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A catalogue of distances of planetary nebulae

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Summary. — This catalogue contains distances of 468 galactic planetary nebulae plus lower limits to 61 objects and upper limits for 134 nebulae. The distances were calculated assuming a relationship between the nebular ionized mass and radius.

Key words : planetary nebulae — distances.

1. Introduction.

A method to determine the distances of galactic planetary nebulae has been recently proposed by Maciel and Pottasch (1980), on the basis of a mass-radius relationship established from selected electron densities and distances. As a result of the application of the method to the 5 GHz measurements of southern planetary nebulae by Milne and Aller (1975) and Milne (1979), a total of 202 distances have been published, including the extension work of Maciel (1981a).

In the present work, the method is applied to all objects in the catalogue of Cahn and Kaler (1971) for which Hβ and/or Hα data were available, extending the number of objects studied to 663.

2. Results.

The catalogue contains distances to 468 planetary nebulae having linear radii in the range 0.01 - 0.4 pc (see Maciel and Pottasch, 1980). Lower/upper limits could be derived for additional 195 objects. These comprise nebulae with radii outside the above range and objects for which the flux and/or the angular size are near or below the detection limit. Of course, the distances of such objects have a comparatively lower accuracy. The contents of the catalogue are as follows (Table I) :

column 1 - a reference number
column 2 - number in the catalogue of Perek and Kohoutek (1967)
column 3 - usual name of the nebula
column 4 - adopted angular radius in seconds of arc
column 5 - distance in kpc
column 6 - LL = distance given is a lower limit
UL = distance given is an upper limit
column 7 - source of original data :
MA, M = Milne and Aller (1975), Milne (1979)
CK = Cahn and Kaler (1971).

3. Final comments.

A detailed discussion of the method used has been made elsewhere (Maciel and Pottasch, 1980 ; Maciel, 1981a). Apart from the evidences discussed in these papers, two more points could be added relative to the new distance scale. First, the ratio of the distance scale to the Seaton-Webster scale was determined as $f = 1.25$, if only optically thin nebulae are considered (Maciel, 1981b). The introduction of Cahn and Kaler (1971) distances produces essentially the same ratio ($f \cong 1.2$), despite the heterogeneity of the data. Second, the present distances are in a reasonable agreement with those recently published by Daub (1982), which are based on an improved relationship between the nebular mass and some function of observable characteristics of planetary nebulae (Fig. 1). The ratio of the two scales is $r = 1.12$ as shown by the least squares straight line in figure 1. The dispersion is relatively high, especially at larger distances. However, considering the individual errors affecting both scales, the ratio implied by figure 1 clearly shows that the scales are statistically equivalent to each other. This makes the present scale particularly interesting, since it contains over twice as many objects as Daub's (1982) scale (limits included). A few nebulae lie well below the line shown in figure 1, for which the source of data were Hβ/Hα measurements, in contrast with radio data used by Daub. According to the distances given, the radii of these nebulae are $\sim$ 0.05 pc, suggesting that they are optically thick. Apart from faulty measurements, it seems reasonable to consider Daub's values as upper limits, for these particular nebulae. In fact, in all cases, Daub's results are essentially the same as the original distances in the catalogue of Cahn and Kaler (1971), which did not include any variations in the ionized masses. Conversely, if these nebulae are optically thin, they would be displaced vertically upwards in figure 1.

These nebulae are : M3-22, AP1-12, H2-43, M3-29, M3-11, NGC 6620 and PE1-21. Their exclusion from

figure 1 would not change very much the slope, which would then be 1.16 (dashed line in Fig. 1).

Finally, it should be mentioned that a few objects generally considered as planetary nebulae may be of a different nature (Kohoutek, 1978, 1983), such as H II regions, emission line stars or protoplanetary nebulae. These objects are BL M, H 2-12, VV 1-8, M 1-67, A 76, NGC 6857, Kr 1-2, VV 1-2, NGC 1985, Sh 2-266, VV 1-5, VV 1-4, VV 1-7, He 2-10, He 2-134, PC 11, NGC 6164, He 2-187, and Ap 1-1, and are maintained in the catalogue for the sake of completeness.

