

Star Dust

National Capital Astronomers, Inc.
January 2013 Volume 71, Issue 5
capitalastronomers.org



Celebrating 75 years 1937-2012

Next Meeting

When: Sat. Jan. 12, 2013
Time: 7:30 pm
Where: UMD Observatory
Speaker: Abderahmen Zoghbi
(UMD)

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Directions to Dinner/Meeting

Our new location for dinner with the speaker before each meeting is at Mulligan's Grill and Pub on the UM Golf Course. Mulligan's is one intersection closer to the observatory on Route 193 than UMUC. One turns on to "Golf Course Road" and drives a few hundred feet to the golf course building, where "Mulligan's Grill and Pub" is located. More detailed directions are on page 7.

The dinner menu can be downloaded from <http://mulligans.umd.edu/>

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 at the observatory. Please try to let him know in advance by e-mail at rigel1@starpower.net.

January 2013: Abderahmen Zoghbi University of Maryland X-Ray Echoes Map the Environment of a Black Hole

Abstract: The study of the physical processes around black holes in active galactic nuclei (AGN) has recently advanced significantly, due to the discovery of the reverberation of light pulses on scales of a few gravitational radii. (The radius of the event horizon of a non-spinning black hole would be 2 gravitational radii.)

You are familiar with reverberation in another context: thunderstorms. When a lightning discharge produces a pulse of sound, the pulse reverberates among the clouds. So we receive a jumble of variously delayed echoes of the same pulse. The jumbling of the echoes produces the rumble of thunder.

In AGN, instead of a pulse of sound, the original disturbance is a large change in the strength of the light emitted by the immediate environment of the black hole. Besides changes in the strength of light at radio, infrared, visible and ultraviolet wavelengths, there are changes at X-ray wavelengths, and those are the main topic of the talk.

The initial detections of reverberation were made in sources that have a bright so-called soft excess, where the delay was between the hard continuum portion of the spectrum and the 'reflected' soft excess portion. The cause of the soft excess is not well understood, however, which has limited the information that we have been able to extract from measurements of those reverberations.

More recently, we discovered light echoes in the iron K band in the bright AGN *NGC 4151*. These are the first light echoes to be seen in this well understood spectral feature. Since the iron K band is well understood, we are able to extract much more information from measurements of these delays. The object shows delays not just between the iron line and the continuum, but also between the parts of the spectral line that are emitted at different radii in the accretion disk.

We have also found other objects that show similar behavior. In this talk, I will discuss how spectroscopy and measurements of the variability in AGN are used to probe the inner regions of active galaxies.

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.

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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 postage in the production of Star Dust (the NCA's single largest expense) and also save some trees. If you can switch from paper to digital, please contact Manjunath Rao, the NCA Secretary, at kurchi@hotmail.com.

Thank you!

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.

Biography: Abderahmen Zoghbi is a postdoctoral research associate at the University of Maryland, and a research scientist at the Joint Space Sciences Institute. He holds a PhD from the University of Cambridge (UK). His research interests include: the variability of compact objects, X-ray reverberation, and observations of the environments of black holes.

Help Keep the NCA Functioning

John Hornstein

The NCA meeting on June 8, 2013 will elect the officers for the 2013-2014 season, and one Board member who will serve a four year term.

Although June seems to be far in the future, for the purpose of finding candidates, it is rather soon.

It is not too early to think about what you would like to do to help keep the National Capital Astronomers alive. Although many types of volunteers are needed, this article will focus only on the two roles for which the need for candidates/volunteers is urgent.

To keep the NCA alive, we need candidates for President, and for the Editor of the Star Dust newsletter. We need their names by mid-April, for inclusion in the list of candidates that will be published in the Star Dust for May and will be announced at the May meeting.

The only requirements are enthusiasm and a willingness to help out. Expertise in astronomy is not needed. The current officers and Board members will be happy to bring you up to speed.

If you would like to help out by serving in any of the positions named above, or for any of the other positions that will be decided during the election in June, please contact any of the current officers or Board members.

