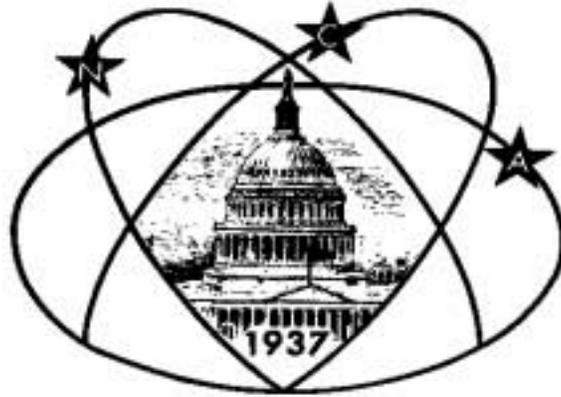


Star



Dust

National Capital Astronomers, Inc.

<http://capitlastronomers.org>

Volume 63, Number 2

October 2004

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October Speaker: Anthony Remijan - Astrobiology and Astrochemistry *Submitted by Jeff Guerber*

Anthony Remijan, NASA-Goddard, will present the featured talk at the October 2 meeting of the National Capital Astrono-

mers. He will give a talk on astrobiology and astrochemistry.

The meeting will be held at 7:30 P.M. in

the University of Maryland Astronomy Observatory on Metzerott Road in College Park, MD.

Steve Robinson Talks about An Amateur Astronomer and Cataclysmic Variables *Reviewed by Jay H. Miller*

This is a review of Steve Robinson's presentation to NCA on September 11, 2004. Steve showed the kind of work amateurs can do. While we all enjoy just taking our telescopes out and looking at the Messier objects or the Moon or the planets, astronomy has the unique ability to let the amateur do rewarding and even necessary work.

Steve's equipment is an 18" JMI Newtonian telescope with digital setting circles, an SBIG ST-9E CCD camera and a computer. His observing is done in our light

polluted skies, and he can reach 17th magnitude with a 2-5 minute exposure. He will normally stack three to five of these images.

His program includes following Blazars (active galactic nuclei), cataclysmic variables (CVs), some long period variables and an occasional supernova or eclipsing variable. On a good night he can make twenty observations. If the Moon is full he will stay 25 degrees from it. If all he can see is Arcturus or Vega, he can still get to 14th magnitude. His observing ses-

sions are normally about three hours. All of his observing is coordinated through the American Association of Variable Star Observers (AAVSO).

He gave a brief summary of cataclysmic variables. There are five types of CVs, the classical nova, the dwarf nova, the recurrent nova, nova-like variables and magnetic CVs. The latter are small binary systems, some of which consist of a fluffy red dwarf and a white dwarf. The red dwarfs have just enough mass to burn hy-

(Continued on page 2)

Open House at Hopewell Observatory *Bob Bolster*

NCA members, families, and guests are invited to enjoy the autumn sky at Hopewell Observatory on Saturday evening, October 9. View the Milky Way and numerous deep-sky objects. Sunset will be at 18:41, astronomical twilight ends at 20:09, and the Moon rises at 03:20. Come any time after sunset.

Directions:

- (1) From the Beltway (I-495) go west on I-66 25 miles to Exit 40 at Haymarket onto U.S. 15.
- (2) Turn left on U.S. 15 at the end of the exit ramp.
- (3) Go 0.3 mile to traffic light, turn right onto Va. 55.
- (4) Go 0.8 mile to Antioch Road (Rt. 681) and turn right.

(5) Go 3.2 miles to the end of Antioch Rd. and turn left onto Waterfall Road (601).

(6) Go one mile and bear right onto Bull Run Mountain Rd. (Rt. 629).

(7) Go 0.9 mile on 629 to narrow paved road at right with an orange

(Continued on page 2)

NCA Events This Month

The Public is Welcome!

NCA Home Page: <http://capitalastronomers.org>

Fridays, October 1, 8, 15, 22, and 29, 6:30 to 9:30 P.M. NCA mirror- and telescope-making classes 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.

