Star Dust

National Capital Astronomers, Inc.

May 2013 *Volume 71, Issue 9*

http://capitalastronomers.org

Celebrating 75 years 1937-2012

Next Meeting

When: Sat. May 11, 2013
Time: 7:30 pm
Where: UMD Observatory
Speaker: Brett W. Denevi (JHU/APL)

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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.

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

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

May 2013: Brett W. Denevi
Johns Hopkins University
Applied Physics Laboratory

MESSENGER's Surprising Images of Mercury

Abstract: In March 2011, the **ME**rcury **S**urface, **S**pace **EN**vironment, **GE**ochemistry, and **R**anging (MESSENGER) spacecraft became the first ever to orbit the planet Mercury. Over the greater than two years of orbital operations, the spacecraft's suite of seven scientific instruments and radio science investigation have returned unprecedented data from the Solar System's innermost planet.

Included among MESSENGER's vast datasets are >150,000 images acquired by the spacecraft's camera system, the Mercury Dual Imaging System (MDIS). These images have provided intriguing new insights into the geologic processes that have shaped Mercury's surface and the overall formation and evolution of the planet closest to the sun. Currently, the spacecraft is orbiting Mercury and continuing to acquire additional data and images, often emphasizing higher resolution images of surface features of high scientific interest. MESSENGER is capable of continuing orbital operations until early 2015.

Biography: Dr. Brett W. Denevi, the Deputy Instrument Scientist of MESSENGER's Mercury Dual Imaging System (MDIS), is a Staff Scientist at the Johns Hopkins University Applied Physics Laboratory. She received her B.A. in geology from Northwestern University in 2002 and her Ph.D. from the University of Hawaii in 2007, where she studied the composition and evolution of the lunar surface using visible and near-infrared spectroscopy. Prior to joining the Applied Physics Laboratory, she was a post-doctoral researcher and faculty research associate at Arizona State University.

Continued on Page 2

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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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.

Continued from Page 1

Dr. Denevi's research focuses on understanding the origin and evolution of planetary crusts, including volcanism, regolith development, and impact modification. She works primarily with imaging and spectrometer data and helped to develop the ground and in-flight calibration of the Lunar Reconnaissance Orbiter Camera (LROC) Wide Angle Camera and the in-flight calibration of MESSENGER's Mercury Dual Imaging System (MDIS). She is a Co-Investigator on the Lunar Reconnaissance Orbiter Camera, a participating scientist on the Dawn mission to Vesta, and in addition to MDIS Deputy Instrument Scientist, leads the Geology Discipline Group of MESSENGER's science team.

Help Needed with Vacuum Pump on ATM Mirror Coating Machine

If you have experience operating, maintaining, or repairing vacuum diffusion pumps, Guy Brandenburg needs your assistance getting the mirror coating machine at our amateur telescope making class in Chevy Chase to work again. Please contact him at 202-635-1860 or gfbranden@earthlink.net .

Come See the Stars!

Exploring the Sky

2013 Schedule

Date	Time	Things of interest in the month:
5/4	9:00pm	Saturn rising in the east; the Beehive in Cancer
6/1	9:00pm	Solstice 6/21; Mercury at Castor's feet
7/13	9:00pm	Summer Triangle; 5-day-old Moon near Virgo
8/10	8:30pm	Andromeda rising; Perseid meteor shower
9/7	8:00pm	Andromeda Galaxy rising; equinox 9/22
10/5	7:30pm	Astronomy Day 10/12; Orionid meteor shower
11/2	7:00pm	Pleiades and Winter constellations appear

Exploring the Sky is an informal program that for over sixty 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.

Sessions are held in Rock Creek Park once each month on a Saturday night from April through November, starting shortly after sunset. We meet in the field just south of the intersection of Military and Glover Roads NW, near the Nature Center. A parking lot is located next to the field.

Beginners (including children) and experienced stargazers are all welcome—and it's free!

