

# Howe 13

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**Abstract:** The star Howe 13 (HWE 13), located in the constellation of Canis Major presents a history of negative observations, even though the WDS lists a pair that should easily be seen through visual observation. This article is about the history of the changes in the identification of the star and a possible explanation for the observation of Herbert Alonzo Howe, proposing an alternative double star to the actual Howe 13.

In Canis Major, only  $2.2^\circ$  west-northwest of the Sirius glare, is the star HWE 13 (HD 47011, R.A.  $06^h 35^m 51^s$ , Dec.  $-16^\circ 06' 09''$ ), which, depending on how up-to-date the references we consult are, we can find components around magnitude 7.4 and 7.5 (Burnham 1906, Comellas 1988, rev 2013, Haas 2006) or more recently 7.37 and 11.20 (WDS 2000). This star was among my list of double stars to observe visually from an urban sky with an 80 mm achromatic refractor.

A couple of stars with a magnitude of 7 and a separation of  $12.6''$  (as described in Haas, 2006) promised to be an attractive and accessible target for my small telescope under those conditions. But I could only spot a solitary star. Data of HWE 13 in the compilation of Haas were accompanied by a visual report by the Australian observer expert Ross Gould, which piqued my curiosity. Where was Howe 13? Why was there only a single star to be observed?

An initial investigation confirmed that this star was a known but unresolved case (Cloudy Nights website, 2007). In the following days some exchanges in the forum AmAstro gave us several interesting results, highlighting among them the discovery of the variability of HD 47011.

Thanks to the analysis made by Sebastián Otero (AAVSO), this star turned out to be a SPB (Slowly Pulsating B-type star), with a period of 0.47056 days and an amplitude of only 0.04 magnitudes (Variable Star Index, AAVSO, 2017).

As for the star's companion, the Tycho-2 catalogue

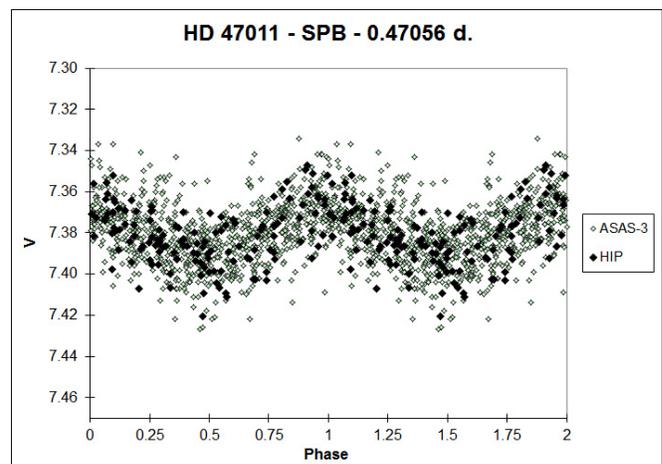


Figure 1. Phase light curve HD 47011 (Image credit: Sebastián Otero, AAVSO)

showed a star of magnitude 11.2 (data taken from Tycho-1 that the WDS also reproduced), but in the observed position the images only showed a weak star of visual magnitude 15.7 (magnitude derived from the catalogue UCAC3) and infrared magnitudes  $J = 15.44$  and  $K = 14.37$  (2MASS). We got a visual confirmation thanks to Rodolfo Ferraiuolo (San Rafael, Mendoza, Argentina), using a  $12''$  (300 mm) reflecting telescope at  $277\times$  under good conditions of darkness and stability. There were no bright stars comparable to those expected in the vicinity of HD 47011.

After some research I found Ross Gould's email

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Figure 2. Image of HD 47011, with the approximate position where the companion star should be (sep. 10.8", A.P. 296°). The weak star appearing at that location (pointed at the end of the arrow) has magnitude 15.7 (Image credit: Aladin v9.0, 2MASS).

address and asked him for his observation report and described Howe 13's problem. A fruitful exchange began, driven by the knowledge and great enthusiasm shown by Gould. He had observed this star several years ago, from a public observatory in Australia and using a C14 telescope that was required to be manually targeted. Gould has done academic studies in history and philosophy, and is currently engaged in, among other things, the search for neglected double stars in the southern sky (sending his recommendations for new measures to the USNO) and writing a column dedicated to double stars in the Australian version of Sky & Telescope. His experience in history was going to be of great importance to this investigation, starting with the

history of the observer after whom the star is named.

