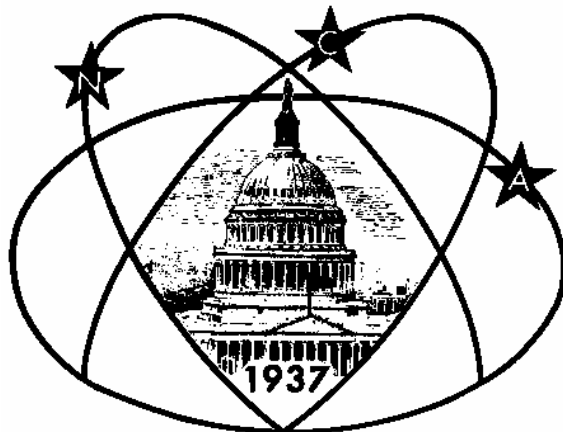


# Star



# Dust

National Capital Astronomers, Inc.

<http://capitlastronomers.org>

Volume 66, Number 1

September 2007

ISSN 0898-7548

## September Speaker: Dr. Douglas P. Hamilton - "Tilting the Planets"

Dr. Douglas P. Hamilton, University of Maryland, College Park will present the talk "Tilting the Planets" at the September 8 meeting of the National Capital Astronomers, 7:30 P.M., at the University of Maryland Observatory in College Park.

while others are tipped over on their sides (Uranus). What can the tilts of the planets teach us about the formation of the Solar System, and about the processes that have sculpted it over 4.5 billion years of history?

### Abstract

The 23.5 degree tilt of Earth's spin axis is responsible for the yearly cycle of the seasons: winter, spring, summer, and fall. But why is Earth tilted at all, and why do the tilts of planetary spin axes vary so wildly in the Solar System? Some planets are barely tilted (Mercury, Venus, Jupiter)

### Biography

Doug Hamilton grew up in Alaska, chasing moose and being chased by them. He attended Stanford and Cornell, then worked for a few years in Heidelberg before coming to the University of Mary-

*(Continued on page 2)*

## National Capital Astronomers Awards Life Membership to Nancy Grace Roman

in recognition of her many years of distinguished service as Secretary, contributor to Star Dust, lecturer, and wise counsel to National Capital Astronomers, Inc.

**Harold Williams**  
President  
June 9, 2007

## Elections held at June 9 Meeting

NCA held its annual election at the June meeting. The candidates elected were:

President - Walter Faust  
Vice president - Jack Gaffey  
Asst. V.P. - John Hornstein  
Secretary-Treasurer - Michael Brabanski  
Asst. Sec'y-Treas. - Jeffrey Norman  
Trustee - Wayne Warren

Congratulations to the winners!

## June Talk by Dr. Nancy Grace Roman: "The Hertzsprung-Russell Diagram" *reviewed by Harold Williams*

[Editor's note: Words in this article that are underlined and in bold are hyperlinks. If you cannot click on the hyperlink to go to the address on the World Wide Web, see the list at the end of this article.]

On June 9, 2007, **Dr. Nancy Grace Roman** gave us a lecture on the **Hertzsprung-Russell Diagram**, the most important diagram in stellar astronomy. **Dr. Roman (resume)** is one of the most famous professional astronomers alive today, having discovered that stars with higher velocity have much lower **metallicity** than others near the Sun.

As a NASA official, she was the program scientist who was largely responsible for bringing us the Hubble. All astronomers love her for this work alone, even if they do not know of all of her other research

accomplishments. The 3.7 Megabytes of PowerPoint slides used in her presentation are **here**.

She was the program scientist who was largely responsible for bringing us the Hubble.

The Hertzsprung-Russell diagram plots stars, with the y-axis being brightness of the stars measured, either in stellar magnitudes or in terms of brightness in terms of the Sun, on a logarithmic scale. On the magnitude scale, negative numbers are brighter and positive numbers are dimmer.

