

**Celebrating 80 Years
of Astronomy
1937-2017**

Star Dust

Newsletter of National Capital Astronomers, Inc.

capitalastronomers.org

September 2017

Volume 76, Issue 1

Next Meeting

When: Sat. Sept. 9th, 2017
Time: 7:30 pm
Where: UMD Observatory
Speaker: Michael F. Corcoran

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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.

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 Lives and Deaths of Extremely Massive Stars

Michael F. Corcoran

(Catholic University of America, Goddard Space Flight Center)

Abstract: Extremely massive stars are extremely rare, but their cosmic importance far exceeds their numbers. These stars are associated with some of the most energetic phenomena in the Universe, and are key sources of chemical elements needed for planets and life. In this talk I'll discuss the current understanding of how massive a star can be, describe how extremely massive stars form, live and die, and show how these stars can become sources of extreme gamma-ray explosions and perhaps even sources of detectable gravitational radiation. In particular, this talk will emphasize the unusual properties of some of the most massive stars directly identified in our local Galactic neighborhood, and the various pathologies these stars exhibit.



Doomed Star Eta Carinae

Eta Carinae may be about to explode. But no one knows when - it may be next year, it may be one million years from now. Eta Carinae's mass - about 100 times greater than our Sun - makes it an excellent candidate for a full blown supernova. Historical records do show that about 150 years ago Eta Carinae underwent an unusual outburst that made it one of the brightest stars in the southern sky. Eta Carinae, in the Keyhole Nebula, is the only star currently thought to emit natural LASER light. This featured image, taken in 1996, brought out new details in the unusual nebula that surrounds this rogue star. Now clearly visible are two distinct lobes, a hot central region, and strange radial streaks. The lobes are filled with lanes of gas and dust which absorb the blue and ultraviolet light emitted near the center. The streaks remain unexplained. (Image Credit: J. Morse (Arizona State U.), K. Davidson (U. Minnesota) et al., WFPC2, HST, NASA, ESA, Hubble. Text and image obtained from apod.nasa.gov/apod/ap151227.html.)

continued on page 2

Recent Astronomy Highlights

While the National Capital Astronomers has been on summer break, astronomy research has continued on unabated. Below are but a few research highlights from recent months.

Diamond Rain Inside Neptune?

Scientists at SLAC National Accelerator Laboratory simulated the conditions deep inside icy gas giants, showing that there may be diamonds raining down within Uranus and Neptune.

- www6.slac.stanford.edu/news/2017-08-21-scientists-create-diamond-rain-forms-interior-icy-giant-planets.aspx
- Citation: D. Kraus *et al.*, *Nature Astronomy*, 21 August 2017 (10.1038/s41550-017-0219)

Nearby System with Four Super-Earths

By spectral analysis of its light, scientists have found evidence that Tau Ceti, a Sun-like star 12 light years away, has a system of four Super-Earths.

- www.sciencedaily.com/releases/2017/08/170817095549.htm
- Citation: Fabo Feng et al *Astronomical Journal*, 2017

The Mystery of Ultra-Diffuse Galaxies

Did these extremely faint galaxies start out small, then inflate by tidal interactions? Or did they begin like other galaxies, but fail to initiate the star formation rates of their brighter cousins? Recent research suggests the latter.

- aasnova.org/2017/07/21/globular-clusters-for-faint-galaxies/
- Citation: Pieter van Dokkum et al 2017 *ApJL* 844 L11

The Cosmic Velocity Web

A research team has measured the velocities of 8,000 galaxies in a billion-light-year region centered on Earth in order to determine the flow of those galaxies and their clusters through the cosmos. A video of the results is available at the following link:

- aasnova.org/2017/08/28/featured-image-the-cosmic-velocity-web/
- Citation: doi.org/10.3847/1538-4357/aa7f78

• *Massive Stars – continued from page 1*



• **Biographical Sketch:** Mike Corcoran received his PhD from the University of Pennsylvania in 1988. At Penn, Mike began a life-long career studying the unusual properties of very massive single and binary star systems, helping to unlock the secrets by which these stars form and transition into supernovae and black holes. Mike has been working as an astrophysicist at the NASA's Goddard Space Flight Center in one form or another since he received his PhD, and now works as a Senior Research Scientist at the Catholic University as part of NASA's Center for Research and Exploration in Space Science and Technology. In addition to studying high-energy emission from massive stars (notably Eta Carinae, the most massive star within 10,000 light years), he works at NASA's High Energy Astrophysics Science Archive Research Center at Goddard, where he serves as archive scientist for a number of high-energy missions, and where he writes the High Energy Astrophysics Picture of the Week (heasarc.gsfc.nasa.gov/docs/objects/heapow), which highlights new developments in x-ray and gamma-ray astrophysics.

