ASTEROID-DEEPSKY APPULSES IN 2012

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(Received: 15 October)

The following list is a very small subset of the results of a search for asteroid-deepsky appulses for 2012, presenting only the highlights for the year based on close approaches of brighter asteroids to brighter DSOs. The complete set of predictions is available at

http://www.minorplanet.info/ObsGuides/Appulses/DSOAppulses.htm

For any event not covered, the Minor Planet Center's web site at *http://scully.harvard.edu/~cgi/CheckMP* allows you to enter the location of a suspected asteroid or supernova and check if there are any known targets in the area.

The table gives the following data, with potentially attractive astrophotography appulses indicated in **bold**:

Date/Time	Universal Date (MM DD) and Time of closest approach
#/Asteroid	The number and name of the asteroid
RA/Dec	The J2000 position of the asteroid
AM	The approximate visual magnitude of the asteroid
Sep/PA	The separation in arcseconds and the position angle from the DSO to the asteroid
DSO	The DSO name or catalog designation
DM	The approximate total magnitude of the DSO
DT	The type of DSO: OC = Open Cluster; GC = Globular Cluster; G = Galaxy
SE/ME	The elongation in degrees from the sun and moon respectively
MP	The phase of the moon: 0 = New, 1.0 = Full. Positive = waxing; Negative = waning

Date	UT	#	Name	RA	Dec	AM	Sep	PA	DSO	DM	DT	SE	ME	MP
01 19	07:13	31	Euphrosyne	01:50.27	+27 11.4	11.6	258	148	Cr 21	8.2	OC	97	146	-0.19
01 30	08:14	387	Aquitania	10:54.30	+17 14.8	12.2	216	233	NGC 3455	12.0	G	150	126	0.42
02 21	00:14	144	Vibilia	11:00.24	+13 52.1	12.4	125	205	NGC 3489	10.3	G	168	157	-0.01
02 26	14:01	387	Aquitania	10:34.94	+21 41.5	11.8	191	38	NGC 3287	12.3	G	167	121	0.20
02 26	21:39	423	Diotima	15:00.79	-07 29.6	12.5	99	184	NGC 5812	11.2	G	112	163	0.22
03 16	11:40	416	Vaticana	10:51.28	+27 57.3	12.0	105	187	NGC 3414	11.0	G	151	127	-0.34
03 19	06:30	432	Pythia	12:36.13	+19 18.3	11.8	116	209	NGC 4561	12.5	G	159	133	-0.11
03 21	19:09	97	Klotho	12:20.59	+05 27.7	11.4	279	37	NGC 4281	11.3	G	173	164	-0.01
03 22	09:25	97	Klotho	12:20.10	+05 33.1	11.4	305	36	NGC 4270	12.2	G	173	168	0.00
03 23	18:02	5	Astraea	11:28.46	+09 25.4	9.4	100	33	NGC 3692	12.1	G	165	151	0.01
04 16	19:00	127	Johanna	15:17.39	-20 58.6	12.4	144	357	NGC 5897	8.6	GC	154	105	-0.18
04 18	01:08	374	Burgundia	12:51.59	-10 31.8	12.2	292	219	NGC 4742	11.3	G	167	157	-0.10
04 21	03:22	374	Burgundia	12:49.48	-10 05.6	12.3	111	41	AN 3	11.6	G	164	166	0.00
04 25	**07:15**	**326**	**Tamara**	**12:58.10**	**+01 34.9**	**11.9**	**9**	**158**	**NGC 4845**	**11.2**	**G**	**156**	**114**	**0.14**
05 23	00:13	5	Astraea	11:30.24	+09 20.9	10.9	265	27	NGC 3705	11.1	G	107	85	0.04
06 14	17:09	37	Fides	12:39.97	-05 52.3	12.5	282	205	NGC 4597	12.1	G	108	161	-0.20
06 17	**03:23**	**596**	**Scheila**	**16:17.05**	**-23 00.6**	**12.2**	**102**	**158**	**M80**	**7.2**	**GC**	**160**	**173**	**-0.05**
06 18	13:59	42	Isis	12:49.17	+03 23.7	12.2	30	232	NGC 4701	12.4	G	102	114	-0.01
06 19	**10:30**	**216**	**Kleopatra**	**18:10.72**	**-07 10.4**	**11.7**	**97**	**11**	**IC 1276**	**10.3**	**GC**	**163**	**164**	**0.00**
07 11	17:14	804	Hispania	20:48.64	-38 03.7	11.4	223	173	NGC 6958	11.4	G	156	84	-0.43
07 17	05:03	89	Julia	13:41.39	-29 51.1	11.7	306	343	NGC 5264	12.0	G	99	120	-0.04
07 18	22:37	196	Philomela	18:12.84	-28 23.7	11.1	224	172	PK 3-4.9	12.0	PN	156	157	0.00
07 20	16:23	196	Philomela	18:11.64	-28 25.8	11.2	228	173	PK 3-4.7	11.0	PN	154	135	0.03
07 24	21:30	11	Parthenope	23:18.77	-07 35.0	9.9	120	271	NGC 7600	11.9	G	135	154	0.34
08 12	**11:18**	**138**	**Tolosa**	**17:02.60**	**-26 16.7**	**12.3**	**44**	**184**	**M19**	**7.2**	**GC**	**117**	**175**	**-0.25**
09 13	07:27	18	Melpomene	17:56.19	-16 33.7	10.4	242	204	PK 11+4.1	12.0	PN	98	134	-0.09
09 21	22:36	287	Nephthys	01:04.89	-06 09.4	11.4	287	319	New 1	11.8	G	162	115	0.40
12 09	**19:39**	**488**	**Kreusa**	**08:27.09**	**+25 58.0**	**12.4**	**9**	**254**	**NGC 2592**	**12.3**	**G**	**135**	**86**	**-0.17**
12 12	15:30	704	Interamnia	02:37.00	+33 18.1	10.3	160	109	NGC 987	12.4	G	143	151	-0.01
12 18	02:18	9	Metis	07:07.07	+27 17.1	8.8	259	204	NGC 2331	8.5	OC	161	133	0.29

