Star Dust

Newsletter of National Capital Astronomers, Inc.

capitalastronomers.org

November 2015 ***Volume 74, Issue 3***

Next Meeting

When: Sat. Nov 14th, 2015

Time: 7:30 pm

Where: UMD Observatory

Speaker: Sergio Dieterich

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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

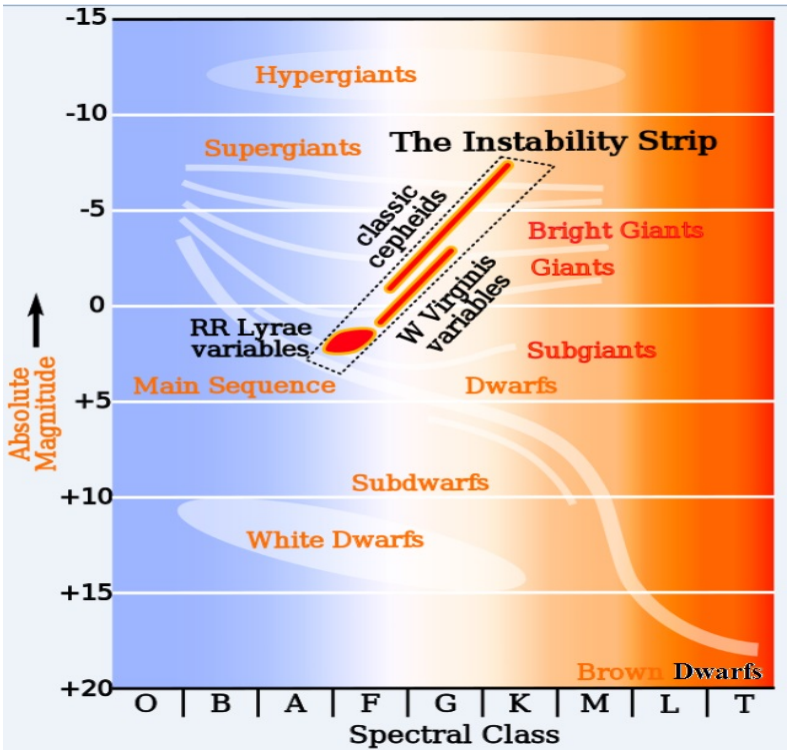
Following the meeting, members and guests are welcome to tour through the Observatory. Weather-permitting, several of the telescopes will also be set up for viewing.

Understanding our Closest and Smallest Stellar Neighbors

Sergio Dieterich,
Carnegie Institution – Department of Terrestrial Magnetism (DTM)

Abstract: Most stars in the Galaxy are significantly smaller than our Sun. Red or M dwarfs are the most numerous and comprise more than 70% of the stars in the Galaxy; however, they are arguably the least understood type of star. This talk will highlight recent developments and advances in our understanding of very low mass stars.

There will be particular emphasis on how recent observations have allowed us to pinpoint the end of the stellar main sequence and how the smallest stars compare and contrast to their even lower mass cousins, the sub-stellar brown dwarfs. Additionally, the types of observations needed to understand the fundamental properties of a star and the interpretation of those observations will be discussed.



(cc)

The Hertzsprung-Russell Diagram of Main Sequence Stars

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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.

http://hubble25th.org/

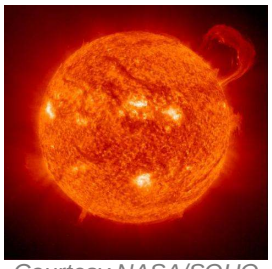
Quick Stellar Classification

Spectral Type & Temperature

Denoted with letters: O (= hottest stars [30,000-60,000 K]), B, A, F, G, K & M (= coolest stars [2,000-3,500 K]). Arabic numbers are also used: 0 (hottest) – 9 (coolest). For example, a G3 star is hotter than a G4, which is hotter than a K0. There are also additional specifications for other stars: W, T, L, S & C (e.g., brown dwarfs = L).

