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LIGHTCURVE PHOTOMETRY OPPORTUNITIES OCTOBER-DECEMBER 2007

Brian D. Warner
Palmer Divide Observatory/Space Science Institute
17995 Bakers Farm Rd.
Colorado Springs, CO 80908 USA
brian@MinorPlanetObserver.com

Alan W. Harris
Space Science Institute
La Canada, CA 91011-3364 USA

Petr Pravec
Astronomical Institute
CZ-25165 Ondrejov, Czech Republic

Mikko Kaasalainen
Rolf Nevanlinna Institute
FIN-00014 University of Helsinki, Finland

Lance A.M. Benner
Jet Propulsion Laboratory
Pasadena, CA 91109-8099 USA

We present here four lists of "targets of opportunity" for the period 2007 October-December. The first list is those asteroids reaching a favorable apparition during this period, are <15m at brightest, and have either no or poorly constrained lightcurve parameters. By "favorable" we mean the asteroid is unusually brighter than at other times. In many cases, a favorable apparition may not come again for many years. The goal for these asteroids is to find a well-determined rotation rate, if at all possible. Don't hesitate to solicit help from other observers at widely spread longitudes should the initial finding for the period indicated that it will be difficult for a single station to find the period.

The Low Phase Angle list includes asteroids that reach very low phase angles. Getting accurate, calibrated measurements (usually V band) at or very near the day of opposition can provide important information for those studying the "opposition effect", which is when objects near opposition brighten more than simple geometry would predict.

The third list is of those asteroids needing only a small number of lightcurves to allow Kaasalainen and others to complete a shape model. Some of the asteroids have been on the list for some time, so work on them is strongly encouraged in order to allow models to be completed. For these objects, we encourage you to do absolute photometry, meaning that the observations are not differential but absolute values put onto a standard system, such as Johnson V. If this is not possible or practical, accurate relative photometry is also permissible. This is where all differential values are against a calibrated zero point that is not necessarily on a standard system.

When working any asteroid, keep in mind that the best results for shape and spin axis modeling are obtained when lightcurves are obtained over a range of phase angles, let alone viewing aspects at different apparitions. Higher phase angles allow shadowing effects to influence the lightcurve and help constrain the modeling solution. If at all possible, try to get lightcurves not only close to opposition when the asteroid is usually near its brightest, but before and after, e.g., when the phase angle is 15° or more. This can be difficult because of the geometry involved, especially main belt asteroids where the maximum phase angle is about 30°. However, the extra effort can and will pay off.

The fourth list gives a brief ephemeris for planned radar targets. Supporting optical observations made to determine the lightcurve's period, amplitude, and shape are needed to supplement the radar data. Reducing to standard magnitudes is not required but high precision work usually is, i.e., on the order of 0.01-0.03mag. A *geocentric* ephemeris is given for when the asteroid is brighter than 16.0 (in most cases). The date range may not always coincide with the dates of planned radar observations, which – for Arecibo – are limited to a relatively narrow band of declinations.

Those obtaining lightcurves in support of radar observations should contact Dr. Benner directly at the email given above. There are several web sites of particular interest for coordinate radar and optical observations. Future targets (up to 2010) can be found at *http://echo.jpl.nasa.gov/~lance/future.radar.nea.periods.html*. Past radar targets, for comparison to new data, can be found at *http://echo.jpl.nasa.gov/~lance/radar.nea.periods.html*. Slightly different information for Arecibo, e.g., principal investigators and the need for astrometry, is given at *http://www.naic.edu/~pradar/sched.shtml*. For Goldstone, visit *http://echo.jpl.nasa.gov/asteroids/goldstone_asteroid_schedule.html*.

Once you have data and have analyzed them, it's important that you publish your results, if not part of a pro-am collaboration, then in the *Minor Planet Bulletin*. It's also important to make the data available at least on a personal website or upon request.

Note that the lightcurve amplitude in the tables could be more, or less, than what's given. Use the listing as a guide and double-check your work.