Outreach Opportunities

Jay Miller

There are two opportunities coming up to help NCA. On 24 January, Maury Elementary School at 13th & Constitution Ave. is having a Science Night and would like a telescope or two.

On 23 March, the Girl Scouts will have their annual science event at the Air & Space Museum's Udvar-Hazy Center near Dulles. This is from 10 AM to 3 PM and there will be many organizations present. The Westminster club always has a large contingent helping. We could use some people to help at the table or you could bring a telescope for indoor or solar viewing. Let me know at rigel1@starpower.net if you can help at either event.

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- Harold Williams (2016)

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APS Mid-Atlantic Senior Physicists Group

www.aps.org/units/maspg
 January 2013 Event

Topic: Geoneutrinos and Heat Production in the Earth

Date: Wednesday January 16, 2013

Time and Location: 1:00PM, with Q&A to follow; in a 1st floor conference room at the American Center for Physics, 1 Physics Ellipse, College Park, MD-- off River Rd., between Kenilworth Ave. and Paint Branch Parkway.

Abstract: The kTon-scale liquid scintillation detectors at KamLAND and Borexino, which measure the flux of electron antineutrinos from the Earth (i.e., geoneutrinos) and nuclear reactors, reveal that radiogenic heat from the decay of Th and U (the only detectable signal) contributes about 40% (20±9 TW) of the Earth's present-day power (46±3 TW). The silicate Earth is predicted to have between 0.5 and 1.5 x 10¹⁷ kg of U (with Th/U of 3.9 and K/U of 1.4 x 10⁴), whereas the core's contribution of radiogenic heat is negligible. These particle physics experiments are now establishing limits on acceptable compositional models for the Earth and defining the amount of nuclear power inside the Earth available to drive plate tectonics, mantle convection, and the geodynamo.

Speaker: William F. McDonough, Professor of Geology, Director of the Plasma Lab, and Director of Graduate Studies; Affiliate Professor of Chemistry and Biochemistry, University of Maryland
 Ph.D. 1988 Geochemistry, Research School of Earth Science, Australian National University
 M.S. 1983 Geochemistry, Sul Ross State University, Alpine, TX, USA
 B.A. 1979 Anthropology, University of Massachusetts, Boston, MA, USA
 2010-present Affiliate Professor, Department of Chemistry and Biochemistry, Univ. of MD
 2005-present Professor, Department of Geology, University of Maryland, College Park, MD Research Associate, Harvard Univ.; Research Fellow, Research Sch. Earth Science, Australian National Univ.; Von Humboldt Fellow, Max-Planck-Institute fur Chemie, Mainz, Germany

Research: Understanding the composition, structure and evolution of the Earth and the other terrestrial planets are dominant themes of my research. My expertise is in using laser ablation systems and plasma mass spectrometers for the chemical and isotopic analyses of samples. I also work with modeling and detecting the electron antineutrino flux from the Earth and nuclear reactors. With my students, we provide chemical and isotopic data that constrain geological processes and data for forensics, nuclear chemistry and archaeology.

Publications: >120 peer-reviewed published papers; Editor, Analytical Geochemistry (Vol 14), Treatise on Geochemistry, Elsevier (2013); Co-editor, Composition, Deep Structure and Evolution of Continents Elsevier (1999); Journal Ed.: Geostandards and Geoanalytical Research

Awards: Robert Wilhelm Bunsen Medal, European Geosciences Union; Distinguished Alum, Sul Ross State Univ.; Copernicus Visiting Scientist, University of Ferrara, Italy; Fellow, American Geophysical Union; Fellow, Geochemical Society and the European Association for Geochemistry; Distinguished Faculty Award, CMPS, Board of Visitors, University of Maryland Fellow, Mineralogical Society of America; Fellow, Geological Society of America; Fellow, Alexander von Humboldt Society

Hopewell Attic

Michael Chesnes

Ongoing improvements to the attic at Hopewell Observatory's Operations Building will soon make it a comfortable space.

