

# Star Dust

Newsletter of National Capital Astronomers, Inc.

[capitalastronomers.org](http://capitalastronomers.org)

November 2021

Volume 80, Issue 3

**Celebrating 84 Years  
of Astronomy**

## Next Meeting

**When:** Sat. Nov. 13th, 2021

**Time:** 7:30 pm

**Where:** Online (Zoom)

See instructions for joining the meeting on Page 8.

**Speaker:** Dr. Julie McEnery

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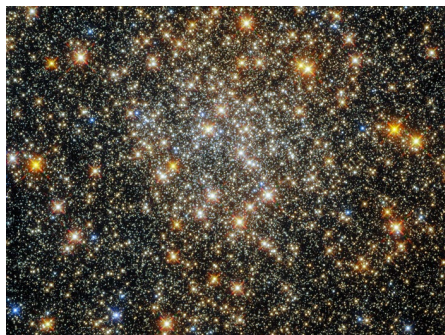


Image Credit - ESA/Hubble AND  
NASA, R. Cohen

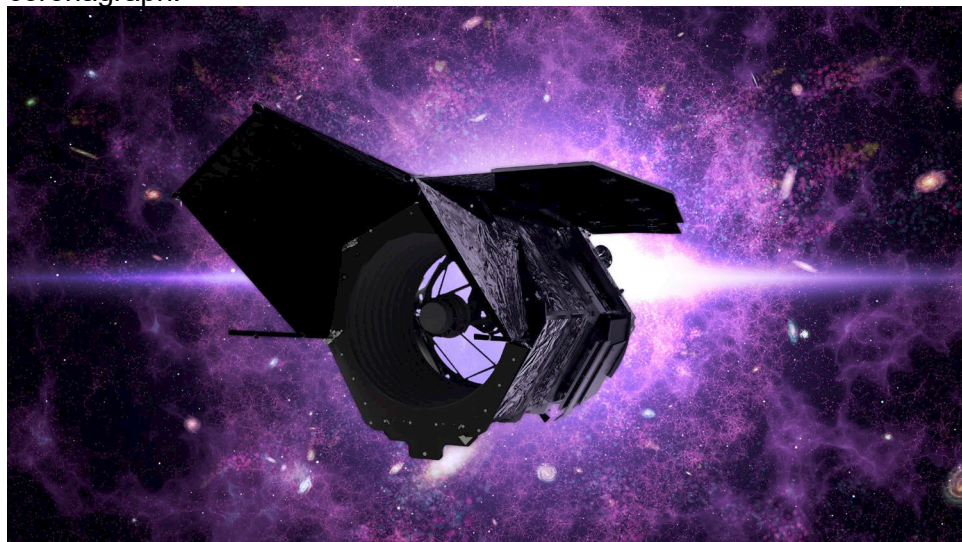
ESO 520-21, also known as Palomar 6, is a globular cluster of stars that lies near the center of the Milky Way. More information can be found at [www.eurekaalert.org/news-releases/929510](http://www.eurekaalert.org/news-releases/929510).

## Surveying the Universe with the Nancy Grace Roman Space Telescope

Julie McEnery

NASA's Goddard Space Flight Center

When it launches in the mid-2020s, NASA's Nancy Grace Roman Space Telescope will create enormous space panoramas of unprecedented detail. The mission's wide field of view will enable sweeping cosmic surveys, yielding a wealth of information about celestial realms from our solar system to the edge of the observable universe. Roman will survey the sky in infrared light, and will have the same resolution in near-infrared wavelengths as NASA's Hubble Space Telescope, but will capture a field of view about 200 times larger. Roman's surveys will deliver new insights into the history and structure of the universe, including the mysterious "dark energy" that is making space itself expand faster and faster. This powerful new observatory will also discover thousands of exoplanets using its wide-field camera and study the atmospheres of giant gaseous planets orbiting other stars with a sophisticated technology demonstration coronagraph.



