

# Star Dust

Newsletter of National Capital Astronomers, Inc.

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

November 2016

Volume 75, Issue 3

## Next Meeting

**When:** Sat. Nov. 12th, 2016

**Time:** 7:30 pm

**Where:** UMD Observatory

**Speaker:** Pamela Conrad

## Table of Contents

Preview of Nov 2016 Talk.....	1
Ad Astra with SLS.....	2
Sky Watchers.....	3
Answer.....	4
Occultations.....	5
Local Trekker Voting Results.....	6
Calendar.....	7

## 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](mailto:rigel1@starpower.net).

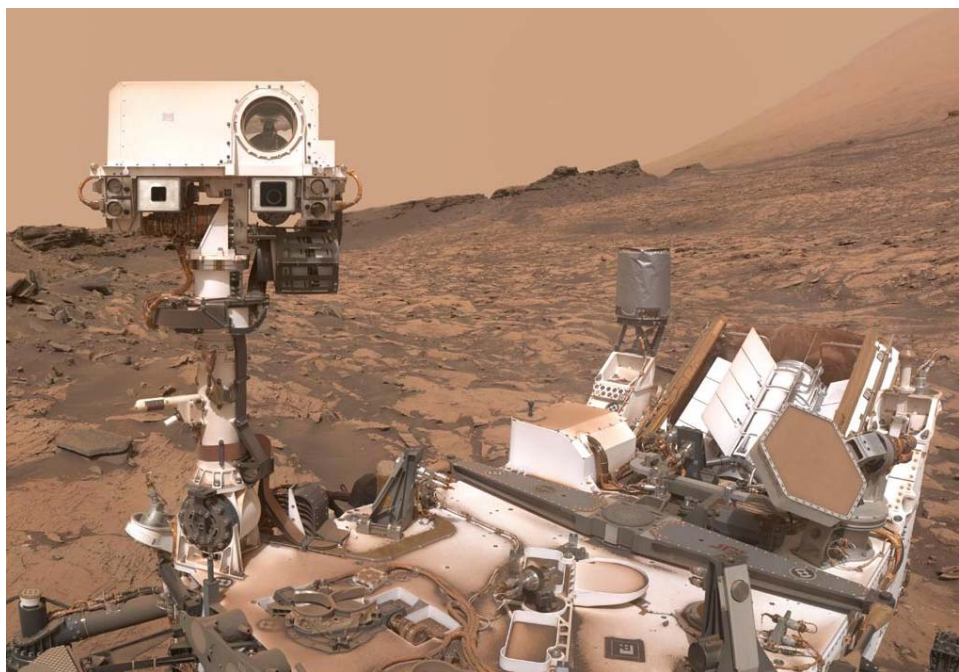
## Observing after the Meeting

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.

## Sizing up the Planetary Neighborhood: Why are Earth and Mars so Different?

*Pamela Gales Conrad*  
*NASA's Goddard Space Flight Center*

**Abstract:** Earth and Mars were made at the same time out of the same stuff. Yet the evolutionary paths of the sister planets have taken us to very different places today. We will explore some of the milestones in Solar System history that have shaped the two planets into eerily similar, yet challengingly different, environments. We'll also look at some of the data from Curiosity Rover that have helped us to understand both past and present surface and atmospheric conditions.



Courtesy NASA/JPL-Caltech/MSSS

Rover Curiosity at the Quela rock-drilling site in the Murray Buttes on lower Mount Sharp. At 3 miles high, Mount Sharp can be seen ascending in the image's upper right corner. Behind Curiosity's mast on the left, dark rocks leading to the M12 Mesa are also visible.

See the full image here:

<http://photojournal.jpl.nasa.gov/jpeg/PIA20844.jpg>

*continued on page 2*

**Devils on the Red Planet**



NASA/JPL-Caltech/University of Arizona

A 30-yard diameter dust devil with a plume over half a mile high (as indicated by its shadow) makes a serpentine path across the surface with the help of late Spring winds. Image captured by NASA's Mars Reconnaissance Orbiter High Resolution Imaging Science Experiment (HiRISE) camera.