During the process of putting up board and batten paneling over the attic's insulation, members of the Hopewell Astronomical Society (HAS) retrieved from the attic a number of telescopes and optical equipment, as well as NCA records, at least some of which were labeled by long-time NCA member Nancy Byrd. I have the records in my possession, but have not examined them yet.

The rediscovered records should make an interesting article for an upcoming issue of *Star Dust*.

NCA members Bob Bolster, Guy Brandenburg, Jay Miller, and Michael Chesnes and HAS member Bill Rohrer have been working on the paneling; it is now in place on half of the attic.



Jay Miller helped measure and cut the panels to size.



Guy Brandenburg pauses after an afternoon of hard work.

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 and Expeditions

David Dunham

Asteroidal and Planetary Occultations

Date	Day	EST	Star	Mag.	Asteroid	Mag.	Asteroid	dur.	Ap.	Location
								mag	s "	
2013										
Jan 15	Tue	21:22	SAO 78598	8.8	1993	RX3		7.7	2	3 NJ, ePA, MD; DC, VA?
Jan 15	Tue	21:47	ZUC48053986	11.7		Rhoda		1.9	10	7 sNJ, DE, MD, DC, nVA
Jan 19	Sat	22:21	ZUC39120641	12.1		Isolda		0.6	18	8 sMD, s&cVA, sWV, TN
Jan 21	Mon	1:03	SAO 81383	7.9		Pax		5.4	4	2 eMA, NH, VT, NY, eON
Jan 28	Mon	22:17	TYC12880045	10.5	2000	WW12		11.7	16	6 TNO; FL, TX; NE, DC?
Jan 30	Wed	4:44	TYC61861396	10.6		Prymno		10.6	2	6 sOH, WV, c&seVA
Feb 9	Sat	1:16	TYC29640914	10.0	1999	AN22		7.1	2	5 neNC, cVA, WV, sOH
Feb 9	Sat	3:37	TYC54270802	11.0		Arctica		3.1	6	7 NJ, MD, DC, PA; nVA?

Lunar Grazing Occultations (*, Dunham plans no expedition)

Date	Day	EST	Star	Mag.	% alt	CA	Location
2013							
Jan 14	Mon	18:26	ZC 3290	7.3	13+ 25	1S	*Herndn, VA; cDC; Gblt&nBowie, MD
Jan 16	Wed	20:31	SAO 109034	8.4	31+ 26	2N	*Stafford, VA; Bel Alton, MD
Feb 4	Mon	2:12	ZC 2217	5.5	41- 3	3S	Duncanon, Colon'l Pk, ChadsFd, PA

2013 - No useful grazes in Mid-Atlantic region in early January
Interactive detailed maps at <http://www.timerson.net/IOTA/>

