Star Dust

Newsletter of National Capital Astronomers, Inc.

capitalastronomers.org

September 2020 ***Volume 79, Issue 1***

Celebrating 83 Years of Astronomy

Next Meeting

When: Sat. Sep. 12th, 2020

Time: 7:30 pm

Where: Online (Zoom)
See instructions for registering to participate in the meeting on Page 2.

Speaker: Dr. Tommy Wiklind

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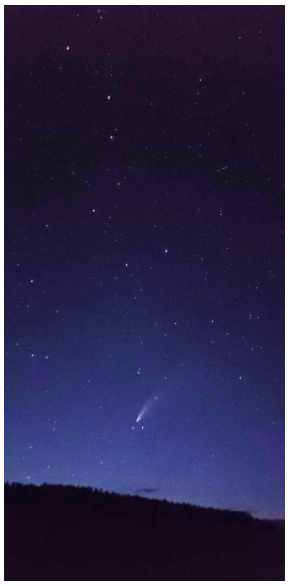

Comet NEOWISE on 7/18/20 in

Annual Membership Dues are Due

The membership form, which contains instructions for where to mail it, is on Page 7. Please support NCA by applying for or renewing your membership at this time in order to keep receiving Star Dust. Thank you.

The Evolution of Galaxies Over Cosmic Time

Tommy Wiklind
The Catholic University of America

Abstract: The universe looked very different at early times. Galaxies were small, intensely forming stars, and their morphology was clumpy and chaotic. If we fast-forward to the present time, we find galaxies with well-defined morphologies (mostly) on the Hubble fork diagram. Most stars reside in elliptical galaxies, devoid of on-going star formation. The star formation that is taking place is mostly in small dwarf galaxies, with our Milky Way being an exception to the rule. By observing galaxies at different redshifts, we can attempt to follow the evolution of galaxies, in terms of their stellar and gaseous content, across cosmic time.

In this talk I will describe what we know, and highlight the difficulties in trying to isolate the physical processes that are driving the evolution of galaxies, from the first galaxies to the present.

Images of M51 in X-ray, UV, optical, near-infrared and far-infrared (from left to right). Image credit: sed.org (website no longer active)

Biography: As an undergraduate I studied mathematics and physics at the University of Gothenburg, as well as astronomy at the University of Lund. I received my PhD at the Chalmers University of Technology in Sweden, using their mm-wave radio telescope to study the molecular interstellar medium in nearby galaxies. This was followed by a postdoc at

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Colorado Image Credit – Elizabeth Warner

Recent Astronomy Highlights

Remnants of Kepler Supernova
Moving at over 23 million miles per hour, the remnants of the supernova Johannes Kepler observed in 1604, don't seem to have slowed down in the four centuries that have passed since the event. The supernova itself has been determined to be Type 1A, a supernova triggered by a white dwarf after it has accumulated a critical amount of material from a companion star. One intriguing theory is that this particular supernova may not have occurred because of a white dwarf feeding off a typical star, but instead may have come about because of a collision between two white dwarfs. More information can be found at https://www.nasa.gov/mission_pages/chandra/images/keplers-supernova-remnant-debris-from-stellar-explosion-not-slowed-after-400-years.html

Cold Gas Being Expelled Near Center of Milky Way
Using the Atacama Pathfinder EXperiment (APEX), a radio telescope located in Chile, astronomers have observed a large amount of cold, molecular gas that seems to have been expelled from near the center of our galaxy. The mechanism causing the gas to be expelled is something of a mystery. Neither the activity of Sagittarius A*, the Milky Way's supermassive black hole, nor the current star formation near the galaxy's center seem capable of causing such an expulsion. The research team's paper can be found at https://arxiv.org/pdf/2008.09121.pdf

Odd Radio Circles
Radio astronomers at the Australian Square Kilometer Array Pathfinder (ASKAP) have detected mysterious circular objects that are bright in radio wavelengths (especially around their edges), but invisible in many other parts of the electromagnetic spectrum. Dubbed Odd Radio Circles (ORCs), they so far defy explanation. For more information, go to https://www.livescience.com/circular-radio-objects-space.html

Biography – continued from page 1

the Observatoire de Meudon in Paris, France. I then returned to Chalmers University in Sweden. I took up a position with the European Space Agency, based at the Space Telescope Science Institute in Baltimore, MD for nine years. I then joined the Joint ALMA Observatory in Santiago, Chile, to build the science infrastructure. Since 2015, I have been Research Professor at the Catholic University of America in Washington DC.

Joint ALMA Observatory Image Credit – www.almaobservatory.org

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: https://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 October's issue of Star Dust, is September 21st.

