Star Dust

Newsletter of National Capital Astronomers, Inc.
capitalastronomers.org

February 2017 ***Volume 75, Issue 6***

Next Meeting

When: Sat. Feb. 11th, 2017

Time: 7:30 pm

Where: UMD Observatory

Speakers: Terry Hurford

Table of Contents

Directions to Dinner/Meeting

Our time and location for dinner with the speaker before this meeting is 5:30 pm at "The Common," the restaurant in the UMD University College building located at 3501 University Blvd.

The meeting is held at the UMD Astronomy Observatory on Metzerott Rd about halfway between Adelphi Rd and University Blvd.

Need a Ride?

Please contact Jay Miller, 240-401-8693, if you need a ride from the metro to dinner or to the meeting @ observatory. Please try to let him know in advance by e-mail at rigel1@starpower.net.

Observing after the Meeting

Following the meeting, members and guests are welcome to tour through the Observatory. Weather-permitting, several of the telescopes will also be set up for viewing.

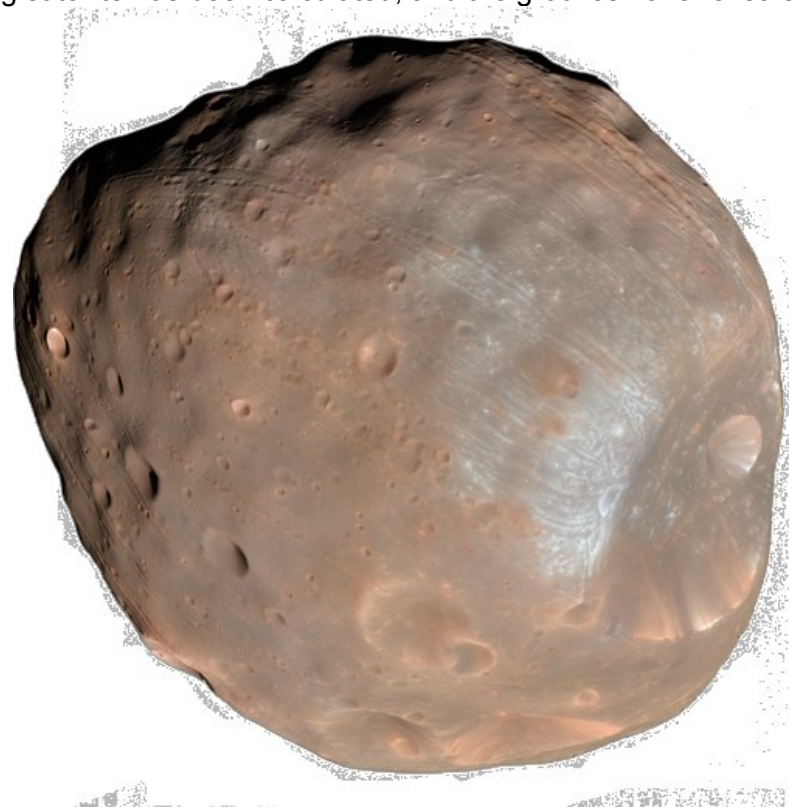
Mars' Intensifying Effect on Phobos

Terry A. Hurford
NASA's Goddard Space Flight Center

Abstract: Phobos, the innermost satellite of Mars, is steadily spiraling closer to the planet because the tides that Phobos raises on Mars lag behind Phobos' orbital position, thereby slowing the satellite's motion.

As Phobos spirals closer to Mars, the tidal forces on it increase. Phobos will suffer tidal disruption before colliding with Mars in a few tens of millions of years.

There is an extensive system of grooves on Phobos. They are mostly symmetric about its sub-Mars point, which is evidence that the grooves are being produced by tidal forces. The surface stress field of the de-orbiting satellite has been calculated, and the grooves have revealed that

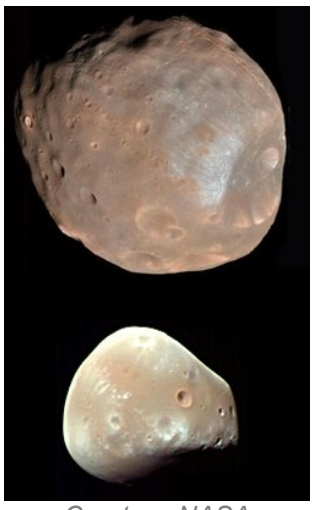


Courtesy NASA/JPL-Caltech/Univ. of Arizona
Phobos, with Visible Grooves & the large Stickney Crater (on right)

continued on page 2

Star Dust © 2017. Star Dust may be reproduced with credit to National Capital Astronomers, Inc.

Phobos and Deimos



Courtesy NASA
Phobos & Deimos

Although Johannes Kepler hypothesized that Mars had moons, it was US astronomer, Asaph Hall, who discovered them in August of 1877. His search base was the US Naval Observatory in Washington, DC. Just when Asaph was about to give up his search, his wife, Angelina, encouraged him to continue. Within the week, he discovered both moons. They were so small and close to Mars that the planet's glare had been hiding them from view!

Aligned with the God of War (Mars/Ares), the moons were named for his twin sons who accompanied the God into battle. According to NASA, Phobos refers to "fear" and Deimos refers to "flight" (fleeing after a fight).

Courtesy UNSO
Oil Painting of Asaph Hall

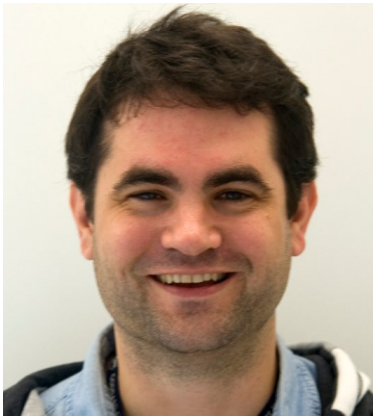
Phobos – continued from page 1

the first signs of tidal disruption are already present on the satellite's surface. Most of Phobos' prominent grooves have an excellent correlation with computed stress orientations.

The model requires a weak interior that has very low rigidity on the tidal evolution timescale, overlain by a ~10 to 100 m exterior shell whose elastic properties are similar to lunar regolith or to powdery asteroid materials.

The fractures on Phobos' surface can be reworked daily through diurnal tidal stress, and may prove to be a natural seismic source for probing Phobos' interior.

Biographical Sketch:



Dr. Terry Hurford is a Planetary Scientist in the Planetary Systems Laboratory in NASA's Goddard Space Flight Center. Both his undergraduate and graduate work were at the University of Arizona. As an undergraduate, he won two Undergraduate Research Awards. During the summer of his Junior year, he was a research assistant at NASA Ames Research Center, in Moffett Field, California. As a graduate student in the University of Arizona's famed Planetary Sciences Department, he won a teaching award, and also began his extensive research on using geological science and expertise in orbital dynamics to obtain information on planetary moons and on other small bodies in the Solar System. This unusual combination of tools enabled him to infer aspects of the past, present and future states of those bodies that we wouldn't have been able to learn about otherwise. In 2005, Dr. Hurford started a post-doc at Goddard, where he is now a full-time employee.

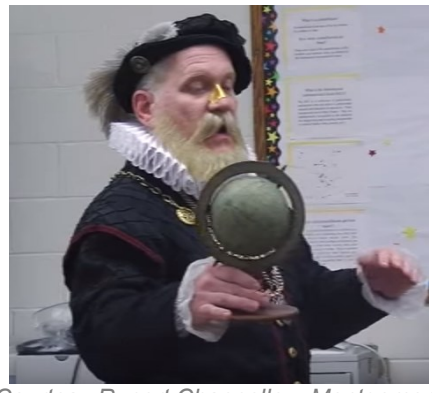
Another Chapter in the World of Women Computors

Courtesy IBM/20th Century Fox

Showings ended at the Air & Space Museum on Feb. 7th; but, the movie is still playing at local theaters. For more information:
www.ibm.com/thought-leadership/hidden-figures/

Star Dust © 2017. Star Dust may be reproduced with credit to National Capital Astronomers, Inc.

Missed one of the NCA Meetings?



Courtesy Rupert Chappelle – Montgomery College Astronomy Videos

Dean Howarth (pictured) and Jeff Jones recorded in action at January's NCA meeting.

Rupert Chappelle has shared several videos of NCA Speakers on his YouTube account. Optional viewing in 2D or 3D. See the legendary debate between Brahe and Kepler, as well as lectures from other speakers, at the following link:

youtu.be/xjf_KD9D85g

The International Astronomical Union Issues Statement on President Trump's Executive Order Impacting Immigrants

Courtesy IAU

In an announcement on January 30th, The IAU indicated that it was

"*profoundly concerned by the impact the recent US executive order, and possible reactions to it from other countries, could have on international collaboration in astronomy and the mobility of scientists.*"

IAU reported that 47 members are from countries included in the executive order and "hundreds more" are from countries where the primary religion is Islam.

The full announcement is at the following link:

www.iau.org/news/announcements/detail/ann17006/

Sky Watchers — *Late Winter Schedule*

February

10	7:33 pm – **Full Moon**, Global. Other Moon Names: *Full Snow Moon, Hunger Moon, Bone Moon.* 7:43 pm – **Planets**, N. Hemisphere. Penumbral Lunar Eclipse.
17	2:00 am - **Planets**, N. Hemisphere. Venus brightest (mag. = - 4.8)
18	4:14 pm – **Moon,** Global. (apogee at 251,268 miles).
18 -27	Evening – **Globe at Night**, Global. Features: *Constellation Orion* (N. & S. Hemispheres).
20	6:00 pm – **Planets**, N. Hemisphere. Saturn 4º south of Moon.
21	9:00 pm - **Asteroid**, N. Hemisphere. *Metis* in opposition to Sun.
26	9:58 am – **New Moon**, Global.

Times EST

Exploring the Sky

*"**Exploring the Sky**"* is an informal program that, for over 60 years, has offered monthly opportunities for anyone in the Washington area to see the stars and planets through telescopes from a location within the District of Columbia.

Presented by the National Park Service and National Capital Astronomers, sessions are held in Rock Creek Park once each month on a Saturday night from April through November, Beginners (including children) and experienced stargazers are all welcome—and it's free!

The Program will return in April 2017!

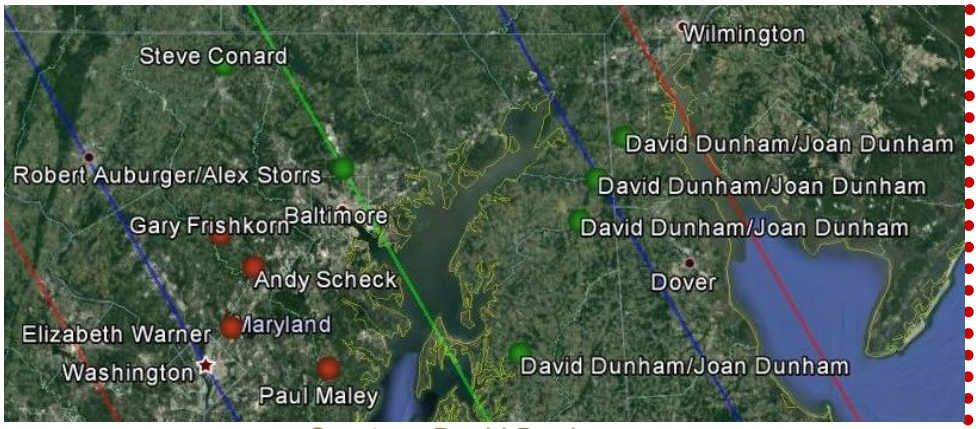
Hosted by: National Capital Astronomers, Inc and Rock Creek Park

Star Dust © 2017. Star Dust may be reproduced with credit to National Capital Astronomers, Inc.

328 Gudrun

David Dunham

On Sunday morning, November 13, 2016 (about 7 hours after the November NCA meeting ended at UMD's observatory in College Park), Elizabeth Warner stayed there to observe the occultation of 12.0-mag. UCAC2 47412446 by the 115-km asteroid (328) Gudrun. She had no occultation, but UMD Observatory was at the farthest southwestern-end of a "fence" of stations that was spread out to record the occultation.



Courtesy David Dunham

The Gudrun Occultation Stations

The green line is the predicted central line, while the blue lines are the predicted edges of the occultation path, and the red lines show where the edges might be in case of 1-sigma path errors. Red dots mark stations where no occultation occurred while green dots show stations that video recorded the occultation.

Besides Elizabeth, three other stations had no occultation, while Steve Conard, at B. Roelke Observatory at Bear Branch Nature Center north of Westminster, recorded only a 1.6-second occultation of the star. It was rather easy to find, at high altitude near 2nd-mag. Menkalinan (beta Aurigae). This showed that the southwestern edge of the path, rather than lying close to I-270 and passing near downtown DC, as predicted, was about 40 km farther east, passing instead near I-97 and Annapolis.

A 10-second occultation was recorded at Towson University's observatory on top of Smith Hall. Joan and I set up 6 stations to record the occultation with stationary telescopes pre-pointed to the altitude and azimuth of the occultation using star charts. The camera battery failed in the cold with the telescope we set up in our backyard in Greenbelt, MD. The other five stations were set up at locations near US 301 on the Eastern Shore, spread across the expected path into the eastern "1-sigma" zone in northern Delaware. All but one of the stations recorded the occultation; a system near Price, MD failed to record. However, we were happy since all three of our 10-inch "suitcase" telescopes, built by John Broughton in Australia, recorded

continued on page 6

Star Dust is published ten times yearly September through June, by the National Capital Astronomers, Inc. (NCA).

ISSN: 0898-7548

Editor: CA Brooks

Editorial Advisors:

- Michael Chesnes
- John D. Gaffey, Jr.
- Alex Klein
- Jeffrey Norman
- Todd Supple
- Elizabeth Warner
- Wayne Warren
- Marjorie Weissberg
- Harold Williams

Electronic Distributor: Jay Miller

Please Get Star Dust Electronically

NCA members able to receive Star Dust, the newsletter of the NCA, via e-mail as a PDF file attachment, instead of hardcopy via U.S. Mail, can save NCA a considerable amount of money on the printing and postage in the production of Star Dust (the NCA's single largest expense), save some trees and have one-click access to all the embedded links in the document. If you can switch from paper to digital, please contact Henry Bofinger, the NCA Secretary-Treasurer, at hbofinger@earthlink.net

Thank you!

Star Dust © 2017. Star Dust may be reproduced with credit to National Capital Astronomers, Inc.

Occultation Notes

- D following the time denotes a disappearance, while R indicates that the event is a reappearance.
- When a power (x; actually, zoom factor) is given in the notes, the event can probably be recorded directly with a camcorder of that power with no telescope needed.
- The times are for Greenbelt, MD, and will be good to within +/-1 min. for other locations in the Washington-Baltimore metropolitan areas unless the cusp angle (CA) is less than 30 deg., in which case, it might be as much as 5 minutes different for other locations across the region.
- Some stars in Flamsteed's catalog are in the wrong constellation, according to the official IAU constellation boundaries that were established well after Flamsteed's catalog was published. In these cases, Flamsteed's constellation is in parentheses and the actual constellation is given in the notes following a /.
- Mag is the star's magnitude.
- % is the percent of the Moon's visible disk that is sunlit, followed by a + indicating that the Moon is waxing and - showing that it is waning. So 0 is new moon, 50+ is first quarter, 100+ or - is full moon, and 50- is last quarter. The Moon is crescent if % is less than 50 and is gibbous if it is more than 50.
- Cusp Angle is described more fully at the main IOTA Web site.
- Sp. is the star's spectral type (color), O,B,blue; A,F,white; G,yellow; K,orange; M,N,S,C red.
- Also in the notes, information about double stars is often given. "Close double" with no other information usually means nearly equal components with a separation less than 0.2". "mg2" or "m2" means the magnitude of the secondary component, followed by its separation in arc seconds ("), and sometimes its PA from the primary. If there is a 3rd component (for a triple star), it might be indicated with "mg3" or "m3". Double is sometime abbreviated "dbl".
- Sometimes the Watts angle (WA) is given; it is aligned with the Moon's rotation axis and can be used to estimate where a star will reappear relative to lunar features. The selenographic latitude is WA -270. For example, WA 305 - 310 is near Mare Crisium.

Mid-Atlantic Occultations

David Dunham

Asteroidal and Planetary Occultations

Date	Day	EST	Star	Mag	Asteroid	dmag	dur. s	Ap. "	Location, Notes
Feb 11	Sat	2:58	4UC50649837	12.8	Regina	3.2	3	10	MD,DC,nVA,cOH
Feb 11	Sat	3:11	2UC24356800	12.1	Baucis	1.6	8	8	eOH,eWV,cVA,eNC
Feb 12	Sun	20:32	2UC43909790	13.9	Bienor	5.8	13	12	e. & cen. USA
Feb 19	Sun	5:28	4UC46258000	13.0	Bezovec	3.1	2	10	cVA,sMD;DC,DE?
Feb 26	Sun	5:08	4U272125269	12.1	Thusnelda	2.3	1.1	8	OH,MD,VA,DC,sPA
Feb 27	Mon	0:10	2UC40018797	12.5	Rita	3.2	7	8	se&cenVA,WV,sOH
Mar 10	Fri	0:17	2UC33931460	12.0	Siegena	0.8	14	8	e&nVA,DC,MD,wPA

Lunar Grazing Occultations

Date	Day	EST	Star	Mag	% alt	CA	Location & Remarks
Feb 18	Sat	3:29	ZC 2223	3.9	54- 25	9S	Lyons&Lansdale,PA;Mt.Holly,NJ
Feb 19	Sun	2:43	ZC 2352*	7.0	45- 12	8S	Hanover,PA;BelAir,Aberdeen,MD
Mar 4	Sat	19:36	theta2 Tau	3.4	44+ 58	2S	*Alberta,Norfolk,VA Beach, VA
Mar 4	Sat	23:18	Aldebaran	0.9	46+ 17	4N	Oscoda,MI;Rochstr,NY;Hrtfd,CT

No expedition from DC planned
** Star in Kepler2 program (see below).*

**** Interactive detailed maps at www.iota.timerson.net/ ****

Total Lunar Occultations

Date	Day	EST	Ph	Star	Mag	%	alt	CA	Sp.	Notes
Feb 11	Sat	19:25	R	rho Leonis	3.8	99-	8	46N	B1	Az85,AA312,ZC1547,dbl?
Feb 14	Tue	3:53	R	SAO138774*	7.7	88-	49	85N	G5	Close double??
Feb 14	Tue	3:53	R	SAO138774*	7.7	88-	49	85N	G5	Close double??
Feb 14	Tue	4:08	R	ZC 1785*	7.8	88-	48	30N	A5	Mg2 10, sep ".7, PA447
Feb 16	Thu	3:25	R	ZC 2008*	6.6	72-	41	75S	K0	Spectroscopic binary
Feb 16	Thu	3:40	R	SAO 139671*	8.3	72-	42	39S	A0	
Feb 16	Thu	4:47	R	SAO 139689*	8.7	72-	43	85N	G0	
Feb 17	Fri	6:08	R	SAO 158835	7.1	63-	37	63S	F2	Sun altitude -10 deg.
Feb 18	Sat	2:36	R	SAO 159351	7.3	54-	21	54N	F5	
Feb 18	Sat	5:16	R	SAO 159398	7.4	53-	36	30N	F0	
Feb 22	Wed	4:18	R	ZC 2758	7.0	18-	3	21N	B2	Azimuth 118 degrees
Feb 22	Wed	5:33	R	ZC 2763	6.5	18-	15	52N	M3	Azimuth 131 degrees
Feb 22	Wed	5:57	R	SAO 162065*	9.0	18-	18	56N	F3	Close double?
Feb 22	Wed	6:03	R	SAO 162079	7.2	17-	19	31S	K4	Sun alt. -10 degrees
Mar 1	Wed	20:46	D	nu Piscium	4.5	14+	8	54S	K3	Azimuth 271, ZC 249
Mar 4	Sat	13:56	D	gamma Tau	3.7	43+	37	63N	G8	Sun alt. +40, ZC 635
Mar 4	Sat	19:08	D	SAO 93947	8.2	44+	61	41N	K2	Close double??
Mar 4	Sat	19:25	D	75 Tauri	5.0	44+	59	21N	K2	ZC 667, Hyades, dbl?
Mar 4	Sat	19:01	D	theta1 Tau	3.8	44+	62	60S	G7	ZC 669,mg2 8, sep. 0.1"
Mar 4	Sat	19:15	D	ZC 672	6.7	44+	60	82N	F7	mg2 8,sep. ".2, PA 263
Mar 4	Sat	19:16	D	theta2 Tau	3.4	44+	60	31S	A7	ZC671,close dbl,VAgraze
Mar 4	Sat	19:52	D	SAO 93969	7.7	45+	54	88N	MA	
Mar 4	Sat	20:09	D	ZC 677	4.8	45+	52	87N	A6	Close double?
Mar 4	Sat	20:15	D	ZC 680	6.5	45+	50	81S	F5	Close double?
Mar 4	Sat	21:48	D	ZC 685	6.6	45+	34	78N	F0	Hyades star
Mar 4	Sat	22:44	D	SAO 94020	7.7	46+	23	55S	G5	Close double?
Mar 4	Sat	23:05	D	Aldebaran	0.9	46+	19	41N	K5	naked eye;MI-NY-CTgraze
Mar 4	Sat	23:39	R	=alpha Tau	0.9	46+	13	-32N	K5	ZC 692, Az. 281, AA 328
Mar 5	Sun	18:29	D	115 Tauri	5.4	56+	69	70N	B5	Sun -6, ZC 814, double
Mar 6	Mon	18:16	D	OU Gem	6.8	67+	64	28N	K0	Sun alt. -3, ZC 985
Mar 6	Mon	19:13	D	SAO 95715	7.7	67+	69	77S	G5	
Mar 7	Tue	0:26	D	SAO 95913	7.6	69+	27	79N	B8	
Mar 7	Tue	18:15	D	ZC 1124	6.9	77+	54	54N	G5	Sun altitude -3 deg.
Mar 8	Wed	2:02	D	74 Gem	5.0	79+	19	31N	M0	ZC 1158, close double?
Mar 8	Wed	20:43	D	SAO 97836*	8.6	86+	65	65N	A2	
Mar 8	Wed	23:48	D	ZC 1278*	8.0	87+	52	59S	K0	
Mar 10	Fri	1:33	D	ZC 1405	6.9	94+	41	86S	K0	
Mar 10	Fri	3:29	D	ZC 1413	6.8	94+	20	67N	B9	

** The star is in the Kepler 2 exoplanet search program so lightcurves of the occultation are desired to check for close stellar duplicity.*

Further explanations & more information is at iota.jhuapl.edu

David Dunham, dunham@starpower.net

Star Dust © 2017. Star Dust may be reproduced with credit to National Capital Astronomers, Inc.

2016-2017 Officers

President:
Joseph Morris
j.c.morris@verizon.net
703-620-0996 (h)

Vice-President:
John Hornstein
jshgwave@yahoo.com
301-593-1095 (h)

Secretary-Treasurer:
Henry Bofinger
hbofinger@earthlink.net
202-675-1075

Asst. Secretary-Treasurer:
Jeffrey B. Norman
jeffreynorman@comcast.net

Trustees:
- Benson Simon (2017)
- Andrew Seacord (2018)
- Wayne Warren (2019)
- Harold Williams (2020)

Appointed Officers and Committee Heads:
Exploring the Sky
Jay Miller
jhmiller@me.com

Telescope Making
Guy Brandenburg
gfbrandenburg@yahoo.com
202-635-1860

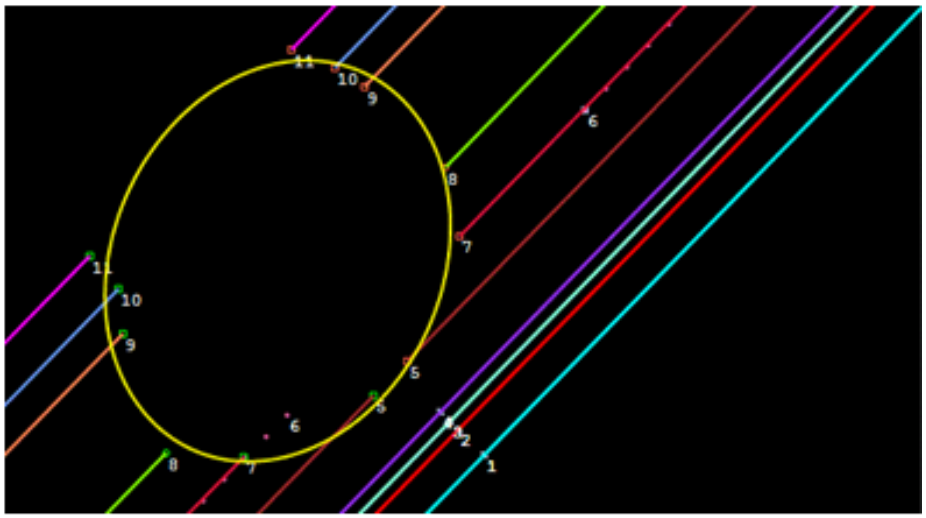
NCA Webmaster
Elizabeth Warner
warnerem@astro.umd.edu
301-405-6555

Star Dust Editor
CA Brooks
NCAStardust@gmail.com
301-860-3266

Social Media
Liz Dervy
Twitter: @NatCapAstro

328 Gudrun – continued from page 4

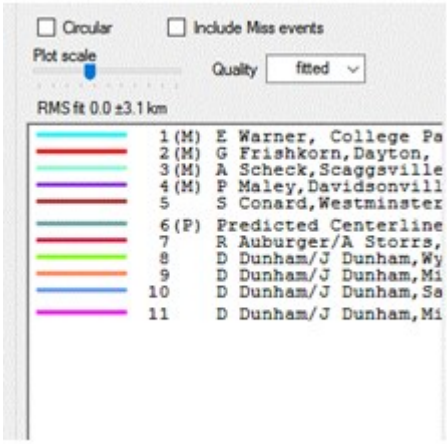
an asteroidal occultation for the first time. Our easternmost (attended) station in Middletown, Delaware used a Watec 120N+ integrating camera with a 120mm refractor. The International Occultation Timing Association's Brad Timerson analyzed the observations, shown below projected onto the plane of the sky perpendicular to a line from the Earth to the star.



Courtesy David Dunham

Sky-Plane Plot of the Gudrun Occultation Observations
Each station traced a diagonal line, with north up and east to the left. The lines are interrupted when the star was occulted by Gudrun. The yellow oval is the best-fit ellipse, with dimensions 114 ±3 km by 91 ±3 km.

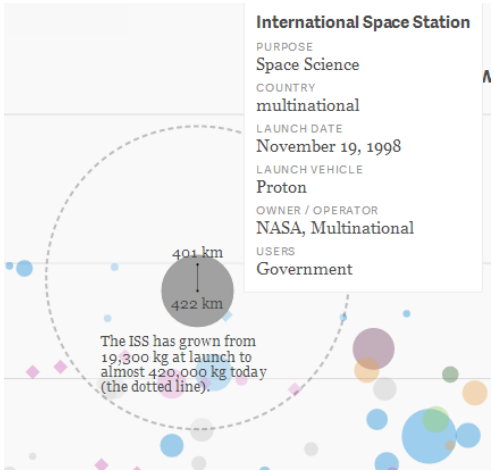
The asteroid is only roughly an ellipsoid; there are deviations from the fitted ellipse by up to 5 km. The occultation occurred about 10 seconds later than predicted.



How Much Space Stuff?

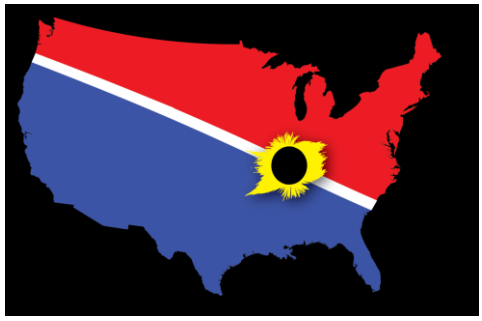
With over 1,000 active satellites, the Union of Concerned Scientists and Quartz can give you a snapshot of who and what is orbiting Earth in an interactive map:

https://qz.com/296941/interactive-graphic-every-active-satellite-orbiting-earth/



Star Dust © 2017. Star Dust may be reproduced with credit to National Capital Astronomers, Inc.

The Great North American Eclipse



Aug 21st 2017

www.greatamericaneclipse.com/

The submission deadline for the March issue of Star Dust is February 25th.

Clear Skies!

Calendar of Events

NCA Mirror- or Telescope-making Classes: Tuesdays and Fridays, from 6:30 to 9:45 pm at the Chevy Chase Community Center (intersection of McKinley Street and Connecticut Avenue, N.W.) Contact instructor Guy Brandenburg at 202-635-1860 or email him at gfbrandenburg@yahoo.com.

