

INTERNATIONAL ASTRONOMICAL UNION COMMISSION 26

(DOUBLE STARS)

INFORMATION CIRCULAR No. 176 (FEBRUARY 2012)

NEW ORBITS

ADS α 2000 δ	Name n	P a	T i	e ω	Ω (2000) Last ob.	2012 2013	Author(s)
- 02249+3039	HDS 314 4°3806	82 ^y 18 0"378	2026.35 109°7	0.283 278°8	87°6 2010.0100	266°4 0"357 264.8 0.345	LING
- 03213+1038	HEI 449 12.7433	28.25 0.155	2001.42 117.5	0.793 185.8	58.7 2010.0048	60.1 0.266 58.9 0.272	ZIRM & RICA
- 04395-4507	I 1489 10.979	32.79 0.270	1997.79 84.1	0.181 281.6	83.1 2010.966	130.4 0.044 195.4 0.035	DOCOBO & CAMPO
6547 08031-0625	A 1581 0.6555	549.21 1.510	1887.92 69.6	0.793 331.2	141.7 2011.2498	298.6 1.456 298.7 1.466	RICA & ZIRM
7457 09379+4554	A 1765 12.830	28.06 0.179	1994.86 117.2	0.408 268.3	131.5 2001.028	7.5 0.128 357.7 0.137	DOCOBO & CAMPO
- 12064-6543	FIN 367 Aa,Bb 4.1379	87.00 0.164	2031.59 131.7	0.079 219.2	75.2 2011.037	294.5 0.133 290.4 0.136	DOCOBO & ANDRADE
- 12446-5717	FIN 65 AB 1.8000	200.0 0.404	1952.75 111.3	0.518 143.7	48.7 2010.069	88.0 0.282 86.8 0.289	DOCOBO & ANDRADE
8799 13091+2127	HU 572 3.4986	102.90 0.400	1986.22 145.0	0.516 30.9	153.7 2011.2502	339.9 0.491 338.3 0.501	RICA & ZIRM
9043 13539-1910	HU 898 2.807	128.25 0.323	1984.63 38.7	0.783 108.9	33.0 2011.037	296.2 0.342 297.4 0.348	DOCOBO & CAMPO
- 13472-0943	KUI 65 2.6487	135.92 0.281	2014.56 132.8	0.867 37.2	105.0 2008.5395	159.2 0.063 137.9 0.053	ZIRM & RICA
10391 17116+3916	HU 1178 AB 0.4726	761.80 0.931	1955.56 93.0	0.627 318.0	13.5 2010.4750	9.3 0.353 9.1 0.349	ZIRM & RICA

NEW ORBITS (continuation)

ADS α 2000 δ	Name n	P a	T i	e ω	Ω (2000) Last ob.	2012 2013	Author(s)
11170 18126+3836	BU 1091 0.2466	1460.0 1.150	1930.10 133.4	0.884 41.7	140.5 2011.742	320.2 0.748 320.0 0.754	SCARDIA et al. (*)
11454 18338+1744	HU 322 AB 8.4912	42.40 0.145	1966.93 99.1	0.615 197.4	90.3 2009.2607	122.6 0.025 105.8 0.053	RICA & ZIRM
- 21044-1951	FIN 328 12.9264	27.85 0.265	2002.46 162.6	0.410 238.2	171.1 2010.586	141.4 0.343 134.9 0.352	DOCOBO & ANDRADE
- 21115+2144	COU 227 1.8122	198.66 0.669	2031.70 52.9	0.299 44.5	126.3 2010.5794	114.8 0.519 116.6 0.518	RICA & ZIRM
14749 21118+5959	MCA 67 Aa,Ab 6.3236	56.93 0.066	2001.45 120.5	0.792 262.8	141.8 2005.8654	105.1 0.059 102.7 0.060	ZIRM & RICA
- 21593+4606	COU 2138 7.9225	45.44 0.238	2001.37 117.7	0.028 154.3	5.1 2007.8225	144.3 0.149 133.7 0.133	DOCOBO & LING
- 22307+1759	COU 234 1.2000	300. 0.513	1987.56 115.3	0.693 176.2	133.9 2007.5991	184.8 0.190 182.3 0.200	DOCOBO & LING
16314 22514+2623	HO 482 AB 0.9399	383.0 0.555	1925.18 121.9	0.608 347.2	166.1 2011.907	17.1 0.532 16.7 0.537	SCARDIA et al. (*)
16672 23191-1328	MCA 74 Aa,Ab 57.0162	6.314 0.187	1980.73 45.8	0.191 208.3	162.6 2009.671	344.6 0.154 65.5 0.114	DOCOBO & TAMAZIAN
16886 23382+5514	A 1493 2.6866	134.0 0.143	2037.28 152.7	0.064 248.5	114.5 2007.5885	300.2 0.140 297.7 0.140	DOCOBO & LING

(*) SCARDIA, PRIEUR, PANSECCHI & ARGYLE

NEW LINEAR FITS

Authors: FRIEDMAN, E.A., MASON, B.D. & HARTKOPF, W.I.

