

Star Dust

Newsletter of National Capital Astronomers, Inc.

capitalastronomers.org

Sept. 2019

Volume 78, Issue 1

**Celebrating 82 Years
of Astronomy**

Next Meeting

When: Sat. Sept 14th, 2019
Time: 7:30 pm
Where: UMD Observatory
Speaker: Dr. Carrie M.
Anderson

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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.

NASA Cassini’s 13-year Journey in the Saturn System

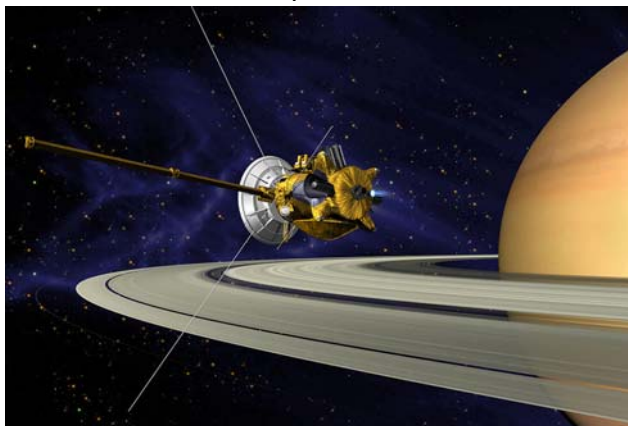
Carrie M. Anderson

Goddard Space Flight Center

Abstract: The legacy of NASA’s Cassini mission began on 15 October 1997, when the Cassini-Huygens spacecraft launched from Cape Canaveral, marking the beginning of its 7-year cruise phase to the Saturn System. Decades earlier, the Pioneer 11 flyby, followed close-in-time by the Voyager 1 and 2 flybys, provided a mere glimpse into the many Saturn System discoveries waiting to be made during the magnificent 13-year journey of the Cassini spacecraft in the Saturn System.

NASA’s Cassini spacecraft was the first to orbit Saturn, enabling a much-anticipated detailed study of Saturn’s environment – this includes its atmosphere, magnetosphere, extensive ring system, and 62 moons. Such discoveries included an in-depth study via remote sensing and in situ measurements of Titan’s atmosphere and surface – Titan is a moon that possesses many Earth-like processes, – as well as the small but mighty moon Enceladus, which has an active south polar region that jets icy material into space from its sub-surface liquid water reservoir.

In this presentation, I will highlight some of the key Cassini science discoveries, including breakthroughs from both the Cassini orbiter and ESA’s Huygens probe, in which the latter made history by being the first to land on a surface (Titan’s) in the outer solar system, marking the farthest distance from Earth that a probe has ever landed.



Artist’s impression of Cassini at Saturn. Image Credit – NASA and JPL

Recent Astronomy Highlights

Summer 2019 was filled with a lot of astronomical highlights. Below are but a few of them.

Moon's Gamma-Ray Glow Brighter Than the Sun's

Cosmic rays, particles accelerated by powerful processes like supernovae, slam into the Moon all of the time, creating gamma rays, some of which have been picked up by the Fermi Gamma-ray Space Telescope. Scientists studying these gamma rays find that the Moon gives off a greater intensity of such rays with energy in the range of 31 million electron volts than does the Sun, although the Sun gives off more of a flux with higher energy gamma rays. More information is at www.sciencedaily.com/releases/2019/08/190815120656.htm

Jupiter Endured Massive Impact?

As the largest planet in the Solar System, Jupiter has taken a lot of hits over its lifetime, including possibly one that is yet to be confirmed on August 7th, but perhaps none bigger than one it is theorized to have taken early in its formation. Gravity measurements from NASA's Juno probe seem to indicate that Jupiter's core is less dense and more extended than expected. How is this possible? Scientists theorize that the discrepancy might be due to the impact from a protoplanet. Such an impact could have caused the original core to mix with lighter materials from the layers above. Settling of heavier materials to the center of Jupiter's core could still be going on to this very day. More information can be found at www.sciencedaily.com/releases/2019/08/190815113735.htm

Cryovolcanic Activity on Pluto?