Clear Skies!

Sky Watchers

September/October

Mercury will work its way higher in the evening sky, moving toward Greatest Eastern Elongation (see below). Venus rises a couple hours before dawn. Mars rises after sunset and will be visible throughout most of the night. Jupiter and Saturn rise in the afternoon and will be high in the evening sky as they draw closer to each other over the next three months, heading for a Great Conjunction on December 21st.	
9/22	Autumnal Equinox – 9:30 a.m.
10/1	Full Moon at 5:06 p.m.
10/1	Mercury at Greatest Eastern Elongation, 25.8° from the Sun and highest in the western sky after sunset.
10/7 - 8	The Draconids Meteor Shower peaks in the evening with approximately 10 meteors/hour. (Best viewing for this meteor shower is in the early evening, unlike with other meteor showers when it is during the pre-dawn hours of the night.)

All times are in EDT (Eastern Daylight Savings Time)

2020-2021 NCA Speakers Schedule

John Hornstein

September 12 Tommy Wiklind (CUA) **The Evolution of Galaxies over Cosmic Time**

October 10 Michael Walter (Carnegie Geophysical Laboratory) **Deep Water and Planetary Evolution**

November 14 Anat Shahar (Carnegie Geophysical Laboratory) **A Geochemist's Perspective on Planetary Differentiation**

December 12 Bethany Cobb Kung (GWU) **Shedding Light on Gravitational Waves**

January 9 Tony Farnham (UMd) **Spontaneous Outbursts from Comets**

February 13 Eliza Kempton (UMd) **Atmospheres of Extrasolar Super-Earths**

March 13 Tom Field (Field Tested Systems) **Astronomical Spectra with Your Own Telescope**

April 10 Tess Jaffe (UMd and GSFC) **Large-Scale Magnetic Fields in Our Galaxy**

May 8 Joe Helmboldt (NRL) **Radio Astronomy Observes the Earth's Ionosphere**

Accurately Predicted Asteroidal Occultation, and Finally, Two in One Night

David and Joan Dunham

At 1:50am Friday morning, July 10, the 100-km asteroid (303) Josephina occulted the 12.4-mag. star UCAC4 314-243004 about 9 deg. south of Saturn in a wide path across Maryland, DC, and northern Virginia. Since the weather forecast looked good even 5 days before the event, I asked Davide Farnocchia and others at JPL who maintain the excellent Horizons ephemeris generation Web site, if they could update the orbit for Josephina, as they had done for a few other asteroids whose occultations we observed from multiple stations during the last several months. They accomplished this, using accurate astrometric points generated from a new analysis, using Gaia DR2 data for the stars, of five past occultations by Josephina. The best of those was a 2018 Feb. 10th occultation that we had observed with 6 others from Arizona. For the July 10th occultation, we ran two of our stationary telescopes with video cameras and computers for recording, one at the UMD Observatory (where we could observe low enough in the south, impossible at our home) and the other on the campus of Montgomery College in Germantown; both successfully recorded the occultation. Both were pre-pointed using stars to the occultation altitude and azimuth late in the evening before the occultation. The event was recorded from 4 other stations run by others, at Gamber, MD; in s.w. Connecticut; and two mobile sites in Tennessee set up by Roger Venable. A good elliptical fit is shown in the sky-plane view of the observed chords in the figure below, with dimensions of 116 by 88 km, ±2 km. With two of the chords near both limits of the actual occultation path, only a small (less than 10 km) south shift was well-determined from the JPL prediction, less than the 1-sigma uncertainty.

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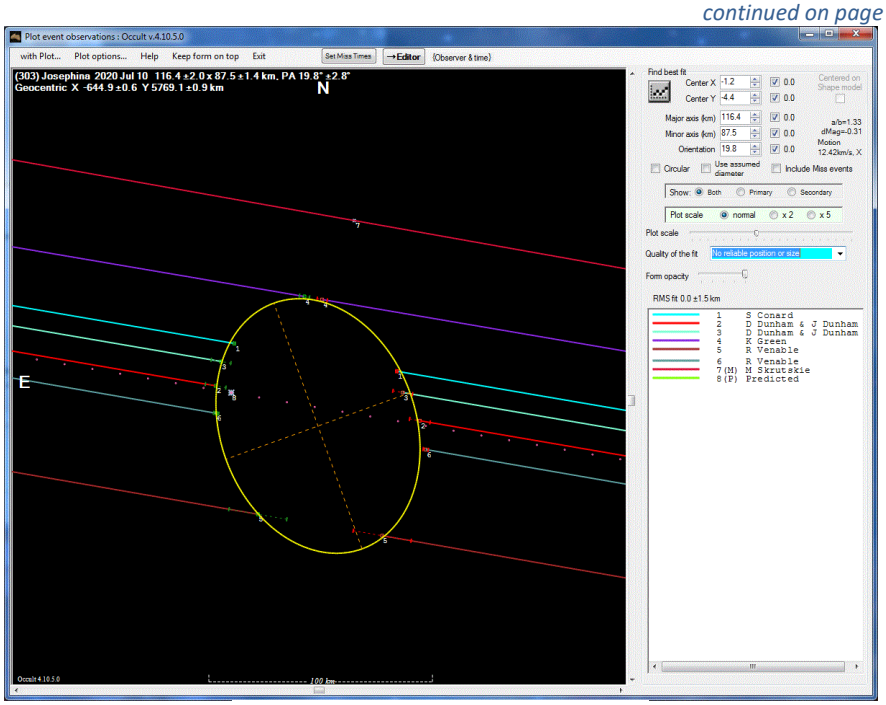

