

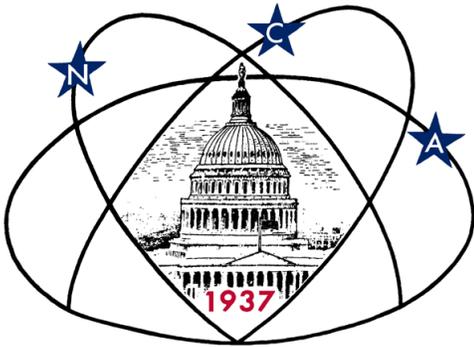
Star Dust

Newsletter of National Capital Astronomers, Inc.

capitalastronomers.org

December 2015

Volume 74, Issue 4



Next Meeting

When: Sat. Dec 12th, 2015

Time: 7:30 pm

Where: UMD Observatory

Speaker: Hiroya Yamaguchi

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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.

The Progenitors of Ia Supernovae as Revealed by X-Ray Observations of Supernova Remnants

Hiroya Yamaguchi,

University of Maryland and NASA’s Goddard Space Flight Center

Abstract: Type Ia supernovae (Ia SNe) are widely believed to result from the thermonuclear explosions of white dwarfs. They are a major source of the iron-peak elements in our Universe: chromium (Cr), manganese (Mn), iron (Fe), cobalt (Co) and nickel (Ni). Also, Ia SNe are particularly important for astrophysics because they are used as distance indicators (standard candles) in cosmology.

Although decades of intense effort to uncover many fundamental aspects of Type Ia SNe yielded limited results, X-ray observations of supernova remnants (SNRs) have now allowed us to accurately measure the abundances of heavy elements being synthesized in supernovae. This observational technique has provided a key for understanding the mechanisms of Type Ia supernova explosions, as well as how they produce heavy elements.

This presentation will address recent observational studies of Type Ia supernova remnants made with the Japanese X-ray astronomy satellite,



*Courtesy NASA/Suzaku and NASA/CXC, DSS, and NASA/JPL-Caltech
X-ray image of Supernova 3C 397 via the Chandra Observatory (purple) and Suzaku (blue)*

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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.

Cosmic Mile Markers

In measuring distance in space, *standard candles* are used. The term refers to celestial objects with known levels of brightness. The distances of these objects can then be determined by their change in luminance (i.e., dimming). Scientists use an equation called the "[inverse square law](#)" to calculate dimming distance.

The "standard," however, depends on how vast the distance in question. For intra-galactic or nearby galactic measures, pulsing Cepheid variable stars are used as the standard (as well as stellar parallax).

If the distance is, well, astronomically far, something really bright has to be used (besides, it's not easy to pick out specific stars at large distances). A very bright celestial object classified as type Ia supernova happens to be a standard candle at vast distances.

When a dense, white dwarf star in a binary system reaches 1.4 solar masses (the Chandrasekhar limit) by pulling material from its companion star, a nuclear reaction occurs and it explodes with a brightness of 5 billion times that of the Sun. This reaction happens the same way, at the same solar mass and with the same brightness each time. So, to ascertain distance, the inverse square law is applied using the known initial luminance compared to how bright the supernova appears.



(cc)
Ia Supernova
2014J in M82
(Cigar Galaxy)

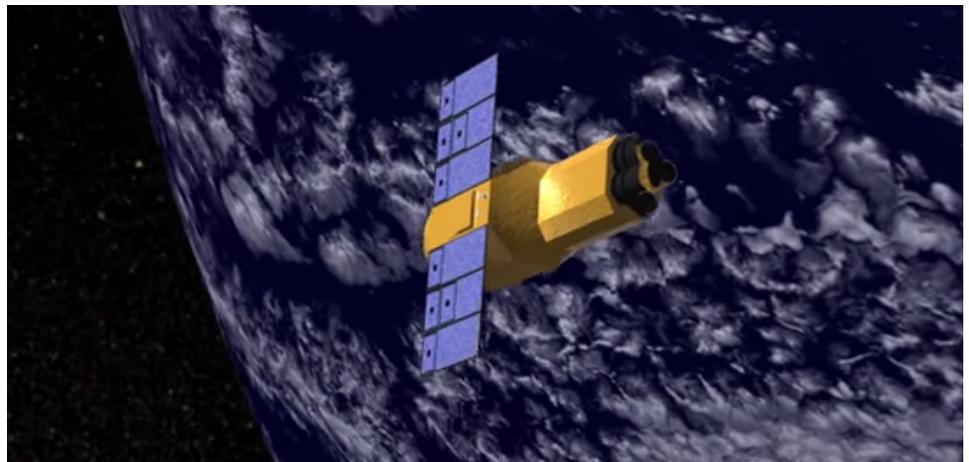
Supernovae Progenitors – continued from page 1