Reviewing data from the New Horizons spacecraft's 2015 encounter with Pluto, scientists have found ammonia in the water ice near a large crack known as Virgil Fossa. This may indicate that a cryovolcano spewed liquid water on the surface of the dwarf planet within the past billion years. More information can be found at www.digitaltrends.com/cool-tech/pluto-cryovolcano-liquid-water/

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Biography: Dr. Anderson is a planetary astronomer in the Astrochemistry Laboratory at NASA's Goddard Space Flight Center (GSFC). Her research focuses on the remote sensing of planetary atmospheres, primarily in the areas of thermal structure and composition, using space- and ground-based data. This includes radiative transfer analyses of the outer planets, including the effects of aerosols and condensates, as well as data analysis techniques in the visible, near-IR, mid-IR, far-IR, and submillimeter spectral regions. Dr. Anderson's research also includes transmission spectroscopy measurements of thin ice films using her SPECTroscopy of Titan-Related ice AnaLogs (SPECTRAL) high-vacuum chamber located in her Spectroscopy for Planetary ICes Environments (SPICE) laboratory at NASA GSFC.

Dr. Anderson's most recent research highlight is her discovery of a chemically new, high-altitude ice cloud residing in Titan's south polar stratosphere during Titan's early southern winter season, chemically consistent with co-condensed hydrogen cyanide and benzene. During her 13-year tenure as a Co-I on the Cassini Composite InfraRed Spectrometer (CIRS) team, Dr. Anderson also discovered additional ice clouds in Titan's stratosphere, including co-condensed ice mixtures containing hydrogen cyanide and cyanoacetylene, methane ice clouds formed via subsidence in Titan's lower stratosphere, the solid-state photochemical formation of dicyanoacetylene ice that is co-condensed with hydrogen cyanide ice in Titan's early northern spring stratosphere, as well as the discovery that Titan's photochemical aerosol is chemically uniform throughout the atmosphere at altitudes below the stratopause.

Dr. Anderson has been heavily engaged in the Phase E part of the Cassini/Huygens mission in the Saturn system, through both data analyses and Cassini CIRS instrument operations, as well as involved in numerous ROSES funding awards.

Dr. Anderson is currently the Deputy Principal Investigator (DPI) on a submillimeter heterodyne spectrometer, aimed at a mission proposal concept to Enceladus. She is also DPI of a joint GSFC/JPL SmallSat mission concept to Venus, with a submillimeter heterodyne spectrometer as the primary instrument. She is also actively engaged in GSFC-internal funding for both mission design concepts for planetary flight mission opportunities as well as projects involving submillimeter heterodyne spectrometer designs for future planetary flight missions.

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

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

From the August 10th Exploring the Sky session, Jay Miller reports, “We coulda used a couple more telescopes. We had three, Todd Supple, Paul Hueper and me and about 200 people. All we got to look at were the Moon, Jupiter and Saturn, but this is fine for most people. Sky was fine until near the end when it started to get a little cloudy.”

The submission deadline for October’s Star Dust, is September 21st.

Clear Skies!

Invitation to Hopewell Observatory Open House on Saturday, October 26

Guy Brandenburg

Anybody interested in astronomy is invited to the upcoming Fall Open House at the privately-owned Hopewell Observatory on the night of Saturday, October 26, 2019.

This observatory was completely built by its members, and it houses a number of telescopes under a roll-off roof. We have 14” and 10” Schmidt-Cassegrains, one or more long-focal-length refractors, and two Newtonian reflectors (14” and 10”) on portable, alt-az mounts. It’s about a 45-minute drive from the intersection of I-66 and the DC Beltway to our site, which is located at an altitude of about 1200 feet, so we very seldom are bothered by the dew that is so common in this area.

