Star Dust

Newsletter of National Capital Astronomers, Inc.

capitalastronomers.org

October 2020 ***Volume 79, Issue 2***

Celebrating 83 Years of Astronomy

Next Meeting

When: Sat. Oct. 10th, 2020

Time: 7:30 pm

Where: Online (Zoom)

See instructions for registering to participate in the meeting on Page 2.

Speaker: Dr. Michael Walter

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Image Credit – ESA/Hubble & NASA, W. Blair; acknowledgment: Leo Shatz

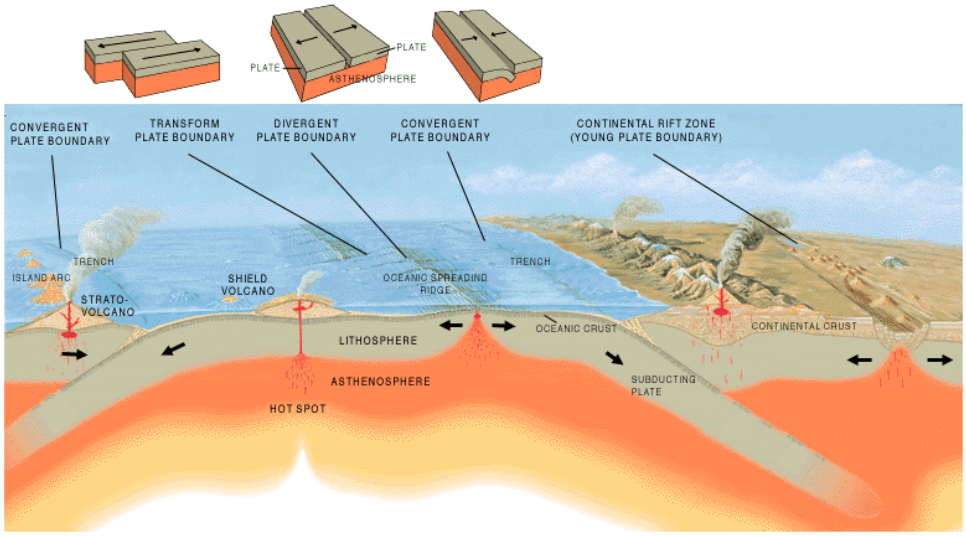
The image above shows a small section of the remnants of the Cygnus supernova, which took place between 10,000 and 20,000 years ago. More information can be found at www.nasa.gov/image-feature/goddard/2020/hubble-views-edge-of-stellar-blast.

Deep Blue Planet

Michael Walter

Earth and Planets Laboratory, Carnegie Institution for Science

Abstract: Earth is unique among the planets in our solar system, and as far as we can tell among exoplanets as well, in that it has an ocean of water covering three quarters of its surface. Where Earth's water came from, how and when it was delivered and how much is in its interior are outstanding questions, answers to which will help us understand what makes our planet, and potentially others like it, habitable. When added to the rocks that make up most of Earth's interior, that is, the silicate mantle, water can significantly affect chemical and physical properties, mineral stability, melting temperatures, rheology, seismic velocities and electrical conductivity. It is possible that water in the interior may explain why Earth has plate tectonics and why silica-rich continents poke above the oceans, and water has been implicated in the origin of large, deep-focus earthquakes and planet-scale oxidation events.



A cross section illustrating the three main types of plate boundaries. Image Credit: USGS (Public Domain)

Recent discoveries indicate that the rocks that make up Earth's interior, and by extension other rocky planets, can host significant amounts of water. Indeed, Earth's mantle alone has the capacity to store many ocean's worth of water and the metallic core even more. But that does not mean it is there. Earth's hot and violent beginning may have been effective at drying out its interior, at least to some degree, but subduction of surface plates into the mantle over billions of years has provided a

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Recent Astronomy Highlights

Venus Forecast – Cloudy With A Chance of Life

Radio astronomers at the James Clerk Maxwell Telescope (JCMT) in Hawaii as well as the Atacama Large Millimeter/submillimeter Array (ALMA) in Chile report observing the signature of phosphine gas (PH_3) in the upper clouds of Venus. The discovery has created quite a bit of excitement because the gas is normally created through biological processes. While abiotic processes for creating phosphine are known, members of the research teams have ruled out many of them as possibilities for creating the concentrations of gas observed. Based on the news, many have speculated about Venusian microbes, riding among the clouds. While temperatures in the upper clouds are around 30° Celsius, the environment is extremely hostile to life as we know it - 95% sulfuric acid. More observations will no doubt be made in the near future, as many try to confirm or refute the presence of life in one of the most unlikely of places in our Solar System. A more in-depth writeup can be found at www.sciencedaily.com/releases/2020/09/200914112219.htm, and a copy of the article on the discovery is at arxiv.org/ftp/arxiv/papers/2009/2009.06593.pdf.

