

Star Dust

Newsletter of National Capital Astronomers, Inc.
capitlastronomers.org

March 2021

Volume 79, Issue 7

**Celebrating 84 Years
of Astronomy**

Next Meeting

When: Sat. Mar. 13th, 2021

Time: 7:30 pm

Where: Online (Zoom)

See instructions for registering to participate in the meeting on Page 8.

Speaker: Tom Field

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Image Credit – NASA, JPL, University of Arizona

Victoria Crater, near the equator of Mars, as imaged by the High Resolution Imaging Experiment (HiRISE) on the Mars Reconnaissance Orbiter. More details are at

commons.wikimedia.org/wiki/File:Victoria_crater_from_HiRise.jpg

(Please note, Victoria Crater is not the crater in which Perseverance

How Amateurs Can Measure the Spectra of Astronomical Objects

Tom Field
Field Tested Systems

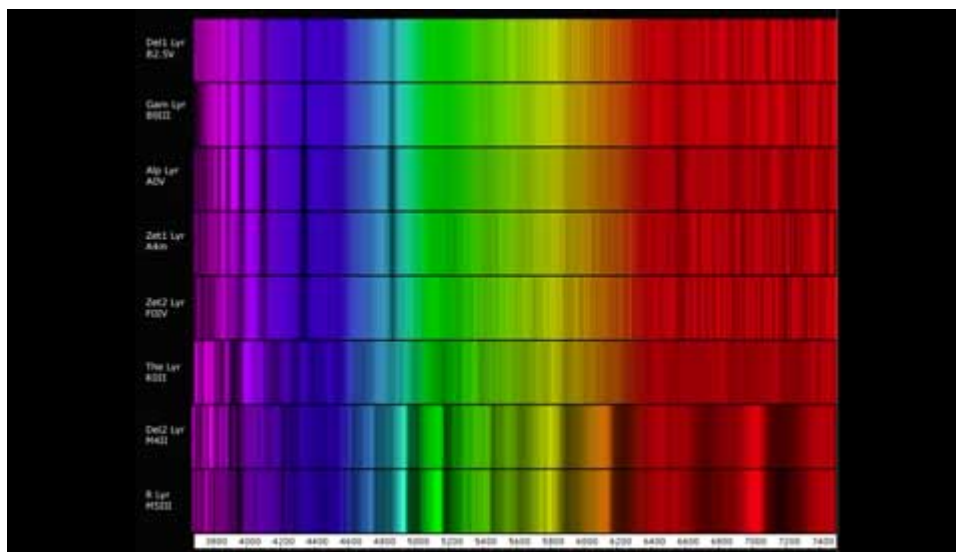


Image credit: Tom Field

Abstract: Even if you wanted to touch a star, they're all impossibly distant. Despite these great distances, astronomers have learned an enormous amount about stars. How? The most common method to study the stars is called spectroscopy, which is the science of analyzing the colorful rainbow spectrum produced by a prism-like device.

Until recently, spectroscopy was too expensive and too complicated for all but a handful of amateurs. Today, though, new tools make spectroscopy accessible to almost all of us. You no longer need a PhD, dark skies, long exposures, enormous aperture ... or a big budget! With your current telescope and FITS camera (or a simple web cam or even a DSLR without a telescope) you can now easily study the stars yourself. Wouldn't you like to detect the atmosphere on Neptune or the red shift of a quasar right from your own backyard?!

This talk, with lots of interesting examples, will show you what it's all about and help you understand how spectroscopy is used in research. Even if you are an armchair astronomer, understanding this field will enhance your understanding of the things you read and the night sky.

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landed. But it's a stunning image.)

Recent Astronomy Highlights

First Black Hole Discovered Is Bigger Than Previously Believed

Cygnus X-1, an x-ray source was first discovered in 1964 by X-ray detectors on a sounding rocket launched from New Mexico. After extensive study of its emissions, as well as the doppler shift of its companion star, Cygnus X-1 was the first such source accepted by the astronomical community at large to be a black hole. The mass of the black hole was estimated at 14.8 times that of the Sun. However recent radio telescope measurements indicate that Cygnus X-1 is farther away than previously believed, over 7000 light years away instead of the previous estimate of approximately 6000 light years. This means that the black hole must be over 20 solar masses, a mass that seems to cause problems for current theory on the formation of stellar mass black holes. More information can be found at www.sciencealert.com/this-black-hole-is-bigger-than-we-thought-challenging-our-current-formation-models.