Some Fridays or Saturdays in October

Observing with NCA's 14-inch telescope in Chevy Chase, MD. For more information, see article this page.

Saturday, October 2 at 7:30 P.M.

NCA meeting at the University of Maryland Astronomy Observatory on Metzerott Road in College Park, MD. Speaker:

Anthony Remijan, NASA-Goddard. See map and directions on Page 6.

Saturday, October 2 at 5:30 P.M., preceding the meeting, dinner with the speaker and NCA members will be at 5:30 p.m. at the Garden Restaurant at the UMD University College Inn and Conference Center. See map and directions on Page 6.

Saturday, October 9. Evening

Open House at Hopewell Observatory. See article starting on Page 1.

Upcoming NCA Meetings

2004: November 6, December 4;

2005: January 8, February 12, March 12, April 2, May 7, and June 4

An Amateur Astronomer and Cataclysmic Variables, continued

(Continued from page 1)

drogen and may have very strong magnetic fields. The white dwarfs are stellar remnants and are heated by leftover radiation rather than fusion. Their masses can be no greater than 1.4 solar masses, otherwise they would collapse to black holes. They will eventually cool to black dwarfs. The red dwarf fills its Roche Lobe, which comes to a point where the gravitational pull of the two stars meets. Material from the red dwarf is pulled through this point onto the compact white dwarf. The matter will either go into an accretion disk around the white dwarf, or it will go directly onto its magnetic poles. If hydrogen accumulates on the surface of the star it can heat up to the point where fusion can take place explosively. This produces the rise in brightness. More information on various types of cataclysmic variables (and other types of variables) can be found on the AAVSO's web site, www.aavso.org.

Although his program includes about 200 stars, he has recently focused on, and spent time discussing, AM Her, a star in which matter goes directly onto the poles rather than into a disk around the white dwarf. The orbital period of the system is three hours and he discussed the observations he made to attempt to better define

the period and the statistics involved.

Variable star estimates are always made by comparing the star's brightness to that of known non-varying stars. The background sky brightness is also measured and taken into consideration in his calculations. Even the height of the star above horizon has to be considered, because the amount of atmosphere you are looking through can affect the observation.

Lastly, he discussed the techniques he uses. Exact polar alignment is important for CCD work. The camera is cooled to reduce noise. Since outdoor temperature can affect the focus of the telescope (three degrees is sufficient to do this), he has constructed a device to automatically correct the focus. The ST-9E has a secondary CCD to automatically guide the telescope. All of this allows him to use stars as faint as 12.5 magnitude for guiding. To standardize his data with others he uses a "Johnson V" filter in front of the camera. This is a standard visual range filter used by astronomers. In a nice touch, the AAVSO lets the observers know who has requested their data. He pointed out that professional astronomers as well as students doing science fair projects have used his data. His last slide was a photo of his setup. He has a concrete pad which extends three feet into the ground to en-

Observing with the NCA C-14

Mike McNeal

On some Friday or Saturday evenings, in Mike McNeal's backyard, 5410 Grove St, Chevy Chase, MD, (Friendship Heights Metro). Call by 10 p.m. the Friday before to find out if an evening is available and to make a reservation if it is. Call Mike at 301-907-9449 or email him at mcnealmi@verizon.net to let him know you are coming.

Open House at Hopewell Observatory, continued

(Continued from page 1)

pipe gate. (Directly across from an entrance gate with stone facing.)

(8) Turn right through pipe gates, go 0.3 mile to top of ridge, and around the concrete building and towers.

(9) Continue on dirt road through the white gate and woods a few hundred feet to the observatory. Park along the road short of the buildings.

If it is raining or hopelessly cloudy the event will be canceled. For further information call (703) 960-9126.

Observatory phone: (703) 754-2317.

sure stability. He rolls the telescope out of his garage and onto pre-marked spots to speed alignment.