*(Continued on page 3)*

## Science Fair Award Winner Honored

We honored one of the winners of the NCA Astroscience Awards in the 2007 science fairs at the June NCA meeting. The winner, Julie Emily Walker, brought her project, "Oops! I made a Martian Environmental Simulator (MES)" to the meeting, and spoke to us about it. She was presented with a certificate, a one-year membership in NCA, and a one-year subscription to Sky and Telescope.

## Calendar of Monthly Events

### The Public is Welcome!

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

**NCA Mirror- and Telescope-making Classes:** Fridays, September 7, 14, 21, and 28, 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 [gfbrandenburg@yahoo.com](mailto:gfbrandenburg@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 P.M. (Nov.-Apr.) or 9 P.M. (May-Oct.). The talks are non-technical. There is telescope viewing afterward if the sky is clear.

**Dinner with NCA members and speaker:** Saturday, September 8 at 5:30 P.M., preceding the meeting, at the Garden Restaurant in the University of Maryland University College Inn and Conference Center. See map and directions on Page 6.

#### Upcoming NCA Meetings—Saturdays

September 8, Dr. Douglas P. Hamilton, Astronomy Dept., University of Maryland, College Park, MD, will present the talk “Tilting the Planets.”

### Come See the Stars! *Exploring the Sky* by Joe Morris 2007 Schedule

<u>Date</u>	<u>Time</u>	<u>Things of interest</u>
9/29	8:00 P.M.	Rock Creek Park Day; Moon just past full
10/20	7:30 P.M.	Orionid meteors; Moon past first quarter
11/3	7:00 P.M.	Pleiades; Andromeda near zenith

*Exploring the Sky* is an informal program that for over 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 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:

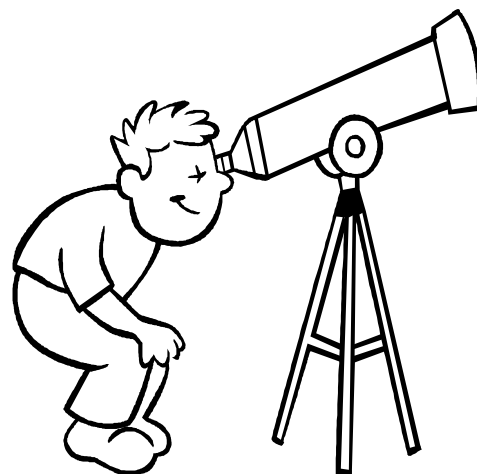
[www.nps.gov/rocr/playourvisit/expsky.htm](http://www.nps.gov/rocr/playourvisit/expsky.htm) or  
[www.capitalastronomers.org](http://www.capitalastronomers.org)

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

## Dr. Douglas P. Hamilton - “Tilting the Planets”

*(Continued from page 1)*

land. His research focuses on planetary dynamics and the origin of the Solar System. He has studied the rings of Jupiter, Saturn, Uranus, and Neptune, the orbital histories of satellite systems, and the curious interactions of extrasolar planets. Doug has a strong interest in undergraduate teaching; he has led a team of undergraduates in producing an interactive set of online tools, called the Astronomy Workshop. These animate planetary orbits show what happens when an asteroid strikes the Earth, and generally allow users to explore the Solar System from the comfort of home. The Astronomy Workshop is available to the public at <http://janus.astro.umd.edu>.



### 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 Michael L. Brabanski, the NCA Secretary-Treasurer, at [mlbrabanski@verizon.net](mailto:mlbrabanski@verizon.net) or 301-649-4328 (home).

*The deadline for the October Star Dust is September 26. 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.*

# Review of Talk by Dr. Nancy Grace Roman: “The Hertzsprung-Russell Diagram”

(Continued from page 1)

On the x-axis, the Hertzsprung-Russell diagram organizes the stars according to their temperature, or color, or spectral type. Temperature, color, and spectral type all have a 1:1 relationship with each other. Temperature is inferred by measuring color, by subtracting two different filtered magnitudes; or by measuring absorption lines in the spectrum of the star and classification according to type.