Evidence for Large Population of Black Holes at Globular Cluster Core

NGC 6397 lies about 7800 light years away, making it one of the closest globular clusters to Earth. In a joint effort, NASA's Hubble Space Telescope and the European Space Agency's Gaia Space Telescope were used over a period of several years to measure the proper motions of the stars within the cluster. While astronomers were expecting to find an intermediate mass black hole, such black holes having a mass between 100 and 10,000 times the mass of the Sun, the orbital motions of the stars in the cluster's core instead seem to indicate that there is a concentration of stellar-mass black holes. Such black holes form directly from stars at the ends of their lives. The black holes then would have slowly migrated to the center of the cluster through gravitational interactions with other stars. More information can be found at scitechdaily.com/unexpected-discovery-hubble-space-telescope-uncovers-concentration-of-small-black-holes/.

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How Amateurs Can Measure... – continued from page 1



Biography: Tom Field has been a Contributing Editor at Sky & Telescope Magazine for the past 7 years. He is the author of the RSpec software (www.rspec-astro.com) which received the S&T "Hot Product" award in 2011. Tom is a popular speaker who has spoken to hundreds of clubs via the web and in-person at many conferences, including NEAF, the NEAF Imaging Conference, the Winter Star Party, the Advanced Imaging Conference, and others.

Unexpected Sighting by WISPR



WISPR image of Venus. The dark patch near the middle of the planet is Aphrodite Terra. The streaks in space are cosmic rays. Image Credit - NASA/Johns Hopkins APL/Naval Research Laboratory/Guillermo Stenborg and Brendan Gallagher

Usually when there is talk of an unexpected discovery in astronomy it is referring to the object being observed, but when it comes to the image above, taken by the Wide-Field Imager for Parker Solar Probe (WISPR), that surprise refers to the instrument itself. Taking an image of the nightside of Venus during a flyby, WISPR apparently also imaged the highlands named Aphrodite Terra by detecting the longer wavelength radiation they give off, compared to their surroundings, since the highlands are cooler than those surroundings. This may indicate that the imager, designed to detect light in the visible part of the spectrum, is also sensitive to near-infrared light. Scientists are trying to confirm this and, if this turns out to be true, they will investigate ways to use WISPR's unexpected ability in the Parker Solar Probe's studies of the Sun. More information is at www.nasa.gov/feature/goddard/2021/parker-solar-probe-offers-a-stunning-view-of-venus.

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

The article-submission deadline for April’s issue of Star Dust, is March 21st.

Clear Skies!

Sky Watchers

March/April

Mars remains the only visible planet in the sky after sunset. Mercury, Jupiter and Saturn will rise in the pre-dawn sky. Venus makes a very slow transition from the morning to the evening sky and will mostly not be very visible at this time.

3/20	Vernal Equinox – The Sun will be directly overhead at the equator at 5:27 a.m. ushering in Spring in the Northern Hemisphere.
3/28	Full Moon at 2:49 p.m.

All times are in EDT (Eastern Daylight Savings Time)

Perseverance Landing

After a seven-month journey from Earth, the NASA Perseverance Rover reached its destination, landing in Jezero Crater on Mars on February 18, 2021 at 3:55 p.m. EST. The rover’s name was selected from over 28,000 submissions that came from students, Kindergarten through 12th grade.



