

Star Dust

Newsletter of National Capital Astronomers, Inc.

capitalastronomers.org

May 2019

Volume 77, Issue 9

**Celebrating 82 Years
of Astronomy**

Next Meeting

When: Sat. May 11th, 2019

Time: 7:30 pm

Where: UMD Observatory

Speaker: Dr. Noel Klingler

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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.

The Winds and Nebulae of Pulsars

Noel Klingler

Penn State University

Abstract: Pulsars are formed from the cores of massive stars when they violently collapse and explode in supernovae explosions. These objects are a type of neutron star -- matter at the most extreme forms, consisting of ~1.5 solar masses compressed into a 10-mile radius, spinning rapidly (hundreds of times per second), and producing the most powerful magnetic fields in nature (trillions of times stronger than that of Earth's). Young energetic pulsars produce winds of particles which flow outwards at nearly the speed of light, whose radiation we can see from radio waves to gamma-rays as a *pulsar wind nebula*. In this talk I will present the magnificent diversity of pulsar wind nebulae as seen with NASA's Chandra X-ray Observatory. I will discuss what we have learned about them in the last few decades, recent progress in this field, and some of the intriguing phenomena we are continuing to discover.



PSR J1509-5850, the pulsar at the center of the image, is approximately 12,000 light years away from Earth. Shown in blue, to the right, are the X-ray emissions from the pulsar's particle jet, as observed by the Chandra X-ray Observatory. Radio emissions are shown in pink. The pulsar is also creating a jet in the opposite direction. Image credit: X-ray: NASA/CXC/George Washington Univ./N.Klingler et al; Optical: DSS; Radio: CSIRO/ATNF/ATCA (CXC is an acronym for the Chandra X-ray Observatory) Caption information is from: www.nasa.gov/mission_pages/chandra/discovering-the-treasures-in-chandra-s-archives.html

Recent Astronomy Highlights

Cluster of Old Stars in Milky Way's Bulge

Astronomers have found a cluster of old, dim stars in our galaxy's central bulge. Labelled HP1, the cluster lies about 21,500 light years away. Its stars have been found to be extremely low in metals (elements besides hydrogen and helium). Based on the amount of metals in these stars, scientists have inferred that they are 12.8 billion years old, having formed when the Universe was only a billion years old. More information can be found at:

<https://www.space.com/milky-way-bulge-hides-old-stars.html>

Comet Fragment Found in Asteroid

Scientists found what appears to be a cometary building block inside a meteorite designated LaPaz Icefield 02342, named after the Antarctic LaPaz Icefield in which it was found. That cometary material probably formed farther out in the early Solar System, over 4.5 billion years ago, then somehow migrated into the area in which primitive carbonaceous chondrite asteroids formed, thus becoming embedded in the asteroid that would become LaPaz Icefield 02342. Having been encased and protected in the meteorite, the fragment is pristine and may give clues about the evolution of our Solar System. More information can be found at:

<https://www.sciencedaily.com/releases/2019/04/190415113828.htm>

Detection of Possible Marsquake

The SEIS probe, **Seismic Experiment for Interior Structure**, is a part of NASA's Mars Insight Lander which landed on the red planet in November 2018. Since then, the sensitive SEIS instrument has been recording vibrations from Martian winds, as well as from the movement of various instruments on Insight. But on April 6, SEIS heard something different, possibly a Marsquake. If it actually were a quake, it was minor in comparison to ones on Earth. Scientists continue to study the signals to determine their true nature. To listen to the signals, go to:

<https://phys.org/news/2019-04-marsquake-tremor-red-planet.html>

continued on page 4



Biography: Dr. Noel Klingler is a postdoctoral scientist at the Pennsylvania State University, having recently received his Ph.D. in astrophysics from the George Washington University in 2018. He works with the Neil Gehrels Swift Observatory -- a NASA space telescope designed to study gamma-ray bursts and other high-energy transient astrophysical phenomena. His current research interests include searching for the electromagnetic counterparts to gravitational wave events (i.e., the short gamma-ray bursts that are produced when two neutron stars collide), and also studies of pulsar wind nebulae, primarily in X-rays, which was the subject of his dissertation.

