Star Dust

Newsletter of National Capital Astronomers, Inc.

capitalastronomers.org

January 2018 ***Volume 76, Issue 5***

Celebrating 81 Years of Astronomy

Next Meeting

When: Sat. Jan 13th, 2018

Time: 7:30 pm

Where: UMD Observatory

Speakers: Dean Howarth and Rachel O'Connell

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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 over the Baltimore-Washington Parkway.

The National Capital Astronomers meeting is held at the UMD Astronomy Observatory on Metzerott 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.

An Evening with Isaac Newton

Dean Howarth and Rachel O'Connell

An evening with Sir Isaac. Historical interpreter, Dean Howarth, will portray noted scientist, Isaac Newton and be accompanied by Ms. Rachel O'Connell, who will portray Newton's niece, Catherine Barton Conduitt. Together they will share recollections of how the astronomical theories of their friend Edmond Halley led to Newton's legendary work, The *Principia*. When Newton moved to London he was accompanied by Catherine, the daughter of his half-sister Hannah. The charming and cosmopolitan young lady helped Newton navigate the London social scene and became the lady of the house on Jermyn Street. Many have heard of Newton's Laws, but few know of the man behind the equations. Join Catherine and her illustrious uncle for some stories about apples, comets...and fishes?!

Biographical Sketches:

Dean Howarth is a veteran physics teacher from northern Virginia. He has created a unique living history program to bring science to life, both for his students and for the public. In his skits he is often joined by a colleague. The skits show vividly how our understanding of the world has developed. They show science as a human activity, a groping for understanding, full of pitfalls and pre-conceptions to be overcome, with observations and measurements helping to steer us in the right direction. Dean and his colleagues regard this activity as a community service, and have performed at museums and historic sites.

Dean Howarth as Newton (copyright – Dean Howarth)

Portraying Catherine Barton is Rachel O'Connell, an adjunct performer with Living Histories of Science. In her 10-year collaboration with Dean

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Recent Astronomy Research Highlights

Over three centuries ago, Isaac Newton introduced the concept of Universal Gravitation, the idea that any body in the Universe attracts every other body. Einstein ultimately gave us an improved understanding of gravity, but the equations Newton derived are so accurate that they are still used today in everything from plotting out the courses of spacecraft through the Solar System to predicting the times of occultations. Nevertheless, gravity at work throughout the Universe leads to many mysteries that scientists continue to investigate. Below is news on some of those mysteries.

Newly Proposed Mechanism for Meteor Explosions

The 20-meter meteor that exploded 12 miles over Chelyabinsk on February 15, 2013 did so with a force thirty times that of the atomic bomb dropped on Hiroshima. Scientists recently proposed that such violent explosions are caused by high-pressure air penetrating cracks in the front of the meteor and building up the internal pressure to the point that the meteor explodes from the inside out. The paper outlining this mechanism can be found in Meteoritics and Planetary Science online at: http://onlinelibrary.wiley.com/doi/10.1111/maps.13034/full

Mystery of Black Hole Jet Formation

The most popular theories about the formation of jets from black holes claim that magnetic fields around those black holes ultimately cause such jets. But recent measurements of the magnetic field around a nine-solar-mass black hole known as V404 Cygni seem to indicate that it is too weak to form such jets. More information, including links to the original paper can be found at: http://www.astronomy.com/news/2017/12/astronomers-might-need-to-rethink-the-way-black-holes-form-jets

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Biographical Sketches – continued from page 1

Howarth, she has shared science-inspired living-history presentations for audiences of all ages at sites such as Mount Vernon, Gadsby's Tavern, Claude Moore Farm, the Banneker Historic Park, the Society of the Cincinnati, Rippon Lodge, and the Stabler-Leadbeater and Hugh Mercer Apothecaries. In the spirit of Abigail Adams, Rachel reminds us to "remember the ladies" in history.