A Planet Orbiting Three Stars?

The triple-star-system GW Orionis lies approximately 1300 light years away. Two of those stars orbit close to each other while the third star orbits much farther away. Astronomers have known for while that the system also contains three rings of dust where planets could potentially form. However, observations using the Atacama Large Millimeter-submillimeter Array (ALMA), along with simulations, have shown evidence for at least one planet in the system in that such a planet could explain some of the orbital irregularities found in the system as well as the fact that the innermost dust ring is not aligned with the other two dust rings. If true, such a planet would be the first discovered in a triple-star system. More information is at www.livescience.com/three-star-solar-system-tatooine-planet.html.

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Abstract – continued from page 1

conduit for water back into the deep interior. We will investigate recent ideas about the origins of Earth's water and look at evidence from experiment, theory and natural samples for water in its interior. Earth is the "blue planet" but perhaps not only on the outside, and its deep interior may hold the key to what makes our world truly unique in the solar system and cosmos – at least so far.

Biography: Dr. Michael Walter is an experimental petrologist interested in the origin and evolution of planetary interiors. He is a staff scientist and Deputy Director of the newly formed Earth and Planets Laboratory of the Carnegie Institution for Science, a merger of two former Carnegie departments, the Geophysical Laboratory and the Department of Terrestrial Magnetism. Previously, Walter was a Professor at the University of Bristol in the U.K for fifteen years and before that a Professor at the Institute for study of Earth's Interior in Japan. Walter uses high-pressure and temperature experiments as a tool to simulate and probe the materials that make up Earth and deep planetary interiors. He is especially interested in how planets melt, how early planets cool, crystallize and evolve, how volatile elements like water and carbon are stored and transported in Earth's interior, and the origin of 'superdeep' diamonds and their mineral inclusions and what they reveal about the Earth's deep mantle.

Registration for NCA Meetings on Zoom

Elizabeth Warner

The NCA Zoom meetings are open to anyone, however, to attend, you must register ahead of time. To register, go to the following link: umd.zoom.us/meeting/register/tJAlc-6sqjsiHdfRNCJnu_I3iawoOyahnYPh. The website is set up so that you can register for any or all of the NCA meetings scheduled for this year.

After registering, you will receive a confirmation email containing logon information for the meeting. Do not share the logon you receive in the confirmation email. Instead, if there is somebody you know who wants to participate in the meetings, share the link above instead.

Exploring the Sky

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

Due to the ongoing Coronavirus Pandemic, Exploring the Sky sessions are canceled. When the situation changes, sessions will once again be scheduled.

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

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The article-submission deadline for November's issue of Star Dust, is October 21st.

Clear Skies!

Sky Watchers

October/November

Mercury drops lower in the evening sky headed toward a transition to the morning sky later in October and racing to Greatest Western Elongation in mid November (see below). Venus continues to rise well before dawn. Mars reaches opposition on October 13 (see below) and will be visible throughout most of the night. Jupiter and Saturn rise in the early afternoon and will be high in the evening sky as they draw closer to each other over the next two months, heading for a Great Conjunction on December 21st.	
10/21-22	The Orionids Meteor Shower peaks on the evening of the 21st into the morning of the 22nd with approximately 20 meteors/hour. With the Moon setting just after midnight, viewing conditions will be ideal during the morning hours.
10/29-30	The Southern Taurids Meteor Shower peaks on the evening of the 29th into the morning of the 30th with approximately 5-10 meteors/hour. The nearly full Moon will interfere with viewing, however the Taurids is known for having some very bright meteors that may be visible despite the less-than-ideal viewing conditions.
10/31	Full Moon - 10:51 a.m. A Full Moon (and Blue Moon) on Halloween, but alas there will probably be very few, if any, trick or treaters going out to enjoy it this year.
10/31	Uranus at Opposition.
11/10	Mercury at Greatest Western Elongation – It will be 19.1 degrees away from the Sun in the morning sky.
11/11-12	The Northern Taurids Meteor Shower peaks on the evening of the 11th into the morning of the 12th with 5-10 meteors/hour. A crescent moon, which will rise in the early morning, should not interfere too much with the viewing, especially of some of the brighter meteors which this meteor shower is known to produce.

