Star Dust

National Capital Astronomers, Inc. **http://capitalastronomers.org**

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March Speaker: Dr. Randy Kimble , "Robotic Servicing of the Hubble Space Telescope?"

Submitted by Jeff Guerber

Dr. Randy Kimble, Project Scientist for the HST Development Project, NASA-Goddard, will present the featured talk at the March 12 meeting of the National Capital Astronomers. The meeting will be held at 7:30 P.M. in the University of Maryland Astronomy Observatory on Metzerott Road in College Park, MD.

Abstract

The Hubble Space Telescope continues to provide spectacular astronomical data and results for the astronomical community and the general public. However, unless the telescope is serviced, its observing lifetime is expected to end after the next few years. Plans for carrying out another in the series of highly successful space shuttle-based servicing missions were disrupted by the loss of the shuttle Columbia in February 2003. Instead, NASA has been studying an ambitious robotic servicing mission to HST, intended to provide a safe de-orbit capability for the telescope, to extend the

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Lesson on Telescope Set Up & Astrophotography after Talk

In response to the NCA Membership Interest Survey, former NCA president Benson J. Simon will provide, immediately following the March NCA lecture, an introductory lesson on quickly and efficiently setting up popular Meade/Celestron-type reflector telescopes and precisely aligning them for star-finding and astrophotography. Basic astrophotography, with and without the telescope, will also be briefly discussed. Exact content will depend on the interests of attendees. Benson will conduct a follow-up session after the April lecture covering points the March attendees express the most interest in. Members do NOT need to bring scopes to the lesson.

Review of talk by Dr. Jonathan Gardner

Reviewed by Jay H. Miller

The speaker at the February 2005 NCA meeting was Dr. Jonathan Gardner of NASA/Goddard Space Flight Center. The title of the talk was "To the Moon, Mars and Beyond for Science and Exploration", and was based on the *Vision for Space Exploration* (VSE) announced by the president last year. The first mission in the program will be to the Hubble Space Telescope. It will not be for servicing, but to attach a booster so that the telescope can be safely deorbited to splash down in the Pacific Ocean. The robotic servicing mission has been deemed to be technically too challenging to be done in time.

Dr. Gardner began his talk with a music

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Science Fairs

Jay H. Miller

March is the time for the local science fairs and we'll need judges for the award NCA gives for the best astronomy related projects. I'm sure you have enough knowledge to ask questions and find out if the kids know what they're talking about. Not only that, there frequently aren't that many astronomy projects and it's pretty easy to

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NCA March Meeting to be Held on March 12

The March meeting of the National Capital Astronomers will be held on Saturday, March 12 at 7:30 P.M. Prior to the meeting there will a dinner with NCA members at the Garden Restaurant in the UMD University College Inn and Conference Center. Please see Page 2 for more information about dinner reservations. See Page 8 for directions on getting to the meeting or the dinner. Page 8 also contains information on obtaining a ride from Metro to the dinner or meeting. In addition, there is a map on Page 8 that can be a help in getting to the meeting by car. All NCA meeting and dinners are open to NCA members and the public as well. Hope to see you there!

NCA Events This Month

The Public is Welcome!

NCA Home Page: http://capitalastronomers.orgt

Fridays, March 4, 11, 18, and 25, 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 gfbrandenburg @yahoo.com.

Saturdays March 5, 19, and 26. Observing with NCA's 14-inch telescope in Chevy Chase, MD. 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 301-907-9449 or email him at mcnealmi@verizon.net to let him know you are coming.

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 after the observatory open house talks if the sky is clear.

Saturday, March 12 at 7:30 P.M. NCA meeting at the University of Maryland Astronomy Observatory on Metzerott Road in College Park, MD. There is observing through the observatory's telescopes at the end of the meeting if the sky is clear.

Saturday, March 12 at 5:30 P.M., preceding the meeting, dinner with NCA members at the Garden Restaurant in the UMD University College Inn and Conference Center. See map and directions on Page 6.

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.