NCA 2017-2018

Schedule of Speakers

- Sep 09 Michael Corcoran (Catholic University), *The Lives and Deaths of Extremely Massive Stars*
- Oct 14 Erika Nesvold (Carnegie DTM), *Debris Disks and New Planets*
- Nov 11 Alexander van der Horst (George Washington U), *Transient Relativistic Jets*
- Dec 09 Mario Gliozzi (George Mason U), *What X-rays Tell Us About Black Holes*
- Jan 13 Dean Howarth & Jeff Jones, *Newton and Halley*
- Feb 10 Brett Denevi (JHU/APL), *The New Moon (Date may change.)*
- Mar 10 Ludmilla Kolokolova (UMd), *What We Can Learn from Dust in the Solar System (Date may change.)*
- Apr 14 Jonathan Gagné (Carnegie DTM), *Planets without Stars*
- May 12 Brian Morsony (UMd), *Relativistic Jets Stir Things Up*
- Jun 09 Science Fair Winners, Election, Astro Photos

Exploring the Sky



"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!

2017 Observation Dates

16 September (8:00 pm) – Saturn, Antares & Vega

21 October (7:30 pm) – Summer Triangle

18 November (7:00 pm) – Pleiades & Winter Constellations

Hosted by: [National Capital Astronomers, Inc](#) and [Rock Creek Park](#)

NCA Member Interview

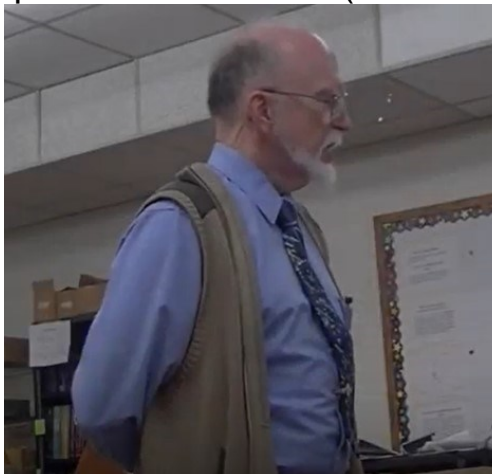
Australian Broadcasting recently did a story on Guy Brandenburg rebuilding his travel telescope ahead of the August 21 eclipse. The video can be viewed at:

www.facebook.com/abcnews.au/videos/10157157152414988/

Guy's log of his eclipse experience can also be found at:

guysmathastro.wordpress.com/2017/08/27/an-eclipse-seen-in-wyoming/

Joseph Chandler Morris (1943 – 2017)



A long-time member of the NCA, Joe Morris died at home on August 8th of natural causes.

Joe grew up in New Orleans where his father was the head of the Physics Department at Tulane University. Receiving his BS and MS in Engineering from the University of Tennessee, Joe entered the work force when large main-frame computers were first coming into wide use. Fascinated by them, Joe made computers and information technology his career. He taught at the University of Tennessee from 1967 to 1984, then became the Department Chief Engineer for Information Technology at the Northern Virginia location of the MITRE Corporation.

Joe perceived early on how crucial it was for the public to understand science. He volunteered an enormous amount of energy, time and thought to advancing that understanding. For many years he served as President of the National Capital Astronomers (NCA). He often began meetings by welcoming new people and, with his usual humor, offering to bankrupt them in becoming members for the outrageous amount of ten dollars a year - five dollars if they were students.

Joe also spearheaded the popular monthly "Exploring the Sky" sessions, which are sponsored jointly by the National Park Service and the NCA, where the public can come to Rock Creek Park to view the sky through telescopes. Joe was particularly pleased that "Exploring the Sky" offered youngsters an opportunity to experience the fascination of science. The sessions would often go late, until everyone had a chance to look through the telescopes. However sometimes things could get overwhelming. At NCA meetings, in soliciting volunteers to help with Exploring the Sky, Joe would often tell of the time when there was an extremely long line of potential star gazers and only one telescope, ending the story with, "Thank God it was cloudy!"

Joe was also a very active volunteer at the Steven F. Udvar-Hazy Center, a branch of the Smithsonian Air & Space Museum, which houses many historically important aircraft. Indeed, flying was a passion of Joe's. He was a licensed amateur pilot. In addition, Joe was also an avid motorcyclist, and took pride in riding his motorcycle at the head of the Fourth of July parades in Oakton, Virginia.

