Star Dust

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Comet Hale-Bob, Other Comets of Recent Vintage, and a Bit of Hubble Space Telescope Results

by Andrew Seacord, II

The 1997 February meeting of the National Capital Astronomers will be held Saturday, April 5, at 7:30 at the Lipsett Amphitheater in the Clinical Center (Building 10) of National Institutes of Health (NIH). Our speaker will be Dr. Malcom B. Niedner, Jr. from Goddard Space Flight Center. He has submitted this abstract of his talk.

"Due to its (apparent) large intrinsic size and the prospect of a great show, Hale-Bopp has astronomers all around the world feverishly awaiting its final increase in activity as it approaches perihelion on April 1. I will summarize what I can about what we have learned about this remarkable object, even at a time when the observational efforts are still in full swing. It is interesting to consider the current 'chapter' of cometary scrutiny in the larger picture of comets since P/Halley and P/Giacobini-Zinner: truly the last dozen years have constituted a Golden Age in cometary physics.

The Hubble Space Telescope (HST) has recently been serviced for the second time by a Shuttle Astronaut crew. I will talk briefly about what this means for the future of HST science. Briefly put, we expect HST to be more scientifically powerful than ever before with the addition of two new instruments—Infrared Camera and Multi-Object Spectrometer (NICMOS) and the Space Imaging Spectrograph (STIS)."

Dr. Malcom B. Niedner, Jr. serves as NASA's Deputy Senior Project Scientist for HST. His research specialty is cometary physics and he was deeply involved in many programs involving Hally's Comet in 1985-86. He came to the HST Project in early 1993 and contributed to the development of the First and Second Servicing Missions of HST using the Space Shuttle. He holds a Bachelor's degree in Physics from Brown University (1971), and Master's and Ph.D. degrees in Astronomy from Indiana University (1976, 1979). Dr. Niedner works in the Laboratory for Astronomy and Solar Physics, NASA Goddard Space Flight Center, Greenbelt, MD. ○

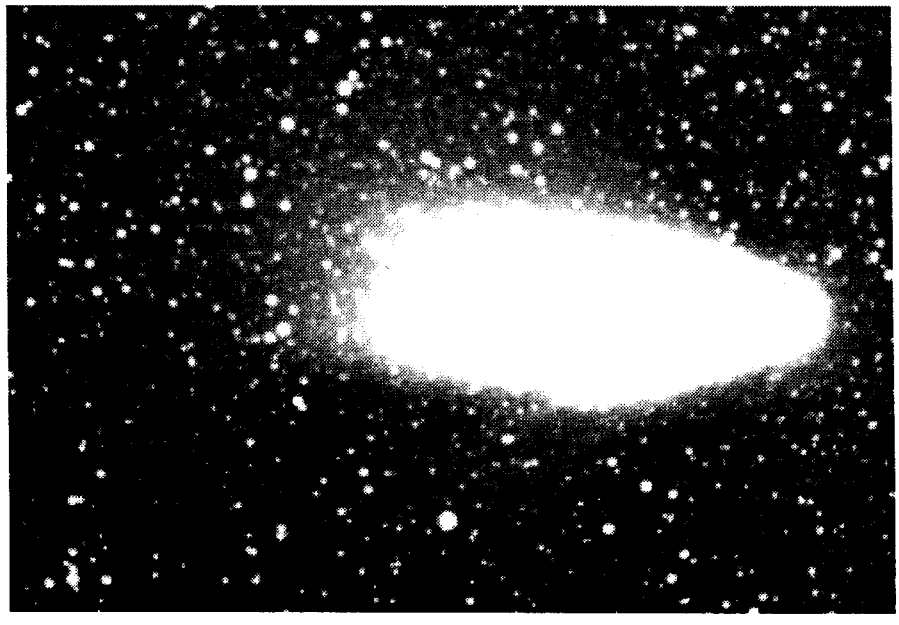


Image of Hale-Bopp taken from Hopewell Observatory by Robert N. Bolster (NCA). Field of view ≈ 4° x 8°. UT: March 7, 1997 10:12. 85-mm Nikkor lens, f/1.8, 240 s exposure with ST-8 CCD camera. The tail close to the nucleus is brighter than it appeared visually, perhaps due to the IR sensitivity of the CCD. The distant dust tail is fainter than seen visually. The ion tail, below the dust tail is also faint.