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TABLE I

	PK	NAME	THETA	D	REMARK	SOURCE		PK	NAME	THETA	D	REMARK	SOURCE
1	000+17 1	PC 12	2.3	6.1		CK	101	009-05 1	NGC 6629	7.5	1.6		MAPN
2	000+12 1	IC 4634	4.2	2.5		MAPN	102	009-05 1	M3-32	3.0	4.6		CK
3	000+03 1	HE2-250	2.6	2.7		CK	103	009-10 1	M3-33	4.0	5.6		CK
4	000-01 1	M3-43	1.9	0.9	LL	CK	104	009-21 1	K1-5	7.9	7.7		CK
5	000-01 5	M2-19	2.9	1.0	LL	CK	105	010+18 1	K2-8	1.8	33.1	UL	CK
6	000-02 6	M3-19	2.7	2.2		CK	106	010+18 2	M2-9	8.6	3.3		MAPN
7	000-03 1	M3-22	3.2	3.0		CK	107	010+04 1	M2-17	3.2	2.7		CK
8	000-04 1	M2-28	2.3	3.7		CK	108	010+00 1	NGC 6537	3.7	0.9	LL	MAPN
9	000-04 2	M3-23	5.3	2.6		CK	109	010-01 1	NGC 6578	4.8	2.1		MAPN
10	000-05 1	H2-40	6.4	6.4		CK	110	010-06 1	IC 4732	2.5	3.4		MAPN
11	001+05 1	H1-14	3.3	6.6		CK	111	010-06 2	PE1-13	3.8	6.6		CK
12	001+05 2	H1-15	2.6	5.6		CK	112	011+06 1	M2-15	3.2	5.4		MAPN
13	001+02 1	HE2-262	2.0	1.5	LL	CK	113	011+05 1	NGC 6439	2.6	3.8		MAPN
14	001+01 1	K1-4	19.7	2.2		CK	114	011+04 1	M1-32	3.8	0.8	LL	CK
15	001-01 1	BL P	2.1	1.0	LL	CK	115	011-00 1	M1-43	2.6	0.7	LL	CK
16	001-04 2	H1-56	1.5	3.6		CK	116	011-00 2	NGC 6567	4.4	2.1		MAPN
17	001-06 2	SWST 1	1.5	2.1	UL	MAPN	117	011-05 1	M1-47	2.3	2.8		CK
18	002+06 1	H1-11	2.2	6.7		CK	118	012-05 1	M1-62	1.8	4.4		CK
19	002+05 1	NGC 6369	14.3	0.6		MAPN	119	013+04 1	M1-33	2.4	1.2	LL	CK
20	002+01 1	H2-20	1.9	1.0	LL	CK	120	013-03 1	M1-48	2.5	7.3	UL	MAPN
21	002-01 1	PE2-11	2.6	1.3	LL	CK	121	013-04 1	PE2-14	2.5	3.1		CK
22	002-02 2	M3-20	5.0	3.7	UL	MAPN	122	013-07 1	PC 21	6.6	5.5		CK
23	002-02 3	PE2-12	2.5	1.1	LL	CK	123	014+06 1	K2-5	12.3	5.7		CK
24	002-03 2	H2-37	2.4	2.0		CK	124	014-04 1	M1-50	2.7	3.9		MAPN
25	002-04 2	M1-42	4.0	4.3		MAPN	125	015-03 1	A 44	28.0	1.8		CK
26	002-06 1	M2-33	2.0	4.9		CK	126	015-04 1	M1-53	3.3	3.6		MAPN
27	002-06 2	H1-63	2.5	5.7	UL	MAPN	127	016+13 1	A 42	30.0	5.1	UL	CK
28	002-07 1	M2-41	7.1	3.9		CK	128	016-01 1	M1-46	7.5	2.4		MAPN
29	002-13 1	IC 4776	3.5	3.3		MAPN	129	016-04 1	M1-54	8.3	3.2		MAPN
30	003+07 1	H2-8	2.1	25.3	UL	CK	130	016-04 2	M1-56	5.0	4.5	UL	MAPN
31	003+05 1	H2-15	2.3	7.5		MAPN	131	017-02 1	M1-52	3.3	2.1		CK
32	003+03 1	H2-17	1.8	7.2		MAPN	132	017-04 1	M3-30	8.3	4.3		MAPN
33	003+02 1	HB 4	2.8	2.2		MAPN	133	017-10 1	A 51	33.5	2.7	UL	CK
34	003-02 1	M1-35	2.6	0.7	LL	CK	134	017-21 1	A 65	18.7	1.5		CK
35	003-02 2	M2-26	4.2	1.3		CK	135	018+04 1	M3-52	5.8	5.2		CK
36	003-02 3	IC 4673	7.4	3.4		MAPN	136	018-01 1	M1-49	2.5	1.1	LL	CK
37	003-04 1	AP1-10	6.5	1.6		CK	137	019+00 1	M3-53	2.3	0.9	LL	CK
38	003-04 3	H1-59	3.0	2.6		CK	138	019-19 1	K2-7	70.0	2.6	UL	CK
39	003-04 4	H2-41	3.8	2.5		CK	139	019-23 1	A 66	134.0	1.2	UL	MAPN
40	003-04 5	NGC 6565	4.5	3.5		MAPN	140	020-00 1	A 45	145.5	1.6	UL	CK
41	003-04 6	AP1-11	6.0	2.1		CK	141	021-00 1	M3-28	4.5	0.9		CK
42	003-04 7	AP1-12	6.0	2.2		CK	142	021-00 2	M3-55	3.6	1.4		CK
43	003-04 9	H2-43	4.5	2.6		CK	143	021-01 1	M1-51	4.6	1.2		CK
44	003-06 1	M2-36	6.9	4.0		MAPN	144	021-05 1	M1-63	2.1	3.2		CK
45	003-14 1	HB 7	2.0	4.8	UL	MAPN	145	022-02 1	M1-57	4.7	3.1		MAPN
46	003-17 1	HB 8	2.5	5.3		CK	146	022-03 1	M1-58	3.5	3.4		MAPN
47	004+06 1	H2-12	2.7	12.9	UL	CK	147	023-02 1	M1-59	2.3	2.5		MAPN
48	004+06 2	H1-24	4.3	3.5		CK	148	024+05 1	M4-9	22.1	1.5		CK
49	004+04 1	M1-25	2.3	3.6		MAPN	149	024+03 1	M2-40	2.5	1.6		CK
