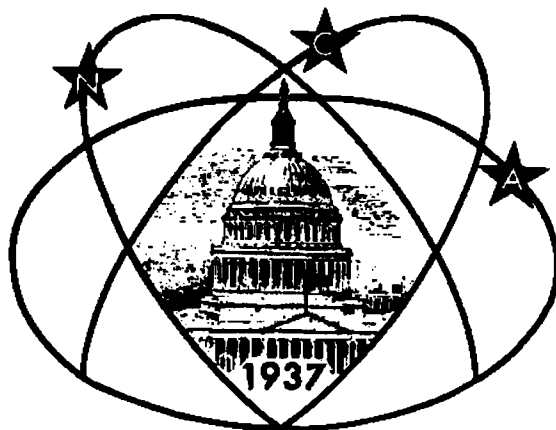


Star



Dust

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Wayne Warren and David Dunham to Describe November 1994 Solar Eclipse Expeditions to Chile and Bolivia

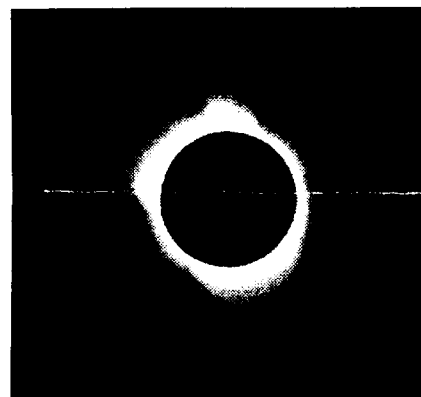
By Wayne H. Warren Jr.

The next meeting of the National Capital Astronomers will be held on April 1, 1995 at 7:30 PM in the Lippsett Amphitheater, Room 1C114, of the Clinical Center (Building 10) at the National Institutes of Health. At this improvisational seminar (arranged last minute when no speaker could be found for the April meeting), NCA members Wayne Warren and David Dunham will relate their experiences on separate expeditions to observe the total solar eclipse of November 3, 1994 in South America. Their presentations will be bolstered by extensive video coverage of both the eclipse itself and eclipse-related travel during the few days before and after the special day.

While the Dunhams traveled to Bolivia to observe the eclipse from the Altiplano region at the southwestern part of that country (due south of the capital La Paz), other NCA members, including Gladys Fuller, Tom Van Flandern, and the Warrens went to Chile with the Van Flanderns' Eclipse Edge Expedition '94. These two locations were at the northern and southern edges of the eclipse path, respectively. The Dunhams were fortunate to have local help from friends and relatives of Ruth Schuett, who provides daycare for their son William, and who hails from Bolivia, while the expedition to Chile enlisted the aid of a local travel agency, Destination Management, Chile

(DMC), of Santiago, which provided a good assortment of knowledgeable and friendly people who turned out to be of invaluable assistance to the successful expedition. Aside from the glorious experience of observing a total eclipse of the Sun, especially from the path edges, where almost all eclipse phenomena are magnified relative to the center of the path, accurate observations of Bailey's bead phenomena from both edges allow an accurate determination of the solar diameter at the time of the eclipse. Diameter measures for eclipses over many years can tell us whether or not the solar radius is changing because of effects such as magnetic buoyancy and/or convection (over the shorter-term) and as the Sun ages and uses more and more of its nuclear fuel (over the longer-term). Hence, both expeditions had telescopes and video camera systems with which to record beads and simultaneous shortwave time signals. Successful video observations were definitely made in Bolivia by the Dunhams, and it appears that some of the observations made in Chile can be time calibrated, even though we thought at first that the time signals had been lost.

Come and join David, Wayne, and other NCA members to hear about and see Bolivia, Chile, and the eclipse itself. We will probably also have time to show some lovely slides of the 1991 Eclipse



Edge Expedition to Mexico that were taken by Harold Williams and his colleagues from Montgomery College. There should also be a little time to say a few words about the next planned

See SOLAR ECLIPSE, on Page 4

Calendar of Monthly Events

The Public is Welcome!

Saturday, April 1, 5:30 PM-Dinner with the speaker(s) at the Sunrise Kabob Restaurant, 4910A St. Elmo Avenue, Bethesda, MD., before the monthly meeting. Reservations are for 5:30 p.m., sharp. Refer to map and description on back page.