Total Lunar Occultations

DATE	Day	EST	Ph	Star	Mag.	% alt	CA	Sp.	Notes
Jan 13	Sun	18:33	D	SAO 145483	7.9	6+ 12	59S	B9	Azimuth 248 degrees
Jan 13	Sun	17:32	D	ZC 3154	7.4	6+ 22	90S	G0	Sun -5, close double?
Jan 13	Sun	18:33	D	SAO 145483	7.9	6+ 12	59S	B9	Azimuth 248 degrees
Jan 14	Mon	17:46	D	51 Aquarii	5.8	13+ 31	4N	A0	Sun -7, ZC3287, close dbl
Jan 14	Mon	18:26	G	ZC 3290	7.3	13+ 25	1S	F0	maybe close double
Jan 16	Wed	19:25	D	SAO 109025	8.2	30+ 38	57N	G5	
Jan 16	Wed	20:11	D	SAO 109032	8.0	31+ 30	30N	G5	close double??
Jan 16	Wed	20:17	D	ZC 17	7.8	31+ 29	59S	G5	
Jan 17	Thu	19:29	D	ZC 124	7.8	40+ 48	45N	K0	
Jan 21	Mon	23:14	D	SAO 93863	7.9	78+ 48	83S	A0	
Jan 22	Tue	21:22	D	106 Tauri	5.3	85+ 71	61S	A5	ZC 765, close double?
Jan 23	Wed	3:19	D	CD Tauri	6.8	86+ 12	51S	F7	Az. 287, ZC 790, double?
Jan 23	Wed	17:33	D	ZC 892	6.7	91+ 33	59N	B9	Sun altitude -3 deg.
Jan 23	Wed	18:07	D	chi 1 Ori	4.4	91+ 39	69N	G0	Sun -10, ZC 894, double?
Jan 24	Thu	0:49	D	chi 2 Ori	4.6	92+ 48	53N	B2	ZC 915, close double?
Jan 24	Thu	18:38	D	ZC 1038	7.1	95+ 35	56S	B9	spectroscopic binary
Jan 28	Mon	3:59	R	omega Leo	5.5	98- 41	87S	F9	AA 289, ZC1397, close dbl
Jan 31	Thu	4:26	R	ZC 1726	6.7	82- 44	61S	F5	
Jan 31	Thu	22:34	R	chi Vir	4.7	75- 1	75N	K2	Az102, ZC1815, close dbl?
Feb 1	Fri	1:33	R	SAO 138948	7.6	74- 31	41N	K0	mg2 11, sep. 7", PA 97
Feb 1	Fri	3:32	R	ZC 1835	7.6	73- 41	57S	K2	
Feb 1	Fri	4:44	R	SAO 138978	7.6	73- 41	73N	K2	
Feb 3	Sun	2:19	R	SAO 158642	7.2	52- 16	53S	A2	
Feb 4	Mon	5:42	R	ZC 2230	6.7	40- 29	65S	F3	maybe close double?
Feb 4	Mon	5:57	R	X 39791	7.6	40- 30	69N	B9	
Feb 4	Mon	6:20	R	SAO 159420	8.4	40- 31	54N	A2	Sun alt. -10 deg.
Feb 4	Mon	6:29	R	ZC 2236	6.9	40- 31	66N	F3	Sun -9, close double
Feb 4	Mon	6:29	R	X133449	7.6	40- 31	66N	F3	Sun -9, close double?
Feb 12	Tue	19:22	D	SAO 128380	8.1	9+ 14	38N	G5	Az. 263, close double?
Feb 13	Wed	18:27	D	SAO 109306	7.8	15+ 35	70N	F5	Sun alt. -9 deg.

Explanations & more information are at <http://iota.jhuapl.edu/exped.htm> .
David Dunham, dunham@starpower.net ,
Phone 301-526-5590

*Thank you Nancy Grace Roman
for finding this article.*

Ancient Galaxies

By Clara Moskowitz and
SPACE.com
Scientific American News

The Hubble Space Telescope has captured the farthest-ever view into the universe, a photo that reveals thousands of galaxies billions of light-years away.

The picture, called eXtreme Deep Field, or XDF, combines [10 years of Hubble telescope views](#) of one patch of sky. Only the accumulated light gathered over so many observation sessions can reveal such distant objects, some of which are one ten-billionth the brightness that the human eye can see.

The photo is a sequel to the original "Hubble Ultra Deep Field," a picture the [Hubble Space Telescope](#) took in 2003 and 2004 that collected light over many hours to reveal thousands of distant [galaxies](#) in what was the deepest view of the universe so far. The XDF goes even farther, peering back 13.2 billion years into the universe's past. The universe is thought to be about 13.7 billion years old.

"The XDF is the deepest image of the sky ever obtained and reveals the faintest and most distant galaxies ever seen," Garth Illingworth of the University of California at Santa Cruz, principal investigator of the Hubble Ultra Deep Field 2009 program, said in a statement. "XDF allows us to explore further back in time than ever before."