Living History Videos

At the January 2016 NCA meeting, Dean and his student, Jennifer Horowitz, appeared as William and Caroline Herschel in "The Natural Philosopher." A video of that presentation is available at the following link: https://www.youtube.com/watch?v=9duJ9xhbPGI

In January of 2017, Dean and Jeff Jones presented "Kepler vs. Tycho: Does the Earth Orbit the Sun?" with Dean as Tycho Brahe and Jeff as Johannes Kepler. A video of the presentation is available at: https://www.youtube.com/watch?v=xjf_KD9D85g&t=27s

These videos were prepared by Rupert Chapelle and Harold Williams.

The Disappearance of π Capricorni

David Dunham

Early Friday evening, October 27, 2017, the first-quarter Moon occulted 5.1-magnitude π Capricorni (π Cap = Zodiacal Catalog #2981) across the Mid-Atlantic region. It was a fine night, and the Applied Physics Laboratory (APL) Astronomy Club held their "Friends and Family" star party at a darkened location near APL's 60-foot space communications antenna in northwestern Laurel, MD. At the star party, I set up a 10-inch "suitcase" telescope to video record the occultation, as well as half a dozen others of stars ranging from 10th to 8.2 magnitude that occurred during the star party.

The π Cap event was nearly grazing, with the disappearance on the dark side of the Moon, 15° from the northern cusp. The northern limit of the occultation passed about 10 miles south of Harrisburg, PA, but we did not try to observe the grazing occultation there since we knew that it would be unobservable, occurring among sunlit mountains on the bright side of the lunar cusp.

π Cap is a triple-star system in which the Aa and Ab components are stars forming a close binary while the B component is a star orbiting the binary farther out. The 8.5-magnitude B component was 3.6 arcseconds[1] away in position angle (PA) 149° such that it would disappear 33 seconds before the primary. The conditions were not good enough to resolve the B star, and the recording of the Aa component was saturated, so the small dip in the light curve that must have occurred when B disappeared, was lost. But the star's Ab component, magnitude 7.9, which was discovered by the HIPPARCOS mission[2], is estimated to be only about 0.1 arcseconds away. We hoped to resolve that star with the occultation since its current location in its orbit was not known.

[1] an arcsecond is 1/3600th of a degree. For reference the full Moon is approximately half a degree or 1800 arcseconds in width.

[2] HIPPARCOS - HIgh Precision PARallax COllecting Satellite

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Exploring the Sky

*"**Exploring the Sky**"* is an informal program that, for over 60 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 welcome—and it's free!

Exploring the Sky will return in April 2018.

The Disappearance of π Capricorni – continued from page 2

The effort was successful, as shown in the figure below, a plot of the light curve of the occultation generated with IOTA's[3] Tangra software. Dots show the light intensity at one-frame (0.03 second) intervals. The vertical red line marks the disappearance of the primary star, approximately at the 25% intensity level (remembering that the recording was saturated, meaning that the highest part of the light curve was cut off), which according to Fresnel diffraction theory, corresponds to the geometric occultation; due to diffraction, it took the star 4 frames or 0.12 seconds to disappear. An image of the star, showing the circular aperture to define its intensity, is at the bottom; a larger annulus was used to determine the background. To the right of the star image is a plot of the intensity across the star. To the far left, behind the light curve plot, is part of the full video frame that shows the star and the aperture near the top. Six frames to the right of the disappearance of the primary star, the light curve drops to the occulted level, but this is not when the Ab component disappeared; rather Tangra could not keep lock on the faint star and the aperture wandered off of it then. Examining the video frames showed that the Ab component actually disappeared 0.37 seconds (11 frames) later.

