

Herschel-400 list -- brighter than you think
by Jay Freeman, April 1999

Several people have privately expressed admiration or disbelief of my observation of the entire Herschel-400 list in a 55 mm refractor, reported on p. 114 of the May, 1999 issue of *Sky & Telescope*. I welcome skepticism, but I do not think praise is warranted. I paid little attention to published magnitudes of the objects during my survey, for the target was a specific list, not a magnitude limit. Yet I did not and do not believe that the faintest objects on the Herschel-400 list are as difficult as commonly perceived.

I have informally known for a long time that many older cataloged magnitudes of deep-sky objects systematically underestimate their brightness to the visual observer -- the fact that many magnitudes were obtained in blue wavelengths guarantees that result, for many kinds of deep-sky objects are intrinsically brighter in the visual than in the blue, and reddening by interstellar dust creates an additional brightness difference, favoring visual wavelengths over blue, for objects near the plane of the Milky Way. To quantify these effects, I decided to look up recent visual magnitudes for at least the fainter objects on the Herschel-400 list.

I downloaded the official Herschel-400 list from the web site of the Astronomical League (AL) on April 3, 1999, from the URL

<http://www.astroleague.org/al/obsclubs/herschel/h400lstn.html>

The magnitudes given by the Astronomical League are asserted to be visual ones, though rather old. I investigated objects for which a magnitude 12.5 or fainter was given, as well as those for which no magnitude was provided. (The latter are indicated by "0.0" for the Astronomical League's magnitude.) That gave me 72 objects in all, 18 percent of the list. I looked up their visual magnitudes in more recent catalogs (see footnotes), and have tabulated the results in Table 1.

I found visual magnitudes for 57 of the 72 objects. The faintest was 12.32, for NGC 4085, and only one other object, NGC 3395, had a recent visual magnitude fainter than 12.0. Some of the objects for which I found no visual magnitude are galaxies with blue magnitudes faint enough to suggest that their visual magnitudes might also exceed 12.0. The faintest such blue magnitude is 13.06, for NGC 3912.

The faintest Herschel-400 object, according to the Astronomical League's data, is NGC 6540, with visual magnitude given as 14.5. Other catalogs suggest this value was obtained in the blue, as further

indicated in the tabulation and footnotes. Brian Skiff (private communication, April, 1999) suggested that there had been no good measurement of the visual magnitude of NGC 6540 so far. Given the position of NGC 6540 in the Sagittarius Milky Way, it would not be surprising if it were highly reddened, with visual magnitude significantly brighter than blue, but I shall not speculate on how much.

The second-faintest Herschel-400 object, according to the Astronomical League's data, is NGC 6369, with a visual magnitude of 14.0 given. A more recent visual magnitude is 11.4. The third- and fourth-faintest objects, according to the Astronomical League's data, are the planetary nebulae NGC 1501 and NGC 7008, both with magnitudes given as 13.5, but with recent visual magnitudes of 11.5 and 10.7 respectively.

I don't think the general nature of these differences is as well-known as it ought to be. Perhaps because the Astronomical League's tabulation is commonly used as a reference for magnitudes of the Herschel 400, that list is often believed to be a difficult challenge, containing objects beyond magnitude 14. Yet in fact, its faintest visual magnitudes seem two magnitudes brighter. Other things being equal, that correction corresponds to a reduction by 60 percent -- a factor of 2.5 -- in the clear aperture (diameter) required to see all the objects on the list. Thus visual observers should take heart, for the Herschel-400 list seems much more accessible to them than is widely believed.

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Table 1. Visual magnitudes of 72 Herschel-400 objects, by NGC number.

"AL" magnitudes are from Astronomical League data, "recent" ones are visual magnitudes from several newer catalogs. The table includes all H-400 objects with "AL" magnitude 12.5 or fainter, and all those with no "AL" magnitude. For some entries with no "recent" magnitudes, I have added blue or photographic magnitudes as comments. See text and footnotes for citation of sources.