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Lightcurve Opportunities

		Brightest				Lightcurve	Data
#	Name	Date	V	Dec	U	Period	Amp
339	Dorothea	10 01.0	12.8	+ 0	2	5.5	0.10
1475	Yalta	10 03.5	14.4	+ 5	0		
41223	1999 XD16	10 04.5	13.9	- 6	0		
493	Griseldis	10 05.9	13.7	+11	0		
11780	1942 TB	10 06.4	14.4	- 7	0		
1405	Sibelius	10 11.9	14.1	+19	0		
917	Lyka	10 13.4	12.7	+14	2	7.92	0.14
1539	Borrelly	10 14.9	13.8	+ 6	0		
1352	Wawel	10 15.1	14.3	+ 7	0		
905	Universitas	10 15.8	12.8	+ 6	2	10.	0.22
2648	Owa	10 16.5	14.4	+18	0		
102	Miriam	10 18.6	10.9	+11	2	15.789	0.08-0.16
1433	Geramtina	10 18.9	14.4	+21	0		
763	Cupido	10 21.2	13.9	+19	0		
4388	Jurgenstock	10 24.4	14.3	+15	0		
271	Penthesilea	10 25.6	13.3	+16	0		
13441	2098 P-L	10 25.7	14.5	+ 5	0		
1160	Illyria	10 25.7	13.9	+25	0		
2118	Flagstaff	10 27.7	14.1	+22	0		
4618	Shakhovskoj	10 29.7	14.6	+32	0		
3285	Ruth Wolfe	10 31.0	14.6	+32	2	3.94	0.20
7517	1989 AD	11 06.2	14.4	+24	0		
1006	Lagrangea	11 06.9	13.6	+35	1	32.8	0.18
5105	Westerhout	11 08.4	14.7	+17	0		
2140	Kemerovo	11 08.8	14.7	+24	2	5.308	0.20
13512	1989 TH1	11 10.8	14.9	+32	0		
1136	Mercedes	11 12.6	13.0	+12	0		
959	Arne	11 12.6	13.2	+17	1	8.60	0.24
5539	Limporyen	11 12.6	14.5	+21	0		

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Lightcurve Opportunities (continued)

#	Name	Brightest Date	V	Dec	U	Lightcurve Data Period	Amp
6905	Miyazaki	11 14.4	13.8	+19	0		
9193	Geoffreycopland	11 14.5	15.0	+22	0		
398	Admete	11 14.7	12.8	+30	0		
651	Antikleia	11 15.3	13.6	+23	2	20.287	0.40
5358	1992 QH	11 15.4	14.5	+36	0		
907	Rhoda	11 16.3	13.1	+24	2	22.44	0.16
1741	Giclas	11 17.2	14.5	+19	0		
2347	Vinata	11 18.3	14.6	+36	0		
7409	1990 BS	11 24.9	14.2	+21	0		
5076	Lebedev-Kumach	11 25.2	14.6	+ 5	2	3.219	0.14
2445	Blazhko	11 28.5	13.8	+17	0		
362	Havnia	11 28.7	12.1	+30	2	18.	0.1
5331	Erimomisaki	11 29.2	13.4	+ 4	0		
19755	2000 EH34	11 29.6	14.6	+27	0		
1544	Vinterhansenia	12 02.5	13.7	+23	2	13.77	0.18
1900	Katyusha	12 04.2	13.7	+29	?		
2378	Pannekoek	12 06.6	14.2	+ 0	0		
971	Alsatia	12 08.3	12.4	+19	2	9.60	0.21
4162	SAF	12 10.5	14.7	+21	2	7.54	0.16
4293	Masumi	12 11.2	14.3	+29	1		<0.1
7520	1990 BV	12 15.4	14.6	+17	0		
1156	Kira	12 19.5	14.4	+23	0		
180	Garumna	12 21.4	12.9	+24	0		
1464	Armisticia	12 22.0	14.7	+24	0		
6823	1988 ED1	12 23.8	13.4	+26	0		
76	Freia	12 24.1	11.7	+20	2	9.972	0.10-0.33
3335	Quanzhou	12 26.8	14.0	+25	0		
3475	Fichte	12 27.0	14.7	+11	0		
1116	Catriona	12 27.2	12.8	+51	2	8.832	0.10-0.20
2009	Voloshina	12 27.6	14.1	+22	0		
1846	Bengt	12 27.7	14.9	+29	0		