The relationship between color and temperature is quite simple, mathematically. The classification of stellar spectra by their spectral lines in absorption is quite com-

plicated. Its relationship to temperature is not simple or obvious (you cannot write a simple mathematical relationship relating temperature to spectral type). Spectral broadening of absorption lines in stars is much more complicated than simple pressure broadening to distinguish luminosity classes. Pressure broadening is most noticeable in separating B through early F spectral type stars of differing luminosity class like supergiants (I) from giants (III) from main sequence dwarfs (V) from white dwarfs (WD). WD=VII, but VII is seldom used. I had naively thought that pressure broadening could be applied uniformly

across spectral types (O, B, A, F, G, K, M, L, S) to differentiate luminosity class, to separate supergiants from giants from main sequence dwarfs from white dwarfs. However, in the cooler stars (G, K, M), line ratios are more useful for determining luminosity class than pressure broadening is.

I think everyone in attendance learned something. If you want to learn more, click on the links and look at Nancy Grace Roman's PowerPoint slides now on the Internet here. If you teach astronomy as I do, you may want to use some of Nancy's slides in your classes. I do.

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## Hyperlinks:

### color

[http://en.wikipedia.org/wiki/color#Physics\\_of\\_color](http://en.wikipedia.org/wiki/color#Physics_of_color)

### Dr. Nancy Grace Roman

[http://en.wikipedia.org/wiki/Nancy\\_Roman](http://en.wikipedia.org/wiki/Nancy_Roman)

### Dr. Roman

<http://www.montgomerycollege.edu/Departments/planet/Nancy/nr.html>

### here

<http://capitalastronomers.org/NancyGraceRoman/HRDiagram2.ppt>

### Hertzsprung-Russell Diagram

[http://en.wikipedia.org/wiki/Hertzsprung-Russell\\_diagram](http://en.wikipedia.org/wiki/Hertzsprung-Russell_diagram)

### metallicity

<http://en.wikipedia.org/wiki/Metallicity>

### resume

<http://www.montgomerycollege.edu/Departments/planet/Nancy/Nancy.htm>

### simple pressure broadening

[http://en.wikipedia.org/wiki/Spectral\\_line#Spectral\\_line\\_broadening\\_and\\_shift](http://en.wikipedia.org/wiki/Spectral_line#Spectral_line_broadening_and_shift)

### spectral lines

[http://en.wikipedia.org/wiki/Spectral\\_line](http://en.wikipedia.org/wiki/Spectral_line)

### spectral type

[http://en.wikipedia.org/wiki/Spectral\\_type](http://en.wikipedia.org/wiki/Spectral_type)

### temperature

<http://en.wikipedia.org/wiki/temperature>

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## Open House at Hopewell Observatory: Saturday, October 6 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 18:46, astronomical twilight ends at 19:44, and the Moon rises at 03:40, phase angle 135 deg., 0.15 illuminated. 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 the 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 (Rt. 601). (6) Go one mile and bear right onto Bull Run Mountain Rd. (Rt. 629). (7) Go 0.9 miles on Rt. 629 to narrow paved road at right with an orange pipe gate (directly across from an entrance

gate with stone facing). (8) Turn right through pipe gates, go 0.3 miles 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.

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## In the News Reported by Dr. Nancy Grace Roman

### Hobbits in Space

[From Govert Schilling, Science/NOW Daily News and Sloan Digital Sky Survey press release]

Astronomers have discovered a number of hitherto unknown “hobbit galaxies” meandering near our Milky Way. Their presence

confirms predictions that the formation of large galaxies left some crumbs on the table.

The galaxies — eight in all — were detected over the past several months by an international team of astronomers as part of the Sloan Digital Sky Survey, which has

mapped about one fifth of the sky in unprecedented detail. The systems shine with the light of just a few thousand to about a hundred thousand suns, compared to a hundred billion suns for our Milky Way galaxy. They're also small, measuring a couple thousand light years across (about one

(Continued on page 4)

## In the News, continued

(Continued from page 3)

percent of the Milky Way's diameter).

A new dwarf galaxy, Leo T, in the Local Group was found as a stellar overdensity in the Sloan Digital Sky Survey. The color-magnitude diagram of Leo T shows two well-defined features which are interpreted as a red-giant branch and a sequence of young, massive stars. As judged from fits to the color-magnitude diagram, it lies at a distance of about 420

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A new dwarf  
galaxy, Leo T, in the  
Local Group was  
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Survey.

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kpc and has an intermediate-age stellar population with a metallicity of  $[Fe/H] = -1.6$ , together with a young population of blue stars of age of 200 Myr. There is a compact cloud of neutral hydrogen with mass roughly  $10^5$  solar masses and radial velocity 35 km/s coincident with the object visible in the HIPASS channel maps. Leo T is the smallest, lowest luminosity galaxy found to date with recent star-formation. It appears to be a transition object similar to, but much lower luminosity than, the Phoenix dwarf. Why star formation is still possible in Leo T, while the seven other hobbit galaxies are dead, is completely unclear. Another curiosity is Leo's lack of association with a major galaxy: it's 1.4 million light years away — too far to be gravitationally bound to our Milky Way galaxy.

Computer simulations predict at least a hundred small satellites surrounding a big system like the Milky Way but so far, only twelve satellite galaxies have been found, all of them substantially larger and brighter than the new population of hobbits. Future sky surveys will probably show up many more of these inconspicuous systems.

## NCA Treasurer's Report

July 1, 2006 to June 30, 2007

<u>INCOME</u>	
Dues	(125 members) \$ 1502.00
Gifts	865.00
Interest	464.95
<i>Sky &amp; Telescope</i>	1815.00
Telescope-making Classes	165.00
TOTAL INCOME	\$ 4811.95
<u>EXPENSES</u>	
<i>Star Dust</i>	\$ 2256.40
<i>Sky &amp; Telescope</i>	1845.20
Speakers' Dinners	339.80
Liability Insurance	320.00
Administration	240.36
Astronomical League	610.00
IDA	\$ 100.00
TOTAL EXPENSES	\$ 5711.76
BALANCE - July 1, 2006	\$ 12065.79
NET CHANGE	-899.81
BALANCE - June 30, 2007	\$ 11165.98

### NCA BUDGET - FISCAL 2007

<u>INCOME</u>	
Dues	\$ 1250.00
Gifts	900.00
Interest	450.00
TOTAL INCOME	\$ 2600.00
<u>EXPENSES</u>	
<i>Star Dust</i>	\$ 2300.00
Speakers Dinners	450.00
Liability Insurance	320.00
Administration	250.00
Astronomical League	(130 members) 660.00
IDA	100.00
TOTAL EXPENSES	\$ 4080.00
NET CHANGE	-1480.00
BALANCE - July 1, 2007	\$ 11165.00
NET CHANGE	-1480.00
BALANCE - June 30, 2008	\$ 9685.00

*Michael L. Brabanski, Secretary-Treasurer*

# Mid-Atlantic Occultations and Expeditions to Mid-October

by Dr. David Dunham

## Asteroidal Occultations

2007	Date	Day	EDT	Star	Mag	Asteroid	dmag	dur.	Ap.	s in.	Location
	Sep 7	Fri	0:07	SAO 108787	8.2	Warhol	7.3	1	2	VA, WV, KY	
	Sep 10	Mon	4:54	TYC13280122	9.8	Bilkis	5.5	2	4	nOH, nPA, NY, CT	
	Sep 29	Sat	22:08	TYC58240469	10.3	Inanda	3.3	2	4	neNC, swVA, sWV	
	Oct 1	Mon	5:43	SAO 117276	8.4	Froeschle	9.1	1	2	nNJ, sNY, sON	
	Oct 7	Sun	3:46	TYC00320866	10.3	Prymno	2.5	5	4	seVA, wN.Car.	
	Oct 10	Wed	22:28	2UC39246328	11.8	Ingeborg	0.5	2	8	wPA, WV, VA, eNC	
	Oct 11	Thu	23:41	TYC00430062	11.3	Kordula	2.4	7	7	seNC, seSC	