[3] IOTA – International Occultation Timing Association

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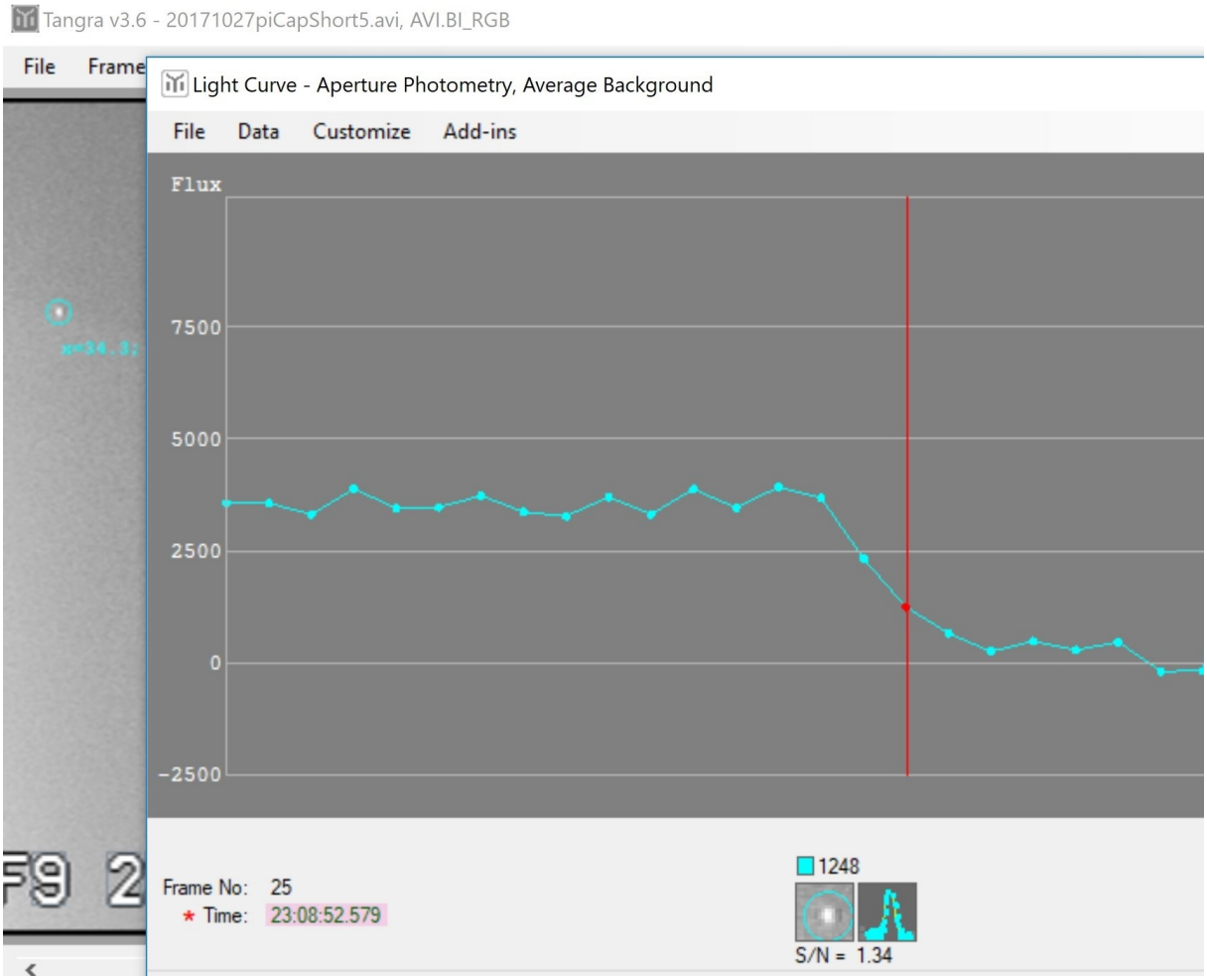

Light curve of the π Cap disappearance recorded by D. Dunham; see the text for details.