Questions? Call the Nature Center at (202) 895-6070 or check the Internet sites:

www.nps.gov/rocr/planyourvisit/expsky.htm

www.capitalastronomers.org

A presentation of the National Park Service and National Capital Astronomers

APS Mid-Atlantic Senior Physicists Group

http://www.aps.org/units/maspg/

May 2013 Event

Date: Wednesday, May 22, 2013
Speaker: Wallace (Wally) Manheimer
Naval Research Laboratory (Retired)
Topic: How Fusion Can Become Relevant
Time: 1:00 PM, with Q&A to follow, in a 1st floor conference room
Location: at the American Center for Physics (www.acp.org), 1 Physics Ellipse, College Park, MD, -- off River Rd., between Kenilworth Ave. and Paint Branch Parkway.

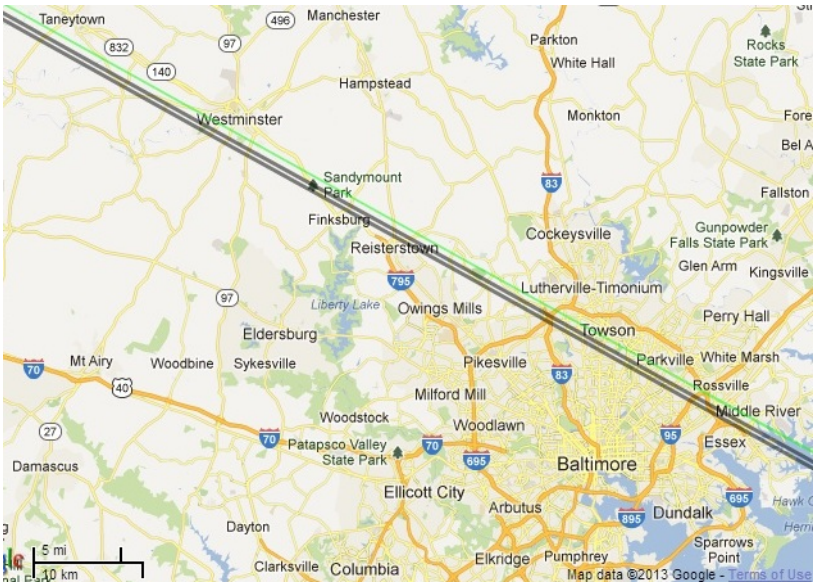
Abstract: In theory, controlled thermonuclear fusion can be billed as one of a relatively few possible solutions to the carbon free energy dilemma. A brief review of other 'sustainable' options, solar, wind, biofuel and sequestration shows that they are nowhere near ready to provide the required power any time soon. However fusion has undergone difficult times lately. Its two large flagships, ITER (International Tokamak Experimental Reactor) and NIF (National Ignition Facility) appear to be taking on water. ITER's schedule has slipped years, and its construction cost estimate has more than tripled since 2005. NIF, while running and routinely generating megajoule laser shots, has still come in at billions over budget. Also, as of November 2012, its neutron production is more than three orders of magnitude down from what had been promised; so far failing in its namesake mission. Yet tokamaks and lasers remain fusion's best hope.

Although fusion's problems are more immediate, one thing that could help it greatly in the long run is to reduce the requirements on the fusion reactor by an order of magnitude. It would be more helpful still if fusion could fit in easily with current energy infrastructure. The tremendous potential of fission suppressed hybrid fusion, or more briefly fusion breeding, is that it offers exactly that potential. This talk will discuss fusion breeding and show how it might offer a solution to the energy dilemma within a reasonable time span. A single fusion breeder reactor can power at least 5 light water reactors (LWR's) of equal power. Thus an ITER or NIF sized device can be an end in itself, rather than a stepping stone to who knows what DEMO, decades and decades later. As a fuel producer, fusion is an order of magnitude more prolific than fast neutron reactors like the integral fast reactor (IFR). But IFR's can burn the actinide wastes of about 5 LWR's of equal power. This is a reasonably mature technology, at least compared to fusion. The combination of fuel production by fusion, power production mostly by LWR's and actinide waste treatment by IFR's have the potential of providing 20-30 terawatts of carbon free power, economically, environmentally soundly, and with no proliferation potential, at least as far into the future as the dawn of civilization was in the past.