Event Horizon Telescope Images a Supermassive Black Hole's Shadow



Image Credit: Event Horizon Telescope Collaboration

In 1918, Heber Curtis of the Lick Observatory, wrote a description of the large galaxy known as M87 (and as NGC 4486). In it, he remarked on a mysterious feature of the galaxy -- "A curious straight ray lies in a gap in

continued on page 3

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

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 June’s Star Dust, is May 21st.

Clear Skies!

• [Event Horizon Telescope... – continued from page 2](#)

• the nebulosity... apparently connected with the nucleus by a thin line of matter.”¹ Just short of a century later, for about a week in April of 2017, a group of eight radio telescopes around the world focused on the point of origin of that “straight ray” and provided the data that would form one of the most eagerly anticipated images in astronomy – the shadow of a supermassive black hole and the radio waves emitted from around it.



• The “thin line of matter” coming out of M87 noted by Heber Curtis.

• Image Credit: NASA and The Hubble Heritage Team (STScI/AURA)

• M87 is 55 million light years from Earth in the Virgo Galaxy Cluster. The supermassive black hole at its center has a mass 6.5 billion times the mass of the Sun and is 38 billion kilometers in diameter. (For comparison, the distance from the Sun to Pluto at its farthest, aphelion, is 7.4 billion kilometers.) That black hole generates the jet of matter that Curtis observed by a mechanism still not completely understood, a jet of matter traveling outward from the center of the galaxy at nearly the speed of light. Another jet is traveling out from the black hole in the opposite direction, but because of relativistic effects, it remains unseen.

• In the image on Page 2, the dark area inside the ring of light is the supermassive black hole’s shadow, approximately 2.6 times as wide as the diameter of the black hole itself. The ring of light around the shadow is composed of radio waves believed to have been radiated by the black hole’s jets. The brightest regions are where the swirling gas of the jets is moving rapidly toward us and the dimmer regions are where it is moving away. The image, and the information that comes from it, are yet another confirmation of Einstein’s General Relativity.

• In the future, more radio telescopes are to be added to the Event Horizon Telescope. In addition, the EHT will observe at a shorter wavelength, improving the resolution of any images of other supermassive black holes, perhaps including Sagittarius A*, the supermassive black hole at the center of the Milky Way.

• A recording of the National Science Foundation/Event Horizon Telescope press conference where the results were announced can be viewed at: <https://www.youtube.com/watch?v=lnJi0Jy692w>. In addition, more information about the Event Horizon Telescope can be found at: <https://eventhorizontelescope.org/>. Finally a video, explaining in more detail what is seen in the image is available at: <https://www.youtube.com/watch?v=GOhOILa4teq>.

• ¹Curtis, H. D. (1918). "Descriptions of 762 Nebulae and Clusters Photographed with the Crossley Reflector". *Publications of the Lick Observatory*. **13**: 9–42.

Sky Watchers

May/June

Mercury transits from morning to evening sky in late May leaving Venus dominant in the eastern pre-dawn sky. Jupiter rises before midnight while Saturn comes up after midnight. Mars remains visible in the west during the evening.	
5/18	Venus will be a 1° 09' south of Uranus.
5/19	Full Moon at 5:11 p.m.

Times in EDT

Slate of Officer and Other Board Member Positions for 2019-2020

John Hornstein, reporting for the Nominating Committee, May 2019

	Current =====	Candidate =====
President	Harold Williams	Harold Williams
Vice President	John Hornstein	John Hornstein
Secretary-Treasurer	Henry Bofinger	Henry Bofinger
Asst. Sec.-Trsr	Jeff Norman	Jeff Norman
Trustee	Wayne Warren (to June 2019)	Guy Brandenburg (to June 2023)
Trustee	Jack Gaffey (to June 2020)	N/A
Trustee	Benson Simon (to June 2021)	N/A
Trustee	Mike Brabanski (to June 2022)	N/A

Thanks to Our Judges at the Science Fairs!

Thank you to the NCA members who volunteered their time to judge the projects of students at this year's local science fairs. Guy Brandenburg judged the PG County Science Fair while Michael Koo, Jay Miller and John Hornstein judged the Montgomery County Science Fair.

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Thank you!

