

Star Dust

Newsletter of National Capital Astronomers, Inc.

capitalastronomers.org

October 2016

Volume 75, Issue 2

Next Meeting

When: Sat. Oct. 8th, 2016

Time: 7:30 pm

Where: UMD Observatory

Speaker: Erin Kara

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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?

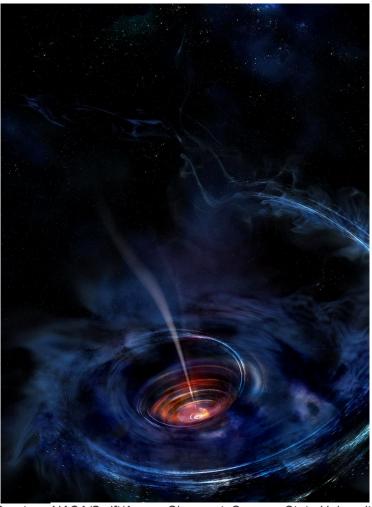
Please contact Jay Miller, 240-401-8693, if you need a ride from the metro to dinner or to the meeting @ observatory. Please try to let him know in advance by e-mail at rigel1@starpower.net.

How We See+Supermassive Black Holes

Erin A. Kara

University of Maryland and NASA's Goddard Space Flight Center

Abstract: The material spiraling toward the event horizon of a black hole is subject to the strongest gravitational distortions in the Universe, so



Courtesy NASA/Swift/Aurore Simonnet, Sonoma State University
Artist conceptualization of a black hole accretion disk where X-ray light and light
echoes are produced.

continued on page 2

Observing after the Meeting

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

Stellar-Mass vs. Supermassive Black Holes

Stellar-mass black holes are about 10-100 times the Suns mass and form when massive stars reach the end of their lives. They can be found throughout galaxies, just as one finds any other stars.

Supermassive black holes can be million to billions of times the Sunos mass and are too big to be formed by collapsing stars (there are a number of theories on their formation). These black holes are found at the centers of galaxies. Sagittarius A*, the black hole at the center of the Milky Way (measured using the orbit of a circling star), is estimated to be about 4.3 million solar masses.

Hard & Soft X-Rays

There are 2 types of X-rays: soft & hard. On the electromagnetic spectrum, **soft X-rays** (the weaker rays) have frequencies of about $3x10^{16}$. 10^{18} Hz and have photon energies of less than 5 keV. The photons are easily absorbed by air & water. **Hard X-rays** (the ones used by doctors & scientists) are stronger at 10^{15} to over 10^{20} Hz, with energies above 5 keV. They overlap the gamma-ray part of the spectrum, the only difference being the source (X-rays from accelerating electrons, gamma rays from atomic nuclei).

Black Hole Simulation

Check out NASAs simulation of a stellar-mass black hole, showing X-rays around the accretion disk:

https://youtu.be/-OtUVDRL_wM

Supermassive Black Holes - continued from page 1

studying these extreme environments can help us understand how gravity behaves when it is pushed to its limits. As material (mainly gas and dust) plunges into the black hole, a significant fraction of its gravitational potential energy is released into the surrounding environments, heating up the remaining infalling material. This material becomes so hot and energetic that it radiates light, much of which is in the X-ray band. So, while the common colloquialism is that black holes are *black*, they are, in fact, the most luminous objects in the universe because of the energetic material around them.

It is impossible to simply take a picture of the space-time around a black hole because the region is too small and too far away. Instead, astronomers develop sophisticated ways of analyzing the limited data available. In this talk, a new and innovative technique that was discovered just 5 years ago will be discussed. The technique is called X-ray reverberation, and it allows us to measure distances of tens of light seconds around black holes that are hundreds of millions of light years away. Just as sound waves reverberate in a large auditorium, X-ray light reverberates in the inflowing material. Since we know the speed of light, we can relate this reverberation time delay to a distance, which helps us determine the size and shape of the material spiraling toward the event horizon.

Understanding these environments close to the event horizon is helping us to understand how black holes grow and how they feed energy back into their surrounding environments.

Biographical Sketch:

Dr. Erin Kara is a Hubble Postdoctoral Fellow and a Joint Space-Science Institute Fellow, working at the University of Maryland and NASAcs Goddard Space Flight Center. Her research is on understanding the inner accretion flows around black holes and other compact objects using X-ray observations. She works with a new technique called X-ray reverberation mapping that probes the flow's geometry and dynamics by measuring the echoes produced when light is scattered by



the inner accretion flow. Dr. Kara completed her graduate studies at the University of Cambridge in the UK before moving to Maryland.

Favorite Star Trek Episode Survey

Hailing All Local Star Trek - Original Series Fans!



Submit your favorite episode from each of the 3 broadcast seasons in this short survey:

https://www.surveymonkey.com/r/CHN7CLD

Courtesv Panda ClipArt

Deadline: October 31, 2016 ~ Star Dust will post the results!

ObserveTheMoonNight.org #ObserveTheMoon



The Great North American Eclipse



August 21st 2017

http://www.greatamericaneclipse.com/

Star Trek 50 Online Art

50 Artists. 50 Years.

A global art exhibition commemorating the 50th anniversary with original 2D & 3D art by artists from around the world.



Courtesy CA Brooks
The original 11-foot TV prop of the USS
Enterprise for Star Trek – The Original
Series, at the Nat'l Air & Space Museum

Sky Watchers

Autumn Schedule

October

8	International Astronomy Day! Global.
11	12:00 am - Planets , N. Hemisphere. Mercury 0.9° north of Jupiter.
16	12:23 am . Full Moon , Global. Other Moon Names: Full Hunter's Moon, Full Travel Moon, Full Dying-Grass Moon (time to reap grain & stock up on meat for the winter)
21 (peak)	12:00 am - Dawn - Meteors , N. Hemisphere. <i>Orionids</i> (debris from Comet Halley, radiant point west of Betelgeuse & Orioncs %dub+)
21-31	Evening . Globe at Night, Global. Features: Constellation Pegasus (N. Hemisphere) & Grus (S. Hemisphere).
30	4:00 am - Planets , N. Hemisphere. Venus 3° south of Saturn.

November

2	12:00 am - Planets , N. Hemisphere. Venus 7° south of Moon.
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Times EDT

(EST begins Nov. 6th at 2 am)

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 its free!

2016 Observation Dates for Autumn

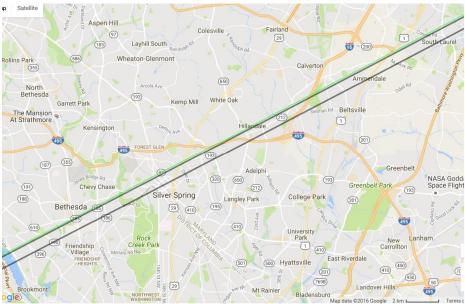
1 October (7:30 pm) . Summer Triangle 5 November (7:00 pm) . Pleiades & Winter Constellations

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

SAO 164269 Occultation

David Dunham

The narrow zone for the grazing occultation of SAO 164269 on Monday evening, Nov. 7, will be between the two dark gray lines on the map of the Maryland suburbs (below). This is the zone that promises the most occultations of the star by hills and craters along the southern edge of the first quarter Moon. However, at least some of this area is likely to be sunlit, possibly rendering some of the contacts unobservable. The Sun altitude of - 8 degrees should not pose any problems with most small telescopes. Another map showing the path over northern Virginia can be found at http://iota.jhuapl.edu/exped.htm. If the weather forecast is good, we'll probably have a small expedition to observe the event from locations near Ammendale Road.



Courtesy D. Dunham Local Map of Nov. 7th Occultation Path

NCA 2016 Board Meeting Report

Guy Brandenburg

The NCA Board had its annual meeting on August 7, 2016. To keep the membership up-to-date, here are the important business items from that meeting:

 We are selling the NCA's Celestron 14-inch Schmidt-Cassegrain telescope and all of its accessories, since it has not been used at all in a long time. Heinrich Bofinger and Guy Brandenburg volunteered to be in charge of figuring out a fair market value, placing ads, and so on. If you want to purchase it, please let us know.

continued on page 6

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

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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¢ 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!



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

```
2016
              EDT.
                                                                 Ap.
                                                      dmag
1.7
                                                                   Location, Notes
Date
        Day
                                          Asteroid
                    4U555021587 13.3
                                          Eulalia
              6:13
                                                                10 WV, nVA, seMD; DC?
0ct
        sat
    18
       Tue
                    2UC35510837 11.1
0ct
                                         Photographica
                                                                   sDE, seMD, DC, nVA
Oct 24 Mon
              2:10
                    SAO 58920
                                    8.9
                                          Hurukawa
                                                                   w&cVA,seMD,sNJ
        wed
                    TYC13480737
                                  10.9
                                          Viola
                                                                   nWV, nVA, MD, DC, DE
Nov
      4 Fri
                   2UC36231075 12.1
                                                                 8 NJ, nDE, eMD, DC, VA
                                          Eurynome
                                                      0.10 10
Nov
             2:33 PPM 51012 9.9 1936 SO 6.7 1 4 CVA,eMD,sePA;DC? and times above are EDT, those below are EST ***
     6 Sun
Nov
  ***
      Dates
              4:40 TYC12760010 10.3
4:05 2UC47412446 12.0
Nov 10 Thu
                                          Masaryk
                                                       5.7
                                                                 5 se&cVA,sWV,nKY
                                                       1.6 15
Nov 13 Sun
                                                                 8 Delmarva, DC, cMD
                                          Gudrun
```

Lunar Grazing Occultations

```
2016 EDT/
Date Day EST Star Mag % alt CA Location & Remarks
Oct 21 Fri 2:02 SAO 95913 7.6 66- 38 10N *Wodsb, BearBrnch, MD; NwFrdm, PA
Nov 5 Sat 20:57 SAO 162789 8.2 32+ 15 3S *Friendsv, MD; Sunbury, WBare, PA
*** Dates and times above are EDT, those below are EST ***
Nov 7 Mon 18:39 SAO 164269 8.1 51+ 36 3S Ctrv&Tysns, VA; Bthsd&sLaurl, MD
```

*** No expedition currently planned from the DC region ***

Interactive detailed maps at http://www.iota.timerson.net/

Total Lunar Occultations

```
2016
                EDT/
                                                          CA Sp. Notes
74S B2
Date
      Day EST Ph Star
8 Sat 19:46 D ZC 2758
                                         Мад
7.0
                                              48+
0ct
                                                    31
Oct 10 Mon 20:24 D ZC 3029
                                         7.0 68+
                                                    35
                                                          64N F2 Maybe close double??
     12
         wed
               20:04 D
                              3313
                                         6.5 86+
                                                          23S K0
                                                          84N A5 mag2 8.0 sep2.4", PA307 32S KO Az 86,AA 223,close dbl?
Oct 13 Thu
                1:41 D ZC 3333
                                         6.4 88+
                                                    24
     17
               21:21 R
                         ZC
                              491
                                         6.0 94-
                                                    15
         Mon
                                         4.5 87-
3.8 87-
                                                               FO Az.80,ZC661,close dbl
G7 ZC669,mg2 8 .08",PA21
                          71 Tauri
Oct 18
               21:57
                                                          48S
         Tue
     18
         Tue
               23:01 R
                         theta1 Tau
                                         3.8
                                                          89N G7
Oct 18 Tue
               23:01 R theta2 Tau
                                         3.4 87-
                                                          71S A7
                                                                   zc671, close double?
                         ZC 677
85 Tauri
0ct
         Tue
                       R
                                                          67N A6
Oct 19
         wed
                0:06 R
                                         6.0 86-
                                                          13S F4 ZC 682, spec bin, TmD19"
                                                         751N K5 AA 57, ZC 692
75N K5 ZC 692, Aldebaran
15S G8 Azimuth 76 deg, ZC1002
17S F6 Az 76,ZC1003,close db]?
     19
                1:37 D Aldebaran
                                         0.9
                                              86-
0ct
         wed
     19
                2:44
                                         0.9 86-
0ct
         wed
                       R
                         =alpha Tau
0ct
     20
         Thu
               23:42
                       R
                          20 Gem
                                         6.9
                                              67-
               23:43
                          21 Gem
                                         6.3 67- 12
Oct 20
         Thu
                       R
                                         5.5 56-
7.4 44-
                                                          39S K2 Azimuth 75, close dbl?
58S K2
                0:28
0ct
     22
23
         Sat
                          zc 1141
         Sun
                3:03 R
                         SAO
                               97901
0ct
                                         6.3 43-
7.5 34-
Oct 23
                4:59 R
                         zc 1284
                                                          89N F0
         Sun
     24
                3:54
                          SA0
                                 98580
                                                          15S KO
         Mon
0ct
                       R
Oct 24
                                         6.9
                                              33-
                4:34 R
                         zc 1399
                                                          30s G5
         Mon
                                         7.7 33- 33
7.7 33- 37
7.8 24- 27
     24
                4:36 R
                                 98591
                         SAO
                                                          81N G0
0ct
         Mon
                                                                   mag2 10 sep. 53", PA272
     24
25
                4:54 R
                                 98595
0ct
                          SAO
         Mon
                                                          85s
                                                          63S F5
                5:01 R
                         SAO 118218
Oct
         Tue
                6:52 R ZC 1516
9:28 D ZC 2441
                                                          58S K5 Sun alt. -8 deg.
71N GO Azimuth 239 deg.
                                         6.6 23- 46
     25
0ct
         Tue
              19:28 D ZC 2441
20:24 D ZC 2715
         wed
                                         6.6 9+ 8
6.3 23+ 14
6.7 23+ 7
                                                9+
Nov
       4
                                                          83N M4 Az. 231, close double?
78S F3 Azimuth 238 deg.
82S A5 mag2 10 sep 21",PA 111
         Fri
Nov
       4 Fri
              21:06 D
Nov
                         zc 2718
                                         8.3 31+ 26
5.7 32+ 8
         Sat 19:35 D SAO1627
Sat 21:55 D ZC 2865
                         SAO162753*
                                                          82S A5 mag2 10 sep 21",
57N KO Azimuth 239 deg.
Nov
       5
Nov
   *** Dates and times above are EDT, those below are EST
ov 6 Sun 21:35 D SAO 163639 7.8 42+ 11 88S F6 Azimuth
ov 7 Mon 20:00 D ZC 3120 7.0 52+ 32 30N AO
Nov
                                                          88S F6 Azimuth 239 degrees
Nov
                         SA0164916*
Nov
       8
         Tue 18:37 D
                                         8.6 62+ 40
                                                          81N F8
         Tue 19:02 D KR Aquarii
                                         7.3 62+ 40
4.2 74+ 15
                                                    40
                                                          77S
                                                               MO ZC 3255
Nov
Nov
     10 Thu
                0:24 D phi Aqr
                                                          80S M2 Azimuth 249, ZC 3412
     13 Sun
                2:07 D WZ Piscium 6.3 97+ 35
                                                          86N M4 ZC 308
Nov
     13 Sun
                4:27 D 64 Ceti
                                         5.6 97+
                                                          83S GO Azimuth 274, ZC 322
```

