Star Dust

Newsletter of National Capital Astronomers, Inc.

capitalastronomers.org

February 2016 ***Volume 74, Issue 6***

Next Meeting

When: Sat. Feb 13th, 2016

Time: 7:30 pm

Where: UMD Observatory

Speakers: Brad Cenko

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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 Metzerott 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.

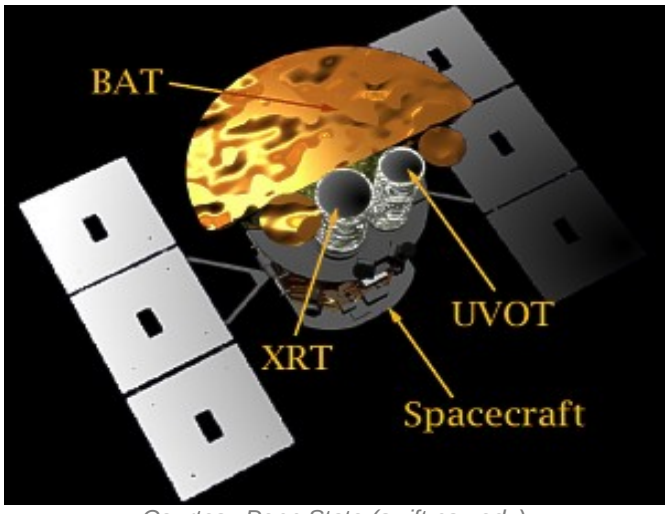
Observing after the Meeting

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.

Gamma-Ray Bursts: Nature's Most Remarkable Explosions

Stephen Bradley Cenko,
NASA's Goddard Space Flight Center
and the University of Maryland

Abstract: Gamma-ray bursts (GRBs) are the brightest explosions since the Big Bang. This talk will begin with the history of the fascinating field of GRB studies, from the initial GRB discovery more than 40 years ago via the Vela satellites (designed to monitor the 1963 Partial Test Ban Treaty with the USSR) to modern observations made with Swift, which can detect GRBs from some of the first stars formed in the Universe. Next, the early debates regarding the galactic or extragalactic nature of GRBs will be addressed and how the puzzle was finally resolved with the discovery of "afterglow" emission and the first spectroscopic redshifts. Finally, Dr. Cenko will relate how modern observations of GRBs help prepare us for the first gravitational wave discoveries from Advanced LIGO and Virgo; and, in particular, how GRBs may solve the longstanding puzzle of the origin of heavy "r-process" elements.



Courtesy Penn State (swift.psu.edu)

The Swift Gamma-Ray Burst Explorer featuring (1) the BAT (Burst Alert Telescope) that produces arcminute positions of GRBs within 10 seconds & repositioning of telescopes to those locations in 50 seconds, (2) the XRT (X-Ray Telescope) that measures GRB position, spectrum & brightness as well as afterglow, and (3) the UVOT (UV/Optical Telescope), a modified Ritchey-Chrétien, which can keep track of individual photon positions.

continued on page 2

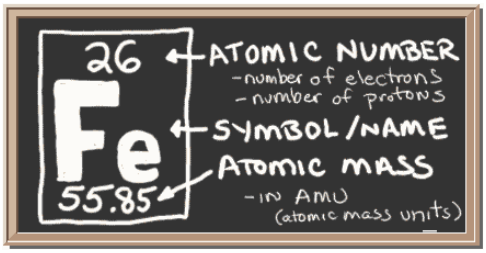
Reminder

After the meeting, everyone is invited to join us at Plato's Diner in College Park. Plato's is located at 7150 Baltimore Ave. (US Rt. 1 at Calvert Rd.), just south of the university's campus. What if it's clear and you want to stick around and observe? No problem -- just come over when you're through. This is very informal, and we fully expect people to wander in and out.

