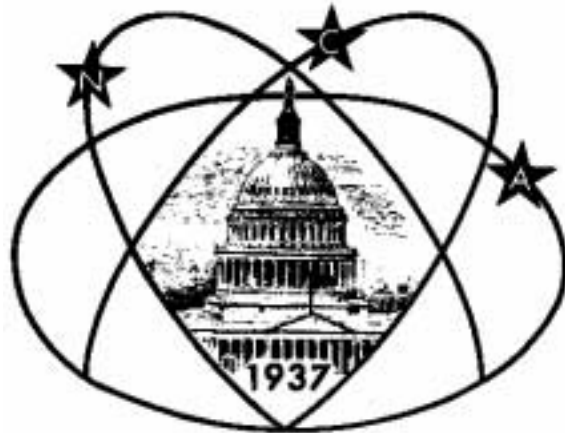


# Star



# Dust

National Capital Astronomers, Inc.

<http://capitalastronomers.org>

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## October Speaker: Dr. M. Coleman Miller, “Black Holes and Trembling Spacetime”

Dr. M. Coleman Miller, Associate Professor, Department of Astronomy, University of Maryland, College Park, MD, will present the talk “Black Holes and Trembling Spacetime” at the October 14 meeting of the National Capital Astronomers, 7:30 P.M., at the University of Maryland Observatory, in College Park, Maryland.

### Abstract

The modern concept of black holes arose in 1916, but most of their many faces have been hidden until recently. Rapid developments in X-ray astronomy, large optical surveys, and computer simulations have shown that black holes are far from stand-offish loners. Instead, they appear to play

a key role in the evolution of galaxies. Further, they are test beds for many areas of fundamental physics. A major discovery yet waiting is direct detection of gravitational waves which are ripples in spacetime. Inwardly-spiraling black holes should be major sources. I will give an overview of black holes, past, present, and future, with an emphasis on recent work and the promise of gravitational wave observations.

### Biography

Cole Miller was raised in Michigan. A love of mathematics combined with awe at pictures of other planets from the Pioneer, Viking, and Voyager missions to stimulate

a lifelong interest in astrophysics. After a B.S. in math and physics from Hillsdale College in Michigan, he earned a Ph. D. in physics from Caltech with a thesis on X-rays from neutron stars. He then did post-doctoral work at the University of Illinois with Fred Lamb; and at the University of Chicago, with Fred’s identical twin brother Don Lamb, with a midway stop at the Nordic Institute for Theoretical Astrophysics in Copenhagen. Since 1999 he has been a professor of astronomy at the University of Maryland, receiving tenure in 2004. He recently returned from a sabbatical at NASA Goddard hosted by the gravitational wave astrophysics group.

## Review of Talk by Dr. Vera Rubin: “Polar Ring Galaxies” by Dr. Nancy Grace Roman

This is a review of the talk given at the September 9 meeting of the National Capital Astronomers by Dr. Vera Rubin, Senior Fellow at the Department of Terrestrial Magnetism, Carnegie Institution of Washington,

Dr. Rubin divided the galaxies she planned to talk about into three classes: normal spiral galaxies, polar ring galaxies and disk galaxies with more than one sense of rotation.

She showed a slide with four scales of features in the universe. The solar system is in an outer arm of the Milky Way. It takes light 30,000 years to travel from the center of the galaxy to the earth. The Milky Way and Andromeda are the largest members of the local group of galaxies; this group is an outlier of the Virgo cluster of galaxies. The

Virgo cluster is in the complex mesh of galaxies and clusters of galaxies she showed. Finally, the edge of the observable universe that we see as the cosmic infrared background is about 13.8 billion light years from the Milky Way.

Galileo was the first to identify the Milky Way as composed of stars. From the southern hemisphere it looks very much like some external galaxies. Newton knew that the velocities of planets were inversely proportional to the square root of their distance from the Sun. Pluto is 100 times as far from the Sun as Mercury and has an orbital velocity 0.1 times as large. It was assumed that this law would also hold for galaxies. Pease obtained the rotation velocities of the inner 2 arcmin of Andromeda. (That galaxy extends 4 degrees on

the sky.) In 1962, Vera Rubin was teaching at Georgetown. She and her students showed that beyond the orbit of the Sun, the rotation of the galaxy was essentially flat with distance.