ADS α 2000 δ	Name -	X_0 Y_0	X_A Y_A	ρ_0 θ_0	T_0 Last ob.	2012 2013
9 00028+0208	HJ 998AC -	6.593071 -5.777731	-0.072446 -0.082670	8.766 48.77	1612.5780 2000.6000	330.1 44.879 330.1 44.772
48 00057+4549	STT 547AC -	-5.695269 33.235783	-0.868296 -0.148791	33.720 189.72	1891.2791 2010.6844	262.1 111.569 262.3 112.409
101 00088+0801	HDO 2 -	11.080887 -2.331782	0.012322 0.058556	11.324 78.12	1744.0040 2000.7300	132.9 19.632 133.0 19.680
00247-5359	HJ 3364 -	-1.836430 23.781565	-0.216291 -0.016702	23.852 184.426	1806.5090 1999.7800	246.2 50.559 246.4 50.750
451 00327+2312	BU 1310AC -	-3.977083 -11.127229	-0.137718 0.0492236	11.817 340.336	1836.8790 2007.6880	275.1 28.207 275.0 28.339
01073-3452	COO 6 -	-0.049581 -0.233957	0.142336 -0.030164	0.239 348.03	1855.4399 1999.99006	677.4 22.780 77.4 22.926
2610 03339+3205	HJ 334 -	-1.456584 1.721853	0.020232 0.017115	2.255 220.23	1377.8900 1998.0601	137.9 16.954 137.8 16.981
2701 03425+3256	HJ 336 -	-20.573658 2.846138	-0.012725 -0.091982	20.770 262.12	1585.2510 1999.3000	324.5 44.740 324.5 44.823
04268+0843	HJ 678AB -	-2.771823 -11.460090	-0.113739 0.027510	11.791 346.40	1872.6830 2007.1260	292.3 20.120 292.1 20.215
06171-2243	HJ 3845 -	22.406897 -10.599377	-0.122976 -0.259970	24.787 64.68	1818.5740 1959.2200	358.7 60.901 358.6 61.163
4927 06215+6224	STF 878AB -	-11.190924 -0.211817	0.002449 -0.129376	11.193 271.08	1747.1200 1999.0200	343.0 36.057 343.1 36.180
6335 07453+2802	H 6 42AC -	-3.826545 -35.562344	0.643041 -0.069192	35.768 353.86	1615.0950 1987.0400	75.9 259.179 76.0 259.820
08102+3527	HJ 3308AB -	-22.205055 24.418877	-0.249003 -0.226429	33.005 222.28	1813.1360 1998.1899	286.0 74.626 286.2 74.928

NEW LINEAR FITS (continuation)

Authors: FRIEDMAN, E.A., MASON, B.D. & HARTKOPF, W.I.

ADS α 2000 δ	Name -	X_0 Y_0	X_A Y_A	ρ_0 θ_0	T_0 Last ob.	2012 2013
08324-0056	HJ 96AC -	-7.634680 9.725451	0.112713 0.088482	12.364 218.13	1499.3430 2004.2159	137.7 74.494 137.6 74.636
7198 09079-0708	STF1316BC -	-2.247722 2.732999	-0.080329 -0.066065	3.539 219.44	1884.8370 2010.2650	294.4 13.691 294.6 13.792
8100 11152+7329	STT 539BC -	-0.585939 1.745930	-0.380061 -0.127550	1.842 198.55	1835.3480 2003.3700	287.0 70.843 287.1 71.243
8440 12095-1151	STF1604BC -	2.123110 -6.966699	-0.291981 -0.088981	7.283 16.95	1981.3160 2010.3470	324.9 11.873 324.1 12.116
12342-3206	HJ 4528 -	-4.547540 16.536470	0.074703 0.020543	17.150 195.38	1693.5050 2004.3600	140.1 30.051 140.1 30.114
12350-4717	HJ 4530A,BC -	0.636136 4.501637	0.383550 -0.054200	4.546 171.96	1857.6990 1966.4500	86.3 59.943 86.3 60.329
13422+1807	HJ 230 -	-34.512737 4.388125	-0.008281 -0.065131	34.791 262.75	1184.9960 2002.2980	320.1 64.487 320.1 64.542
13510+2346	HJ 2688 -	-13.628181 9.259405	-0.041207 -0.060650	16.476 235.81	1673.6880 2007.2000	292.2 29.779 292.3 29.841
9281 14288+5430	HJ 2725AB,C -	-3.373027 12.265869	0.048027 0.013207	12.721 195.38	1522.5870 2000.1000	132.9 27.497 132.9 27.542
15565+1540	STT 584AB -	-96.594749 27.094456	-0.360605 -1.285598	100.323 254.33	1777.5840 2000.3199	326.6 328.682 326.6 329.954
16152-0046	HJ 1290 -	11.080775 -5.862827	0.019349 0.036570	12.536 62.12	1641.9730 2008.3979	112.8 19.787 112.9 19.819
17054-3346	WNO 5 -	-3.086665 3.581273	-0.145428 -0.1253436	4.728 220.76	1870.6440 1998.5200	300.9 27.547 300.9 27.737
17061+4329	WFC 186 -	2.582238 0.325838	0.009483 -0.075156	2.603 97.19	1769.9380 2008.7321	15.3 18.520 15.2 18.595

