Star Dust

Newsletter of National Capital Astronomers, Inc.

capitalastronomers.org

March 2019 ***Volume 77, Issue 7***

Celebrating 82 Years of Astronomy

Next Meeting

When: Sat. Mar. 9th, 2019

Time: 7:30 pm

Where: UMD Observatory

Speaker: Dr. Keith Gendreau

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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 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.

NICER: an X-ray telescope on the International Space Station

Keith Gendreau (GSFC)

Abstract: The Neutron Star Interior Composition Explorer (NICER) was launched to the International Space Station (ISS) on June 3, 2017. NICER is an aimed X-ray timing and spectroscopy instrument that measures the arrival times of X-ray photons to better than 100 nanoseconds, while providing moderate X-ray energy resolution in the 200-12000 eV energy range. The mission focus is to understand ultra-dense matter, through the timing of X-ray emissions from neutron stars. In addition, NICER provided the first demonstration of autonomous pulsar-based navigation. Initial operations on the International Space Station (ISS) will be discussed, as well as well as NICER's early results on science and technology.

NICER on the ISS (Image Credit: NASA)

Biography: Dr. Keith Gendreau earned his PhD in astrophysics at MIT working on X-ray CCDs for space applications and for measuring the cosmic X-ray background. He started at NASA/GSFC in 1995, working on several X-ray missions, and on the development of X-ray sources,

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Recent Astronomy Highlights

Length of Saturnian Day Determined
With Saturn's solid surface buried deep under clouds of gas as well as layers of liquid and metallic hydrogen and helium, it has been difficult to find a "sign post" by which to measure the length of planet's day. But such a sign post has been found in an unlikely place – the planet's rings. Besides being one of the most beautiful structures in the Solar System, Saturn's rings have also been found to serve as sort of a seismometer, reacting gravitationally to vibrations within the planet's solid core. From those measurements, the length of the Saturn's day has been determined to be 10:33:38 hours. More information is at - www.nasa.gov/feature/jpl/scientists-finally-know-what-time-it-is-on-saturn

Discovery of a sub-Saturn Exoplanet Challenges Current Planetary Formation Theory
The Runaway Gas Accretion Model posits that in the formation of a solar system, if a planetary core of approximately 10 times the mass of the Earth forms, it will rapidly take in nearby gas, quickly growing in mass. According to the model, Saturn had such a solid core, becoming 95 times as massive as the Earth, while Neptune did not, becoming only 17 times the Earth's mass. This seemed to imply that exoplanets between the masses of Neptune and Saturn should be rare. However gravitational microlensing of the light from a distant star by another star and one of its planets has shown that planet to be 39 times the mass of the Earth, indicating that such sub-Saturns may not be so rare after all. For more information, go to - www.keckobservatory.org/sub-saturn/

Origin of Tiny Neptunian Moon
Hippocamp, a 20-mile-wide moon of Neptune, has been a mystery since its discovery in 2013. Scientists now theorize that it was created in the collision of an asteroid or comet with the much larger moon, Proteus For more information, go to - www.sciencedaily.com/releases/2019/02/190221095033.htm

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Biography – continued from page 1

detectors, and optics for application in space and on the ground. He is the principal investigator of the Neutron Star Interior Composition Explorer mission on the ISS.

Dr. Gendreau in front of the NICER payload at the Space Station Processing Facility (SSPF) at Kennedy Space Center (KSC) just before delivery to Space X for launch. (Image Credit: Keith Gendreau)

Dr. Gendreau in front of Pad 39B at the Kennedy Space Center (KSC) (Image Credit: Keith Gendreau) Additional images regarding NICER are available at - www.flickr.com/photos/133663809@N04/sets/72157654837314150

"An Interview with Einstein" Rescheduled

Due to the cancellation of the NCA's January 12th meeting, the program featuring Dean Howarth and Rachel O'Connell has been rescheduled for the June 8th meeting, along with the presentations by Science Fair Awardees.

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

2018 Exploring the Sky Sessions

6 April	8:30 p.m. – Moon, Mars, Orion Nebula, Beehive Cluster
4 May	9:00 p.m. – Moon, Mars, Beehive Cluster
1 June	9:00 p.m. – Mars, M13
6 July	9:00 p.m. – Moon, Jupiter, M13
10 Aug.	8:30 p.m. – Moon, Jupiter, Saturn, M13
7 Sep.	8:00 p.m. – Moon, Jupiter, Saturn
5 Oct.	7:30 p.m. – Moon, Saturn
2 Nov.	7:00 p.m. – Moon, Saturn, Uranus

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

The submission deadline for April's Star Dust, is March 21st.