Saturday, April 1, 7:30 PM-NCA meeting, featuring Wayne H. Warren, Jr. and David W. Dunham will speak on "The November 3, 1994 Solar Eclipse Expeditions to Bolivia and Chili." Meeting will be held in the Lippsett Amphitheater, Room 1C114 of the Clinical Center (building 10) at the National Institutes of Health (NIH). For directions, refer to map and description on back page.

Saturday April 1, Night-Waxing crescent Moon provides this month's Saturday night with *longest* "deep night" period (i.e., continuous time interval with neither daylight, twilight, nor Moonlight), although period doesn't begin until after Moon sets early Saturday night. Several relatively dark-sky sites are available for NCA members' use, preferably after tonight's monthly meeting. Information: Daniel Costanzo, 703/841-4765.

Monday, April 3, 10, 17, and 24, 8:30 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. Information: USNO Public Affairs Office, 202/653-1541.

Tuesdays, April 4, 11, 18, and 25, 7:30 PM-Telescope making classes at Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnell, 202/362-8872.

Wednesday, April 5-"Sky Watch" column by Blaine P. Friedlander, Jr. appears in *The Washington Post* "Style" section. It lists many other events for the month.

Fridays, April 7, 21, and 28 8:30 PM-Open nights with NCA's Celestron-14 telescope at Ridgeview Observatory; near Alexandria, Virginia; 6007 Ridgeview Drive (off Franconia Road between Tele-

graph Road and Rose Hill Drive). Information: Bob Bolster, 703/960-9126.

Fridays, April 7, 14, 21, and 28, 7:30 PM-Telescope making classes at American University, McKinley Hall Basement. Information: Jerry Schnell, 202/362-8872.

Tuesday, April 18, 6:30 PM-"Large Body Impacts in the History of Earth," Virgil L. Sharpton of the Lunar and Planetary Institute in Texas will be speaking at the Carnegie Institution of Washington, DC. Information: 202/328-6988 or 202/265-2752.

Saturday, April 22, Night-"Exploring the Sky", Rock Creek Park. Coordinator will be either Bob Bolster or Joe Morris. See March issue for details.

Saturday, April 22, Night-Waning crescent Moon provides this month's Saturday night with *third longest* deep night period, including Moonless skies between dusk and Midnight EDT. See April 1 listing.

Saturday, April 29, Beginning 6:00 PM-Open House at Hopwell Observatory. See article on page 5 for directions.

Saturday, April 29, 7:00 PM-"Discovery of Extra-Solar Planets". Montgomery College's Public Planetarium. The planetarium is attached to the Science South building on the ground level and has a conspicuous silver-colored domed roof. Montgomery College Planetarium, Montgomery College, Takoma Avenue and Fenton Street, Takoma Park, MD 20912-4197. Phone: 301/650-1463

Saturday, April 29, Night-Waning crescent Moon provides this month's Saturday night with *second longest* deep night period, with Moonless skies all night long. See April 1 listing.

Wednesday, May 3-"Sky Watch" column appears in *The Washington Post* "Style" section. It lists many other events for the month.

Saturday, May 6, 7:30 PM-The May NCA meeting will feature Demosthenes Kazanas speaking about "Changing the Law of Gravity to Solve the Dark Matter Problem."

Observing the Sun From Earth and Space

Reviewed by Harold William

On Saturday March 4, 1995 at the National Institutes of Health (NIH), David Batchelor a staff member in the Space Physics Data Facility (Code 632) of the Goddard Space Flight Center (GSFC) spoke to us on "Observing the Sun From Earth and Space." We did not meet in the Lippsett Amphitheater as advertised because of a problem with the rooms ceiling, instead we meet in the nicer Masur auditorium near the first floor elevators. As the members filed in, David Batchelor had reprints of a fascinating article on the x-ray sun to hand out and small slips or green and red filters that we latter held in front of our eyes to see a stereographic image of the sun.

David first told us how he became interested in science as a North Carolina youth. His grandmother worked in a department store, and when his mother would take him shopping with her, David would hang out in the large book section of the department store while she shopped elsewhere in the store. David discovered the Tom Swift's junior series of science fiction fantasy books. He built out of construction paper cutouts of Tom Swift's spacecraft and airplanes. He laid them out in a research facility similar to the GSFC like Tom Swift. With all the budget cutting currently in vogue in congress, David nervously wondered whether NASA and the GSFC might be headed for spacecraft and equipment that was little more than cardboard cut outs for show.