Biography: Wally Manheimer graduated from MIT undergraduate and graduate school, with both degrees in physics. Since 1970 he has been at the Naval Research Laboratory in the Plasma Physics Division. During that time, he worked on laser fusion, magnetic fusion, plasma processing, microwave tubes, high power microwaves, radar systems, nuclear disturbed upper atmospheres and a little bit on the Earth's radiation belts. During the time at NRL he had two external sabbaticals, one at Culham Laboratory as a visiting scientist in 1977-1978, and one as a visiting professor at Moscow State University in 1995; and one internal sabbatical in the Radar division at NRL. He has been retired since 2004, but has continued to work at NRL as a consultant mostly in laser fusion. For 15 years, he had become convinced that the fusion program, both magnetic and inertial, has been making a serious mistake in pursuing pure fusion rather than fusion breeding. He has written several scientific papers on the topic and looks forward to returning to the DC area to discuss this important issue at the MASPG.

Correction to May 12 Occultation Map
(in April 2013 Star Dust)

The multiple events zone for the graze of ZC 846 on May 12 is shown between the two dark gray lines south of Taneytown to Middle River, MD.



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	EDT	Star	Mag.	Asteroid	dur. dmag	dur. s	Ap. "	Location
2013									
May 11	Sat	21:06	TYC13300781	11.5	Rhodesia	3.8	1	7	PA,MD,DE,sNJ;DC?
May 12	Sun	1:22	2UC19912233	13.2	Gudrun	1.0	10	10	NC;VA,MD,WV,SC?
May 12	Sun	2:19	TYC56933315	12.1	Hansa	1.3	5	8	MD,PA,wNY;DE,DC?
May 15	Wed	3:08	TYC56011009	11.2	Titania	2.4	5	7	e&sSC,cenGA,TX
May 22	Wed	20:58	2UC36297044	12.5	Ginevra	2.9	4	8	eNC,Sun alt. -9
May 22	Wed	23:09	SAO 118769	9.8	Aivazovskij	6.4	2	4	nOH,PA,NJ;nMD?
Jun 1	Sat	0:49	TYC73850789	10.0	Ernestina	5.2	2	5	VA,NC;MD,DE,SC?
Jun 6	Thu	4:33	2UC30390929	12.2	Rosalia	2.5	4	8	sNE,sNY,nPA;NJ?
Jun 7	Fri	2:09	TYC05450222	9.8	Pardina	6.5	1	4	LI;NJ,DE,eMD?
Jun 9	Sun	0:08	TYC21420649	10.1	Alvarez	4.7	1	5	DE,MD,PA;DC,NJ?

Lunar Grazing Occultations (*, Dunham plans no expedition)

Date	Day	EDT	Star	Mag.	%	alt	CA	Location
May 12	Sun	20:56	ZC 846	8.9	8+	17	6N	Finksbrg,sTowsn,MiddlRiver,MD
May 12	Sun	21:46	SAO 94723	7.8	8+	7	5N	Abngdn,VA;HiPt,nDun,EmrldI,NC
May 12	Sun	22:09	SAO 94739	7.6	8+	4	4N	RichmndHgts,OH;Shrewsbury,PA