Perseverance being lowered to the Martian surface by the sky crane.
Image Credit – NASA/JPL-Caltech

The so-called ‘seven minutes of terror’, from when Perseverance’s entry capsule entered the Martian atmosphere to touchdown, included various stages such as release of the capsule’s heat shield, a supersonic parachute deployment (with the parachute having the phrase “Dare Mighty Things” encoded in its red and white stripes – a mantra at NASA’s Jet Propulsion Laboratory), and a sky-crane lowering of the rover to the ground. Each stage went off automatically and without a hitch. Indeed, since it took eleven minutes for radio signals to arrive at Earth from Mars, the landing was over before NASA scientists and engineers even had

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Perseverance Landing – continued from page 3

confirmation of atmospheric entry. The sequence of events and technologies involved in the landing have been used on previous rover missions to Mars; however, for the first time, video of the landing was recorded with a number of cameras. That video can be found at www.youtube.com/watch?v=HS1CWAKbRu0.



Jezero Crater as seen by the High Resolution Stereo Camera on the ESA's Mars Express orbiter. Image Credit ESA/DLR/FU-Berlin/NASA/JPL-Caltech

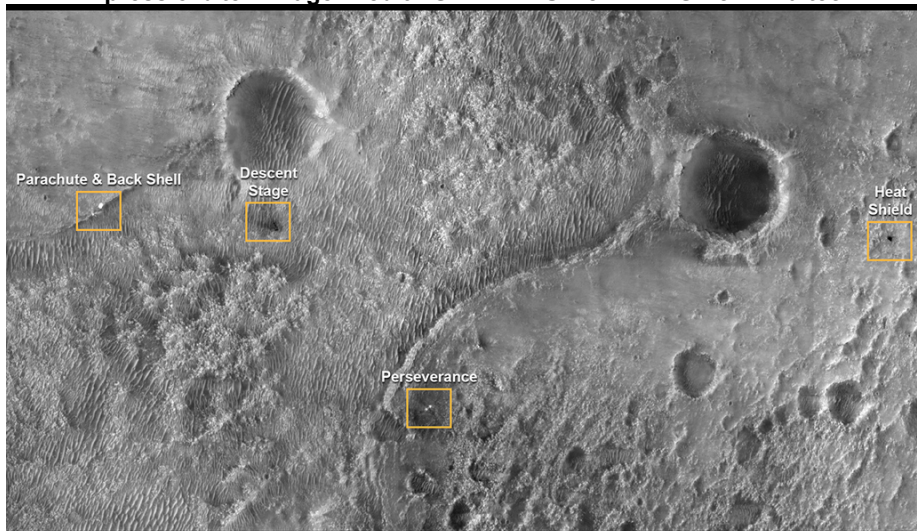


Image of the Perseverance landing site, along with the final landing sites of the parachute, descent stage and heat shield, taken by the Mars Reconnaissance Orbiter. Image Credit – NASA/JPL-Caltech/MSSS

Jezero Crater has never previously been explored by a rover. It was chosen because billions of years ago the crater contained a lake. Nearby are the remains of the bed of a river that flowed into it, as well as mineral deposits, fanning out from the ancient river's entry point. If there was ever life on Mars, such a region on the surface is where fossilized evidence of its past existence is most likely to be found.

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Thank you!

Recent Astronomy Highlights – continued from page 2

Hydrogen Chloride Discovered in Martian Atmosphere

The landing of NASA's Perseverance rover has received a lot of attention these days, but another important discovery was recently made by the ExoMars Trace Gas Orbiter, a joint venture of the European Space Agency and Russia's Roscosmos group. ExoMars detected the presence of hydrogen chloride in the red planet's tenuous atmosphere. One significance of the discovery is that it implies that water is an important part of the planet's climate since it generally takes water to free chlorine from other compounds. More information on this discovery can be found at www.msn.com/en-us/news/technology/a-mars-orbiter-just-detected-something-it-s-never-seen-before/ar-BB1dDLoi?ocid=msedgntp.