Calendar of Monthly Events

The Public is Welcome!

NCA Home Page: http://myhouse.com/NCA/home.htm

Fridays, April 4, 11, 18, and 25, 7:30 PM-Telescope making classes at American University, McKinley Hall Basement. Information: Jerry Schnall, 202/362-8872.

Fridays, April 4, 11, and 25, 9:00 PM-Open nights with NCA's Celestron–14 telescope at Ridgeview Observatory; near Alexandria, Virginia; 6007 Ridgeview Drive (off Franconia Road between Telegraph Road and Rose Hill Drive). Information: Bob Bolster, 703/960-9126.

Saturday, April 5, 5:30 PM-Dinner with the speaker and other NCA members at the Thai Place Restaurant at 4828 Cordell Avenue, Bethesda, MD. *See* map and description on back page.

Saturday, April 5, 7:30 PM-NCA meeting, will feature Dr. Malcom B. Niedner, Jr. speaking on "Comet Hale-Bopp, Other Comets of Recent Vintage, and a Bit of Hubble Space Telescope Results." For directions, *see* map and description on back page.

During questionable weather, call the IOTA Hotline (Phone: 301/474-4945) for NCA meeting status. The absence of a cancellation notice on the Hotline means the meeting will take place.

Mondays, April 7, 14, 21, and 28, 7:30 PM-Public nights at U.S. Naval Observatory (USNO), in Northwest Washington, D.C. (off Massachusetts Avenue). Includes orientation on USNO's mission, viewing of operating atomic clocks, and glimpses through the finest optical telescopes in the Washington-Baltimore region. Held regardless of cloud cover. Information: USNO Public Affairs Office, 202/762-1438. Home page: http://www.usno.navy.mil.

Tuesdays, April 8, 15, 22, and 29, 7:30 PM-Telescope making classes at Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 202/362-8872.

See page 6 for more Washington area astronomical events. Other events too numerous to list in *Star Dust* are listed in the publications *Sky & Telescope*, the *Astronomical Calendar 1996*, the *Observer's Handbook 1996*, in numerous software packages, and other links available on the NCA Home Page (*see* above for address). NCA members can purchase all these (and much more) at a discount. To join NCA, use membership application on page 7.

The Structure of the Solar Corona: A Review

by Andrew Seacord, II

For the NCA March meeting, Dr. Joe Davila, an astrophysicist with NASA Goddard's Solar Physics Branch, presented a fine lecture entitled "The Structure of the Solar Corona". Dr. Davila is the principal investigator of the Solar Extreme ultraviolet Rocket Telescope and Spectrograph (SERTS) program. The lecture was centered around the SERTS program and its results obtained to date. In addition, however, some results of spacecraft observatories, such as the Japanese spacecraft Yohkoh and the NASA/European Space Agency (ESA) Solar and Heliospheric Observatory (SOHO), were integrated into the presentation.

In order to establish a framework on which to base a discussion of SERTS, Davila reviewed some solar structure and physics, starting with the core and moving out through the radiative and convective zones of the interior and through the photosphere, chromosphere, transition zone, and, finally, the corona. The complex magnetic field, which seems to control much of what happens in the corona, is thought to originate in the convection zone, which occupies the outer 20% or so of the interior. The temperature of the photosphere, the sharply-defined "surface" of the sun has a temperature of about 5770 K whereas the coronal temperature reaches at least 3 million K.

Because of its high temperature, the solar corona is a strong emitter in the range from extreme ultraviolet (euv) through X-rays, including the euv spectra of ionized helium (He II) and multiply ionized iron (e.g. Fe XV). (Note: The Roman numeral signifies the level of ionization of an atom: He I is neutral helium with all of its (two) electrons; He II is ionized helium with one electron removed; Fe XV is ionized iron with 14 electrons removed). Photographs of the X-ray corona, taken by the Yohkoh space craft, were shown to illustrate the large-scale turbulence in the corona. The photos also showed large-scale

loops of hot gas which are linked to the extensive magnetic field there. Also, the magnetic field propels large masses of hot gas through the corona and out into interplanetary space. Some of these "coronal mass ejections", as they are called, are estimated to have masses as large as 10,000 times that of the earth. Some of them which have been ejected along the ecliptic have collided with the earth's magnetic field, causing severe magnetic storms and bright, extensive aurae. It is thought that a coronal mass ejection which occurred on 6 January may have caused the demise of the AT&T Telstar 401 communication satellite.