The Disappearance of π Capricorni – continued from page 3

A few minutes earlier, Michael Skrutskie at the University of Virginia's Leander McCormick Observatory recorded the occultation as well. His recording also shows the companion, but at that location farther from the northern limit of the occultation, the Ab component disappeared only 0.14 arcseconds (two of their FITS-format frames)[4] after the bright Aa star. The near-grazing geometry and different local lunar slopes are probably responsible for these differences.

[4]FITS – Flexible Image Transport System, the digital file format used most often in astronomy

Sky Watchers

January/February

Venus rises higher in the evening sky from January into February. Mercury transitions from morning sky to evening sky in mid-February. Jupiter, Mars and Saturn rise in the early morning hours.	
1/31	Full Moon (8:27 a.m.) and Lunar Eclipse. This will be the last of two supermoons in January. Since it is also the second Full Moon of the month, it is a Blue Moon. It is known as the Snow Moon. Unfortunately, with regard to the lunar eclipse, the Moon will only just be starting to enter the umbra, the fully shadowed region, of the Earth when it sets on the East Coast.

Times - Eastern Standard Time

Calendar of Events

NCA Mirror- or Telescope-making Classes: Tuesdays AND Fridays, from 6:30 to 9:45 pm at the Chevy Chase Community Center (intersection of McKinley Street and Connecticut Avenue, N.W.) Contact instructor Guy Brandenburg at 202-635-1860 or at gfbrandenburg@yahoo.com.

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 can be found at: www.astro.umd.edu/openhouse

Mid-Atlantic Senior Physicists Group: "Fundamental Physics and the Fifth Dimension" with Dr. Raman Sundram of the University of Maryland. Wed. Jan. 17th, at 1 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. http://www.aps.org/units/maspg/

Upcoming NCA Meeting at the University of Maryland Observatory: 10 February: Brett Denevi (JHU/APL), *The New Moon*

UMD Amateur Radio Astronomy Team Meetings: Wednesdays and Saturdays 2:00 p.m. to 5:00 p.m. (and other times when interesting phenomena occur) at the University of Maryland Observatory. For more information, contact Sarah Brown - Sarah.E.Brown@verizon.net

Montgomery College's Planetarium: "How Are Stars Born?" Saturday, January 27 at 7:00 p.m. Directions and information can be found at http://www2.montgomerycollege.edu/departments/planet/

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Editor: Todd Supple

Editorial Advisors:

- Michael Chesnes
- John D. Gaffey, Jr.
- Jeffrey Norman
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- Harold Williams

Electronic Distributor: Jay Miller

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Thank you!

The submission deadline for February's Star Dust, is Jan. 24th.

Clear Skies!

Recent Astronomy Research Highlights – continued from page 2

Alternate Theory of Solar-System Formation

A currently popular theory is that our Solar System was formed when a supernova triggered the collapse of a cloud of gas. But based on the abundances of two isotopes, aluminum-26 and iron-60, in our Solar System relative to their average abundances in the rest of the galaxy, scientists have proposed that our Solar System may instead have originated in the shell of a bubble formed around a Wolf-Rayet star, a type of star 40 – 50 times as big as our Sun. More can be found at the following link: http://iopscience.iop.org/article/10.3847/1538-4357/aa992e/meta

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

Date	Day	EST	Star	mag.	Asteroid	dmag	dur. s	Ap. "	Location, Notes
2018									
Jan 12	Fri	22:12	4UC59639934	12.9	Majuba	2.4	3	3	nDE,MD,DC,nVA,WV
Jan 13	Sat	19:39	TYC52401315	11.7	Anahita	1.7	1.1	9	nMD,sePA,nDE,NJ
Jan 21	Sun	17:55	SAO 74826	9.6	America	5.7	2	4	nwPA,sNY,MA,sNH
Jan 24	Wed	23:28	4UC50849644	12.9	Deikoon	4.8	4	10	NJ,PA;MD,DC,nVA?
Jan 31	Wed	19:59	TYC48661456	11.4	Herluga	3.5	3	6	neNC,sVA,sWV,KY
Feb 3	Sat	2:28	4UC44243434	12.1	Thereus	8.1	3	8	TNO,NEng;eUSA?
Feb 5	Mon	1:56	4UC49723500	13.1	Pretoria	1.4	17	11	DE,MD,DC,nVA,WV

* before the asteroid name indicates an event in the list of high-interest asteroidal occultations of the ESO Large Programme.

