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)**
-	HDS 314	$82^{y}18$	2026.35	0.283	87°6	266°4 0″357	LING
02249+3039	4°3806	0″378	109°7	278°8	2010.0100	264.8 0.345	
-	HEI 449	28.25	2001.42	0.793	58.7	60.1 0.266	ZIRM
03213+1038	12.7433	0.155	117.5	185.8	2010.0048	58.9 0.272	& RICA
-	I 1489	32.79	1997.79	0.181	83.1	130.4 0.044	DOCOBO
04395-4507	10.979	0.270	84.1	281.6	2010.966	195.4 0.035	& CAMPO
6547	A 1581	549.21	1887.92	0.793	141.7	298.6 1.456	RICA
08031-0625	0.6555	1.510	69.6	331.2	2011.2498	298.7 1.466	& ZIRM
7457	A 1765	28.06	1994.86	0.408	131.5	7.5 0.128	DOCOBO
09379+4554	12.830	0.179	117.2	268.3	2001.028	357.7 0.137	& CAMPO
-	FIN 367 Aa,Bb	87.00	2031.59	0.079	75.2	294.5 0.133	DOCOBO
12064-6543	4.1379	0.164	131.7	219.2	2011.037	290.4 0.136	& ANDRADE
-	FIN 65 AB	200.0	1952.75	0.518	48.7	88.0 0.282	DOCOBO
12446-5717	1.8000	0.404	111.3	143.7	2010.069	86.8 0.289	& ANDRADE
8799	HU 572	102.90	1986.22	0.516	153.7	339.9 0.491	RICA
13091+2127	3.4986	0.400	145.0	30.9	2011.2502	338.3 0.501	& ZIRM
9043	HU 898	128.25	1984.63	0.783	33.0	296.2 0.342	DOCOBO
13539-1910	2.807	0.323	38.7	108.9	2011.037	297.4 0.348	& CAMPO
-	KUI 65	135.92	2014.56	0.867	105.0	159.2 0.063	ZIRM
13472-0943	2.6487	0.281	132.8	37.2	2008.5395	137.9 0.053	& RICA
10391	HU 1178 AB	761.80	1955.56	0.627	13.5	9.3 0.353	ZIRM
17116+3916	0.4726	0.931	93.0	318.0	2010.4750	9.1 0.349	& 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	320.2 320.0	0.748 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	122.6 105.8	0.025 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	141.4 134.9	0.343 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	114.8 116.6	0.519 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	105.1 102.7	0.059 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	144.3 133.7	0.149 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	184.8 182.3	0.190 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 16.7	0.532 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 65.5	0.154 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	300.2 297.7	0.140 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	HJ 998AC	6.593071	-0.072446	8.766	1612.5780	330.1 44.879
00028+0208	-	-5.777731	-0.082670	48.77	2000.6000	330.1 44.772
48	STT 547AC	-5.695269	-0.868296	33.720	1891.2791	262.1 111.569
00057+4549	-	33.235783	-0.148791	189.72	2010.6844	262.3 112.409
101	HDO 2	11.080887	0.012322	11.324	1744.0040	132.9 19.632
00088+0801	-	-2.331782	0.058556	78.12	2000.7300	133.0 19.680
	HJ 3364	-1.836430	-0.216291	23.852	1806.5090	246.2 50.559
00247-5359	-	23.781565	-0.016702	184.426	1999.7800	246.4 50.750
451	BU 1310AC	-3.977083	-0.137718	11.817	1836.8790	275.1 28.207
00327+2312	-	-11.127229	0.0492236	340.336	2007.6880	275.0 28.339
	COO 6	-0.049581	0.142336	0.239	1855.4399	677.4 22.780
01073-3452	-	-0.233957	-0.030164	348.03	1999.99006	77.4 22.926
2610	HJ 334	-1.456584	0.020232	2.255	1377.8900	137.9 16.954
03339+3205	-	1.721853	0.017115	220.23	1998.0601	137.8 16.981
2701	HJ 336	-20.573658	-0.012725	20.770	1585.2510	324.5 44.740
03425+3256	-	2.846138	-0.091982	262.12	1999.3000	324.5 44.823
	HJ 678AB	-2.771823	-0.113739	11.791	1872.6830	292.3 20.120
04268+0843	-	-11.460090	0.027510	346.40	2007.1260	292.1 20.215
	HJ 3845	22.406897	-0.122976	24.787	1818.5740	358.7 60.901
06171-2243	-	-10.599377	-0.259970	64.68	1959.2200	358.6 61.163
4927	STF 878AB	-11.190924	0.002449	11.193	1747.1200	343.0 36.057
06215+6224	-	-0.211817	-0.129376	271.08	1999.0200	343.1 36.180
6335	H 6 42AC	-3.826545	0.643041	35.768	1615.0950	75.9 259.179
07453+2802	-	-35.562344	-0.069192	353.86	1987.0400	76.0 259.820
	HJ 3308AB	-22.205055	-0.249003	33.005	1813.1360	286.0 74.626
08102+3527	-	24.418877	-0.226429	222.28	1998.1899	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**
	HJ 96AC	-7.634680	0.112713	12.364	1499.3430	137.7 74.494
08324-0056	-	9.725451	0.088482	218.13	2004.2159	137.6 74.636
7198	STF1316BC	-2.247722	-0.080329	3.539	1884.8370	294.4 13.691
09079-0708	-	2.732999	-0.066065	219.44	2010.2650	294.6 13.792
8100	STT 539BC	-0.585939	-0.380061	1.842	1835.3480	287.0 70.843
11152+7329	-	1.745930	-0.127550	198.55	2003.3700	287.1 71.243
8440	STF1604BC	2.123110	-0.291981	7.283	1981.3160	324.9 11.873
12095-1151	-	-6.966699	-0.088981	16.95	2010.3470	324.1 12.116
	HJ 4528	-4.547540	0.074703	17.150	1693.5050	140.1 30.051
12342-3206	-	16.536470	0.020543	195.38	2004.3600	140.1 30.114
	HJ 4530A,BC	0.636136	0.383550	4.546	1857.6990	86.3 59.943
12350-4717	-	4.501637	-0.054200	171.96	1966.4500	86.3 60.329
	HJ 230	-34.512737	-0.008281	34.791	1184.9960	320.1 64.487
13422+1807	-	4.388125	-0.065131	262.75	2002.2980	320.1 64.542
	HJ 2688	-13.628181	-0.041207	16.476	1673.6880	292.2 29.779
13510+2346	-	9.259405	-0.060650	235.81	2007.2000	292.3 29.841
9281	HJ 2725AB,C	-3.373027	0.048027	12.721	1522.5870	132.9 27.497
14288+5430	-	12.265869	0.013207	195.38	2000.1000	132.9 27.542
	STT 584AB	-96.594749	-0.360605	100.323	1777.5840	326.6 328.682
15565+1540	-	27.094456	-1.285598	254.33	2000.3199	326.6 329.954
	HJ 1290	11.080775	0.019349	12.536	1641.9730	112.8 19.787
16152-0046	-	-5.862827	0.036570	62.12	2008.3979	112.9 19.819
	WNO 5	-3.086665	-0.145428	4.728	1870.6440	300.9 27.547
17054-3346	-	3.581273	-0.1253436	220.76	1998.5200	300.9 27.737
	WFC 186	2.582238	0.009483	2.603	1769.9380	15.3 18.520
17061+4329	-	0.325838	-0.075156	97.19	2008.7321	15.2 18.595