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

**Biography:** Julie McEnery is the senior scientist for high energy astrophysics at the Goddard Space Flight Center. She currently serves as the senior Project Scientist for the Nancy Grace Roman Space Telescope, a NASA Astrophysics flagship mission that will study the

*continued on page 2*

## Recent Astronomy Highlights

### Juno Peers Through Jupiter's Clouds

NASA's Juno probe, in orbit around our Solar System's largest planet, has found interesting results about Jupiter's belts and zones. Belts are the dark, reddish bands around the planet, while zones are the lighter, whiteish bands. Juno has a microwave radiometer which can peer down through Jupiter's upper atmosphere approximately 250 kilometers, where the pressure is around 100 bars or 100 times the average atmospheric pressure at the surface of the Earth. Readings show that both types of bands extend deep down into the atmosphere, at least in the mid latitudes of the planet. In addition, down to regions where the pressure is approximately 5 bars, the belts are bright in the microwave region of the spectrum while the zones are dark. But below, in regions where the pressure is 10 bars or greater, it is the zones that appear microwave bright and the belts that appear dark. This switch may be due to temperature or to the amount of ammonia present in the belts and zones, since ammonia absorbs microwave radiation. More info is at [www.sciencedaily.com/releases/2021/10/211028153800.htm](http://www.sciencedaily.com/releases/2021/10/211028153800.htm).

### Mystery of Bennu's Boulder-Covered Surface Possibly Solved

Up until OSIRIS-REx neared its target, the asteroid Bennu, astronomers believed the asteroid was covered in fine regolith, created by meteoroid impacts over billions of years. However, the surface of Bennu actually turned out to be comprised almost exclusively of large rocks and boulders. Scientists now believe that the rocky covering of the asteroid is due to those rocks and boulders being extremely porous. Such porous rocks would compress, like sponges, when meteoroids hit them, instead of breaking and producing fine regolith. The porosity also slows heating and cooling as Bennu's surface by the Sun, leading to less heat-induced cracking as well. More information is at [earthsky.org/space/asteroid-bennu-boulder-mystery-solved-regolith-osiris-rex/](http://earthsky.org/space/asteroid-bennu-boulder-mystery-solved-regolith-osiris-rex/).

*continued on page 4*

*Biography – continued from page 1*



expansion history of the Universe, the evolution of cosmic structure and perform a statistical census of planets around other stars. She also leads a technology development program to modify detectors developed for particle accelerator experiments on Earth for use in space-based high energy astrophysics applications. Her scientific research focuses on the study of extreme high energy transients and the development of the ground and space-based observatories needed to pursue this. Prior to Roman, she was the project scientist for the Fermi Gamma-ray Space telescope which explored the violent and energetic universe in gamma-rays. She is the senior scientist for high energy astrophysics at Goddard Space Flight Center, and co-director of the Joint Space Sciences Center between Goddard and the University of Maryland. She holds professorships at the University of Maryland and the George Washington University. She is a fellow of the American Physical Society and a recipient of both the NASA Exceptional Scientific Achievement and the Outstanding Leadership Medals.

(Editor's Note: A video about the Nancy Grace Roman Space Telescope, named in honor of the longtime member of the National Capital Astronomers, is available at the following link - [www.youtube.com/watch?v=PNO\\_ofQijbY](https://www.youtube.com/watch?v=PNO_ofQijbY). Our thanks to Sue Bassett for informing us of the video.



**Nancy Grace Roman**

## 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](http://www.capitalastronomers.org) or the Rock Creek Park web site, [www.nps.gov/rocr/planyourvisit/expsky.htm](http://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](http://www.astronomyindc.org)

**The article-submission deadline for December’s issue of Star Dust, is November 21st.**

**Clear Skies!**

## Reflections on National Capital Astronomers’ Past, Present and Future

*Michael Chesnes*

Guy Brandenburg’s article in the October 2021 Star Dust, “Disturbing Racist Clauses Found in Early NCA Constitutions & Bylaws,” was an important call for us to reflect as an organization on our contribution to society as a whole. The information Guy found through his research was disappointing, but only initially shocking. On further reflection it wasn’t entirely surprising, considering the overall state of American society at that time.

I remain grateful to our predecessors who passed on to us our hobby of amateur astronomy as we know it today. Their talent, inventiveness, and determination are still awe-inspiring years or decades after their deaths. But clearly they let down their contemporaries, and we today can do better if we try.