Lunar Grazing Occultations

Date	Day	EST	Star	Mag	% alt	CA	Location & Remarks
2018							
Jan 26	Fri	18:43	SAO 93802	9.0	72+ 62	7S	Dulles,VA;Rockv,Colmb,Balt,MD
Feb 9	Fri	5:59	ZC 2390	6.7	33- 31	10S	Overtn,Midlothn,Chesapeake,VA

* No expedition from the DC region expected
Interactive detailed maps at http://www.iota.timerson.net/

Total Lunar Occultations

Date	Day	EST	Ph	Star	Mag	%	alt	CA	Sp.	Notes
2018										
Jan 19	Fri	17:57	D	ZC 3261*	8.9	7+	18	77N	G6	Sun -9;mg2 12 .8" PA296
Jan 19	Fri	18:19	D	SAO164933*	9.6	7+	16	82N	K0	Sun -11
Jan 20	Sat	17:42	D	ZC 3377	7.9	13+	30	82S	K0	Sun altitude -6 deg.
Jan 21	Sun	17:52	D	SAO 146928	7.8	20+	38	61S	G5	Sun -7,mg2 10, sep .2"
Jan 21	Sun	20:25	D	SAO146959*	9.8	21+	14	66S	G0	Azimuth 252 deg.
Jan 21	Sun	20:55	D	X 53937*	9.7	21+	9	67S	G5	Azimuth 256 deg.
Jan 21	Sun	21:12	D	SAO146968*	9.7	21+	6	72N	G5	Azimuth 259 deg.
Jan 23	Tue	17:44	D	ZC 210	6.6	39+	54	50N	B9	Sun -5,mg2 9.5 6" PA329
Jan 23	Tue	18:42	D	SAO109910*	9.7	40+	51	75N	G0	mag2 13 sep 5" PA 66 dg
Jan 23	Tue	19:02	D	SAO109917*	9.3	40+	48	84S	G0	
Jan 23	Tue	19:15	D	X 2066*	9.0	40+	47	62N	F8	mag2 10 sep 1.1" PA 60
Jan 23	Tue	22:09	D	SAO 109982	8.2	41+	18	77S	F5	
Jan 24	Wed	17:43	D	SAO 110466	8.0	50+	58	67S	F2	Sun alt. -5 degrees
Jan 24	Wed	21:05	D	SAO 110502	7.6	51+	41	39N	F0	
Jan 25	Thu	21:56	D	ZC 479	8.2	63+	44	70S	K5	
Jan 26	Fri	0:35	D	ZC 491	6.0	64+	15	40S	K0	Az. 275, close double?
Jan 26	Fri	18:39	D	SAO 93806	7.7	72+	62	73N	A0	close double?
Jan 26	Fri	22:32	D	ZC 627	6.6	74+	50	23N	K1	
Jan 27	Sat	21:29	D	ZC 787	7.1	83+	68	78N	B3	mag2 8.3 sep 3" PA165
Jan 28	Sun	1:04	D	SAO 94510	7.3	84+	34	74N	K5	
Jan 28	Sun	3:30	D	ZC 823	6.7	85+	7	52S	A2	Az288,mg2 10 3" PA129
Jan 28	Sun	17:50	D	SAO 95391*	9.2	90+	35	81N	A2	Sun -5; close double?
Jan 28	Sun	18:24	D	SAO 95409*	9.1	91+	42	48N	F5	Sun alt. -12 deg.
Jan 28	Sun	22:36	D	ZC 971	7.3	91+	69	22N	G5	
Jan 29	Mon	2:49	D	SAO 95760*	8.8	92+	26	32S	G0	
Jan 29	Mon	4:15	D	22 Gem	7.1	93+	11	86S	A0	Az.286, ZC 1006
Jan 30	Tue	3:44	D	ZC 1151	6.9	98+	28	74S	F0	
Feb 1	Thu	1:02	R	7 Leonis	6.3	99-	65	52S	A1	AA 229,ZC1415,TrmDst 8"
Feb 1	Thu	2:20	R	11 Leonis	6.6	99-	60	87S	F2	AA 264,ZC1420,TrmDst14"
Feb 1	Thu	5:05	R	psi Leonis	5.4	99-	32	46N	M2	AA 312,ZC1434,TrmDst 9"
Feb 1	Thu	20:45	R	ZC 1529	6.6	96-	18	78N	G5	Axis Angle 277 deg.
Feb 3	Sat	6:54	R	ZC 1693	7.5	89-	26	36N	F5	Sun altitude -4 deg.
Feb 4	Sun	1:37	R	ZC 1781	7.6	82-	44	77N	M*	
Feb 6	Tue	3:21	R	SAO139740*	9.4	63-	37	48S	F8	
Feb 8	Thu	2:28	R	ZC 2245*	6.3	43-	11	58S	K0	Azimuth 119 degrees
Feb 8	Thu	3:29	R	X 39928*	8.3	43-	20	66S	F5	mag2 10 sep 3" PA 323dg
Feb 8	Thu	4:54	R	SAO159490*	8.3	42-	30	78N	F0	
Feb 9	Fri	6:16	R	ZC 2390*	6.7	33-	30	32S	B9	Sun altitude -10 deg.
Feb 10	Sat	4:24	R	SAO 160534	8.3	25-	11	43S	F0	Azimuth 127 deg.