Joe will be missed. The members of the National Capital Astronomers are grateful for his many years of service. Clear Skies Forever, Joe! Unless, of course, the line is long and there's only one telescope.

Sky Watchers

September

Saturn is visible in the evening sky throughout the month (and into October), setting around 11:30 p.m. mid-month and around 10:30 p.m. at the end of the month.	
Jupiter is visible in the early evening sky, setting around 8:30 p.m. mid-month.	
Mercury, Venus and Mars are visible in the morning sky throughout the month.	
12 th	Mercury is at its greatest elongation (angular separation from the Sun) of 18 degrees and will be the high in the predawn sky.
13 th	Moon at perigee – 229,820 miles from Earth – 12:06 p.m.
16 th	Conjunction of Mercury and Mars – 3' separation - 2:23 p.m.
17 th	Waning crescent Moon passes by Venus.
18 th	Waning crescent Moon passes by both Mercury and Mars.
26 th	Waxing crescent Moon passes 4 degrees north of Saturn.
27 th	Moon at apogee – 251,250 miles from Earth – 2:50 a.m.

October

5 th	Full Moon – Known as the Full Hunter's Moon and Dying Grass Moon. 2:40 p.m.
5 th	Conjunction of Mars and Venus – 13' separation – 9:26 a.m.
9 th	Moon at perigee – 227,953 miles from Earth – 1:54 a.m.

Times EDT

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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), save some trees and have one-click access to all the embedded links in the document. If you can switch from paper to digital, please contact Henry Bofinger, the NCA Secretary-Treasurer, at hbofinger@earthlink.net

Thank you!

• **The submission deadline for October's Star Dust, including Eclipse pictures and stories, is September 26th. Please send material to NCAstardust@gmail.com**

Clear Skies!

NCA Telescope For Sale

• The NCA has an **Orange Tube Celestron 14" Schmidt-Cassegrain** - \$1400 or best offer. Details about the telescope's condition are at: www.astromart.com/auctions/details.asp?auction_id=20017.
 • Pictures are available at: www.walkerandhenry.com/NCA%20C14%20Sale/album/index.html
 • If interested, contact Guy Brandenburg, gfbrandenburg@yahoo.com or Henry Bofinger, hbofinger@earthlink.net.

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 Occultations

Date	Day	EDT	Star	mag.	Asteroid	dmag	dur. s	Ap. " Location, Notes
Sep 12	Tue	2:09	SAO 146133	9.0	Germania	2.5	18	4 SLC,Reno,SFO
Oct 1	Sun	2:36	4UC54222955	12.8	Undina	0.6	11	9 WV,nMD,sPA;nVA?
Oct 3	Tue	3:41	4UC424-2109	13.8	Dike	0.7	5	13 DE,SMD,DC,nVA
Oct 5	Thu	19:54	4U410143659	12.7	Triton	1.2	161	9 e. N.America
Oct 8	Sun	4:49	TYC01061212	10.9	Traversa	4.7	4	6 ePA,DE;NJ,eMD?
Oct 9	Mon	0:05	TYC06440643	9.4	Nysa	1.1	11	4 WNY,nWPA,n&swOH
Oct 14	Sat	4:08	SAO 128801	9.6	Zeissia	4.9	1	4 nNJ,e-swPA,SOH

Lunar Grazing Occultations

Date	Day	EDT	Star	Mag	% alt	CA	Location & Remarks
Sep 9	Sat	6:12	nu Piscium	4.5	89- 42	9N	*Richmond, Delmarva,VA
Sep 17	Sun	5:31	SAO 98571	7.8	9- 17	8N	*Hagerstown,MD;Logansville,PA
Oct 11	Wed	5:31	SAO 95410	8.3	63- 69	7N	Winchstr,VA;Comus,Baltimore,MD
Oct 12	Thu	2:40	SAO 96571	8.5	52- 32	11N	Catlett,VA;Woodmore,sBowie,MD
Oct 15	Sun	5:05	Regulus	1.4	20- 24	7N	Baker,MT;Bismrk,ND;Bemidji,MN