All times are in EDT (Eastern Daylight Savings Time)

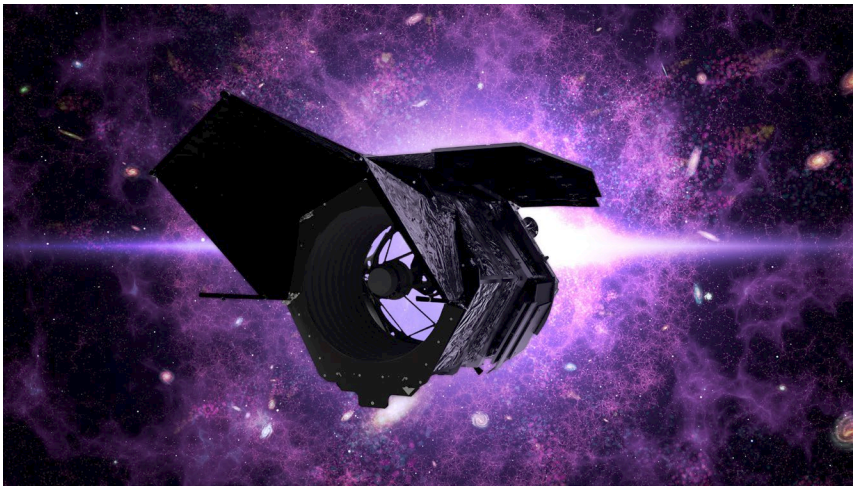
Updates on Vera Rubin Observatory and Nancy Grace Roman Space Telescope

Despite the current pandemic, work has continued on the observatory and telescope named after two of NCA's past members.

With regard to the Vera Rubin Observatory, the Department of Energy's SLAC National Accelerator Laboratory has released the first 3200-megapixel images ever taken. The sensor array that took the images will be part of the camera that will be used at the Rubin Observatory as part of the Legacy Survey of Space and Time (LSST) which will take place over a period of 10 years. An article about the achievement can be found at www6.slac.stanford.edu/news/2020-09-08-sensors-world-largest-digital-camera-snap-first-3200-megapixel-images-slac.aspx. In addition, a video explaining the efforts involved in creating the camera, as well as the way it will be used to get a time lapse of the Universe is at www.youtube.com/watch?v=7GvEzzxjbGc&feature=youtu.be.

Meanwhile, NASA reports that work on the primary mirror for the Nancy Grace Roman Space Telescope has been completed. The mirror was originally given to NASA by the National Reconnaissance Office where it has since been modified. While the mirror is the size of the one in the Hubble Space Telescope, it will have a field of view one hundred times larger. More details about the accomplishment are in an article at www.nasa.gov/feature/goddard/2020/primary-mirror-for-nasas-roman-space-telescope-completed. (Thanks to Sue Bassett for pointing out the article.)

Also, NASA recently reported that the Roman Space Telescope, with its planned ability to look at large patches of space for long periods, will be ideal for detecting rogue planets, planets that wander space, not part of any star system. Such detections will take place when the telescope sees the gravitational microlensing of light from background stars by those rogue planets. More information about this concept is available at www.nasa.gov/feature/goddard/2020/unveiling-rogue-planets-with-nasas-roman-space-telescope



Artist representation of the Nancy Grace Roman Telescope. Image Credit: NASA

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

ISSN: 0898-7548

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Thank you!

Recent Astronomy Highlights – continued from page 2

A Galaxy That Shouldn't Have Been

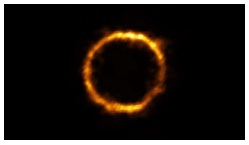

Image Credit: ALMA (ESO/NAOJ/NRAO), Rizzo et al.

It looks like a ring of fire, but the image above is of a disk galaxy like the Milky Way, with its light having been gravitationally lensed by an intervening galaxy. One problem – such a galaxy should not have existed when the Universe was only 1.4 billion years old, which is when the radio emissions forming this image were generated. More info is at www.eso.org/public/news/eso2013/

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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.