Solar granulation with convective boiling was apparent in the ground based images that David showed us with hot bright matter rising from the center of the granulation cell and colder darker matter descending at the edge. Many of the features that we see on the sun are the size of the earth or a large state like Texas. One arc second of resolution corresponds to 700 kilometers on the surface of the sun, and we seldom have one arc second resolution. We would certainly like to know more at a finer resolution scale.

Sunspots, darker cooler regions on the sun's surface, occur in approximately 11 year cycles and follow a butterfly pattern with solar latitude during the cycle. The sunspots were inter-



preted as imperfections on the surface of the perfect celestial orb by the church in Galileo's time and this caused him much controversy. Shortly after Galileo discovered sunspots, the sun became less active and the sunspot cycle all but disappeared. During this sunspot deficit, the total light reaching the earth was reduced and a little ice age insued for about one hundred years.

Spectra of sunspots reveal that they are areas of strong magnetic fields. The Zeeman splitting of spectral lines is proportional to the magnetic field. As a spectroscope slit is passed across a sunspot, the Zeeman splitting, which when not on a spot, is small to nonexistent become larger as the light comes from the spot. Spectra also reveal the elements in the sun, in fact, helium, was discovered. Helos, the Greek name for the sun, is contained in the name of helium—a gas first discovered on the sun before it was isolated on the Earth. The arrangement of the magnetic pole structure within sunspot groups reveal that the approximately 11 year cycle of sunspot maxima is actually a 22 year cycle since ever 11 years the polarity of the north and south poles within a sunspot group at a particular latitude reverses. The reason how the dynamo reverses the magnetic field exhibited on the surface and the particular time scale that its chosen are not understood at all. The magnetic field impedes the movement of hot material boiling up from the center thus cooling the surface where the magnetic fields are the strongest. The movement of the sunspot across the disk of the sun also informs us of the solar rotation of around 27 days.

During an eclipse, we see the corona which is the super hot, very tenuous atmosphere of the sun. The corona has many trumpet shaped streamers where material from the sun is blown into space creating a solar wind of electrons and protons. These charge particle from the sun sometimes disrupt radio communications and can cause electrical overloads and power outages in the electric grid of a country like what happened in Canada in 1989.

Even though sunspots are cool dark regions on the sun, when there are lots of sunspots, there are even more plages, which are regions much larger than sunspots, but are hotter and brighter than even the average sun. So dark sunspots herald a brighter sun not a darker one. The plages surface brightness, while greater than the regular sun, do not vary quickly like the dimming that occurs in the smaller more compact dark sunspot, and because of this the brighter plages are harder to see than the more obvious sunspots.

The sun as a whole, vibrates like the head of a drum with complex vibration patterns. These global oscillation of the surface actually reveal the complex rotation pattern within the sun. Not only does the sun rotate deferentially on the surface—this is revealed by timing sunspots which vary during the cycle with latitude—but the interior does not rotate the same even on cylinders around the rotation axis. This is a very big mystery and was totally unanticipated. Soho, a spacecraft which will measure this glo-

See BATCHELOR, on Page 6

Upcoming Lunar Grazing Occultations (no Asteroidal Events)

by David Dunham

DATE	Day	EST/ EDT	Star	Mag	%	alt	CA	Location
Apr 1	Sat	19:09	092761	7.5	3+	12	9N	e. of Jacksonville, NC
Apr 2	Sun	21:30	093173	8.4	8+	7	9N	n. of Harrisburg, PA
Apr 8	Sat	1:15	1091	6.7	49+	11	8N	Vienna, VA & Brandywine, MD
May 3	Wed	21:41	095090	8.0	16+	19	6N	Westminster, MD
May 4	Thu	22:52	096203	8.0	23+	14	6N	Stratford, VA

Dates and times after Apr. 1 are EDT. For more information and for joining the expedition(s), call David Dunham at 301/474-4722 or 953-5609. Occultation recorded message: 301/474-4945

Hopewell Observatory Open House

NCA members, families, and friends are invited to the spring open house at Hopewell Observatory on Saturday evening and Sunday morning April 29-30 to observe the spring sky, numerous Messier objects, Mercury, Mars, and Jupiter. Sunset will be at 8:01 PM and astronomical twilight ends at 9:41. If you wish, come any time after 6:00 PM and bring your prepared picnic dinner. Coffee, tea, and cocoa will be provided by the Hopewell Corporation.