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

• TESS Finds an Earth-Sized Planet

• The **Transiting Exoplanet Survey Satellite**, TESS, has discovered its first Earth-sized planet orbiting a star known as HD 21749. An orange, main-sequence star, HD 21749 is 52 light years away from Earth. The planet, named HD 21749c, is too close to its star to support life, orbiting the star in only 7.8 days. Its surface temperature is estimated to be around 800 degrees Fahrenheit. However, the finding gives hope to the scientists working on the mission that other such Earth-sized planets will be found around other close stars, some of which may have the potential to harbor life. The paper reporting the discovery can be found at: <https://arxiv.org/pdf/1901.00051.pdf>

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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
May 15	Wed	0:07	4UC31188828	12.4	Sobinov	3.5	3 9	se-CVA,OH;nVA?
May 17	Fri	2:44	4U449132124	12.9	Olga	1.2	4 10	nVA,DC,MD,SPA,NJ
May 20	Mon	4:38	4U304196279	13.7	Pippa	1.9	7 11	PA,OH;MD,DC,nVA?
May 23	Thu	1:46	4U365152480	11.8	Eurynome	1.0	11 8	SNJ,PA,nEMD,swNY
Jun 10	Mon	22:09	4UC33671211	11.2	Josephina	3.1	14 5	neNC,CVA,nwV,eOH
Jun 11	Tue	23:56	4U370122042	13.5	Fedynskij	1.8	4 11	SNJ,nMD,swPA,nOH

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

Lunar Grazing Occultations

2019	Day	EDT	Star	Mag	% alt	CA	Location, Notes
May 10	Fri	23:16	ZC 1298	6.4	39+ 27	4N	Faber, Templetn,VA;Coinjock,NC
May 10	Fri	23:27	ZC 1303	6.8	39+ 25	3N	Emmaus,Newtown, PA; FtDix, NJ
May 12	Sun	21:02	ZC 1545	8.0	61+ 61	5N	NwFreedm,PA;BlAir,MD;Camdn,DE

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

Lunar Total Occultations

2019	Day	EDT	Ph Star	Mag	% alt	CA	Sp. Notes
May 10	Fri	20:26	D SAO 97941	7.5	38+ 58	85N	A* Sun altitude -4 deg.
May 10	Fri	20:27	D 35 Cancri	6.6	38+ 58	50S	G0 Sun -4,ZC1282, Praesepe
May 10	Fri	21:29	D SAO 97973	7.7	38+ 47	61N	A0 All this pm, Praesepe
May 10	Fri	22:19	D SAO 97999*	7.4	39+ 38	45N	F0
May 10	Fri	22:37	D ZC 1293*	6.8	39+ 34	65N	K0 Mg2 10, sep .5", PA 248
May 10	Fri	22:40	D ZC 1294*	7.3	39+ 34	60N	A0 Mg2 12, sep .8", PA 290
May 10	Fri	22:41	D SAO 98014*	7.5	39+ 34	62N	A0 close double??
May 10	Fri	22:44	D BU Cancri*	7.6	39+ 33	58S	A7 SAO 98009
May 10	Fri	22:51	D SAO 98018*	7.5	39+ 32	58N	A0
May 10	Fri	22:53	D ZC 1297*	6.8	39+ 31	83S	A9 Maybe close double?
May 10	Fri	22:57	D epsilonCnc*	6.3	39+ 31	52N	A* ZC 1299, spec. binary
May 10	Fri	23:08	D BN Cancri*	7.8	39+ 28	63S	A8 SAO 98027
May 10	Fri	23:18	D EP Cancri*	6.8	39+ 27	27N	A6 ZC 1303; nNJ graze
May 10	Fri	23:21	D HI Cancri*	8.0	39+ 26	81S	A3 X13184, Mg2 10,2", PA164
May 10	Fri	23:42	D BX Cancri*	7.9	39+ 22	54N	A7 SAO 98053
May 11	Sat	1:16	D ZC 1312*	6.8	40+ 5	48S	F2 Azimuth 290 degrees
May 11	Sat	21:55	D 8 Leonis	5.7	50+ 51	77S	K1 ZC1418, close double??
May 11	Sat	22:23	D SAO 98674	7.8	50+ 45	29S	F8 =dbl,sep. .3", PA 253
May 12	Sun	0:44	D ZC 1430	8.0	51+ 19	27S	K0
May 12	Sun	20:52	D ZC 1545	8.0	61+ 63	22N	F2 Sun alt. -8, nEMD graze
May 12	Sun	21:56	D SAO 99185*	7.9	62+ 56	83S	A3 close double?
May 13	Mon	22:02	D ZC 1669*	6.7	73+ 57	74N	F5
May 14	Tue	2:51	D SAO118952*	7.1	74+ 9	43S	A2 Azimuth 271 degrees
May 14	Tue	23:44	D ZC 1783	7.3	83+ 47	43N	A0
May 15	wed	2:50	D ZC 1796*	7.6	84+ 16	44N	A5 Mg2 9 sep 49", PA 290
May 15	wed	20:11	D SW Vir	7.1	90+ 35	88N	M7 Sun alt. -1, SAO 139236
May 16	Thu	3:02	D ZC 1923	7.0	91+ 19	85N	K0 Close triple star?
May 19	Sun	22:57	R ZC 2425	5.9	98- 15	74S	G5 Az 133, AxisAngle 248
May 21	Tue	5:02	R ZC 2588	7.0	93- 24	59N	O7 Sun alt. -9, AxisA 301
May 21	Tue	5:43	R SAO 186069	7.4	93- 19	66N	B1 Sun -2, AxisAngle 294
May 24	Fri	3:34	R ZC 3014	7.3	72- 23	88N	K0 Probably close double
Jun 6	Thu	21:44	D SAO 80131	7.2	16+ 21	28S	K0
Jun 6	Thu	22:31	D ZC 1261*	7.3	16+ 13	65N	A5 Az 286,mag2 9 38",PA192
Jun 8	Sat	20:05	D 37 Leonis	5.4	36+ 55	31S	M1 Sun alt. +3, ZC 1504
Jun 8	Sat	20:36	D SAO 99052	8.2	36+ 51	61N	G0 Sun altitude -2 deg.
Jun 10	Mon	23:41	D SAO 119272	7.6	60+ 29	60N	F5

