

Star Dust

Newsletter of National Capital Astronomers, Inc.

capitalastronomers.org

January 2017

Volume 75, Issue 5

Next Meeting

When: Sat. Jan. 14th, 2017

Time: 7:30 pm

Where: UMD Observatory

Speakers: Dean Howarth
& Jeffrey Jones

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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 "The Common," the restaurant in the UMD University College building located at 3501 University Blvd.

The meeting is held at the UMD Astronomy Observatory on Metzert Rd about halfway between Adelphi Rd and University Blvd.

Need a Ride?

Please contact Jay Miller, 240-401-8693, if you need a ride from the metro to dinner or to the meeting @ observatory. Please try to let him know in advance by e-mail at rigel1@starpower.net.

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.

Kepler Debates Tycho: Does the Earth Orbit the Sun?

*Dean Howarth and Jeffrey Jones
Natural Philosophers & Educators*

Abstract: The story of the flamboyant Danish astronomer, Tycho Brahe, and the ingenious German mathematician, Johannes Kepler, is one of the most interesting episodes in the history of science.

Appearing in period attire and using an array of replica instruments and demos, Dean and Jeff capture the dynamic rivalry between the two men of science in a witty, yet scientifically accurate, narrative suitable for all ages and all levels of interest and experience.

Principles of astronomy and physics, and even arcane theories of the past are shared and debated with the audience who learns that the lessons of the past have much to do with the science of today!

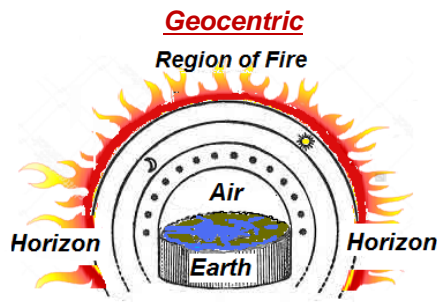


Courtesy Cytcerones (cc)

Monument to Tycho Brahe and Johannes Kepler in Prague

continued on page 2

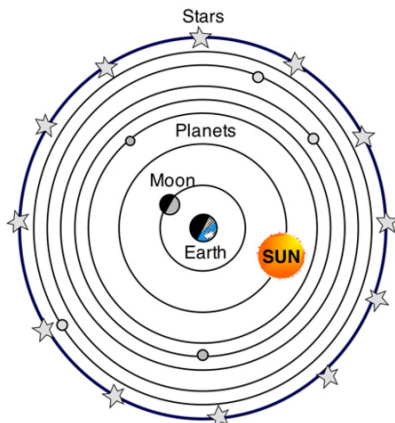
Early Solar System Beliefs



(underground courses of heavenly bodies)

Modified from Blogger.com'SX1508

The philosopher, Anaximander, used reason & observations to derive a model of the Universe. His model features Earth's flat surface atop a cylindrical base (ca 5th century BCE). A solid sphere separates the fire region from the air, which contains Earth & stars. However, the sphere has holes in it that allow the light of the fire ring to shine through as additional stars. The philosopher also indicated that there were 3 continents on Earth: Asia, Europe & Libya.



Courtesy pics-about-space.com

Ptolemy's model (2nd century CE) features fixed stars and a spherical Earth at the center. There were heliocentric models (e.g., Aristarchus of Samos) before Claudius Ptolemaeus proposed his geocentric model; but they didn't gain ground. In addition, the geocentric view was accepted by the Roman Catholic Church in the Middle Ages and any open opposition to this view was heresy.

continued on page 3

• *Kepler Debates Tycho – continued from page 1*

Biographical Sketch:

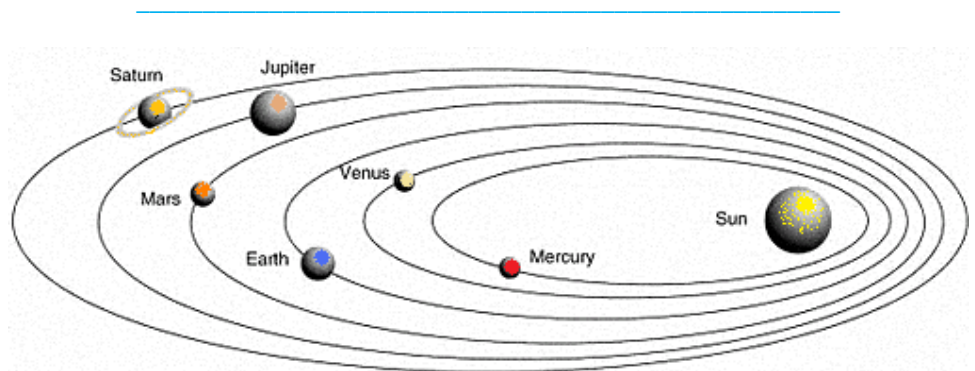
• Dean Howarth and Jeffrey Jones are veteran physics teachers in Fairfax County, VA. For over a decade, the two have collaborated on unique and innovative ways to bring science to life. Both men are firm believers that the history of science is a fruitful and compelling way to introduce the