Steve's talk was very impressive and a good way to begin this season of NCA meetings. While his equipment might be more sophisticated than some amateurs would want, as I've said before, you can do useful variable star observations with the "one X" eyeball or a pair of binoculars. The AAVSO web site can help you get started. More information on Steve's observing can be found at his web site, highenergyastro.homestead.com.

Brown Dwarfs *Nancy Grace Roman*

(From a seminar talk that I heard by Dr. Subhanjoy Mohanty at the Dept. of Terrestrial Magnetism, Carnegie Institution of Washington.)

Brown dwarfs are objects formed like stars that are lower in mass than about 0.08 times the mass of the sun or 80 times the mass of Jupiter. Stars as small as 15 Jupiter masses have been definitely observed in star forming regions and masses as small as 5 Jupiter masses have been suspected. These stars are so small that the cores never get hot enough to fuse hydrogen. Although they were not seen until fairly recently, they are at least as common as red dwarf stars. They differ from planets because they do not orbit stars; some are probably double or double with a red dwarf.

Mysterious Signals *Nancy Grace Roman*

(I saw this at the web site newscientist.com)

Mysterious Signals from 1000 Light Years
Away

by Eugenie Samuel Reich

In February 2003, astronomers involved in the search for extraterrestrial intelligence (SETI) pointed the massive radio telescope in Arecibo, Puerto Rico, at around 200 sections of the sky.

The same telescope had previously detected unexplained radio signals at least twice from each of these regions, and the astronomers were trying to reconfirm the findings. The team has now finished analysing the data, and all the signals seem to have disappeared. Except one, which has got stronger.

This radio signal, now seen on three separate occasions, is an enigma. It could be generated by a previously unknown astronomical phenomenon. Or it could be something much more mundane, maybe an artefact of the telescope itself.

But it also happens to be the best candidate yet for a contact by intelligent aliens in the nearly six-year history of the SETI@home project, which uses programs running as screensavers on millions of personal computers worldwide to sift through signals picked up by the Arecibo telescope.

The President's Letter

There are two items I'd like to bring to your attention.

First: I received the following invitation from Ed Seward at NOVAC:

Jay,

Our 2004 Star Gaze is on Saturday October 16th. While the public is supposed to leave by 11 P.M., NCA members can stay as long as NOVAC members are there. There will be a \$6 park entry fee. People can get more information at <http://www.novac.com/gaze/>

We will have at least one person (hopefully more) out there with a Hydrogen-Alpha filter for solar observing. Ed.Seward@comcast.

Second: The Astronomical Society of the Pacific is having several trips in the next year to see the Aurora Borealis in February and the solar eclipse in April. You can get the specifics at www.astro.society.org. They are listed under "Events".

Jay Miller, President NCA

News from the NCA Telescope- and Mirror-Making Workshop *Guy Brandenburg*

Since the last report, several people have finished excellent 4.25", 6", 8", and 10" diameter mirrors. Several have also completed their telescopes. Among various notable projects, a high school junior is currently polishing a 16-inch-diameter 3/4"-thick plate glass mirror. There are plans for, but not a whole lot of physical progress on, a group project for an 8" Lurie-Houghton telescope, which involves two corrector plates made of the same material but opposite curvatures, and a spherical mirror. We were able to find a professor at the University of Maryland Geology Department to calculate the index of refraction of some Water-White glass we were planning to use, to three decimal places, using special indexing oils.

In early summer, we experienced a major flood when a thunderstorm dropped about 3 inches of rain in about an hour and lots of that water rolled off of the parking lot, in through the back door of the Chevy Chase Community Center (CCCC), and down the steps in a torrent, to the basement, where our workshop is located. Fortunately some of us were there that night, and we were able to put wood and other soakable items up on tables. The water was ankle-deep in the basement by the time we left.