The great Leonids meteor shower of 1866 motivated Herbert Alonzo Howe's (1858-1926) interest in astronomy. After graduating from the University of Chicago in 1875, Mr Howe began his work as an assistant at the Cincinnati Observatory (United States) observing double stars (Menzel, 1926). On April 28, 1876, using the Observatory's 11-inch refractor, Howe discovered the star that at the time of its publication had number 13 of a list of 50 doubles (Howe, 1876, Figure 3). But this star is not the modern Howe 13: checking the published position we see that it is in R.A. 10<sup>h</sup> 09<sup>m</sup> 26<sup>s</sup>, Dec. -36° 03' (1880). Correcting the coordinates by precession we can see that the original Howe 13 coincides with the

11	20	4.5	7.5,	10.	April 14,	"	Many stars in the field.	11	.....	9 34 45	+2.57	-32 22	-16.2	E
12	125	3.0	8.	8.5	April 14,	"		12	W. Mural Zones, (237) 68.....	10 5 25	2.61	36 0	17.6	Z
13	320	1.5	8.5,	9.5	April 28,	"		13	W. Mural Zones, (237) 72.....	10 9 26	2.62	36 3	17.8	Z
14	160	6.0	8.	10.	April 24,	"	One of a small equilateral triangle in the finder.	14	W. Mural Zones, (9) 32 .....	10 52 35	2.80	35 2	19.2	Z
15	350	2.0	8.	9.	Jan'y 30,	"		15	Lacaille, 4570.....	10 57 32	2.89	26 52	19.3	C

Figure 3. Star number 13 pictured in the 1876 publication "Catalogue of 50 new double stars", H. A. Howe (Publications of the Cincinnati Observatory, vol. 1)

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136	...	...	...	332	35	332	25	18	19	...	...	136	...	76.150	314.5	...	7.8	8.5	3.1	H	
137	Anonymous	6 31 18	16 2	318	30	318	40	18	29	1.54 <sup>s</sup>	1.647	137	H. A. H.	76.791	300.3	11.19	8.0	9.0	6	H	Place only approximate.
138	Piazza vi 223	6 38 13	38 17	293	29	293	15	18	19	1.151	1.136	138	Δ 32	76.147	275.4	7.92	...	2	U	Power 150.	
139	B. A. C. 2219	6 40 57	30 49	329	9	327	25	168	43	0.802	0.838	139	h 3891	76.089	220.0	5.59	6.5	9.0	6	S	
				328	55	329	39			0.776	0.781										

Figure 4. Star number 137 that matches the position of the modern Howe 13 (in R.A. 06<sup>h</sup>). The acronym H.A.H. points to Herbert Alonzo Howe as the observer. "Micrometrical Measurements of 166 Double and Triple Stars", Stone (1877).

position of the modern Howe 68, located in the constellation of Antlia.

To find the original Howe 13 (in R.A. 06<sup>h</sup>) we must read a publication of the following year (Stone, 1877), where the number 137 shows a star with a position that matches the searched one (although in the notes the position is indicated as "only approximate"), R.A. 06<sup>h</sup> 31<sup>m</sup> 18<sup>s</sup>, Dec.-16° 02' (1880), with magnitudes of 8.0 and 9.0, a separation of 11.19", and a A.P. of 300.3". See Figure 4.

Finding the original publication identifying Howe 13 in R.A. 06<sup>h</sup> solves part of the question raised, although we must notice that up to that time Howe 13 was a star in another location (R.A. 10<sup>h</sup>), at some point later, the numbering should have changed to match modern Howe stars (those currently appearing in the WDS).

In 1899 we find that star number 17 in the 10<sup>h</sup> section of the "Reference Catalogue of Southern Double Stars" by R. T. A. Innes (Innes, 1899, Figure 5), is Howe 13 in R.A. 10<sup>h</sup>, showing three measurements (two published in the main catalogue, and a third in the appendix).