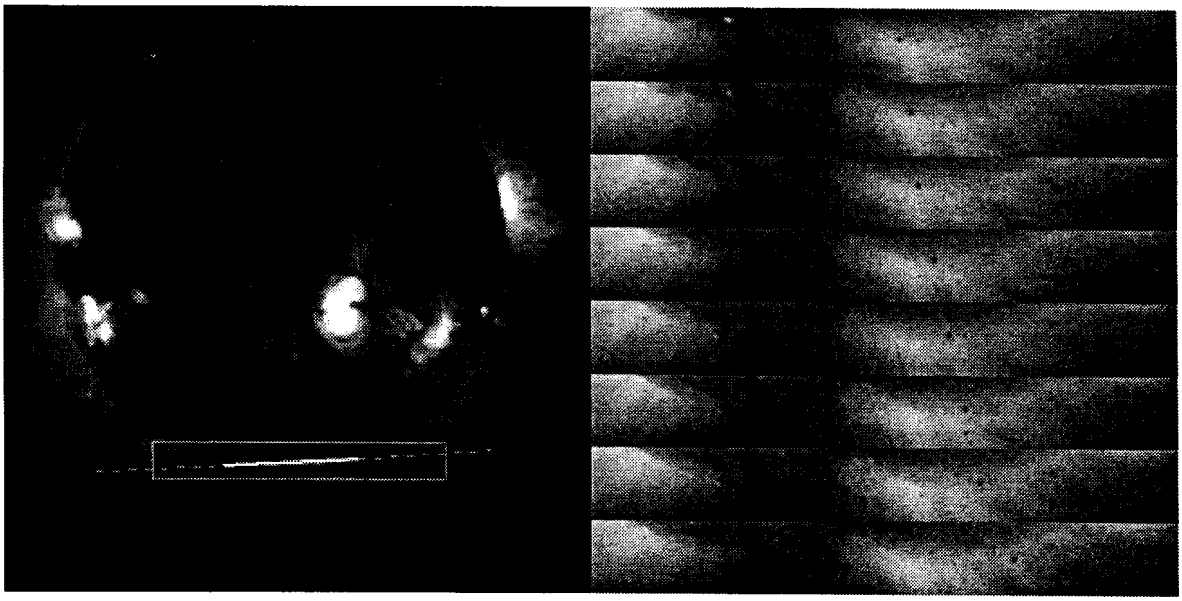
The SERTS program is based on a rocket-borne extreme ultraviolet (euv) telescope. The telescope has an aperture of 4 inches and is the payload of a two-stage Black Brandt solid propellent rocket that is launched from White Sands missile range. The telescope, itself, consists of a grazing incidence primary mirror and a hyperbolic secondary mirror. Part of the light passes through a mirrored slit to a 3,600 line-per-inch reflection grating which disperses the light so that its spectrum in the range of 30 to 350 Angstroms can be recorded. The remainder of the light is reflected from the slit to a video camera.

After launch, the system follows a traditional powered trajectory until the second stage burns out. During the unpowered coast, the payload separates from the second stage. Compressed nitrogen jets rotate the cylindrical payload until the end, originally attached to the second stage, is pointed toward the sun. A door opens and, within 20 seconds, the telescope is locked on the sun and data taking begins. Data is recorded for about seven minutes while the telescope follows the top of its parabolic trajectory. At the end of data recording, the door closes and the telescope continues its parabolic trajectory toward the ground until a parachute opens. The payload is then retrieved and the recorded spectral data is analyzed.

The spectrum of the corona in the range of 300 - 350 Angstroms has two components, a continuous thermal component and features, or lines, whose intensities rise above the continuous spectrum between them. The profile of each line is analyzed to determine its width, intensity, and position (wavelength of the center). The width of the line profile is related to the temperature and turbulence of the coronal gas. The intensity of the line (brightness at the center of the line) is determined by the temperature of the gas as well as the abundance of the ionized species emitting that line. From analysis of the SERTS spectral data, it was found that the He II line is brighter in the cooler gas at the bottom of a large coronal arc, where the temperature is from 50,000 K to 100,000 K than it is from the much hotter gas at the upper part of the loop where the temperature is about 3million K. The Fe XV line, however, was found to be brighter in the upper part of the coronal loop than it is at the bottom. Analysis also showed that the width of the He II line is narrower where the line is brighter. These observations are interpreted as being spectra generated by hot gas moving from the hotter part of the corona down the coronal loops to the transition zone beneath it.