Upcoming NCA Meetings
2005: March 12, April 2, May 7, and June 4

March Speaker, *continued*

(Continued from page 1)
telescope's observing lifetime (by installing new batteries and gyros), and to augment its scientific capabilities with two powerful new instruments, Wide Field Camera 3 and the Cosmic Origins Spectrograph. This talk will cover the status and plans for the robotic servicing mission and the scientific potential of the new instruments.

Bio
Dr. Kimble did his undergraduate work at MIT and received his Ph. D. at the University of California, Berkeley (1983), both degrees in physics. From 1983-1990, he was on the research staff at the Johns Hopkins University, where he worked on the Hopkins Ultraviolet Telescope, which flew as a shuttle-attached payload in 1990 and 1995. In 1990, he joined the Laboratory for Astronomy and Solar Physics at Goddard Space Flight Center, where he has worked primarily on HST ever since. He served as Instrument Scientist for the Space Telescope Imaging Spectrograph during most of its development and through its observing lifetime after its installation onto HST in Servicing Mission 2 in 1997. He was also a member of the Advanced Camera for Surveys team. In 2002, he became HST Development Project Scientist; in that capacity he also serves as Instrument Scientist for Wide Field Camera 3. His primary interests are in astronomical instrumentation, detectors in particular.

Eclipse Trip to Egypt

Submitted by Jeff Norman

A few days ago, I received a phone call from Sue Bassett who said that the travel agent who planned NCA's eclipse trip to Turkey has found a good hotel in Egypt where we can watch the March 29, 2006 total solar eclipse. If you have any questions, comments or suggestions, please either call me at (202)966-0739 or email me at jeffrey.norman@att.net.

Science Fairs

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select the best. The fairs I know about are Montgomery County's on March 12 at the Montgomery County Fair Grounds and D.C.'s at the new McKinley Tech High School on March 19. Both are from 9-12. Steve Robinson has volunteered to do the Montgomery County, but I like to have more than one person, if possible. Other fairs are Prince George's County and there are several in Virginia. If you can help, please let me know.

Jay

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 hard-copy 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 April Star Dust is March 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.

To the Moon, Mars and Beyond, *continued*

(Continued from page 1)

video on the Hubble. The interesting music was supplied by an *a cappella* group called the Chromatics (www.thechromatics.com), whose repertoire is based on astronomical themes. He then went into VSE whose purpose is " . . . to advance U.S. scientific, security and economic interests through a robust space exploration program. . . . guided by compelling questions of scientific and societal importance, including the origin of our solar system and the search for life beyond Earth."

He said we explore and do science for the same basic reasons: discovery, financial gain, military advantage, inspiration and the advancement of civilization. Exploration has included such people as Magellan, Cook, and Lewis and Clark.

Dr. Gardner then began to talk about the *Vision for Space Exploration* which is divided into four main themes:

1) robotic and telescopic observation of the Moon setting up the possibility of a manned trip to the Moon in the next decade,
2) continuing with the program of Mars Rovers with the possibility of a manned mission in the far future,
3) continued exploration ofthe outer Solar System and
4) extra-solar planet search.

Lunar exploration will study the Moon's composition, search for resources, and serve as a test bed and precursor for future human missions to Mars and beyond. Dr. Gardner discussed the Apollo missions and also the formation of the Moon. The Apollo mission's selenology (as opposed to geology, the study of the Earth) showed that the Moon has very little iron. This and the question of angular momentum can only be answered by a collision between the Earth and a Mars-sized body forming the Moon from the outer mantle of the still-molten Earth. As for future missions, a 2008 Lunar Reconnaissance Orbiter will map lunar resources, a 2009 Robotic Lander will study the capabilities for sustainable exploration. Later robotic landers, at up to one per year, will set up a robotic network, study reusable planetary landing and launch systems, pre-position propellants and study resource extraction. Human return to the Moon will demonstrate resource utilization, surface power, habitation and life support, and planetary mobility. Resource extraction will include the search for water near the south pole of the Moon.