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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

2021	Day	EST/ EDT	Star	Mag.	Asteroid	dmag	dur.	Ap. s	Location
Mar 13	Sat	20:02	TYC07220041	10.5	La Serena	8.3	0.6	4	wNC,cVA,seMD;DC?
*** Dates and times above are EST, those below are EDT ***									
Mar 15	Mon	5:41	4U328125039	13.4	Reddish	5.0	1.5	9	nVA,SMD;DC,nMD?
Mar 16	Tue	23:34	4UC55729725	14.2	Hera	0.3	8	12	OH,MD,NJ;nVA,DC?
Mar 17	Wed	1:32	4UC58428853	14.2	Tubingia	2.1	3	12	neOH,nVA;DC,MD?
Mar 17	Wed	5:45	4U322136250	14.2	2006 JR	4.9	2	12	nVA,DC,MD,PA,NJ
Mar 18	Thu	23:09	4UC41252078	13.9	Milanstefanik	2.8	2	11	MD,DC,nVA,wPA,OH
Mar 19	Fri	19:36	SAO 82349	7.7	Feodosia	5.3	7	5	eMA,NJ,MD,DC,nVA
Mar 23	Tue	22:19	4UC59208909	11.8	Ducrosa	5.0	1.1	5	nOH,nVA,SMD;DC?
Mar 28	Sun	22:03	4UC56936521	14.2	Lindemania	2.2	4	11	swPA,nVA,SMD;DC?
Mar 29	Mon	1:03	4UC37770242	12.3	Polit	5.0	3	6	swMD,nVA,eOH;DC?
Mar 30	Tue	0:49	SAO 99659	8.0	Coelestia	5.3	4	2	cVA,cwV,soH,nMO
Apr 2	Fri	5:05	4U336116367	12.7	wendeline	4.8	4	7	OH,sPA,NJ;MD,DC?
Apr 2	Fri	5:58	44 Cap	5.8	Jupiter	(R only)			cUSA; day in DC
Apr 7	Wed	23:59	TYC24430710	9.4	Nanjingdaxue	9	1.1	3	CPA,CMD,ecVA;DC?
Apr 8	Thu	23:22	4UC61229799	14.5	Muschi	1.5	1	13	nWOH,swPA,MD;DC?
Apr 11	Sun	5:48	4U288156226	13.7	Carnegia	2.3	9	11	CPA,MD,DC,n&eVA
Apr 12	Mon	23:03	4UC38759434	13.8	Shouichi	2.9	2	11	nWOH,MD;DC,nVA?
Apr 13	Tue	4:40	4U347169452	11.9	Eltigen	4.6	2	6	OH,nVA,DC,MD;PA?

Note that the April 2nd occultation of 44 Capricorni by Jupiter will not be observable in the Mid-Atlantic region since it will occur after sunrise. I include it only because it is mentioned on p. 49 of the April issue of Sky and Telescope, where the daytime condition along the Atlantic coastal areas is not mentioned. The event will occur before sunrise in Indiana, where it might be observed with a methane-band filter to dim Jupiter's glare.

Lunar Grazing Occultations

2021	Day	EDT	Star	Mag	% alt	CA	Location, Notes
Mar 19	Fri	20:22	SAO 76692	8.1	35+	54	4S Earlysville & Thornburg,VA
Mar 21	Sun	1:11	ZC 853	7.1	46+	10	4N Proffitt,Atlee,Mechancsvil,VA
Apr 1	Thu	2:29	lambda Lib	5.0	83-	26	16S Lisbon,Columbia,Annapolis,MD