Continued on next column

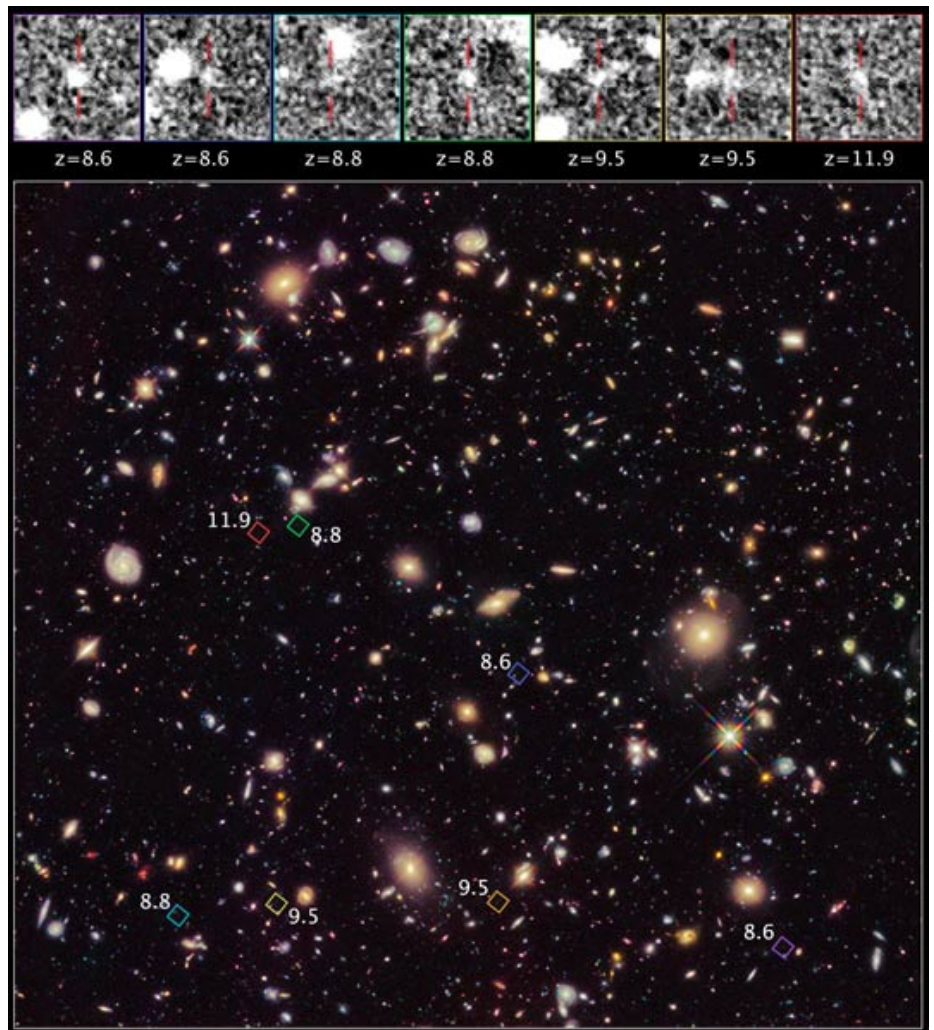
The photo reveals a wide range of galaxies, from spirals that are Milky Way-lookalikes, to hazy reddish blobs that are the result of collisions between galaxies. Some of the very tiny, faint galaxies could be the seeds from which the biggest galaxies around today grew.

The XDF is a portrait of a small area of space in the southern constellation Fornax, and spans only a small fraction of the area of the full moon. Within that region, Hubble has revealed 5,500 galaxies, many of which existed shortly after the birth of the universe.

The farthest-away galaxies are 13.2 billion light-years from Earth, meaning their light has taken 13.2 billion years to travel to Hubble's cameras.

"The light from those past events is just arriving at Earth now, and so the XDF is a 'time tunnel into the distant past,'" according to a NASA statement. "The youngest galaxy found in the XDF existed just 450 million years after the universe's birth in the Big Bang."

Hubble was only able to image these objects by amassing light in 2,000 images of the same area, with a total exposure time of 2 million seconds, through two of its cameras: the Advanced Camera for Surveys and the Wide Field Camera 3.