Luminosity

Roman numerals are used: 0/Ia+ (= very luminous [e.g., hypergiants]), Ia, Iab, Ib, II, III, IV, V, VI (sd sub dwarfs, low luminosity) and D (white dwarfs).



Courtesy NASA/SOHO

*At a surface temperature of about 6,000 K, our hydrogen-burning Sun holds a stellar classification of "**G2V**" ("yellow" dwarf star)… right in the middle of the main sequence.*

Stellar Neighbors – continued from page 1

Biographical Sketch:

Courtesy Sergio Dieterich

Serge Dieterich began working with data from the Hubble Space Telescope while still an undergraduate physics major at The Johns Hopkins University. He went on to earn an MS in Physics and a PhD in astronomy at Georgia State University. He then won an NSF Astronomy and Astrophysics Postdoctoral Fellowship, which brought him to his current position at the Department of Terrestrial Magnetism (DTM) at the Carnegie Institution for Science. Beginning with his PhD dissertation, he has become an expert on the new and important topic of the most massive non-stars and the least massive stars, regarding their similarities and differences. In the course of his work, he has also become an expert on the stars that are the Sun's neighbors in the Galaxy. He is a skilled observational astronomer, who has acquired optical and near-infrared data at many of the great ground-based telescopes. He has also extensively used the Hubble Space Telescope.

Meteor Showers and Solar Wind

John Hornstein

Courtesy NASA/JPL-Caltech

Timothy Stubbs, last month's speaker, conveys his pleasure at meeting and sharing his research with the NCA members at the October meeting. As a follow-up, Tim is also sharing the internet links and references below for anyone who is interested in meteor showers or getting a clearer picture of how the solar wind affects the planets, moons, asteroids and comets that are immersed in it.

Web Links

- IAU Meteor Data Center: www.astro.amu.edu.pl/~jopek/MDC2007/
- International Meteor Organization (lots of meteor observation advice): www.imo.net/
- The "*Frozen-in Theorem*" (in regard to the NCA member's question about why the solar wind has an electric field. Tim feels that this will enhance his explanation from the meeting): www.sp.ph.imperial.ac.uk/~mkd/Handout4.pdf

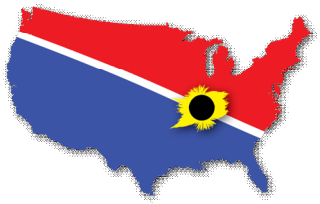
continued on page 4

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

www.greatamericaneclipse.com/

Sky Watchers — Late Autumn Schedule

November

11-12	Overnight – **Meteors**, N. Hemisphere. *North Taurids* (eastern – southern sky, debris from Comet 2P/Encke, radiant point near Pleiades). *Compared to other showers, Taurids don't generate many meteors, but do have more "fireballs" (bright ones).*
17	Overnight – **Open Clusters**, N. Hemisphere. M45 – *Pleiades* [*RA 3:47:30, Dec +24º6'*] (mag = 1.6, visible w/o binoculars, but they'll provide a better view).
17-18	Overnight - **Meteors**, N. Hemisphere. *Leonids* (debris from Comet Tempel-Tuttle, radiant point near Regulus).
22	9:04 pm – **Planets**, N. Hemisphere. Moon & Uranus Conjunction (southeastern sky in Constellation Pisces, Uranus = mag 5.8).
25	5:44 pm – **Full Moon** (moonrise time), N. Hemisphere. Other Moon Names: *Full Beaver's Moon, Full Frosty Moon. Beavers are active, preparing for winter, and humans take the opportunity to set traps for them as they also prepare for winter.)*

Times EST

December

2-11	Evening – **Globe at Night**, Global. Features: *Constellation Pegasus* (N. Hemisphere) & *Sagittarius* (S. Hemisphere).
4	12:19 am – **Planets**, N. Hemisphere. Moon & Jupiter Conjunction (southern sky in Constellation Leo, Jupiter = mag -2.0).
7	Pre-dawn – **Planets**, N. Hemisphere. Moon & Venus Conjunction (southeastern sky in Constellation Virgo, Venus = mag -4.7).
13-14	Overnight - **Meteors**, N. & S. Hemispheres. *Geminids* (debris from Asteroid 3200 Phaethon, radiant point near stars Castor & Pollux).

