard spectrum from which it was derived is removed from further consideration. After rejecting the deviant pixels, ALLSTAR sums the elements of each difference spectrum and sorts the sums for all matches in ascending order. These ordered sums provide a rating system in which the standard spectrum generating the smallest sum is the best match to the target spectrum.

The technique embodied in ALLSTAR differs from that used in previous RECONS efforts (Kirkpatrick, Henry, & McCarthy 1991) in four ways: (1) ALLSTAR interpolates fluxes every 1 Å rather than every 3 Å; (2) the target spectra are compared with the standard spectra over the entire 6500–9000 Å range, rather than over preassigned chunks of the spectra; (3) rejection of varying telluric features and detector defects is carried out in a rigorous, well-defined fashion; and (4) spectral typing is based on a single, best match to a standard spectrum rather than a relative ranking of all spectra from bluest to reddest. For 100 of our 106 standard stars, ALLSTAR returns the same spectral types previously reported by RECONS and listed in Table 2. For the remaining six, ALLSTAR produces spectral types within 0.5 subtype (the published uncertainty) of those previously reported. These 0.5 subtype discrepancies are attributable to subtle differences in the reduction techniques and are not significant. Therefore, we have not altered the previously published types.

In Table 2, " J " has been appended to some of the previously published spectral types to denote those stars whose spectra represent the combined light of multiple components. The " J " (for joint) designation was not previously used for GJ 22AC, GJ 352AB, GJ 570BC, G 203-047AB, GJ 791.2AB, GJ 829AB, GJ 896AC, and GJ 896BD because, for many of these systems, close companions have been discovered since their spectral types were first published. We anticipate that other changes in spectral type will occur once spectra obtained at infrared wavelengths are combined with existing optical spectra.

5. RESULTS AND DISCUSSION

Table 3 contains astrometric, photometric, and spectroscopic information for the 34 stars in our sample. The photometry is given on the Johnson (*UBV*) and Cousins (*RI*) systems. The photometry from Weis (1996) has been converted to the Cousins system using the relations of Bessell & Weis (1987). Previously reported spectral types for many of the stars come from Reid, Hawley, & Gizis (1995) and Hawley, Gizis, & Reid (1996), who used narrower band spectra (≈6200–7400 Å) than ours to determine the spectral types of over 2000 known and candidate nearby stars. Our observations differ from theirs in that ours cover more than 3 times the spectral range and result in somewhat more robust spectral types. Also listed are distances to stars with trigonometric parallaxes from *Hipparcos* (denoted by H) or from a weighted mean of YPC and *Hipparcos* measurements (denoted by YH).

Using the M_V–spectral type relation of Henry, Kirkpatrick, & Simons (1994) for red dwarfs,

$$M_V = 0.101(\mathrm{ST})^2 + 0.596(\mathrm{ST}) + 8.96 \quad (1)$$

(where ST is spectral type), we have estimated distances (last column of Table 3) to stars for which we have obtained new spectra and that have V_J photometry. Comparison of the true and predicted distances for the stars with known trigonometric parallaxes shows that the errors on the distance estimates are substantial, which is typical of distances estimated spectroscopically. However, only for GJ 190 and GJ 433 do the trigonometric and spectroscopic distances differ by more than a factor of 2. GJ 433 is a known close binary system (Bernstein 1997), and we are suspicious that GJ 190 may also be a close binary system.

We find that 11 of the candidate nearby stars identified by Wroblewski & Torres (1997; WT stars) are red dwarfs of types M0.0 V–M5.5 V. The 12th WT star is a newly identified nearby white dwarf. The two Calan-ESO stars are also red dwarfs. As expected, the *Hipparcos* stars with large parallax errors are giants and, therefore, not members of the solar neighborhood. The four stars in the photometrically selected sample yield the highest proportion of nearby stars: GJ 1123 and GJ 1128 are likely to be within 10 pc, while GJ 1129 lies just beyond 10 pc. (We lack the accurate V_J photometry required to estimate the distance to LHS 1957.) Many of the targets with estimated distances within 25 pc are being observed in our southern parallax program, CTIOPI. Those stars likely to be within the 10 pc RECONS horizon receive the highest priority.