*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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Occultations – Continued from page 5

2019 May 10, 10-11pm EDT: The 39% sunlit Moon transits the Beehive

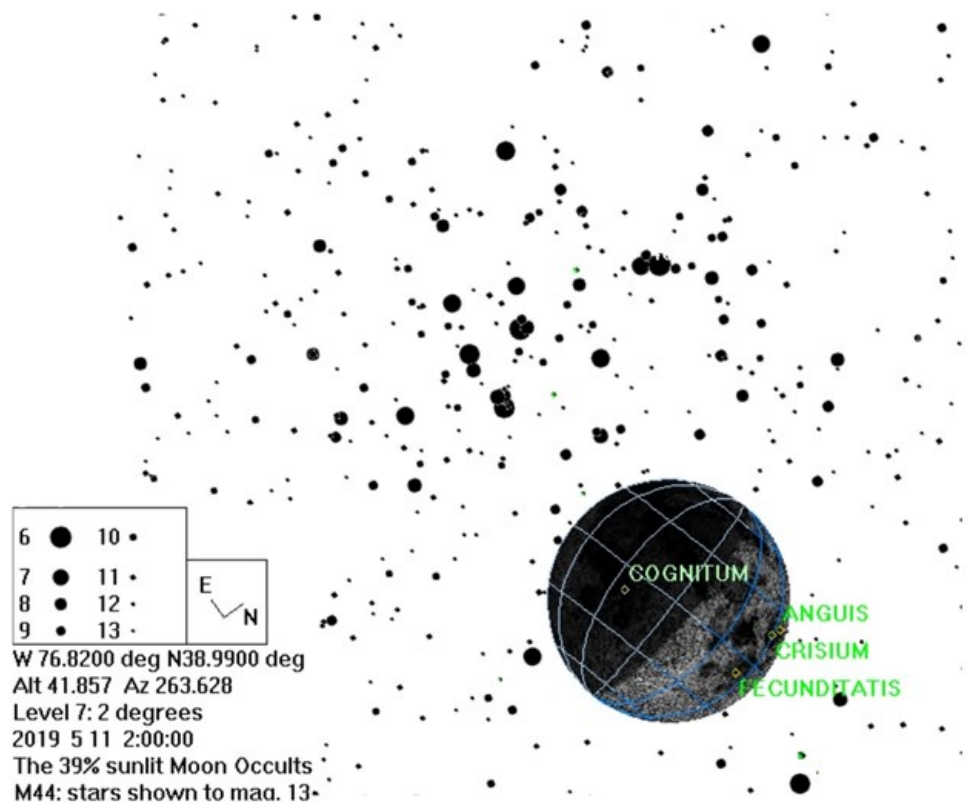


Image Credit - Project Pluto's Guide8 program and David Dunham

This will be an interesting spectacle as dozens of stars, 6th-10th magnitude in M44 (the Praesepe or Beehive cluster) will be covered in rapid succession by the advancing dark edge of the fat crescent Moon. The view shows the Moon and M44 shortly before the occultation as seen from Greenbelt, MD, near Washington, DC at 10:00pm EDT of May 10th. Times for the brighter events are given in the occultation table (Page 5). Fainter events can be predicted using IOTA's free Occult 4 program, see: <http://www.lunar-occultations.com/iota/occulttips.pdf>. Good northern-limit grazing occultations during the passage are some distance away, in central NJ and southern VA. This will occur the night BEFORE the May NCA meeting. Note that, just after the NCA meeting, at 9:55pm, there will be a good occultation of 5.7-mag. 8 Leonis, a possible close double, by the first-quarter Moon; recordings of the event will be valuable to check the possible duplicity.

Montgomery College Planetarium News

The Montgomery College's 24-foot planetarium, which is run by NCA President Harold Williams, had its last public show, "Star Stories", on May 4, 2019. In a couple of years, programs will resume in a new 50-foot planetarium in the Leggett Mathematics and Science Building on the Takoma Park/Silver Spring campus.

Recent Astronomy Highlights – continued from page 4

Mercury’s Solid Inner Core