Image Credit - John Moore and IOTA

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Please Get Star Dust Electronically

NCA members able to receive Star Dust, the newsletter of the NCA, via e-mail as a PDF file attachment, instead of hardcopy via U.S. Mail, can save NCA a considerable amount of money on the printing and postage in the production of Star Dust (the NCA's single largest expense), save some trees and have one-click access to all the embedded links in the document. If you can switch from paper to digital, please contact Henry Bofinger, the NCA Secretary-Treasurer, at hbofinger@earthlink.net

Thank you!

Recent Astronomy Highlights – continued from page 2

Two Exoplanets in One System Directly Imaged for First Time

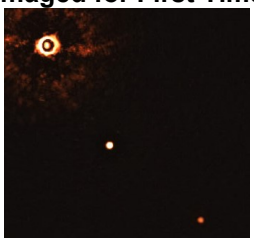

Image Credit: ESO/Bohn *et al.*

Located 309 light years away, the K-3 type star, TYC 8998-760-1 (upper left), hosts at least 2 planets, the first being about 14 times the mass of Jupiter (left of center) and the second 6 times Jupiter's mass (lower right). Details and a larger image are at http://www.sci-news.com/astronomy/directly-imaged-multi-planet-system-young-sun-like-star-08665.html

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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

2020	Day	EDT	Star	Mag.	Asteroid	dmag	dur. s	Ap. "	Location
Sep 5	Sat	2:13	TYC57570560	11.8	Sigelinde	2.6	10	5	sMD,cVA,wNC,eTN
Sep 5	Sat	4:16	SAO 127057	7.0	2014 NW65	16	2	2	eUSA
Sep 5	Sat	23:54	4UC39701685	12.7	Backlunda	2.4	4	10	PA,MD,DC,eVA,eNC
Sep 14	Mon	0:26	29 Ceti	6.2	Bojeva	8.6	3	2	cNE,NY,nwPA,nOH
Sep 17	Thu	23:45	5U621128381	16.4	1996 RJ	1.0	4	14	sMD,cVA;DC,nVA?
Sep 25	Fri	21:02	4U324111633	11.9	Adelinda	3.2	5	8	w&nVA,DC,MD,NJ
Sep 25	Fri	22:09	PPM 167366	8.8	Hela	5.3	1.1	2	OH,MD,DE;nVA,DC?
Sep 28	Mon	3:50	4UC67742635	13.7	Gerla	3.0	1.7	9	n&cVA,DC,cMD,ePA
Sep 29	Tue	0:37	4U492130358	13.9	Aidamina	0.8	7	9	NJ,DE,eMD,seVA
Oct 3	Sat	3:45	4UC42300267	13.0	Brita	1.4	5	8	DE,sMD,DC,n&cVA
Oct 4	Sun	3:07	ZC 3537	6.9	Nevanlinna	8.2	3	2	ne-scPA,wMD,WV
Oct 4	Sun	5:42	SAO 118158	8.4	Althaea	5.6	1.5	2	sOH,nWV,nMD,sNJ
Oct 7	Wed	23:47	4UC43690756	14.0	Tyumenia	2.3	2	12	sOH,WV,MD,nVA,DC
Oct 9	Fri	3:14	4UC58341355	13.0	Latvia	2.2	1.8	8	w&cVA,sMD,DE;DC?