50	004+02 1	H2-25	2.3	6.3		MAPN	150	024-02 1	M2-46	2.2	1.4	LL	CK
51	004+01 1	H2-24	3.1	6.3		MAPN	151	024-03 1	PE1-17	2.5	3.2		CK
52	004-03 1	M2-29	2.8	1.2	LL	CK	152	025+40 1	IC 4593	6.0	2.4		MAPN
53	004-04 1	H1-60	1.9	4.0		CK	153	025-00 1	PE1-14	2.3	0.9	LL	CK
54	004-04 2	M1-44	1.9	1.8	LL	CK	154	025-02 1	PE1-15	6.6	1.9	UL	CK
55	004-05 1	M3-26	3.7	3.1		CK	155	025-04 2	IC 1295	54.1	0.7		CK
56	004-05 2	HE2-376	1.7	6.3		CK	156	025-11 1	A 60	39.0	3.1	UL	MAPN
57	004-05 3	PE1-12	6.0	5.9		CK	157	025-17 1	NGC 6818	9.1	1.5		MAPN
58	004-05 4	K2-9	5.2	8.9	UL	CK	158	026+01 1	VV1-8	32.8	1.4		CK
59	004-05 5	M2-37	3.6	3.8		CK	159	026-01 2	PE2-15	1.5	1.4	LL	CK
60	004-11 1	M3-29	4.1	3.0		CK	160	026-02 1	PE1-16	3.8	1.2		CK
61	004-11 2	HE2-418	6.5	5.8		CK	161	026-02 3	PE1-19	2.2	1.4	LL	CK
62	004-22 1	HE2-436	5.0	4.5	UL	MAPN	162	027+00 1	M2-45	3.4	2.5		MAPN
63	005+06 1	M3-11	3.6	3.1		CK	163	027-02 1	PE1-18	3.4	1.5		CK
64	005+05 1	M3-12	3.0	3.1		CK	164	027-03 1	A 49	22.0	2.1		CK
65	005+05 2	H2-16	8.0	5.4		MAPN	165	027-05 1	IC 4846	1.0	3.3	LL	MAPN
66	005+04 1	H1-27	3.3	4.7		MAPN	166	028+01 1	M2-44	3.7	0.8	LL	CK
67	005+03 1	PE1-9	6.2	3.5		CK	167	028-03 1	PE1-21	4.3	2.5		CK
68	005-02 1	M3-24	5.1	1.1		CK	168	028-04 1	PE1-20	3.2	3.4		CK
69	005-03 2	H2-42	5.1	3.1		CK	169	029+00 1	A 48	20.0	1.8		CK
70	005-04 1	H2-44	4.1	2.7		CK	170	029-05 1	NGC 6751	10.5	2.8		MAPN
71	005-05 1	M2-38	4.0	3.7		CK	171	030+03 1	A 47	8.0	5.5		CK
72	005-06 1	NGC 6620	2.5	4.0		CK	172	031+05 1	K3-3	4.6	11.5	UL	CK
73	005-08 1	HF2-2	9.3	4.5		CK	173	031-10 1	M3-34	2.8	4.4		CK
74	006+04 1	H2-18	1.9	3.9		CK	174	032+05 1	K3-4	5.9	6.5	UL	CK
75	006+04 2	M3-15	2.1	1.5	LL	CK	175	032-03 1	K3-18	2.0	6.2	UL	CK
76	006+03 1	HA2-22	3.1	2.5		CK	176	032-06 1	K2-10	10.8	14.3	UL	CK
77	006+03 2	M1-28	13.0	3.5		MAPN	177	033-02 1	NGC 6741	3.9	1.7		MAPN
78	006+02 4	PE2-10	1.9	1.0	LL	CK	178	033-05 1	A 55	25.8	1.8		CK
79	006-02 1	M1-41	4.2	1.4		CK	179	033-06 1	NGC 6772	56.0	1.4		MAPN
80	006-03 2	H2-45	2.3	2.3		CK	180	034+11 1	NGC 6572	6.2	0.8		MAPN
81	006-04 1	PE2-13	2.9	6.0		CK	181	034+06 1	K3-5	5.2	7.4		CK
82	007+07 1	M1-22	4.5	4.4		CK	182	034-06 1	NGC 6778	7.9	2.2		MAPN
83	007+06 1	M1-23	3.5	3.7		CK	183	035-00 1	AP2-1	16.4	1.6		CK
84	007+06 2	M1-24	3.2	3.8		CK	184	036+17 1	A 43	40.0	2.7	UL	CK
85	007+01 1	HB 6	2.9	1.9		MAPN	185	036-01 1	SH2-71	49.8	1.0		CK
86	007-03 1	M2-34	4.2	2.0		CK	186	036-57 1	NGC 7293	390.0	0.2		CK
87	007-06 1	H1-66	4.1	4.0		CK	187	037-03 2	A 56	90.6	1.7	UL	CK
88	007-06 2	VY2-1	4.0	3.9	UL	MAPN	188	037-05 1	A 58	19.9	3.8		CK
89	008+05 1	TH4-2	9.5	2.5		CK	189	037-06 1	NGC 6790	3.6	1.5		CK
90	008+03 1	NGC 6445	16.6	1.0		MAPN	190	037-34 1	NGC 7009	13.4	0.9		MAPN
91	008-01 1	M1-40	2.9	1.9		MAPN	191	038+12 1	CN3-1	2.7	2.9		MAPN
92	008-03 1	H1-64	3.8	2.1		CK	192	038+02 1	YM 16	152.0	0.9	UL	CK
93	008-04 1	M2-39	1.7	8.8		MAPN	193	038-03 3	K2-11	6.5	4.4	UL	CK
94	008-04 2	M2-42	1.9	2.3		CK	194	038-25 1	A 70	21.0	3.5		CK
95	008-06 1	H2-47	13.0	8.4	UL	CK	195	039+02 1	K3-17	7.4	2.4		CK
96	008-07 2	NGC 6644	1.3	1.7	LL	CK	196	039-02 1	M2-47	4.5	2.9		MAPN
97	009+14 1	NGC 6309	6.9	2.1		MAPN	197	040-00 1	A 53	20.4	1.6		CK
98	009+10 1	A 41	9.2	5.4		CK	198	041-02 1	NGC 6781	35.0	0.9		MAPN
99	009+04 1	TH4-5	3.2	4.4		CK	199	042-06 1	NGC 6807	1.0	5.5		MAPN
100	009-04 1	H1-67	2.8	2.5		CK	200	042-14 1	NGC 6852	14.0	3.4		MAPN