Suzaku. The satellite's sensitivity allowed successful detection of weak emission lines of the iron-peak elements from a number of supernova remnants. From 3C 397, one of the brightest Type Ia supernova remnants in the Milky Way, we discovered extremely strong emissions of Mn and Ni for the first time. The abundances of these elements were measured and they are the highest reported in any Type Ia SNe/SNRs. We confirmed that these abundances of elements can be achieved only by electron capture reactions taking place in the dense cores of exploding white dwarfs. This indicates that the progenitor mass of this SNR had become close to the so-called Chandrasekhar limit, the maximum mass of a stable white dwarf. That answers the major long-standing question about the physics of Type Ia supernovae.

The future prospects for the forthcoming X-ray mission, ASTRO-H, will also be discussed.

Biographical Sketch:

Dr. Hiroya Yamaguchi is an Assistant Research Scientist at the University of Maryland, but usually works at the NASA's Goddard Space Flight Center. In 2008, he received a Ph.D. in Science from Kyoto University, Japan. Subsequently, he held postdoctoral positions at RIKEN, Japan's National Research & Development Institute, and at the Harvard-Smithsonian Center for Astrophysics (Cambridge, MA). He is currently involved in developing software for the ASTRO-H mission, a joint US-Japan X-ray observatory to be launched in early 2016. His research interests include supernovae and their remnants, galactic chemical evolution, and atomic processes. He is also familiar with X-ray detectors, as he was involved in detector development and calibration when he was a graduate student.



Courtesy NASA
Suzaku X-Ray Observatory

For a brief video introduction to Suzaku, see the following link:

<https://youtu.be/oSUGMeoFZIY>

Can you see the Stars?



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!

The Great North American Eclipse



August 21st, 2017

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

Sky Watchers

Late Autumn Schedule

December

2-11	Evening – Globe at Night , Global. Features: <i>Constellation Perseus</i> (N. Hemisphere) & <i>Grus</i> (S. Hemisphere).
13-14	Overnight - Meteors , N. & S. Hemispheres. <i>Geminids</i> (debris from Asteroid 3200 Phaethon, radiant point near stars Castor & Pollux).
14	Overnight – Open Clusters , N. Hemisphere. NGC 1981 (in Orion’s sword, mag = 1.6, use binoculars).
19	8:00 pm – Planets , N. Hemisphere. Moon & Uranus Conjunction (southeastern sky in Constellation Pisces, Uranus = mag 5.8).
21	11:42 pm – Winter Solstice , N. Hemisphere. 
25	12:00 am – Asteroids , N. Hemisphere. <i>27 Euterpe</i> (in Constellation Gemini at opposition & perigee, mag 8.3, use a telescope). 6:11 am – Full Moon (moonrise time), N. Hemisphere. Other Moon Names: <i>Full Cold Moon</i> , <i>Full Yule Moon</i> , <i>Long Night Moon</i> .
31	5:06 am – Planets , N. Hemisphere. Moon & Jupiter Conjunction (southern sky in Constellation Leo, Jupiter = mag -2.2).

Times EST

January

1-10	Evening – Globe at Night , Global. Features: <i>Constellation Orion</i> (N. & S. Hemispheres).
3	Pre-dawn – Planets , N. Hemisphere. Moon & Mars Conjunction (southern sky in Constellation Virgo, Mars = mag 0.8).

Times EST

“R” is for Rocket

“Earth, in all its beauty, is just our starting place.”

(Blue Origin)

Ray Bradbury’s short story, “The Rocket Man,” inspired songs to be written and readers to dream of a future in which daily space travel was a part. That reality is nearer to fruition as commercial space companies ‘get off the ground’ with crafts that can land back on Earth for re-use.



Courtesy NASA

Astronauts & space experts Inside the 7-passenger Dragon V2 spacecraft prototype

One of the well-known companies is California-based Space Exploration Technologies (SpaceX), with its Dragon spacecraft and Falcon 9 rocket booster. Dragon is familiar because of its many cargo trips to the International Space Station (ISS). The Dragon V2 (i.e., the “Crew Dragon”) is designed for carrying humans into space with a capacity for 7 passengers. Initial plans include low Earth orbit travel and ISS docking; but, future



*Courtesy NASA/Dmitri Gerondidakis
Dragon V2*

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Thank you!



• UNESCO’s 2015 International Year
• Theme is **“Light and Light-Based
• Technologies.”** A segment of this
• theme has been allocated to the night
• sky, including star gazing, dark sky
• awareness issues, cosmic radiation and
• the centenary anniversary of the general
• theory of relativity.