Lunar Grazing Occultations

2020	Day	EDT	Star	Mag	% alt	CA	Location, Notes
Sep 14	Mon	4:29	X112323*	9.6	13- 14	14N	Goldvein,Dumfres,VA;sMrltn,MD
Sep 27	Sun	19:25	kappa Cap	4.7	86+ 20	14N	Elkwod,MdwayIs,VA;Ironside,MD
Oct 9	Fri	6:17	SAO 78634	8.5	56- 76	9N	Manasas,Francnia,VA;Andrws,MD

*in Kepler2 program so occultation light curves are sought.

More information about these is at http://iota.jhuapl.edu/exped.htm

Lunar Total Occultations

2020	Day	EDT	Ph	Star	Mag	% alt	CA	Sp.	Notes
Sep 12	Sat	2:05	R	ZC 1050	5.7	31- 9	33S	K5	Azimuth 67 degrees
Sep 12	Sat	3:50	R	SAO 78870	7.8	30- 29	78N	B2	
Sep 13	Sun	6:43	R	ZC 1200	6.9	20- 50	73N	K0	Sun altitude -2 degrees
Sep 21	Mon	20:51	D	ZC 2296*	7.3	27+ 11	72S	A2	Az 233, close double?
Sep 21	Mon	21:13	D	SAO159662*	7.8	28+ 8	84N	B9	Azimuth 237 deg.
Sep 21	Mon	21:54	D	beta1 Sco	2.6	28+ 1	77N	B0	Az243,ZC2302,Acrab
Sep 21	Mon	21:54	D	beta2 Sco	4.8	28+ 1	77N	B2	Az243,ZC2303,dbl,b1+10s
Sep 22	Tue	21:25	D	ZC 2450	7.5	38+ 12	67S	K2	Azimuth 227 deg.
Sep 23	Wed	22:31	D	SAO 186240	7.3	50+ 10	48N	B2	Az 227, close double?
Sep 24	Thu	22:47	D	ZC 2780	7.1	61+ 14	74S	A0	Azimuth 219 deg.
Sep 25	Fri	22:16	D	SAO 188805	8.1	70+ 24	24N	F0	Close double star
Sep 26	Sat	22:54	D	ZC 3062	7.5	79+ 27	45S	K2	
Sep 27	Sun	23:31	D	SAO 164674	7.6	87+ 31	74N	A8	
Sep 30	Wed	2:48	D	ZC 3458	6.2	97+ 28	65S	K0	
Sep 30	Wed	20:02	D	33 Piscium	4.6	99+ 14	63S	K1	Az109,ZC5,TermDist14"
Oct 3	Sat	4:05	R	nu Piscium	4.5	98- 46	27S	K3	AA222,ZC249,TermDist7"
Oct 4	Sun	3:09	R	ZC 352	7.1	95- 61	75N	K0	AA 292,close double?
Oct 4	Sun	5:17	R	ZC 360	6.7	95- 45	86S	F0	Axis Angle 272 deg.
Oct 4	Sun	23:13	R	SAO 93261	7.4	90- 31	84N	G8	
Oct 5	Mon	22:22	R	SAO 93630*	7.5	84- 15	75N	G0	Azimuth 80 deg.
Oct 7	Wed	3:46	R	ZC 725*	7.0	75- 68	77S	A0	
Oct 8	Thu	2:27	R	SAO 77355	7.5	67- 47	77N	K1	
Oct 8	Thu	4:05	R	ZC 859	6.6	66- 64	64S	B8	
Oct 8	Thu	6:54	R	SAO 77526	8.0	66- 69	60N	A0	Sun alt. -4 deg.
Oct 9	Fri	5:03	R	ZC 1019	6.8	56- 66	74N	A5	mag2 12 3s later
Oct 9	Fri	5:31	R	ZC 1023	6.4	56- 71	35N	F8	close double?; PA graze
Oct 10	Sat	2:02	R	SAO 79426	8.4	47- 22	70S	A0	mag2 12 8s later
Oct 10	Sat	3:13	R	SAO 79470	7.6	47- 36	74N	K0	
Oct 10	Sat	3:27	R	SAO 79477	7.8	46- 38	84N	K2	
Oct 10	Sat	5:08	R	SAO 79524	8.0	46- 57	84S	F5	
Oct 12	Mon	3:44	R	SAO 98567	7.5	26- 18	64S	A3	
Oct 12	Mon	4:25	R	ZC 1400	8.3	26- 26	30N	F5	close dbl; wMD,PA graze
Oct 13	Tue	3:19	R	42 Leonis	6.2	17- 1	88S	A1	Azimuth 72 deg, ZC 1514
Oct 13	Tue	5:52	R	ZC 1532	7.6	16- 29	30N	K0	
Oct 13	Tue	6:37	R	ZC 1535	6.9	16- 38	61S	K0	Sun alt. -8 deg.