Courtesy Dean Howarth

• sometimes complex principles of science to their students and to the public.

• Stories about the great scientists of the past show the human element and drama behind great advances in science. This drama remains intriguing throughout the ages and invites listeners to learn more about the science and technologies that affect modern life.

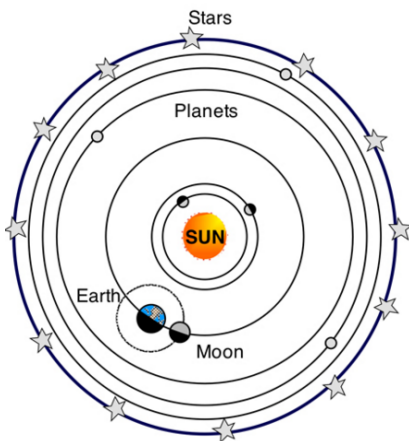


Courtesy Philosophy in Georgetown (WordPress.com)

• Tycho Brahe's assistant, Johannes Kepler, was a Copernican. Among other things, he discovered that the planetary orbits in the Solar System were elliptical.

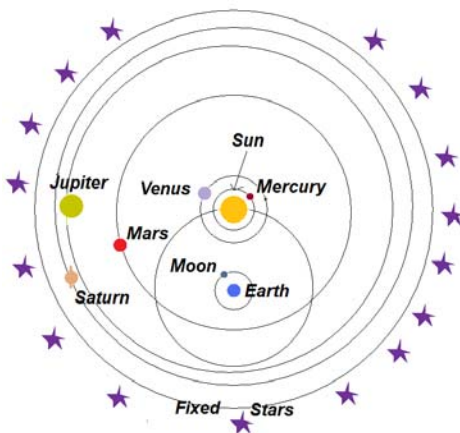
System Beliefs – continued from page 2

Heliocentric



Courtesy pics-about-space.com

Nicolaus Copernicus (Mikolaj Kopernik), proposed that the Sun was the center of the planetary system. In 1514 CE, he released a manuscript, “Small Commentary,” in which he introduced his heliocentric system; and, “On the Revolutions of the Heavenly Spheres” was released in 1543, just before Copernicus died. The latter work was banned by the Church in 1616 (a few months after Galileo’s Inquisition trial). It remained a prohibited book until 1835.



Courtesy DL Jeffery - UNLV Physics & Astronomy

Tycho Brahe (17th century CE) developed an integrated model of both geocentric & heliocentric components: all other planets orbit the Sun, which orbits Earth.

Sky Watchers

Winter Schedule

January

12	6:43 am – Full Moon , Global. Other Moon Names: <i>Full Wolf Moon, Moon After Yule, Old Moon. Snow Moon.</i> 9:00 pm – Planets , N. Hemisphere. Venus 0.4° north of Neptune.
17	8:00 pm - Asteroids , N. Hemisphere. Vesta (in opposition to the Sun).
18	12:00 am – Planets , N. Hemisphere. Jupiter 3° south of Moon.
19 -28	Evening – Globe at Night , Global. Features: <i>Constellation Orion</i> (N. & S. Hemispheres).
21	7:14 pm – Moon , Global (apogee at 251,602 miles).
24	5:00 am - Planets , N. Hemisphere. Saturn 4° south of Moon.
31	8:00 pm – Planets , N. Hemisphere. Mars 2° north of Moon.

Times EST

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 all welcome—and it’s free!



The Program will return in April 2017!

Hosted by: [National Capital Astronomers, Inc](#) and [Rock Creek Park](#)

Vera Rubin and the NCA

John Hornstein

You have probably seen the articles in the Washington Post and elsewhere on Vera Rubin's death. Vera Rubin made epochal contributions to astronomy, especially to our understanding of what material the Universe is comprised.