*The star is in the Kepler 2 exoplanet search program so lightcurves of the occultation are desired to check for close stellar duplicity

Further explanations & more information is at
http://iota.jhuapl.edu/exped.htm .
David Dunham, dunham@starpower.net

2017-2018 Officers

President:
Harold Williams
haroldwilliams@me.com or
Harold.Williams@montgomerycollege .edu

Vice-President:
John Hornstein
jshgwave@yahoo.com
301-593-1095 (h)

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jeffreynorman@comcast.net

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Appointed Officers and Committee Heads:
Exploring the Sky
Jay Miller
jhmiller@me.com

Telescope Making
Guy Brandenburg
gfbrandenburg@yahoo.com
202-635-1860

NCA Webmaster
Elizabeth Warner
warnerem@astro.umd.edu
301-405-6555

Star Dust Editor
Todd Supple
NCAStardust@gmail.com
301-595-2482 (h)

Social Media
Liz Dervy
Twitter: @NatCapAstro

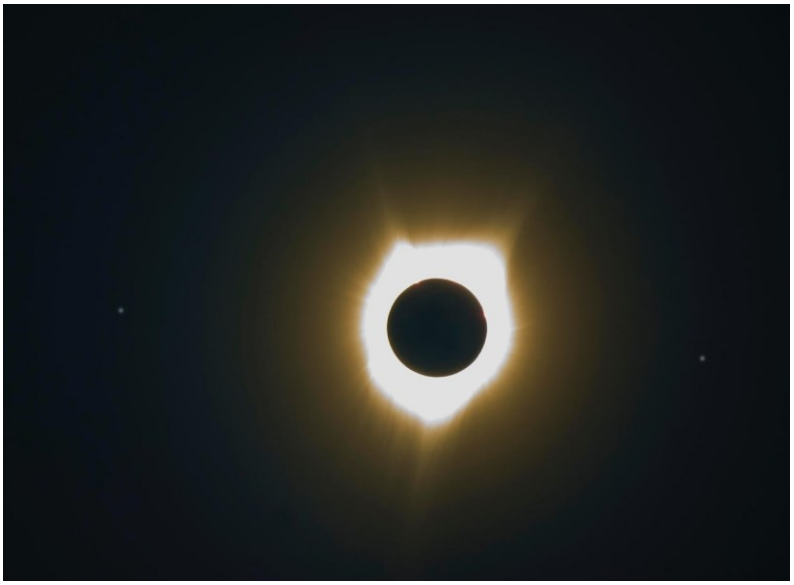
Report From New Hampshire

Dick Byrd

Just a note to let you all know that Nancy and I are doing fine up here in the Great North Woods of New Hampshire. We belong to the NH Astronomical Society (NHAS). This is a very active group and has an observatory not unlike Hopewell.

NHAS roll-off roof observatory, somewhat reminiscent of Hopewell, but really not as large nor as well-done. It houses a 14" Celestron.

In August, we did a long trek by car (6,500 miles!) to see the total eclipse. We camped in Oregon, near the Idaho border in the desert. Temps were 100F+ day and 50F night. It was a great eclipse. The sky was crystal clear.



The Eclipse at Totality

I was prompted to write to my NCA friends after seeing that NHAS has been awarded the 2017 Outreach Award by the NASA Night Sky Network. Several years ago, we were awarded the "Out-of-This-World" award by Astronomy magazine, "…for sharing the wonders of the

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New Hampshire Shoreline – beautiful, but far from ideal for stargazing

Stellafane

Report from New Hampshire – continued from page 6

