

# LDS 968 AB-C: The Distant Companion of HU575

Edgardo Ruben Masa Martin

Double Star Section Coordinator  
Syrma Astronomical Society  
(Syrma-MED)  
Valladolid, Spain

**Abstract:** The astronomer Peter van de Kamp (1901-1955) published (Astronomical Journal, 1939) a short note including a study on the separated component of the orbital system HU575 (=WDS14426+1929). This new companion (LDS 968 AB-C) had been discovered by Janet M. DeVilbiss some years before. HU575 AB has two close components with magnitudes 9.77 and 10.05. The distance between them is 0.7". The distant companion has magnitude 10 and is placed at 135" from the main component, according to DeVilbiss' measurement. The relevant van de Kamp's result lies in detecting the common proper motion of about 0.31" by year, from the closer pair to the furthest component, predicting a potential physical relationship: "*A physical connection between the two stars is strongly indicated.*" As we can see in the WDS data, the remote component was catalogued with Luyten's observer code (LDS 968) when it was actually discovered by Miss DeVilbiss.

In this paper spectral types and luminosity classes for the whole system are deduced using optical and infrared photometry, and a new relative astrometry is obtained. A study on the nature of the system is also presented.

## HU 575 AB: An orbital pair

This pair was discovered by Hussey, who measured it the first time in 1902.51. Since then until 2001, 144 official measurements have been accumulated in the WDS catalog, being a frequently observed pair. The reason lies in the fact that the orbital system has a period of 51.7 years, with the secondary moving in retrograde sense. Its orbit is collected in the *Sixth Catalog of Orbits of Visual Binary Stars* by William I. Hartkopf & Brian D. Mason. In Table 1 are shown the positions of the secondary for the next five years. The apparent relative orbit is shown in Figure 1.

The system is formed by two stars whose magnitudes are 9.773 and 10.05 as listed in the CCDM catalog. Practically all sources report spectral type M0 for the main component, but the NLTT catalog (Luyten, 1969) lists a K5 spectrum. According to the spectral distribution of energy in BVJHK bands and the kinematic data (reduced proper motion), a K8V spectrum was found (jointly for AB), our result being in the same range with the professional measurements. It is,

Year	Theta (°)	Rho (")
2005.0	174.3	0.690
2006.0	171.3	0.683
2007.0	168.2	0.669
2008.0	164.9	0.650
2009.0	161.5	0.625
2010.0	157.6	0.600

**Table 1:** Future positions of HU 575.

therefore, a red dwarf lying on the main sequence and it is 22.5 parsecs (73 light-years) distant deduced from Hipparcos catalog data. The NLTT catalog puts it near 18.98 parsecs changing slightly the value of the trigonometric parallax. The important annual proper motion of AB pair from Tycho-2 is:  $\mu_\alpha = -0.261 \pm 0.0013$  as/yr and  $\mu_\delta = -0.179 \pm 0.0014$  as/yr.