Times EST

Meteor Showers & Solar Wind – continued from page 2

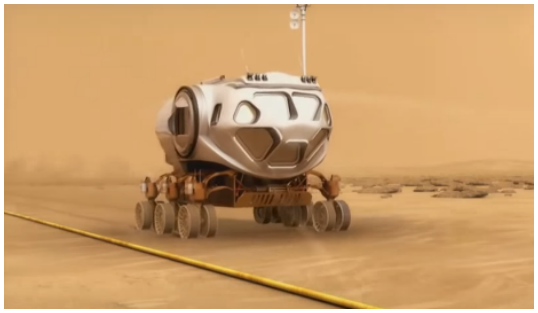
Helpful Books

Kivelson, Margaret G. & Russell, Christopher T. (1995). *Introduction to Space Physics.* Cambridge University Press.

Baumjohann, Wolfgang & Treumann, Rudolf A. (2012). *Basic Space Plasma Physics.* Imperial College Press.

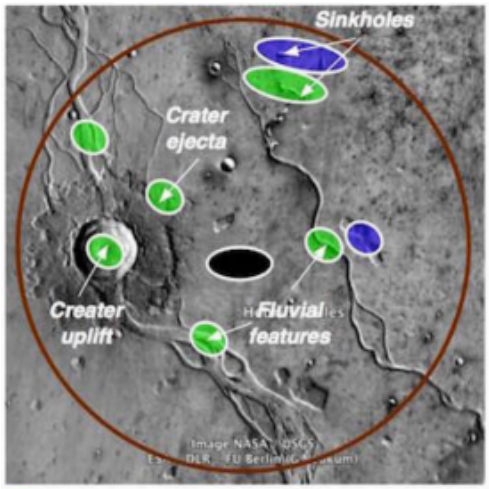
Planetary Destinations

Since there is a NASA Mars mission planned for 2035, a meeting was held last month at the Lunar and Planetary Institute (Houston) to begin the process of identifying the data and robotic missions required to select a Mars landing site as well as assessing the resources that would be available at the landing site. The meeting was called "*First Landing Site/ Exploration Zone Workshop for Human Missions to the Surface of Mars*." In attendance and opening the meeting were Ellen Ochoa (Director, Johnson Space Center) and John Grunsfeld (Associate Administrator, NASA Headquarters Science Mission Directorate). NASA's proposal is that there will be crews of 4-6 people on each of 3-5 missions, each lasting about 500 Martian days. The missions would include constructing a "surface field station" in the middle of the EZ (exploration zone) where all the missions would land.

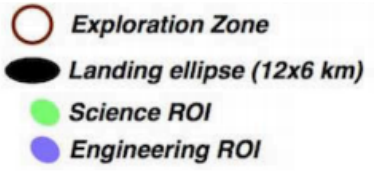


Courtesy NASA

Pressurized rover design for human travel on Mars in a sample EZ. The rover is designed to travel at least 60 miles from base camp and up to 14 Martian days.



A proposed EZ from the meeting and relevant ROIs (Regions of Interest)



Source: Davila et al (2015) The Hebrus Valles Exploration Zone: Access to the Martian Surface and Subsurface

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Thank you!