In 1965, Kent Ford’s image tube increased the speed of obtaining spectra by a factor of ten. Ford wanted to use the image tube; Dr. Rubin wanted to understand the rotation of galaxies. During World War II, Walter Baade used the 100-inch on Mount Wilson to identify individual stars and HII regions in Andromeda. He gave a series of lectures at Harvard that were published in a book in 1963 (*Evolution of Stars and Galaxies*), a wonderful book. Kent Ford and Vera Rubin obtained spectra of the HII regions Baade had identified, offsetting from

(Continued on page 3)

## NCA Events This Month

The Public is Welcome!

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

**NCA Mirror- and Telescope-making Classes:** Fridays, October 6, 13, 20, and 27, 6:30 to 9:30 P.M. 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](mailto:gbrandenburg@yahoo.com).

**Open house at Hopewell Observatory,** Saturday evening, October 21. See article on Page 4 for information and directions.

**Open house talks and observing** at the University of Maryland Observatory in College Park on the 5th and 20th of every month at 9 P.M. The talks are non-technical. There is telescope viewing afterward if the sky is clear.

**Upcoming NCA Meetings—Saturdays**  
October 14, NCA dinner and meeting.  
See Page 1 and Page 7.

November 11: Neil Gehrels, NASA/GSFC, "The most Energetic Events in the Universe".  
December 9, TBA.

See Page 6 for other events this month.

## Observing with NCA C-14 Mike McNeal

Schedule is open, generally, Saturdays at 7:30 P.M. Call to set up a time.

In Mike McNeal's backyard, 5410 Grove St, Chevy Chase, MD, (Friendship Heights Metro).

Please make reservations by 10 p.m. the Friday before. Call Mike at 301-526-2648 or email him at [mcnealmi@verizon.net](mailto:mcnealmi@verizon.net).

We need a new volunteer to house NCA's C-14, make it available for weekly viewing, and transport it to other sites, e.g., Exploring the Sky and star parties.

*The deadline for the November Star Dust is October 25.*

*Please send your material to Elliott Fein by that date to ensure inclusion. Send submissions to Elliott Fein at [elliott.fein@verizon.net](mailto:elliott.fein@verizon.net).*

*Articles submitted may be edited to fit the space available.*

## Exploring the Sky by Joe Morris

### 2006 Schedule

Date	Time	Things of interest
10/21	7:30 P.M.	Orionid meteor shower peak
11/4	7:00 P.M.	Moon (in Aries) near full; Pleiades

*Exploring the Sky* is an informal program 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>

A presentation of the National Park Service and National Capital Astronomers.

## News and Notes from the NCA Mirror- and Telescope-Making Workshop

by Guy Brandenburg

[Continued from last month]

A few months ago, with a lot of help from my son, Josef, I took delivery of an entire surplus 12-inch heliostat that some folks at NASA-Goddard were trying to get rid of. A heliostat has a flat mirror that follows the Sun and directs the rays of the Sun into a fixed location. The rays of the Sun could then be used for scientific purposes like examining the solar spectra near or inside sunspots, for lighting a chamber, or just for burning small insects. The one we got weighs several hundred pounds, since the aluminum plates are generally 3/4 inch thick; many are about 30 inches by 30 inches. Its electronics date from about 20

years ago and seem to require 220 volts, according to the electronic schematics that were supplied. It looks like it's in excellent mechanical condition and its supplied 12-inch flat mirror seems to be in good shape. However, one of the main cables was severed, intentionally, most likely when it was removed from where it used to be located. I am not very good at electronics, and would love to have some assistance in getting this thing back into working order, and then would like to have suggestions and help in finding a location to install this mirror for the purpose of making a serious solar telescope. We have some decent spectral gratings (from the Powers Collec-

tion of surplus NRL goods that is mostly housed by Mike Mills [NOVAC]) that could be used by students at some institution for analyzing the solar spectrum and looking at all of those wonderful absorption lines. Wherever it gets mounted would need an absolutely rock-solid foundation, surrounded by greenery or water (but not tall trees); it would obviously not need to be in a dark-sky location. But wherever it is should be secure, have electricity, and have an Internet connection.