Directions to Mulligan's Grill and Pub

<http://mulligans.umd.edu/directions>

Take I-66 East -or- I-270 South to the Washington, D.C. Beltway (I-495).

Proceed East on I-495 toward Baltimore / Silver Spring.

Take Exit #25 (US 1) South toward College Park.

Proceed approximately 2 miles on US 1.

Exit right onto route 193 West (University Blvd).

Second stop light (Golf Course Road); turn right.

Proceed into the Golf Course parking lot.

For those of you using a GPS unit you can input: the intersection of 193 and Stadium Dr or 38.990987,-76.954399.

Calendar of Events

NCA Mirror- and Telescope-making Classes: Tuesdays Jan. 1, 8, 15, 22, 29 and Fridays, Jan. 4, 11, 28, 25, 6:30 to 9:30 pm at the Chevy Chase Community Center, at the northeast corner of the intersection of McKinley Street and Connecticut Avenue, N.W. Contact instructor Guy Brandenburg at 202-635-1860 or email him at gbrandenburg@yahoo.com. In case there is snow, call 202-282-2204 to see if the CCCC is open.

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

Dinner: Saturday, Jan. 12 at 5:30 pm, preceding the meeting, at *Mulligan's Grill and Pub* at the University of Maryland Golf Course.

Owens Science Center Planetarium: "Fancy Nancy Sees Stars!" Fri. Jan. 11 at 7:30 pm; Sat. Jan 12 at 11:00 am & 1:30 pm. www1.pgcps.org/howardbowens

Mid Atlantic Senior Physicists Group : "Geoneutrinos and Heat Production in the Earth" Wed. Jan. 16 at 1:00pm. American Center for Physics, College Park, MD. See page 3.

Montgomery College Planetarium: 7621 Fenton Street, Takoma Park, MD (240) 567-1463. Sat. 26 Jan. 2012 at 7:00 pm. "How are Stars Born?" in the Planetarium. www.montgomerycollege.edu/Departments/planet/

Science Night: Maury Elementary School, D.C. Jan. 24. **Girl Scouts:** Udvar-Hazy Mar. 23. See page 2 or contact rigel1@starpower.net for more information on these events.

Upcoming NCA Meetings at the University of Maryland Observatory
 Jan 12 **Abderahmen Zoghbi** (UMD), X-ray Echoes Map the Environment of a Black Hole
 Feb 09 **Lindy Elkins-Tanton** (DTM), Magma and Water Oceans in the Early Solar System
 Mar 09 **Paul Ray** (NRL), X-ray Pulsars

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

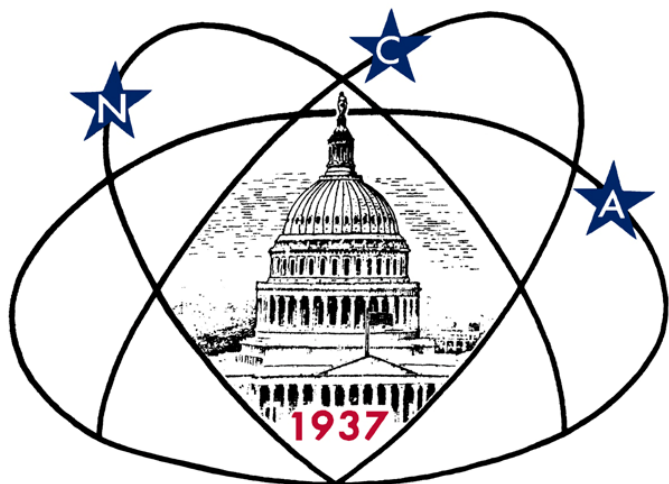
NCA c/o Elizabeth Warner

400 Madison St #2208

Alexandria, VA 22314

First Class

Dated Material



Next NCA Mtg:

Jan. 12

7:30 pm

@ UMD Obs

**Abderahmen Zoghbi
(UMD)**

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