Amateur astronomers are needed at star parties, science fairs, and planetarium shows, such as at the Owens Science Center in Lanham, MD, where much of my volunteering has taken place. As we emerge from the pandemic, there will be opportunities to participate on site in these events as well as virtually. Due to advances in communications and robotics, it is my suspicion that amateur astronomy will migrate away from the paradigm of owner/operators of small telescopes observing in person at local sites. The accessibility of equipment and techniques for amateur astronomy is related to the larger topic of diversity, equity, and inclusion (DEI) and worthy of a much longer essay.

## (957) Camelia, another odd-shaped asteroid

*David and Joan Dunham*

On 2021 September 15, around 8:54 UT, (957) Camelia occulted 7.2-mag. SAO 75054 from a path that extended from southern California to Minnesota. The occultation was recorded from nine stations deployed across the path in a plan coordinated with IOTA’s asteroidal occultation tool Occult Watcher. The event timings are projected in the sky plane at the asteroid in the figure on page 6. The odd shape of Camelia is clearly shown. The best-fit ellipse, with dimensions 83 by 51 km, fits the data poorly. Sometimes when we see results like this, timing errors are suspected, but in this case, all of the observations were with GPS time-inserted video, and the bright star resulted in very small time errors. A complication for this event was that 4.8-mag. lambda Arietis was only 37” from the target, but even in the case with two of the smallest telescopes used where the two stars were not separated, the changes in the combined star’s intensity when SAO 75054 disappeared and reappeared were clear and accurately timed.

Another interesting aspect is, although few observers tried this event, most ran two or more telescopes pre-pointed to the altitude and azimuth of the star: Joan and I ran 3 stations north and south of Wikieup, AZ; Ted Blank ran 3 more near Kingman (his two northernmost stations had no occultation and are not shown on the plot; they were both north of the closest miss line #10 by Vadim Nitikin in Colorado); Bob Jones ran 2 stations near 29 Palms, Calif.; and Steve Messner ran 2 telescopes in

*continued on page 6*

# Sky Watchers

## November/December

Mercury will appear lower in the morning sky as the days pass until it goes behind the Sun on Nov. 28, transiting to the evening sky in early December. Venus will remain in the evening sky throughout late November into December. Mars will be in the morning sky, but will still not be very visible due to being on the opposite side of the Sun from Earth. Jupiter and Saturn will be high in the eastern sky at sunset.	
11/17-18	The Leonids Meteor Shower peaks on the evening of the 17 <sup>th</sup> into the morning of the 18 <sup>th</sup> with approximately 15 meteors/hour. Unfortunately, the nearly full Moon will cause less-ideal-viewing conditions.
11/19	Full Moon at 3:59 a.m. A partial lunar eclipse will also take place, although it is partial in that only a small sliver of the Moon will not pass into the complete shadow of the Earth, the Umbra. The eclipse will begin when the first part of the moon enters the Earth's Penumbra at 1:02 a.m. and it will end at 7:03 a.m., only minutes after sunrise. More details can be found at <a href="http://eclipse.gsfc.nasa.gov/LEplot/LEplot2001/LE2021Nov19P.pdf">eclipse.gsfc.nasa.gov/LEplot/LEplot2001/LE2021Nov19P.pdf</a> .
12/4	Total Solar Eclipse – only visible in the Southern Atlantic, Antarctica and South Africa.

All times are in EST (Eastern Standard Time)