Another result from the SERTS program is that the abundance of ionized species, such as the aluminum Al X ion and the silicon Si XI ion, changes with time. During a 1989 flight, the abundance of these two species agreed with the Standard Abundance Model. However, during the 1991 SERTS flight, observations indicated that the Al X to be over abundant and the Si XI to be under abundant by a factor of three.

Much has yet to be learned about the solar corona, in particular, the cause of its 3 million K temperature and the process, or mechanism, which causes the changes in abundance of the ionized species. The SERTS program will continue to fly the euv telescope and continue its collaboration with other programs. O



Left: A full-Sun soft X-ray image, showing the track of Mercury during the transit. The box shows the field of view of the observations in the right panel. Right: Eight snapshots during the transit. Mercury can be seen as a dark silhouette. The diameter of Mercury at the time of the transit was about ten arc s. At the left of the dark notch (a coronal hole) a flaring coronal bright point can be seen in the upper two or three frames. (http://www.space.lockheed.com/SXT/Mercury_Transit_of_Solar_Corona.html)

Images of Past Comets

1

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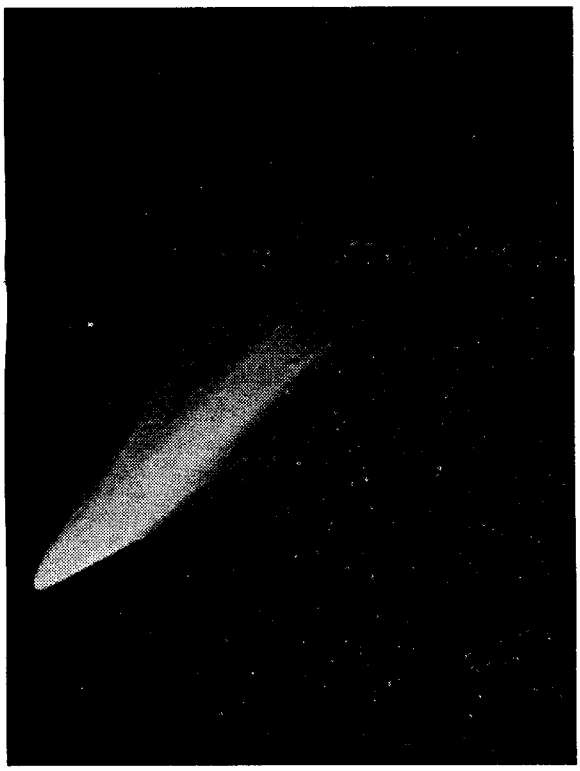

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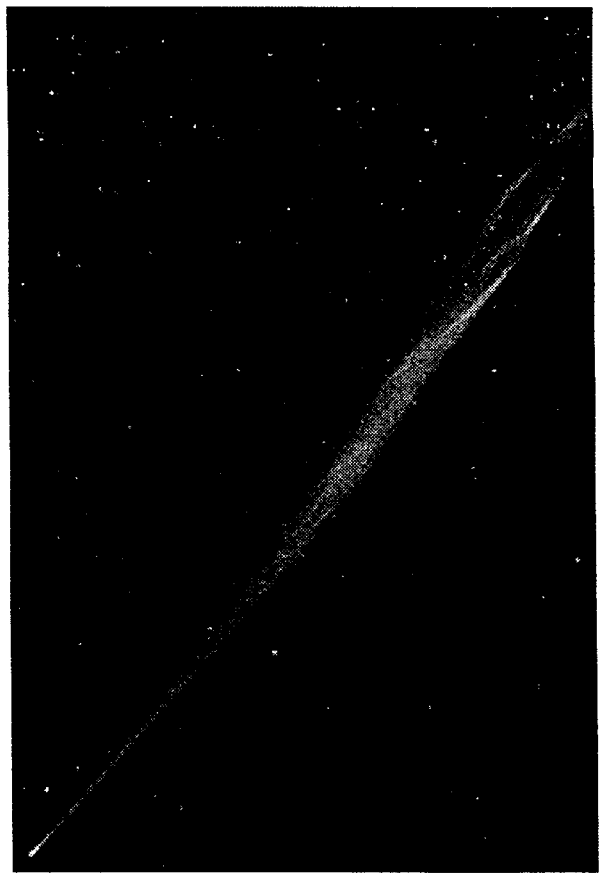