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

Total Lunar Occultations

DATE	Day	EST	Ph	Star	Mag.	%	alt	CA	Sp.	Notes
May 12	Sun	20:50	D	ZC 846	8.9	8+	18	18N	A0	Sun -8; MD graze
May 12	Sun	22:03	D	SAO 94739	7.6	8+	5	19N	B9	Az. 291; sPA graze
May 13	Mon	20:36	D	SAO 95707	7.9	14+	29	64N	F0	Sun altitude -5 deg.
May 13	Mon	21:02	D	SAO 95715	7.7	14+	24	36S	G5	Sun altitude -10 deg.
May 14	Tue	23:05	D	SAO 96825	8.1	22+	9	69N	B9	Azimuth 284 deg.
May 15	Wed	21:39	D	SAO 97580	7.8	29+	32	88S	K0	
May 15	Wed	23:59	D	ZC 1237	6.5	30+	6	84N	A7	Azimuth 283 deg.
May 16	Thu	22:48	D	SAO 98261	8.4	39+	26	76N	G5	
May 16	Thu	23:00	D	SAO 98260	8.0	39+	23	50S	A0	
May 16	Thu	23:07	D	RT Cancri	7.7	39+	22	67S	M4	SAO 98266,var.rng.1.0mg
May 17	Fri	23:40	D	SAO 117904	7.3	49+	22	86N	K2	
May 19	Sun	0:19	D	SAO 118388	7.8	60+	20	88S	K0	
May 21	Tue	0:15	D	SAO 138680	7.6	79+	31	53N	G5	mg2 10,sep. ".5, PA 73d
May 21	Tue	23:20	D	49 Vir	5.2	87+	38	71S	K2	ZC 1884
May 22	Wed	1:53	D	157785	6.9	88+	19	44S	K0	
May 22	Wed	23:36	D	158333	7.2	94+	36	71S	G6	
May 22	Wed	23:36	D	ZC 2017	6.4	94+	36	23S	K1	Terminator Distance 19"
May 23	Thu	22:11	D	ZC 2147	6.9	98+	28	35N	K0	TmD 10", close double?
May 24	Fri	21:49	D	Acrab =	2.6	100+	16	-11N	B0	AA 32,ZC2302,close dbl
May 24	Fri	22:23	R	beta Sco	2.6	100+	21	-83N	B0	AA 330,ZC2302,close dbl
May 26	Sun	4:18	R	xi Oph	4.4	98-	23	69S	F2	AA 240,ZC2498,m2 9, 5"
May 28	Tue	0:27	R	45 Sgr	5.8	87-	13	76S	K0	Az.127,ZC2828,closeDbl?
May 29	Wed	2:31	R	SAO 163564	7.3	77-	25	48S	K4	
May 29	Wed	3:20	R	SAO 163584	7.9	77-	31	76S	G5	
May 31	Fri	2:15	R	SAO 145963	7.5	55-	13	89S	A2	Azimuth 109 deg.
May 31	Fri	4:23	R	SAO 146006	8.1	55-	34	49N	K0	Very close double?
Jun 2	Sun	3:34	R	SAO 128489	7.2	34-	16	72N	K2	
Jun 2	Sun	3:36	R	ZC 3525	7.6	34-	16	63N	K5	
Jun 2	Sun	3:45	R	SAO 128494	7.6	34-	18	83N	F0	
Jun 3	Mon	4:51	R	62 Piscium	5.9	24-	25	54S	G8	Sun alt. -9, ZC 103
Jun 3	Mon	5:22	R	delta Psc	4.4	24-	31	75N	K5	Sun alt. -4, ZC 105

See the bottom of p. 4 for a map of the path for the graze of ZC 846 (not "SAO 846" as noted in previous issue) over north-central Maryland.

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 locating this article.

"Way too Bright" Supernova Eludes Astronomers

By John Matson
Scientific American

All supernovae are bright. When a star ends its life in a cataclysmic explosion, it emits a burst of energy and light that can outshine the rest of the galaxy in which it resides. But some supernovae are a little too bright—at least from the standpoint of the researchers trying to figure out what caused them.

A supernova discovered in August 2010 at the Pan-STARRS 1 telescope in Hawaii falls into that category. The supernova, PS1-10afx, is so far away that its light has taken nine billion years—more than half the age of the universe—to reach Earth. And at that distance, its apparent glow implies that the supernova shone with the luminosity of 100 billion suns at the source. But whether PS1-10afx is a superluminous cataclysm that defies explanation or a somewhat humdrum supernova that only appears extraordinary because of a chance cosmic alignment depends on whom you ask. In newly published studies, two teams of researchers have taken opposing positions on this question.

"It doesn't match too well to any of the previous superluminous supernovae," says Ryan Chornock, an astronomer at the Harvard–Smithsonian Center for Astrophysics. "In this case we find that it's hard to explain this object with any of those models." Chornock and his colleagues reported the supernova's unusual attributes, including a redder-than-normal color, its rapid brightening and fading and its extreme luminosity.

That combination of traits, however, seems to exclude PS1-10afx from any of the explanations

Continued on next column

that have been floated as an energy source for various extra-bright supernovae: for instance, a supernova exploding into a dense circumstellar medium, which would convert the kinetic energy of the blast into extra radiation or the rapid spin of a highly magnetized neutron star formed in a stellar collapse. Aside from its extreme peak luminosity, the researchers reported in their study, PS1-10afx is an oddball in almost every other observable respect.

But what if the supernova was not actually as bright as it seemed? Gravitational lensing, a well-documented consequence of Albert Einstein's general theory of relativity, can dramatically magnify and brighten the appearance of distant cosmic objects. (In other words, adopting the caveat on a rear-view mirror: "objects in telescope are dimmer than they appear.") Such lensing occurs when two celestial bodies fall into alignment as seen from Earth: The gravitational pull of the intervening object bends the light rays from the background object, focusing them toward Earth like a magnifying lens.