* No expedition planned from the Washington, DC region

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

Total Lunar Occultations

Date	Day	EDT	Ph Star	Mag	% alt	CA	Sp. Notes
Sep 10	Sun	1:23	R xi2 Ceti	4.3	82- 40	46S	B9 ZC 364
Sep 11	Mon	1:55	R ZC 491	6.0	72- 40	84N	K0 maybe close double
Sep 11	Mon	3:33	R ZC 498	6.3	71- 56	53S	A0 spectroscopic binary
Sep 11	Mon	5:17	R 5 Tauri	4.1	71- 64	5S	K0 ZC 508,TermD 13"; dbl?
Sep 12	Tue	1:05	R gamma Tau	3.7	61- 22	81N	G8 ZC 635, Hyadum I, dbl?
Sep 12	Tue	4:02	R 70 Tauri	6.6	60- 54	69S	F7 ZC 659, close = double
Sep 12	Tue	5:17	R theta Tau	3.8	60- 64	14S	G7 ZC669,mg2 8 .08" PA212
Sep 12	Tue	5:48	R 75 Tauri	5.0	60- 67	68N	K2 Sun-12,ZC667,closeDb1?
Sep 12	Tue	6:02	R ZC 672	6.7	60- 67	62S	F7 Sun -9, close double
Sep 12	Tue	8:58	D Aldebaran	0.9	59- 49	-70S	K5 Sun+25, AA 110, ZC 692
Sep 12	Tue	10:05	R =alpha Tau	0.9	58- 36	71S	K5 Sun+37, ZC 692
Sep 13	Wed	4:57	R 115 Tauri	5.4	48- 55	32S	B5 ZC 814, close triple
Sep 14	Thu	4:15	R OU Gem	6.8	37- 38	33S	K0 ZC 985
Sep 15	Fri	4:26	R SAO 96897	7.3	26- 29	70S	F0 mag2 8.1 sep 61" PA 97
Sep 16	Sat	3:54	R ZC 1260*	7.1	17- 11	57N	F5 Azimuth 77 degrees
Sep 16	Sat	4:28	R 25 Cancrri*	6.1	17- 17	86N	F6 ZC1262, close dbl??
Sep 17	Sun	5:39	R SAO 98571	7.8	9- 19	26N	A3 mag2 12 sep 13" PA 152
Sep 17	Sun	6:07	R ZC 1396	6.8	9- 24	82N	K2 Sun altitude -9 deg.
Sep 18	Mon	6:01	R ZC 1515	7.8	4- 11	72S	F8 Sun -10, Azimuth 85deg
Sep 27	Wed	20:21	D 16 Sgr	6.0	49+ 28	43S	B0 ZC2639,mg2 13 6",PA216
Sep 27	Wed	20:27	D X 43603*	8.5	49+ 27	85N	B9
Sep 28	Thu	22:59	D ZC 2798*	6.1	59+ 16	33N	K1 =dbl, sep .08", PA 210
Sep 29	Fri	23:21	D SAO 163193	7.8	68+ 20	52S	F5
Oct 1	Sun	21:03	D SAO 164579	7.2	85+ 34	26S	F3
Oct 1	Sun	22:08	D 44 Cap	5.9	85+ 37	79N	A9 ZC3177, close double??
Oct 7	Sat	22:16	R ZC 444	5.9	92- 21	43S	K6 close double??
Oct 8	Sun	3:55	R ZC 462	6.0	91- 61	37S	B8 close double??
Oct 9	Mon	2:53	R ZC 608	6.0	84- 62	36S	F3 mag2 9 sep 3.7" PA 222
Oct 9	Mon	22:16	R ZC 741	5.5	76- 4	79S	K1 Az. 71, close double?
Oct 11	Wed	5:24	R SAO 95390	7.4	63- 69	45S	B8 close double??
Oct 11	Wed	6:33	R 71 Orionis	5.2	62- 69	74S	F6 Sun -8, ZC 947
Oct 13	Fri	4:45	R Tegmine	5.1	40- 44	67S	G0 ZC1236 = zeta Cancrri**
Oct 13	Fri	4:45	R SAO 97646	6.2	40- 44	68S	G0 close double
Oct 13	Fri	5:52	R ZC 1241*	6.5	40- 56	83S	A0 cls triple,m2 12 m3 11
Oct 13	Fri	6:45	R SAO 97680	7.7	39- 64	72S	K0 Sun altitude -7 deg.
Oct 14	Sat	3:09	R 73 Cancrri	7.6	30- 14	48S	M* Azimuth 82, ZC1356
Oct 14	Sat	3:16	R SAO 98365	7.9	30- 16	36S	F5
Oct 14	Sat	6:05	R 81 Cancrri	6.5	29- 47	34S	G9 ZC 1371, close double
Oct 15	Sun	5:37	D Regulus	1.4	19- 30	-57N	B7 AA 56,ZC1487=alpha Leo
Oct 15	Sun	6:41	R Regulus	1.4	19- 42	67N	B7 Sun -8,mg2 12 sep .05"