Direction:

(1) From the Beltway (1-495) go west on I-66, 25 miles to Exit 40 at Haymarket onto U.S. 15. (2) Turn left on U.S. 15 at the end of the exit ramp. (3) Go 0.3 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 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 gate, go 0.3 miles to top of ridge, and around the microwave station. (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. For further information call 703/960-9126 or 301/320-3621

SOLAR ECLIPSE, from Page 1

Eclipse Edge Expedition (1998), which will either be to the famous Galapagos Islands of Equador or to somewhere in the Caribbean.

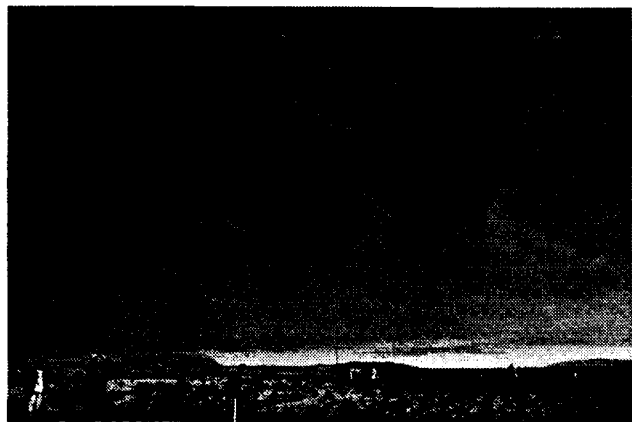


Photo of the approaching lunar shadow seconds prior to the onset of totality, total solar eclipse, 94/11/03, Sevaruyo, Bolivia, S 19°30', W 66° 52', elevation 3,993 m (13,100 ft.). Also shows horizon, eclipse watchers, train in background. — Dale Ireland



Prominences visible at third contact; total solar eclipse 94/11/03. This photo taken with a 400mm, f/11, at 1/250 sec., on ASA 400 film, shows 3rd contact and a small segment of photosphere as well as the red prominences spanning about 90° of the Sun's western limb. — Dale Ireland

New Series of Biographical Sketches of NCA Members

By Wayne H. Warren Jr.

At the suggestion of Gary and Alisa Joaquin, we are initiating a new series of articles in *Star Dust*, in which brief biographical sketches of NCA members will be given. This seems a good way to learn about other members' interests and backgrounds, which I, for one, know very little now, with the exception of a few people with whom I have been associated for many years. Readers of *Star Dust* might begin to give some thought as to what they would write about themselves, since many of you will eventually be asked to contribute to this column. We will probably ask the officers, past officers, and NCA trustees to be the first contributors, since members will be most interested in the backgrounds and interests of those who are and have been active in NCA. I think that we will discover that we are associated with a high percentage of members who have been or are involved with the sciences in some way, and that their mutual interests in other areas have led to our common interest in astronomy.

Having approved of the Joaquin's suggestion, we felt it appropriate for me to be the first to volunteer a contribution. (Gary volunteered me and Harold Williams didn't seem to have any objections at all.) We hope that our readers will enjoy this series and will pass any comments and suggestions that they may have along to us.

NCA Member Biographical Series

Wayne H. Warren Jr. received a BA in physics from Fairleigh Dickinson University (Madison, New Jersey) in 1968, where he attended evenings while working full-time at the Warner-Lambert Research Institute and at Bell Telephone Laboratories in Murray Hill, New Jersey. At Bell Labs, he was involved in research on high-temperature superconductors and antiferromagnetic materials using ultrasonic techniques at liquid helium temperatures.