Using data from NASA’s MESSENGER mission, MErcury Surface, Space ENvironment, GEochemistry and Ranging, scientists have deduced that Mercury has a solid inner core that is nearly as big as Earth’s. MESSENGER orbited the planet from 2011 to 2015 before being deliberately impacted on the planet’s surface. During the mission, precise readings of the spacecraft’s accelerations due to the planet’s gravity provided information about gravitational anomalies, localized regions of higher and lower density. MESSENGER also gathered data about the rotation of Mercury. Scientists then created models of Mercury’s interior to determine which one best fit the data provided by the mission. An iron core 2000 kilometers in diameter provides that best fit. In comparison, Earth’s solid inner core is 2400 kilometers in diameter. For more information, go to:

www.sciencedaily.com/releases/2019/04/190417130007.htm

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... Open house talks and observing at the University of Maryland Observatory... Next NCA Meeting at the University of Maryland Observatory: 8 June 7:30 p.m., Science Fair Winners, Elections, Astrophotos, and Interview with Einstein... The Mid-Atlantic Senior Physicists Group: “Thorium Fuel-Cycle Based Molten Salt Reactor (MSR): Safeguards, Materials and Chemistry” by Dr. Jinsuo Zhang, Virginia Tech, May 15th at 1:00 pm at the American Center for Physics...

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.?

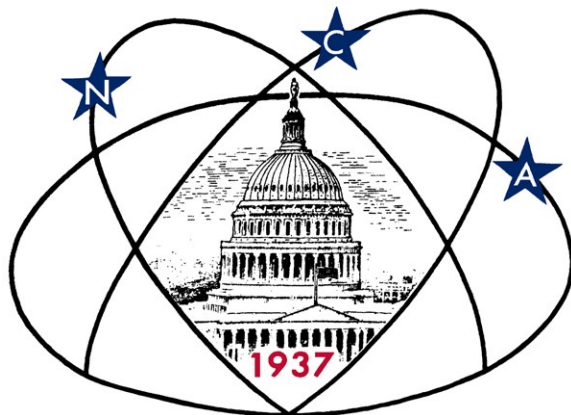
Are you interested in volunteering for: Telescope making, Exploring the Sky, Star Dust, NCA Officer, etc.?

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 May 11th

7:30 pm

@ UMD Observatory

Dr. Noel Klinger

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