The spectra of the most interesting stars in our sample are shown in Figures 1 and 2. Several noteworthy stars are discussed here, in alphabetical order.

ESO 440-064 (spectral type M5.5 V) is one of the two latest stars observed. It exhibits a prominent Hα emission feature. This star and ESO 440-139, which is estimated to lie at 20 pc, were revealed during the Calan-ESO effort of Ruiz and collaborators (Ruiz et al. 1993) to reveal new proper motion stars in the southern sky.

GJ 432B is a 15th magnitude companion 17″ from a sixth magnitude K0 dwarf. Observing difficulty precludes much information for this star. Its spectrum is similar to our white dwarf spectrophotometric standard, GJ 440. We cannot determine with our spectral coverage whether the star has type DC or DQ, but it is not type " m " as reported by Gliese & Jahreiß (1991).

GJ 1123, GJ 1128, GJ 1129, and WT 84 are four stars with estimated distances within 15 pc. All are being observed as high-priority CTIOPI targets because they may lie within the RECONS horizon of 10 pc. WT 84 (spectral type M5.5 V) is one of the two latest stars observed and exhibits a prominent Hα emission feature.

GJ 2036A and GJ 2036B have enormous Hα emission features.

HIP 14555 (=LTT 1479, GJ 1054A) was observed instead of the intended target, HIP 14559, which lies 28″ to the east. The *Hipparcos* parallax of HIP 14559 ($V_J = 11.72$), $0''.11473 \pm 0''.03398$, has a large error because of the

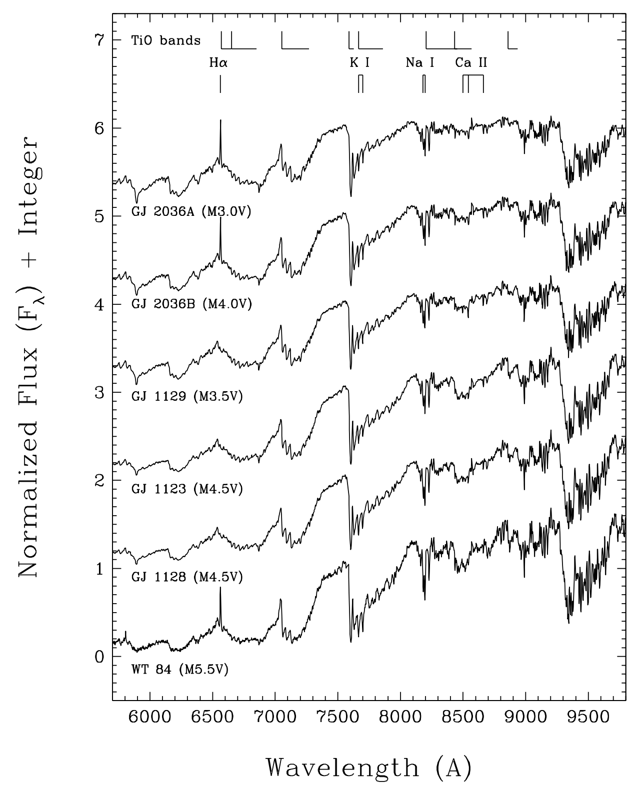

FIG. 1.—Spectra of some of the nearest suspects in our sample of candidate nearby stars. The spectra and photometry of GJ 1129, GJ 1123, GJ 1128, and WT 84 suggest that these stars lie within 15 pc (see Table 3). The spectra of GJ 2036A and GJ 2036B exhibit enormous Hα emission features. Important spectral features are labeled at the top. The absorption complex at 9300 Å and redward is due primarily to H_2O in the Earth's atmosphere.