NEW LINEAR FITS (continuation)

Authors: FRIEDMAN, E.A., MASON, B.D. & HARTKOPF, W.I.

ADS α 2000 δ	Name -	X_0 Y_0	X_A Y_A	ρ_0 θ_0	T_0 Last ob.	2012 2013
17097-5420	HJ 4917	-1.594242	0.083490	11.937	1898.4980	31.0 15.296
	-	-11.829822	-0.011252	352.326	2000.3800	31.3 15.348
17133-6712	DUN 214AB	-13.055362	0.144872	27.965	1849.2150	15.8 38.642
	-	-24.730068	-0.076480	332.17	2007.3730	16.0 38.756
17224-3012	HO 413	-4.668693	-0.051410	5.444	1838.0990	311.7 18.212
	-	2.800621	-0.085701	239.04	1998.6100	311.7 18.308
10778 17462+1019	AG 356	3.019531	-0.063086	6.317	1830.1790	215.6 14.507
	-	5.548050	0.034334	151.44	2004.4130	215.8 14.571
10903 17559+3326	HO 72BC	5.127814	0.018452	5.146	1901.3000	163.3 24.950
	-	-0.430571	0.219755	85.20	2003.4810	163.4 25.165
17589-3652	DUN 219	-33.259064	-0.036054	37.953	1498.6210	253.5 54.007
	-	-18.283575	0.065585	298.80	1999.6100	253.4 54.060
11431 18317+2310	HU 321AB	-2.845246	0.078033	3.294	1883.8220	20.9 20.113
	-	-1.660777	-0.133686	300.27	2000.3900	20.9 20.265
11510 18369+3846	H 5 39AB	34.471737	-0.196474	41.857	1810.3719	183.681.421
	-	23.743351	0.285250	124.56	2010.4250	183.8 81.719
11632 18428+5938	STF2398BC	-38.835636	1.380131	48.391	1915.0830	155.6 229.368
	-	28.869774	1.856553	233.37	2000.29006	155.4 231.629
18488+3319	HJ 1349	6.113636	0.068556	13.064	1663.6550	92.1 30.015
	-	-11.544742	0.036304	27.90	2008.4260	92.2 30.085
12061 19074+3230	STF2461AC	31.750431	1.105189	45.007	1829.0160	54.1 288.862
	-	31.899099	-1.100038	135.13	1983.7800	54.1 290.402
12061 19074+3230	STF2461CE	67.730011	-1.221359	100.277	1866.1331	205.0 261.582
	-	73.946144	1.118688	137.51	1983.8199	205.1 263.112
13149 19563+3505	HJ 1455AD	24.066206	0.035809	46.808	2286.1819	162.8 48.187
	-	40.147305	-0.021466	149.06	2007.7980	162.8 48.178

NEW LINEAR FITS (continuation)

Authors: FRIEDMAN, E.A., MASON, B.D. & HARTKOPF, W.I.