## Young Exoplanet Directly Imaged

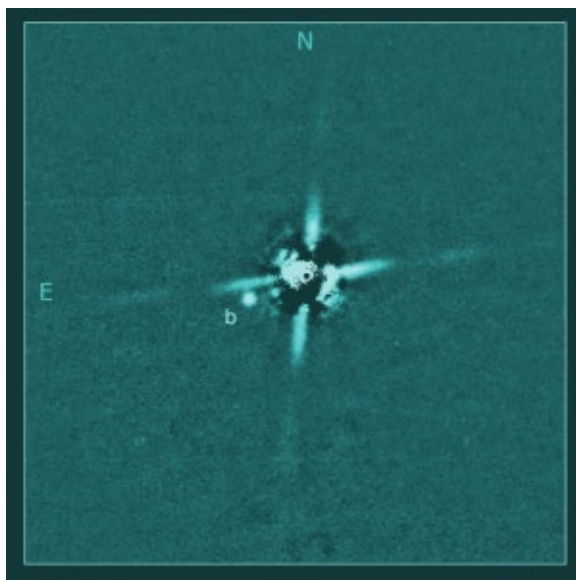


Image Credit – Subaru Telescope

Shown just left and below center in the above infrared image, the exoplanet designated 2M0437b lies approximately 400 light years away from Earth in a stellar nursery known as the Taurus Cloud. More information is available at [keckobservatory.org/infant-planet](http://keckobservatory.org/infant-planet). In addition, a prepublication copy of the paper detailing the research on the exoplanet, can be found at [arxiv.org/pdf/2110.08655.pdf](http://arxiv.org/pdf/2110.08655.pdf).

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**Thank you!**

*Recent Astronomy Highlights – continued from page 2*

### Possible Ancient 'Protocluster' of Galaxies Discovered

Astronomers believe they have discovered a protocluster, or a type of 'shipyard' where galaxies were in the process of forming together when the Universe was only three billion years old. Designated PHz G237.01+42.50, the protocluster seems to be forming stars at about 1000 times the current rate of one stellar mass per year of the Milky Way. Such a high rate implies that the protocluster is receiving a large amount of hydrogen and helium. The protocluster will likely be a target for further study by the James Webb Space Telescope which is scheduled to launch in December. More information on this discovery can be found at [www.sciencedaily.com/releases/2021/10/211027172624.htm](http://www.sciencedaily.com/releases/2021/10/211027172624.htm).

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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	Star	Mag.	Asteroid	dmag	dur.	Ap.	Location
							s	"	
Nov 10	Wed	21:55	4UC51507599	11.7	2002 TC302	8.7	21	5	NY, PA, OH; DC, VA?
Nov 15	Mon	0:36	4UC67234256	12.5	Aegle	0.8	17	6	SMD, SDC, CVA, seAZ
Nov 19	Fri	6:25	4UC56823448	11.7	Spiraea	4.2	4	5	neMD, se-WPA, neOH
Nov 21	Sun	19:53	4UC54104357	14.4	Automedon	1.7	6	12	NJ, eMD, DC, e&scVA
Nov 27	Sat	6:13	TYC12421614	11.7	2000 JW55	7.2	1.1	7	se-WMD; DC, nVA?
Nov 28	Sun	2:35	4UC52332111	14.3	Jimmiller	2.9	3	11	CMD, DC, nVA, SOH
Nov 30	Tue	5:07	TYC01541495	9.4	Romanskaya	8.2	2.4	3	sVA, nWNC, seTN
Dec 2	Thu	20:45	SAO 59047	6.7	Recha	7.3	4	2	seVA, CNC, wSC, nGA
Dec 3	Fri	5:12	SAO 118541	8.5	Dynamene	5.1	8	2	n&eTN, w&SNC, nSC
Dec 4	Sat	20:41	4UC60238680	12.6	Zeuxo	1.8	6	7	CNJ, nMD, nVA; DC?
Dec 5	Sun	2:54	4UC62326760	12.7	Franklina	2.8	2.1	7	SNJ, nMD, nMD, COH
Dec 6	Mon	23:25	TYC07570685	10.3	Hamatonbetsu	7	2.6	4	SNJ, nMD, nWV, SOH
Dec 8	Wed	1:26	TYC18682873	11.6	Caltech	3.5	4	5	s&wMD, DC, nVA, WPA
Dec 10	Fri	17:27	TYC11740404	10.1	1990 RE5	8.2	1.4	5	CVA, SMD, CDE, SNJ
Dec 12	Sun	0:59	4UC61645959	14.0	Hale	2.2	5	11	eVA, s&cMD, DC, WPA
Dec 14	Tue	2:14	TYC08081422	10.5	Careatia	5.8	4	4	SNJ, CMD, DC, n&cVA

## Lunar Grazing Occultations

2021	Day	EST	Star	Mag	% alt	CA	Location, Notes
Nov 11	Thu	18:16	ZC 3215	7.5	55+	31	8S Falmouth, VA; Largo, Crofton, MD
Nov 12	Fri	19:39	SAO 165327	7.8	65+	37	11S Ldysmt, Ambr, VA; LaPlt, Brstl, MD
Nov 21	Sun	21:24	ZC 902	6.6	93-	32	12N Wilsn, NC; sChesapek, nVA Bch, VA