Stellar Alchemy

In the beginning, there was hydrogen & helium; and, through the stars, other elements were made…

Stars can create new atomic nuclei (nucleosynthesis) by thermonuclear fusion (if the nuclei have masses less than 56) or by neutron-capturing (if the atomic masses are heavier than 56). Neutron-capturing refers to a reaction in which the nucleus of an atom collides & merges with one or more neutrons to create an even heavier nucleus. In stars, the process of heavy-element nucleosynthesis is achieved by slow neutron-capturing (s-process) or rapid neutron-capturing (r-process). In the



Iron (symbol = Fe), atomic mass = 56: a seed for heavy-element nuclei.

s-process, only one neutron at a time is captured before radioactive decay turns it into a proton, which changes the atomic number of the element (thereby changing the element). This "slow" process occurs in asymptotic-giant-branch (AGB) stars like red giants, which have carbon/oxygen cores. The s-process accounts for about half of the atomic nuclei heavier than iron. An example of an element made from this process is arsenic (symbol = As).

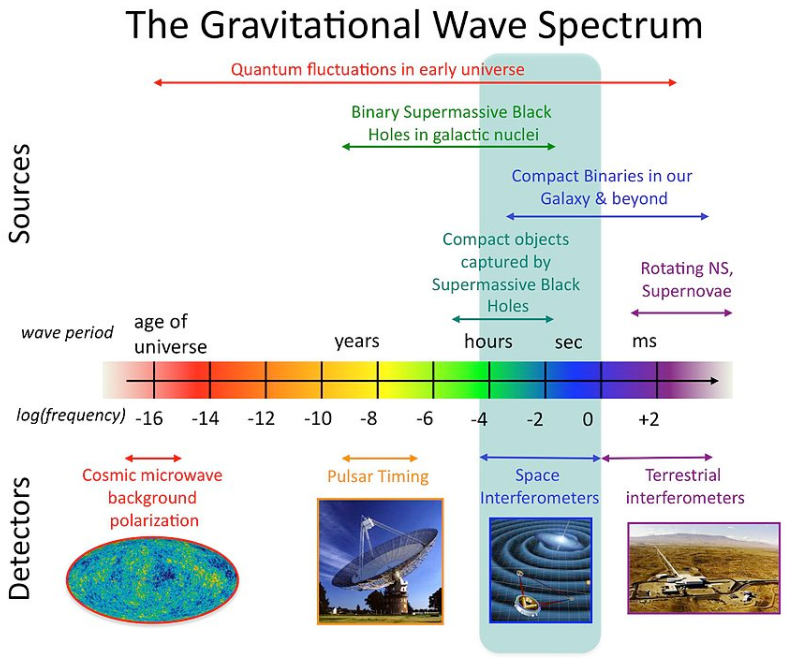
continued on page 3

GRBs – continued from page 1

Biographical Sketch:

Courtesy Elizabeth Warner

Brad Cenko is a Research Astrophysicist at NASA's Goddard Space Flight Center. He is a deputy Project Scientist for NASA's Swift Gamma-Ray Burst explorer, currently the premier facility for detecting and characterizing GRBs. He is also an Adjunct Assistant Professor at the University of Maryland, College Park. Brad earned his PhD at the California Institute of Technology, where he robotized the Palomar 60-inch telescope to perform rapid-response observations of Swift GRBs (and other transients). After that, he was a postdoctoral scholar at the University of California, Berkeley, working primarily on wide-field optical surveys such as the Palomar Transient Factory.



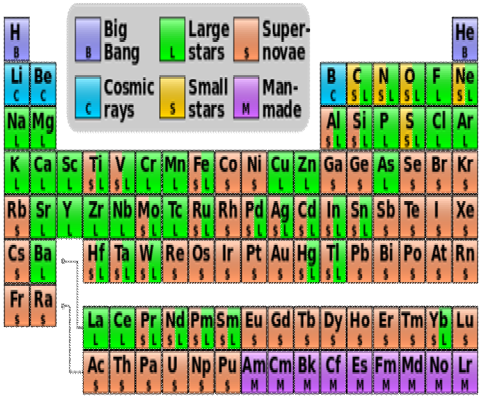
Courtesy NASA/GSFC

Sources of gravitational waves and their detection tools, which include interferometers like LIGO [LSC], LISA [ESA] & Virgo [EGO].

Are you ready for the discovery? Here's a quick primer on gravitational waves from PhD Comics (in cooperation with LIGO):

https://youtu.be/4GbWfNHtHRg

Atomic Origin Story – continued from page 2



Courtesy Northern Arizona University Meteorite Laboratory
Nucleosynthesis Periodic Table

Accounting for the other half of heavier nuclei is the r-process in which more than one neutron can be captured before radioactive decay occurs. This "rapid" neutron-capturing process happens during supernovae in which the star cores have collapsed. An example of an element made from this process is uranium (symbol = U).

Coming in April 2016

"***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!

Sky Watchers — *Early Spring Schedule*

February

16	3:00 am – **Stars & Planets**, N. Hemisphere. Aldebaran 0.3º south of Moon.
22	1:20 pm – **Full Moon** (moonrise time), N. Hemisphere. Other Moon Names: *Full Snow Moon, Full Hunger Moon, Full Wolf Moon.*
23	11 pm – **Planets**, N. Hemisphere. Jupiter 1.7º north of Moon.

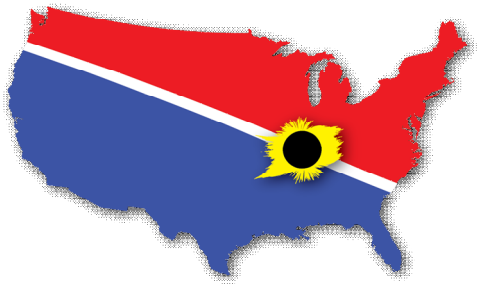
Times EST

March

1-10	Evening – **Globe at Night**, Global. Features: *Constellations Orion* (N. Hemisphere) & *Crux* (S. Hemisphere).
2	2 am – **Planets**, N. Hemisphere. Saturn 2º south of Moon.
7	6 am – **Planets**, N. Hemisphere. Venus 4º south of Moon.
10	8 pm – **Planets**, N. Hemisphere. Uranus 1.9º north of Moon.

Times EST

The Great North American Eclipse



August 21st, 2017

http://www.greatamericaneclipse.com/

Space Flowers

Earth's northern hemisphere will officially emerge from winter into spring with March's vernal equinox. Therefore, now is the perfect time to welcome a new (and may I say "gorgeous") inhabitant of the ISS: the first zinnia blossom in space!

The "Veggie" (Veg-01 experiment) produced the first romaine lettuce in space and, during the earthbound testing of the lettuce, zinnias were planted for the astronauts to enjoy.

Earth gardeners with brown thumbs know that making flowers happy is not necessarily an easy path, even on their planet of origin. Now, imagine that situation in a pressurized titanium/steel enclosure orbiting the Earth at 4.8 miles-per-second. The zinnias were fraught with challenges: they didn't have enough water, they had too much water, there was mold, etc. Therefore, on Christmas Eve 2015, NASA decided that ISS astronaut Scott Kelly would be the official "gardener" to the zinnias and would make autonomous, real-time decisions in the best interest of the plants instead of waiting for Earth directives.

By January 2016, astronaut gardener Kelly's attention to the zinnias helped the plants survive and recover from their challenges, resulting in the healthy bloomers now tasting the sunshine at an average of 250 miles above us. Remember that the next time you watch an ISS fly-by!

Today, zinnias…tomorrow, tomatoes!

Courtesy NASA/Scott Kelly
The first zinnia bloom in space.

#SpaceFlower

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Thank you!

ALCon 2016

August 10 – 13, 2016
Washington, DC

The Annual Astronomical League Convention includes space exploration & astronomy talks, special tours, an awards banquet, "Star-B-Que" and more!

Hosted by NOVAC and the Astronomical League

https://Alcon2016.astroleague.org

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
Feb 17	Wed	20:24	TYC23970538	10.3	Wells	5.9	5	5	ePA,sNJ,nDE;eMD?
Feb 18	Thu	18:51	1U542030426	13.6	Bezovec	1.3	2	12	eVA,DC,MD,sePA
Feb 19	Fri	20:12	SAO 112401	9.3	Vladimir	6.7	3	4	eVA,eMD,DE;DC?
Feb 20	Sat	20:30	15 Cancri	5.6	2000 SO115	12	1.6	2	PA,MD,VA,WV;DC?
Mar 5	Sat	21:11	TYC18770294	10.9	Euterpe	0.6	11	6	WV,nVA,MD,DC,sDE
Mar 9	Wed	0:18	2UC37538800	12.1	Elektra	0.9	20	8	eNC,VA,MD,DC,wPA

Lunar Grazing Occultations

2016							
Date	Day	EST	Star	Mag	% alt	CA	Location & Remarks
Feb 13	Sat	20:04	ZC 352	7.1	35+ 40	1N	Martnsbg,WV;Marstn&Ptapsco,MD
Feb 14	Sun	21:44	SAO 93411	8.7	47+ 34	5N	Bensley, s.Varina, &Toano, VA
Feb 16	Tue	1:13	75 Tauri	5.0	60+ 7	8N	Halifx,Malvern,Phiadelphia,PA
Feb 17	Wed	22:22	SAO 95469	8.0	79+ 59	7N	Wshgtn&Dumfries,VA;LaPlata,MD

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

Total Lunar Occultations

2016		EST/							
Date	Day	EDT	Ph	Star	Mag	%	alt	CA	Sp. Notes
Feb 13	Sat	19:55	D	ZC 352	7.1	35+	41	16N	K0 close double?? mag2 10
Feb 13	Sat	21:03	D	25 Arietis	6.5	35+	29	84S	F5 ZC 362, in Cetus
Feb 14	Sun	18:39	D	SAO 93387	7.1	46+	62	77N	F8 Sun alt. -12 deg.
Feb 15	Mon	23:34	D	70 Tauri	6.6	59+	25	50S	F7 ZC 659,close dbl,Hyades
Feb 16	Tue	0:54	D	theta1 Tau	3.8	59+	10	47S	G7 Az283,ZC669,mg2 7,sp".2
Feb 16	Tue	1:01	D	ZC 672	6.7	60+	9	89N	F7 Az.284,mag2 8,sep. ".15
Feb 16	Tue	1:05	D	75 Tauri	5.0	60+	8	30N	K2 Az.285,ZC667,mg2 8,".02
Feb 16	Tue	1:08	D	theta2 Tau	3.4	60+	7	15S	A7 Az.285,ZC671,mg2 5,".02
Feb 16	Tue	1:39	D	ZC 677	4.8	60+	2	84N	A6 Az289,close dbl?,Hyades
Feb 17	Wed	0:27	D	111 Tauri	5.0	70+	26	67S	F8 ZC 806
Feb 17	Wed	0:58	D	SAO 94531	7.6	70+	20	12S	B5
Feb 17	Wed	2:09	D	117 Tauri	5.8	70+	7	41S	M1 Azimuth 287 deg.,ZC 820
Feb 17	Wed	18:41	D	ZC 934	6.4	78+	59	31N	K1 Sun altitude -11 deg.
Feb 17	Wed	20:32	D	ZC 944	5.9	78+	69	85S	A6 ZC 944, close = double
Feb 18	Thu	0:42	D	ZC 970	6.3	79+	34	86S	G9
Feb 24	Wed	1:09	R	tauLeonis*	5.0	98-	54	70S	G8 AA 250, ZC 1663
Feb 29	Mon	3:29	R	ZC 2200	7.5	65-	33	37N	K0
Mar 2	Wed	3:26	R	SAO 160265	7.8	46-	19	23N	A4
Mar 2	Wed	4:24	R	SAO 160270	7.9	45-	26	56N	B9
Mar 3	Thu	2:49	R	ZC 2578	6.5	36-	5	87N	A1 Azimuth 119 deg.
Mar 3	Thu	6:20	R	ZC 2596	7.5	35-	30	62S	B0 Sun -4, close dbl.
Mar 4	Fri	4:09	R	ZC 2745 *	6.8	26-	9	89S	K1 Az123,mg2 12 sep. 16"
Mar 4	Fri	5:54	R	ZC 2755	6.6	25-	24	78S	G8 Sun alt. -9 deg.
Mar 10	Thu	18:50	D	SAO 109664	7.3	5+	16	81N	K0 Sun alt. -9 deg.
Mar 11	Fri	20:41	D	SAO 110353	7.8	12+	8	77N	F5 Azimuth 275 deg.
Mar 11	Fri	20:57	D	ZC 315	7.3	12+	5	85N	A0 Az. 277, close dbl?
*** Dates and times above are EST, those below are EDT ***									
Mar 13	Sun	20:45	D	SAO 93732*	9.6	31+	44	66S	G0
Mar 13	Sun	20:56	D	SAO 93735*	8.7	31+	41	47S	G0
Mar 13	Sun	20:57	D	SAO 93746	8.0	32+	30	18S	G5 close double?
Mar 13	Sun	22:38	D	SAO 93757*	8.2	32+	23	52N	G0 close double?
Mar 13	Sun	23:23	D	ZC 608	6.0	32+	14	42S	F3 Az.278, mag2 9 sep. 4"

** 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

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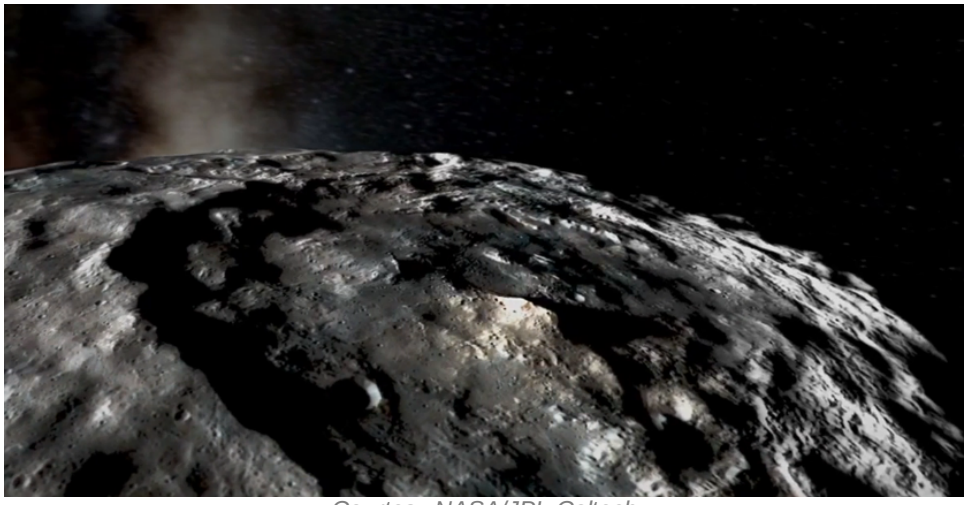
Planetary Destinations

Hitchhiking to Ceres

Thanks to the Jet Propulsion Lab's video, you can ride along with spacecraft Dawn on its 900-mile-altitude fly-by of the dwarf planet, Ceres:



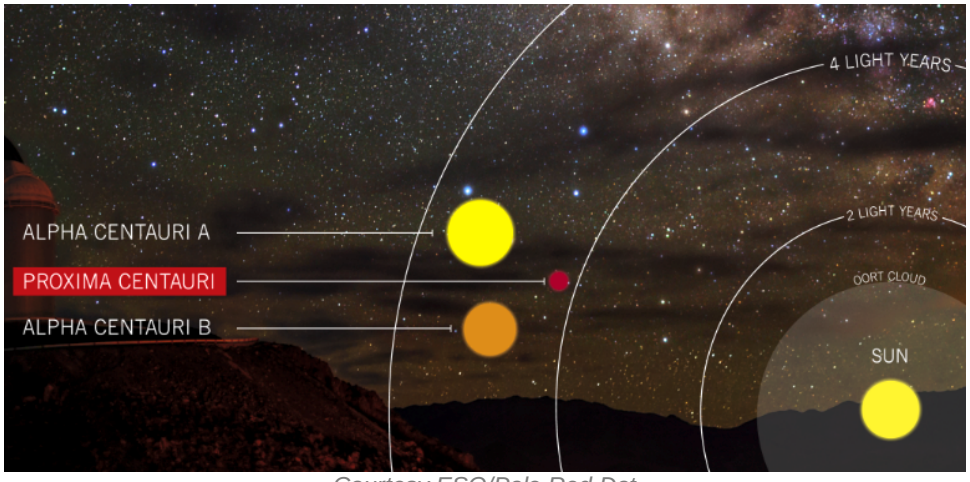
Courtesy NASA/JPL-Caltech
Urvara Crater, Ceres

https://youtu.be/nJiw2NxqoBU

Exoplanet Hunt

ESO is spearheading a worldwide campaign to find an Earth-like planet orbiting a red-dwarf star called Proxima Centauri in the Centaurus constellation. This nearby star is 4.2 ly from the Sun; and, current observations of the star's orbit indicate the possibility of an orbiting planet.

The January-April campaign is called "Pale Red Dot" and will allow the public to follow the scientists as they work via blogging and tweeting.



Courtesy ESO/Pale Red Dot
#PaleRedDot

Rock Art

Courtesy NASA/JPL-Caltech

Sometimes, Rover Curiosity generates almost 1,000 photos per Martian day (sol). Here's one of Curiosity's "artsy" photos of a black, pyramid-shaped rock on sol 43 (Sept. 19, 2012). The rock was named "Jake Matijevic" after the lead engineer for Rovers Curiosity, Sojourner, Spirit & Opportunity.

The submission deadline for the March issue of Star Dust is February 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

Mid-Atlantic Senior Physicists Group: "Neutron Capture Processes in Stars: Theories, Stellar Sites, and Implications from Presolar Grain Studies" with Nan Liu (DTM), Wed. Feb. 17, at 1 pm at the American Center for Physics (1st floor conference room). www.aps.org/units/maspg/

Smithsonian Stars Lecture Series: "Surprises in the Outer Solar System" with Matthew Holman (Harvard-Smithsonian Center for Astrophysics). Sat. Feb. 20, at 5:15 pm (lecture), 6:30 pm (stargazing). FREE, but, registration required. airandspace.si.edu/events/tickets/

Owens Science Center Planetarium (Family Night): "Hello, Earth: Greetings from Endeavour," Fri. Mar. 11, 7:30 pm; $5/adult; $3/students/senior/teachers/military; children under 3 free. www1.pgcps.org/howardbowens

Upcoming NCA Meetings at the University of Maryland Observatory:
12 March: Eleonora Troja (UMD, GSFC), "Neutron Star Collisions."
9 April: Richard Walker (UMD), "The Origin of the Moon."

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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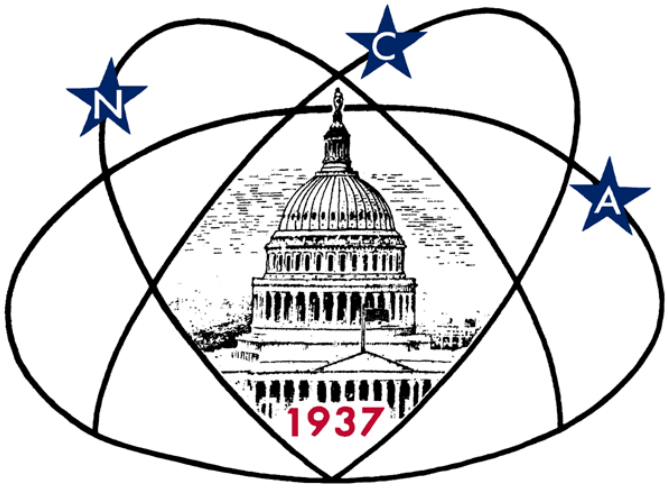
400 Madison St #2208
Alexandria, VA 22314

First Class
Dated Material



Next NCA Meeting:

2016 February 13th
7:30 pm
@ UMD Observatory

Stephen Bradley Cenko

Inside This Issue