TABLE I *(continued)*.

	PK	NAME	THETA	D	REMARK	SOURCE		PK	NAME	THETA	D	REMARK	SOURCE
201	043+37 1	NGC 6210	8.1	1.3		MA,M	301	103+0C 2	M2-52	7.C	1.5		CK
202	C43+03 1	M1 65	1.8	2.3		CK	302	104+07 1	NGC 7139	38.0	1.6		CK
203	043-03 1	M4-14	3.7	1.6		CK	303	104-01 1	M2-53	7.4	0.9		CK
204	C43-13 1	A 67	33.5	3.2	UL	MA,M	304	104-25 1	JN 1	157.0	0.9	UL	CK
205	C44+01 1	K3-23	1.6	1.0	LL	CK	305	106-17 1	NGC 7662	7.7	0.8		CK
206	044-09 1	A 64	18.4	3.6		CK	306	107+21 1	K1-6	107.0	1.5	UL	CK
207	C45+24 1	K1-14	23.5	5.3	UL	CK	307	107+02 1	NGC 7354	1C.0	0.8		CK
208	C45-04 1	NGC 6804	20.2	1.6		MA,M	308	107-02 1	M1-80	4.0	1.6	LL	CK
209	046-04 1	NGC 6803	2.8	2.5		MA,M	309	107-13 1	VY2-3	2.3	7.4		CK
210	C47+42 1	A 39	87.0	1.9	UL	CK	310	11C-12 1	K1-20	17.0	6.1	UL	CK
211	047+04 1	K3-21	3.6	10.5	UL	CK	311	111-02 1	HB 12	5.0	0.5	LL	CK
212	047-04 1	A 62	80.5	1.1	UL	CK	312	112-1C 1	A 84	64.7	1.1		CK
213	C48+02 1	K3-24	3.1	3.6	UL	CK	313	113-0E 1	A 83	27.0	3.8	UL	CK
214	048+01 1	HE2-429	2.1	0.8	LL	CK	314	114-04 1	A 82	36.2	2.0		CK
215	049+8E 1	H4-1	3.0	12.7	UL	CK	315	116+08 1	M2-55	19.3	1.9		CK
216	C49+02 1	HE2-428	4.8	1.7		CK	316	117+1E 1	IC 1454	17.0	3.3		CK
217	C5C+05 1	A 52	18.5	3.1		CK	317	118+02 1	SH1-118	62.0	1.5	UL	CK
218	C50+03 1	M1-67	50.2	1.0		MA,M	318	118-74 1	NGC 246	112.0	0.4		CK
219	C50-3E 1	A 76	6.5	8.8		CK	319	119+0E 1	A 1	23.5	3.7	UL	CK
220	C51+25 1	K1-15	21.5	7.2	UL	CK	320	119-0E 1	HU1-1	2.5	1.9	LL	CK
221	051+09 1	HU2-1	1.5	1.9	LL	CK	321	120+0S 1	NGC 40	18.2	0.8		CK
222	C51+0E 1	K1-17	22.5	3.9	UL	CK	322	122-04 1	A 2	15.5	3.0		CK
223	051-03 1	M1-73	2.5	1.9		CK	323	123+34 1	IC 3568	9.0	2.1		CK
224	052-02 2	ME1-1	5.0	3.8		MA,M	324	125-47 1	PHL 932	138.0	1.1	UL	CK
225	C53+24 1	VY1-2	2.3	4.7		CK	325	130+01 1	IC 1747	6.5	0.9		CK
226	C53+03 1	A 59	43.3	1.8		CK	326	13C-1C 1	NGC 650	69.2	0.7		CK
227	053-01 1	K3-38	2.0	1.3	LL	CK	327	130-11 1	M1-1	3.0	6.1	UL	CK
228	C53-03 1	A 63	20.0	2.7		CK	328	131+02 1	A 3	30.0	2.0		CK
229	C54-12 1	NGC 6891	6.3	2.1		MA,M	329	136+04 1	A 6	93.0	1.5	UL	CK
230	055+16 1	A 46	31.7	3.1	UL	CK	330	138+02 1	IC 289	18.4	1.3		CK
231	C55+0E 1	A 54	28.0	4.1	UL	CK	331	141-07 1	A 5	63.7	1.7	UL	CK
232	055+02 2	HE1-1	2.7	3.6	UL	CK	332	144+0E 1	NGC 1501	25.9	1.1		CK
233	055-01 1	K3-43	1.4	1.5	LL	CK	333	144-15 1	A 4	1C.0	6.1		CK
234	C56+14 1	K2-6	13.4	8.9	UL	CK	334	147+04 1	M2-2	5.8	1.4		CK
235	C56-0C 1	K3-42	1.7	0.8	LL	CK	335	147-02 1	M1-4	2.0	0.8	LL	CK
236	057-08 1	NGC 6879	2.5	3.7		CK	336	148+57 1	NGC 3587	100.0	0.7		CK
237	C58+0E 1	A 57	18.4	5.0	UL	CK	337	151+02 1	VV1-2	125.0	0.7	UL	CK
238	058-1C 1	IC 4997	1.0	2.3	LL	MA,M	338	153+22 1	A 16	70.5	2.3	UL	CK
239	C59+04 1	K3-34	4.8	5.7	UL	CK	339	158+37 1	A 28	134.0	2.4	UL	CK
240	C59-18 1	A 72	63.7	1.1		CK	340	159-1S 1	IC 351	3.5	3.0		CK
241	C6C-0C 1	K3-45	3.4	1.9		CK	341	161-14 1	IC 2003	3.3	2.4		CK
242	C6C-03 1	NGC 6853	100.0	0.4		MA,M	342	164+31 1	NGC 2474	19C.0	0.9	UL	CK
243	060-04 1	A 68	19.2	3.2		CK	343	165-15 1	NGC 1514	50.2	0.8		CK
244	C60-07 1	HE1-5	14.8	2.8		CK	344	166+1C 1	IC 2149	4.2	0.7	LL	CK
245	C6C-C7 2	NGC 6886	3.0	2.8		MA,M	345	167-0C 1	A 8	30.0	2.6		CK
246	C61+0E 1	K3-27	8.2	5.7		CK	346	169-0C 1	IC 2120	23.4	1.5		CK
247	C61+03 1	HE2-437	3.6	7.0		CK	347	171-25 1	BA 1	19.0	3.6		MA,M
248	061-09 1	NGC 6905	23.5	1.8		MA,M	348	172+0C 1	A 9	18.5	3.1		CK
249	062+09 1	NGC 6765	19.0	4.1		CK	349	173-05 1	K2-1	66.0	1.4	UL	CK
250	C62-0C 1	M2-48	4.2	1.6		CK	350	176+0C 1	NGC 1985	35.0	1.7		CK