*Vassar College, courtesy AIP Emilio Segrè Visual Archives
Vera at Kitt Peak National Observatory*

In particular, her measurements of the orbital rotation speeds in spiral galaxies as a function of the distance from the galactic center eventually forced astronomers to take Fritz Zwicky's earlier assertion seriously - based on his measurements of clusters of galaxies - that there was an enormous amount of matter in the Universe that doesn't produce or absorb light. Vera's contribution led to the realization that most of the matter (as distinguished from the Dark Energy) in the Universe was Dark Matter. This has since been confirmed in ways that are quite independent of both Vera's and Zwicky's types of measurements. It has been confirmed by gravitational lensing (the gravity produced by Dark Matter deflects light) and by cosmological measurements on the fluctuations in the cosmic microwave background radiation.

You might not know that Vera also had a long-lasting connection to the NCA.

She joined the NCA while still a teenager, and resumed her association with the NCA when her career trajectory brought her



*Vassar College, courtesy AIP Emilio Segrè Visual Archives
Vera looking through a telescope at Vassar College (NY)*

continued on page 6

• **Star Dust** is published ten times yearly
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• trees and have one-click access to all the
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• switch from paper to digital, please contact
• Henry Bofinger, the NCA Secretary-
• Treasurer, at hbofinger@earthlink.net

Thank you!



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 Watts angle (WA) is given; it is aligned with the Moon's rotation axis and can be used to estimate where a star will reappear relative to lunar features. The selenographic latitude is WA -270. For example, WA 305 - 310 is near Mare Crisium.

Mid-Atlantic Occultations

David Dunham

Asteroidal and Planetary Occultations

Date	Day	EST	Star	Mag	Asteroid	dmag	dur.	Ap.	Location, Notes
Jan 12	Thu	2:44	4UC58620000	12.5	Ruvuma	3.4	3	8	neNC, se-cVA, cWV
Jan 16	Mon	23:21	2UC38742909	11.9	Picka	3.0	11	7	seMD, c&wVA, seKY
Jan 18	Wed	2:23	HI P 41443	9.7	Adria	3.3	7	4	DE, MD, DC, nVA, cOH
Jan 20	Fri	0:18	TYC12540475	10.4	Gierasch	5.4	6	5	sePA, MD, DC, VA
Jan 21	Sat	1:04	TYC18860343	10.9	Hertha	1.7	10	6	cVA, cWV, sOH, siN
Jan 21	Sat	2:10	4UC67939848	13.5	Freda	1.5	9	11	neNC, cVA, nWV, OH
Jan 23	Mon	2:31	TYC08321229	10.8	Antenor	5.1	6	6	MD, DC, nVA, swPA
Jan 24	Tue	21:01	TYC00521250	9.9	Hugo	7.2	1	4	nWSC, cenNC, seVA
Jan 28	Sat	22:12	4UC55829711	13.1	Armi da	1.2	12	10	DE, MD, DC, nVA, LAX
Jan 30	Mon	22:29	SAO 96656	8.5	Hersilia	4.1	10	3	nNC, wVA, sKY, DEN
Feb 11	Sat	2:58	4UC50649837	12.8	Regina	3.2	3	10	MD, DC, nVA, cOH
Feb 11	Sat	3:11	2UC24356800	12.1	Baucis	1.6	8	8	eOH, eWV, cVA, eNC

Lunar Grazing Occultations

Date	Day	EST	Star	Mag	% alt	CA	Location & Remarks
Jan 22	Sun	6:28	ZC 2280	6.5	26- 32	5S	Rapdn, Broknbrg, Cedon, Glens, VA
Jan 31	Tue	20:23	5 Ceti	6.2	17+ 12	1S	s. DC suburbs, Opal VA-CroomMD
Feb 2	Thu	19:25	SAO 110188	9.8	36+ 45	3S	*StephensCity, VA; Sykesville, MD
Feb 3	Fri	23:26	ZC 426	8.4	49+ 15	5N	Malta, Dublin, PA; E. Windsor, NJ