A Message from David Dunham

The Occultation Page is on hiatus while I prioritize my recovery from a recent stroke. Some events for October are still given on the Mid-Atlantic occultations page at iota.jhuapl.edu/exped.htm, but it will not be updated as extensively or as often as in the past. I hope to resume it at a reduced level in Spring 2021 after we return from our winter stay in Arizona.

You are encouraged to use the free Occult Watcher system to obtain information about asteroidal occultations, and their circumstances, for your location – the link is www.occultwatcher.net/publish.htm. You can download IOTA's free Occult software from www.lunar-occultations.com/iota/occult4.htm to generate lunar occultation predictions for your location.

One valuable event that I do want to note is an occultation on October 21st 06:14 UT of a faint (mag. 17.0) star near the Circlet of Pisces by the Trojan asteroid (21900) Orus, a target of NASA's Lucy mission; event information is at www.asteroidoccultation.com/2020_10/1021_21900_73536.htm while a detailed interactive map, suitable for zooming in to select observing sites in the relatively narrow path that crosses Pennsylvania from Pittsburgh to Scranton, is at lucy.swri.edu//occ/20201021Orus.html.

We have a 16-inch Skywatcher and QHY 174M GPS camera that might be transported to the path to record the occultation, but since we won't be able to do that, we are seeking others who might be able to borrow and transport the equipment to make the observation. If interested, you would need to come to our home in Greenbelt to work with us in at least one practice session some night before to image the target, although the light pollution here is probably too great to actually see the target (but it should be possible in dark locations in PA). Someone with previous experience with the equipment, especially the camera (such as from a past SwRI expedition), is preferred. Also, anyone else with access to a large scope who is interested in helping should contact Roxanne Kamin at rlkamin@prodigy.net – she is organizing the IOTA effort for the event in the region.

David Dunham, dunham@starpower.net

An Occultation by a Large TNO Observed from the Eastern USA

David and Joan Dunham

(28978) Ixion is a large trans-Neptunian object (estimated size about 600 km) discovered in 2001 by James Elliot, who arranged the flight of the Kuiper Airborne Observatory that discovered the rings of Uranus in 1977. Astronomers have been eager to characterize the distant object with occultation observations since its discovery, but until recently, there have been no successes. Several minutes before 10pm EDT (2h UT) of August 16th (Aug. 17th UT), the Paris Observatory's Lucky Star Project predicted that an occultation of 14th-mag. UCAC4 301-143385 in western Sagittarius would be occulted by Ixion across the eastern USA, but at relatively low altitude shortly after the end of nautical twilight. In spite of these conditions, the occultation of the faint star was recorded by George Viscome near Lake Placid, NY, by Bob Dunford in Illinois, and by Roger

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An Occultation by a Large TNO Observed from the Eastern USA – continued from page 5

Venable in Georgia. Joan and I tried to observe it from Greenbelt, but light pollution and trees foiled our effort. The occultation occurred about 5 minutes early, but the Lucky Star path was good. An ellipse fitted to the 3 chords, shown in the figure by IOTA and John Moore, is 759 by 660 km.

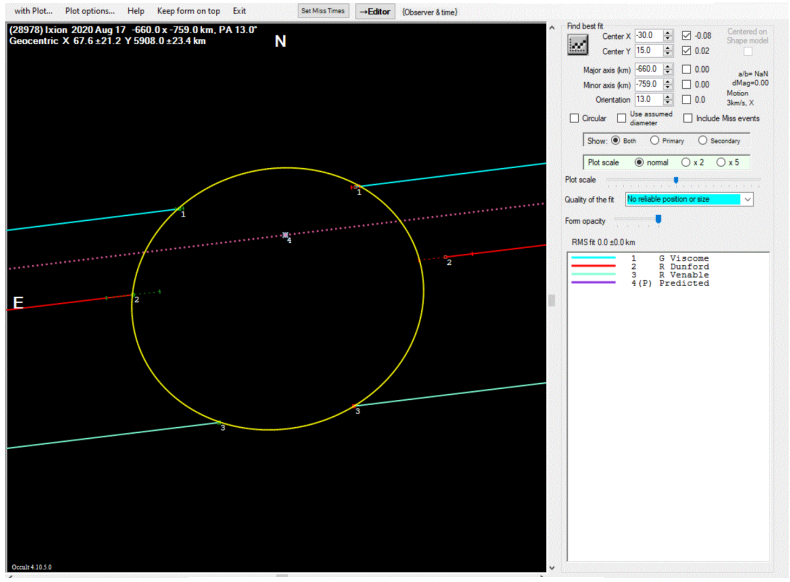

Image Credit - John Moore and IOTA

(On Oct. 13, around 2h UT, the Lucky Star project notes that there will be another occultation by Ixion, of a relatively bright (mag. 10.0) star, that will be visible at rather low altitude in nautical twilight from the southwestern USA.)