• <http://www.light2015.org/Home/CosmicLight.html>

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

2015/2016								dur.		Ap.	
Date	Day	EST	Star	Mag	Asteroid	dmag	s	"	Location	Notes	
Dec 13	Sun	22:58	2UC47418472	12.3	Marlu	3.3	5	8	NYC, NJ, sPA; MD?		
Dec 18	Fri	18:17	TYC12921352	10.5	Sidonia	2.1	6	6	NJ, PA, MD, nVA; DC?		
Dec 22	Tue	22:35	54 Arietis	6.3	2000 AD118	12.	2	2	eNY, PA, WV; MD, VA?		
Dec 23	Wed	21:21	TYC01443018	10.3	2000 YZ	6.8	3	5	sNJ, DE, MD, VA; DC?		
Dec 25	Fri	3:05	4U558014061	13.0	Selene	1.7	5	10	DE, MD, OH; DC, nVA?		
Dec 28	Mon	4:13	2UC36951276	11.8	Asterope	0.8	8	7	cen&nVA, WV, sOhio		
Jan 1	Fri	19:15	4U607027051	13.3	Happelia	1.2	6	10	NJ, DE, sMD, VA; DC?		
Jan 3	Sun	19:25	4U517141242	12.4	Hippo	2.2	5	8	SKY, sVA; nVA, sMD?		
Jan 4	Mon	21:49	TYC48820616	11.7	Hirons	4.2	5	9	NJ, sPA; MD, nVA?		
Jan 4	Mon	22:35	2UC41517708	12.5	2003 WU172	8.9	6	8	TNO: Canada; USA?		
Jan 9	Sat	0:51	TYC24020481	10.2	Pannonia	6.6	2	5	DE, MD, DC, nVA, WV		

Lunar Grazing Occultations

2015/2016											
Date	Day	EST	Star	Mag	% alt	CA	Location & Remarks				
Dec 15	Tue	19:57	18 Aquarii	5.5	22+ 13	1S	Hagerstown, MD & York, PA				
Dec 19	Sat	23:06	77 Piscium	6.4	67+ 28	3N	sOiliCity, Blossburg&Gibson, PA				
Dec 22	Tue	2:59	ZC 454	5.6	87+ 11	12N	sWarren, nTroutRn, Warri orRn, PA				
Dec 26	Sat	3:36	NP Gem	6.0	99- 49	20N	Rio, Ashland, & Capeville, VA				
Jan 7	Thu	6:14	SAO 160204	9.4	7- 12	0N	Winfld, El dersbrg, Bal ti more, MD				
Jan 11	Mon	18:19	SAO 164125	9.3	4+ 8	-3S	Reston, VA; Potomac, n. Laurel, MD				

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

Total Lunar Occultations

2015/2016											
Date	Day	EST	Ph Star	Mag	% alt	CA	Sp.	Notes			
Dec 14	Mon	19:27	D ZC 2986	6.4	13+ 8	49S	G8	Azimuth 243 degrees			
Dec 15	Tue	17:38	D SAO 164322	7.8	21+ 33	82N	K0	Sun altitude -10 deg.			
Dec 16	Wed	18:37	D ZC 3270	5.8	31+ 35	71N	K3				
Dec 16	Wed	20:50	D ZC 3280	7.2	32+ 16	76S	K0				
Dec 17	Thu	22:11	D SAO 146615	7.6	44+ 14	53S	K2	Azimuth 252 deg.			
Dec 18	Fri	18:26	D ZC 4	6.3	54+ 51	84N	G9				
Dec 19	Sat	22:49	D 77 Piscium	6.4	66+ 32	36N	F4	ZC 155, double, PA graze			
Dec 19	Sat	22:50	D SAO 109667	7.3	66+ 32	37N	F6	companion of 77 Psc			
Dec 20	Sun	23:10	D ZC 300	7.5	77+ 41	71N	G5	Mag2 9 sep. .2" PA 146d			
Dec 22	Tue	2:48	D ZC 454	5.6	87+ 13	41N	K3	Az 277; PA & NYC graze			
Dec 23	Wed	22:54	D ZC 741	5.5	98+ 68	28S	K1	double?; Term. Dist. 10"			
Dec 27	Sun	3:12	R 1 Cancri	5.8	96- 60	25S	K3	AA215, ZC1197, TermD 15"			
Dec 28	Mon	21:08	R xi Leonis	5.0	85- 6	78S	K0	Az 81, ZC1409, close dbl			
Dec 28	Mon	23:22	R SAO 98671	7.7	85- 31	19S	A0				
Dec 29	Tue	1:02	R ZC 1423	6.7	84- 49	49S	A3	Mag2 11.6 sep 8" PA 99d			
Dec 29	Tue	4:36	R ZC 1433	7.0	84- 57	83N	F8				
Dec 29	Tue	6:02	R SAO 98747	6.9	83- 44	78S	K5				
Dec 30	Wed	3:06	R ZC 1539	7.3	76- 56	41S	G5	Maybe close double?			
Dec 30	Wed	6:06	R 48 Leonis	5.1	75- 48	42N	G8	ZC1549, close double??			
Jan 1	Fri	1:52	R ZC 1737	7.8	58- 27	61N	A2	Mg2 8.5 sep 72" PA 177			
Jan 1	Fri	2:15	R SAO 119179	8.2	58- 31	61N	K0				
Jan 1	Fri	6:14	R SAO 138591	7.6	57- 49	75N	K0				
Jan 3	Sun	2:28	R 77 Vir *	7.0	39- 13	46S	F0	Azimuth 111, ZC 1947			
Jan 3	Sun	5:23	R 81 Vir *	7.1	38- 39	79N	K0	ZC1951, mg2 8 2.7" 40			
Jan 5	Tue	5:35	R SAO 159111	7.5	21- 24	37N	G1				