Clear Skies!

Ultima Thule Update 2

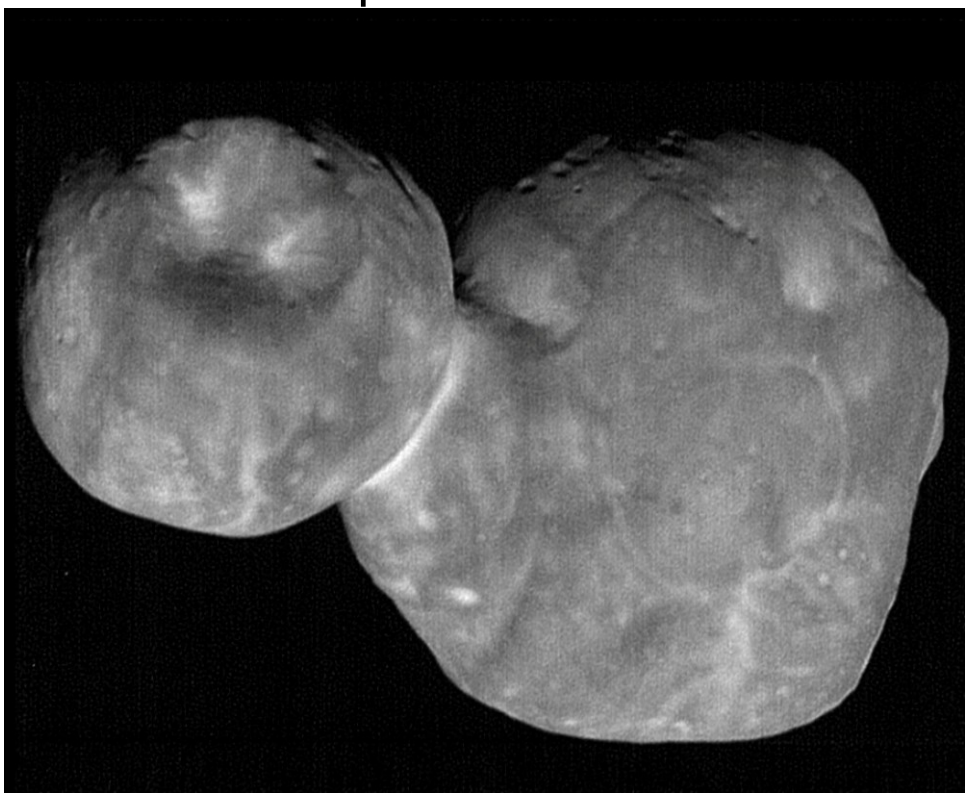


Image Credit: NASA/Johns Hopkins Applied Physics Laboratory/Southwest Research Institute, National Optical Astronomy Observatory

At the end of February, NASA released the sharpest image yet of Ultima Thule (shown above). The image has a resolution of approximately 33 meters/ pixel.

Discussion is still ongoing about whether the pit-like structures on the Kuiper Belt object were created by impacts, sublimation, collapse or some other process.

One interesting discovery comes from images of the dark side of the object. By studying how it occulted stars in the background, scientists have determined that Ultima, the larger lobe of Ultima Thule, appears to be flatter than previously believed. How such a flat object could have formed remains a mystery.

Image Credit: NASA/Johns Hopkins Applied Physics Laboratory/Southwest Research Institute/National Optical Astronomy Observatory

Sky Watchers

March/April

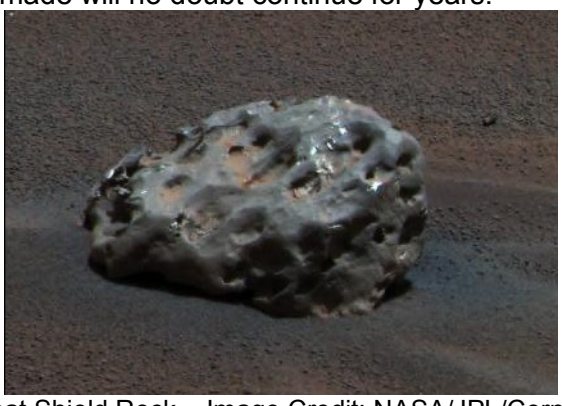
Mercury transits back to the early morning sky in mid-March, reaching greatest Western elongation on April 11th. (see below), Venus, Jupiter and Saturn are up in the morning sky while Mars remains viewable after sunset. Two conjunctions will give people with telescopes a couple of opportunities to 'planet hop' from Mercury and Venus to the much dimmer Neptune (see below).