Lunar Total Occultations

2021	Day	EST/ EDT	Ph Star	Mag	% alt	CA	Sp.	Notes	
Mar 7	Sun	6:11	R ZC 2657*	6.9	34-	23	52S A6	Sun alt. -5 deg.	
Mar 8	Mon	5:37	R SAO 187998	8.3	25-	15	31N F5	Sun alt. -11,Azimuth142	
*** Dates and times above are EST, those below are EDT ***									
Mar 17	Wed	22:30	D SAO 93283	8.0	19+	10	50N K3	Azimuth 282 degrees	
Mar 18	Thu	21:12	D ZC 575*	8.0	26+	35	54S A0	mag2 12 sep ".5 dT +.7s	
Mar 18	Thu	21:22	D SAO 93643*	8.3	26+	33	47N A0		
Mar 18	Thu	22:31	D SAO 93661	8.2	26+	20	27S K5		
Mar 19	Fri	20:06	D SAO 76692	8.1	35+	57	24S F5	Sun altitude -10 deg.	
Mar 19	Fri	23:08	D SAO 76733	8.3	35+	23	9S A2		
Mar 20	Sat	22:24	D 121 Tauri	5.4	45+	42	79N B2	ZC 839	
Mar 22	Mon	1:22	D SAO 78521	7.8	55+	19	63N K2		
Mar 22	Mon	2:29	D ZC 1015	6.5	56+	7	57S A3	Az 296, mag2 10 dT -0.6s	
Mar 23	Tue	0:33	D SAO 79416	7.6	65+	38	52N F8		
Mar 23	Tue	2:11	D NQ Gem	8.0	66+	20	38N R9	ZC 1140	
Mar 25	Thu	3:29	D SAO 98567	7.5	84+	22	79S A3		
Mar 25	Thu	18:41	D eta Leonis	3.5	90+	30	24N A0	Sun +8 deg., ZC1484	
Mar 26	Fri	3:32	D 42 Leonis	6.2	91+	29	32N A1	ZC 1514	
Mar 29	Mon	22:31	R ZC 1985*	6.9	97-	18	28N K0	AA 324, Term. Dist. 13"	
Mar 30	Tue	23:51	R mu Librae	5.3	91-	18	66N A*	ZC2114, mag2 7, dT -1.9s	
Apr 2	Fri	2:59	R 22 Oph	6.8	73-	19	72N G8	ZC2430, mag2 10, dT +.13s	
Apr 3	Sat	4:11	R SAO 186047	8.0	62-	19	87S B6		
Apr 4	Sun	4:20	R SAO 187583	8.0	50-	13	45N A2	Azimuth 140 degrees	
Apr 4	Sun	6:24	R ZC 2781	7.4	50-	24	66N K4	Sun altitude -5 degrees	

*in Kepler2 program so occultation light curves are sought.

More information is at <http://iota.jhuapl.edu/exped.htm>
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Occultations – continued from page 5

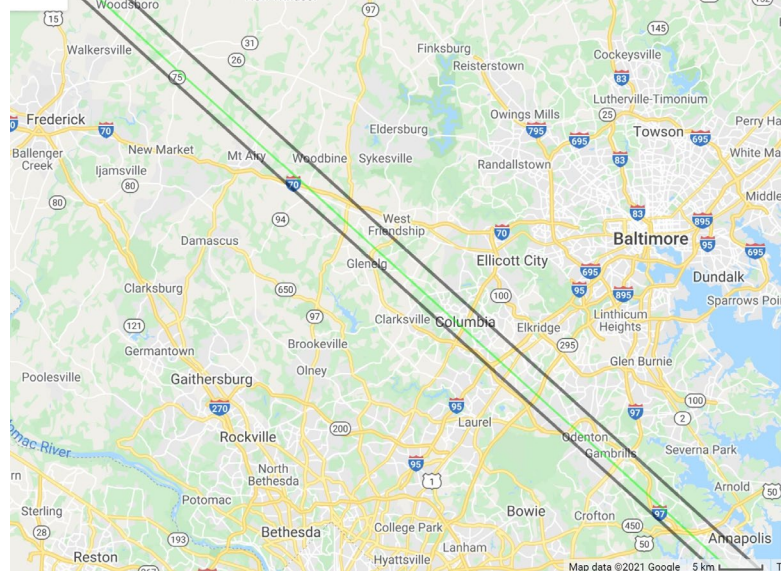


Image Credit – David Dunham and Google Maps

The path for the April 1st grazing occultation of 5.0-mag. lambda Librae across Maryland is between the two dark gray lines on the above map. The multiple events zone shown is only a kilometer wide. The graze will occur around 11:51pm EDT 16 deg. from the southern cusp on the dark side of the Moon, 25 deg. above the southern horizon. I plan to be in Maryland then, and may lead an expedition, probably near the town of Lisbon, if the sky is clear. Contact me at dunham@starpower.net if you might be interested in trying the event; high magnification is recommended to spread out glare from the 83% sunlit waning Moon.