We also took delivery of the full-thickness 24-inch blank that Bob Bolster had been

*(Continued on page 3)*

# Review of talk by Dr. Vera Rubin

*(Continued from page 1)*

bright stars. In the center, there were very few emission regions; there they observed stars. The behavior of the rotation curve near the center is not yet understood. In 1970, they published their results showing flat rotation curves. In 1975, the radio astronomers extended this curve, continuing the flat behavior. As late as 1978, people were arguing that Keplerian rotation was possible, if the very outermost points were ignored.

By 1983, larger telescopes allowed the observation of a number of other galaxies, all of which showed flat outer rotation curves, implying that spiral galaxies are embedded in spheroids of dark matter. The least massive galaxies show the greatest amount of dark matter. Dr. Rubin studied disk galaxies primarily; spectra of elliptical galaxies are much more difficult to interpret.

In 1983, Francois Schweitzer showed Dr. Rubin a galaxy with a flat disk superposed on a polar ring. A study of such a galaxy gives information concerning the distribution of mass in three dimensions. Assuming that there is dark matter in all galaxies, the question is how is it distributed. Dr. Rubin observed that the velocity is the same at the same distance from the center whether in the disk or in the ring, implying

that the distribution of dark matter is more nearly spherical than flat. The most studied polar ring galaxy is NGC 4650A. Regions of the polar ring are very blue with young blue stars. It is thought that these result from interaction between the two galaxies. The 21-cm. contours are quite extended. It appears that the disk has penetrated the ring. Such galaxies occur mostly in regions in which galaxies are relatively dense. The disk and ring are always perpendicular. Otherwise, precession would align them. The disks are old with little gas; the rings have much gas and dust. The dust shows as absorption in the distribution of light brightness in the system. The stars in the rings seemed to have formed about 2 million years ago. All galaxies are evolving, and polar ring galaxies give us a chance to study some of the processes.

Next, Dr. Rubin turned to about 100 galaxies in the Virgo Cluster. NGC 4550 is a small elliptical, the closest elliptical to M87, the central galaxy in the cluster. Many stars are counter-rotating compared to the gas. However, about half of the stars rotate in the same direction as the gas. Linden Bell had written a paper in 1960 in which he discussed galaxies with counter-rotating stars. No one can figure out how to make such a galaxy. If you merge two gal-

axies, they will puff up. There are no successful models of counter-rotation galaxies merging edge-on. This is the only clear example. There may be a couple of others somewhat similar. Scott Tremaine said that counter-rotating galaxies are stable.

In 2000, Scott Tremaine wrote a paper on how such a galaxy can be formed. This comes about because of the interaction of the halo and disk. However, the predictions of Tremaine's model do not match the observations.

## Question Period

If galaxies precess from tilted polar rings into the disk, you would expect intermediate cases. If the rings are not close to polar, the galaxies become very messy.

Dr. Rubin then described the next things that she is interested in: are very low luminosity irregular galaxies. These are a non-uniform group but they tend to occur in clusters. A galaxy that may have no dark matter has been identified. These low surface brightness galaxies may have very low rotations but it is still measurable.

If the outer rotation curves are flat, the density decreases as the inverse square of the distance from the center. People are beginning to suggest that galaxies become more massive as they age.

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## News and Notes from the NCA Mirror- and Telescope-Making Workshop

*(Continued from page 2)*

custodian of for a number of years. It's not Pyrex, rather, some sort of other, unidentified 4-inch-thick optical glass. It weighs about 200 pounds, so I built a special sledge to carry it in, which my daughter, Alexandra, and I handled using a furniture-moving cart without too much strain. Grinding and polishing this behemoth will be quite a job, regardless of the optical design finally chosen. Then the problem will be where and how to mount it! Suggestions are most welcome.

Alan Bromborsky has been kind enough to make us some jigs to cut circles using either a router, or the bandsaw that is in the wood shop. He has also donated some other hand tools (an angle grinder and a circular saw). He also replaced some of the guide wheels on the bandsaw. Steve LaPrade had generously replaced the guide blocks on the bandsaw several months ago,

which also made a big difference.