No expedition from DC planned

*** Interactive detailed maps at <http://www.iota.timerson.net/> ***

Total Lunar Occultations

Date	Day	EST	Ph Star	Mag	% alt	CA	Sp.	Notes
Jan 9	Mon	2:28	D 48 Tauri *	6.3	86+ 17	29S	F5	ZC 626
Jan 9	Mon	3:56	D gamma Tau	3.7	86+ 1	65S	G8	Az 289, ZC 635, double??
Jan 17	Tue	5:30	R ZC 1732	6.8	73- 50	81S	K0	close double??
Jan 18	Wed	0:08	D Porrima	2.8	66- 12	-82N	F0	Az 102, AA 80, ZC 1821
Jan 18	Wed	1:16	R Porrima	2.8	65- 25	80N	F0	mg1=mg2=3.5, 1.2s apart
Jan 18	Wed	2:27	R ZC 1825	5.9	65- 36	57N	G8	
Jan 19	Thu	3:55	R SA0139388*	7.9	55- 38	53S	K2	
Jan 21	Sat	4:59	R ZC 2158	7.5	36- 30	80S	A0	
Jan 22	Sun	6:42	R ZC 2280	6.5	26- 32	25S	M1	Sun altitude -8 degrees
Jan 24	Tue	6:50	R ZC 2531	7.5	12- 21	53N	K0	Sun alt. -6 deg.
Jan 29	Sun	18:19	D X 51773*	9.5	4+ 10	38S		Sun -10, Azimuth 247 dg
Jan 31	Tue	20:18	D 5 Ceti	6.2	17+ 13	11S	K2	Az257, ZC13, sp. bin., grz.
Jan 31	Tue	20:18	D ZC 15	7.1	17+ 13	69S	G5	Az. 257, close double?
Feb 1	Wed	18:12	D ZC 128	7.0	26+ 45	52S	G5	Sun alt. -9 deg.
Feb 1	Wed	20:54	D SA0109613*	7.6	26+ 18	70N	F6	close double??
Feb 3	Fri	17:18	D mu Ceti	4.3	47+ 60	48S	F1	Sun +2, ZC 405, triple?
Feb 4	Sat	20:55	D SAO 93603*	8.8	60+ 54	55S	F8	
Feb 4	Sat	21:04	D SAO 93605*	8.7	60+ 52	68N	K0	
Feb 4	Sat	23:41	D ZC 576*	8.1	61+ 24	68S	G5	mag2 11 sep. 9" PA 103
Feb 6	Mon	0:51	D SAO 94187	7.2	72+ 23	73N	F8	spectroscopic binary
Feb 6	Mon	2:22	D ZC 741	5.5	73+ 6	46N	K1	Az. 287, close double?
Feb 9	Thu	23:09	D 54 Cancris	6.4	99+ 66	66N	G2	ZC1323, dbl ??, TrmDst14"
Feb 11	Sat	19:25	R rho Leonis	3.8	99- 8	46N	B1	Az85, AA312, ZC1547, dbl ?
Feb 14	Tue	3:53	R SA0138774*	7.7	88- 49	85N	G5	Close double??

* 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>

David Dunham, dunham@starpower.net

The southern-limit grazing occultation of 6.2-magnitude 5 Ceti (= ZC 13) around 8:23 pm EST (Jan. 31) will be visible between the two dark gray lines crossing the southern Washington, DC suburbs shown in the map.



Check <http://iota.jhuapl.edu> for links to the lunar profile, and to similar maps for the graze of SAO 110188 on Feb. 2nd.

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Vera Rubin – continued from page 4

back to the Washington area, when she earned her PhD under George Gamow, and later, when she joined the staff of the Carnegie Institution of Washington.

Vera continued to attend NCA meetings until late in 2007. There are several fascinating online articles about her life, her personality, and her struggles with gender bigotry.

Learn More About Vera

Personal recollections by people who knew Vera

- docs.google.com/document/d/1H5zUk4CKxbru6pJTSIEPJsdJG2mG0hvGqplPIr5j7TI/edit

The 13th item is an amusing brief recollection by Nancy Grace Roman, and the next-to-last item is by Wayne Warren. It cites a phenomenon that every one of us has noticed, and that might well have been what first triggered Vera's interest in astronomy.