Warning: the road up the mountain is not the greatest, and there is no running water. We do have bottled water, electricity, a warming cabin, hand sanitizer, and an outhouse, and we will have ready the makings for tea, coffee, hot chocolate, and hot cider. Detailed driving directions can be found at <https://bit.ly/2HnY2GI>. You can stay as late as you like, and if you feel like bringing your own telescope to set up in our small grassy yard, that’s fine, too!

Most of the planets will be visible, and so will numerous deep-sky objects like galaxies, globular clusters, and nebulae. The Moon, however, will be hiding, so we should be able to see a good bit of the Milky Way, weather permitting. If it’s your first visit to Hopewell, we recommend that you come before it gets completely dark, especially since you will need to walk about 100 yards in the dark. There are no streetlights up there, so bring a flashlight! (We can give you red plastic film to put over any white lights.) Sunset is predicted for about 7 pm, and it takes about an hour after that to get completely dark.

For more information, feel free to email [gbrandenburg at yahoo dot com](mailto:gbrandenburg@yahoo.com).

Sky Watchers

September/October

With Mars on the opposite side of the Sun and Mercury and Venus appearing very close to the Sun, Jupiter and Saturn will be the only planets visible in the evening sky, with Jupiter setting around 11:00 p.m. and Saturn setting after midnight.	
9/13	Conjunction of Mercury and Venus. 5:35 p.m. Mercury will be 20’ south of Venus. Probably not visible.
9/14	Full Moon at 12:34 a.m.
9/23	Autumnal Equinox. 3:50 a.m.
10/8	The Draconids Meteor Shower peaks in the evening with approximately 10 meteors/hour. A quarter Moon sets near midnight making for ideal viewing afterward.

Times in EDT

A Report from the 2019 Stellafane Convention

Guy Brandenburg

I drove up to the 2019 telescope-makers convention and star party known as Stellafane this year, for the first time in about 15 years. It's located in Springfield, Vermont, which is for me about a 10-hour drive. I'm glad I went, because I got a chance to help out with the optical judging and see two demonstrations of relatively new telescope-making techniques.

If you don't know, up until a few decades ago, Springfield was known as 'Precision Valley' because of its large number of factories where workers made high-precision machine tools of all sorts. Russell Porter, who helped design the 200-inch Palomar telescope, was hired by one of the companies, and started a club for some of the workers to make telescopes. The workers were intrigued to discover that while they could measure the accuracy of their factory work to about a thousandth of an inch, with a telescope mirror, they could routinely get the accuracy down to a few MILLIONTHS of an inch – roughly a thousand times more precise, with very simple tools. These amateur telescope makers eventually built some very unusual telescopes and observatories at the small site a few miles southeast of town, and have been holding gatherings there almost every summer for over 80 years.

This time, I got to help star-test about ten homemade telescopes and their mirrors with a crew of about eight other amateur or professional opticians/telescope makers. What we did is aim each one at the bright star Altair with a short focal-length eyepiece, and bring the star into focus, then out of focus away from the tube, and then back into focus, and then roll it out of focus TOWARD the tube. When you do that, you see concentric bright and dark rings that give you lots of information about the mirror quality, telescope collimation, and more. (Richard Suiter's book on star tests explains this in great detail.) Every single scope we looked at was good or excellent, which apparently is not always the case each year. In fact, they awarded THREE first place prizes!

There were also about a dozen or so telescopes that were entered in the mechanical category, but I didn't have the opportunity to look at them all, nor was I invited to be on that judging team.

One weird feature of Stellafane is that the small field around the old Stellafane clubhouse and turret observatory, around which the judging is held, is quite a long walk from what is now the main Stellafane property. From my tent, I measured it as one-half mile, so I got quite a bit of exercise carrying stuff from one site to the other! There were close to a thousand attendees!