### LDS 968 AB-C: The Distant Companion of HU 575

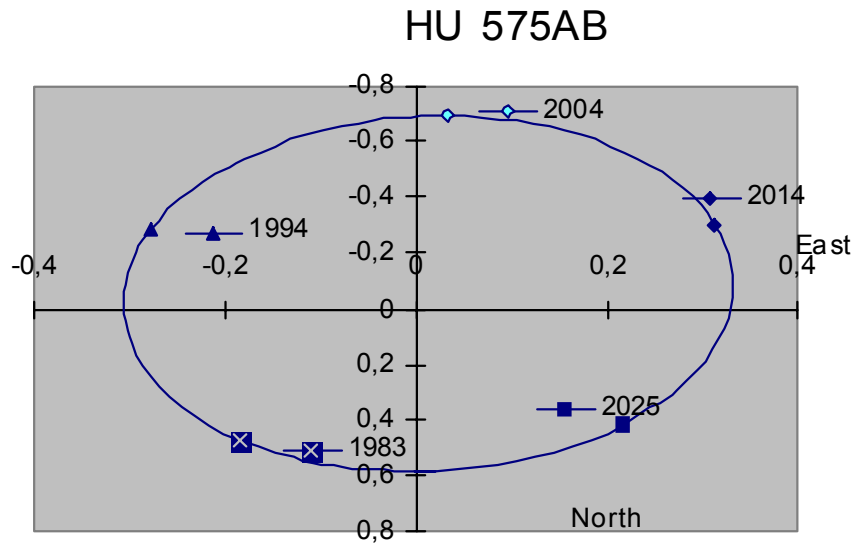


Figure 1: Apparent relative orbit of HU 575AB

#### C component (LDS 968 AB-C)

The distant component is a star with magnitude  $m_V=10.08$  (Hipparcos) that has a proper motion almost identical to the AB pair, as we can see again in the Tycho-2 catalog:  $\mu_\alpha = -0.2633 \pm 0.0013$  as/yr and  $\mu_\delta = -0.1785 \pm 0.0013$  as/yr, which is a strong indication of a physical relationship with the main component.

According to the spectral distribution of energy in BVJHK bands and the kinematic data (reduced proper motion), an identical spectrum to the AB pair one was measured, that is to say, K8V. The professional astronomical literature assigns M0 and K5, just as it was in the HU 575 AB case and places the distance at 25.9 parsecs (84 light-years) or puts it into 18.98 parsecs again, as it appears in the consulted sources.

The methodology used to determine spectral types and luminosity classes by the LIADA Double Stars Group follows:

- Photometric data (JHK from 2MASS and BV from Hipparcos/Tycho-2) were transformed to the spectral type. If the stars are very red, it is also possible to deduce the luminosity class by using J-H vs H-K two-color diagrams [M. S. Bessell & J. M. Brett (1988) and Gerald E. Kron (1988)] and several tables that relate photometric data with spectral data. Several useful tables are from *Handbook of Space Astronomy and Astrophysics* of the Harvard University. The process transforms the magnitudes of the “problem-star” in energy in Jy

( $1 \text{ Jy} = 10^{-23} \text{ erg} \cdot \text{cm}^2 \cdot \text{sec}^{-1} \cdot \text{Hz}^{-1}$ ) and compares the spectral distribution of a component with those of the empirical tables.

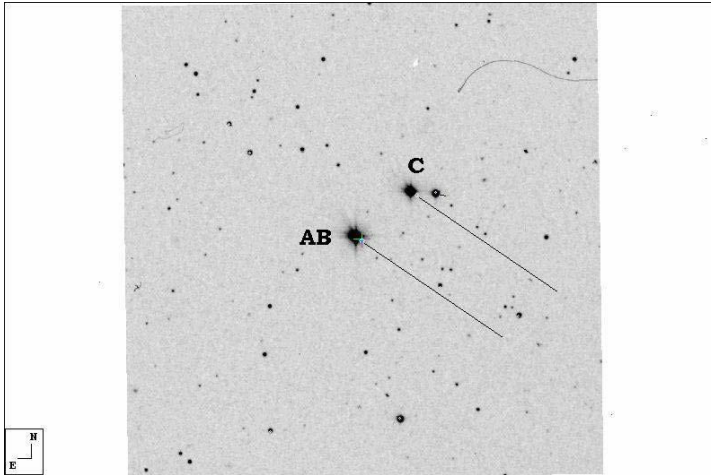
- When the star is not red enough to obtain the luminosity class by using only photometric data, then we must use Reduced Proper Motion Diagrams (Eric M. Jones, 1972; C. A. Nelson, 2003; Salim S., 2002). These diagrams relate the observational photometric data and proper motions with a parameter that is characteristic of a population star (dwarfs, giants, subdwarfs, white dwarfs...)
- Precision: comparing our spectral data on 19 components with well-determined proper motions and precise BVJHK photometry, with those obtained by professionals using spectroscopy, the mean difference is 0.5 spectral subclasses and the luminosity class was estimated correctly in all components (F. M. Rica, 2005).