## Lunar Grazing Occultations

DATE	Day	EDT	Star	Mag	% alt	CA	Location
Sep 8	Sat	0:19	SAO 80439	8.2	10- 7	6N	Deerwood, Columbia, & BaltimorMD
Sep 22	Sat	21:18	ZC 3046	7.1	81+ 30	11S	Doswell, VA; Newmarket, MD
Oct 4	Thu	6:32	kappa Gem	3.6	40- 65	5S	Pittsburgh & Duncanon, PA Sun-8
Oct 5	Fri	3:26	SAO 80262	8.1	30- 20	3N	La Plata, MD; Charlottesville, VA
Oct 17	Wed	19:58	ZC 2702	6.8	36+ 17	14S	Bethesda, Columbia, Towson, MD

## Total Lunar Occultations

DATE	Day	EDT	Ph Star	Mag	% alt	CA	Sp.	Notes
Sep 7	Fri	3:11	R SAO 79739	7.1	17- 7	84S	F0	Azimuth 65 deg.
Sep 8	Sat	4:13	R SAO 80426	7.7	10- 6	28S	K0	Azimuth 69 deg.
Sep 8	Sat	4:23	R SAO 80439	8.2	10- 8	14N	K2	Az 70; Graze in MD
Sep 14	Fri	20:16	D 83 Vir	5.6	11+ 1	84N	G1	ZC 1967; Az 248 deg.
Sep 15	Sat	20:25	D ZC 2076	7.1	17+ 4	83N	K0	Azimuth 239 deg.
Sep 16	Sun	19:56	D SAO 183357	8.2	25+ 12	42N	K1	Az 224; Sun alt. -9
Sep 16	Sun	20:19	D ZC 2188	7.5	25+ 9	38N	A2	Az228;mg2 8.6 2", PA 163
Sep 16	Sun	20:41	D SAO 183377	7.4	25+ 6	32N	F2	Az232;mg2 8.2 .6", PA263
Sep 17	Mon	20:51	D ZC 2320	7.0	34+ 9	63N	B9	Azimuth 223 deg.
Sep 18	Tue	20:36	D ZC 2453	6.6	43+ 16	14N	K1	
Sep 18	Tue	21:04	D SAO 185017	7.6	43+ 13	82S	B9	Azimuth 215 deg.
Sep 22	Sat	21:11	D ZC 3046	7.1	82+ 29	20S	F5	Graze, VA, s&e MD, NJ
Sep 23	Sun	20:25	D ZC 3182	7.5	90+ 27	70S	A2	
Sep 24	Mon	22:26	D ZC 3325	6.9	96+ 39	40S	G0	Maybe very close dbl
Sep 25	Tue	0:53	D ZC 3333	6.4	96+ 40	52N	A5	mag2 7.9 2.7", PA 307
Sep 29	Sat	6:29	R 26 Arietis	6.1	90- 43	32N	A9	ZC 370; Maybe close dbl
Sep 29	Sat	22:54	R SAO 75845	7.6	84- 26	73N	A3	
Oct 2	Tue	1:30	R SAO 77224	7.4	63- 34	77S	F8	Maybe close double
Oct 2	Tue	3:02	R SAO 77268	8.2	62- 52	72N	B8	Oct.2-4 events in
Oct 2	Tue	4:00	R SAO 77314	8.2	62- 62	63S	B8	Milky Way, Gemini
Oct 3	Wed	1:15	R SAO 78501	7.8	52- 20	41S	K0	
Oct 3	Wed	2:28	R ZC 1013	7.0	51- 34	89S	G0	mag2 8.9 sep .7", PA 290
Oct 3	Wed	4:56	R ZC 1028	7.5	50- 61	41S	G8	
Oct 3	Wed	6:07	R SAO 78685	8.0	50- 73	24N	B9	
Oct 4	Thu	1:58	R SAO 79521	7.4	40- 16	75S	G2	Spectroscopic binary
Oct 4	Thu	4:53	R SAO 79610	7.2	39- 49	67N	F8	
Oct 6	Sat	4:07	R ZC 1395	6.3	21- 16	86S	G9	
Oct 6	Sat	4:24	R SAO 98568	8.0	20- 20	48N	M	
Oct 8	Mon	6:04	R SAO 118619	8.3	7- 15	86N	K5	Azimuth 96 deg.