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1) Comet Kohoutek (1973)
2) Comet Mueller (1993)
3) Comet West (1975)
4) Comet Ikeya-Seki (1965)

Grazing Occultations and Asteroidal Appulses, 1997 April

by David Dunham

Grazing Occultations

Date	Day	EST	Star	Mag	%	alt	CA	Approximate Location
April 12	Sat	23:54	0970	6.5	34+	10	3N	Holyoke, MA (valuable n. Cassini gr.)
April 15	Tue	23:49	X13488	8.2	63+	38	6N	Great Falls, VA & Rosaryville, MD
April 16	Wed	21:05	098671	7.7	71+	62	6N	Fairfax, VA & Pleasant Springs, MD

Asteroidal Appulses

Date	Day	EST	Star	Mag	Asteroid	dmag	dur sec.	ap. in.	Location
April 1	Tue	2:06	204595	9.5	Anacostia	3.4	7	5	Virginia*
April 15	Tue	20:26	079765	8.8	Bamberga	3.7	14	3	Georgia
May 2	Fri	5:10	122258A	8.1	Eunike	4.4	16	2	Nova Scotia

*Also on April 1 at 4:56, 3.9-mag., phol Sgr will reappear 66 deg. from the north cusp on the dark side of the 43% sunlit waning Moon, the brightest lunar occulatoin event in April for the DC area.

Eclipse '98 in Curaçao

Don't forget, your next payment for Curaçao is coming due. Mail payments to: NCA, P.O. 2509, Laurel, MD 20709. Make checks payable to Greenbelt Travel.

Payment Schedule			
	Triple Occupancy	Double Occupancy	Single Occupancy
2nd Payment (by May 1997)	250.000	250.00	250.00
3rd Payment (by November 1997)	250.00 (300.00)	300.00 (350.00)	350.00(400.00)

Note: For the third payment, the lesser amount is for those who made a $200.00 deposit; the larger amount is for those who made a $150.00 deposit. The last payment may be adjusted based on the final airfare.

Our New Address!!!

As of March 28, our new address is 4910 Schuyler Dr., Annandale, VA 22003. Our phone numbers including our fax should remain the same. Our email address has not changed. If the numbers change, we will inform everyone. Also, everyone will be invited to a special open house to see our new studio and home on June 21 at 1:00 PM. We will continue to post more information and directions. 703/750-1636 — Alisa Joaquin, ed.

Comet Watch Continues

The following is a list of parks that will be hosting comet watching during April. Please, contact them to see if they may need assistance.

April 4: Wheaton Regional Park
Brookside Nature Center
1400 Glennallen Ave., Wheaton, MD
Contact: Lynette Scaffidi 301/946-9071

April 8: Black Hill Regional Park
Visitors Center
20926 Lake Ridge Dr., Boyds, MD
Contact: Glen Cumins 301/ 972-3476

National Capital Area Astronomical Events

Free Lectures at the Einstein Planetarium and Other Daily Events
National Air & Space Museum

202/357-1550, 202/357-1686, or 202/357-1505 (TTY)
Home page: http://www.nasm.edu

Other Area Astronomical Events

April 4, 7:00-9:00 PM-"Comet Hale-Bopp" at Historic Bladensburg Waterfront Visitors Center. (Se Habla Espanol.)Note: Due to construction activities, meetings may be moved to an alternate site. Call Geof Lane for more information at 301/927-2163.

April 5, 8:00 PM-"Black Holes — A Walk on the Weird Side" by Dr. John C. L. Wang, University if Maryland, Department of Astronomy, College Park.

April 19, 7:00 PM-"Black Holes, Gravity to the Max" Montgomery College's Planetarium, Takoma Park, MD. Information: 301/650-1463.

April 20, 9:00 PM-"Warped and Twisted Galaxies" by Dr. Eve Ostriker, University if Maryland, Department of Astronomy, College Park.

April 27, 9:00 AM -4:00 PM-"Special Open House" Goddard Space Flight Center (GSFC—Greenbelt, MD). Details: 301/286-8981.