ADS α 2000 δ	Name -	X_0 Y_0	X_A Y_A	ρ_0 θ_0	T_0 Last ob.	2012 2013
13560	STF2658BC	-15.515335	-0.065916	16.101	1732.0270	208.6 70.887
20136+5307	-	-4.304286	0.237602	285.51	2000.3700	208.6 71.128
14073	STF2704AB,D	5.117892	-0.122294	28.757	1710.9050	317.8 47.193
20375+1436	-	-28.297535	-0.022118	10.25	2009.7400	317.7 47.292
14274	STT 594AB	-26.498772	-0.349936	38.314	1882.7510	257.7 73.415
20462+3358	-	-27.672396	0.335094	316.24	2007.8680	257.5 73.829
16140	HJ 1796	17.012409	-0.038850	26.780	1662.5050	6.1 32.035
22386+5648	-	-20.681864	-0.031957	39.44	2004.8850	6.1 32.063
	HJ 972	2.479737	-0.074473	23.453	1794.2371	208.7 28.567
22530+3140	-	23.321299	0.007919	173.93	2008.5081	208.9 28.609

NEW WIDE COMMON PROPER MOTION COMPANIONS TO EXOPLANET
HOST STARS

In a new project to search for wide new physical companions to exoplanet hosts, Francisco Rica has found new wide common proper motion companions to several exoplanet host stars. Astrometric measures (using online photographic surveys and CCD cameras), astrophysical characterization for the stellar components and a dynamical study of this new stellar system will be performed. The astromechanics will be used to determine if the stellar components for these new system could be gravitationally bound. The Table 1 lists same basic astrophysical data and Table 2 lists astrometrics measures:

Table 1.
Astrophysical data

Name Star	V mag.	SpT	Distance (pc)	PM-AR (mas/yr)	PM-DEC (mas/yr)
HD134606	6.86	G5-6 IV	26.5	-178	-165
2MASS J15152170-7031572	12.7	M3V	—	-181	-166
HD158038	7.47	K1III	103.6	+ 45	- 58
2MASS J17254334+2718382	15.00	M3V	—	+ 50	- 58
HD215456	6.63	G3IV-V	38.0	+208	- 49
2MASS J22460336-4858224	14.1	M2.5V	39	+214	- 50

Table 2.
Astrometric measures

Binary	Epoch	θ (deg)	ρ (arcsec)	Aperture	Method
1	1976.238	144.12	56.55	48	DSS
	1980.392	144.42	57.52	48	DSS
	1987.392	144.76	56.97	48	DSS
	1992.57	144.80	57.23	48	DSS
	1993.54	144.27	57.65	48	DSS
	1999.142	144.70	57.33	48	DSS
	2000.2199	144.52	57.36	51	2MASS
	2000.237	145.19	57.43	48	DSS
2	2000.231	313.18	38.32	51	2MASS
3	1999.721	294.80	50.76	51	2MASS

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5. BERGER, J.-P. et al: *First astronomical unit scale image of the GW Orionis triple system - Direct detection of a new stellar companion*. *Astron. Astroph.* **529**, L1 (2011)
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12. CVETKOVIC, Z. et al.: *CCD Measurements of Double and Multiple Stars at NAO Rozhen: Orbits and Linear Fits of Five Pairs*. *Astron. J.* **142** 73 (2011).
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24. GRIFFIN, R. F.: *Spectroscopic binary orbits from photoelectric radial velocities - Paper 218: HD 115461, HD 116247, HD 116345, and HD 120006*. *The Observatory* **131**, 139 (2011).
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IRVING W. LINDENBLAD (1929-2011)

Irving Werner Lindenblad, graduate of Wesleyan University (Middletown, CT), Astronomer at the U.S. Naval Observatory, 1957-1989, died 11 November 2011. He was 82.

His first work at the USNO was working in and later in charge of the Solar Program making sunspot counts and determining their positions. In the mid 1960s he left this project and began what was probably his most important work at the USNO, his careful observation of the Sirius binary star system. The large magnitude difference ($dV = 9.96$) and close angular separation ($3''06 < \text{sep} < 11''94$) of these stars have presented an observational challenge ever since the companion's existence was ascertained from periodic proper motion errors noted by Friedrich Bessel in 1844.