**Earth & Mars: The Basics**

**Average Distance from Sun**

93 million miles, 142 million miles

**Average Speed Orbiting Sun**

18.5 miles second, 14.5 miles/second

**Diameter**

7926 miles, 4220 miles

**Axial Tilt**

23.5 degrees, 25 degrees

**Year Length**

365.25 days, 687 Earth days

**Day Length**

23 hrs 56 min, 24 hrs 37 min

**Gravity**

2.66 times Mars, 0.375 times Earth

**Average Temperature**

57° F, -81° F

**Atmosphere**

Nitrogen, Oxygen, etc., CO<sub>2</sub>, H<sub>2</sub>O vapor

**Blue Martian Twilight**



NASA/JPL-Caltech/MSSS/Texas A&M Univ. Martian sunset (through dust particles) captured by Rover Curiosity.

• Earth and Mars – continued from page 1

• **Biographical Sketch:**

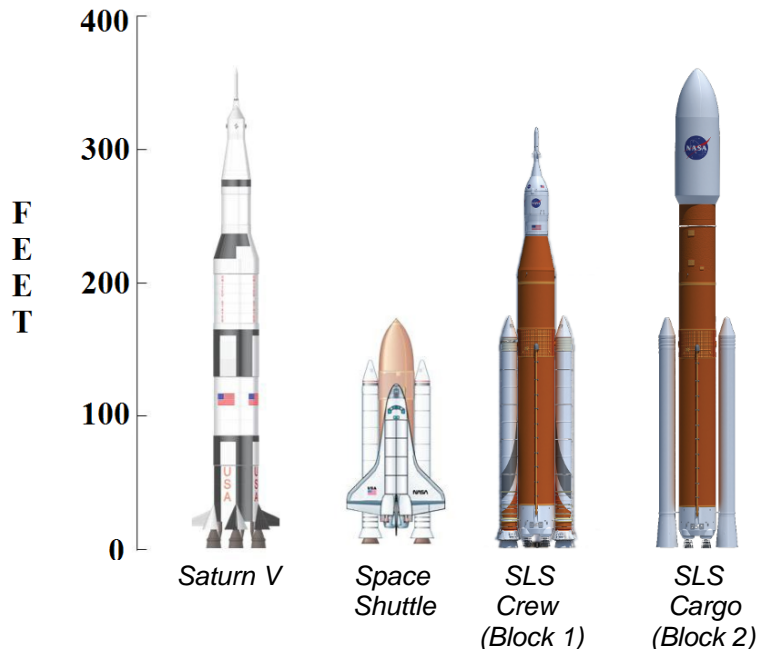
• Pamela “Pan” Conrad is an astrobiologist and planetary scientist. For many years, she has worked on approaches to the measurement of planetary habitability. She also has many years of experience in instrument and mission development as well as operations. She is the Deputy PI and Investigation Scientist for Sample Analysis on the Mars Science Laboratory mission. Pan is also looking ahead to the payload of NASA’s Mars 2020 mission where she will be a co-investigator to both the SHERLOC DUV Raman spectrometer & LINF instrument and the MEDA environmental sensing package.



• Recently, Pan has become involved with science definition for the human exploration of Mars. Her primary scientific interests are in planetary habitability and noble gas geochronology on Mars. She probes questions in these topics in the field on Mars with Curiosity’s payload and on Earth in extreme environments.

**Ad Astra with SLS**

• To carry crew and payloads deeper into space (with a focus on Mars), NASA has developed the “Space Launch System” (SLS). It will launch an Orion capsule multipurpose spacecraft (which can carry at least 4 crew members) on top of an exploration class rocket, which has lift capacity beyond the Saturn V rocket that made human travel to the Moon possible.