3/20	Full Moon at 9:43 p.m., the last Supermoon of 2019. It occurs a little less than four hours after the Vernal Equinox which takes place at 5:58 p.m.
4/2	Conjunction of Mercury and Neptune - At 2:54 p.m. the two planets will be only 23' (a little more than 1/3 of a degree) apart. Mercury will be north of Neptune.
4/10	Conjunction of Venus and Neptune – At 11:52 p.m. the planets will be only 18' (a little more than ¼ of a degree) apart. Venus will be south of Neptune.
4/11	Mercury at Greatest Western Elongation – 27 degrees from the Sun, the planet will be at its highest above the horizon in the dawn sky.

Times in EDT

NASA Bids Farewell to Opportunity

In mid-February, NASA closed out the 15-year mission of Opportunity on Mars. A mission designed to last 90 days, Opportunity kept going for sixty times as long, finding evidence in places like Victoria Crater and Endeavor Crater that Mars was once a planet with surface water. With discoveries such as the spherical 'blueberries' and the Heat Shield Rock, the first meteorite discovered on another planet (see below), Opportunity was a gold mine of information about the red planet. Unfortunately, ever since a dust storm blanketed the region in June 2018, NASA has been unable to renew contact with the rover. But while Opportunity has completed its mission, research on the discoveries it made will no doubt continue for years.



Heat Shield Rock – Image Credit: NASA/JPL/Cornell

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Thank you!

Recent Astronomy Highlights – continued from page 2

Oldest White Dwarf So Far Discovered

The white dwarf LSPM J0207+3331 was discovered by a citizen scientist working with the Backyard Worlds: Planet 9 project. Based on its low temperature of 6000K, it appears to be approximately 3 billion years old. It also appears to have dust rings, based on findings by NASA"s Wide-field Infrared Survey Explorer (WISE) space telescope. This is something of a mystery in that scientists previously believed that such rings, formed in the upheaval after a star ejects much of its mass before becoming a white dwarf, could exist only for 100 million years. More information can be found at - www.sciencedaily.com/releases/2019/02/190219132736.htm

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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 Occultations

2019	Day	EDT	Star	Mag.	Asteroid	dmag	dur. s	Ap. "	Location
Mar 10	Sun	6:08	SAO 185044	8.7	Rhoda	6.5	4	3	cOH,WV,scVA,eNC
Mar 10	Sun	22:39	4UC43654391	13.8	Anchises	2.7	6	13	VA,sOH;sMD,DC?
Mar 16	Sat	21:22	4UC61525584	13.6	Sorga	2.1	3	12	sPA,sNJ;nMD,DC?
Mar 18	Mon	22:28	SAO 138774	9.0	Rabe	6.4	2	3	cVA,sOH;sMD,nVA?
Mar 19	Tue	5:53	4U356121969	12.7	Fedynskij	4.0	2	9	sPA,nMD;nVA,DC?
Mar 21	Thu	2:11	TYC19160286	12.2	Bamberga	0.6	37	8	NJ,eMD,eVA;DC?
Mar 27	Wed	6:35	4U308196373	12.4	Etheridgea	3.0	5	9	OH,nWV,n&eVA;DC?
Mar 30	Sat	0:01	4UC61427189	11.8	Sorga	3.9	2	7	nOH,eVA;wMD,DC?
Mar 31	Sun	22:14	4UC44320906	13.1	Letaba	2.6	5	10	VA,sMD,DE;NC,DC?
Apr 1	Mon	4:53	4U321199054	12.7	Brita	3.5	4	10	wPA,MD,DC;nVA?
Apr 3	Wed	0:53	4UC41541120	12.6	Helio	1.4	15	10	w&nVA,eMD,DE;DC?
Apr 3	Wed	2:54	4UC52556010	11.8	Eunike	1.0	10	7	e&nVA,MD,DC,wPA