251	C63+13 1	NGC 6720	34.6	0.7		CK	351	189+19 1	NGC 2371	21.8	1.5		CK
252	C64+4E 1	NGC 6058	13.2	4.1		CK	352	189+07 1	M1-7	4.5	5.7		MA,M
253	064+15 1	M1-64	8.6	3.1		CK	353	190-17 1	J 320	3.2	4.1		MA,M
254	064+05 1	30 3639	5.5	0.6	LL	CK	354	194+02 1	J 900	5.5	2.1		MA,M
255	C65+0C 1	NGC 6842	23.7	1.7		CK	355	195-0C 1	SH2-266	33.5	1.3		MA,M
256	C65-05 1	HE1-6	7.6	6.9	UL	CK	356	196-01 1	VV1-5	162.0	0.5		MA,M
257	065-27 1	PS 1	0.5	9.3		CK	357	196-1C 1	NGC 2022	9.7	2.2		MA,M
258	C66-28 1	NGC 7094	44.0	2.9	UL	MA,M	358	196-12 1	A 11	15.0	4.3		MA,M
259	C68+01 2	HE1-4	11.2	1.9		CK	359	197+17 1	NGC 2392	22.4	1.1		MA,M
260	068-0C 1	M1-75	7.0	3.1	UL	CK	360	197-02 1	VV1-4	63.2	0.8		MA,M
261	C69+03 1	K3-46	11.5	3.2		CK	361	197-03 1	A 14	16.4	2.8		CK
262	C69-02 1	NGC 6894	22.0	1.5		CK	362	197-14 1	K1-7	17.0	3.0		CK
263	069-03 1	K3-58	3.9	5.7	UL	CK	363	198-06 1	A 12	18.5	2.6		MA,M
264	C7C+01 2	NGC 6857	19.3	1.9		CK	364	20C+0E 1	A 19	35.0	3.2	UL	MA,M
265	072-17 1	A 74	416.0	0.6	UL	CK	365	204+04 1	K2-2	207.0	1.0	UL	MA,M
266	C74+02 1	NGC 6881	2.5	1.7		CK	366	204-08 1	A 13	76.3	1.8	UL	MA,M
267	C75+04 1	ANON.	14.2	4.2		CK	367	205+14 1	YM 29	307.0	0.5	UL	MA,M
268	076+01 1	A 69	39.9	0.3		CK	368	206-4C 1	NGC 1535	9.2	1.6		MA,M
269	077+14 1	A 61	100.5	1.7	UL	CK	369	208+33 1	A 30	63.5	3.1	UL	CK
27C	C78+18 1	A 5C	23.3	2.8		CK	370	210+01 1	M1-8	11.0	3.5		MA,M
271	C79+06 1	K3-56	2.0	20.3	UL	CK	371	211-03 1	M1-6	2.5	3.0	UL	MA,M
272	079+05 1	M4-17	7.6	1.8		CK	372	214+07 1	A 20	32.0	3.0	UL	MA,M
273	C81-14 1	A 78	53.5	4.0	UL	CK	373	215+11 1	K1-11	1CC.0	2.1	UL	MA,M
274	C82+11 1	NGC 6833	1.0	2.6	LL	CK	374	215+03 1	NGC 2346	27.3	1.5		MA,M
275	C82+07 1	NGC 6884	3.8	1.7		CK	375	215-24 1	IC 418	6.2	0.8		MA,M
276	C83+12 1	NGC 6826	12.7	0.7		CK	376	215-3C 1	A 7	375.0	0.5	UL	MA,M
277	C84-03 1	NGC 7027	6.0	0.7		CK	377	216-0C 1	A 18	36.6	1.7		CK
278	C85+04 1	A 71	78.5	0.9		CK	378	217+14 1	A 24	177.4	0.9	UL	MA,M
279	086-08 1	HU1-2	2.5	2.2		CK	379	219+31 1	A 31	486.0	0.5	UL	CK
280	C88+0E 1	KR1-2	12.5	5.3	UL	CK	380	219+01 1	K1-9	18.3	2.6		CK
281	C88-01 1	NGC 7048	27.5	1.2		CK	381	220-53 1	NGC 1360	214.0	0.5	UL	MA,M
282	089+0C 1	NGC 7026	9.5	0.9		CK	382	221+05 1	M3-3	6.1	2.5		CK
283	C89-CC 1	SH1-89	22.6	1.6		CK	383	221-04 1	A 17	21.4	3.7		CK
284	C89-02 1	M1-77	3.5	0.7	LL	CK	384	221-12 1	IC 2165	4.0	1.9		MA,M
285	C89-05 1	IC 5117	1.0	1.7	LL	CK	385	223-02 1	K1-8	4C.0	1.6		MA,M
286	C93+05 2	NGC 7008	42.8	0.9		CK	386	224+15 1	K1-13	9C.2	2.1	UL	MA,M
287	C93+01 1	M1-78	3.2	3.1		CK	387	226+05 1	M1-16	1.5	5.5		MA,M
288	C93-02 1	M1-79	16.5	1.0		CK	388	227+33 1	A 32	6C.0	2.4	UL	MA,M
289	C94+27 1	K1-16	57.0	2.5	UL	CK	389	228+05 1	M1-17	1.5	5.8		MA,M
290	C95+C7 1	A 73	36.6	2.8	UL	CK	390	229-02 1	K1-10	31.1	2.1		CK
291	C96+29 1	NGC 6543	9.4	0.7		CK	391	231+04 1	M1-18	15.2	2.1		CK
292	096+02 1	K3-61	31.0	1.1		CK	392	231+04 2	NGC 2438	35.2	1.5		MA,M
293	C97+03 1	A 77	18.7	1.5		CK	393	232-01 1	M1-13	5.0	4.5		MA,M
294	C97-02 1	M2-50	2.0	1.5	LL	CK	394	233-1E 1	A 15	17.0	3.1		MA,M
295	098+02 1	K3-63	3.5	1.7	UL	CK	395	234+02 1	NGC 2440	16.4	1.1		MA,M
296	1CC-CS 1	IC 5217	3.4	2.8		CK	396	234-0E 1	K2-3	31.7	2.4		CK
297	101+0E 1	A 75	28.1	3.5	UL	CK	397	235+01 1	VV1-7	124.0	1.8	UL	MA,M
298	102-02 1	A 79	27.1	1.3		CK	398	236+03 1	K1-12	19.0	3.9		MA,M
299	1C2-C5 1	A 80	54.8	1.1		CK	399	238+34 1	A 33	134.4	1.6	UL	MA,M
300	103+0C 1	M2-51	19.6	1.5		CK	400	239+13 1	NGC 2610	19.5	2.6		MA,M