I was quite impressed with the quality of most of the talks. The day before the main event, several commercial vendors gave presentations at a hotel in Springfield itself; the quality of those talks was unfortunately a bit uneven. The talks I enjoyed the most were:

- How to silver (not aluminize) a telescope mirror with sprayed-on solutions in the open air, including a final overcoat that prevents tarnishing and keeps the optical quality excellent

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• **Thank you!**

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

• Sibling Stars Stay Together Longer Than Previously Suspected

• To date the European Space Agency's GAIA
• spacecraft has precisely mapped the
• position and proper motion (motion across
• the sky) of over a billion stars. In examining
• this wealth of data, scientists have
• discovered over 2000 previously unknown
• clusters of stars and groups of co-moving
• stars within 3000 light years of Earth. About
• half of these groups have formed into long
• strings of stars. Such a large population of
• groups indicates that the previous belief that
• most stars leave the group in which they
• formed within a few million years must be
• modified. Instead many of these clusters of
• siblings can remain together for billions of
• years. This fact may help in furthering the
• understanding of the evolution of the Milky
• Way. For more information, go to
• <http://sci.esa.int/gaia/61523-gaia-untangles-the-starry-strings-of-the-milky-way/>

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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.	Ap.	Location
Sep 13	Fri	5:14	TYC19080078	9.3	Yesenin	8.3	1.1	3	nVA, DC, cMD, sNJ
Sep 15	Sun	6:05	4UC56919456	13.8	Beljawska	1.8	2.4	9	WV, nVA, MD, DC, sNJ
Sep 16	Mon	22:40	4U316221737	12.8	Hippo	1.4	14	10	cVA, cMD, DC, ePA
Sep 19	Thu	5:38	TYC24051401	11.7	Leukothea	3.0	7	6	cVA, SMD, sNJ; DC?
Sep 26	Thu	5:55	SAO 80087	7.5	Octavia	7.2	3	2	sOH, sw-ePA, nNJ
Sep 27	Fri	4:07	4UC58239941	12.5	Philippa	3.2	2.4	8	w&nVA, cMD, DC, NJ
Oct 9	Wed	4:35	4UC45739297	11.6	Gallia	1.4	4	7	cVA, SMD, cWV, sOH
Oct 12	Sat	2:19	TYC32931959	11.3	Phaethon*	5.5	0.2	6	seMD, c-swVA, eTN

*parent of Gemini ds, see <http://iota.jhuapl.edu/2019Phaethon.htm>
 Most event details at <http://www.asteroidocculatation.com/>

Lunar Grazing Occultations

2019	Day	EDT	Star	Mag	% alt	CA	Location, Notes
Sep 18	Wed	4:47	ZC 393	6.7	85-60	16N	Chantly, VA; Burtinsvl, Hanovr, MD
Sep 21	Sat	3:31	SAO 77012	7.8	58-49	15N	Burke, VA; GWU; MtRainer, GSFC, MD
Sep 26	Thu	6:09	X 15390	10.7	8-22	13N	nStrl ng, VA; Layhills, Laurel, MD
Oct 1	Tue	19:48	30 Librae	6.5	14+13	5N	Warfld, StonyCrk, LangleyAFB, VA