NGC#	Type (1)	Magnitudes (2)		Comments
		AL	recent	
246	PLN	----	10.9	
278	Gal	12.5	10.85	
596	Gal	12.5	10.87	
615	Gal	12.5	11.5	
1022	Gal	12.5	11.44	

1501	PLN	13.5	11.5	
1535	PLN	----	9.6	
1788	DfN	----	-----	
1931	C/N	13.0	11.3	
1999	DfN	----	-----	
2022	PLN	13.0	11.6	
2024	DfN	----	-----	"Flame Nebula" or "Tank Tracks"
2185	DfN	----	-----	
2371	PLN	13.0	11.2	for NGC 2371 and 2372 combined
2372	PLN	13.0		see NGC 2371
2392	PLN	----	9.1	
2479	OCl	----	-----	9.6 (4), 10 (5)
2742	Gal	12.5	11.7	
2782	Gal	12.5	11.49	
2811	Gal	13.0	11.27	
2950	Gal	12.5	10.95	
2964	Gal	12.5	11.34	
2974	Gal	12.5	10.78	
3193	Gal	12.5	10.92	
3226	Gal	12.5	11.4	
3242	PLN	----	7.7	
3277	Gal	13.0	11.74	
3395	Gal	12.5	12.1	
3608	Gal	12.5	10.98	
3619	Gal	12.5	-----	blue magnitude 12.6 (3)
3655	Gal	13.0	11.64	
3665	Gal	12.5	10.76	
3729	Gal	13.0	11.38	
3813	Gal	13.0	11.72	
3900	Gal	12.5	11.38	
3912	Gal	13.0	-----	blue magnitude 13.06 (3)
3962	Gal	12.5	10.59	
3982	Gal	12.5	-----	blue magnitude 11.74 (3)
4085	Gal	13.0	12.32	
4102	Gal	12.5	-----	blue magnitude 12.3 (3)
4143	Gal	12.5	-----	blue magnitude 12.1 (3)
4150	Gal	12.5	11.66	
4245	Gal	12.5	11.36	
4273	Gal	12.5	11.92	
4281	Gal	12.5	11.32	
4346	Gal	12.5	-----	blue magnitude 12.18 (3)
4419	Gal	12.5	11.13	
4478	Gal	12.5	11.23	
4485	Gal	13.0	11.96	
4550	Gal	12.5	11.59	
4660	Gal	12.5	10.99	

4800	Gal	13.0	-----	blue magnitude 12.3 (3)
4845	Gal	12.5	-----	blue magnitude 12.10 (3)
5273	Gal	12.5	11.57	
5473	Gal	13.0	11.4	
5557	Gal	13.0	11.10	
5631	Gal	12.5	-----	blue magnitude 12.50 (3)
5689	Gal	12.5	11.9	
5982	Gal	12.5	11.13	
6207	Gal	12.5	11.62	
6217	Gal	12.5	11.22	
6369	PLN	14.0	11.4	
6401	GCl	-----	9.5	
6426	GCl	12.5	11.20	
6445	PLN	13.0	11.2	
6517	GCl	13.0	10.3	
6540	OCl	14.5	-----	14.6 (4), 15 (5)
6544	GCl	-----	8.25	
6781	PLN	12.5	11.4	
7000	DfN	-----	-----	North American Nebula
7008	PLN	13.5	10.7	
7448	Gal	12.5	11.65	

Footnotes:

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(1) The abbreviations are: C/N -- cluster with nebula; DfN -- diffuse nebula; Gal -- galaxy; GCl -- globular cluster; OCl -- open cluster; PLN -- planetary nebula.

The exact nature of a few of these objects possibly differs from the types listed, which are as the Astronomical League provided; however, I shall not address those issues here.

(2) m1: Magnitude provided on the Astronomical League's Herschel 400 web pages as of 3 April 1999. These data are stated to be visual magnitudes, though quite old.

m2: Visual magnitude from more recent compilations, generally from

_Sky_Catalog_2000.0_, volume 2, 1985. Alan Hirshfeld and Roger W. Sinnott, eds. Sky Publishing.

_Sky_Catalog_2000.0_ did not give visual magnitudes for planetary nebulae, so I obtained those from

_Planetary_Nebulae_, 1991. Steven J. Hynes. Willmann-Bell.

- (3) For objects other than planetary nebulae, and for which `_Sky_Catalog_2000.0_` gave no visual magnitude, I added a blue magnitude from that same source, if one was given.
- (4) The magnitude given is a photographic magnitude provided by `_Sky_Catalog_2000.0_`, with wavelength band specified only as "photographic".
- (5) The magnitude given is a photographically determined blue magnitude, given in `_NGC_2000.0_` (1988, Roger W. Sinnott, Sky Publishing). This source gives photographic blue magnitude values only to the nearest magnitude.