INTERNATIONAL YEAR OF LIGHT 2015

COSMIC LIGHT IAU

*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.*

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							dur.	Ap.	
Date	Day	EST	Star	mag.	Asteroid	dmag	s	"	Location, Notes
Nov 14	Sat	18:04	PPM 273500	10.3	1940 GO	7.1	2	5	eVA,MD,ePA;DC?
Nov 16	Mon	2:15	2UC39612169	12.2	Sylvania	0.8	4	8	nDE,nMD,swPA
Nov 20	Fri	18:14	2UC35143508	12.1	Sabauda	1.8	5	8	NYC,nNJ,sPA;nMD?
Nov 20	Fri	21:24	2UC29759153	14.7	Echeclus	3.2	8	10	NE,PA,NY;MD?
Nov 21	Sat	22:36	TYC34020356	9.7	Silvretta	4.5	3	4	sMD,nVA,WV;DC?
Nov 26	Thu	19:26	SAO 163674	8.9	Melanie	6.7	1	3	NY,nwPA,nOH,IN
Dec 4	Fri	1:37	4U579020198	12.4	Polydoros	4.5	2	8	sVA,nNC,TN;sMD?
Dec 4	Fri	21:28	2UC31093266	11.6	Felicitas	1.6	5	7	nVA,MD,DC,ePA,NJ
Dec 6	Sun	2:32	TYC02540283	10.2	Roucarie	6.5	1	5	nOH,sPA,sNJ;nMD?
Dec 7	Mon	2:42	TYC19241850	11.3	Diotima	1.3	19	7	neNC,e&nVA,eWV
Dec 7	Mon	20:36	2UC34434958	12.5	Croatia	1.5	9	8	DE,sMD,DC,nVA
Dec 11	Fri	5:24	SAO 139360	9.5	Branham	8.0	1	4	NC,KY;sVA,sWV?
Dec 13	Sun	22:58	2UC47418472	12.3	Marlu	3.3	5	8	NYC,NJ,sPA;MD?

Lunar Grazing Occultations

2015							
Date	Day	EST	Star	Mag	% alt	CA	Location & Remarks
Nov 13	Fri	18:05	SAO 160220	9.4	5+ 5	-1S	Chantily,VA;Kensgtn,Laurel,MD
Dec 1	Tue	7:20	ZC 1381	6.4	67- 46	8S	Rckv,SlvrSpg,Woodmor,MD;Sun+2
Dec 7	Mon	6:21	ZC 1997	6.9	14- 28	8S	n Westminster, MD; Sun -10
Dec 8	Tue	4:55	ZC 2097	6.8	9- 6	2N	York & Oxford,PA; SomersPt,NJ

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

Total Lunar Occultations

2015										
Date	Day	EST	Ph	Star		Mag	%	alt	CA	Sp. Notes
Nov 14	Sat	18:50	D	ZC 2578		6.5	10+	6	50N	A1 Azimuth 240
Nov 15	Sun	17:41	D	ZC 2731		6.6	17+	23	76N	A1 Sun -10, close double
Nov 15	Sun	17:42	D	SAO 161850		7.2	17+	23	84N	A2 Sun altitude -10 deg.
Nov 15	Sun	20:09	D	ZC 2745		6.8	17+	2	46S	K1 Azimuth 244 degrees
Nov 16	Mon	18:01	D	SAO 162937		7.9	26+	28	67S	A2 Close double??
Nov 16	Mon	19:38	D	ZC 2889		6.9	26+	16	82N	M2
Nov 16	Mon	19:54	D	SAO 162989		7.2	26+	14	88N	F5 Azimuth 234 degrees
Nov 17	Tue	17:51	D	tau Cap		5.2	35+	35	69N	B7 Sun -12,ZC3015,CloseDbl
Nov 18	Wed	19:59	D	BP Cap		7.3	47+	32	57N	M1 ZC 3165
Nov 19	Thu	18:37	D	ZC 3306	*	7.8	58+	43	60S	F0 mg2 8.7,sep. 8",PA 329d
Nov 20	Fri	23:27	D	ZC 3470		7.1	70+	23	21S	A0
Nov 24	Tue	0:07	D	xi Arietis		5.5	95+	53	77S	B7 ZC 354, close double??
Nov 26	Thu	5:52	D	Aldebaran		0.9	100-	16	-81S	K5 WA 141, ZC 692
Nov 26	Thu	6:32	R	=alpha Tau		0.9	99-	9	14S	K5 Sun -6, Az.284, AA 234
Nov 27	Fri	2:16	R	115 Tauri		5.4	97-	65	79N	B5 AA 297,ZC814,close dbl
Nov 27	Fri	19:52	R	ZC 944		5.9	94-	10	75N	A6 Az 75,AA 295,close dbl
Nov 27	Fri	23:06	R	ZC 970		6.3	93-	46	42S	G9 Axis Angle 231 degrees
Nov 28	Sat	5:39	R	20 Gem		6.9	92-	41	81S	G8 ZC1002 Companion 21Gem
Nov 28	Sat	5:40	R	21 Gem		6.3	92-	40	82S	F6 ZC1003 R 20 Gem +18s
Dec 7	Mon	6:30	R	X 37082		7.8	14-	30	73S	F0 Sun -8,mg2 11 7" PA181
Dec 7	Mon	6:42	R	ZC 1996		6.7	14-	32	72S	K5 Sun altitude -6 deg.
Dec 7	Mon	12:39	D	Venus		-4.2	13-	21	-53N	Sun +28, duration 30s
Dec 7	Mon	13:51	R	Venus		-4.2	13-	8	69N	Sun +23, Az 250
Dec 8	Tue	5:05	R	ZC 2097		6.8	9-	8	21N	K0 Az. 113; PA & NJ graze