Present Mars studies will continue. By the end of this decade we will have sent three Rovers (including Spirit and Opportunity), a lander, and two orbiters, which will study the capabilities of advanced robotic missions to return samples to Earth or drill into the surface. Previous missions go back to 1976. While they did not find the hoped for proof of life, they did show that the atmosphere was thick enough and the surface was warm enough in the past for liquid water to have existed. Gullies and "blueberries" of hematite have been seen. Sulphates and other minerals also point to the existence of water for long periods of time in the past. One cause for concern is the radiation level, which while having an average of only 2-3 times that of the ISS, does peak to higher levels. The next mission to Mars will be the Mars Reconnaissance Orbiter in August, which will look for subsurface water and search for future landing sites, and will contain an "interplanetary internet", which will allow us to send it e-mail, and an optical navigation camera to guide future missions.

This will be followed by Phoenix in 2007, which will look at the north polar cap that may melt every 50,000 years or so and may indicate a habitable zone at the ice-soil boundary. The Phoenix will have a robotic arm that will allow the addition of Mars soil to Earth water that will be carried inside the lander to look again for potential life. None of the water will leave the vehicle and contaminate the surface. Two years after this, the Mars Science Laboratory will have a nuclear-powered minivan-sized smart rover with hazard avoidance capabilities. Over the next decade, missions will have more rovers, telecommunications capabilities, a possible sample return in 2014 and robotic testbeds for human missions.

Human missions beyond the Moon could include circumnavigating Mars, visiting a near-Earth asteroid, or erecting or upgrading a deep space telescope. These would test the systems necessary to go to Mars before actually going there.

Study of the outer Solar System will depend on results from present missions and include robotic probes to study the habitable environments of the moons in detail with submarines on Europa and balloons on Titan and may not occur until 2020.

Exploration of Jupiter and beyond began with Voyagers 1 and 2, which are now poised to leave the heliosphere and enter outer space. Galileo began its journey to Jupiter in 1989. Among other things, it has found that Europa has an ocean covered with a thin (less than four kilometer) crust of ice over a possibly salt water ocean. It's probably the most likely place outside of Earth and Mars to harbor life, although two of the other Galilean satellites also have water oceans.

Cassini began its mission in 1997 and is ongoing. Cassini has 12 instruments and the Huygens probe that landed on Titan contained six. These instruments study the atmosphere, winds, clouds and rings of Saturn and Titan's atmosphere and surface, along with characteristics of the other moons. It's interesting that pictures of Saturn's clouds show it to look like Jupiter. Future missions to this area of the Solar System include a 2012 Jupiter Icy Moons Orbiter which will have a nuclear-electric ion propulsion system, study three of the moons, and look for life on Europa.

Research is not confined to studying the Solar System. The Origins program will use a number of techniques to look for extrasolar planets. The Spitzer and Webb telescopes, along with the Kepler mission, which will look for planetary eclipses of their stars, and the Space Interferometry mission, which will look for the gravitational effects of the planets on their stars, will be used to assist in the design of an advanced space telescope and the Terrestrial Planet Finder (TPF) which will be launched in the next decade. The TPF is being split into two parts, a visible light mission and an infrared mission.

In the question and answer period, Dr. Gardner discussed the Hubble and its successor. He explained that the six-meter Webb telescope will operate in the infrared to help it look for the first galaxies. The reason the original Hubble mirror did not undergo a full end-to-end optical test was that it would have cost 100 million dollars and they knew any problems could be corrected because it was built to be serviceable. The JWST will undergo this test

(Continued on page 5)