Mondays Through Fridays, 10:00 Saturdays and Sundays, 10:00 AM and 1:00 PM-Paul E. Garber Preservation, Restoration, and Storage Facility, NASM. Take a tour of this facility where they preserve and restore aircraft as well as spacecraft, engines, propellers, models, and other flight-related objects. Guide conducted tours including the workshops. Individuals and groups are welcome. Reservations must be made two weeks in advance. No heating or air conditioning so dress accordingly. Details: 202/357-1400, or write to ATTN: Reservation Office, Education Services Division, MRC-305, NASM, Washington, DC 20560.

The 1997 Northeast Astronomy Forum & Telescope Show

Sunday April 20, 1997
8:45 AM to 6:00 PM
Holiday Inn Conference Center
Suffern, New York.

Speakers include Bob Berman, *Discover* Magazine, J. Kelly Beatty, Senior Editor, *Sky & Telescope*, and John Shibley, Associate Editor, *Astronomy* Magazine. There will be door prizes as well as a raffle.

Adults	$12.00
Pre-registration & RAC Members	$10.00
Children 12-17 & College Students	$5.00
Ages 11 and Under	Free

Make check payable to:
The Rockland Astronomy Club

and mail to:
Northeast Astronomy Forum
C/O Don Urban, Treasuruer
73 Haring St.
Closter, NJ 07624-1709

Call Holiday Inn at 914-357-8314 by April 6th for the $79.00 "Forum" rate. Lunch will be available for $11.00 in the hotel dining room.

Web Page Sites

For more detailed events and information check out these web sites

Guide to Star Gazing and Planetarium Programs: http://128.183.127.48/pl_guide.html (This is a complete guide for the Baltimore/Washington area.)

Goddard Space Flight Center: http://pao.gsfc.nasa.gov/vc/events/JAN-JUN97.htm

Montgomery College's Planetarium: http://myhouse.com/mc/planet.htm

NCA Home Page: http://myhouse.com/NCA/home.htm

University of Maryland Department of Astronomy: http://www.astro.umd.edu/openhouse/speakers.html

Don't throw this newsletter away. If your finish with it, pass it on to someone else to read or recycle it. It's right for astronomy and the environment.

Newsletter Deadline for May *Star Dust* April 15, 1997

*****DO NOT BE LATE!!!*****

Send Submissions to Alisa & Gary Joaquin, at 4910 Schuyler Dr, Annandale, VA, 22003, Leave a message on voice mail 703/750-1636. Text files or graphic files in .GIF or .TIFF may be sent via E-Mail to ajglj@erols.com or fax submissions to 703/658-2233. **No submissions will be accepted after the 20th.** There will be no exceptions. We need a reasonable amount of time to design, edit, and review this newsletter. We would appreciate everyone's help in this matter. Thank you.

National Capital Astronomers, Inc.

SERVING SCIENCE & SOCIETY SINCE 1937

NCA is a non-profit, membership supported, volunteer run, public-service corporation dedicated to advancing space technology, astronomy, 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. For information: 301/320-3621 or 703/841-4765.

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 as skilled observers frequently deploying to many parts of the National Capital region, and beyond, on campaigns and expeditions collecting vital scientific data for astronomy and related sciences. They also serve locally by assisting with scientific conferences, judging science fairs, and interpreting astronomy and related subjects during public programs.

Discussion Groups exchange information, ideas, and questions on preselected topics, moderated by an NCA member or guest expert.

Publications received by members include the monthly newsletter of NCA, *Star Dust*, and an optional discount subscription to *Sky & Telescope* magazine.

NCA Information Service answers a wide variety of inquiries about space technology, astronomy, and related subjects from the public, the media, and other organizations.

Consumer Clinics on selection, use, and care of binoculars and telescopes, provide myth-breaking information, guidance, and demonstrations for those contemplating acquiring their first astronomical instrument.

Dark-Sky Protection Efforts educate society at large about the serious environmental threat of light pollution, plus seek ways and means of light pollution avoidance and abatement. NCA is an organizational member of the International Dark-Sky Association (IDA), and the National Capital region's IDA representative.

Classes teach about subjects ranging from basic astronomy to hand-making a fine astronomical telescope. NCA's instructors also train educators in how to better teach astronomy and related subjects.

Tours travel to dark-sky sites, observatories, laboratories, museums, and other points of interest around the National Capital region, the Nation, and the World.

