

Star Dust

Newsletter of National Capital Astronomers, Inc.

capitalastronomers.org

February 2019

Volume 77, Issue 6

**Celebrating 82 Years
of Astronomy**

Next Meeting

When: Sat. Feb. 9th, 2019
Time: 7:30 pm
Where: UMD Observatory
Speaker: Dr. Elizabeth Ferrara

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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 Metzert 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.

Using Pulsar Timing Arrays to Detect Supermassive Black Hole Mergers

Elizabeth Ferrara (UMd, GSFC)

Abstract: The Fermi-LAT Collaboration participated in localizing the source of the gravitational waves that were detected from the first observed merger of neutron stars, and also participated in monitoring the changing electromagnetic emissions that resulted from that merger. The *Pulsar Search Consortium* (PSC) is a group of gamma-ray and radio astronomers who search for new pulsars by combining data from space-based gamma-ray and X-ray telescopes with data from large single-dish radio observatories. Some of the pulsars they discover are now being used to search for gravitational wave emissions from mergers of mutually-orbiting Super-Massive Black Hole Binaries. In order to make these detections, researchers are using the pulsars themselves as a Galactic-scale instrument, called a Pulsar Timing Array, that is sensitive to very-low-frequency gravitational waves. Dr. Ferrara will discuss her work discovering new pulsars, and her work with NANOGrav, the North American Nanohertz Observatory for Gravitational Waves.



Biography: Dr. Elizabeth Ferrara obtained her PhD in 2000 from the Department of Physics and Astronomy at Georgia State University. Her PhD thesis studied the variability properties of optical emissions from a class of Super Massive Black Holes, and compared them with X-ray

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Recent Astronomy Highlights

Sagittarius A* Anomaly

Observations of radio emissions from Sagittarius A*, the supermassive black hole at the center of the Milky Way, have provided astronomers with a surprise. Those emissions seem to be coming from a smaller region than expected. Current theory, and observation of other supermassive black holes, indicates such radio emissions come from the radio jets, the twin streams of material coming off of the black holes at nearly the speed of light. Scientists have proposed two possible explanations for the unusually small region of radio-wave emissions from Sagittarius A* - either the emissions are coming from the black hole's accretion disk, or one of the radio jets is pointed at Earth. More information can be found at: arxiv.org/abs/1901.06226

Early Supermassive Black Holes Explained?

The light from quasars, actively feeding supermassive black holes, has been detected from less than a billion years after the Big Bang, however astronomers have had a hard time explaining how such black holes could have grown so massive so quickly. Recent simulations of early galaxy formation show that such black holes may have formed directly from large clouds of gas in which star formation did not take place. More information is available at: www.sciencedaily.com/releases/2019/01/190123131730.htm

Origin of Titan's Atmosphere

Saturn's moon, Titan, has a surprisingly thick atmosphere comprised mostly of nitrogen and methane, the latter of which breaks down quickly and must be replenished. With the European Space Agency's Rosetta mission to 67P/Churyumov-Gerasimenko having found that a quarter of the comet's mass is organic material, a new study posits that Titan's atmosphere forms from such organic material. Taken in when the moon formed, that organic material is, in theory, being cooked within Titan, releasing the gases. More info is at: www.sciencedaily.com/releases/2019/01/190123105842.htm

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Biography – continued from page 1

variability from the same objects. Since then her research has focused on the emissions associated with Super Massive Black Holes, and later, also on the emissions from neutron stars, such as pulsars. In 2001, she began working at NASA's Goddard Space Flight Center, as part of the mission operations division. She has been involved in launching three separate missions, the most recent in 2008 with the launch of the Fermi Gamma-ray Space Telescope. In 2009, Dr. Ferrara moved to the University of Maryland when she joined the Fermi science team at Goddard. (The US Department of Energy also participates in operating Fermi.) In addition to extensive scientific research with the Large Area Telescope (LAT), which is the primary instrument on Fermi, Dr. Ferrara is also a member of the Fermi-LAT Collaboration, the Pulsar Search Consortium, and NANOGrav.

Science Fairs

John Hornstein

Each year, the NCA seeks to identify noteworthy projects in astronomy at the regional science fairs in Montgomery County (March 23), DC (March 16), Northern Virginia (a joint fair for Arlington County and Alexandria, March 16), and Fairfax County (March 16). The winners of awards from the NCA and their families are invited to a dinner before our June meeting (June 8 this year), receive framed certificates at that meeting, are invited to present their projects at that meeting, receive one year of honorary membership in the NCA, and receive a 1-year subscription to Sky & Telescope.