Mid-Atlantic Occultations and Expeditions

by David Dunham

Asteroidal Occultations

Date	Day	EST	Star	Mag	Asteroid	dur. dmag	Ap. s	in.	Location
Mar 10	Thu	3:57	SAO 207275	8.1	Ianthe	5.3	8	2	sw NC, sw SC
Mar 15	Tue	19:40	PPM 178165	8.9	Selinur	4.8	4	3	n. New England
Mar 16	Wed	19:01	2UC35730627	11.4	Vundtia	3.1	11	7	s.Penn.,n.NJ
Mar 20	Sun	5:05	TYC14370499	12.3	Ninina	1.7	8	10	PA,MD,DC,DE,VA
Mar 21	Mon	22:34	TYC23771158	11.5	2002 XV93	9.9	21	7	TNO; Americas?
Mar 24	Thu	22:57	TYC01481998	11.7	Lilliana	3.6	5	8	w.N.Car.;s.VA
Mar 27	Sun	20:33	TYC13301721	10.0	Campania	4.0	6	4	OH,PA,NJ,NY-LI
Mar 30	Wed	20:10	SAO 95218	8.1	Beate	7.7	2	2	WV,nMD,nDE,sNJ

Grazing Occultations

DATE	Day	EST	Star	Mag	% alt	CA	Location
Mar 4	Fri	4:40	SAO 185391	9.0	43- 10	14S	Crofton & Mayo, MD
Mar 14	Mon	21:50	tau Ari	5.3	24+ 14	4N	Sunbury&Kutztn,PA;Trenton,NJ
Mar 14	Mon	22:23	63 Arietis	5.2	24+ 9	-5S	Ladysmith & Johnsontown, VA
Mar 17	Thu	22:06	SAO 77875	8.9	52+ 44	8N	Erie,Hershey,Springfield,PA

Total Lunar Occultations

DATE	Day	EST	Ph	Star	Mag	% alt	CA	Sp.	Notes
Mar 2	Wed	3:13	R	X39461	7.5	65- 25	27N	K0	9.2mg2 sep.10",PA192dg
Mar 2	Wed	3:21	R	ZC 2204	7.7	65- 26	64N	K0	/sigma Sco=ZC 2349
Mar 3	Thu	2:21	R	sigma Sco	2.9	54- 10	41N	B1	5.1mg2 sep..4",PA249dg
Mar 3	Thu	6:05	D	Antares =	1.1	53- 25	-82N	M1	ZC 2366; Sun alt. -7
Mar 3	Thu	7:25	R	alpha Sco	1.1	53- 21	69N	M1	Sun alt. +8
Mar 4	Fri	2:48	R	43 Oph	5.3	43- 4	63N	K4	ZC 2505; Az. 131 deg.
Mar 4	Fri	4:12	R	SAO 185394	7.8	42- 14	71S	G8	Azimuth 146 deg.
Mar 4	Fri	4:17	R	SAO 185400	7.2	42- 14	80N	F5	Azimuth 147 deg.
Mar 5	Sat	3:51	R	ZC 2681	7.8	31- 3	44N	A1	Az.131; close double
Mar 5	Sat	4:38	R	ZC 2688	7.0	31- 9	56S	G6	Az. 140 deg.
Mar 6	Sun	6:08	R	SAO 188429	7.7	20- 13	70S	K4	Azimuth 143 deg.
Mar 14	Mon	21:38	D	tau Ari	5.3	24+ 17	30N	B5	mg2 8.1 1",PA48;grazePA
Mar 14	Mon	22:12	D	63 Ari	5.2	24+ 10	16S	K3	mg2 8.3.5",291;graze VA
Mar 14	Mon	22:13	D	SAO 75906	7.5	24+ 10	76S	G5	mg2 8.7 1",PA106;Az289d
Mar 16	Wed	19:53	D	SAO 76945	7.5	42+ 58	33S	A2	
Mar 16	Wed	21:01	D	SAO 76965	7.6	43+ 46	82N	G	probable close double
Mar 17	Thu	20:00	D	SAO 77818	6.7	52+ 67	75N	K5	
Mar 19	Sat	0:24	D	ZC 1067	7.1	63+ 27	12S	K2	possible close double
Mar 19	Sat	21:20	D	ZC 1181	7.0	71+ 70	49N	G8	mg2 10.1 ".4, PA 208deg
Mar 20	Sun	19:21	D	ZC 1290	6.9	79+ 65	53N	F8	
Mar 30	Wed	0:34	R	ZC 2295	7.2	79- 13	54S	A0	mg2 9.4 4.5", PA 346deg
Mar 30	Wed	0:49	R	ZC 2299	6.2	79- 15	39N	K2	
Apr 1	Fri	2:37	R	ZC 2631	6.5	58- 10	17N	B9	