Until that moment we had found two types of results in the publications: Howe stars with the old numbering (with Howe 13 in R.A. 10<sup>h</sup>), and Howe stars with the modern numbering (such as the current WDS,

<b>No. 17.</b>	<b>Howe 13.</b>	<b>C. Z. 10 h. 686.</b>	<b>8.3</b>
	10 <sup>h</sup> 31 <sup>m</sup> 18 <sup>s</sup>	— 36° 9'.2.	
	8.8 and 9.3		
1877.3	300.8	2.95	Cinc. 1 n
1885.2	306.6	3.36	" 1
Also noted as a double star at Cordoba.			
A fainter and wider pair, Howe 12, is 4 <sup>m</sup> pr. a little N.			

Figure 5. Star number 17 of the "Reference Catalogue of Southern Double Stars" (Innes, 1899) shows Howe 13 in R.A. 10<sup>h</sup>, position of the modern Howe 68.

with Howe 13 in R.A. 06<sup>h</sup>). We were getting closer. Evidently at some point Howe stars were re-arranged in right ascension order, the original ones and those that were discovered later, and numbered again with this new order, leaving behind the previous numbering.

There had to be a publication that showed this change, and we found it in the impressive work by Sherburne Wesley Burnham, "A General Catalogue of Double Stars within 121° of the North Pole" of 1906, see Figure 6. The catalogue is divided into two volumes, and volume 1 contains an index where the stars are grouped by observer and each one refers to the number that corresponds to it within the catalogue notes of volume 2. In this index you can see the complete list of Howe stars, ordered by right ascension and numbered with the same modern numbering that is used in the WDS, from 1 to 63. Within the catalogue of S. W. Burnham Howe 13 has the number 3505 (see Figure 7). After that, other Howe stars were added, but the numbering has not been altered, so doubles beyond the number 63 can be found mixed as a subgroup within the full listing of Howe stars.

It is interesting that not only Howe stars had a new numbering, but also other stars catalogued by some other observers, something to keep in mind when we review publications prior to this great general catalogue.

This solves the problem with the identification of the star, but does not explain the missing double star expected, but a simple star, identified as such in the Tycho-2 catalogue (actual data of Tycho-1), and in the WDS where it appears with 4 observations. Gould provides a possible explanation. An analysis of the area and the nearby doubles stars makes him suspect that the star that Gould really observed that night with the C14 was actually S 518, located 2.8° west of HWE 13. The instrument he used provided 0.5° of visual field, and because of the relatively rich area in bright stars and adding the difficulty of pointing the instrument manually, makes it very likely, and he is convinced of it, that he observed S 518 instead of HWE 13, which, after all, did not present duplicity, his having overlooked it is probable.

Did Herbert Howe see another star? This seems to be the case, and would explain the publication of 1877

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**I. STARS DISCOVERED BY MODERN OBSERVERS**

no.	$\beta$	A	Hu	Ho	Ox	See	A. G.	Hd	Hu	Es	Kr	Ku	Howe	Stone	Weisse	Arg
1	455	888	4	53	56	12751	121	20	80	88	45	7792	490	32	114	27
2	617	2353	18	266	70	13	230	50	190	246	...	9518	660	220	459	403
3	662	4091	111	283	105	...	280	59	399	297	85	6	681	463	699	495
4	714	5078	183	446	104	162	301	66	500	780	137	109	810	471	2288	800
5	854	5730	356	571	131	...	310	68	552	939	...	190	811	1201	2483	802
6	913	5797	719	657	152	...	319	79	823	1046	...	370	1305	1599	2490	978
7	1034	5799	771	757	157	...	397	84	1241	1243	240	470	1411	2216	2612	1112
8	1226	5907	852	764	193	196	460	89	1723	1376	...	723	1852	2233	2638	1326
9	1418	5913	873	773	197	...	465	107	1778	1406	...	1213	2054	2314	2853	1412
10	1460	6378	890	1033	212	547	514	113	1984	1539	625	1294	2090	2707	2891	1553
1	1549	6436	914	1038	245	696	533	119	5534	1607	684	1520	2311	2950	3026	2359
2	1699	6542	985	1059	260	708	534	123	6142	1877	858	1536	2632	3018	3417	3154
3	2823	6636	1035	1516	262	721	536	124	6168	2325	1071	1615	3505	3351	3506	3165
4	2905	7090	1086	1754	279	778	567	158	6344	2437	1331	1685	3522	3535	3882	3403
5	2980	7173	1092	2164	317	874	608	174	6520	3612	1495	1861	3614	3609	3957	3502
6	3116	7204	1118	2422	349	1102	710	179	6727	3732	...	1931	3617	3727	4321	3677
7	3186	7248	1132	2441	357	1147	712	186	6740	3756	1528	2164	3938	4061	4325	4082
8	3275	7261	1283	2635	374	...	769	203	6808	4595	1547	2228	4143	4469	4438	4563
9	3569	7365	1651	2955	385	1387	776	204	6969	6836	...	2349	4411	5173	4636	4623
20	3635	7395	1681	3038	479	1467	795	209	6990	8287	1721	2466	4422	5604	4871	4639
1	4074	7405	1706	3089	541	1473	821	210	7053	8652	1894	2525	4542	5635	4993	4825
2	4108	7446	1796	3230	584	1621	895	293	7094	8796	2091	2697	4551	5756	5309	5082
3	4405	7569	1847	3235	609	1659	920	299	7135	9675	2205	3004	4935	6164	5327	5265