The American Institute of Physics

- www.aip.org/remembering-vera-rubin

AIP is providing access to audio and video interviews with Vera, and with prominent astronomers talking to Vera about her life

Astrobites

Astrobites, an astronomy blog, posted a fine brief article by Leonardo dos Santos:

- astrobites.org/2016/12/30/the-unsung-contributions-of-vera-rubin-her-mission-in-retrospect/

There is also a very informative Astrobites post by Zephyr Penoyre:

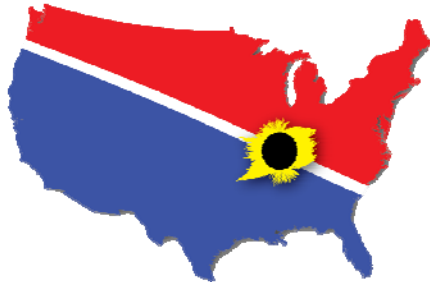
- astrobites.org/2016/12/27/how-one-person-discovered-the-majority-of-the-universe-the-work-of-vera-rubin/

The Washington Post

Links to articles, images and video:

- www.washingtonpost.com/national/vera-rubin-astronomer-who-verified-existence-of-dark-matter-dies-at-88/2016/12/26/545e617c-cb9d-11e6-a747-d03044780a02_story.html?utm_term=.4c152a0b0180
 - Shortcut: wpo.st/6cVQ2
- www.washingtonpost.com/news/speaking-of-science/wp/2016/12/27/how-vera-rubin-changed-science/?tid=ptv_rellink&utm_term=.83a64e2bd4e4
 - Shortcut: wpo.st/PcVQ2
- www.washingtonpost.com/local/from-lab-to-olympic-podium-to-white-house-accomplished-women-still-get-dismissed/2016/12/29/cc109552-cdd0-11e6-a747-d03044780a02_story.html?utm_term=.0e341f29cf42
 - Shortcut: wpo.st/ecVQ2

The Great North American Eclipse



Aug 21st 2017

www.greatamericaneclipse.com/

The submission deadline for the February issue of Star Dust is January 28th.

Clear Skies!

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 email him 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: www.astro.umd.edu/openhouse
- Lockheed Martin IMAX Theater in DC: "Rogue One: A Star Wars Story" (PG-13), Dates through Wed. Jan. 19, \$15 (adults) and \$13.50 (youth), shows start at 11:40 am. <http://www.si.edu/lmax/>
- Steven F. Udvar-Hazy Center in Chantilly, VA: Making STEM Magic January Challenge: "Astro-Bots: Astronomy," Sat. Jan. 14, FREE (parking \$15), 10 am - 3 pm. <https://airandspace.si.edu/events/robotics>
- Mid-Atlantic Senior Physicists Group: "Probing Physics & Astrophysics with Gravitational Wave Observations" with Peter Shawhan (UMD), Wed. Jan. 18, at 1 pm at the American Center for Physics (1st floor conference room). <http://www.aps.org/units/maspg/>
- New Telescope Owners Nights: Wednesday, Jan. 25 or Saturday, Jan. 28, from 6:00 pm to 9:00 pm (30-minute time slots). Registration required. www.astro.umd.edu/openhouse/2programs/new-telescope-owners-nights.html
- Upcoming NCA Meetings at the University of Maryland Observatory: 11 Feb: Alycia Weinberger (Carnegie), "Planet-forming Disks around Stars."

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.?

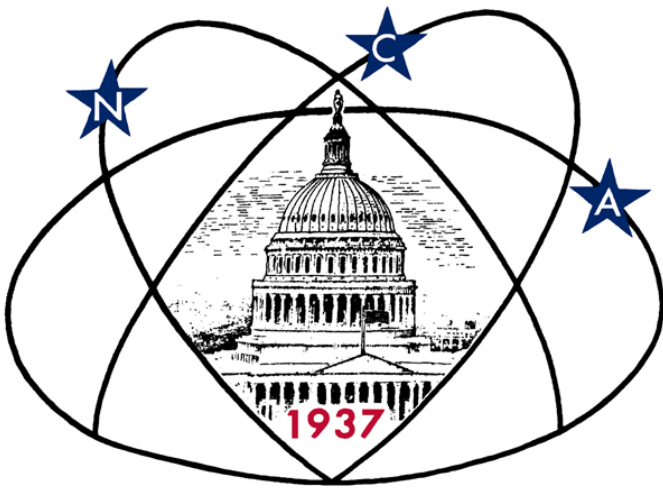
Are you interested in volunteering for: Telescope making, Exploring the Sky, Star Dust, NCA Officer, etc.?

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
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First Class
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Next NCA Meeting:

2017 January 14th

7:30 pm

@ UMD Observatory

**Dean Howard and
Jeffery Jones**

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