The Science Fairs that the NCA judges will all occur in March this year. All are on Saturdays. **If you are willing to judge any of these fairs, please send a message to me at jshgwave@yahoo.com, and I will send you information on how to register as a Community/Organization judge for the fairs of your choice.** (We do not register as Category Judges, because astronomy is not a separate category at these fairs.)

Ryugu and Bennu

New Horizon's New Year's Day encounter with Ultima Thule (see below) may be getting most of the fanfare these days, but the exploration of two asteroids is also providing scientists with a lot of exciting findings as well. Japan's Hyabusa2 has been exploring the asteroid 162173 Ryugu since last June. And just before the new year, NASA's Origins, Spectral Interpretation, Resource Identification, Security Regolith-Explorer (OSIRIS-REx) went into orbit around 101955 Bennu, setting the record for the smallest astronomical object ever orbited by a spacecraft. Ryugu and Bennu are both diamond shaped and both are believed to have come from the same parent body, which likely was destroyed by collision with another asteroid sometime in the distant past.

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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](#)

With the winter months, the Exploring the Sky program will take a hiatus until April of 2019.

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 March’s Star Dust, is February 21st.

Clear Skies!

Ultima Thule Update



Image Credit: NASA/Johns Hopkins University Applied Physics Laboratory/Southwest Research Institute

- Data and images continue to be transmitted back by the New Horizons spacecraft from its flyby of Ultima Thule (official name – 2014 MU69), including the picture shown above, which was taken when the spacecraft was a little over 4000 miles from the Kuiper Belt object. Images with better resolution and with color will be received from New Horizons over upcoming months. The pits seen on the top of both lobes of Ultima Thule certainly look like impact craters, but they could also be ‘collapse pits’ or the result of other processes, such as outgassing. The same uncertainty goes for the large depression, nearly 4 miles in diameter, on the smaller of the two lobes (upper left). Some scientists claim that the relative lack of craters indicates that the Kuiper Belt is sparsely populated with objects capable of making such craters.
- The brightness of the ‘collar’ where the two lobes meet is certainly going to be the subject of much speculation over coming months. No satellites were detected orbiting Ultima Thule. Scientists classify Ultima Thule as a ‘cold classical’, a Kuiper Belt object that has remained in that region since the formation of the Solar System.
- Only about one percent of the data from the encounter with the Ultima Thule has been received so far. The highest resolution images will be received by the end of February, but current expectations are that it will take until August or September of 2020 to receive all of the data.
- It has also been reported that the maneuvering of New Horizons to Ultima Thule used less of the spacecraft’s fuel than expected, meaning more will be available for targeting another Kuiper Belt object should such a target be found, and if NASA approves an extension of the mission.

Sky Watchers

February/March

Mercury transits back to the early evening sky, joining Mars and having a conjunction with Neptune (see below). Venus, Jupiter and Saturn remain visible in the morning sky	
2/19	Conjunction of Mercury and Neptune - At 7:10 a.m. the two planets will be only 46' (roughly $\frac{3}{4}$ of a degree) apart.
2/27	Mercury reaches greatest elongation in the evening sky.

Times in EST

Lunar Eclipse 2019

Despite frigid temperatures and the late hour, many in the Washington D.C. area took time to witness the "Super Blood Wolf Moon of 2019" as the media came to call it.



Image Credit: Elizabeth Warner - Taken at about 00:25 with a Samsung Galaxy S9+ held up to eyepiece on a 7" refractor telescope

The eclipse came with an additional surprise when a meteoroid impact was seen by some observers. The impact happened at 11:41 a.m. EST. It is the first time such an impact has been recorded during a lunar eclipse. A picture showing the moment of impact can be found at the following link: apod.nasa.gov/apod/ap190125.html

According to personnel involved with the Moon Impacts Detection and Analysis System (MIDAS), the impactor was most likely a rock from a comet, perhaps around 20 pounds or so, traveling at approximately 38,000 miles per hour. More information can be found at: www.nytimes.com/2019/01/23/science/lunar-eclipse-meteor-moon.html

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Thank you!