Most event details at http://www.asteroidoccultation.com/

Lunar Grazing Occultations

2019	Day	EDT	Star	Mag	% alt	CA	Location, Notes
Mar 15	Fri	19:49	X 97438	9.5	67+ 69	6S	Germntown,Columbia,Edgemer,MD
Mar 17	Sun	0:33	SAO 80046	7.9	79+ 49	3N	Thurmnt,Eldrsburg,Baltimor,MD
Apr 9	Tue	18:54	97 Tauri	5.1	21+ 46	3S	s. Richmond, Cape Charles, VA
Apr 12	Fri	20:23	SAO 79710	7.8	52+ 69	-1S	Winfield,nEldrsbrg,nBaltmr,MD

Interactive and static maps are at http://iota.jhuapl.edu/exped.htm

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Lunar Total Occultations

2019	Day	EDT	Ph	Star	Mag	%	alt	CA	Sp.	Notes
Mar 10	Sun	19:01	D	SAO 110566	7.0	17+	33	42S	A5	Sun -11, NC graze
Mar 11	Mon	20:29	D	SAO 93387	7.1	25+	40	79N	F8	
Mar 12	Tue	19:47	D	SAO 93805	7.0	34+	58	68S	B8	Sun altitude -8 deg.
Mar 11	Mon	20:29	D	SAO 93387	7.1	25+	40	79N	F8	
Mar 12	Tue	19:47	D	SAO 93805	7.0	34+	58	68S	B8	Sun altitude -8 deg.
Mar 12	Tue	23:29	D	SAO 93845	8.3	36+	17	66S	G8	1-line spec. binary
Mar 14	Thu	21:53	D	SAO 78006	7.3	57+	58	50N	F0	mag2 11 D +10 sec
Mar 14	Thu	23:43	D	ZC 935	6.8	57+	37	44S	B5	
Mar 15	Fri	22:29	D	ZC 1086	6.4	68+	62	66S	G9	close double??
Mar 15	Fri	23:50	D	SAO 79174	7.3	68+	47	72N	G5	mag2 12 D +63 sec
Mar 16	Sat	2:15	D	SAO 79250	7.8	69+	20	34N	K2	
Mar 18	Mon	2:47	D	ZC 1387	7.0	88+	33	20S	A5	close double??
Mar 18	Mon	4:07	D	ZC 1395	6.3	89+	19	76N	G9	
Mar 18	Mon	23:09	D	37 Leonis	5.4	94+	64	39N	M1	ZC 1504
Mar 24	Sun	0:21	R	FY Librae	7.1	87-	18	76N	M5	ZC 2135
Mar 25	Mon	1:32	R	theta Lib	4.1	78-	17	80S	K0	ZC 2271
Mar 27	Wed	2:25	R	58 Oph	4.9	58-	6	86S	F6	Az124,ZC2547,close dbl?
Mar 28	Thu	5:49	R	ZC 2716*	7.7	47-	24	9N	B3	mg2 11 sep 1.5" PA 38dg
Mar 28	Thu	6:39	R	SAO187196*	8.0	47-	27	84N	F7	Sun-5,mg2 12 2",mg3 12
Mar 29	Fri	5:05	R	SAO188288	8.4	38-	14	43N	M1	Azimuth 135 degrees
Apr 7	Sun	21:36	D	SAO 93301	7.2	7+	4	25N	G5	Az 284, close double?
Apr 9	Tue	19:36	D	97 Tauri	5.1	21+	49	29S	A7	Sun 0,ZC730,mg2 11,182"
Apr 9	Tue	20:34	D	SAO 94183	7.6	21+	38	77S	K5	Sun altitude -11 deg.
Apr 9	Tue	22:49	D	X 06365*	8.7	22+	13	53S	G5	Azimuth 284 deg.
Apr 10	Wed	19:47	D	SAO 77596	7.3	30+	58	64N	B9	Sun altitude -2 deg.
Apr 10	Wed	22:06	D	SAO 77667	7.7	31+	32	23S	B9	mg2 11 33",mg3 9 116"
Apr 10	Wed	22:08	D	SAO 77690	8.0	31+	32	60N	K2	
Apr 10	Wed	22:51	D	SAO 77717	8.4	31+	24	75N	A0	
Apr 10	Wed	23:40	D	SAO 77757	7.9	32+	15	87S	A2	Az285,close double?
Apr 11	Thu	19:17	D	SAO 78750	6.8	41+	71	82S	M*	Sun altitude +4
Apr 11	Thu	21:28	D	36 Gem	5.3	41+	50	68N	A2	ZC1047,close double?
Apr 11	Thu	22:27	D	SAO 78834	8.3	42+	39	64N	K0	
Apr 11	Thu	23:08	D	ZC 1054	7.0	42+	31	86N	B9	mg2 7.6 .1",mg3 11 21"
Apr 12	Fri	0:41	D	SAO 78919	8.3	43+	14	45S	K2	Az 286, close double?
Apr 12	Fri	0:57	D	SAO 78935	7.7	43+	11	43N	K0	Az 289 degrees
Apr 13	Sat	20:36	D	ZC 1322*	6.4	64+	70	68S	A2	Sun altitude -11 deg.