Low Phase Angle Opportunities

#	Name	Date	α	V	Dec
105	Artemis	10 05.0	0.77	11.7	+03
231	Vindobona	10 07.1	0.95	13.3	+08
734	Benda	10 13.0	0.81	13.6	+10
1539	Borrelly	10 14.9	0.92	13.8	+06
540	Rosamunde	10 17.4	0.20	13.5	+09
102	Miriam	10 18.7	0.55	11.0	+11
1332	Marconia	10 28.9	0.50	13.7	+15
396	Aeolia	10 29.8	0.73	13.8	+16
1150	Achaia	11 03.7	0.66	13.9	+14
208	Lacrimosa	11 04.4	0.55	12.8	+17
767	Bondia	11 05.9	0.81	13.6	+14
509	Iolanda	11 07.1	0.97	12.1	+14
797	Montana	11 08.3	0.60	13.7	+18
131	Vala	11 10.6	0.96	13.3	+15
959	Arne	11 12.6	0.48	13.2	+17
168	Sibylla	11 13.6	0.86	12.3	+15
6905	Miyazaki	11 14.5	0.61	13.8	+20
222	Lucia	11 17.6	0.37	14.0	+18
1542	Schalen	11 21.1	0.65	14.0	+18
492	Gismonda	11 25.5	0.26	13.7	+21
566	Stereoskopia	11 25.8	0.68	12.3	+19
562	Salome	11 27.4	0.60	14.0	+19
1544	Vinterhansenia	12 02.5	0.52	13.7	+23
1197	Rhodesia	12 05.3	0.44	13.7	+24
248	Lameia	12 14.0	0.61	13.5	+22
149	Medusa	12 21.4	0.82	12.7	+22
180	Garumna	12 21.4	0.46	12.9	+24

Shape/Spin Modeling Opportunities

#	Name	Brightest Date	V	Dec	Per (h)	Amp.	U
3415	Danby	10 17.2	14.7	+11	2.851	0.09-0.14	3
83	Beatrix	11 16.8	11.9	+22	10.16	0.18-0.27	4
34	Circe	11 17.6	12.1	+12	12.15	0.24	3
76	Freia	12 24.1	11.7	+20	9.972	0.10-0.33	2
5	Astraea	12 31.	11.4	+04	16.800	0.10-0.30	4
24	Themis	12 31.	12.6	+10	8.374	0.09-0.14	3
48	Doris	12 31.	11.9	+08	11.89	0.35	3
369	Aeria	12 31.	13.1	-03	4.787	0.08	2
409	Aspasia	12 31.	12.7	+09	9.020	0.10-0.14	4

Radar-Optical Opportunities

2340 Hathor

No lightcurve parameters have been reported for this asteroid, which has an estimated diameter of about 0.5 km. Larger instruments, probably 0.5-m or more, will be needed to get good data.

Date 2007	Geocentric RA(2000)	DC(2000)	E.D.	V	α	E
10/22	18 22.21	-12 16.4	0.060	17.14	108.9	68
10/26	20 27.71	-13 58.0	0.068	16.25	82.4	94
10/30	21 49.58	-12 55.0	0.090	16.36	66.1	109
11/03	22 36.69	-11 31.5	0.118	16.74	57.9	116
11/07	23 05.79	-10 21.0	0.148	17.17	53.7	119
11/11	23 25.61	- 9 22.4	0.181	17.58	51.6	120
11/15	23 40.34	- 8 31.4	0.214	17.96	50.6	120
11/19	23 52.07	- 7 45.0	0.248	18.30	50.2	119