David Dunham, e-mail dunham@starpower.net, more info. http://iota.jhuapl.edu
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GSFC Cosmology Lectures

Jeff Guerber

The NASA announcement that follows is included in *Star Dust* at the suggestion of Jeff Guerber. It was obtained from http://university.gsfc.nasa.gov/eyesonthesky

NASA's Goddard Space Flight Center invites you to a special series of lectures and discussions: "Eyes on the Sky: Peeking into the Universe's Past, Fathoming the Future." In celebration of World Year of Physics 2005, the centennial of Einstein's miraculous year of discoveries, this event will feature some of the world's leading scientists and showcase NASA's cutting-edge scientific endeavors. Designed to bring the excitement of science to the incurably curious, this series aims to commence an enduring dialog between experts and novices, to ponder the latest puzzles and marvel together as the universe shyly reveals its mystery and charm.

Time and Location
Colloquia will be held Feb. 10-May 12 at 7 p.m. in the Goddard Visitor Center Auditorium. Refreshments and informal interaction with speakers will follow each lecture. Appropriate for high school/college level and above. Free parking is available at the Visitor Center.

March Lectures
March 10: Al Kogut, GSFC, "The Great Time Machine in the Sky"
March 24: John Wood, GSFC, "The Dis covery of the Acceleration of the Expan sion of the Universe"

Reservations
Admission is free but on-line reservations are requested to help us plan for the event. Please help us avoid chaos! RSVP at http://university.gsfc.nasa.gov/eyesonthesky/rsvp.jsp.

Getting there by Metro
If you are riding the metro, please take the green line to College Park Metro Station. Free shuttle bus service to NASA Goddard Visitor Center will be provided on the evening of the lectures. To help us arrange for appropriate size shuttle buses, on the RSVP page please indicate that you plan to use the service.
Shuttle Bus Schedule: Please visit this site or call us at the numbers listed below for up-to-date shuttle bus schedule before making your trip. We don't have the schedule as we go to press, but, to give you an idea, for Thursday, Feb 24 the bus was to depart College Park Metro at 6:15 p.m. The bus was to be available for boarding starting 6:00 p.m. It was to depart NASA Goddard Visitor Center: at 8:20 p.m. and again at 9:10 p.m.. The two departure times are to accommodate people who want to interact with the speaker. Once at the College Park Metro Station, from the Calvert Road side of the station, hop on the NEW WORLD TOURS bus. The trip to the Visitor Center takes 15-20 minutes.

Contact Information
For questions, contact us by phone at 301-286-2893/ 9690 or via e-mail at lrana@pop600.gsfc.nasa.gov.

To the Moon, Mars and Beyond, *continued*

(Continued from page 3)
because its orbit will be one million miles from Earth at the Lagrange 2 point and it isn't able to be serviced. He also pointed out that computers are vulnerable to the same radiation problems that humans are subject to. They have to be "space hardened" and they can not always contain the latest chip versions.

Ongoing and future plans for continuing the study of the Sun and Earth were not covered in the talk. To answer the question "why do any of this when there are so many problems on Earth?", he quoted Dr. Robert R. Wilson, director of the Fermilab, as to what relevance it had to national security, "It has nothing to do directly with defending our country, except to make it worth defending."