Every so often, we get folks who bring in commercial or home-made telescopes whose optics they want us to check. Most of the big-name telescope mirrors we see aren't nearly as well-figured as the mirrors our members make. The last Meade mirror (12 or 14 inches) we checked clocked at about 1/2 wave accuracy. However, a small 3.5-inch telescope mirror with a focal ratio of about f/10 that Kurt Endress brought in, that he suspected might have been an Edmunds kit from the 1960's, had a very nice perfectly spherical figure as shown in the Ronchi test. We stripped off the old coating, cleaned it, and re-aluminized it within about an hour and a half.

My own personal project, which I began with Nagesh Kanvindeh (NOVAC) and a little bit of help from Michael Chesnes (Howard Astronomical League, or HAL)

and some consultation from Aki Lötjönen (Finland), Steve Johnson (local), and Rick Scott (Arizona?), is nearing completion. It's a Lurie-Houghton telescope with two 7.5-inch diameter corrector plates in the front of the telescope that both use the identical type of glass (in our case, something called BK-7) and that have identical, but opposite, spherical curves. The mirror is also spherical, and its diameter is 8" at f/5. There is a flat diagonal mirror. Supposedly, this design is completely corrected for coma, astigmatism, spherical aberration, and color, has a very wide, flat field, and is good for both optical and photographic uses. We will see about all of that. Grinding, de-wedging, polishing, and figuring the two corrector plates has been the tricky part, especially since two of the surfaces are convex. Fortunately, since the convex surfaces fit exactly into the con-

To be continued next month

# The Pluto Controversy

*Dr. Nancy Grace Roman*

For at least the past ten years, there has been a controversy in the astronomical community questioning whether Pluto can be called a planet. The problem was that we had no clear definition of what constitutes a planet. If the definition is based on size, then if we call Pluto a planet, we must call several other objects planets.

Pluto's status up until now was a result of several errors. In the early 20<sup>th</sup> century, there seemed to be effects on the orbit of Neptune that could not be explained by the attractions of the known planets. As a result, a search for a planet beyond Neptune was started. After much searching, a young astronomer at Lowell Observatory found an object, Pluto. At the time, we thought that it was larger than we now know it to be. Further observations proved that there were no discrepancies in the orbit of Neptune, so another planet was unneeded. Moreover, Pluto is too small to have any influence on Neptune. It is appreciably smaller than the Earth's moon. Recently, many other bodies have been found beyond Neptune. One is larger than Pluto and another, at least comparable in size. It is likely that more larger ones will be found. Thus, the only reason for calling Pluto a planet is historical. To be consistent, there must be either eight planets or at least ten. The current definition sets a definition of a planet that excludes Pluto, thus avoiding an unending increase in the number of planets.

## Membership Directory Error

*Nancy Grace Roman*

I had to replace the program I use for printing the directory. When I did, I used a wrong format that omitted the addresses and telephone numbers. I replaced several of these, but there are two or three whom I cannot identify, to whom I sent the defective directory. If you received a defective directory within the past month, please let me know and I'll replace it.

Nancy.roman6@verizon.net

Nancy Grace Roman  
4620 North Park Avenue, #306W,  
Chevy Chase, MD 20815-4580

# Open House at Hopewell Observatory: Saturday, October 21

*Bob Bolster*

NCA members, families and guests are invited to view the autumn sky at Hopewell Observatory in the Bull Run Mountains. See the Milky Way and numerous deep-sky objects. The Sun sets at 18:24, and astronomical twilight ends at 19:53. 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 traffic light at the end of the exit ramp. (3) Go 0.3 miles to traffic light, turn right onto Va. 55. (4) Go 0.8 miles 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 miles on Rt. 629 to a narrow paved road at right with an orange pipe gate (Directly across from an entrance gate with stone facing). (8) Turn right through the pipe gates, go 0.3 miles to the top of the ridge and around the concrete building and towers. (9) Continue on a dirt road through a 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.

## Other National Capital Area Meetings

### Northern Virginia Astronomy Club

**7:00 p.m., October 14**

#### Science from a Light-polluted Driveway

Bob Bunge will demonstrate how to do real science from light polluted suburbs. He'll show how to observe a variable star. After downloading a variable star chart, an explanation of how to make the observation is made, followed by a mock upload of the observation to the website of the American Association of Variable Star Observers.