Editor's Note: Like many other conferences, the 2020 IOTA conference took place online. For those who might be interested, the presentations, including several by David and Joan Dunham can be found at occultations.org/community/meetingsconferences/na/2020-iota-annual-meeting/presentations-at-the-2020-annual-meeting/.

Victor J. Slabinski (1940 – 2020)

It is with sadness that we report the passing of Victor J. Slabinski on June 6th, 2020. A long-time member of NCA, Victor was known for his insightful questions of the speakers at the organization's meetings.

Coming of age in the era of Sputnik, Victor developed an early interest in the orbits of satellites. In 2005, he and Tom Van Flandern gave an in-depth interview for the American Institute of Physics which highlighted their work in tracking satellites and their participation in *Operation Moonwatch*, an effort organized by the Smithsonian Astrophysical Observatory (SAO) and carried out by amateurs around the country. That interview can be found at www.aip.org/history-programs/niels-bohr-library/oral-histories/32102. Victor worked for COMSAT/INTELSAT for nearly three decades before going to the U.S. Naval Observatory, specializing in orbital dynamics throughout his career. His work is credited with helping in the development of the Global Positioning System (GPS). More about Victor and his life can be found at www.usno.navy.mil/USNO/tours-events/in-memoriam-2013-victor-j.-slabinski-ph.d.-1940-2020.

Recent Astronomy Highlights – continued from page 4

Largest Binary Black Hole Merger Detection So Far

On May 21, 2019, the National Science Foundation's Laser Interferometer Gravitational Wave Observatories (LIGO), as well as VIRGO, a similar facility in Italy, observed the gravitational waves of the largest black-hole merger seen so far. Named GW190521, the merger was between an 85-solar-mass and a 66-solar-mass black hole. The resultant black hole has a mass of approximately 142 solar masses, putting it in the range of 'intermediate-mass black holes' which weigh in at between 100 and 1000 solar masses. The merger, located approximately 5 gigaparsecs away, took place when the Universe was around half its current age. During the merger the equivalent of eight solar masses of energy was released in the form of gravitational waves. More information is at news.mit.edu/2020/ligo-virgo-gravitational-wave-0902.

Calendar of Events

NCA Mirror- or Telescope-making Classes: The Chevy Chase Community Center is currently closed due to the coronavirus pandemic. When it reopens, classes will be 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 (leave message) or at gfbrandenburg@yahoo.com. More info 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 are temporarily suspended. When they resume, they will be on the 5th and 20th of every month at 8:00 pm (Nov.-Apr.) or 9:00 pm (May-Oct.). Updates are posted at www.astro.umd.edu/openhouse

Next NCA Meeting (Zoom): **14 Nov.** 7:30 p.m.,
Anat Shahar (Carnegie Geophysical Laboratory)
A Geochemist's Perspective on Planetary Differentiation

The APS Mid-Atlantic Senior Physicists Group: **(Zoom Meeting)** Oct. 21st at 1:00 p.m., Carrie M. Anderson, Planetary Systems Branch, NASA's Goddard Space Flight Center, will give a talk entitled "The Cassini-Huygens Mission in the Saturn System." More information is at www.aps.org/units/maspg/meetings/meeting.cfm?name=SENIOR1020.
To attend the meeting, use the following link and meeting info: apsphysics.zoom.us/j/97663175377?pwd=NXFnMXR3RnRlWHJrSElnbDZyc29pZz09. Meeting ID: 976 6317 5377 Passcode: 254954
Dial in access 301-715-8592 (Germantown).

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

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Celebrating 83 Years of Astronomy

Next NCA Meeting:

2020 October 10th

7:30 pm

(On Zoom)

Dr. Michael Walter

(See Zoom registration instructions on Page 2.)

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