Figure 6. Part of the "General Catalogue of Double Stars within 121° of the North Pole" (Burnham, 1906) showing Howe stars with their modern numeration. To the Howe 13 corresponds the number 3505 in the catalogue.

where the star with the number 137 corresponds to the position of HWE 13, which was marked as approximate. Could it be star S 518? It is also possible, the magnitudes of the components of S 518 (6.98 and 8.4) could be compatible, the separation of about 17" could also be accepted, although the position angle (300° for HWE 13 and 88° for S 518) does not seem to match, but if we accept a quadrant error and we add 180° at 88° of S 518, we have an angle of 268°. The 1991 measure was originally listed in the WDS with this reversed P.A. of 88°. Although some concessions must be made, the explanation could be right.

But where do the WDS data come from? Apparent-

ly, the most modern data came from the Hipparcos astrometric mission. This mission used the Hipparcos Input Catalogue as reference, and in that catalogue it appears under the identification CCDM 06358-1606, with data basically identical to those of 1877: magnitudes 8.3 and 9.3 for the components (both stars with +0.3 magnitudes in relation to the originals, perhaps by some general adjustment of the data), separation of 11.2" and P.A. of 300°. The star was included in the catalogue because the satellite was expected to measure it, but if we check the generated data (HIP 31502 for the first and HIP 31500 for the second) the second does not have information, revealing that it was never really ob-

**3505.** Howe 13. From Cin<sup>3</sup>. Not examined, but this star probably is SD (15°) 1448, the place of which is R. A. 6<sup>h</sup> 30<sup>m</sup> 27<sup>s</sup>; Decl. -16° 1'.

Figure 7. The star number 3505 of the catalogue: Howe 13 with its modern position, in R.A. 06<sup>h</sup> (Burnham, 1906)

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served by the satellite. The star was added to the Tycho-1 (first reduction, year 1991) with magnitude 11.2 (that is the origin of the data that currently appears in the WDS), but not in the Tycho-2 (second reduction, year 2000), since the data presented for these stars in Tycho-2 are actually Tycho-1.

It is unclear why Tycho-1 included the star, but it is speculated some kind of error that forced the inclusion of a star where one was expected to be, but that in fact it was never measured.

In fact, the only observation of the WDS that seems to be real is the original one (1877) and, as we have seen, it was probably a misidentification.

### Chronology

The following points show chronologically the historical moments mentioned in this article.

1876 — Herbert Alonzo Howe discovered from the Cincinnati Observatory the star that was published with the number 13 in a list with 50 new double stars. This star is not the current Howe 13 (currently appearing in the WDS) but the current Howe 68.

1877 — Ormond Stone (director of the Cincinnati Observatory) published a list of measurements of 166 double and triple stars. Star number 137 of that publication was observed by Howe and corresponds to the modern position of Howe 13, which appears in the WDS. The notes in the publication indicate that the position is approximate.

1906 — Sherburne Wesley Burnham published a large general catalogue in which the stars of Howe have been regrouped, sorted by right ascension and renumbered. From now on all stars, from 1 to 63, correspond to the modern numbering (displayed in the WDS). The star that until that moment was Howe 13, is now Howe 68, and current Howe 13 is the star mentioned in the publication of 1877 (the one that had, remember, an approximate position).

1991 — Although the double was present in the 1960s Index Catalogue that preceded the WDS, the Hipparcos satellite failed to observe the secondary component of Howe 13, but for reasons that are unclear it was nevertheless included in the Tycho-1 catalogue with magnitude 11.2, data then incorporated into the WDS.