Next, an image of the whole system showing the proper motion of the stars for one thousand-year period is shown in Figure 2. It can be observed that the trajectories are practically parallel.

#### On the discovery of C component

We will treat now the matter of the attribution of the discovery of C component. We saw before, in WDS, that the first historical measurement is attributed to Luyten. However, Peter van de Kamp published (van de Kamp, 1939) a brief description entitled “A Distant

## LDS 968 AB-C: The Distant Companion of HU 575



**Figure 2:** Simulation of the trajectories of the common proper motion for a thousand-year period. This composition is produced with Guide 8.0 software on the DSS palate.

*Companion To HU 575 = ADS 9352*" where it is made clear that Janet M. DeVilbiss (a woman astronomer who collaborated with him on repeated occasions) measured the AB-C pair on two plates taken on the nights 1933.240 and 1934.178, and on two more taken at 1939.225. She got the values of  $309^\circ$  and  $135''$  for theta and rho respectively. Though it was not specified, we must suppose that the values of the relative astrometry were the result of working out the average of the measurements made with the four plates. If we accept this premise, then the final epoch for the observation (at worst) must be the average of the dates when the plates were made, that is to say, 1935.547.

This observation predates by a short period Luyten's observation (1936) and therefore it ought to be put in WDS catalog. The complete original note is shown in Figure 3.

In this paper, van de Kamp explains how the proper motions of AB and C components were deduced and, in light of their similar values, that there probably was a physical connection between them. Note that the proper motions obtained by van de Kamp are very similar to the current ones, confirming the observers' good work.

Just a year later, in 1940, van de Kamp and DeVilbiss published a new work jointly (van de Kamp, DeVilbiss, 1940) entitled "*Proper motions of some double stars.*" In this paper the authors present a list where the proper motions for eight orbital systems are deduced, including measurements of the pair we are studying. One fragment from the article is shown in Figure 4.

### Relative Astrometry

LDS 968 AB-C has only four official measurements of position angle and of separation since 1936, Luyten's measure date. The historical measures are listed in Table 2.

Two parameters have remained fixed since the first official measurement except the last value of the distance in the entry of 1996.518 by Walt L. Sanders. The huge disagreement in *rho* indicates either an error by Sanders' or a transcription mistake in the WDS. This veteran observer works with the Lick 36-inch refractor and uses a Clark filar micrometer. At present he is working on a project started in 1966

### A DISTANT COMPANION TO HU 575 = A.D.S. 9352

By PETER VAN DE KAMP.

Hu 575 ( $14^h 38^m.0$ ,  $+19^\circ 55'$ , 1900; BD+20° 3010) is a binary<sup>1</sup> with a period of 50.6 years, semi-axis major of  $''66$  and with magnitudes 10.0 and 10.5 for the components. The dynamical parallax<sup>1</sup> based on these elements is  $''047$ ; a spectroscopic parallax<sup>2</sup> of  $''029$  for the brighter component (spectrum M0) has been published.

The positions of BD+20° 3010 and of the neighbouring star BD+20° 3009 have been measured by Miss DEVILBISS on two plates taken on the nights 1933.240, 1934.178 and on two plates taken 1939.225. BD+20° 3009 is in position angle  $309^\circ$  at a distance of  $135''$  and is approximately one magnitude fainter than BD+20° 3010. The following relative proper motions are derived:

	$\mu_x$	$\mu_y$	$\mu$	$p$
BD+20° 3010	$-''24$	$-''17$	$''29$	$235^\circ$
BD+20° 3009	$-''26$	$-''19$	$''32$	$234^\circ$

A physical connection between the two stars is strongly indicated. The difference in motion is of the order of the errors.