Perseverance Landing – continued from page 4

An article explaining many advantages of the site can be found at www.nytimes.com/2020/07/28/science/nasa-jezero-perseverance.html. In its travels through the crater, Perseverance will collect and test soil and rock samples for any signs of ancient life and will store some of them for a possible sample-return mission completed by future probes or humans.

Searching for life is not the only mission objective. One other objective is the testing of a helicopter fittingly named Ingenuity. The helicopter, with a four-foot rotor span, will be flown a number of times to test the viability of such devices for future missions to Mars. If successful, Ingenuity will be the first manned powered flight vehicle to fly on a planet other than Earth.



NASA's Ingenuity Mars Helicopter. Image Credit – NASA/JPL-Caltech

Recent Astronomy Highlights – continued from page 4

Farfarout

An object nicknamed Farfarout, because it is the most distant object detected in our Solar System, was first seen in 2018 by the Subaru 8-meter telescope in Hawaii. It was given the provisional designation 2018 AG₃₇, ('A' stands for the first half month of January. 'G' and '37' combine to indicate it is the 932nd object discovered during that period.) Observed a number of times since then to determine its orbit, Farfarout's average distance from the Sun is 132 AU (AU - astronomical unit, the average distance of the Earth from the Sun), but its elliptical orbit takes it as far out as 175 AU and as close to the Sun as 27 AU, where it is likely to have had strong gravitational interactions with Neptune. One orbit takes about 1,000 years. Based on its brightness and distance, astronomers estimate that Farfarout is at least 250 miles in diameter. More information is available at phys.org/news/2021-02-astronomers-

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 gfbrendenburg@yahoo.com. More info is at guysmathastro.wordpress.com/ and home.earthlink.net/~gfbrenden/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): 10 Apr. 7:30 p.m., Tess Jaffe (UMD and GSFC), **Large-Scale Magnetic Fields in Our Galaxy**

The APS Mid-Atlantic Senior Physicists Group: (Zoom Meeting) Mar. 24th at 1:00 p.m., Dr. Larry Nittler, Carnegie Institute of Washington, will give a talk entitled "Supernova Dust in the Solar System." Please note that this is the 4th **Wednesday of March**, not the 3rd. More information is available at www.aps.org/units/maspg/meetings/meeting.cfm?name=SENIOR0321
To attend the meeting, use the following link and meeting info:
apsphysics.zoom.us/j/96519243880?pwd=YW9zUkozRXo3WVJsaWpibHBsUmJsQT09
Meeting ID: 965 1924 3880 Passcode: 543566
Dial in access 301 715 8592 (Washington DC).

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.?

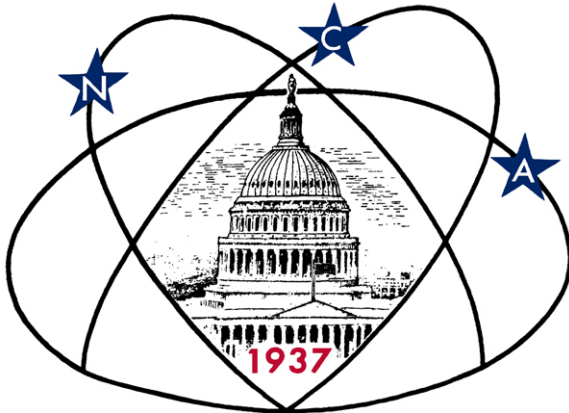
Are you interested in volunteering for: Telescope making, Exploring the Sky, Star Dust, NCA Officer, etc.?

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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If undeliverable, return to
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Alexandria, VA 22314

First Class
Dated Material



Celebrating 84 Years of Astronomy

Next NCA Meeting:

2021 March 13th

7:30 pm

(On Zoom)

Tom Field

The NCA Zoom meetings are open to anyone, however, you must register ahead of time. To register, go to: umd.zoom.us/meeting/register/tJA1c-6sqjsiHdfRNCJnuI3iawoOyahnYPh. 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, share the link above instead.

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