• [Recent Astronomy Highlights – continued from page 2](#)

• **Black Hole or Neutron Star Birth Observed?**

• It's known as AT2018cow, a sudden
 • flare of light that took place on June 17th
 • of last year. The event was 10 to 100
 • times brighter than a typical supernova,
 • and it faded more quickly than
 • supernovas normally do, so the nature
 • of the event was not known at first.
 • Speculation now is that the event was
 • indeed a supernova, a star dying, to
 • form either a black hole or a neutron
 • star. The brightness of the event seems
 • to have been caused by there being less
 • gas and dust ejected than typical,
 • allowing for a less clouded view. More
 • information is available at:
 • news.northwestern.edu/stories/2019/01/birth-of-a-black-hole-or-neutron-star-captured-for-first-time/

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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	EST/ EDT	Star	Mag.	Asteroid	dmag	dur. s	Ap. " Location
Feb 12	Tue	2:37	4UC52049420	11.3	Smuts	4.1	4 7	MD,DC,swPA;nVA?
Feb 15	Fri	20:55	4UC62034489	13.3	The NORC	3.1	6 12	LI,SMD,cVA;DC?
Feb 19	Tue	21:44	4UC45050006	11.4	Carina	2.4	7 7	neNC,se&cVA,WV
Feb 20	Wed	20:01	HIP 52533	10.3	Mathesis	2.2	8 4	NJ,sePA,nMD;DC?
Feb 21	Thu	2:28	SAO 116714	8.6	Cortusa	6.7	3 2	sNJ,neMD,s&wPA
Feb 26	Tue	0:10	4UC61445178	13.5	Byblis	0.9	5 12	neNC,se&cVA,swV
Feb 27	Wed	19:36	4UC83410692	12.4	Hidalgo	2.6	2 9	cPA,eMD,eVA;DC?
Feb 28	Thu	3:19	SAO 183286	7.5	Nummela	8.8	2 2	eON,cNY,ePA,NJ
Feb 28	Thu	3:45	4UC35275880	13.2	Kunigunde	2.9	3 12	swPA,MD;nVA;DC?
Mar 4	Mon	20:44	4UC40539251	12.4	Helio	1.2	18 9	MD,DE,sNJ;DC?
Mar 7	Thu	0:40	4UC52549819	12.3	Ulla	2.4	9 9	NJ,ePA;DE,eMD?
Mar 8	Fri	20:18	4UC60816424	13.5	Portlandia	1.7	2 13	OH,nVA;DC,SMD?
*** Dates and times above are EST, those below are EDT ***								
Mar 10	Sun	6:08	SAO 185044	8.7	Rhoda	6.5	4 3	cOH,WV,scVA,eNC

Most event details at www.asteroidoccultation.com/

Lunar Grazing Occultations

2019	Day	EST	Star	Mag	% alt	CA	Location, Notes
Feb 11	Mon	21:00	mu Ceti	4.3	41+	35 4S	
Feb 13	Wed	20:10	NatBrge, Colleen, Hanover, wallops, VA	7.8	62+	65 6S	
Feb 28	Thu	5:19	Winfal, sRichmond, Mntrose, Parksly, VA	8.1	31-	22 13S	
Mar 1	Fri	4:05	Charlottesvill, Richmond, Norfolk, VA	6.1	23-	3 14S	
Mar 1	Fri	4:05	Madison, Ladysmth, Saluda, Eastvill, VA	6.1	23-	3 14S	