Courtesy NASA/Marshall

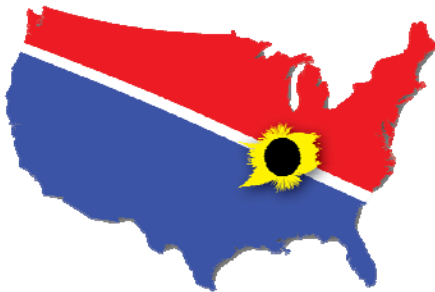
continued on page 4

**Can you see the Stars?**



<https://www.globeatnight.org/>

**The Great North American Eclipse**



**Aug 21<sup>st</sup> 2017**

<http://www.greatamericaneclipse.com/>

**Keep Up with the Journey to Mars**



**#JourneyToMars**

<http://www.nasa.gov/content/journey-to-mars-overview>

**Sky Watchers**

**Late Autumn Schedule**

**November**

12	6:00 am - <b>Planets</b> , N. Hemisphere. Uranus 3° north of Moon.
14	8:52 am – <b>Full Super Moon</b> , Global (perigee at 221,524 miles). Other Moon Names: <i>Full Beaver's Moon, Full Frosty Moon (the beavers are active, preparing for winter, and humans take the opportunity to set traps for them as they also prepare for winter)</i>
17-18	Overnight - <b>Meteors</b> , N. Hemisphere. <i>Leonids</i> (debris from Comet Tempel-Tuttle, radiant point near Regulus)
18	4:00 pm - <b>Planets</b> , N. Hemisphere. Mercury 3° north of Antares.
20-30	Evening – <b>Globe at Night</b> , Global. Features: <i>Constellation Perseus</i> (N. Hemisphere) & <i>Grus</i> (S. Hemisphere).
24	9:00 pm - <b>Planets</b> , N. Hemisphere. Jupiter 1.9° south of Moon.
29	7:18 am – <b>New Moon</b> , Global.

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!

**2016 Observation Dates for Autumn**

**5 November (7:00 pm)** – Pleiades & Winter Constellations

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

**The Program will return in April 2017!**

*Ad Astra w/ SLS – continued from page 2*

SLS also has multiple configurations. The “initial” configuration (Block 1) has 8.8 million pounds of thrust and can carry 77 tons of payload. The “evolved” configuration (Block 2) has 9.2 million pounds of thrust and can carry 143 tons of payload. Exploration Mission 1 (EM-1) for SLS will be unmanned in 2018 (a 3-week mission beyond the Moon) and EM-2, with a crew, is scheduled for 2021.

*Science Fiction precedes science fact and always teaches us lessons ahead of time (however, what lesson is learned depends on the individual, doesn't it?). Author, Frederic Brown (credited on p. 6 with a Star Trek episode), was a master of lessons in really, really short stories! Here is one of his classics from 1954, cataloged by Project Gutenberg. It is simply called...*

## Answer

*Frederic Brown*

Dwan Ev ceremoniously soldered the final connection with gold. The eyes of a dozen television cameras watched him and the subether bore throughout the universe a dozen pictures of what he was doing.

He straightened and nodded to Dwar Reyn, then moved to a position beside the switch that would complete the contact when he threw it. The switch that would connect, all at once, all of the monster computing machines of all the populated planets in the universe -- ninety-six billion planets -- into the supercircuit that would connect them all into one supercalculator, one cybernetics machine that would combine all the knowledge of all the galaxies.

Dwar Reyn spoke briefly to the watching and listening trillions. Then after a moment's silence he said, "Now, Dwar Ev."

Dwar Ev threw the switch. There was a mighty hum, the surge of power from ninety-six billion planets. Lights flashed and quieted along the miles-long panel.

Dwar Ev stepped back and drew a deep breath. "The honor of asking the first question is yours, Dwar Reyn."

"Thank you," said Dwar Reyn. "It shall be a question which no single cybernetics machine has been able to answer."

He turned to face the machine. "Is there a God?"