TABLE I *(continued)*.

	PK	NAME	THETA	D	REMARK	SOURCE		PK	NAME	THETA	D	REMARK	SOURCE
401	240-07 1	M3-2	3.8	3.2		CK	501	315+09 1	HE2-104	2.5	6.3	UL	MA,M
402	241+02 1	M3-4	6.9	4.6		MA,M	502	315+05 1	HE2-109	3.7	4.3		CK
403	241-07 1	M4-1	2.8	4.4		MA,M	503	315-00 1	HE2-111	6.0	2.8		MA,M
404	242-11 1	M3-1	5.6	4.3		MA,M	504	315-13 1	HE2-131	3.0	1.6		MA,M
405	243-01 1	NGC 2452	9.8	2.7		MA,M	505	316+08 1	HE2-108	5.5	3.9		MA,M
406	244+12 1	A 29	200.0	0.8	UL	CK	506	317-05 1	HE2-119	25.0	1.7		MA,M
407	245+01 1	M3-5	3.5	4.9		MA,M	507	318+41 1	A 36	239.0	0.6	UL	MA,M
408	248+29 1	A 34	150.0	1.4	UL	MA,M	508	318-02 1	HE2-114	15.0	4.1		MA,M
409	248+08 1	HE2-10	5.6	3.4		CK	509	318-02 2	HE2-116	25.5	1.1		CK
410	248-08 1	M4-2	4.0	3.6		CK	510	319+15 1	IC 4406	17.3	1.7		MA,M
411	249-05 1	A 23	27.0	2.0		CK	511	319+06 1	HE2-112	7.3	2.5		MA,M
412	250+00 1	A 26	20.0	2.0		CK	512	319-09 1	HE2-134	5.0	6.0	UL	MA,M
413	252+04 1	K1-1	21.7	1.9		CK	513	320-05 1	HE2-138	3.5	3.1		MA,M
414	253+10 1	K1-2	32.0	3.3	UL	MA,M	514	321+02 1	HE2-115	1.5	2.0	LL	MA,M
415	254+05 1	M3-6	4.8	2.6		MA,M	515	321+02 2	HE2-117	2.5	1.7		MA,M
416	258-00 1	HE2-9	2.2	0.8	LL	CK	516	321+01 1	HE2-120	13.5	3.2		MA,M
417	259+00 1	HE2-11	32.5	1.2		CK	517	321-16 1	HE2-185	5.0	4.9	UL	MA,M
418	261+32 1	NGC 3242	19.9	0.8		MA,M	518	322-00 1	PE2-8	0.8	2.9	LL	MA,M
419	261+08 1	NGC 2818	24.6	2.3		MA,M	519	322-02 1	MZ 1	12.6	2.4		MA,M
420	261+02 1	HE2-15	10.0	2.1		MA,M	520	322-05 1	NGC 5979	4.0	2.6		MA,M
421	263-05 1	PB 2	1.5	4.7		MA,M	521	322-06 1	HE2-136	5.0	4.5	UL	MA,M
422	264-08 1	HE2-7	6.5	3.2		MA,M	522	323+02 1	HE2-123	2.3	2.9		MA,M
423	264-12 1	HE2-5	1.5	5.4		MA,M	523	323-02 1	HE2-132	9.0	3.7		MA,M
424	265+04 1	NGC 2792	6.8	1.8		MA,M	524	324+02 1	HE2-125	1.7	1.8	LL	CK
425	269-03 1	PB 3	3.5	3.2		MA,M	525	324-01 1	HE2-133	2.0	1.7	LL	MA,M
426	272+12 1	NGC 3132	28.0	1.1		MA,M	526	325+04 1	HE2-128	1.5	4.7	UL	MA,M
427	273-03 1	HE2-18	5.5	3.1		CK	527	325+04 2	HE2-127	1.5	9.1	UL	MA,M
428	274+03 1	HE2-37	11.5	2.3		CK	528	325+03 1	HE2-129	0.7	10.3	UL	CK
429	274+02 2	HE2-35	1.5	5.9	UL	MA,M	529	325-04 1	HE2-141	6.9	2.8		MA,M
430	275+72 1	KJ-4	343.0	0.6	UL	MA,M	530	325-12 1	HE2-182	1.5	3.8	UL	MA,M
431	275-01 1	PE2-4	3.5	1.9		CK	531	326+42 1	IC 972	22.0	3.8	UL	MA,M
432	275-02 1	HE2-28	5.0	4.7		MA,M	532	326-06 1	HE2-151	1.5	8.4	UL	MA,M
433	275-02 2	HE2-29	7.0	4.0		MA,M	533	326-10 1	CN1-2	1.5	7.1	UL	MA,M
434	275-04 1	PB 4	5.4	2.9		MA,M	534	327+13 1	HE2-118	1.5	8.4	UL	MA,M
435	275-04 2	HE2-21	1.2	7.2		MA,M	535	327+10 1	NGC 5882	7.0	1.6		MA,M
436	277-03 1	NGC 2899	45.0	1.5		MA,M	536	327-01 1	HE2-143	2.6	2.7		MA,M
437	278+05 1	PB 6	5.5	4.0		MA,M	537	327-01 2	HE2-140	1.3	2.9		MA,M
438	278-04 1	HE2-32	17.4	2.2		CK	538	327-02 1	HE2-142	1.7	3.7		MA,M
439	278-05 1	NGC 2867	8.6	1.6		MA,M	539	327-06 1	HE2-158	1.0	10.0		CK
440	278-06 1	HE2-26	1.5	4.7	UL	MA,M	540	327-07 1	HE2-163	10.0	3.1		CK
441	279-03 1	HE2-36	5.0	2.7		MA,M	541	328-02 1	HE2-146	11.0	1.7		MA,M
442	281-05 1	IC 2501	1.0	2.0	LL	MA,M	542	329+02 1	SP 1	36.0	1.6		MA,M
443	282+03 1	HE2-48	7.0	5.1		CK	543	329-02 1	HE2-149	1.5	8.4	UL	MA,M
444	283+03 1	HE2-50	5.9	2.8		CK	544	329-02 2	MZ 2	11.4	2.3		MA,M
445	283+02 1	MY 60	3.7	3.4		MA,M	545	330-02 1	HE2-153	6.5	1.2		CK
446	283-01 1	HF 4	10.6	1.9		CK	546	330-03 1	HE2-159	5.0	4.3		MA,M
447	283-04 1	HE2-39	5.2	3.4		CK	547	331+16 1	NGC 5873	2.7	3.8		MA,M
448	285+01 1	PE1-1	1.5	2.2	LL	CK	548	331+00 1	PE1-4	5.2	1.2		CK
449	285+01 2	PE1-2	2.5	2.1		CK	549	331-01 1	MZ 3	12.7	1.0		MA,M