Studies of gravitational lensing have already been used to infer the presence of invisible dark matter in galaxy clusters and to discover otherwise hidden extrasolar planets orbiting distant stars. Now a group of researchers believes the effect may explain the anomalous supernova PS1-10afx as well.

Having seen Chornock give a talk about PS1-10afx and other supernovae at a scientific conference, and later having read a preprint of their study, astronomer Robert Quimby began to look into possible explanations himself. "I think you always have to have some skepticism when someone says, 'We haven't seen this before,'" says Quimby,. "We really have to be sure we haven't missed anything." So he plugged the data collected by Chornock and his colleagues into two computer programs that attempt to match supernova spectra—light broken down by wavelength—to the various categories of supernova that astronomers have established: type Ia, type IIn, and so on.

"Right away I got a perfect match to a type Ia supernova," Quimby says. "But it was way too bright." A type Ia supernova—the variety of stellar explosion that provided the evidence for an accelerating expansion of the universe in the late 1990s—is thought to mark the demise of a compact white dwarf star that has accreted enough material to have swelled beyond its maximum stable mass.

In a paper appearing in the May 1 issue of the ApJ Letters, Quimby and his colleagues argue that the supernova was a fairly ordinary type Ia supernova that has been magnified by the lensing of some unseen yet massive object between the supernova and Earth. One possibility for the lens is a small galaxy that has so far escaped detection.

"I think that's the most likely explanation -- there's two galaxies," Quimby says. "There's just a small lensing galaxy, and then you have a background host galaxy" where the supernova occurred. A more exotic possibility is that a free-floating black hole magnified the supernova.

Chornock and his colleagues do not view the lensing mechanism as a likely explanation. "This was a hypothesis that we actually considered prior to his paper," Chornock says. But the team rejected it based on a number of factors, including the fact that no object has been found that fits the bill for a possible gravitational lens. "Based on our knowledge of the universe, which is of course imperfect, that kind of lensing is usually produced by clusters of galaxies. That's clearly not the case here because there's no cluster of galaxies," he adds, noting that the explanation favored by Quimby and his colleagues "does require some sort of unexpected or unlikely alignment."

Do You Want to Edit Star Dust?

Michael Chesnes

Editing this newsletter has been a great way for me, as a relatively recent member, to learn about NCA and all the activities our members undertake. It has also alerted me to the many astronomical events available to the public in the metropolitan Washington, D.C. region.

The articles which appear here share their author's enthusiasm for the projects they undertake. The projects often involve observation, travel, and public outreach, amongst other things. This Newsletter allows these projects to be shared with both members and non-members of the NCA.

Please consider volunteering as a Star Dust editor. It makes NCA stronger to have a group of experienced editors among the membership who can be called upon to fill vacancies, and it will help this publication evolve by incorporating fresh perspectives. If you are interested in serving as an editor, I am willing to assist you during your first year.

Calendar of Events

NCA Mirror- and Telescope-making Classes: Tuesdays May. 7, 14, 21, 28 and Fridays, May. 3, 10, 17, 24, 31, 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 gfbrandenburg@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

NCA Pre-meeting Dinner: Saturday, May 11 at 5:30 pm, preceding the meeting, at *Mulligan's Grill and Pub* at the University of Maryland Golf Course.

Owens Science Center Planetarium: "To Tell a Fib" (Fibonacci Sequence) Fri. May 10 at 7:30 pm; $5/adult; $3/students/senior/ teachers/military; children under 3 free. Doors open 7:00 for pre-show activities. http://www1.pgcps.org/howardbowens

Mid Atlantic Senior Physicists Group: Wallace (Wally) Manheimer, Naval Research Laboratory. "How Fusion Can Become Relevant" Wed. May 22 at 1:00pm. American Center for Physics, College Park, MD. See page 4 for details.

Upcoming NCA Meetings at the University of Maryland Observatory:

11 May **Brett W. Denevi** (JHU/APL) MESSENGER's Surprising Images of Mercury
8 Jun Science Fair Winners

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
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Next NCA Mtg:

May 11

7:30 pm

@ UMD Obs

Brett W. Denevi (JHU/APL)

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