He then attended Indiana University in Bloomington, where he earned an MA (1970), with a thesis entitled "Photoelectric Observations of Lunar Occultations", and PhD (1975) in astronomy, with the thesis topic "A Four-Color and H β Study of the Orion OB 1 Association" under the supervision of David L. Crawford (National Optical Astronomy Observatories/Kitt Peak National Observatory, who is the founder and Executive Director of the International Dark-Sky Association). Following an NAS/NRC postdoctoral associateship at NASA's Goddard Space Flight Center under the sponsorship of Jaylee M. Mead, he joined the National Space Science Data Center (NSSDC) as a contractor employee, where he remained for 14 years as a member of the science staff, Manager of the Analysis Group, and Head of the newly formed Astronomical Data Center (ADC) at the NSSDC. While at the ADC, he developed, in collaboration with Mead, and joined in 1981 by NCA member Nancy G. Roman, the present archive of machine-readable astronomical catalogs, and was co-editor of the *Astronomical Data Center Bulletin*. In 1992, he was transferred

to the Space and Earth Sciences contract of Hughes ST Systems Corporation, where he now works in Goddard's Laboratory for Astronomy and Solar Physics supporting the development of a new satellite acquisition and tracking star catalog to be used on future NASA missions that employ CCD star trackers. His main research project at the present time involves the updating, enhancement, and preparation of a new fifth edition of the *Bright Star Catalogue*, a collaborative effort with E. Dorrit Hoffleit of Yale University.

Wayne is a member of the International Astronomical Union (IAU), the American Astronomical Society, the Royal Astronomical Society, the Astronomical Society of the Pacific, the International Amateur-Professional Photoelectric Photometry Association, the International Occultation Timing Association, the Planetary Society, the American Association of Variable Star Observers, and the Greenbelt and Goddard Space Flight Center astronomical groups. His primary activities are in IAU Commission 5 (Documentation and Astronomical Data), where he is a member of the Organizing Committee and cochair of the Joint Working Group on Astronomical Libraries, and in Commission 45 (Spectral Classification) as a member of the Working Group on standard stars, where he is collaborating with A. G. Davis Philip (Institute for Space Observations and Union College) to prepare machine-readable files of standard stars in all the major disciplines of stellar astronomy.



Newsletter Deadline for
May *Star Dust*
April 15, 1995

Send Submissions to Gary & Alisa Joaquin, at 7821 Winona Ct., Annandale, VA, 22003, or send an ASCII file via E-Mail at 71561.1747@compuserve.com or fax to 703/658-2233. Submissions must be on time or they may not get in. Wishing everyone a Happy Easter. (No relation to Taxes.)



Attention Dark-Sky Astronomers!

April's traditionally clear skies, relatively long nights, lack of mosquitoes (compared to Summer months), and comfortable nighttime temperatures can provide some of the best opportunities in the National Capital Region for those wishing to personally experience the Universe under a relatively dark sky. This April we are blessed with three Saturday nights where, for all practical purposes, Moonless skies prevail during the convenient hours between dusk and Midnight: **April 1, 22, and 29**. Please take advantage of them. For details, see the "Calendar of Monthly Events" on page 2.

bal oscillation, the so called helioseismology, will reveal more information about the movement within the convective zone of the sun. In the core of the sun, which is quite small only 20% of the sun, where the heat is actually generated by nuclear fusion of hydrogen into helium energy, is moved around not by convection, but by radiation. In the radiation zone of the interior of the sun, the light produced by the nuclear reactions is absorbed and scattered as visible light would be in trying to move through milk. The random walk that the light from the interior must take means that the gamma rays produced in the hydrogen to helium burning core take a comparatively long time to scatter out. In the process, the one gamma ray produced in the core will become a myriad of lower energy photons before it reaches the cooler surface where the average photon will not be a gamma ray but a visible light photon.

The needs of the Apollo missions to the moon required that we understand the ultraviolet and the solar wind from the sun that is absorbed by the Earth's atmosphere before it reaches us on the ground. The astronauts have gold visors on their helmets to reflect the ultraviolet or they would all get a lethal sun burn in short order. The proton flux from the solar wind generated by energetic flares are life threatening to an astronaut caught outside with only a spacesuit. During such an event the astronaut should be safely inside the spacecraft.

The evening lecture had many beautiful images of the sun in every waveband imaginable from radio to gamma rays, but the most visually exciting images to me were the Yohkoh, meaning "sunbeam," soft x-ray images in the 3-45 angstrom range. The full motion video of this was exciting beyond belief. The sun, dark in x-rays, is surrounded by a puffy x-ray corona. Curiously the most stable longest lived pattern in the corona as the sun rotated were the coronal holes or dark regions in the corona.