2017 — Sebastián Otero discovered the variability of HD 47011 (primary component of Howe 13).

### Conclusions

It has been confirmed that Howe 13 does not present the duplicity shown in the WDS, and it is suggested as a possible candidate that S 518 is the star originally observed by Herbert Howe and published in 1877 by the Cincinnati Observatory under the direction of Ormond Stone.

We also want to alert the reader that the identification of Howe stars, and of several other observers, have different numbers and designations in publications previous to the work of S. W. Burnham of 1906, since they have been reordered and renumbered, so the old designations do not match modern ones (WDS).

### Acknowledgment

I want to especially thank Ross Gould, who, due to his expertise, knowledge and great enthusiasm, located and analysed many of the documents mentioned, including the index in the Volume 1 of the Burnham catalogue of 1906 which solved the question of identification of the star. I am also grateful to Brian Skiff, Sue French, Sebastián Otero, Rodolfo Ferraiuolo, Fabián Quattrochi and Juan-Luís Gonzales Carballo for their contributions.

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<https://learnserversales.wordpress.com/2017/06/30/no-19-of-the-observador-de-estrellasdobles/>

### References

- AmAstro, public forum communications (2017), <http://groups.yahoo.com/group/amastro/>
- Burnham, Robert Jr., *Burnham's Celestial Handbook*, Dover, 1966, Vol. 1.
- Burnham, S. W., "A General Catalogue of Double Stars within 121° of the North Pole", Vol. 1 and 2, The Carnegie Institution of Washington, 1906.
- Cloudy Nights, <https://www.cloudynights.com/topic/100744-howe-13/>
- Gould, Ross (private communications, 2017).
- Haas, Sissy, *Double Stars for Small Telescopes*, Sky Publishing, 2006.
- Hathi Trust Digital Library, <https://babel.hathitrust.org/cgi/mb>
- Hipparcos/Tycho Catalogue Data, Hipparcos Catalogue, <https://hipparcos-tools.cosmos.esa.int/cgi->

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[bin/HIPcatalogueSearch.pl?  
hipId=31502&hdId=&tyc1=&tyc2=&tyc3=  
https://hipparcos-tools.cosmos.esa.int/cgi-bin/  
HIPcatalogueSearch.pl?  
hipId=31502&hdId=&tyc1=&tyc2=&tyc3=](https://hipparcos-tools.cosmos.esa.int/cgi-bin/HIPcatalogueSearch.pl?hipId=31502&hdId=&tyc1=&tyc2=&tyc3=)

Howe, H. A., "Catalogue of 50 new double stars discovered with the 11 in. refractor of the Cincinnati Observatory", *Publications of the Cincinnati Observatory*, vol. 1, pp.1-4, 1876.

<http://adsabs.harvard.edu/abs/1876PCinO...1....1>.

Innes, R. T. A., "Reference Catalogue of Southern Double Stars", *Annals of the Royal Observatory*, Cape of Good Hope, Vol II, Part II, 1899.

Mason et al., "The Washington Visual Double Star Catalog", 2001-2014, <http://vizier.u-strasbg.fr/viz-bin/VizieR?-source=B/wds>

Menzel, Donald H., *Publications of the Astronomical Society of the Pacific*, **38**, 379 (1926PASP...38..379M), <http://articles.adsabs.harvard.edu/full/1926PASP...38..379M>

Otero, Sebastián (private communications, 2017).

Palencia R. B., Nuevo Catálogo Comellas, et al., 2013. <https://sites.google.com/site/nuevocatalogocomellas/home>

SAO/NASA Astrophysics Data System (ADS), <http://articles.adsabs.harvard.edu>

Stone, Ormond A. M., "Micrometrical Measurements of 166 Double and Triple Stars, observed with the 11 in. refractor of the Cincinnati Observatory during the years 1875-76, under the superintendence of Ormond Stone", A. M. Director, 1877. <https://babel.hathitrust.org/cgi/pt?id=mdp.39015019235590;view=2up;seq=60;size=175>

Stelle Doppie. <http://stelledoppie.goaction.it>.

VizieR. <http://vizier.u-strasbg.fr/>

Variable Star Index (VSX), HD 47011, Otero, Sebastián, 2017. <https://www.aavso.org/vsx/index.php?view=detail.top&oid=477401>

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