*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 iota.jhuapl.edu/exped.htm.
David Dunham, dunham@starpower.net

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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 gbrandenburg@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

• **Upcoming NCA Meeting** at the University of Maryland Observatory: Oct 14 Erika Nesvold (Carnegie DTM), *Debris Disks and New Planets*

2017 NCA Board Meeting Minutes (July 23, 2017)

Heinrich Bofinger

• (Present - Heinrich Bofinger, Jack Gaffey Jr., John Hornstein, Jay Miller, Jeffrey Norman, Todd Supple and Harold Williams)

• The first topic was the Treasurer's report, which highlighted the continued intentional drawdown of the Capitol One bank balance, at the rate of about \$350 a year, and about \$4.50 per member. It was agreed that this was not alarming, and that currently membership fees are to remain as they are. The balance is still high at around \$5,700. It was also noted that the Assistant Secretary-Treasurer is filing the required tax returns annually. The Secretary-Treasurer's report was voted as formally accepted.

• A second topic of discussion was the sale of the NCA's Celestron C14, which had not proceeded as planned in the previous year. It has been determined that the efforts should be continued.

• It has been decided that the NCA dinners would be moved. (The new location is still to be decided upon.)

• It was voted that the compensation for the once-a-year appearance of Dean Howarth shall be continued at the current rate of \$140.00.

• John Hornstein presented his schedule of speakers.

• Board meetings are to continue on an annual basis, with interim meetings called only when needed for specific issues.

NCA Financial Position 2016-2017

Heinrich Bofinger

• Membership: 79, 27 attrition, 20 new.

Table 1: Membership history

Fiscal Year	2016-17	2015-16	2014-15
Members end of year	79	87	75
New	20	50 (some late renewals)	22
Attrition	27	23	50
Lifetime	2	2	2

• *continued on page 7*

Table 2: Net Income and Expenses - unadjusted

Item	2016-17		2015-16	
	Amount	Per member	Amount	Per member
Income ¹	\$1,100.45	\$13.93	\$940.00	\$10.80
Expenses	\$1,467.12	\$18.57	\$1,729.65	\$19.88
Net	-\$318.23	-\$4.70	-\$789.65	-\$9.08

¹ Income includes US \$45.00 still pending.

Table 3: Expense Items

Item	Yearly Amounts			Per Member		
	2016-17	2015-16	2014-15	2016-17	2015-16	2014-15
No of Members	79	87	75			
Misc (incl. dinners)	\$198.44	\$170.56	\$222.66	\$2.51	\$1.96	\$2.97
Insurance & Legal	\$320.00	\$400.00	\$320.00	\$4.05	\$4.60	\$4.27
Stardust	\$436.68	\$664.09	\$631.84	\$5.53	\$7.63	\$8.42
Astronomical League	\$400.00	\$395.00	\$920.00	\$5.06	\$4.54	\$12.27
Intl Dark Sky Association	\$100.00	\$100.00	\$100.00	\$1.27	\$1.15	\$1.33
Telescope Making Class			\$903.98			\$12.05
Total	\$1,467.12	\$1,729.65	\$3,098.48	18.57	\$19.88	\$41.31

Table 4: Bank balances

	Amount	
Opening Balance	\$6,085.91	7/01/2016
Closing Balance	\$5,722.68	7/23/2017
Net Change	\$363.23	
Current Balance	\$5,722.68	All items included except for awards dinner (\$48.44), and pending US \$45.00 deposit

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.?

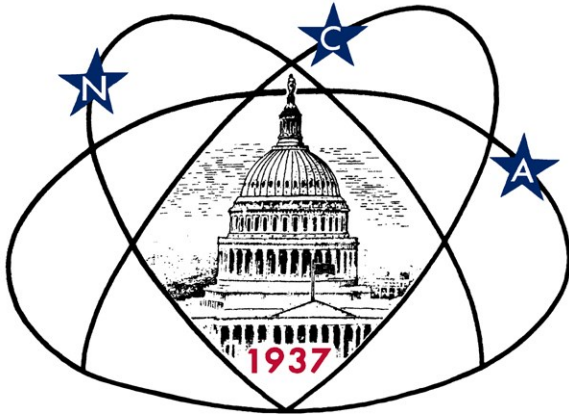
Are you interested in volunteering for: Telescope making, Exploring the Sky, Star Dust, NCA Officer, etc.?

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



*Celebrating 80 Years of Astronomy
1937-2017*

Next NCA Meeting:

2017 Sept. 9th

7:30 pm

@ UMD Observatory

**Dr. Michael F.
Corcoran**

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