On Friday, September 17, the remnants of Hurricane Ivan caused the early closing of the CCCC. The previous week, the CCCC had been closed for deep cleaning. Unfortunately, the deep cleaners also threw out our stash of clean newspapers, bottles, and cans that we use for

covering the tables while polishing and grinding, and for storing abrasives. They also moved around the mechanical pump for our aluminizing chamber, causing leaks in the rubber hoses that connect the pump to the vacuum chamber. I bought some more hoses (originally designed for automobile radiators and plumbing connections) and replaced them. Jerry Schnall was also able to get some normal thick gum-rubber vacuum hose from a friend at American University. The pump now works as well as ever, and looks better, too.

While attending a 2-week astronomy workshop at Mount Wilson Observatory in California (near Pasadena), which also involved visits to CalTech (California Institute of Technology), the Jet Propulsion Lab (JPL), and the Palomar Mountain Observatory, I was able to interview some of the technicians there to find out their process for re-aluminizing telescope mirrors. The two biggest surprises were that they use Orvus soap and their bare fingers to wash off all of the old dirt, and towards the end of the process they use a slurry of powdered calcium carbonate (limestone) with cotton pads to do a final cleaning before their final rinse. They also used compressed dry nitrogen to dry off the distilled water. Everything else was about the same as what we did in the NCA/CCCC workshop.

My home page:
http://home.earthlink.net/~gfbranden/GFB_Home_Page.html

Mid-Atlantic Occultations and Expeditions

by David Dunham

Asteroidal Occultations

Date	Day	EDT/ EST	Star	Mag	Asteroid	dmag	dur.	Ap. s in.	Location
Oct 10	Sun	1: 13	TYC51900628	10. 8	Jarmila	4. 9	3	7	DC, MD, nVA, DE
Oct 16	Sat	0: 01	TYC00100323	10. 0	Hollandia	3. 6	4	4	MD, nVA, WV, DE
Oct 19	Tue	22: 17	ZC 0017	7. 8	Kahrstedt	6. 8	2	2	SC, s. N. Car.
*** Dates and times above are EDT, those below are EST ***									
Oct 29	Fri	2: 19	SAO 97355	9. 4	Flora	1. 1	11	3	WV, nVA, DC, MD
Nov 2	Tue	4: 43	SAO 99303	9. 2	Alfaterna	7. 1	1	3	WV, nVA, SMD
Nov 5	Fri	21: 43	lambda Aur	4. 7	2000 BX6	13. 4	1	1	nwOhio, n. NY

Grazing Occultations

DATE	Day	EDT/ EST	Star	Mag	% alt	CA	Location
Oct 4	Mon	1: 36	ZC 0762	6. 6	70- 39	14N	Waynesburg & Arona, PA
Oct 6	Wed	2: 47	X95310	9. 1	51- 37	12N	Mt. Airy & Finksburg, MD
Oct 9	Sat	3: 31	SAO 80898	8. 0	23- 13	8N	Hanover and York, PA
Oct 19	Tue	21: 06	ZC 2788	6. 0	39+ 13	10S	Newport News & Chincoteague, VA
*** Dates and times above are EDT, those below are EST ***							
Nov 2	Tue	0: 44	49 Aurigae	5. 3	77- 49	9N	Hampton, VA
Nov 4	Thu	0: 13	SAO 80677	7. 6	50- 10	7N	Chester, VA; Assateague, MD