Links for interactive maps are at <http://iota.jhuapl.edu/exped.htm>

Lunar Total Occultations

2019	Day	EDT	Ph Star	Mag	% alt	CA	Sp.	Notes
Sep 17	Tue	22:16	R SAO 110566	7.0	86-11	67S	A5	Azimuth 87 degrees
Sep 18	Wed	4:41	D ZC 393	6.7	85-60	9N	K0	Terminator Dist. 11 deg
Sep 18	Wed	4:53	R ZC 393	6.7	85-59	24N	K0	nVA&cMD graze; double??
Sep 18	Wed	23:47	R SAO 93387	7.1	78-22	65S	F8	
Sep 20	Fri	1:14	R ZC 620	6.1	69-32	86N	K0	
Sep 21	Sat	1:01	R X 72361	7.5	59-21	60S		Mg2 7.8 sep. 1.0", PA115
Sep 21	Sat	1:01	R ZC 760	6.6	59-21	60S	A5	Mg2 7.6 sep. 1.0", PA295
Sep 21	Sat	3:30	G SAO 77012	7.8	58-49	15N	F0	nVA, DC, &cen. MD graze
Sep 22	Sun	0:18	R ZC 905	6.9	49-5	76N	A0	Az. 66, close double
Sep 22	Sun	1:07	R SAO 77863	8.3	48-13	47S	K2	Az. 73, Gem Milky Way
Sep 22	Sun	1:55	R SAO 77916	7.8	48-22	27S	A3	mg2 11 sep 0.8", PA 338
Sep 22	Sun	3:29	R ZC 922	7.9	47-40	87S	K0	
Sep 22	Sun	3:29	R SAO 77977	8.0	47-40	39N	K2	mg2 11 sep. .06", PA 76
Sep 22	Sun	3:57	R SAO 77990	7.8	47-45	74S	B1	mg2 11 sep. .5", PA 147
Sep 22	Sun	4:53	R ZC 928	5.9	47-56	53N	K4	
Sep 22	Sun	6:02	R TV Gem	6.9	46-67	24S	M1	ZC939, Sun-11, close dbl?
Sep 23	Mon	1:24	R SAO 78969	7.8	37-7	69S	K5	Azimuth 67 degrees
Sep 23	Mon	1:48	R SAO 78987	7.7	37-11	68S	F5	Azimuth 70 degrees
Sep 23	Mon	1:58	R SAO 78996	7.4	37-13	78S	G5	Azimuth 72 degrees
Sep 23	Mon	5:23	R SAO 79126	7.6	36-51	83N	K2	
Sep 23	Mon	6:41	R SAO 79151	8.1	35-64	73S	F5	Sun -4, 1st star, sep. 9"
Sep 23	Mon	6:41	R SAO 79152	8.2	35-64	74S	F5	2nd star, 1st star +17s
Sep 23	Mon	11:16	R Wasat	3.5	34-49	45S	F0	ZC 1100, Sun alt. +44
Sep 24	Tue	2:42	R ZC 1216	7.5	26-9	52S	A2	Az. 71, close double?
Sep 24	Tue	3:32	R SAO 79953	7.8	26-18	18S	G5	close double?
Oct 1	Tue	18:49	D omicronLib	6.1	14+21	14S	F2	Sun -1, ZC2193, double?
Oct 3	Thu	19:39	D SA0185220*	7.5	32+23	81N	G3	Sun alt. -11 deg.
Oct 4	Fri	20:16	D SA0186478*	7.1	43+23	31N	F7	close double?
Oct 6	Sun	19:06	D SA0188815	8.0	62+27	85N	K0	Sun alt. -5 deg.
Oct 6	Sun	19:30	D ZC 2921	6.0	62+28	67S	K0	Sun alt. -10 deg.
Oct 6	Sun	21:11	D ZC 2928	6.4	63+27	75S	F7	close double?
Oct 8	Tue	23:42	D AP Cap	7.7	81+28	68N	B9	SA0164653, mg2 11, sep 4"
Oct 9	Wed	1:53	D ZC 3197	6.4	81+10	32N	K3	Azimuth 239 deg.
Oct 9	Wed	19:43	D 56 Aquari	6.4	87+25	49S	B8	ZC 3304
Oct 10	Thu	18:43	D ZC 3413	6.1	92+12	53S	K5	Sun alt. -2, Azimuth114
Oct 11	Fri	0:26	D ZC 3438*	7.7	93+39	49S	B3	
Oct 11	Fri	1:40	D ZC 3442*	7.9	93+31	81S	F5	
Oct 11	Fri	19:41	D ZC 3529	6.6	97+18	25N	G5	TmD 12", close double??
Oct 11	Fri	20:25	D 30 Pi sci um	4.4	97+25	50S	M3	ZC3536, close double?