Lindenblad utilized several techniques to obtain very accurate and precise relative measurements of Sirius A and B (AJ 75, 841; 1970 & AJ 78, 226; 1973). The first was the Hertzprung photographic method, already well-established at the US Naval Observatory in which he was an active participant (PUSNO 18, Pt. 7; 1969). Ejnar Hertzprung developed this multiple exposure technique for observing double stars photographically around 1914 at Potsdam. The technique involved taking one or more rows of 17 to 35 exposures of a small field which normally includes only the double star itself. An important feature of the technique is the use of coarse objective gratings to substantially reduce the magnitude error by providing two symmetrically placed grating images of the primary star of approximately the same size as the image of the secondary. However, the large magnitude difference of Sirius presented special challenges. Lindenblad also utilized a hexagonal diaphragm which produced a point spread function with a six-cusped image rather than the usual Airy diffraction pattern of circular apertures. Rotation of the diaphragm allowed the companion to be placed between the "spikes" for the companion to be observed. Rather than the coarse grating of the Hertzprung method, Lindenblad used many evenly spaced extremely fine wires to produce good first-order images. These were affixed in a steel frame of mounting bars so that thermal expansion of the duraluminum hexagon was not transferred to the wires. Finally, measures were made of higher order images to measure and take into account the Ross effect, an emulsion contraction consideration. Making the observations of Sirius AB with all of these innovative techniques, the observations taken as part of this program remain the most precise ground-based measures of Sirius A and B obtained. This work led to the best current V band estimate of the brightness of Sirius B as well as (AJ 78, 205; 1973) ruling out possible higher order proper motion perturbations and periodicities (i.e., the "Dogon" companion) or (A&A 41, 111; 1975) investigating the "red" Sirius controversy.

In the mid 1970s, after the Sirius project, Lindenblad worked in the field of Earth Orientation. He made particular study of the geophysical effects of the rotation of the Earth and modeled polar motion and was in charge of the 65 cm Photographic Zenith Tube in Washington. He became interested in possible tidal effects on polar motion and the correspondence between lunar phase and seismic events such as earthquakes and volcanoes. He predicted when Mt. Saint Helens would blow and told Dennis McCarthy on the Friday (16 May 1980) before the event (18 May) that if it was going to erupt, it would be that weekend because of the phase of the Moon.

Recently, a cache of unreduced photographic plates of Sirius taken with Lindenblad's methodology were uncovered, which yielded a total of 166 good observations of Sirius A

and B obtained on 68 nights from 1970 to 1984. There is an excellent chance we may be able to improve upon the current “best” orbit of Sirius, that of van den Bos from 1960. The greatest challenge faced in this task is replicating the accuracy and precision of this excellent and careful researcher. What is clear at this point is that the results of his innovative data acquisition methodology will continue to be felt for many years to come.

Also see : http://www.washingtonpost.com/local/obituaries/irving-w-lindenblad-astronomer-minister/2011/12/13/gIQAuGLPsO_story.html

B. D. Mason

Jesus M. COSTA (1926-2012)

It is with sincere sadness that I inform you of the death of our colleague, Jesus-Manuel Costa (retired in 1991).

Costa was a disciple of R. M. Aller and, as a member of the Spanish C.S.I.C., he played an important role in the defense of our Observatory after the death of its founder in 1966 until a new Scientific Director was named in 1983.

His contribution to double star research is reflected in his micrometer measurements (CSA code) and in the orbits published in the journal, *Urania*, as well as in the Information Circulars of our Commission between 1978 and 1991.

Rest in peace!

J. A. Docobo
Director
R.M.Aller Astronomical Observatory

INFORMATIVE NOTES

- COMMISSION 26 ELECTIONS

The election process in our Commission is open. We need to elect the new Vice-President and three members of the Organizing Committee. The general information about this subject is available at these addresses:

<http://www.usno.navy.mil/USNO/astrometry/optical-IR-prod/wds/dsl>

http://www.usc.es/astro/com26_elections.doc

Please, note that the deadline to present nominations is March 26th.

Jose-Angel Docobo
C26 President

- A workshop will be organized next June in order to define the needs in a new reduction of old observations mainly astrometric photographic plates in the scope of the arrival of the Gaia catalogue and mainly for moving objects such as solar system bodies.

The creation of an international working group could be made during this workshop.

I thank you in advance and I would be glad to receiving your comments.

Information on this workshop at: http://www.imcce.fr/hosted_sites/naroo/

Jean-Eudes Arlot

IMCCE/Paris observatory/CNRS

- 2014 Meeting of Commissions 26, 30 and 54?

The potential meeting for 2013 in the Caucusus will not be held due to a insufficient positive response from members of the three relevant commissions. We are now focusing on venues that are generally more accessible for a 2014 date. Possibilities at present are:

Brussels, Belgium summer

Flagstaff, AZ, USA summer

Washington, DC, USA spring

There has also been interest in Commission 42 for the meeting and it is possible that the sponsoring commissions lists will grow.

Please let me or one of the other Commission VPs (30 Dimitri Pourbaix and 54 Gerard van Belle) know if you are interested and if you have any venue preferences.

Brian Mason

The deadline for contributions to Information Circular No. 177 is:

June 15th 2012

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