#### REFERENCES

1. *Union Obs. Cir. No. 98*, 350, 1937.
2. *Astroph. Jour.*, **81**, 252, *Mount Wilson Contr.* **22**, 122; 1934.

*Sproul Observatory  
Swarthmore College  
Swarthmore, Pennsylvania  
1939, April 3.*

**Figure 3:** Van de Kamp's 1939 note on the discovery of HU 575C

## LDS 968 AB-C: The Distant Companion of HU 575

32

THE ASTRONOMICAL JOURNAL

No. 1125

## PROPER MOTIONS OF SOME DOUBLE STARS

FROM PHOTOGRAPHS TAKEN WITH THE TWENTY-FOUR INCH SPROUL REFRACTOR

BY PETER VAN DE KAMP AND JANET M. DEVILBISS

ADS	Name	1900 R. A.	1900 Decl.	Vis. Mag.	Sp.	$\mu_{\alpha} \cos \delta$	$\mu_{\delta}$	p. e.	Intervals
		h m	° ' "			"	"	"	
9352	Hu 575 AB " C	14 38.0 "	+19 55 "	9.5 10.5	M0 M0	-.243 -.262	-.170 -.186	±.006 "	6, 5

**Figure 4:** Fragment of article from Van de Kamp and DeVilbiss, 1940. **Note:** The electronic documents shown here have been extracted from ADS (Astrophysics Data System) and they are © from the American Astronomical Society.

(Sanders, 1966) where he studies primarily wide M dwarf stars. As he hasn't yet finished his survey, the measurements appear with the Sdr9999 code in the WDS and are waiting to be published in the definitive work. Sanders has an *Unpublished Results File* on the WDS Internet site. We have inspected this file and the value of the distance is 121.7"; therefore it seems that there is no mistake WDS transcription.

### Updating parameters

A measurement was made in order to update the relative astrometry using fv 4.0.1 software, a FITS viewer and editor tools developed at the High Energy Astrophysics Science Archive Research Center (HEARSAC) at NASA/GSFC. We used a J band plate from 2MASS dated in 2000.187.

Also, by means of the catalog AC2000.2, we obtained positions in RA and DEC for the epoch 1898.451, which were transformed into Theta and Rho. This new measurement has great historical value due to its antiquity.

Using a DSS plate dated in 1955.359 we obtained a third measurement. We use, again, the software fv as tool of measurement. The results obtained are presented in Table 3.

Our measurements are in agreement with the three historical (Luyten, Hipparcos and Tycho) measurements, this way the Sanders' error is confirmed.

### Nature

Several professional criteria of characterization were used to determine if there was or not a physical association between AB and C components. The empirical Aitken's criteria defines it optical. Nevertheless, it is a curiosity that Aitken actually includes it with the code ADS9352C in his own catalog, probably because of the special feature of having similar proper motions and to be a nearby pair, therefore a wide one, with strong possibility of a physical relationship.

The modified J. L. Halbwachs criterion (Rica, 2004) yields a probability of 99% of a physical relationship. The Jean Dommanget (1955), Dimitris Sina-chopoulos (1992) and Wilson (2001) criteria, which were also applied in this study, indicate that LDS968 AB-C is a physical pair.

The other two criteria used, which are of Van de Kamp (1968) and Abt (1988) do not support the previous result.

According to the obtained values we could say that

Date	P.A.	Sep.	Mag. A	Mag. B	N	RefCode	Aperture	Method
1936.	309.	135.	10.6	11.2	1	Luy1969	24	H
1991.25	309.4	135.093	9.77	10.12	1	HIP1997b	54	T
1991.46	309.4	134.972	9.25	10.28	1	TYC2000c	07	T
1996.518	309.2	121.7	.	.	2	Sdr9999	36	A

**Table 2:** Historical data for LDS 968 AB-C

### LDS 968 AB-C: The Distant Companion of HU 575

Source	Epoch	Theta (")	Rho (")
AC2000.2	1898.451	309.414	134.787
DSS	1955.359	309.467	135.027
2MASS	2000.187	309.595	135.087