*in Kepler2 program so occultation light curves are sought.

More information is at http://iota.jhuapl.edu/exped.htm
David Dunham, dunham@starpower.net

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Accurately Predicted Asteroidal Occultation, and Finally, Two in One Night – continued from page 4

We tried to run a 3rd attended mobile station at Myersville, MD, having arrived there just over 30 minutes before the occultation, at 5:50 UT. I tried to pre-point using the 4-star asterism of 4th-mag. stars sometimes called Terebellum, consisting of omega, 59, 60, and 62 Sagittarii, but the maxi FOV is small enough that it can show only the two closest of those stars at once. After I roughly pointed the scope below Saturn with the help of a laser pointer, I found a pair of bright stars, but they did not match any of the pairs of Terebellum; I spent a lot of time scanning the charts to find the distinctive pair, with no success, so we didn't acquire the target star in time there. The problem turned out to be the Mira variable V1943 Sagittarii, which was much brighter than expected in our red-sensitive camera, nearly as bright as the Terebellum stars. I discussed that effort in a presentation called "Ode to V1193 Sagittarii" that I gave at the online IOTA meeting in late July; you can see it, and another talk about improving asteroid orbits for and with occultation observations, on the meeting presentations Web page under the "Community" tab on IOTA's main Web page at http://occultations.org/ .

1.2h after the Josephina occultation, another occultation, of another 12th-mag. star by the asteroid (846) Lipperta, was predicted to occur in southern Pennsylvania. Although south of the expected path, we decided to try it; no special effort had been made to update Lipperta's orbit so its prediction was quite uncertain. As luck would have it, the actual path shifted well south so that it crossed northern Maryland; both Steve Conard at Gambers and us at Myersville recorded the occultation. The event was also observed from a third station in Texas.

Many others in IOTA have recorded two separate asteroidal occultations in one night, but this was the first time that Joan and I did this. July 10th was also the day before Joan's and my 50th wedding anniversary. If it hadn't been for COVID-19, Joan and I would have been too busy to observe the occultations, since we would have been preparing for a large family reunion at our home to celebrate, but that will have to wait until next year. A picture at our wedding reception, standing on a lunar graze cable trailer and with other important occultationists (USNO's Tom Van Flandern is at left) who came there to celebrate, is shown below.

Recent Astronomy Highlights – continued from page 4

Light from Ancient Quasars Used to Map Andromeda Galaxy's Halo

Ultraviolet light from forty-seven quasars behind the Andromeda Galaxy was captured by the Hubble Telescope's Cosmic Origins Spectrograph (COS) as part of Project AMIGA (Absorption Map of Ionized Gas in Andromeda). The purpose of the project was to study the light from these quasars for signs of absorption by elements within the Andromeda Galaxy's gaseous halo in order to map it. Astronomers discovered that the halo actually contains two shells. The inner shell extends out about half a million light years from Andromeda's center. It is extremely active and complex, containing heavy elements from supernovae within the galaxy. The outer shell is more homogeneous, less active and extends over halfway to the Milky Way. For more information, go to https://www.sciencedaily.com/releases/2020/08/200827141345.htm

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 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.). Details can be found at www.astro.umd.edu/openhouse

Next NCA Meeting (Zoom): **10 Oct.** 7:30 p.m., Michael Walter, (Carnegie Geophysical Laboratory) **Deep Water and Planetary Evolution**

The APS Mid-Atlantic Senior Physicists Group: **(Zoom Meeting)** Sep. 16th at 1:00 p.m., Larry Nittler, Carnegie Institution for Science, Department of Terrestrial Magnetism, will talk about "A Cometary Fossil Inside an Asteroidal Meteorite." More information is at https://www.aps.org/units/maspg/meetings/meeting.cfm?name=SENIOR0920. To attend the meeting, use the following link and meeting info: https://apsphysics.zoom.us/j/95507673720?pwd=TG1WczkrUXlxZndkclkvOVNmbUpiQT09. Meeting ID: 955 0767 3720 Passcode: 251197
Dial in access 301-715-8592 (Germantown).

The **Jewish Museum of Maryland** is opening a new exhibit, *Jews in Space: Members of the Tribe in Orbit* with a talk on Sep. 10 at 7 p.m. For more info and to register, go to http://jewishmuseummd.org/single/jews-in-space-curators-talk/.

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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First Class
Dated Material

Celebrating 83 Years of Astronomy

Next NCA Meeting:

2020 September 12th

7:30 pm

(On Zoom)

Dr. Tommy Wiklind

(See Zoom registration instructions on Page 2.)

Inside This Issue