## Lunar Total occultations

2021	Day	EST	Ph Star	Mag	% alt	CA	Sp.	Notes
Nov 11	Thu	22:03	D ZC 3227	6.3	56+	17	26N	K0
Nov 12	Fri	17:34	D 69 Aqr*	5.7	65+	31	59N	B9 Sn-8, ZC3343, m2 9, dT+43s
Nov 12	Fri	19:33	D SAO 165327	7.8	65+	37	20S	F0
Nov 12	Fri	19:39	D tau Aquarii	4.1	65+	38	13N	K5 ZC3349, mag2 10, dT +545s
Nov 12	Fri	19:45	R SAO 165327	7.8	65+	37	2S	F0 Term. Dist. 6"; Graze
Nov 13	Sat	17:36	D ZC 3480	7.2	74+	30	66N	F5 Sun altitude -8 degrees
Nov 13	Sat	19:02	D ZC 3484	6.9	75+	40	70S	G5
Nov 13	Sat	21:30	D ZC 3490	7.2	75+	40	71N	F8
Nov 15	Mon	1:20	D ZC 66	7.1	84+	18	26S	A0
Nov 17	Wed	17:48	D 31 Arietis	5.6	98+	18	61S	F7 Sun-11, ZC 384, close dbl
Nov 19	Fri	3:57	D SAO 93521	8.7	1E	34	88U	F8 lunar eclipse
Nov 19	Fri	5:01	R SAO 93521	8.7	43E	21	84U	F8 lunar eclipse
Nov 19	Fri	23:36	R 51 Tauri	5.6	99-	69	88N	F0 AA269, ZC631, dbl, TmD 11"
Nov 20	Sat	0:34	R 56 Tauri*	5.3	99-	73	73N	A0 AA283, ZC634, TermDst 11"
Nov 20	Sat	4:23	R kappa Tau	4.2	99-	39	30N	A7 AA326, ZC656, dbl?, TrmD4"
Nov 20	Sat	4:36	R 67 Tauri*	5.3	99-	37	60N	A7 AA296, ZC657, TermDst 11"
Nov 20	Sat	22:38	R 103 Tauri	5.5	97-	54	42N	B2 AA 313, ZC 767, close dbl
Nov 22	Mon	21:21	R ZC 1046	7.0	88-	21	57S	F8 close double?
Nov 22	Mon	21:31	R ZC 1049	6.8	88-	23	15S	A2
Nov 23	Tue	2:00	R 39 Gem	6.2	87-	72	85S	F8 ZC1061, close double?
Nov 23	Tue	2:14	R 40 Gem	6.4	87-	74	42S	B8 ZC1062, close double??
Nov 26	Fri	23:59	R SAO 99091	7.3	52-	8	49S	G5 Az77, mg2 10 dT -5sec
Nov 28	Sun	6:14	R ZC 1647	6.7	40-	59	76S	A2 Sun altitude -10 deg.
Nov 29	Mon	6:39	R SAO 119272	7.6	29-	51	44N	F5 Sun altitude -5 degrees
Nov 30	Tue	3:53	R SAO 139080	7.8	20-	15	18N	K0 Azimuth 105 degrees
Dec 2	Thu	6:23	R SAO 158842	7.2	5-	14	35N	K1 Sun -9, Azimuth 123 deg
Dec 2	Thu	6:24	R SAO 158831	7.9	5-	14	62S	F0 Sun alt. -8, Az. 124 dg
Dec 2	Thu	6:58	R SAO 158861	7.8	5-	19	54N	K2 Sun alt. -2 deg.
Dec 7	Tue	17:03	D ZC 3012	6.9	18+	24	90N	A7 Sun alt. -4 deg.
Dec 7	Tue	18:20	D SAO 189555	7.2	18+	17	66S	G1
Dec 7	Tue	18:34	D ZC 3018	6.4	18+	15	38N	G8 Azimuth 221 degrees
Dec 8	Wed	19:50	D 190556	7.0	28+	16	74N	K1
Dec 8	Wed	20:38	D ZC 3178	6.2	28+	9	74N	A0 Az. 236, close double?
Dec 10	Fri	22:16	D ZC 3458	6.2	50+	17	68S	K0
Dec 11	Sat	21:10	D ZC 25	7.4	60+	38	83S	G6
Dec 12	Sun	20:55	D ZC 128	7.0	69+	49	13N	G5
Dec 13	Mon	0:15	D SAO109613*	7.6	70+	18	8N	F6 close double??
Dec 14	Tue	0:59	D ZC 269	7.0	79+	21	46S	K0 mag2 12, 12", dTime -57s

\*in Kepler2 program so occultation light curves are sought.