450	285-02 1	HE2-47	1.5	2.0	UL	MA,M	550	331-02 1	HE2-157	1.5	5.4		MA,M
451	285-05 1	IC 2553	4.4	2.8		MA,M	551	331-02 2	HE2-161	5.0	4.0		MA,M
452	285-14 1	IC 2448	4.5	2.9		MA,M	552	331-03 1	HE2-162	1.0	5.6	UL	MA,M
453	286+02 1	HE2-55	9.0	2.6		CK	553	331-03 2	HE2-165	25.0	1.6		CK
454	286-04 1	NGC 3211	6.9	2.5		MA,M	554	331-05 1	PC 11	1.5	6.2	UL	MA,M
455	286-06 1	HE2-41	5.0	3.6	UL	MA,M	555	332-03 1	HE2-164	8.0	2.3		MA,M
456	288+00 1	HF 38	12.6	2.2		CK	556	332-04 1	HE2-170	1.5	7.1	UL	MA,M
457	288-02 1	PE1-3	4.0	4.7		MA,M	557	333+01 1	HE2-152	5.5	2.0		MA,M
458	288-05 1	HE2-51	6.2	3.0		MA,M	558	334-05 1	IC 4642	7.7	2.7		MA,M
459	289+07 1	HE2-63	1.5	7.8		MA,M	559	335-01 1	HE2-169	4.0	2.5		MA,M
460	289-00 1	AG CAR	17.8	1.3		MA,M	560	336+01 1	PE1-6	3.6	4.0		MA,M
461	289-01 1	HE2-57	10.0	2.2		CK	561	336-00 1	NGC 6164	180.0	0.2		MA,M
462	29C+07 1	FG 1	13.6	2.4		MA,M	562	336-05 1	HE2-186	1.5	6.2		MA,M
463	290-00 1	HF 48	9.5	2.0		CK	563	336-06 1	PC 14	3.5	4.5		MA,M
464	291+03 1	HE2-64	4.2	4.6		CK	564	337+01 1	PE1-7	1.0	2.6	UL	MA,M
465	291-04 1	IC 2621	2.5	2.1		MA,M	565	337-05 1	HE2-187	3.0	3.2		CK
466	292+04 1	PB 8	2.5	5.1		MA,M	566	338+05 1	HE2-155	7.3	2.7		MA,M
467	292+01 1	NGC 3699	22.4	2.0		MA,M	567	338-08 1	NGC 6326	5.9	2.5		MA,M
468	292+01 2	HE2-67	2.5	4.3	UL	MA,M	568	341+13 1	NGC 6026	27.0	1.9		MA,M
469	293+01 1	HE2-70	17.4	1.9		CK	569	341+05 1	NGC 6153	11.7	1.0		MA,M
470	294+43 1	NGC 4361	57.0	0.9		MA,M	570	341-09 1	HE2-248	2.5	6.7	UL	MA,M
471	294+04 1	NGC 3918	8.0	0.9		MA,M	571	342+27 1	ME2-1	3.3	4.0		MA,M
472	294-04 1	HE2-68	1.5	5.1	UL	MA,M	572	342+10 1	NGC 6072	35.0	1.3		MA,M
473	296-03 1	HE2-73	2.0	3.4		MA,M	573	342+00 1	H1-3	7.9	1.4		CK
474	296-06 1	HE2-71	1.5	7.8	UL	MA,M	574	342-02 1	PE1-8	9.9	2.2		CK
475	296-20 1	NGC 3195	19.7	2.4		MA,M	575	342-14 1	SP 3	17.5	2.2		MA,M
476	297+03 1	HE2-78	1.5	3.8		CK	576	343+11 1	H1-1	1.2	8.8		CK
477	298-00 1	HE2-77	12.5	0.6	UL	MA,M	577	343-07 1	PC 17	2.5	4.8		CK
478	298-01 2	HE2-76	8.9	1.6		CK	578	344+00 1	H1-5	2.6	0.9	LL	CK
479	298-04 1	NGC 4071	31.7	2.4		MA,M	579	344-01 1	H1-6	6.0	1.4		CK
480	299+02 1	HE2-82	12.0	2.0		CK	580	345+06 1	HE2-175	3.3	6.4		CK
481	299-01 1	HE2-81	3.2	0.9	LL	CK	581	345+00 1	IC 4637	7.1	1.4		MA,M
482	300+00 1	HE2-83	2.8	0.7	LL	CK	582	345-08 1	IC 1	4.8	1.0		MA,M
483	300-00 1	HE2-84	14.0	1.6		CK	583	346+12 1	K1-3	50.0	3.0	UL	MA,M
484	300-01 1	HE2-85	5.1	1.6		CK	584	346-06 1	IC 4663	7.2	3.2		MA,M
485	300-02 1	HE2-86	1.8	2.6		MA,M	585	348-09 1	HE2-306	1.5	7.1		CK
486	303+40 1	A 35	450.0	0.5	UL	MA,M	586	348-13 1	IC 4699	3.4	5.2		MA,M
487	304-04 1	IC 4191	7.0	2.0		MA,M	587	349+01 1	NGC 6302	22.3	0.4		MA,M
488	306-00 1	TH2-A	12.2	2.5		MA,M	588	349-01 1	NGC 6337	23.5	1.7		MA,M
489	307-03 1	NGC 5189	70.0	0.7		MA,M	589	350+04 1	H2-1	2.8	3.4		MA,M
490	307-04 1	MYCN 18	3.0	2.8		MA,M	590	350-03 1	H1-26	9.0	2.5		CK
491	307-05 1	HE2-97	2.5	4.9	UL	MA,M	591	350-05 1	H1-28	3.9	1.7		CK
492	308-12 1	HE2-105	17.5	3.6		MA,M	592	351+05 1	M2-5	2.5	1.5		CK
493	309+00 1	HE2-96	2.0	0.9	LL	CK	593	351-06 1	H1-37	4.3	3.9		CK
494	309-04 1	HE2-99	8.5	4.2		MA,M	594	352+05 1	M2-6	2.1	3.1		CK
495	309-04 2	NGC 5315	2.6	1.2	LL	MA,M	595	352+03 2	H1-8	1.8	5.1		MA,M
496	310-02 1	HE2-103	10.0	4.0		MA,M	596	352+00 1	H1-12	3.4	0.9	LL	CK
497	311+02 1	HE2-102	4.5	4.0		MA,M	597	352-00 1	H1-13	4.8	0.8		CK
498	312+10 1	NGC 5307	6.3	2.3		MA,M	598	352-04 1	H1-30	2.7	2.2		CK
499	312-01 1	HE2-107	5.0	3.1		MA,M	599	352-07 1	FG 3	12.5	2.0	UL	MA,M
500	312-02 1	HE2-106	1.5	3.5	UL	MA,M	600	353+08 1	MYCN 26	2.5	6.2	UL	MA,M