Universe with the public through the placement of telescopes at libraries throughout New England." Our club, in conjunction with Orion Telescopes, has placed telescopes (the Orion StarBlast 4.5 inch) in almost every library in New Hampshire! They can be checked out by our citizens for free and they come with instructions for set-up and use. Certain modifications are made to the telescopes for ease of use and resistance to mishandling. Club members often act as "foster-parents" to the telescope in a library. In addition, we train a library staff member as an apprentice astronomer. This is a great way to introduce youngsters to astronomy! You can see more detail on this at our club web site: http://nhastro.com/ltp.php

We live on the shores of Mirror Lake in central NH in a dense forest, which is beautiful, but NOT good for observing. From our septic field, the only place on the lot that is treeless, we can see about 10 degrees around Zenith! Since Stellafane is a short trip to Vermont, I visited it this past Summer.

We just wanted you to know we still remember well our over twenty-five-year membership in your great organization. Take care.

(Dick and Nancy Byrd were members of the NCA starting back in the 1970s. Nancy served a year as President in the 1990s and was editor of Star Dust for several years. Dick and Nancy were also part of the original group, along with Bob McCracken, Bob Bolster and others, that built the Hopewell Observatory in Haymarket, VA.)

National Capital Astronomers Membership Form

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

Address: _____ **ZIP Code:** _____

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

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

Please indicate which activities interest you:

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

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

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

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

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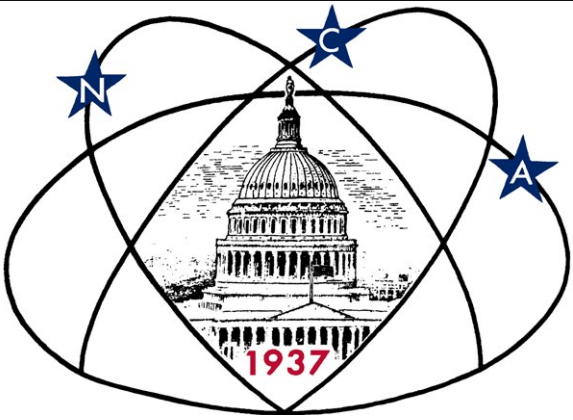

Celebrating 81 Years of Astronomy

Next NCA Meeting:

2018 January 13th
7:30 pm
@ UMD Observatory

Dean Howarth and Rachel O'Connell *present* "An Evening with Isaac Newton"

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