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

Lunar Total Occultations

2019	Day	EST	Ph Star	Mag	% alt	CA	Sp. Notes
Feb 11	Mon	20:45	D mu Ceti	4.3	41+	37 26S	F1 ZC405,closedbl? VAgaze
Feb 13	Wed	17:56	D SAO 93927	7.5	61+	65 51N	F0 Sun altitude -3 deg.
Feb 13	Wed	18:11	D SAO 93934	7.5	61+	66 51S	G5 Sun altitude -6 deg.
Feb 13	Wed	19:53	D SAO 93958	7.8	61+	66 30S	G2 close double?? VA graze
Feb 13	Wed	19:59	D SAO 93962*	7.0	62+	65 89S	F7 Maybe close double?
Feb 13	Wed	20:22	D SAO 93967*	7.8	62+	63 69N	B7 Mg2 9.4 sep .05", PA 63d
Feb 13	Wed	22:59	D ZC 684*	6.2	62+	36 23N	B9 ZC 684,double, PA graze
Feb 13	Wed	23:08	D ZC 689	7.9	63+	34 76S	F2
Feb 15	Fri	19:37	D SAO 78406	7.6	82+	66 87S	A0
Feb 16	Sat	18:59	D SAO 79443	7.6	90+	49 50S	A0
Feb 17	Sun	2:41	D 79 Gem	6.5	92+	29 49S	A1 ZC 1171
Feb 17	Sun	20:23	D ZC 1287*	6.7	96+	52 67N	A5 Praesepe star
Feb 17	Sun	22:04	D ZC 1297*	6.8	97+	67 13N	A9 close dbl,Term.Dist. 3"
Feb 18	Mon	0:36	D ZC 1312*	6.8	97+	61 71N	F2
Feb 21	Thu	2:25	R ZC 1709	6.6	96-	56 39S	K0 Axis Angle 209 deg.
Feb 23	Sat	6:09	R SAO139528*	7.2	80-	33 56N	K0 Sun alt. -8 deg.
Feb 25	Mon	1:37	R SAO159219	7.6	62-	17 80S	K1
Feb 25	Mon	1:53	R ZC 2200	7.5	62-	19 78N	K0
Feb 25	Mon	4:18	R ZC 2208*	7.2	61-	34 57S	K5
Feb 27	Wed	3:18	R ZC 2465*	7.4	41-	12 88N	B9 Azimuth 129 degrees
Feb 28	Thu	5:02	R SAO 186291	7.7	31-	18 85S	K5 double?
Feb 28	Thu	5:23	R SAO 186323	8.1	31-	21 41N	K2
Feb 28	Thu	5:35	R SAO 186319	8.0	31-	22 87S	K0
Feb 28	Thu	5:35	R SAO 186335	8.1	31-	22 33S	B5 close dbl? VA graze
Feb 28	Thu	6:19	R SAO 186348	7.9	30-	26 79S	B1 Sun altitude -5 deg.
Mar 1	Fri	4:18	R ZC 2762	6.1	22-	5 32S	A1 Az 124, VA graze
Mar 8	Fri	18:33	D SAO 129029	7.9	5+	17 49S	K4 Sun -6 deg., NC graze
Mar 8	Fri	19:27	D ZC 126	7.6	5+	7 85S	K0 Az 265, close dbl??
Mar 9	Sat	19:58	D SAO 110095	7.8	10+	12 86N	K0 Azimuth 267 degrees
*** Dates and times above are EST, those below are EDT ***							
Mar 10	Sun	19:01	D SAO 110566	7.0	17+	33 42S	A5 Sun -11, NC graze

*in kepler2 program so occultation light curves are sought.

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

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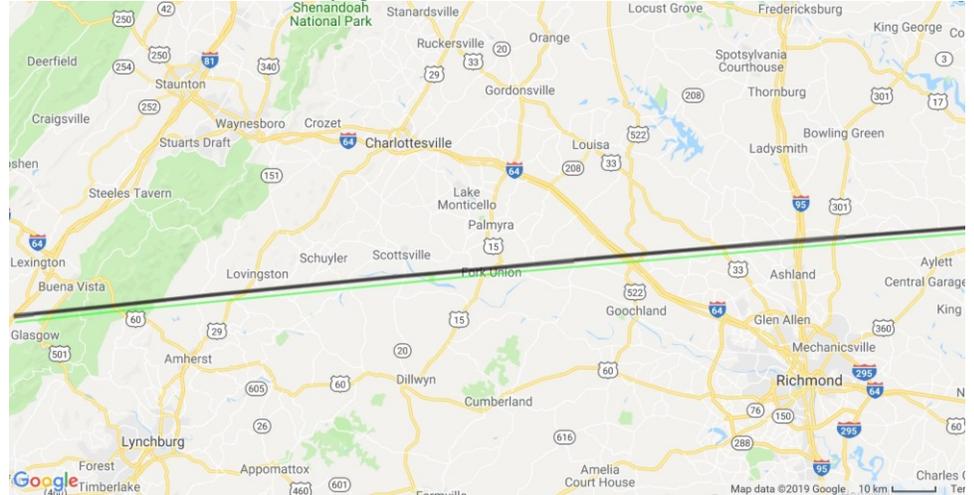
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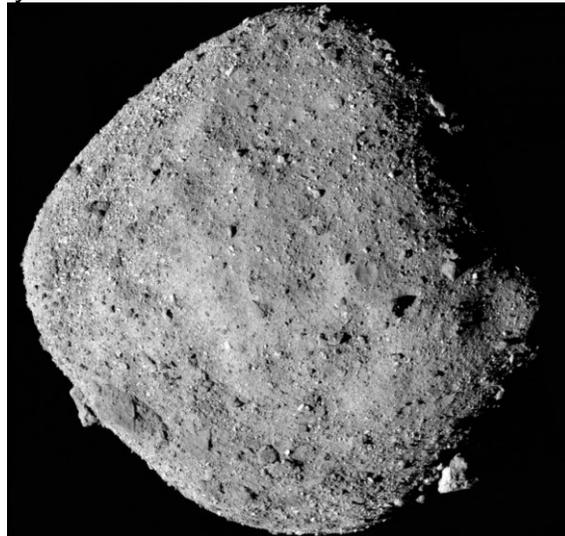
Occultations – continued from page 5