*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 Sept. 21st SAO 77012 Grazing Occultation Path Across Part of Maryland

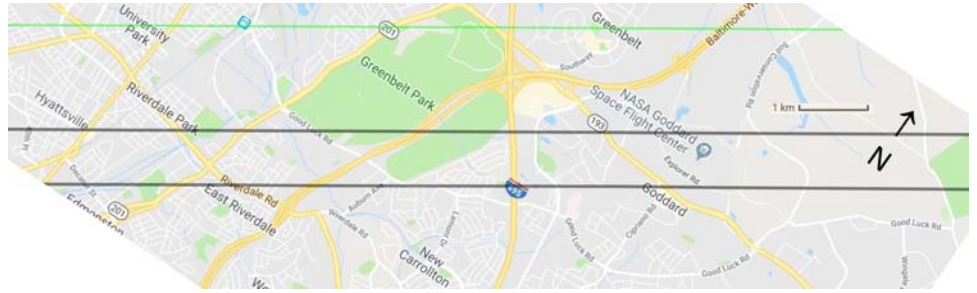


Image Credit – David Dunham and Google Maps

The best areas for observing the graze of 7.8-mag. SAO 77012 by the 58% sunlit waning Moon will be between the two dark gray lines shown on the map. There are actually two very narrow ranges that observers should aim for, a northern one whose northern edge is the northern dark gray line, to just 100m (0.1 km) south of it, and a southern one whose southern edge is the southern dark gray line, to 200m north of it; in these two narrow strips, as many as ten occultations of the star by hills and craters along the Moon's northern edge will occur. We can predict these quite well now with a very detailed LRO model of the Moon's surface, and very accurate data for the star from ESA's Gaia mission. The graze events will occur over a period between 3:28 and 3:33 am EDT when the star will be over the dark side of the Moon, about 13° from the northern cusp, which the star will appear to pass over at about 3:22 am, and then it will become easier to see as it moves farther from the lunar glare near the cusp. Some events (but fewer) will also occur for observers as far north as the light green line, which is the northern limit for a spherical Moon with its mean radius; only about 100m north of the light green line, the star will no longer be occulted, while south of the southern gray line, a single occultation, at least 4 minutes long, will occur, with some chance of other brief events near the D and R. The path also crosses parts of Annandale, Bailey's Crossroads, and the n.w. part of Arlington Cemetery in Virginia, and over the White House. The predicted profile, and maps like the above showing the path across DC and suburban Virginia, and an interactive Google map for zooming in on the path even more, are at iota.jhuapl.edu/exped.htm. That site also has details for the other two graze paths that cross the greater DC area, both north of the Sept. 21st path (they will occur on Sept. 18 and 26), but they involve fainter stars relative to the lunar phase, making them harder to see. The Oct. 1st graze will be truly spectacular, but being in southern Virginia, it will require some travel from the DC area.

A Report from the 2019 Stellafane Convention – continued from page 4

- How to set up and perform optical interferometry on a telescope mirror using a very inexpensive Bath interferometer
- What to avoid when choosing binoculars for astronomy
- Performing a double-pass autocollimation test

I also enjoyed the opportunity to talk to lots of other amateur AND professional telescope makers at the various presentations and at the dining area. The weather was uniformly great.

Twenty hours of driving, and paying lots of highway tolls, mean that I'm probably not going to return very often, but I'm very glad that Francis O'Reilly, the current vice-president of the Springfield Telescope Makers, invited me to go.