More information is at [iota.jhuapl.edu/exped.htm](http://iota.jhuapl.edu/exped.htm)  
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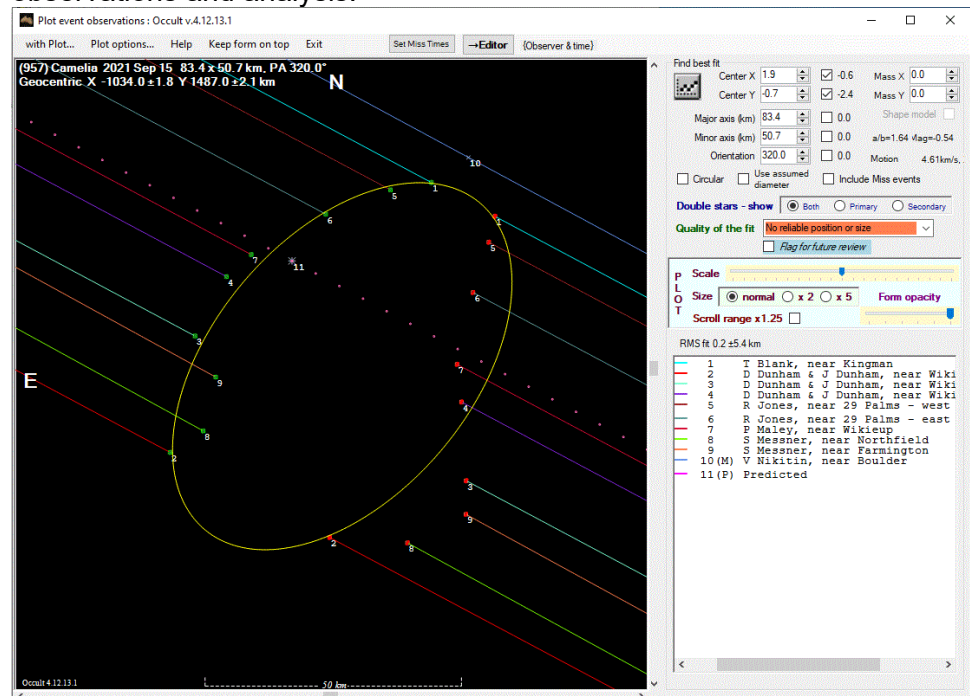
#### Social Media

Twitter: [@NatCapAstro](https://twitter.com/NatCapAstro)

(957) *Camelia*, another odd-shaped asteroid – continued from page 3

Minnesota. Paul Maley ran a station of his own north of Wikieup. We thank everyone who participated in this very successful occultation.

Camelia has no shape model determined from rotational light curve observations. Our observations of this occultation might motivate such observations and analysis.



Sky plane Plot of timings of the occultation of SAO 75054 by (957) *Camelia* on 2021 Sept. 15. Credit: John Moore, IOTA.



This map from Occult Watcher shows the 3 stations set up by Ted Blank in the upper left while our 3 stations are in the lower right. The green line is the predicted central line while the blue lines are the predicted limits, and the dark red lines are the limits in case of a 1-sigma shift to the north or south. The actual path was wider than predicted and shifted more than 1-sigma to the south. Credit: Google Maps, Occult Watcher, and David Dunham, IOTA.