General membership meetings are open to the public, and are held at Enterprise Hall, room 80, on the campus of George Mason University in Fairfax, Virginia. The meeting hall is in the basement floor of the building. It is best to park in parking lot B and walk up the hill to the rear of Enterprise Hall (see note above).

Meetings start at 7:00 P.M., on the second Sunday of every month. If you come earlier you can do a little socializing. The first part of the meeting is club business, during which the officers make reports about their activities and areas of responsibility. The next part of the meeting usually includes:

- Show and Tell, where members share gadgets, books, techniques, etc.
- The Observing Report, describing the astronomical events for the next month.
- Q&A, where beginning astronomers

are encouraged to ask questions to be answered by more experienced members.

- The Sky Tour, describing what's where in the sky for the next month.

The final part of the meeting is a program, usually by one of the members, but sometimes by "outside experts." We've had presenters from all aspects of Astronomy.

There's a good deal of socializing before and after meetings, allowing members to put faces with the voices they've heard in the dark.

#### Please Join Us for Dinner!

Since February 1995, a number of NOVAC members have been congregating on the night of our regular meetings for dinner. Hopefully this assists in getting to know one another, at a more relaxed location than at the meeting itself. It's also nice to see who it is you're talking to for a change and be able to connect faces with names - unlike the usual observing situation. All are welcome to attend, whether NOVAC members or prospective members, guests or whoever - just be prepared to discuss a little astronomy or any other topic that pops up!

If you'd like to join us, stop by the Red, Hot and Blue restaurant at 5:30 P.M. See you there!

Source: <http://novac.com/>

# Mid-Atlantic Occultations and Expeditions

## by Dr. David Dunham

### Asteroidal Occultations

Date	Day	EDT/ EST	Star	Mag	Asteroid	dmag	dur.	Ap. s in.	Location
Oct 15	Sun	5:09	TYC13300113	11.6	Mathilde	3.5	6	7	eKY, swVA, neNC
Oct 24	Tue	21:41	TYC68931628	11.8	Amphitrite	0.4	10	8	IN, Ohio, sOnt.
Oct 28	Sat	4:38	TYC12650502	12.4	Sapientia	1.4	12	9	OH, PA, nNJ, CT
*** Dates and times above are EDT, those below are EST ***									
Nov 8	Wed	5:57	SAO 139429	8.5	Idelsonia	8.4	1	2	S. Car., n. GA

### Grazing Occultations

DATE	Day	EDT/ EST	Star	Mag	% alt	CA	Location
Oct 14	Sat	0:32	76 Gem	5.3	48- 8	7N	Lewisburg & Bedford, PA
Oct 17	Tue	4:03	SAO 99040	8.9	20- 12	0N	Westminster, MD; Mt. CubaOb, DE
Oct 28	Sat	20:52	PPM 270298	8.9	40+ 16	15S	Frostbrg, MD; Bedford, PA
*** Dates and times above are EDT, those below are EST ***							
Nov 1	Wed	20:57	ZC 3461	6.3	83+ 47	17S	Williamsbrg, VA; Salisbury, MD
Nov 1	Wed	22:20	ZC 3465	6.5	83+ 43	17S	Fayetteville, NC; Suffolk, VA
Nov 2	Thu	17:59	ZC 35	6.2	90+ 26	11S	Grantsville, MD; Sun alt. -9
Nov 12	Sun	2:43	SAO 98460	8.0	65- 43	5S	Jarrett & Chesapeake, VA