Recent Astronomy Highlights – continued from page 4

Possible Black Hole-Neutron Star Merger Detected

The gravitational waves from a merger were detected by LIGO and Virgo on August 14th, signals of an event that took place approximately 900 million years ago. While binary black hole mergers and neutron star mergers have already been detected, a merger between one of each had not been conclusively observed up until that point. (Another may have been detected in April, but the evidence is not as conclusive.) Study of the gravitational waves has shown that one of the objects is in the mass range for black holes while the other is in the mass range for neutron stars. However, there is the possibility that the less massive object is a low-mass black hole, since the lower limit, if any, for the mass of a black hole is not known. For more information, go to phys.org/news/2019-08-scientists-black-hole-swallowing-neutron.html

Calendar of Events

- **NCA Mirror- or Telescope-making Classes:** Tuesdays AND Fridays, from 6:30 to 9:30 pm at the Chevy Chase Community Center (intersection of McKinley Street and Connecticut Avenue, N.W.) Contact instructor Guy Brandenburg at [202-635-1860](tel:202-635-1860) or at gfbrandenburg@yahoo.com. Additional information is at guysmathastro.wordpress.com/ and home.earthlink.net/~gfbranden/GFB_Home_Page.html
- **Open house talks and observing at the University of Maryland Observatory** in College Park on the 5th and 20th of every month at 8:00 pm (Nov.-Apr.) or 9:00 pm (May-Oct.). Details: www.astro.umd.edu/openhouse
- **Next NCA Meeting** at the University of Maryland Observatory: **12 October** 7:30 p.m., Duilia Demello (CUA), *Interacting Galaxies, and Star Formation Outside Galaxies*
- **The Mid-Atlantic Senior Physicists Group** usually has a talk on the third Wednesday of the month at 1:00 pm at the American Center for Physics (1st floor conference room). 1 Physics Ellipse, College Park MD - off River Rd. between Kenilworth Ave. and Paint Branch Parkway. www.aps.org/units/maspg

National Capital Astronomers Membership Form

Name: _____ **Date:** ___/___/___

Address: _____ **ZIP Code:** _____

Home Phone: ___ - ___ - ___ **E-mail:** _____ **Print / E-mail Star Dust (circle one)**

Membership (circle one): Student..... \$ 5; Individual / Family.....\$10; Optional Contribution.....\$__

Please indicate which activities interest you:

- Attending monthly scientific lectures on some aspect of astronomy _____
- Making scientific astronomical observations _____
- Observing astronomical objects for personal pleasure at relatively dark sites _____
- Attending large regional star parties _____
- Doing outreach events to educate the public, such as Exploring the Sky _____
- Building or modifying telescopes _____
- Participating in travel/expeditions to view eclipses or occultations _____
- Combating light pollution _____

Do you have any special skills, such as videography, graphic arts, science education, electronics, machining, etc.?

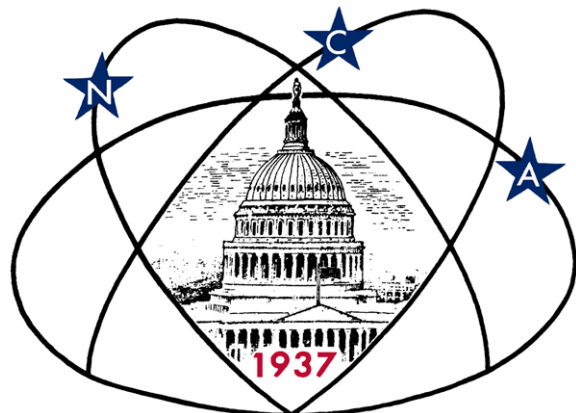
Are you interested in volunteering for: Telescope making, Exploring the Sky, Star Dust, NCA Officer, etc.?

Please mail this form with check payable to **National Capital Astronomers** to:
Henry Bofinger, NCA Treasurer; 727 Massachusetts Ave. NE, Washington, DC 20002-6007

National Capital Astronomers, Inc.

If undeliverable, return to
NCA c/o Elizabeth Warner
400 Madison St #2208
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Celebrating 82 Years of Astronomy

Next NCA Meeting:

2019 September 14th

7:30 pm

@ UMD Observatory

Dr. Carrie M.
Anderson

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DUES are DUE!