TABLE I *(continued).*

	PK	NAME	THETA	D	REMARK	SOURCE
601	353+06 1	M2-7	3.9	4.4		CK
602	353-05 1	H1-38	3.5	5.7		CK
603	354+04 1	M2-10	2.0	3.9		CK
604	354-07 1	H1-52	6.0	4.7		CK
605	355-02 1	M3-14	3.6	1.6		CK
606	355-03 3	H1-35	1.0	2.7	UL	MAPN
607	355-04 1	HF2-1	4.7	2.4		CK
608	355-06 1	M3-21	2.5	4.9		MAPN
609	356+04 1	M2-11	5.0	5.1	UL	MAPN
610	356+04 2	M3-38	12.5	3.6	UL	MAPN
611	356-02 1	M2-21	2.1	4.2		CK
612	356-03 1	M2-26	2.3	2.2		CK
613	356-04 1	CN2-1	1.2	3.6		MAPN
614	356-04 2	H1-41	6.3	4.1		MAPN
615	356-05 1	M2-35	5.4	3.9		CK
616	356-05 2	M2-24	3.6	7.2		MAPN
617	356-06 1	M3-49	4.9	4.8		CK
618	356-06 2	H1-51	6.6	5.1		CK
619	356-07 2	H1-57	6.3	4.4		CK
620	357+04 1	M2-7	2.7	8.0	UL	CK
621	357+03 1	M3-7	3.4	4.6		MAPN
622	357+03 2	M3-41	2.2	3.4		MAPN
623	357+03 4	M3-42	2.6	4.0		CK
624	357+02 1	AP1-1	4.5	5.8	UL	MAPN
625	357+02 5	M4-4	3.3	3.0		CK
626	357+01 1	H1-23	1.4	0.8	LL	CK
627	357-03 2	M2-16	2.7	1.8		CK
628	357-03 3	M2-29	2.4	1.2	LL	CK
629	357-04 1	H1-42	3.0	4.2		MAPN
630	357-04 2	M2-22	2.6	2.2		CK
631	357-05 1	M1-34	5.6	3.5		CK
632	357-06 1	M3-50	2.0	8.3		CK
633	358+07 1	M3-36	2.1	5.9		CK
634	358+05 1	M3-39	10.0	1.5		MAPN
635	358+05 2	M3-40	5.0	4.1	UL	MAPN
636	358+04 1	M3-8	2.8	4.9		MAPN
637	358+03 1	M3-10	1.8	6.1		MAPN
638	358+03 6	H1-20	2.3	4.1		MAPN
639	358+03 8	TH3-26	3.0	3.2		CK
640	358-00 2	M1-26	2.1	1.4	LL	MAPN
641	358-01 1	BL D	6.5	1.1		CK
642	358-02 1	M4-7	2.4	2.6		CK
643	358-03 1	H1-44	1.8	3.2		CK
644	358-03 2	M2-30	5.6	4.7		CK
645	358-04 1	H1-46	2.5	4.3	UL	MAPN
646	358-05 1	PE1-11	4.4	2.3		CK
647	358-05 2	H1-49	5.0	5.6	UL	MAPN
648	358-05 4	M3-51	4.6	4.6		CK
649	358-07 1	NGC 6563	22.6	1.9		MAPN
650	358-21 1	IC 1297	3.5	3.0		CK
651	359+15 1	A 40	16.0	4.7		MAPN
652	359+06 1	M3-37	5.3	9.8	UL	CK
653	359+05 1	M2-12	2.5	5.7	UL	MAPN
654	359+05 2	M3-9	9.0	3.4		MAPN
655	359-00 1	HB 5	10.0	1.2		MAPN
656	359-01 1	M1-29	3.2	0.7	LL	CK
657	359-01 2	M3-44	2.1	1.0	LL	CK
658	359-01 3	M3-45	2.9	1.0	LL	CK
659	359-02 2	M3-16	4.1	1.4		CK
660	359-02 4	M3-46	2.2	2.6		CK
661	359-03 2	M2-33	3.3	3.5		CK
662	359-04 1	M3-48	2.4	4.4		CK
663	359-04 3	M2-25	7.1	2.0		CK

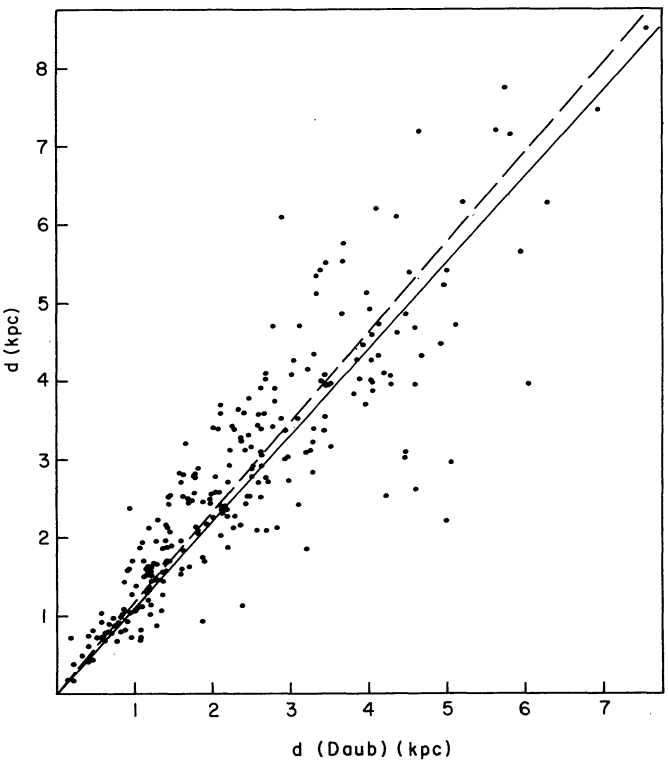

FIGURE 1. — Comparison of the present distances with those given by Daub (1982). The number of common objects is 256, and the slope of the solid line is 1.12. For comparison, a straight line with slope 1.16 is also shown (dashed line).