The graze of 4.3-mag. μ Ceti near the south cusp on the dark side of the 41% sunlit Moon at 9pm Mon. Feb. 11 will be the best of the year in the Mid-Atlantic region, worth a trip to the 300-meter-wide graze zone that passes about 20 miles north of Richmond, VA as shown on the map. The path, from which 6 or more occultations of the star are likely, also passes over Wallops and Chincoteague Island as shown on another map at iota.jhuapl.edu/exped.htm where more about the event is given. Image Credit: D. Dunham & Google Map

Ryugu and Bennu – continued from page 2

But there are significant differences between the two asteroids as well. While Ryugu seems to be almost entirely covered in boulders, Bennu has areas that appear relatively smooth. Results also show that Bennu (shown below) has significantly more water than Ryugu, that water being locked up in clay minerals.



Bennu – Image Credit: NASA/Goddard/University of Arizona

Scientists speculate that the differences in the compositions of the two asteroids may be because they came from different regions within their parent body, Bennu from a region where water was more common.

Both spacecraft are scheduled to take samples from their asteroids and return them to Earth. No doubt the results obtained from those samples will vastly improve our knowledge of the formation of the Solar System.

Recent Astronomy Highlights – continued from page 4

Planet Nine? Perhaps Not.

The highly elliptical orbits of a number of TNO's, trans-Neptunian objects, which share the same spatial orientation, have caused some scientists to speculate that there is a planet with a mass of approximately ten times that of Earth somewhere in the Kuiper Belt. This 'Planet Nine' could have gravitationally perturbed those TNOs into their current orbits. However, years of searching for such a planet have so far turned up nothing. A group of scientists now claim that perhaps the unusual orbits of the trans-Neptunian objects might instead be caused by the gravitational influence of the planets in our Solar System, plus that of the debris in the Kuiper Belt. But in order for theory to be true, according to simulations, the amount of debris must be more than previously believed, again approximately ten times the mass of the Earth. The research team's article is available at:

arxiv.org/pdf/1804.06859.pdf

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](tel: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: **9 March** 7:30 p.m., Keith Gendreau (GSFC), *NICER: What - besides neutrons - is inside neutron stars?*
- **Montgomery College's Planetarium** – "African Skies", Feb 16th at 7:00 p.m. For more information and directions, go to: www2.montgomerycollege.edu/departments/planet/
- **The Mid-Atlantic Senior Physicists Group** usually has a talk on the third Wednesday of the month 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.?

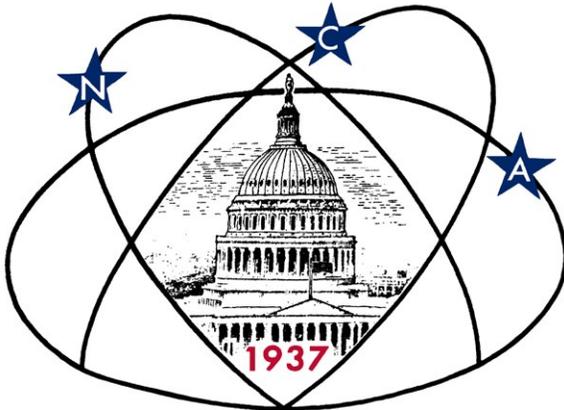
Are you interested in volunteering for: Telescope making, Exploring the Sky, Star Dust, NCA Officer, etc.?

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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Celebrating 82 Years of Astronomy

Next NCA Meeting:

2019 February 9th

7:30 pm

@ UMD Observatory

Dr. Elizabeth
Ferrara

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