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, the Smithsonian Institution, the U.S. Naval Observatory, and others.

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

Fine Quality Telescopes up to 36-cm (14-inch) aperture are available free for member's use. NCA also has access to several relatively dark-sky sites in Maryland, Virginia, and West Virginia.

YES! I'D LIKE TO JOIN THE NATIONAL CAPITAL ASTRONOMERS

Enclosed is my payment for the following membership category:

[ ] Regular
- [ ] *Sky & Telescope* and *Star Dust.* ($51 per year)
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[ ] Junior (Only open to those under age 18) Date of birth: _____
Junior members pay a reduced rate.
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If family membership, list names of additional participating immediate family members in same household, with birthdates of all those under 18 years old: _____

Note: If you already subscribe to ***Sky & Telescope***, please attach a recent mailing label. You may renew this subscription through NCA for $22 when it expires.

Make check payable to: **National Capital Astronomers, Inc.**, and send with this form to:

NCA c/o Jeffrey B. Norman, 5410 Connecticut Avenue, NW, Apt. #717, Washington, D.C. 20015-2837.

The following information is optional. Please indicate briefly any special interests, skills, education, experience, or other resources which you might contribute to NCA. **Thank you, and welcome to NCA!**

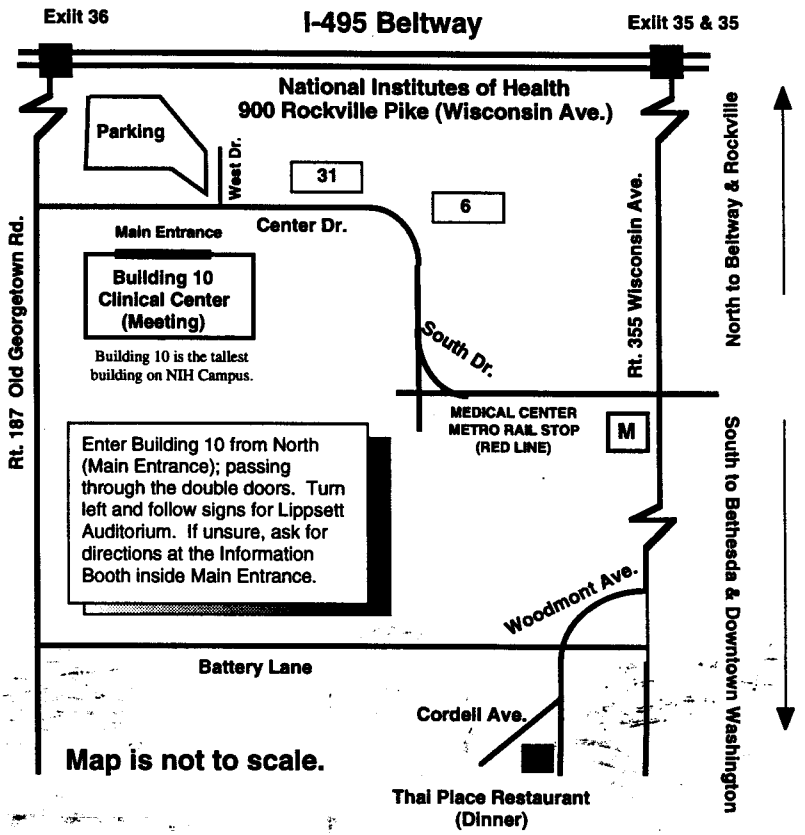
_____

_____

Getting to the NCA Monthly Meeting

Metrorail Riders - From Medical Center Metro Stop: Walk down the hill, pass the bus stops and turn right at the anchor onto Center Drive. Continue uphill to Building 10, the tallest building on campus (walking time about 10 minutes). Also, the J2 bus line connects the Bethesda (7:16 PM) and NIH (7:23 PM) Metro stops with Building 10 (7:25 PM).

To Thai Place Restaurant - Take Wisconsin Avenue toward Bethesda and bear right onto Woodmont. Follow Woodmont to Cordell Avenue (2 blocks south of Battery). The Thai Place Restaurant is on the corner of Cordell Avemue and Woodmont Avenue (4828 Cordell Avenue). There should be adequate parking on the street outside the restaurant. Seats are not guaranteed after 5:30 PM.



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April 1997