TABLE 3

SAMPLE STARS

Name	R.A. (J2000.0)	Decl. (J2000.0)	μ	θ	U_J	B_J	V_J	R_C	I_C	Reference	Previous Spectral Type	Reference	Adopted Spectral Type	Exposure (s)	Known Distance (pc)	Estimated Distance (pc)
Stars with Trigonometric Parallaxes																
HIP 14555..........	03 07 55.7	−28 13 11	0.360	250.6	...	...	10.21	...	...	1	...	...	M1.0 V	90	19.1 H	12.9
HIP 20965..........	04 29 43.4	−29 01 47	0.045	223.8	...	...	7.73	...	...	1	K III/IV	11	Giant +	10	>100 H	...
GJ 2036A...........	04 53 31.2	−55 51 37	0.130	059.0	13.78	12.70	11.13	...	...	2	M2.0 V	12	M3.0 V	60	11.2 H	7.8
GJ 2036B...........	04 53 31.2	−55 51 37	0.130	059.0	15.03	13.75	12.15	...	...	2	M3.5 V	12	M4.0 V	60	11.2 H	6.9
LHS 1731...........	05 03 20.1	−17 22 25	0.512	209.0	...	13.32	11.69	10.56	9.15	3	M3.0 V	13	M3.0 V	1560	9.3 H	10.1
GJ 190................	05 08 35.0	−18 10 19	1.376	156.6	12.86	11.84	10.32	9.17	7.67	4, 5	M3.5 V	13	M3.5 V	420	9.3 YH	4.1
GJ 203................	05 28 00.2	09 38 38	0.783	195.1	15.33	14.12	12.49	11.29	9.80	4, 6	M3.5 V	13	M3.5 V	1200, 135	9.7 YH	10.8
GJ 239................	06 37 10.8	17 33 53	0.885	293.4	12.27	11.14	9.64	8.72	7.75	3, 5	K7.0 V	13	M0.0 V	300, 35	9.8 YH	13.7
GJ 1125..............	09 30 44.6	00 19 22	0.760	229.0	14.52	13.27	11.72	10.58	9.13	3, 6	M3.5 V	13	M3.0 V	30	9.9 YH	10.3
GJ 358................	09 39 46.4	−41 04 03	0.663	305.0	13.32	12.21	10.72	9.64	8.29	5	M2.0 V	12	M3.0 V	600, 22	9.5 YH	6.5
GJ 432B.............	11 34 30.5	−32 50 01	1.063	320.3	...	...	...	...	...		DC	12	DC/DQ	600	9.5 YH	...
GJ 433AB..........	11 35 26.9	−32 32 24	0.780	186.0	12.51	11.36	9.84	8.84	7.69	4, 6	M1.5 V	12	M2.0 VJ	420, 20	9.1 YH	4.1
GJ 442B.............	11 46 32.5	−40 29 47	1.592	284.4	...	...	...	...	...		M4.0 V	12	M4.0 V	480	9.2 YH	...
GJ 480.1.............	12 40 46.3	−43 33 59	1.047	311.7	15.36	13.97	12.24	11.07	9.63	4, 6	M3.0 V	12	M3.0 V	120	7.8 YH	13.1
Candidate Nearby Stars																
WT 60................	01 51 59.7	−57 47 58	0.652	212.2	...	...	...	...	...		...	...	M4.0 V	600	...	...
WT 84................	02 17 27.9	−59 22 43	0.559	212.6	...	...	15.88	14.29	12.28	7	...	...	M5.5 V	600	...	13.1
WT 1356............	03 13 19.7	−16 38 47	0.682	235.4	...	...	...	...	...		...	...	M4.5 V	600	...	...
HIP 15689..........	03 22 05.5	−13 16 44	[a]	[a]	12.08	12.04	11.54	...	...	8	...	...	Giant +	140	...	...
WT 133..............	04 02 13.9	−43 25 26	0.561	175.5	...	...	16.09	14.71	13.00	9	...	...	M4.5 V	600	...	30.2
WT 135..............	04 11 27.1	−44 18 09	0.689	066.7	...	...	...	...	...		...	...	M2.5 V	420	...	...
HIP 20968..........	04 29 44.9	−29 01 37	[a]	[a]	...	...	11.42	...	...	1	...	...	Giant +	60	...	...
WT 207..............	07 02 36.6	−40 06 29	0.624	105.3	...	...	15.08	13.91	12.31	7	...	...	M4.0 V	600	...	26.5
WT 214..............	07 28 40.1	−61 20 41	0.626	319.5	...	...	16.06	14.80	13.17	7	...	...	M4.0 V	600	...	41.7
WT 233..............	07 56 13.7	−67 05 19	0.792	325.2	...	...	16.23	15.34	14.44	9	...	...	M0.0 V	600	...	284.4
LHS 1957...........	07 57 00.2	−45 37 23	0.666	341.6	...	...	...	...	...		...	...	M2.5 V	270	...	...
GJ 1123..............	09 16 45.0	−77 49 42	1.023	139.3	15.89	14.74	13.10	...	...	6	M4.5 V	12	M4.5 V	210	...	7.6
GJ 1128..............	09 42 53.0	−68 54 06	1.057	348.0	15.73	14.51	12.78	...	...	6	M4.5 V	12	M4.5 V	120	...	6.6
WT 244..............	09 44 28.6	−73 58 39	0.524	256.9	...	...	15.24	13.85	12.07	7	...	...	M4.5 V	600	...	20.4
GJ 1129..............	09 44 48.0	−18 12 48	1.633	264.0	15.47	14.19	12.60	...	...	6	M4.0 V	13	M3.5 V	120	...	11.6
WT 248..............	10 05 54.9	−67 21 31	1.197	264.5	...	...	14.51	13.43	12.02	7	...	...	M3.0 V	600	...	37.2
WT 1759............	10 12 01.9	−18 43 34	0.508	264.8	...	...	15.44	15.20	14.97	9	...	...	DC/DQ	600	...	28.3[b]
WT 1760............	10 12 06.2	−28 51 38	0.505	144.8	...	...	16.19	14.84	13.14	9	...	...	M4.0 V	600	...	44.3
ESO 440-064......	11 48 48.5	−28 33 27	0.710	260.0	...	...	...	14.88	12.97	9	M6.4 V	10	M5.5 V	600	...	...
ESO 440-139......	12 03 27.5	−29 22 49	0.310	316.0	...	...	15.19	...	...	10	M5.5 V	10	M4.5 V	600	...	20.0