Meteor Showers

Full Moon: March 25

Major Activity: None

Minor Activity

Radiant	Duration	Maximum
Eta Draconids	March 22-April 8	Mar. 29-31
Beta Leonids	February 14-April 25	Mar. 19-21
Rho Leonids	February 13-March 13	Mar. 1-4
Leonids-Ursids	March 18-April 7	Mar. 10/11
Delta Mensids	March 14-21	Mar. 18/19
Gamma Normids	March 11-21	Mar. 16/17
Eta Virginids	February 24-March 27	Mar. 18/19
Pi Virginids	February 13-April 8	Mar. 3-9
Theta Virginids	March 10-April 21	Mar. 20/21

Daylight Activity

Radiant	Duration	Maximum
March Aquarids	February ??-April ??	Mar. 15-18

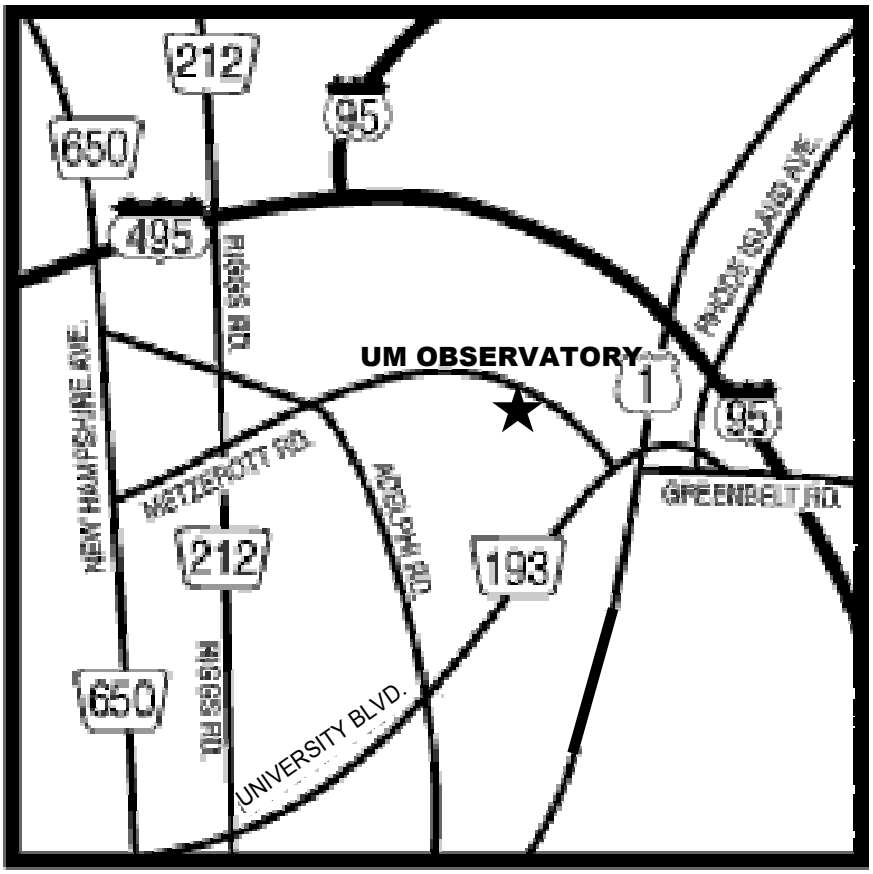
Source:http://comets.amsmeteors.org/meteors

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.



Getting to the NCA Meeting

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 st88@ioip.com, 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.)

Star Dust is published ten times yearly, September through June, by the National Capital Astronomers, Inc. (NCA).
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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 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: _____ ZIP Code:_____
Telephone: ____-____-_____ E-mail: _____
Would you prefer to get *Star Dust* by e-mail? ____
Present or Former Occupation (or, If Student, Field of Study): _____
Academic Degrees: _____ Field(s) of Specialization: _____
Employer or Educational Institution: _____

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: ……..… $15 ……..with *Sky and Telescope*....$48
Standard Individual or Family Membership: …….. $27 ……...…..with *Sky and Telescope*....$60

NCA offers two premium membership categories for those wishing to make extra contributions to the organization:
Contributing Member: $60 Sustaining Member: $125

Please mail this form with your check payable to National Capital Astronomers, to:
Mr. Jeffrey Norman, NCA Treasurer; 5410 Connecticut Avenue, NW #717; Washington, D.C. 20015

National Capital Astronomers, Inc.
If undeliverable, return to
NCA c/o Nancy Roman
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FIRST CLASS
DATED MATERIAL

Inside this issue: