Star Dust

Newsletter of National Capital Astronomers, Inc.

capitalastronomers.org

October 2018 ***Volume 77, Issue 2***

Celebrating 81 Years of Astronomy

Next Meeting

When: Sat. Oct. 13th, 2018

Time: 7:30 pm

Where: UMD Observatory

Speakers: Dr. Derek C. Richardson

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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 “Hunan Treasure” at 7537 Greenbelt Road, Greenbelt, MD 20770 in Greenway Center just east of where Greenbelt Road crosses over the Baltimore-Washington Parkway.

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

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.

The Double Asteroid Redirection Test (DART): Defending Earth

Derek C. Richardson
University of Maryland

Abstract: Over 700,000 asteroids have been catalogued to date, of which nearly 20,000 are "near-Earth asteroids" (NEAs), and some of those pose a threat of future collision with Earth (although there is no imminent danger from asteroids being tracked currently). The Double Asteroid Redirection Test (DART), a NASA mission led by the Johns Hopkins University Applied Physics Laboratory, is a technology demonstration of using a kinetic impactor to deflect such potentially hazardous asteroids. The mission will target the tiny 150 m-diameter moon of binary asteroid Didymos, striking it with the 500 kg DART spacecraft at around 6 km/s, changing the moon's 12 h orbital period around its larger companion by at least 73 s. The impact will have no significant bearing on any future encounter of Didymos with Earth. In this talk, I will provide background about asteroids (including binaries), the hazard they pose and possible corresponding mitigation strategies, and details about the DART mission. DART, which is now in Phase C development (construction), is part of a broader cooperation with the European Space Agency called the Asteroid Impact and Deflection Assessment (AIDA).

Image Credit: NASA, Johns Hopkins Applied Physics Laboratory

Recent Astronomy Highlights

Albireo Mystery Solved
The head in the constellation of Cygnus the Swam, Albireo appears to the naked eye to be a single star, but when seen through a telescope it is revealed to be a pair of stars, one blue and the other yellowish-red. There has always been a question about whether the pair form an optical double (two stars that appear to be close to each other, but are not gravitationally bound), or an actual binary system. Thanks to the data from the Gaia probe, which measured the positions and velocities of stars with incredible precision, the mystery has been solved. Albireo is an optical double. For more on how the mystery was solved, go to www.syfy.com/syfywire/long-standing-astronomical-mystery-solved-albireo-is-not-a-binary-star

Jet from Neutron Star Disproves Theory
The theory was that a neutron star with a powerful magnetic field could not eject a jet of material. But a neutron star designated Swift J0243.6+6124 (Sw J0243) seems to be doing just that, forcing scientists to rethink their theory. More information can be found at: www.sciencedaily.com/releases/2018/09/180926140829.htm

Neutron Star Collision Speaks to the Number of Space and Time Dimensions
The detection of the 2017 neutron star-neutron star collision has given evidence of many things from the origin of heavy elements to the confirmation that gravitational waves travel at the speed of light. Now analysis of that collision seems to support the idea that in our Universe there are only three dimensions of space and one of time. The stipulation is that if there were more dimensions, energy from the gravitational waves generated by the collision would have leaked away, causing the strength of the waves to be less than what was detected. For more information, go to: arxiv.org/pdf/1801.08160.pdf

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Derek C. Richardson's Biography: I am a tenured Professor of Astronomy at the University of Maryland in College Park. I joined the Department of Astronomy in August 2000. I have a B.Sc. in Physics and Astronomy from the University of British Columbia (1990), and a Ph.D. in Astrophysics from the University of Cambridge (1993). My first postdoctoral position was at the Canadian Institute for Theoretical Astrophysics in Toronto (1993 to 1996). I then spent 3 years as a postdoc in the Astronomy Department at the University of Washington in Seattle, followed by 1 year there as a Research Assistant Professor before moving to Maryland.

My research interests include computational astrophysics, planet formation, planetary ring dynamics, asteroid evolution, and granular dynamics. As a theorist, I'm a faculty member of our department's Center for Theory and Computation. I am also the contact person for the scientific cooperation agreement with Côte d'Azur Observatory. Currently I am Dynamics Working Group lead in support of the DART mission.

In addition to my research and teaching, I am Chair of the Astronomy Computing Committee, a Member of the Information Technology Division's High Performance Computing Center's Allocations Advisory Committee, and Chair of the Information Technology Division's High Performance Computing Center's Research Technology Working Group. I am also the faculty advisor for the UMd Gamer Symphony Orchestra student group!

In 2002, Asteroid 12566 Derichardson was named in my honor, which is totally cool.

My hobbies include birding, gaming, and watching ice hockey (go Caps!).

Exploring the Sky

*"**Exploring the Sky**"* is an informal program that, for 70 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!

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

Final 2018 Exploring the Sky Session
17 Nov 7:00 pm – Saturn, Mars, Uranus, Moon

More information can be found at NCA's web site, www.capitalastronomers.org or the Rock Creek Park web site, www.nps.gov/rocr/planyourvisit/expsky.htm. You can also call the Nature Center at (202) 895-6070. For general information on local astronomical events visit www.astronomyindc.org

Have an astronomy related experience to share with your fellow NCA members? The submission deadline for November's Star Dust, is October 21st.

Clear Skies!

Sky Watchers

October/November

Venus transits to the morning sky near the end of October, while the rest of the visible planets – Mercury, Mars, Jupiter and Saturn - will be viewable after sunset.	
10/23	Uranus at Opposition – Uranus will be at its closest to Earth and its brightest, although still only visible through high-power telescopes.
10/21, 22	The Orionids Meteor Shower peaks during the evening of 10/21 into the morning of 10/22. 20 meteors per hour. Unfortunately, the Moon will interfere with viewing conditions.
10/24	Full Moon at 12:46 p.m.
10/31	Conjunction – Mercury and Jupiter approach to a little over 3° from each other at 11:38 a.m.
11/5, 6	The Taurids meteor shower will peak during the evening of the 5th into the morning of the 6th. 5-10 meteors per hour. Viewing condition will be ideal late at night when the waxing crescent Moon has set.

Times in EDT

NCA 2018-2019
Schedule of Speakers

Sep 8 Erik Blaufuss (UMd), High Energy Neutrinos Detected by the Ice Cube Neutrino Observatory

Oct 13 Derek Richardson (UMd), The Double Asteroid Redirection Test (DART): Defending the Earth from Asteroids

Nov 10 Erika Kohler (GSFC), What is on the surface of Venus?

Dec 9 Peter Shawhan (UMd), New Astronomy with Gravitational Waves

Jan 12 Dean Howarth & Colleague, Einstein and Eddington

Feb 9 Elizabeth Ferrara (UMd/GSFC), Pulsar Timing Arrays Look for Mergers of Super-Massive Black Holes

Mar 9 Keith Gendreau (GSFC), NICER: What - besides neutrons - is inside neutron stars?

Apr 13 Noam Izenberg (APL), Solar System Planets Help Us Understand Exoplanets

May 11 Noel Klingler (George Washington U), Winds from Pulsars

Jun 8 Science Fair Winners, Election, Astrophotos

Current Space Missions

Since this month's talk will be about a future scientific space mission, it seems like a good time to highlight some missions that are currently showing results, or will show them in the near future.

First is the Parker Solar Probe. Launched in mid-August, Parker will study the Sun's corona during a series of orbits that will take it inside the corona itself. The probe will provide images of the corona and measure its electronic and magnetic properties. In addition, the probe will study the subatomic particles coming from the Sun. The official website for the Parker Solar Probe is: www.nasa.gov/content/goddard/parker-solar-probe

Next is the Japanese Hayabusa2 probe which arrived at a 1-kilometer asteroid named Ryugu in June. Recently the probe released two small probes known as Rover 1-A and Rover 1-B that are on the surface of the asteroid, taking closeup pictures like the one below. Later Hayabusa2 will drop an impactor to create a crater on Ryugu. Hayabusa2 will then drop to the asteroid's surface and collect samples from inside the crater for return to Earth. The mission's website is: global.jaxa.jp/projects/sat/hayabusa2/index.html

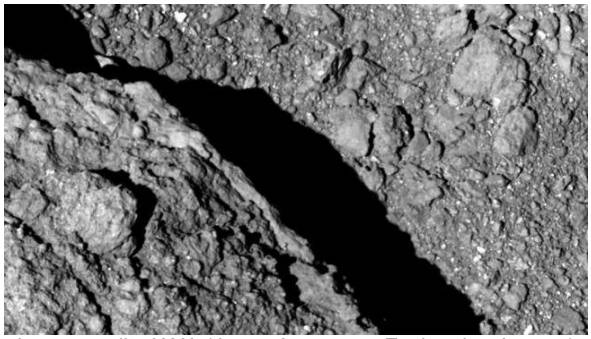

Image credit: JAXA (Japan Aerospace Exploration Agency)

Finally, the farthest out probe, and the one that gave us a whole new view of Pluto, is New Horizons. Currently it is approaching its second target, nicknamed Ultima Thule. A Kuiper Belt object approximately thirty-seven kilometers in diameter, Ultima Thule is four billion miles from the Sun. The flyby will take place on January 1, 2019. New Horizons' telescopic Long Range Reconnaissance Imager (LORRI) recently provided a first image of Ultima Thule. That image, below right, is actually one in which an earlier image of the region was subtracted out of a later image, below left, to reveal the target. The mission's website is: www.nasa.gov/mission_pages/newhorizons/main/index.html

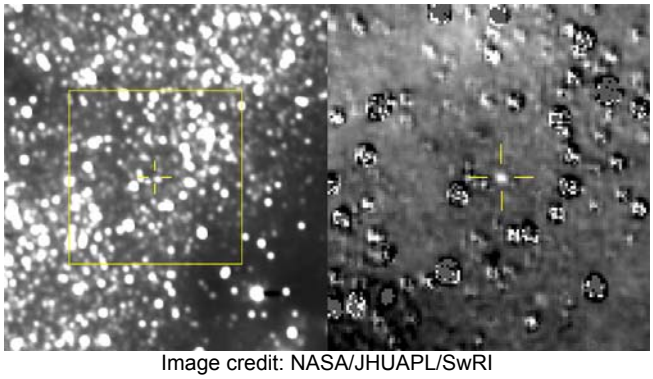

Image credit: NASA/JHUAPL/SwRI

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Thank you!

Recent Astronomy Highlights – continued from page 2

Unexpected Filamentary Structure Detected in the Sun's Outer Corona

By changing the imaging parameters of a coronagraph on the Solar Terrestrial Relations Observatory-A (STEREO-A) spacecraft, scientists obtained images showing filamentary structures within the outer corona of the Sun. Those filaments are described as having a "woodgrain" appearance. Prior to these observations, the outer corona was considered to be smooth. Further study will no doubt take place when NASA's Parker Solar Probe, launched this year, begins its observations of the Sun. An article from the investigators can be found at the following link: iopscience.iop.org/article/10.3847/1538-4357/aac8e3/meta

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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 Axis angle (AA) is given. It is the angle measured around the Moon's disk, from the Moon's axis of rotation. It can be used with a lunar map to tell where a star will reappear relative to lunar features.

Mid-Atlantic Occultations

David Dunham

Asteroidal and TNO Occultations

2018 Date	Day	EDT\ EST	Star	Mag.	Asteroid	dmag	dur. s	Ap. "	Location
Oct 9	Tue	2:29	4U580123831	12.9	Aethra	2.1	3	11	sMD,cVA,sWV;DC?
Oct 10	Wed	22:40	4U337196502	12.9	?Siri	1.7	4	11	WV,wMD,ePA,seNY
Oct 14	Sun	22:00	4U377162176	13.7	?Armor	0.8	3	13	wMD,sePA,nNJ;DC?
Oct 18	Thu	5:18	4UC49854484	14.0	?Eudora	2.7	3	13	sPA,nMD,sNJ;DC?
Oct 19	Fri	4:03	TYC40580666	10.0	*Barcelona	4.3	2	5	sNJ,nDE,ePA,wNY
Oct 27	Sat	5:49	4UC494-4013	13.3	?Herrick	2.2	4	12	sMD,cVA,sWV;DC?
Oct 28	Sun	4:33	TYC07650506	11.1	Kleopatra	0.9	10	7	ON,cNY,sNEng,LI
Nov 3	Sat	21:14	4U365174135	11.3	?Menelaus	7.2	2	7	TN,VA,MD,DE;DC?
*** Dates and times above are EDT, those below are EST ***									
Nov 8	Thu	5:04	4UC55118316	13.9	?1999 XR13	2.6	4	12	s&cMD;DC,nVA?
Nov 9	Fri	4:44	SAO 115431	9.7	*Gerlinde	4.8	9	4	wPA,wMD,cVA,eNC

? less certain prediction, will be refined
Event details at http://www.asteroidoccultation.com/

Lunar Grazing Occultations

2018 Date	Day	EDT/ EST	Star	Mag	% alt	CA	Location, Notes
Oct 17	Wed	23:28	SAO 163869	7.6	62+ 15	5S	*Wncstr,VA;Myrsv,MD;LedrsH,PA
Oct 27	Sat	5:20	delta2 Tau	4.8	92- 53	10N	*s. Tioga, New Milford, PA
Oct 29	Mon	4:08	ZC 969	7.3	75- 69	10N	Reston,VA;Bethesda,Beltsvl,MD
*** Dates and times above are EDT, those below are EST ***							
Nov 4	Sun	5:37	SAO 119272	7.6	12- 27	4N	*Fairfx,Alex'ia,VA;Clinton,MD
Nov 5	Mon	5:33	X 35722	10.4	6- 14	7N	*Boyds,Fulton,Ft.Meade,MD

* No expedition from DC planned (for all above, asteroids, too)

Lunar Total Occultations

2018 Date	Day	EDT/ EST	Ph	Star	Mag	%	alt	CA	Sp.	Notes
Oct 14	Sun	19:02	D	SAO 186294	7.9	33+	27	56N	F3	Sun altitude -7 deg.
Oct 14	Sun	19:27	D	ZC 2614	6.2	33+	25	36N	B1	Sun altitude -12 deg.
Oct 14	Sun	20:22	D	ZC 2618	6.4	33+	19	40N	A2	
Oct 15	Mon	19:19	D	SAO187546*	8.0	42+	28	70N	K2	Sun alt. -11 deg.
Oct 15	Mon	22:35	D	omicronSgr	3.8	43+	7	90N	K0	Azimuth 234, ZC 2779
Oct 15	Mon	22:44	D	ZC 2778	7.3	43+	6	30N	F8	Az. 236,close double
Oct 17	Wed	21:11	D	ZC 3026	7.4	62+	30	74N	K1	
Oct 18	Thu	0:12	D	ZC 3035	6.8	63+	9	32S	F3	Azimuth 236 deg.
Oct 19	Fri	23:26	D	50 Aquarii	5.8	80+	32	48S	K0	ZC 3288
Oct 21	Sun	0:09	D	ZC 3409	7.0	87+	36	43S	K0	
Oct 21	Sun	2:11	D	psi1 Aqr	4.2	87+	19	64S	K0	ZC 3419
Oct 23	Tue	1:20	D	ZC 106*	6.6	97+	46	77S	K0	
Oct 27	Sat	5:43	R	delta2 Tau	4.8	92-	50	44N	A7	ZC 653, nPA graze
Oct 27	Sat	5:51	R	SAO 93913	7.0	91-	49	47S	F6	mag2 11 sep. .2" PA 109
Oct 27	Sat	6:50	R	SAO 93927*	7.5	91-	38	66N	F0	Sun altitude -8 deg.
Oct 27	Sat	21:41	R	104 Tauri	4.9	86-	10	61S	G4	Az. 74,ZC 764,close dbl
Oct 28	Sun	4:28	R	ZC 796*	6.7	84-	70	82S	A0	
Oct 28	Sun	4:41	R	ZC 798*	6.2	84-	69	47N	K0	
Oct 29	Mon	2:35	R	ZC 957*	8.9	76-	55	87N	A2	close double
Oct 29	Mon	4:05	D	ZC 969	7.3	75-	68	6N	B8	nVA & MD graze (nearby)
Oct 29	Mon	4:11	R	ZC 969	7.3	75-	70	14N	B8	
Oct 30	Tue	0:38	R	ZC 1098	7.2	66-	22	43S	K0	
Oct 30	Tue	1:59	R	SAO 79245	7.8	66-	37	83S	G5	
Oct 30	Tue	4:49	R	SAO 79343	7.7	65-	67	29S	F0	
Oct 30	Tue	6:13	R	ZC 1123	7.3	64-	71	20S	A5	mag2 8.1 sep 7" PA 46
Oct 31	Wed	2:06	R	SAO 97720*	8.5	54-	27	50N	F5	mag2 10 sep. 38" PA 96
Nov 1	Thu	2:23	R	GO Cancri	8.4	43-	18	54S	A0	ZC 1379
Nov 1	Thu	4:13	R	ZC 1387	7.0	42-	38	63S	A5	maybe close double?
Nov 1	Thu	6:26	R	ZC 1395	6.3	41-	61	70N	G9	
*** Dates and times above are EDT, those below are EST ***										
Nov 11	Sun	19:02	D	SAO187096*	7.9	18+	19	49N	B8	

*in Kepler2 program so occultation light curves are sought.

More, esp. total lunar occultations, at http://iota.jhuapl.edu/exped.htm
David Dunham, dunham@starpower.net

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Mid Atlantic Occultations by David Dunham – continued from page 5

For these grazes and most of the other ones listed, you can use an interactive map to zoom in on the path in more detail, to select possible observing sites, that is linked to from the notes for the graze at iota.jhuapl.edu/exped.htm .

The map below shows the narrow zone, 1.1 km wide, between the two dark gray lines, for the grazing occultation of 7.3-mag. ZC969 that will occur for a few minutes starting at 4:05am EDT of Mon. Oct. 29th. The best parts of the graze zone are inside it, within 200m of the n. edge and 500m of the s. edge. The path also passes just north of Marshall and over The Plains, VA; Gambrills & Severna Park, MD; and the s. part of Atlantic City, NJ.

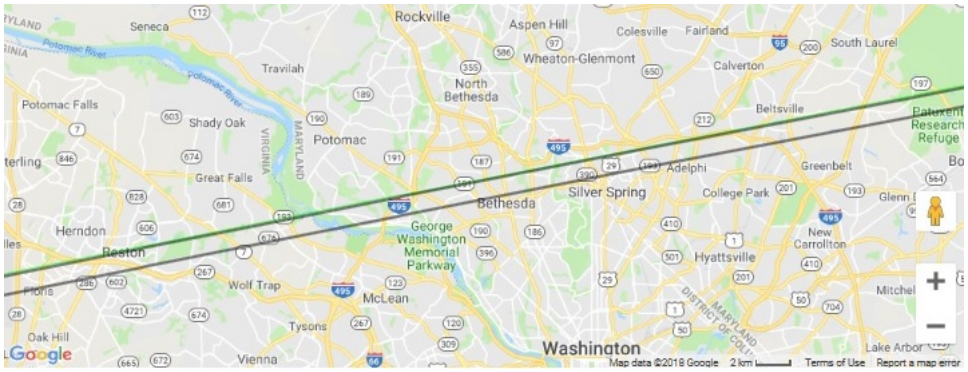

Image Credit: David Dunham and Google Maps

The map below shows the zone, 1.9 km wide, between the two dark gray lines, for the grazing occultation of 7.6-mag. SAO 119272 that will occur for a few minutes starting at 5:33am EST of Sun. Nov. 4th (note that the change from EDT to EST occurs just a few hours before the graze). The small percent sunlit will make this an interesting graze to observe, although it has an average lunar profile, with only a few occultations of the star expected. The Sun alt. will be -13 deg. The star's spectral type is F5. The path also passes over Front Royal, VA. Joan and I will have moved to Arizona for the winter, so we won't be able to lead expeditions for this and other events until our return to the area next April.

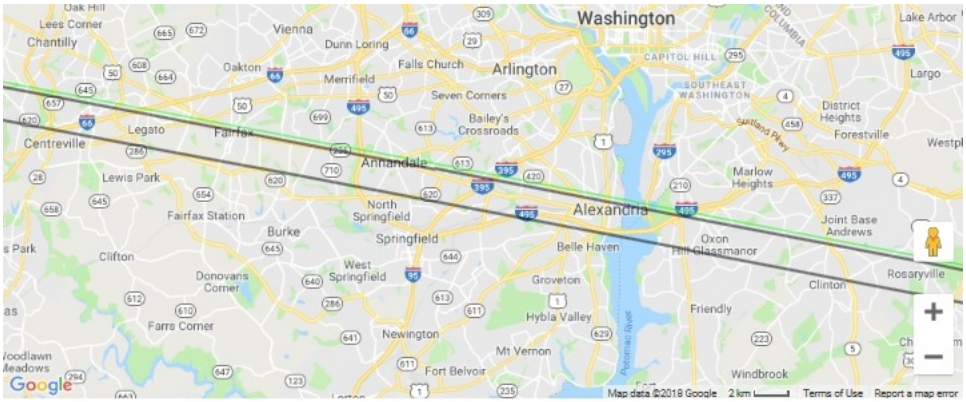

Image Credit: David Dunham and Google Maps

Recent Astronomy Highlights – continued from page 4

Ring of Black Holes or Neutron Stars
Recent observations of the Lindsay-Shapley Ring, AM 0644-741, by the Chandra X-Ray Observatory, show the distinctive galaxy contains a number of very bright X-Ray sources, likely black holes or neutron stars in binary systems that are feeding off of their companions. The current theory is that the galactic ring was created by the collision of two galaxies. More information can be found at: www.sci-news.com/astronomy/chandra-ring-black-holes-neutron-stars-galaxy-06385.html

Image Credit: X-ray – NASA / CXC / INAF / A. Wolter *et al*; optical – NASA / STScI

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 at gfbrandenburg@yahoo.com. Additional information is at guysmathastro.wordpress.com/ and home.earthlink.net/~gfbranden/GFB_Home_Page.html

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

Mid-Atlantic Senior Physicists Group:"A Primer on the Physics of Free-Electron Lasers" by Dr. Henry P. Freund, American Physical Society Wed., October 17, at 1:00 p.m. at the American Center for Physics (1st floor conference room) with Q&A to follow. 1 Physics Ellipse, College Park, MD-- off River Rd., between Kenilworth Ave. and Paint Branch Parkway. www.aps.org/units/maspg/

Next NCA Meeting at the University of Maryland Observatory:
10 November: 7:30 p.m., Erika Kohler (GSFC), *What is on the surface of Venus?*

Montgomery College's Planetarium – "When Was Creation", Oct. 20th 7:00 p.m. For more information and directions, go to: www2.montgomerycollege.edu/departments/planet/

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

National Capital Astronomers, Inc.

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Alexandria, VA 22314

First Class
Dated Material

Celebrating 81 Years of Astronomy

Next NCA Meeting:

2018 October 13th

7:30 pm

@ UMD Observatory

Dr. Derek C. Richardson

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