Total Lunar Occultations

DATE	Day	EDT/ EST	Ph Star	Mag	% alt	CA	Sp.	Notes
Oct 4	Mon	1: 54	R ZC 762	6. 6	70- 45	43N	B5 mg2	8. 2, . 08", PA327, PAgrz
Oct 5	Tue	1: 57	R ZC 906	6. 6	61- 37	19S	K1 mg2	8. 3, sep. . 04", PA 153
Oct 5	Tue	2: 53	R ZC 909	6. 0	61- 48	85S	B9	
Oct 6	Wed	0: 04	R ZC 1042	6. 7	52- 8	52S	A2	Azimuth 61 deg.
Oct 8	Fri	2: 02	R ZC 1290	6. 9	32- 8	45N	F8	Azimuth 66 deg.
Oct 9	Sat	3: 40	R SAO 80898	8. 0	23- 15	26N	K0	Az 76; graze, s. Penn.
Oct 10	Sun	4: 20	R 42 Leonis	6. 2	15- 11	72N	A1	ZC 1514; Az. 80 deg.
Oct 18	Mon	18: 45	D ZC 2586	6. 0	28+ 19	80N	B3	Sun-5; close double
Oct 19	Tue	20: 50	D ZC 2788	6. 1	39+ 14	32S	K3	Az 214; graze, se VA
*** Dates and times above are EDT, those below are EST ***								
Oct 27	Wed	1: 46	D ZC 214	6. 2	99+ 52	66S	K1	terminator 14" away
Oct 27	Wed	23: 22	R SAO 92843	9. 2	54E 63	71U	G0	WA 209; lunar eclipse
Oct 29	Fri	22: 09	R ZC 566	6. 1	96- 46	62N	B8	WA 292 deg.
Oct 30	Sat	3: 01	R 33 Tauri	6. 1	95- 65	25N	B9	WA 329; term. 18" away
Oct 31	Sun	21: 46	R ZC 844	5. 8	85- 36	36S	B9	mag2 6. 6, 1. 1", PA 324
Nov 3	Wed	5: 29	R upsilonGem	4. 1	67- 75	14N	K5	ZC 1149
Nov 4	Thu	4: 51	R 24 Cancri	6. 9	58- 72	60N	F0	ZC 1263 mg2 7. 3, 5. 4", 50
Nov 4	Thu	6: 33	R 28 Cancri	6. 1	57- 71	74S	F0	ZC 1270; spec. binary
Nov 5	Fri	2: 35	R ZC 1373	6. 5	49- 39	85N	A2	ZC 1373

David Dunham, e-mail dunham@erols.com, more info. <http://iota.jhuapl.edu>
Phone home 301-474-4722; office 240-228-5609; car 301-526-5590

Are You Coming to Dinner?

If you are planning to come to the dinner before the meeting, please tell Benson J. Simon, telephone: 301-776-6721, e-mail st88@ioip.com, so that we can make reservations for the right number of people.

Do You Need a Ride?

Please contact Jay Miller, 301-530-7942, 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 email at jhmiller@os2bbs.com)

Do You Want to get *Star Dust* Electronically?

Any member wishing to receive *Star Dust*, the newsletter of the National Capital Astronomers, via e-mail as a PDF file attachment, instead of hardcopy via U.S. Mail, should contact Nancy Grace Roman, the NCA Secretary, at nancy.roman6@verizon.net or 301-656-6092 (home).

The deadline for the November Star Dust is October 15.

Please send your material to Elliott Fein by that date to ensure inclusion.

Send submissions to Elliott Fein at elliott.fein@erols.com.

Text must be in ASCII, MS Word (97 or earlier), or WordPerfect.

All articles submitted may be edited to fit the space available.

Support the IDA

Meteor Showers

October Radiants

Full Moon: September 28, October 28

Major Activity

Radiant	Duration	Maximum
Orionids (ORI)	October 15-29	Oct. 21 at 01:30 UT

Minor Activity

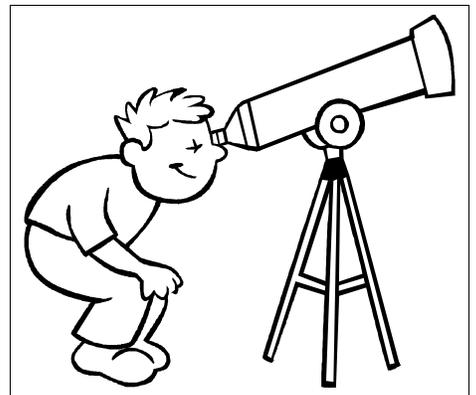
Radiant	Duration	Maximum
Arietids (Autumn)	September 7-October 27	Oct. 8/9
Delta Aurigids (DAU)	September 22-October 23	Oct. 6-15
Eta Cetids	September 20-November 2	Oct. 1-5
October Cetids	September 8?-October 30?	Oct. 5/6
October Cygnids	September 22-October 11	Oct. 4-9
Draconids (GIA)	October 6-10	Oct. 9/10
Epsilon Geminids (EGE)	October 10-27	Oct. 18/19
Northern Piscids	October 5-16	Oct. 12/13