LIGHTCURVE PHOTOMETRY OPPORTUNITIES: 2012 JANUARY–MARCH

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We present lists of asteroid photometry opportunities for objects reaching a favorable apparition and have no or poorly-defined lightcurve parameters. Additional data on these objects will help with shape and spin axis modeling via lightcurve inversion. We also include lists of objects that will be the target of radar observations. Lightcurves for these objects can help constrain pole solutions and/or remove rotation period ambiguities that might not come from using radar data alone.

We present four lists of "targets of opportunity" for the period 2012 January-March. For background on the program details for each of the opportunity lists, refer to previous issues, e.g., *Minor Planet Bulletin* **36**, 188. In the first three sets of tables, "Dec" is the declination, "U" is the quality code of the lightcurve, and "α" is the solar phase angle. See the asteroid lightcurve data base (LCDB) documentation for an explanation of the U code:

http://www.minorplanet.info/lightcurvedatabase.html

Objects with U = 1 should be given higher priority when possible. *Do not overlook asteroids with* U = 2 *on the assumption that the period is sufficiently established.* Regardless, do not let the existing period influence your analysis since even high quality ratings have been proven wrong at times. Note that the lightcurve amplitude in the tables could be more or less than what's given. Use the listing only as a guide.

The first list is an *abbreviated list* of those asteroids reaching V < 15.0 at brightest during the period and have either no or poorly-constrained lightcurve parameters. The goal for these asteroids is to find a well-determined rotation rate. A more complete list as well as one including objects V < 16.0 can be found on the CALL web site.

http://www.minorplanet.info/CALL/targets_2012_Q1.htm

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."

The third list is of those asteroids needing only a small number of lightcurves to allow spin axis and/or shape modeling. Those doing work for modeling should contact Josef Ďurech at the email address above and/or visit the Database of Asteroid Models from Inversion Techniques (DAMIT) web site for existing data and models:

http://astro.troja.mff.cuni.cz/projects/asteroids3D

The fourth list gives a brief ephemeris for planned radar targets. Supporting optical observations to determine the lightcurve period, amplitude, and shape are needed to supplement the radar data. *High-precision work, 0.01-0.02 mag, is preferred, especially if the object is a known or potential binary*. Those obtaining lightcurves in support of radar observations should contact Dr. Benner directly at the email given above.

Future radar targets:
http://echo.jpl.nasa.gov/~lance/future.radar.nea.periods.html

Past radar targets:
http://echo.jpl.nasa.gov/~lance/radar.nea.periods.html

Arecibo targets:
http://www.naic.edu/~pradar/sched.shtml

Goldstone targets:
http://echo.jpl.nasa.gov/asteroids/goldstone_asteroid_schedule.html

As always, we encourage observations of asteroids even if they have well-established lightcurve parameters and especially if they are lacking good spin axis and/or shape model solutions. Every lightcurve of sufficient quality supports efforts to resolve a number of questions about the evolution of individual asteroids and the general population. For example, pole directions are known for only about 30 NEAs out of a population of 8000. This is hardly sufficient to make even the most general of statements about NEA pole alignments, including whether or not the thermal YORP effect is forcing pole orientations into a limited number of preferred directions (see La Spina *et al.*, 2004, *Nature* **428**, 400-401). Data from many apparitions can help determine if an asteroid's rotation rate is being affected by YORP, which can also cause the rotation rate of a smaller, irregularly-shaped asteroid to increase or decrease. See Lowry *et al.* (2007) *Science* **316**, 272-274 and Kaasalainen *et al.* (2007) *Nature* **446**, 420-422.

The ephemeris listings for the optical-radar listings include lunar elongation and phase. Phase values range from 0.0 (new) to 1.0 (full). If the value is positive, the moon is waxing – between new and full. If the value is negative, the moon is waning – between full and new. The listing also includes the galactic latitude. When this value is near 0°, the asteroid is likely in rich star fields and so may be difficult to work. It is important to emphasize that the ephemerides that we provide are only guides for when you might observe a given asteroid. Obviously, you should use your discretion and experience to make your observing program as effective as possible.

Once you've analyzed your data, it's important to publish your results. Papers appearing in the *Minor Planet Bulletin* are indexed in the Astrophysical Data System (ADS) and so can be referenced by others in subsequent papers. It's also important to make the data available at least on a personal website or upon request.