[a] The *Hipparcos* proper motions have enormous errors, probably caused by the effects of nearby bright stars.

[b] Distance derived by comparison to the white dwarf standard, GJ 440.

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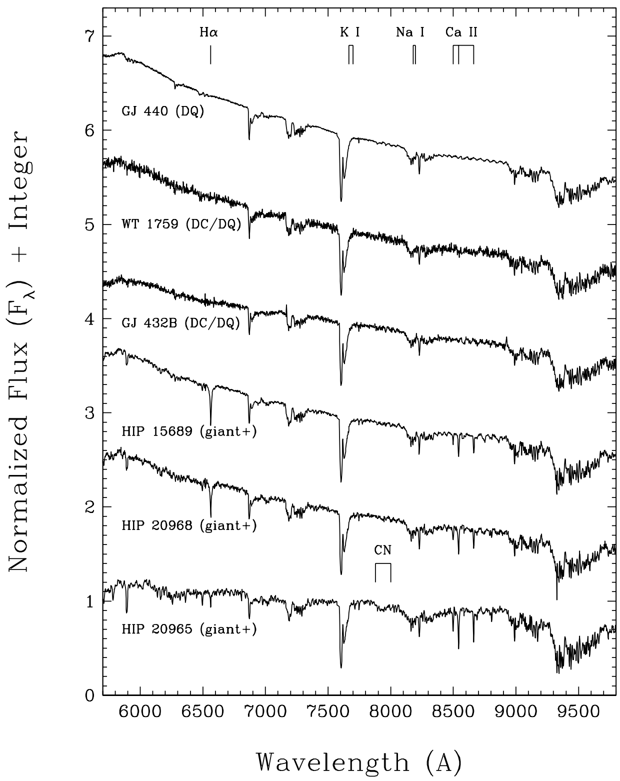

FIG. 2.—Spectra of the three white dwarfs and the three giants. WT 1759 is a newly identified white dwarf with an estimated distance of 28 pc. GJ 432B is a nearby white dwarf companion to a K0 dwarf. The spectra of both white dwarfs are similar to that of the DQ6 spectrophotometric standard, GJ 440. HIP 15689, HIP 20968, and HIP 20965 are giants or supergiants, as indicated by the lack of K I absorption near 7700 Å, the weak Na I absorption near 8200 Å, and the strong Ca II triplet in the 8500–8700 Å window. Note also the CN absorption feature near 7900 Å in the spectrum of HIP 20965. Important spectral features are labeled at the top. The absorption complex at 9300 Å and redward is due primarily to H_2O in the Earth's atmosphere.

proximity of HIP 14555 ($V_J = 10.21$). HIP 14555 has spectral type M1.0 V and a prominent Hα emission feature. Using our new spectral type and the V_J magnitude from *Hipparcos*, we estimate a distance to HIP 14555 of 12.9 pc, which is 5 σ less than the distance obtained from the *Hipparcos* parallax of $0''.05238 \pm 0''.00503$. The fainter star found 64″ to the southwest is LTT 1477 (=GJ 1054B), which has common proper motion with HIP 14555.

HIP 15689 ($V_J = 12.16$) lies 24″ southwest of HIP 15690 ($V_J = 8.83$). The *Hipparcos* parallax of $0''.22745 \pm 0''.06179$ for HIP 15689 has a large error because of the proximity of HIP 15690. Our spectrum of HIP 15689 lacks a K I feature, has a weak Na I feature, and has a strong Ca II triplet. These features clearly indicate that the star is a giant or supergiant. It is therefore not a nearby star.

HIP 20968 ($V_J = 11.42$) lies 21″ northeast of HIP 20965 ($V_J = 7.73$). The *Hipparcos* parallax of $0''.12070 \pm 0''.05647$ for HIP 20968 has a large error because of the proximity of HIP 20965 (parallax $0''.00218 \pm 0''.00189$). Our spectra indicate that both stars are giants or supergiants. HIP 20968 is therefore not a nearby star. HIP 20965's spectrum shows the CN band at 7900 Å.

WT 248 (M3.0 V) is estimated to lie at a distance of 37 pc, despite its large proper motion ($1''.197$ yr^{-1}). Its spectrum does not show the obvious CaH band around 6900 Å that is characteristic of subdwarfs, as might be expected for such a high velocity star.

WT 1759 is a newly identified nearby white dwarf. Its spectrum is virtually identical to that of our spectroscopic standard, GJ 440, which is a DQ6 white dwarf with a temperature of ~8500 K (Bergeron, Leggett, & Ruiz 2001). With our spectral coverage, we cannot determine if the star has type DC or DQ. Assuming that WT 1759 has the same absolute magnitude as GJ 440, we estimate that the distance to WT 1759 is 28 pc.

6. CONCLUDING REMARKS

The recent identifications of candidate nearby stars from the proper motion studies of Wroblewski and collaborators, Ruiz and collaborators, and others, and from photometric sky surveys such as DENIS, 2MASS, and SDSS, suggest that many nearby stars remain undiscovered. In essence, this paper represents a small step in fingerprinting some suspected nearby stars via spectroscopy. We have established a method for consistent spectral typing that will provide definitive types for both the RECONS effort (horizon 10 pc) and the more extensive NASA/NSF NStars Project (horizon 25 pc). Using this method, we report the first spectral types on a standard system for 16 nearby star candidates. We also provide updated spectral types for 18 other stars using broader spectral coverage than was previously available.

This work will allow us to improve the luminosities, colors, and temperatures for the ubiquitous red dwarfs as well as broaden the database used to investigate the luminosity function, mass function, kinematics, and multiplicity of stars in the solar neighborhood. The nearest objects, such as GJ 1123 and GJ 1128 from this study, will be prime targets of upcoming NASA missions like *SIRTF*, *SIM*, and *TPF*, as well as being additions to the target lists of SETI efforts like Project Phoenix.

T. J. H. and T. C. B. thank the Space Telescope Science Institute in Baltimore, Maryland for providing the facilities and resources necessary to conduct this research during the Summer Student Programs of 1996 and 1997. T. J. H. and L. M. W. thank the NStars Project for current support and are grateful for the dedicated work of Dana Backman, Jerry Blackwell, and Takeshi Okimura, who have made the NStars Database a reality. We also would like to thank members of the CTIOPI team, specifically Phil Ianna, Ricky Patterson, and John Subasavage, for their work on the CTIOPI photometry. More information on nearby star work can be found at the RECONS and NStars Web sites.[2]

[2] Available at http://www.chara.gsu.edu/RECONS and http://nstars.arc.nasa.gov, respectively.

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