Daylight Activity

Radiant	Duration	Maximum
Sextantids	September 24-October 9	Sept. 30-Oct. 4

Source: <http://comets.amsmeteors.org/meteors>

Join the
International Dark-Sky Association
3225 N. First
Avenue Tucson, AZ
85719-2103
www.darksky.org



Getting to the NCA Monthly Meeting and the Dinner Before the Meeting

Jeff Guerber

NCA meetings are now held at 7:30 p.m. at the University of Maryland Observatory, in College Park on Metzerott Rd. between University Blvd. (MD-193) and Adelphi Rd. To get there from the Capital Beltway (I-495), either take US Rt. 1 south about a mile, turning right onto MD-193 West, then at the first light turn right onto Metzerott; or, take New Hampshire Ave. (MD-650) south, turn left at the second light onto Adelphi Rd., two more lights, turn left onto Metzerott, and proceed about a mile to the observatory. The observatory is on the south side of Metzerott Rd., directly opposite the UM System Administration building; you can park there if the observatory lot is full, but be careful crossing Metzerott Rd.

At 5:30 p.m. before the meeting, please join us for dinner at the Garden Restaurant in the UMD University College Inn and Conference Center, 3501 University Blvd. East at Adelphi Rd. From the Beltway, either take New Hampshire Ave. south, turn left onto Adelphi, and at the third light (passing Metzerott) turn left onto University then immediately right into the garage; or, take US-1 south, turn right onto University Blvd. west, and take it to the intersection with Adelphi Rd. Park either in the garage (costs), or in Lot 1 nearby (free). To get to the Observatory, exit to the right onto University Blvd. (MD-193) east, and at the second light turn left onto Metzerott Rd.

Come See the Stars!

by Joe Morris

Exploring the Sky 2004-2005 Schedule

Date	Time	Notes
10/16	7:30 P.M.	Orionid meteor shower 10/2-11/7
11/13	7:00 P.M.	Leonid meteor shower 11/14-11/21

Exploring the Sky is an informal program jointly sponsored by National Capital Astronomers and the National Park Service that for nearly fifty 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 immediately 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:
<http://www.nps.gov/rocr/planetarium>
 or
<http://www.capitalastronomers.org>

Observing after the Meeting

Elizabeth Warner

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



Getting to the NCA Meeting

Star Dust is published ten times yearly, September through June, by the National Capital Astronomers, Inc. (NCA).
Editor: Elliott Fein, Co-editor: Adele Fein, Editorial Advisor: Nancy Byrd. Consultant: Jeffrey Norman
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<http://capitalastronomers.org>

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NCA Web Page: <http://capitalastronomers.org/>.

Appointed Officers and Committee Heads: Exploring the Sky - Joseph C. Morris; Meeting Facilities - Jay H. Miller;

Observing - Michael McNeal, mcnealmi@verizon.net; Telescope Making - Guy Brandenburg; *Star Dust* Editor - Elliott Fein

SERVING SCIENCE & SOCIETY SINCE 1937

NCA is a nonprofit, membership-supported, volunteer-run, public-service corporation dedicated to advancing astronomy, space technology, and related sciences through information, participation, and inspiration, via research, lectures, presentations, publications, expeditions, tours, public interpretation, and education. NCA is the astronomy affiliate of the Washington Academy of Sciences. All are welcome to join NCA.

SERVICES & ACTIVITIES:

Monthly Meetings feature presentations of current work by researchers at the horizons of their fields. All are welcome; there is no charge. See monthly *Star Dust* for time and location.

NCA Volunteers serve in a number of capacities. Many members serve as teachers, clinicians, and science fair judges. Some members observe total or graze occultations of stars occulted by the Moon or asteroids. Most of these NCA members are also members of the International Occultation Timing Association (IOTA).

Publications received by members include the

monthly newsletter of NCA, *Star Dust*, and an optional discount subscription to *Sky & Telescope* magazine.

Consumer Clinics: Some members serve as clinicians and provide advice for the selection, use, and care of binoculars and telescopes and their accessories. One such clinic is the semiannual event held at the Smithsonian Institution National Air and Space Museum.

Fighting Light Pollution: NCA is concerned about light pollution and is interested in the technology for reducing or eliminating it. To that purpose, NCA is an Organization Member of the International Dark Sky Association (IDA). Some NCA members are also individual members of IDA.

Classes: Some NCA members are available for educational programs for schools and other organizations. The instruction settings include star parties, classroom instruction, and schoolteacher training programs that provide techniques for teaching astronomy. NCA sponsors a telescope-making

class, which is described in the *Star Dust* "Calendar of Monthly Events."

Tours: On several occasions, NCA has sponsored tours of astronomical interest, mainly to observatories (such as the National Radio Astronomy Observatory) and to the solar eclipses of 1998 and 1999.

Discounts are available to members on many publications, products, and services, including *Sky & Telescope* magazine.

Public Sky Viewing Programs are offered jointly with the National Park Service, and others. Contact: Joe Morris, joemorris@erols.com or (703) 620-0996.

Members-Only Viewing Programs periodically, at a dark-sky site.

NCA Juniors Program fosters children's and young adults' interest in astronomy, space technology, and related sciences through discounted memberships, mentoring from dedicated members, and NCA's annual Science Fair Awards.

Fine Quality Telescope, 14-inch aperture, see "Calendar of Monthly Events."

Yes! I'd like to join the NATIONAL CAPITAL ASTRONOMERS

Date:

Name(s): _____

Address: _____

Telephone: _____ E-mail: _____

Other family members who should receive a membership card: _____

_____ I prefer to receive *Star Dust* by e-mail

Dues:

___ \$60 With *Star Dust* and a discount subscription to *Sky & Telescope*.

___ \$27 With *Star Dust* ONLY.

___ \$45 Junior membership with *Star Dust* and a discount subscription to *Sky & Telescope*.

___ \$15 Junior membership with *Star Dust* ONLY.

___ \$100 Contributing member (with *Sky & Telescope*) (\$40 tax-deductible).

___ \$150 Sustaining member (with *Sky & Telescope*) (\$90 tax-deductible).

Junior members only: Date of Birth: _____ Only members under the age of 18 may join as juniors.

Tax deductible contribution: _____ Thank You.

Please send this form, with your check payable to National Capital Astronomers, Inc., to:

Mr. Jeffrey Norman, NCA Treasurer, 5410 Connecticut Ave NW #717, Washington DC 20015-2837



National Capital Astronomers, Inc.

If undeliverable, return to
NCA c/o Nancy Roman
4620 N. Park Ave., #306W
Chevy Chase, MD 20815-4551

FIRST CLASS DATED MATERIAL

Inside this issue:

October Speaker	1
Review of September Talk	1
Open House at Hopewell	1
NCA Events This Month	2
Observing with the NCA C-14	2
The President's Letter	3
NCA Telescope- and Mirror-Making	3
Mysterious Signals	3
Brown Dwarfs	3
Mid-Atlantic Occultations	4
Dinner Reservations	5
Ride Reservations	5
Meteor Showers	5
Exploring the Sky	6
Directions to Meeting	6
Observing after the Meeting	6
Map to Meeting Place	6
About NCA	7
Membership Application	7