**Table 3:** Measurements made by the author.

LDS968 AB-C could be surely a physical double star. Because not all of the criteria were in total agreement, there is the possibility that it is, only, a common origin pair. The first statement is corroborated by van de Kamp (1939) and later for Miss Lippincott (1960), who measured the parallax and the proper motions of this system. In her own words: *"The agreement of the  $\mu$  and  $\pi$  values leaves no doubt about the physical connection between AB and C."* We have found, also, another professional work (Upgren and Kuzma, 1983) that makes reference to Lippincott and confirms their opinion. He remarks in his article that *"...their nearly identical proper motion confirms their physical association detected previously by Lippincott."*

#### Relative proper motion

The annual relative proper motion, that is, the difference between the proper motions of the components, give us the projected relative orbital motion and the velocity of the binary systems. This parameter provides other important criteria for the study of double stars (Hall, 1892).

The historical relative astrometry, in addition to our own measurements are plotted in a X ( $=\rho \cdot \cos\theta$ ) vs Epoch and Y ( $=\rho \cdot \sin\theta$ ) vs Epoch diagrams. A linear fit shows the relative proper motion of C in relation to AB, expressed in arcseconds per year. We can compare our values with those calculated using the individual proper motions of the astronomical literature. If similar results are found, it would indicate that the observed trajectory is in a good agreement with the individual proper motions and gives an idea of the precision of the historical measurements.

The total relative proper motion can also be computed by means of the expression:

$$(\mu_{\text{Total relative}})^2 = (\mu_X)^2 + (\mu_Y)^2$$

According this statement and using our measurements along with the historical data, which cover 102 years, the relative proper motion of the system was calculated:  $\mu(\alpha) = -2.3$  mas/yr and  $\mu(\delta) = +1.3$  mas/yr. These values are in excellent agreement with those

obtained from the individual proper motions of the catalogue Tycho-2 ( $-2.3$  and  $+0.5$  mas/yr), so LDS968 AB-C is a common proper motion pair. In the calculation we have rejected the 1936 measurement because we think that it has an important error. We believe that Luyten did not measure the pair but simply copied Devillbiss's measurement without doing any checking. The linear regression shows that, for the epoch 1936.0, the values of theta and rho would be approximately  $309.43''$  and  $134.91''$ ; therefore, there is a notable difference with Devillbiss's values.

#### Orbital parameters

If the stars are gravitationally bound, a possible orbital period of about 320,000 years has been calculated by means of the equation (from Couteau, 1960):

$$P = 1656 \frac{(r\rho)^{3/2}}{\sqrt{\Sigma m}},$$

where  $r$  is the average distance to the system in parsecs,  $\rho$  is the angular separation and  $\Sigma m$  is the sum of masses of the components. This last parameter is derived from the expression given by P. Baize (1947) which is based on the mass-luminosity relation (Figure 5)

$$\log m = -0.1117 (M_B - 4.77)$$

where  $M_B$  is the bolometric absolute magnitude.

Therefore, the average period is inferred as a function of the separation, the distance in parsecs and the bolometric magnitude of the components.

The completed orbital data gives an expected semi-axis major of 4,620 A.U. ( $189.07''$ ) and a projected separation of 3,301 A.U.

The orbital periods which we have deduced are unusual, but are possible. The astronomer van Biesbroeck (1957) made a study of wide binaries with well-determined parallaxes. The systems that he listed had projected linear separations ranging from 7,500 to 44,000 A.U. This last value represents orbital periods of some ten million years! The projected separation for our system is 3,301 A.U., a value that is not as unlikely as it might seem at first. A typical example such as just described could be the case of the triple system  $\alpha$  Centauri: the AB pair has a period of 80.09 years and a semi-axis major of 23.2 A.U. The C component (Proxima Centauri) is distant from the main pair  $2^\circ 11'$ , that is, 14,000 astronomical units of projected separation, equivalent to an orbital period on the or-