* 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

**Free
Hubble
e-Books
and other downloads**

<http://hubble25th.org/resources/>



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“R” is for Rocket – continued from page 4

plans include space colonization. A V2 orbital test without a crew may occur as early as 2016.



Blue Origin is another west-coast company (Washington) that completed its first test flight with the New Shepard spacecraft on November 23, 2015 in Texas. Its rocket booster launched and propelled the craft to the test altitude of approximately 100 km; and then the crew capsule (which can hold 6 passengers) separated and parachuted back to Earth. This was followed by the rocket returning to Earth for a successful vertical landing.



Courtesy Blue Origin

Rocket & capsule (left) and vertical landing of New Shepard rocket booster (right)

See the Blue Origin promotional rocket landing footage at this link:

<https://youtu.be/9pillaOxGCo>

SpaceX and Blue Origin both have online feeds to keep everyone posted on their progress (@SpaceX and @BlueOrigin). However, there are quite a few other private companies in the space race with aspirations to build moon bases, provide ISS taxi service and support human space colonization. There are also likely to be more ingenious ideas to come.

“...now, who wants to go to space?”

(Blue Origin)

Learn how to use your Telescope

Calendar of Events



Courtesy CA Brooks

Telescope class on the grounds of the University of Maryland Observatory (College Park).

Coming January 2016!

The submission deadline for the January issue of Star Dust is Dec 31st.

Clear Skies!

- NCA Mirror- or Telescope-making Classes: Tuesdays and Fridays, from 6:30 to 9:45 pm at the Chevy Chase Community Center... Open house talks and observing at the University of Maryland Observatory... Phoebe Waterman Haas Public Observatory... Owens Science Center Planetarium... Mid-Atlantic Senior Physicists Group... Owens Science Center Planetarium... Upcoming NCA Meetings at the University of Maryland Observatory...

National Capital Astronomers Membership Form

Name: _____ Date: ___/___/___

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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.?

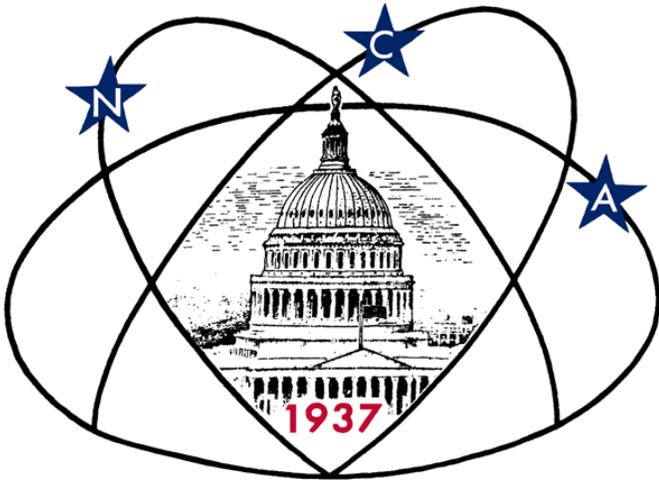
Are you interested in volunteering for: Telescope making, Exploring the Sky, Star Dust, NCA Officer, etc.?

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Next NCA Meeting:
2015 December 12th
7:30 pm
@ UMD Observatory

**Dr. Hiroya
Yamaguchi**

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