* 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 are at http://iota.jhuapl.edu/exped.htm

David Dunham, <u>dunham@starpower.net</u>

2016-2017 Officers

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- " Andrew Seacord (2018)
- Wayne Warren (2019)
- " Harold Williams (2020)

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Board Meeting Report - continued from page 4

- The club will have a membership coordinator position. Among other things, the MC will welcome new members and connect new and current members with tasks that need doing. Guy Brandenburg volunteered to take this on until another person steps up to take over.
- 3. John Hornstein will be coordinating the science fair judgings.
- 4. Dues will remain at \$10/member until our bank account is reduced to \$5,000. Meanwhile, you will soon be able to pay your dues for anything up to five years at one time, instead of needing to renew every single year.
- 5. We will have a contest to design a new NCA logo, with a deadline of New Year's Eve 2016. A vote will be taken on winning designs, and one option will be to retain the current one.
- 6. The current Stardust editor (CA Brooks) will be stepping down from that position in June 2017, and will need to be replaced by another volunteer.



Courtesy Eric Kaufman

Eric Kaufman, son of NCA member, Bernard Kaufman, took this beautiful picture of the Milky Way this summer from the dark skies of West Virginia.

Hopewell Open House & Star Party

Guy Brandenburg

All are welcome to attend a star party at the Hopewell Observatory. The event is scheduled for the night of October 29-30. The observatory is about 30 miles due west from the DC beltway, near the intersection of I-66 and US-15 at Haymarket, VA. You can stay all night looking for celestial wonders through our telescopes or through your own.



You can find a very complete guide at this

link: http://bit.ly/1MPDNQW

There's still time to enter Air & Space Magazine's 4th Annual Photo Contest



Courtesy Ivan Eder (cc)
Comet 17P/Holmes (2007)

There are 4 categories: **Astronomy**, **Military**, **Civilian** and **People & Planes**. You can compete to win cash prizes.

The contest is free to enter and open until midnight (EST), **November 1, 2016**,

The submission deadline for the November issue of Star Dust is October 29th.

Clear Skies!

Calendar of Events

NCA Mirror- or Telescope-making Classes: Tuesdays and Fridays, from 6:30 to 9:30 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 Voyage of Time" (not rated), Premieres Fri. Oct. 7, \$9 (adults) and \$7.50 (youth), evening shows only. Check dates here: https://www.si.edu/lmax/Movie/1260

International Astronomy Day: "Bringing Astronomy to the People," Sat. Oct. 8. (Astronomy Week: Oct. 3-9).

Mid-Atlantic Senior Physicists Group: "Down-to-Earth Searches for Cosmological Dark Matter" with Carter Hall (UMD), Wed. Oct. 19, at 1 pm at the American Center for Physics (1st floor conference room). http://www.aps.org/units/maspg/

Owens Science Center Planetarium (First Friday of the Month): "Follow the Sun," (includes a preparation for the Great North American Eclipse of 2017), Fri. Nov. 4, 7:30 pm; \$5/adult; \$3/students/senior/teachers/military; children under 3 free. www1.pgcps.org/howardbowens

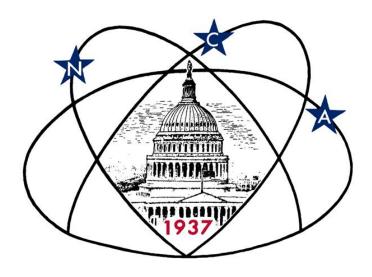
Upcoming NCA Meetings at the University of Maryland Observatory: **12 Nov:** Pamela Conrad (GSFC), "Why the Earth and Mars are so Different."

National Capital Astronomers Membership Form				
Name:	Date://			
Address:	ZIP Code:			
Home Phone: E-mail: Pri	nt / 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 sit 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 	es			
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, W				

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: 2016 October 8th 7:30 pm @ UMD Observatory

Dr. Erin A. Kara

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