The mighty voice answered without hesitation, without the clicking of a single relay. "Yes, now there is a God."

Sudden fear flashed on the face of Dwar Ev. He leaped to grab the switch.

A bolt of lightning from the cloudless sky struck him down and fused the switch shut.

• **Star Dust** is published ten times yearly  
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### Please Get Star Dust Electronically

• NCA members able to receive Star Dust,  
• the newsletter of the NCA, via e-mail as a  
• PDF file attachment, instead of hardcopy via  
• U.S. Mail, can save NCA a considerable  
• amount of money on the printing and  
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• switch from paper to digital, please contact  
• Henry Bofinger, the NCA Secretary-  
• Treasurer, at [hbofinger@earthlink.net](mailto: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

2016								dur.		Ap.	
Date	Day	EST	Star	Mag	Asteroid	dmag	s	"	Location	Notes	
Nov 9	Wed	18:32	4UC41294899	12.8	Strobel	3.5	2	9	WV, nVA, DC, cMD, DE		
Nov 10	Thu	4:40	TYC12760010	10.3	Masaryk	5.7	3	5	se&cVA, sWV, nKY		
Nov 13	Sun	4:05	2UC47412446	12.0	Gudrun	1.6	15	8	Delmarva, DC, cMD		
Nov 15	Tue	5:27	TYC02341485	11.4	Xanthippe	2.5	7	7	sWV, s.cenVA, neNC		
Nov 24	Thu	3:30	TYC12942161	11.1	Picka	3.1	4	7	seMD, cenVA, sWV		
Nov 26	Sat	2:14	TYC08201105	10.4	Beslan	7.4	3	5	PA, MD, DE; DC, nVA?		
Nov 27	Sun	20:00	4UC42901086	11.6	Arete	2.0	7	7	Delmarva, ePA, cNY		
Dec 7	Wed	19:51	SAO 164862	8.9	Catriona	6.4	1	3	seVA, cNC, cSC, cGA		
Dec 8	Thu	4:17	4UC49511516	12.8	Eos	0.5	7	9	seMD, cVA; DC, nVA?		
Dec 10	Sat	3:56	2UC43417556	12.3	Loreley	0.9	14	8	NJ, PA, MD; DC, nVA?		

## Lunar Grazing Occultations

2016											
Date	Day	EST	Star	Mag	% alt	CA	Location & Remarks				
Nov 7	Mon	18:39	SAO 164269	8.1	51+ 36	3S	Ctrv&Tysns, VA; Bthsd&sLaurI, MD				

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

## Total Lunar Occultations

2016											
Date	Day	EST	Ph Star	Mag	% alt	CA	Sp.	Notes			
Nov 13	Sun	2:07	D WZ Pisci um	6.3	97+ 35	86N	M4	ZC 308			
Nov 13	Sun	4:27	D 64 Ceti	5.6	97+ 9	83S	G0	Azimuth 274, ZC 322			
Nov 15	Tue	19:25	R ZC 741	5.5	96- 11	52N	K1	Az77, AA 322, close dbl?			
Nov 16	Wed	22:46	R SAO 95263	7.7	90- 38	81N	G5				
Nov 16	Wed	23:56	R ZC 934	6.4	89- 50	13S	K1	Terminator Distance 13"			
Nov 17	Thu	1:26	R ZC 943	6.6	89- 65	41N	B8				
Nov 17	Thu	2:48	R ZC 951	6.6	89- 69	44S	K2	maybe close double			
Nov 18	Fri	4:50	R SAO 96791	7.8	80- 64	81S	K0	close double?			
Nov 18	Fri	4:56	R SAO 96794	8.0	80- 63	85S	A0	close double?			
Nov 19	Sat	0:06	R ZC 1235	7.3	71- 30	20S	K0				
Nov 19	Sat	0:24	R SAO 97640	7.3	71- 33	83N	G0				
Nov 19	Sat	1:00	R ZC 1238*	6.0	71- 40	80N	G8	close double?			
Nov 19	Sat	4:48	R ZC 1247*	7.0	70- 67	70S	A0				
Nov 19	Sat	5:17	R SAO 97731*	7.6	70- 65	77N	K5				
Nov 19	Sat	6:39	R ZC 1258	6.7	70- 55	51N	K0	Sun altitude -4 deg.			
Nov 20	Sun	0:46	R SAO 98380	7.3	61- 26	81N	K5	maybe close double			
Nov 23	Wed	4:39	R SAO119023*	8.6	30- 35	11N	A5				
Nov 23	Wed	5:13	R X17605*	9.8	29- 41	83N	G5				
Nov 23	Wed	5:52	R SAO119033*	8.1	29- 46	66N	K0	close double??			
Nov 23	Wed	5:57	R SAO 119031	8.4	29- 47	73S	K0	Sun altitude -12 deg.			
Nov 27	Sun	6:28	R SAO 158835	7.1	4- 14	89N	F2	Sun -7, Azimuth 118			
Dec 2	Fri	17:11	D 43 Sgr	4.9	10+ 22	53N	K0	Sun -5, ZC2814, double?			
Dec 4	Fri	17:44	D ZC 2816*	7.0	10+ 18	33N	B5	Sun -11, mg2 9 40" PA159			
Dec 4	Sun	17:32	D ZC 3076	7.8	25+ 33	87S	K0	Sun -9, close double			
Dec 4	Sun	20:13	D SAO 164131	8.0	26+ 13	15N	G8	Azimuth 238 degrees			
Dec 5	Mon	20:09	D ZC 3219	8.3	35+ 23	77S	K1				
Dec 9	Fri	0:00	D SAO 109383	7.8	69+ 19	62S	K2				
Dec 9	Fri	0:03	D SAO 109387	7.9	69+ 19	69S	G5				
Dec 10	Sat	21:01	D ZC 368	6.2	87+ 61	79S	K2	mg2 10 sep 1.5" PA 141			
Dec 11	Sun	2:42	D ZC 393	6.7	89+ 15	31N	K0	Az. 272, close double?			
Dec 11	Sun	23:13	D ZC 516	6.9	95+ 62	89S	G5	close double??			
Dec 12	Mon	2:22	D ZC 526	6.7	95+ 32	39S	G5				

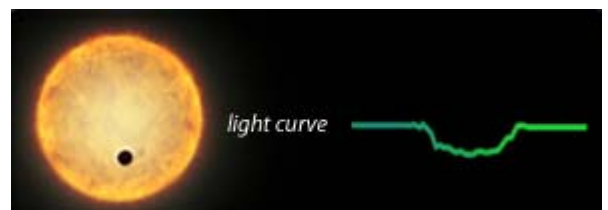
\* The star is in the Kepler 2 exoplanet search program so lightcurves of the occultation are desired to check for close stellar duplicity.

Further explanations & more information is at <http://iota.jhuapl.edu>

David Dunham, [dunham@starpower.net](mailto:dunham@starpower.net)

## How does Kepler find Planets?

<https://kepler.nasa.gov/>



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Image: Star Trek (Paramount/CBS)

The alien known as the 'Gorn' first appeared in "The Arena" (Season 1, Episode 18). It was based on the Science Fiction Hall of Fame short story, "Arena," by Frederic Brown (1944).

In celebration of Star Trek's 50<sup>th</sup> Anniversary, the Star Dust Editor posted an online survey to discover the most popular episodes among local trekkers.

The demographics of the respondents break almost even at 57% males & 43% females, ages 35 and over. The affiliations of the participants were: NCA, Washington Astronomy Meetup, Planetary Society DC, Howard Astronomical Association, general science nerds, and self-identified "Trekkies." Thanks to all the respondents who took time to vote with a special 'shout-out' to the Howard Astro Association whose members participated the most!

### ...and the Winning Episodes are....

Season 1 Winner:

***City on the Edge of Forever***  
 (36% of votes)

Season 2 Winner:

***The Trouble with Tribbles***  
 (23% of votes)

Season 3 Winner:

***Plato's Stepchildren***  
 (25% of votes)

Newsweek's "Top 10" Local Winner:

***City on the Edge of Forever***  
 (36% of votes),

*followed closely by*

***The Trouble w/ Tribbles***  
 (21% of votes)

**Rematch!**



Courtesy Bandai Namco Entertainment America (Video Game Commercial) *Captain Kirk vs. the Gorn, 46 years later.*

<https://youtu.be/4hnBp7x2QAE>

**The submission deadline for the December issue of Star Dust is November 27<sup>th</sup>.**

**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.). No class on Nov. 11. Contact instructor Guy Brandenburg at 202-635-1860 or email him at [gbrandenburg@yahoo.com](mailto:gbrandenburg@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](http://www.astro.umd.edu/openhouse)
- Lockheed Martin IMAX Theater in DC: "The Voyage of Time" (not rated), Dates through Thurs. Nov. 24, \$9 (adults) and \$7.50 (youth), 4:10 pm shows only. Check dates here: <https://www.si.edu/Imax/Movie/1260>
- Steven F. Udvar-Hazy Center IMAX Theater in Chantilly, VA: "Doctor Strange" (PG-13), Dates through Nov. 17, \$15 (adults) and \$13.50 (youth), evening shows only. Check dates here: <http://www.si.edu/Imax/movie/1282>
- Mid-Atlantic Senior Physicists Group: "Fusion Energy: Concepts, Progress and Prospects" with Stephen Dean (Fusion Power Associates), Wed. Nov. 16, at 1 pm at the American Center for Physics (1<sup>st</sup> floor conference room). <http://www.aps.org/units/maspg/>
- Owens Science Center Planetarium: "Winter Sky Festival," Fri. Dec. 9, 7:30 pm; \$5/adult; \$3/students/senior/teachers/military; children under 3 free. [www1.pgcps.org/howardbowens](http://www1.pgcps.org/howardbowens)
- Upcoming NCA Meetings at the University of Maryland Observatory: 10 Dec: John Baker (GSFC), "Detections of Gravitational Waves."

**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.?

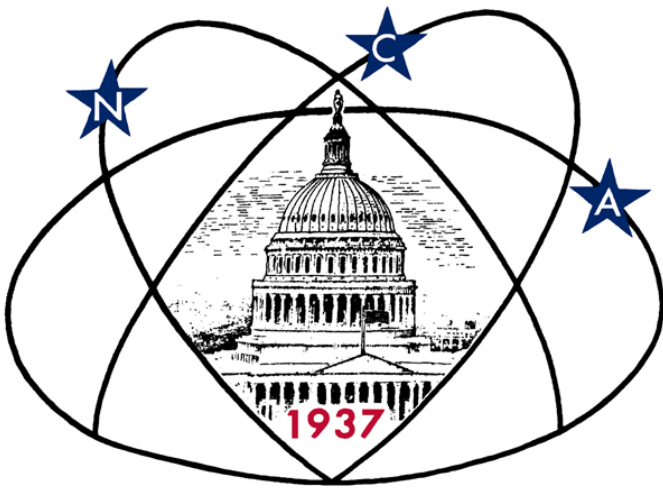
Are you interested in volunteering for: Telescope making, Exploring the Sky, Star Dust, NCA Officer, etc.?

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

First Class  
Dated Material



*Next NCA Meeting:*

**2016 November 12<sup>th</sup>**

**7:30 pm**

**@ UMD Observatory**

**Dr. Pamela  
Conrad**

## **Inside This Issue**

Preview of Nov 2016 Talk.....	1
Ad Astra with SLS.....	2
Sky Watchers.....	3
Answer.....	4
Occultations.....	5
Local Trekker Voting Results.....	6
Calendar.....	7