More information is at <http://iota.jhuapl.edu/exped.htm> .  
David Dunham, dunham@starpower.net, phone 301-474-4722

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

## The NCA Meeting

NCA meetings are now held at 7:30 p.m. at the University of Maryland Observatory, in College Park. The observatory is located on Metzertott Road between Adelphi Road and University Blvd. in College Park. From the beltway (I-495):

- if on the Inner Loop, take Exit 28B toward Takoma Park, which puts you on New Hampshire Ave. (MD-650) south, turn left at the second light onto Adelphi Road, two more lights, turn left onto Metzertott Road, and proceed 0.6 miles to the observatory entrance (on your right);
- if on the Outer Loop, take the College Park/Route 1 exit. Head south on Route 1 for about a mile until you see a sign for 193 West. Get on 193 West. The first traffic light is at Metzertott Road. Take a right onto Metzertott Rd., continue past a traffic light at St. Andrews Place. The observatory entrance is about a quarter of a mile on the left side of the road after that. The observatory entrance is slightly hidden, so slow down to turn left as soon as you pass a large "System Administration" sign. The observatory entrance is almost directly across the street from the UM System Administration sign (3300 Metzertott Rd.).

## The Dinner before the Meeting

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 at the second traffic light onto Adelphi Rd., 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 Road. 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 Road. Once on Metzertott Rd., continue past a traffic light at St. Andrews Place. The observatory entrance is about a quarter of a mile on the left side of the road after that. The



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 e-mail at rigel1@starpower.net.)

observatory entrance is slightly hidden, so slow down to turn left as soon as you pass a large "System Administration" sign. The observatory entrance is almost directly across the street from the UM System Administration Sign (3300 Metzertott Rd.).

# 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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## National Capital Astronomers, Inc.

<http://capitalastronomers.org>

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

### Yes, I'd like to join NATIONAL CAPITAL ASTRONOMERS!

Name: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_

Street address: \_\_\_\_\_

City/State/ZIP: \_\_\_\_\_

Telephone: \_\_\_\_-\_\_\_\_-\_\_\_\_ E-mail: \_\_\_\_\_

Other family members who should receive a membership card: \_\_\_\_\_

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

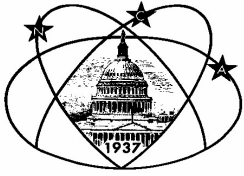
Standard Individual or Family Membership: ..... \$10 .....with *Sky and Telescope*....\$43

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

Contribution amount: \_\_\_\_\_

Please mail this form with your check payable to National Capital Astronomers, to:

Mr. Michael L. Brabanski, NCA Treasurer; 10610 Bucknell Drive, Silver Spring, MD 20902-4254



## **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**

***NCA Will  
Meet on  
September 8!***

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***Inside this issue:***

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<b>September Speaker</b>	<b>1</b>
<b>Review of June Speaker's Talk</b>	<b>1</b>
<b>Election Results</b>	<b>1</b>
<b>NCA Events This Month</b>	<b>2</b>
<b>Exploring the Sky</b>	<b>2</b>
<b>Open House at Hopewell</b>	<b>3</b>
<b>In the News</b>	<b>3</b>
<b>Treasurer's Report</b>	<b>4</b>
<b>Occultations and Expeditions</b>	<b>5</b>
<b>Getting to the Meeting</b>	<b>6</b>
<b>About NCA</b>	<b>7</b>
<b>Membership Application</b>	<b>7</b>
<b>NCA Officers et al.</b>	<b>7</b>