* *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

November 2nd

2000-2015

The ISS celebrates
15 years
of continuous habitation in space!

Courtesy NASA/ESA

2015-2016 Officers

Planetary Destinations – continued from page 4

Almost 50 possible EZs were proposed, including Gale Crater (the rover landing site), Chryse Planitia (Viking 1 landing site) and Hebrus Valles (where caves are located). The presentations are posted online by the Lunar and Planetary Institute. The idea is that the astronauts "live off the land" to the highest extent possible.

Naturally, water will be an important resource, but in more ways than one might think. It will be needed for sustaining life, but also for use in necessities such as radiation shielding and manufacturing rocket propellant (unlike the Mars One proposal, NASA astronauts intend to return to Earth).

See all of the structures in the sample Mars EZ Surface Field Station here starting at time stamp 2:05:30: https://youtu.be/ONp6xaOJ_o0

Through the Clouds…

Courtesy Bernard Kaufman
The September 2015 Lunar Eclipse

It was cloudy in the DC area during September's lunar eclipse; however, NCA member Bernie Kaufman was able to get this quick photo of the Moon through a brief break in the clouds.

Adieu!

Courtesy NASA/JHUAPL/SwRI

Crescent of Pluto as New Horizons looked back at the planet in the July 2015 fly-by. Some of the features include Sputnik Planum (sunlit) bordered above by Norgay Montes (mountains reaching 11,000 feet). Below Sputnik are glaciers. The entire image was cleaned & released in October.

The submission deadline for the December issue of Star Dust is Nov. 27th.

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

Phoebe Waterman Haas Public Observatory at the National Air & Space Museum, Solar viewing, Wed. – Sun., 12 – 3 pm (weather permitting).

Owens Science Center Planetarium: "Andromeda & the Demon Star," Fri. Nov. 13, 7:30 pm; $5/adult; $3/students/senior/teachers/military; children under 3 free. www1.pgcps.org/howardbowens

Saturday Star Party: Sat. Nov. 14, 4:30 – 7:30 pm, Sky Meadows State Park, VA. (parking $5). Includes Jr. Astronomer program, a speaker from JPL and observations. airandspace.si.edu/events/star-parties/

Mid-Atlantic Senior Physicists Group: "Global Warming 56 Million Years Ago and What It Means for Us" with Scott Wing (Smithsonian), Tues. Nov. 17 *, at 1 pm at the American Center for Physics (1st floor conference room). www.aps.org/units/maspg/

* *Note: this meeting is the 3rd Tuesday instead of Wednesday.*

Upcoming NCA Meetings at the University of Maryland Observatory:
12 December: Hiroya Yamaguchi (UMD/GSFC), "What Produced Supernova 3C 397?"

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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First Class
Dated Material

Next NCA Meeting:

2015 November 14th

7:30 pm

@ UMD Observatory

Dr. Sergio Dieterich

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