4954 Eric

We repeat the notice for this asteroid that was included in the previous issue of the *Minor Planet Bulletin* since an extended campaign for this asteroid is planned for Arecibo in October and November. Photometry will help estimate the pole position. It will be brighter than 15th magnitude until mid-March 2008. The solar elongation is greater than 100° for most of the ephemeris period below, so it should be a workable target for months. The period is well-known, 12.057 hr, so it makes better sense to observe it one to three nights every few weeks in order to get both the entire curve – if possible – and any changes in the curve as it moves through a very large range of PAB values.

Date 2007/08	Geocentric RA(2000)	DC(2000)	V	α	E	LPAB	BPAB
08/30	23 28.22	-26 36.3	12.41	15.3	158	339.7	-13.8
09/29	22 15.63	-11 53.0	11.67	26.3	146	344.7	-0.6
10/29	21 29.73	+15 59.0	12.26	53.6	112	358.6	20.1
11/28	21 50.28	+39 53.8	12.82	61.9	99	27.7	35.6
12/28	23 33.38	+58 03.8	13.12	55.6	103	62.6	38.5
01/27	3 19.16	+61 46.4	13.57	45.2	112	90.6	30.8
02/26	6 01.90	+49 07.8	14.42	39.2	111	111.0	20.6
03/27	7 29.22	+36 20.9	15.41	36.6	101	127.1	12.7
04/16	8 13.08	+29 32.4	16.00	34.7	93	136.5	8.8

(11500) 1989 UR

This 0.6 km asteroid will be within range of backyard telescopes for ~3 weeks in November. It's southerly motion means that observers on both sides of the equator will have a chance to provide supporting observations. Pravec reports a period of ~73 hours. Such a period usually requires a collaboration among observers at widely different longitudes to get a complete lightcurve. It's possible this is also a "tumbler" (non-principal axis rotation), which adds to the challenge *and* the importance of finding a solution.

Date 2007	Geocentric RA(2000)	DC(2000)	E.D.	V	α	E
11/08	6 19.82	+27 59.8	0.150	16.16	43.5	131
11/10	6 31.94	+25 59.9	0.137	15.96	44.6	130
11/12	6 45.75	+23 28.7	0.123	15.76	46.2	129
11/14	7 01.63	+20 16.8	0.111	15.57	48.6	127
11/16	7 20.05	+16 12.2	0.099	15.39	51.8	124
11/18	7 41.55	+11 01.3	0.089	15.26	56.4	119
11/20	8 06.68	+ 4 32.7	0.081	15.20	62.5	113
11/22	8 35.90	- 3 14.2	0.075	15.25	70.2	106
11/24	9 09.33	-11 56.5	0.071	15.44	79.4	97
11/26	9 46.48	-20 44.1	0.071	15.78	89.1	87
11/28	10 26.05	-28 36.7	0.075	16.26	98.3	77

3200 Phaethon

The period for this object is about 3.6 hours. The value is well-established. However, data obtained near the time of the radar

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observations will help establish the phase of the lightcurve at the time of the radar observations. The pole position has been reported, so the primary interest here is that, due to the faster rotation, there's a possibility the asteroid is binary. Careful photometry may help answer that question.

Date	Geocentric					
2007	RA(2000)	DC(2000)	E.D.	V	α	E
11/08	7 53.01	+31 22.5	0.702	16.19	41.5	110
11/12	8 02.66	+31 06.1	0.617	15.86	42.7	112
11/16	8 13.95	+30 43.3	0.532	15.50	44.1	114
11/20	8 27.89	+30 09.2	0.449	15.09	46.1	115
11/24	8 46.28	+29 14.0	0.367	14.63	49.1	115
11/28	9 12.66	+27 34.9	0.288	14.13	53.8	113
12/02	9 54.54	+24 09.5	0.213	13.60	62.4	107
12/06	11 07.48	+15 55.6	0.151	13.28	79.7	92

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