### Total Lunar Occultations

DATE	Day	EDT/ EST	Ph	Star	Mag	% alt	CA	Sp.	Notes
Oct 13	Fri	0:04	R ZC	1035	6.7	58- 13	79N	K3	Az. 285; close double?
Oct 15	Sun	0:41	R	76 Gem	5.3	48- 9	30N	K5	Az64; ZC1169; PA graze
Oct 16	Mon	3:09	R ZC	1402	7.3	28- 13	46S	K0	Azimuth 78 deg.
Oct 17	Tue	4:00	R	SAO 99035	8.5	19- 12	45N	A0	Azimuth 83 deg.
Oct 17	Tue	5:07	R ZC	1506	7.0	19- 24	79N	G0	Probably close double
Oct 20	Fri	6:59	R ZC	1787	6.2	3- 12	78S	F2	Az106; Sun-5; spec. bin.
Oct 26	Thu	18:44	D	SAO 185731	7.9	20+ 15	85N	K5	Az. 209; Sun alt. -7
Oct 26	Thu	20:16	D ZC	2560	8.0	21+ 5	87N	F0	Azimuth 226 deg.
Oct 28	Sat	19:46	D ZC	2887	7.7	40+ 22	77N	K2	
*** Dates and times above are EDT, those below are EST ***									
Oct 30	Mon	20:19	D	SAO 164583	7.2	62+ 32	40N	K0	
Oct 30	Mon	20:53	D ZC	3180	8.1	63+ 29	58S	M0	
Nov 1	Wed	0:34	D	65 Aquarii	7.0	75+ 12	67S	K0	ZC 3332; Az. 247 deg.
Nov 1	Wed	20:43	D ZC	3461	6.3	83+ 47	38S	K3	Graze, seMD, seVA, NC
Nov 1	Wed	22:08	D ZC	3465	6.5	84+ 44	44S	F8	Graze, seVA, NC
Nov 2	Thu	23:39	D ZC	53	6.9	92+ 46	68N	B8	mg2 10.4, sep60", PA175
Nov 4	Sat	1:24	D ZC	203	6.8	97+ 44	39N	K0	Terminator dist. 20"
Nov 7	Tue	23:31	R ZC	797	6.4	90- 53	81N	B9	Maybe close double
Nov 9	Thu	3:06	R ZC	996	6.9	82- 78	54N	A2	Maybe close double
Nov 9	Thu	5:12	R	SAO 78496	7.5	81- 66	79N	K0	
Nov 9	Thu	5:55	R	49 Aurigae	5.3	81- 58	52N	A0	ZC 1008; Sun -10
Nov 10	Fri	2:01	R ZC	1131	7.3	73- 59	61S	A2	
Nov 11	Sat	4:20	R ZC	1267	8.1	63- 71	42N	A0	mg2 9.7, sep25", PA163
Nov 12	Sun	3:05	R	SAO 98460	8.4	53- 48	36S	A3	Graze in s. Virginia
Nov 12	Sun	3:39	R ZC	1377	7.0	53- 54	61S	A3	
Nov 12	Sun	4:57	R	SAO 98481	7.9	53- 66	76N	F0	=mags, sep 0.1", PA 62

David Dunham, e-mail [dunham@starpower.net](mailto:dunham@starpower.net), more info. <http://iota.jhuapl.edu>  
 Phone home 301-474-4722; office 240-228-5609; cell 301-526-5590

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

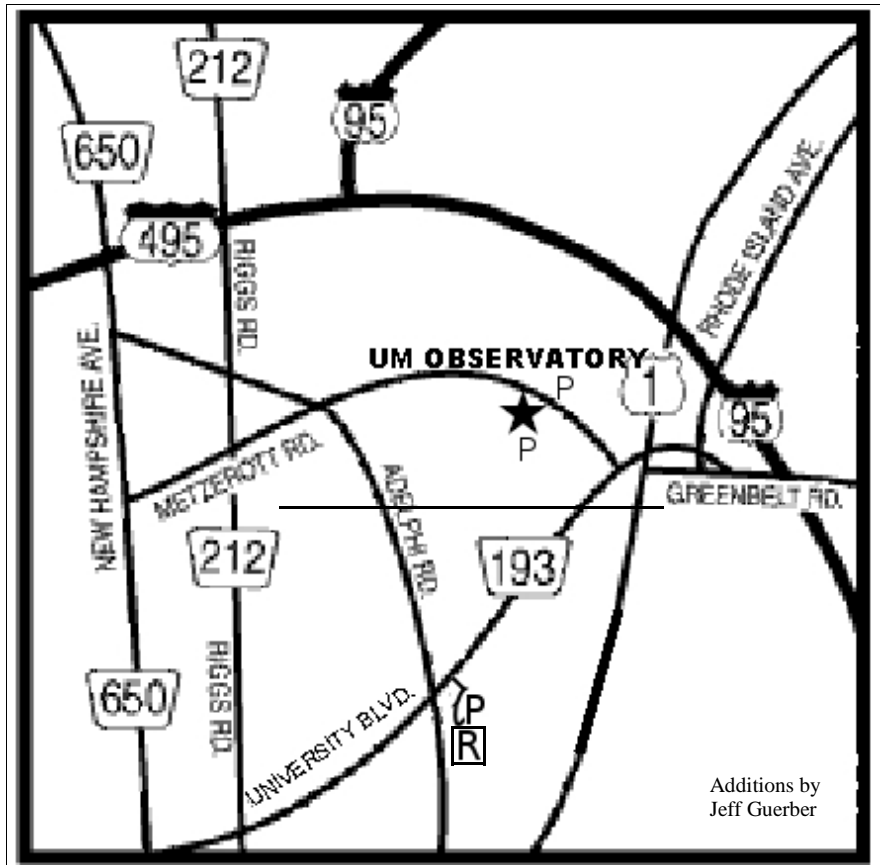
Jeff Guerber

NCA meetings are now held at 7:30 p.m. at the University of Maryland Observatory, in College Park on Metzertott 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 Metzertott; or, take New Hampshire Ave. (MD-650) south, turn left at the second light onto Adelphi Rd., two more lights, turn left onto Metzertott, and proceed about a mile to the observatory. The observatory is on the south side of Metzertott Rd., directly opposite the UM System Administration building; you can park there if the observatory lot is full, but be careful crossing Metzertott 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 Metzertott) 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 Metzertott Rd.

### 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).



Getting to the NCA Meeting  
Star=Observatory R=Restaurant P=Parking

## 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 set up for viewing.

### 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 bjs32@cornell.edu so that we can make reservations for the right number of people.

### Do You 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 email at rigel1@starpower.net.)

# Support the IDA

Join the International Dark-Sky Association  
3225 N. First Avenue Tucson, AZ  
85719-2103  
[www.darksky.org](http://www.darksky.org)

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Editor: Elliott Fein, Co-editor: Adele Fein, Editorial Advisor: Nancy Byrd. Consultant: Jeffrey Norman  
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## National Capital Astronomers, Inc.

<http://capitalastronomers.org>

Dr. Harold Williams, NCA President, Harold.Williams@montgomerycollege.edu, 301-650-1463 (planetarium), 301-565-3709 (home).

Dr. Walter L. Faust, NCA Vice-president, program chair, and President-elect, wlf Faust1370@direcway.com, 301-217-0771.

Dr. John D. Gaffey, Jr., Vice-President-elect.d

Dr. Nancy Grace Roman, NCA Secretary, nancy.roman6@verizon.net, 301-656-6092 (home).

Mr. Michael L. Brabanski, NCA Treasurer, Assistant Secretary, 10610 Bucknell Dr., Silver Spring, MD 20902-4254, 301-649-4328 (home), mlbrabanski@verizon.net

Jeffrey B. Norman, Assistant Treasurer.

Trustees: Guy Brandenburg, Gary Joaquin, Jeffrey Norman, Benson Simon.

NCA Webmaster, Dr. Harold Williams, see info in top line above.

Elliott Fein, NCA *Star Dust* Editor, elliot.fein@verizon.net, 301-762-6261 (home), 5 Carter Ct., Rockville, MD 20852-1005.

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. NCA is an IRS Section 501(c)(3) tax-deductible organization. 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.

**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 semi-annual 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).

**Classes:** Some NCA members are available for educational programs for schools and other organizations. The instruction settings include star parties, classroom instruction, and school-teacher 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."

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Would you prefer to get *Star Dust* by e-mail? \_\_\_\_\_

#### MEMBERSHIP CATEGORIES AND ANNUAL DUES RATES

All members receive *Star Dust*, the monthly newsletter announcing NCA activities. As an added optional benefit to extend your knowledge of astronomy you may also choose *Sky and Telescope* magazine at the discounted rate of \$33.

Student Membership: ..... \$5 .....with *Sky and Telescope*....\$38

Standard Individual or Family Membership: ..... \$10 .....with *Sky and Telescope*....\$43

You are welcome to make contributions in any amount in addition to the dues shown above.

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## FIRST CLASS DATED MATERIAL

***NCA Will  
Meet on  
October 14!***

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