Open house talks and observing at the University of Maryland Observatory in College Park on the 5th and 20th of every month at 8:00 pm (Nov.-Apr.) or 9:00 pm (May-Oct.). Details: www.astro.umd.edu/openhouse

Lockheed Martin IMAX Theater in DC: "The Matrix" (R), Dates starting Sun. Feb. 5, $15 (adults) and $13.50 (youth), shows start at 5:15 pm. www.si.edu/Imax/

Mid-Atlantic Senior Physicists Group: "A New Look at the TeV Sky with the HAWC Gamma Ray Observatory" with Jordan A. Goodman (UMD), Wed. Feb. 15, at 1 pm at the American Center for Physics (1st floor conference room). www.aps.org/units/maspg/

Steven F. Udvar-Hazy Center in Chantilly, VA: "Journey into Space 3D" Dates through Thurs. Feb. 16, $9 (adults) and $7.50 (youth), shows start at 10:10 am. www.si.edu/Imax/

Owens Science Center Planetarium: "Figure it Out: Women's Contributions to Astronomy," Fri. Mar. 10, 7:30 pm; $5/adult; $3/students/senior/teachers /military; children under 3 free. www1.pgcps.org/howardbowens

Upcoming NCA Meetings at the University of Maryland Observatory:
11 Mar: Richard Mushotzky (UMD), ASTRO-H/Hitomi - The Wonderful Brief Life of an X-ray Telescope.

National Capital Astronomers Membership Form

Name: _____ **Date:** ___/___/___

Address: _____ **ZIP Code:** _____

Home Phone: ____-____-_____ **E-mail:** _____ **Print / E-mail Star Dust (circle one)**

Membership (circle one): Student….. $ 5; Individual / Family…..$10; Optional Contribution…..$__

Please indicate which activities interest you:

- Attending monthly scientific lectures on some aspect of astronomy ____
- Making scientific astronomical observations ____
- Observing astronomical objects for personal pleasure at relatively dark sites ____
- Attending large regional star parties ____
- Doing outreach events to educate the public, such as Exploring the Sky ____
- Building or modifying telescopes ____
- Participating in travel/expeditions to view eclipses or occultations ____
- Combating light pollution ____

Do you have any special skills, such as videography, graphic arts, science education, electronics, machining, etc.?

Are you interested in volunteering for: Telescope making, Exploring the Sky, Star Dust, NCA Officer, etc.?

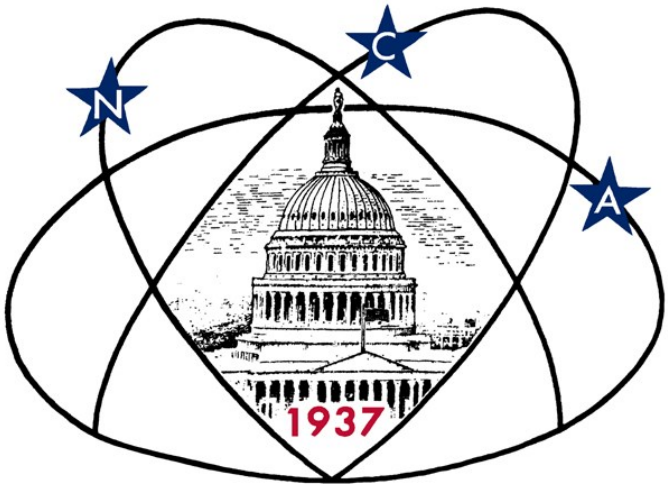
Please mail this form with check payable to ***National Capital Astronomers*** to:
Henry Bofinger, NCA Treasurer; 727 Massachusetts Ave. NE, Washington, DC 20002-6007

Star Dust © 2017. Star Dust may be reproduced with credit to National Capital Astronomers, Inc.

National Capital Astronomers, Inc.

If undeliverable, return to
NCA c/o Elizabeth Warner
400 Madison St #2208
Alexandria, VA 22314

First Class
Dated Material



Next NCA Meeting:

2017 February 11th

7:30 pm

@ UMD Observatory

Terry A. Hurford

Inside This Issue