## LDS 968 AB-C: The Distant Companion of HU 575

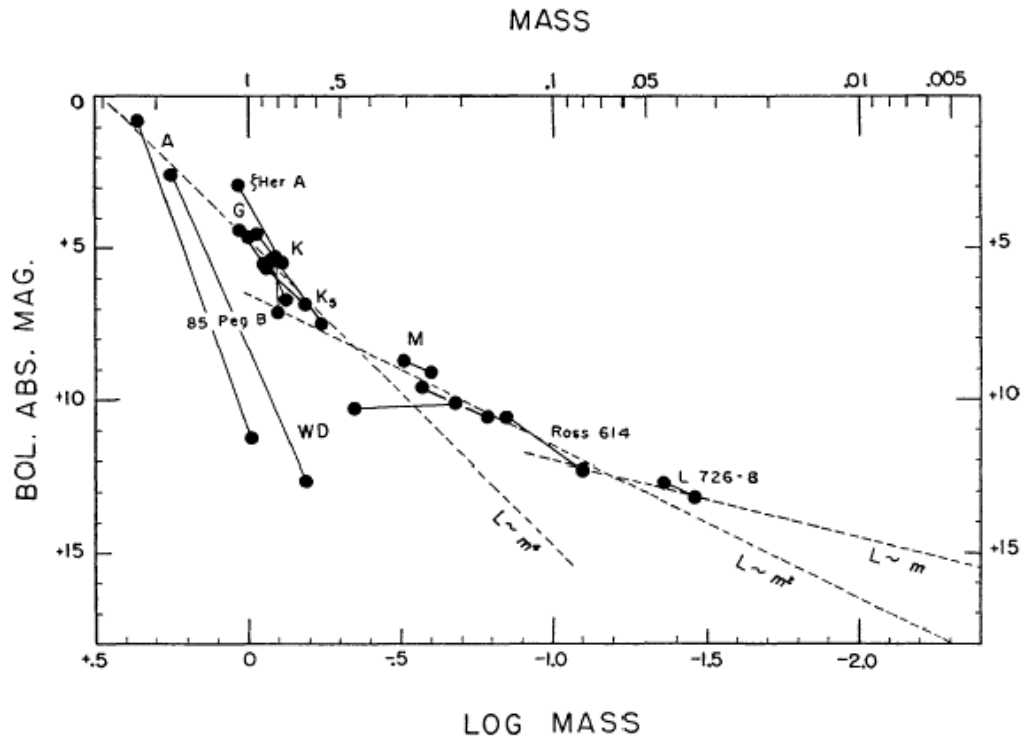


Figure 5: Mass-luminosity diagram for visual binaries (Van de Kamp, 1961).

der of a million years.

## Conclusions

This study demonstrates by means of historical documents that the C component (LDS 968 AB-C) of Hu 575 was discovered by Miss DeVilbiss. The attribution of the discovery to Luyten is an error that should be corrected in WDS.

We have detected an error in the Sanders' historical measure (1996.518) for AB-C pair. The value of the separation is not congruent with the other three historical ones.

Using professional catalogs as described in the text, we have updated the relative astrometry for the AB-C pair with three new measurements. Values in 1898.451: 309.414" and 134.787". Values in 1955.359: 309.467" and 135.027". Values in 2000.187: 309.595" and 135.087".

Spectral types and luminosity classes are deduced by using optical and infrared photometry, jointly with the kinematic data (reduced proper motion). Identical K8V spectral types and luminosity classes for the components have been obtained. We think that luminosity classes that we have inferred are an important and new contribution because there are no references

about them in the astronomical literature.

A study of the system LDS 968 AB-C (applying several professional criteria) indicates that it is surely a physical binary star. Orbital parameters have been derived.

This system was included in the 4<sup>th</sup> Observational Program (October/December 2004) of LIADA'S Double Stars Section.

## Acknowledgements

This research has made use of the Washington Double Star Catalog maintained at the U.S. Naval Observatory.

This research has made use of data products from the Two Micron All Sky Survey (2MASS), which is a joint project of the University of Massachusetts and the Infrared Processing and Analysis Center, California Institute of Technology, funded by the National Aeronautics and Space Administration and the National Science Foundation.

This research has made use of the SIMBAD database, operated at CDS, Strasbourg, France.

This research has made use of Aladin, an interactive software sky atlas allowing the user to visualize digitized images of any part of the sky, to superimpose

# LDS 968 AB-C: The Distant Companion of HU 575

entries from astronomical catalogs or personal user data files, and to interactively access related data and information from the *SIMBAD*, *NED*, *VizieR*, or other archives for all known objects in the field. *Aladin* is particularly useful for multi-spectral cross-identifications of astronomical sources, observation preparation and quality control of new data sets (by comparison with standard catalogues covering the same region of sky).

This research has made use of Guide 8.0 astronomical software of Project Pluto.

This research has made use of fv 4.0.1 software, a tool for viewing and editing any FITS format image or table. It is provided by the High Energy Astrophysics Science Archive Research Center (HEARSAC) at NASA/GSFC. The package is available in

<http://heasarc.gsfc.nasa.gov/docs/software/ftools/fv/>

This research has made use of DSS. The Digitized Sky Surveys were produced at the Space Telescope Science Institute under U.S. Government grant NAG W-2166. The images of these surveys are based on photographic data obtained using the Oschin Schmidt Telescope on Palomar Mountain and the UK Schmidt Telescope. The plates were processed into the present compressed digital form with the permission of these institutions.

Thanks to Francisco Rica, his comments have been a great help.

Finally, the author is very grateful to Mrs. Teresa Herranz Yuste for her preliminary translation (Spanish-English) of this work.

## References

- Abt, H. A., 1988, *Maximum Separations Among Cataloged Binaries*, *Astron.J.*, 331, 922-931.
- Bonnarel F., et al., *The ALADIN interactive sky atlas. A reference tool for identification of astronomical sources.*, *Astron. Astrophys., Suppl. Ser.*, 143, 33-40 (2000) - April(I) 2000.
- Baize, P., 1947, *B.A.*, 13, p.2.
- Bessel, M. S. And Brett, J. M., 1988, *JHKLM Photometry: Standard Systems, Passbands and Intrinsic Colors*, *PASP*, 100, 1134-1151.
- Couteau, P., 1960, *Contribution a l'étude du dénombrement des étoiles doubles visuelles*, *Journal des observateurs*, volume 43, n° 3, p. 52.
- Cutri, R. N. Et al., *Explanatory to the 2 MASS Second Incremental Data Release.*  
<http://www.ipac.caltech.edu/2mass/releases/second/index.html>.
- Eric, M. J., 1972, *Reduced Proper Motion Diagrams*, *Astron. J.*, 173, 671-676.
- Gerald, E. K. And Roach, F. E., 1988, *The Distribution of (B-V) in Two Star Catalogs*, *PASP*, 100, 90-96.
- Hall, A., 1892, *Notes on double stars (I) and (II)*, *Astron. J.*, 12.
- Hog, E. Et al., 2000, *The Tycho-2 Catalogue of 2.5 Million Brightest Stars*, *Astron. J.*, 335, 27.
- Martin, V. Z., *Handbook of Space Astronomy and Astrophysics*, Ed. Cambridge University Press, <http://ads.harvard.edu/books/hsaa/>
- Nelson, C. A. et al., 2002, *A Proper Motion Survey for White Dwarfs with the Wide Field Planetary Camera 2*, *Ap. J.*, 573, 644.
- Lippincott, S. L., 1960, *Parallax and orbital motion of HU 575 = ADS 9352 from photographs taken with the 24-inch Sproul refractor*, *Astron. J.*, 65, 383.
- Rica, F. M., 2004, *LIADA's Double Stars Section Circular*, 6 (In Spanish), 23-26.
- Rica, F. M., 2005, *LIADA's Double Stars Section Circular*, 2 (In English), 11-12.
- Sanders, W. L., 1966, *Micrometer measures of wide M-type double stars*, *Astron. J.*, 71, 1008.
- Salim, S., Gould, A., 2002, *Classifying Luyten Stars using an Optical-Infrared Reduced Proper Motion Diagram*, *Ap. J.*, 575, 83.
- Ungren, A. R. and Kuzma, T. J., 1983, *Parallaxes and proper motions. XV*, *Astron. J.*, vol. 88, p. 132-134.
- Van de Kamp, P., 1939, *A distant companion to HU 575 = ADS 9352*, *Astronomical Journal*, vol. 48, iss. 1107, p. 80-80.
- Van de Kamp, P., 1961, *Double Stars*, *Publications of the Astronomical Society of the Pacific*, vol. 73, iss. 435, p. 395.
- Van de Kamp, P. and DeVilbiss J. M., 1940, *Proper motions of some double stars*, *Astronomical Journal*, vol. 49, iss. 1125, p. 32-32.
- Van Viesbroeck, G., 1957, *Very Close and Very Wide Double Stars*, *Journal of the Royal Astronomical*



**LDS 968 AB-C: The Distant Companion of HU 575**

Society of Canada, Vol. 51, p.38.

Wenger, M., Ochsenbein, F., Egret, D. Et al., *SIMBAD astronomical database*, <http://simbad.u-strasbg.fr/>

**Other General References**

The following works, though not specifically cited in this article, were useful to the author and may be useful to the reader.

Aitken, R.G. 1932, *New General Catalogue of Double Stars within 121 degrees of the North Pole*, Carnegie Institution of Washington.

Barton, S.G. 1926, *AJ* **36**, 155.

Burnham, S.W. 1906, *General Catalogue of Double Stars within 121 degrees of the North Pole*, Carnegie Institution of Washington.

ESA 1997, *The Hipparcos and Tycho Catalogues* (ESA SP-1200) (Noordwijk: ESA).

Fabrizius, C. & Makarov, V.V. 2000, *A&AS*, **144**, 45.

Fabrizius, C., Hoeg, E., Makarov, V.V., Mason, B.D., Wycoff, G.L., & Urban, S.E. 2002, *A&A*, **384**, 180.

Hartkopf, W.I., Mason, B.D., & Worley, C.E. 2001, *AJ*, **122**, 3472.

Hartkopf, W.I., McAlister, H.A., & Mason, B.D. 2001, *AJ*, **122**, 3480.

Hoffleit D., Warren, Jr., W.H. 1991, *The Bright Star Catalogue, 5th Revised Ed.*, (Preliminary Version).

Innes, R.T.A. 1927, *Southern Double Star Catalogue, -19 to -90 degrees*, Union Observatory, Johannesburg, South Africa.

Jeffers, H.M. & van den Bos, W.H. 1963, *Index Catalogue of Visual Double Stars, 1961.0*, Pub. of the Lick Observatory, 21.

Mason, B.D., Wycoff, G.L., Hartkopf, W.I., Douglass, G.G., & Worley, C.E. 2001, *AJ*, **122**, 3466.

Morlet, G., Salaman, M., & Gili, R. 2000, *A&AS*, **145**, 67.

Worley, C.E., & Douglass, G.G. 1984, *Washington Visual Double Star Catalog, 1984.0*, U.S. Naval Observatory, Washington.

Worley, C.E., & Douglass, G.G. 1997, *A&AS*, **125**, 523

The author observes double stars from his private observatory called Camino de Palomares Astronomical Observatory (OACP). He is coordinator of the Double Star Section of the Syrma Astronomical Society (Syrma-MED), Valladolid, Spain. Mr. Masa contributed an article to the inaugural issue of this journal.