*Recent Astronomy Highlights – continued from page 4*

**Astronomers Present Possible Discovery of Planet in Another Galaxy**

Until recently, all of the exoplanets discovered have been within the Milky Way and most within 3000 light years of Earth. However, astronomers have found evidence for a possible planetary candidate in M51, the Whirlpool Galaxy, which lies approximately 28 million light years away. If the planet does indeed exist, it is in a binary system with one of the stars having become either a neutron star or a black hole. The stellar remnant is feeding off of gas from its companion star, creating X-rays in the feeding process. Since the stellar remnant is small, only miles across, a planet transiting in front of it could completely block out the X-rays. Astronomers estimate that the planet is about the size of Saturn and orbits the binary at about twice Saturn’s distance from our Sun. More information is at [www.sciencedaily.com/releases/2021/10/211027094914.htm](http://www.sciencedaily.com/releases/2021/10/211027094914.htm).

**Calendar of Events**

**NCA Mirror- or Telescope-making Classes:** The Chevy Chase Community Center is reopening and classes are resuming. Classes will be Tuesdays and Fridays, from 5:00 to 8:30 pm at the Chevy Chase Community Center (intersection of McKinley Street and Connecticut Avenue, N.W.) Please contact instructor Guy Brandenburg at 202-262-4274 (leave message) or at [gfbrandenburg@yahoo.com](mailto:gfbrandenburg@yahoo.com) if you plan to attend. DC’s Department of Parks and Recreation wants folks to formally register. Also note that masks are mandatory, as in all DC government buildings. More info is at [guysmathastro.com](http://guysmathastro.com).

**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](http://www.astro.umd.edu/openhouse).

**Next NCA Meeting: 11 December 7:30 p.m.** Brian Williams (GSFC) **Remnants of Supernovae**

**The APS Mid-Atlantic Senior Physicists Group: (Zoom Meeting)** November 17th at 1:00 p.m., Stephen Obenschain, U.S. Naval Research Laboratory, will give a talk entitled "Progress Toward High-gain Inertial Confinement Fusion with Lasers". More information on the meeting is available at [www.aps.org/units/maspg/meetings/meeting.cfm?name=SENIOR1121](http://www.aps.org/units/maspg/meetings/meeting.cfm?name=SENIOR1121) . If you're interested in attending the meeting, please email [units@aps.org](mailto:units@aps.org).

**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.?

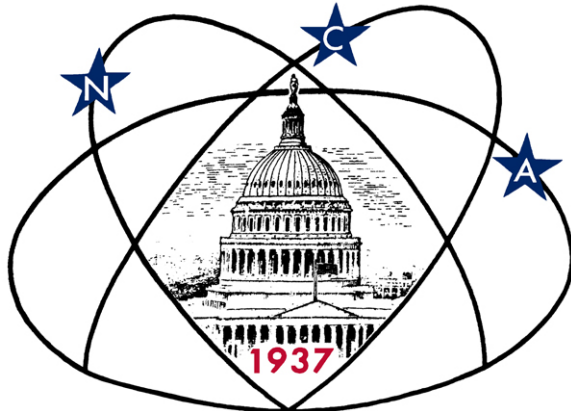
Are you interested in volunteering for: Telescope making, Exploring the Sky, Star Dust, NCA Officer, etc.?

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  
Alexandria, VA 22314

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*Celebrating 84 Years of Astronomy*

*Next NCA Meeting:*

**2021 November 13<sup>th</sup>**

**7:30 pm**

**(On Zoom)**

**Dr. Julie McEnergy**

To join the Zoom meeting, use the following link:  
[umd.zoom.us/j/96856095178?pwd=cWhyNE92bGFYUkYxZnl6eWVlK0lKdz09](https://umd.zoom.us/j/96856095178?pwd=cWhyNE92bGFYUkYxZnl6eWVlK0lKdz09)

Please download and import the following iCalendar (.ics) files to your calendar system: [umd.zoom.us/meeting/tJlIcu-opz4rHdxfgBb8Lh5wRlgETFQ8lnI5/ics?icsToken=98tyKuCupj4sGt2QsR6PRowAGo\\_4M\\_TxmCVcgqdFmhjHAXh\\_albhBO5FF4ZZIYDc](https://umd.zoom.us/meeting/tJlIcu-opz4rHdxfgBb8Lh5wRlgETFQ8lnI5/ics?icsToken=98tyKuCupj4sGt2QsR6PRowAGo_4M_TxmCVcgqdFmhjHAXh_albhBO5FF4ZZIYDc)

Please note that NCA Zoom meetings are often recorded.

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