NEW LINEAR FITS (continuation)

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

ADS	**Name**	X_0	X_A	ρ_0	T_0	**2012**
α**2000**δ	**-**	Y_0	Y_A	θ_0	**Last ob.**	**2013**
	HJ 4917	-1.594242	0.083490	11.937	1898.4980	31.0 15.296
17097-5420	-	-11.829822	-0.011252	352.326	2000.3800	31.3 15.348
	DUN 214AB	-13.055362	0.144872	27.965	1849.2150	15.8 38.642
17133-6712	-	-24.730068	-0.076480	332.17	2007.3730	16.0 38.756
	HO 413	-4.668693	-0.051410	5.444	1838.0990	311.7 18.212
17224-3012	-	2.800621	-0.085701	239.04	1998.6100	311.7 18.308
10778	AG 356	3.019531	-0.063086	6.317	1830.1790	215.6 14.507
17462+1019	-	5.548050	0.034334	151.44	2004.4130	215.8 14.571
10903	HO 72BC	5.127814	0.018452	5.146	1901.3000	163.3 24.950
17559+3326	-	-0.430571	0.219755	85.20	2003.4810	163.4 25.165
	DUN 219	-33.259064	-0.036054	37.953	1498.6210	253.5 54.007
17589-3652	-	-18.283575	0.065585	298.80	1999.6100	253.4 54.060
11431	HU 321AB	-2.845246	0.078033	3.294	1883.8220	20.9 20.113
18317+2310	-	-1.660777	-0.133686	300.27	2000.3900	20.9 20.265
11510	H 5 39AB	34.471737	-0.196474	41.857	1810.3719	183.681.421
18369+3846	-	23.743351	0.285250	124.56	2010.4250	183.8 81.719
11632	STF2398BC	-38.835636	1.380131	48.391	1915.0830	155.6 229.368
18428+5938	-	28.869774	1.856553	233.37	2000.29006	155.4 231.629
	HJ 1349	6.113636	0.068556	13.064	1663.6550	92.1 30.015
18488+3319	-	-11.544742	0.036304	27.90	2008.4260	92.2 30.085
12061	STF2461AC	31.750431	1.105189	45.007	1829.0160	54.1 288.862
19074+3230	-	31.899099	-1.100038	135.13	1983.7800	54.1 290.402
12061	STF2461CE	67.730011	-1.221359	100.277	1866.1331	205.0 261.582
19074+3230	-	73.946144	1.118688	137.51	1983.8199	205.1 263.112
13149	HJ 1455AD	24.066206	0.035809	46.808	2286.1819	162.8 48.187
19563+3505	-	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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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 Freiedrich 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 Hertzsprung photographic method, already well-established at the US Naval Observatory in which he was an active participant (PUSNO 18, Pt. 7; 1969). Ejnar Hertzsprung 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

- COMMISSSION 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

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

June 15th 2012

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