*in Kepler2 program so occultation light curves are sought.

More, esp. total lunar occultations, at http://iota.jhuapl.edu/exped.htm
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Yesterday's Missions, Today's Discoveries

Even while new space missions are being designed and launched, surprises are still coming from the data and materials gathered by other missions decades ago.

In early 1971, the astronauts of Apollo 14 collected 94 pounds of soil and rock from the Fra Mauro region of the Moon. From among those samples, scientists recently discovered a 1.8-gram sample of quartz, feldspar and zircon, which are extremely rare on the Moon. How did it get there? Scientists theorize that an asteroid or comet colliding with the Earth 4 billion years ago may have launched it into space where it eventually fell onto the Moon. It should be noted that 4 billion years ago the Moon orbited only a third of its current distance from the Earth.

There is a chance that the sample formed in extreme conditions within the Moon, but the more likely explanation is that it did indeed migrate from the Earth to the Moon, only to be returned by the Apollo 14 crew billions of years later. More information can be found at: www.sciencedirect.com/science/article/pii/S0012821X19300202

Meanwhile, data taken by NASA's Solar and Heliospheric Observatory, SOHO, in the 1990s have recently shown that the outermost layer of the Earth's atmosphere, the geocorona, extends much further than previously believed, out to 600,000 kilometers, over twice the distance to the Moon. SOHO remains in service at this time, spending most of its time studying the Sun. But between 1996 and 1998, it was used to record ultraviolent emissions from the extremely diffuse hydrogen that makes up the geocorona's outermost regions. More information about this discovery can be found at - sohowww.nascom.nasa.gov/hotshot/index.html/

By the way, closer in toward Earth, the geocorona contains oxygen and nitrogen, which also emit radiation in the ultraviolet part of the spectrum, as seen in the image below which was taken by the astronauts of Apollo 16 while on the Moon in 1972.

Ultraviolet image of the geocorona taken in 1972 by an ultraviolet telescope that was left behind on the Moon. Image Credit: NASA

Recent Astronomy Highlights – continued from page 4

Evolution of a Stellar Mass Black Hole's Corona Observed with Light Echoes

Astronomers using the NICER X-ray Telescope on the ISS (the subject of this month's NCA talk – see Page 1) have recorded changes in the size of a corona above a stellar mass black hole identified as MAXI J1820+070. The black hole is approximately 10,000 light years away from Earth and was discovered in 2018. Changes in the size of the corona were discovered because of decreases in the differences in time it took for X-rays emitted from that corona to reflect off various regions of the black hole's accretion disk and reach NICER. Such decreases can be explained by the shortening of the corona from approximately 100 miles above the black hole to only 10 miles. More information can be found at - cmns.umd.edu/news-events/features/4307?fbclid=IwAR12hmLJ8638sFG1r1ZKr2rmBr69mZV0eEA0ZeYsXpz5yeykacV3GSpVyCU

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

Next NCA Meeting at the University of Maryland Observatory:
13 April 7:30 p.m., Noam Izenberg (APL), *Solar System Planets Help Us Understand Exoplanets*

Montgomery College's Planetarium – "The Vernal Equinox, the First Day of Spring", March 20th at 7:00 p.m. For more information, go to: go.activecalendar.com/montgomerycollege/site/takoma-silver/event/the-vernal-equinox-the-first-day-of-spring/

The Mid-Atlantic Senior Physicists Group: "Detection of Nuclear Weapons" by Jim Ziegler, US Naval Academy (retired), March 20th at 1:00 pm at the American Center for Physics (1st floor conference room). 1 Physics Ellipse, College Park MD -- off River Rd. between Kenilworth Ave. and Paint Branch Parkway. www.aps.org/units/maspg

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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First Class
Dated Material

Celebrating 82 Years of Astronomy

Next NCA Meeting:

2019 March 9th

7:30 pm

@ UMD Observatory

Dr. Keith Gendreau

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