I would like to thank Dan Costanzo for sending me typed notes of the lecture. It was most helpful to me in writing this review. As usual, we are indebted to NIH and NCA member Jay Miller for arranging to meet at NIH, where he works.

Important Information Numbers

Smithsonian Sky Watchers' Report: Non-technical information recording on astronomical events, objects, and phenomena in the Washington, D.C. region's sky. Updated weekly. 202/357-2000

Sky & Telescope "Skyline": Moderately technical information recording on latest in space technology, astronomy, and related sciences. Updated weekly, or sooner if necessary. 617/497-4168

McDonald Observatory "Star Date": Non-technical information on space technology, astronomy, and related subjects. Broadcast weeknights, around 8:00 PM, by listener-supported public radio station WAMU FM 88.5

Accurate Time Services (via phone line): Eastern Time (in 24 hour mode) and Universal Time given via the U.S. Naval Observatory and the National Institute of Standards and Technology. Excellent for synchronizing clocks and watches. (Voice Recordings) 202/653-1800, 900/410-TIME, and 303/499-7111; (Modem Time Service) 202/653-0351

"Space Weather" Indices: Highly technical, but quite useful voice recording on Solar activity and its effect on Planet Earth, given via the National Oceanic and Atmospheric Administration. Updated every three hours. 303/497-3235 (anytime) or WWV at 2.5, 5, 10, 15, and 20 MHz (at 18 minutes after every hour)

Local Weather, Sunrise/Sunset, and UV Index: Recording of latest weather forecast out to five days, plus Sunrise/Sunset times, and forecasted Solar ultraviolet radiation index. Covers Washington, DC and vicinity. 703/260-0307

NCA Artificial Satellite Prediction Service: Free customized prediction of viewing opportunities. Satellites frequently are clearly visible to unaided eyes or binoculars, even from heavily light polluted areas. Contact Walter I. Nissen, Jr., (voice phone) 216/243-4980, (e-mail) dk058@cleveland.freenet.edu

NCA Jupiter Galilean Moon Prediction Service: Free customized prediction of viewing opportunities for Jupiter's four Galilean moons. They are clearly visible in small telescopes and binoculars, even from heavily light-polluted areas. Contact John Lohman (voicephone) 703/820-4194 at least one week prior to anticipated viewing.

Occultation Line: Highly technical, but quite useful voice recording with latest updates on occultations and grazings of stars by the Moon, planets, and asteroids; from the International Occultation Timing Association. Many of these events are visible with the unaided eye, binoculars, and small telescopes. 301/474-4945

Other Free Public Science & Technology Lectures: National Air and Space Museum (NASM): 202/357-1552 (ask to receive NASM bimonthly calendar by mail); University of Maryland (Astronomy Department): 301/405-3001; Goddard Space Flight Center (Goddard Visitor Center): 301/286-8981; Carnegie Institution of Washington: 202/328-6988 or 202/265-2752

Science & Technology Public Radio Programs: Quality, informative, and educational radio programs featuring space technology, astronomy, and related sciences are presented at irregular intervals on **WAMU-FM 88.5**. For program listing, call WAMU Public Radio Listener Talk Show Hotline: 202/885-1200 and Press 3.

"Star Huster": Completely non-technical, frequently outrageous, but always informative information on astronomical events, objects, and phenomena. Broadcast every night, just before sign-off (generally shortly before 1:00 AM) on Maryland Public Television (MPT) stations. Check your local tv guide for your local MPT Channel. Updated weekly. (MPT can also be picked up in the District and Virginia.

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, judge 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 Workshops 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*. (\$46 per year)
 - Star Dust* only (\$24 per year)
- Junior (Only open to those under age 18) Date of birth: _____
 - Junior members pay a reduced rate.
 - Sky & Telescope* and *Star Dust*. (\$32 per year)
 - Star Dust* only (\$10 per year)

			()
First name	Middle	Last name	Telephone
Street or Box	Apartment	City	State Zip

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.

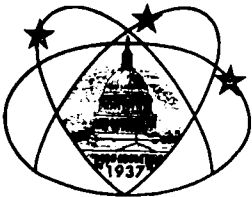
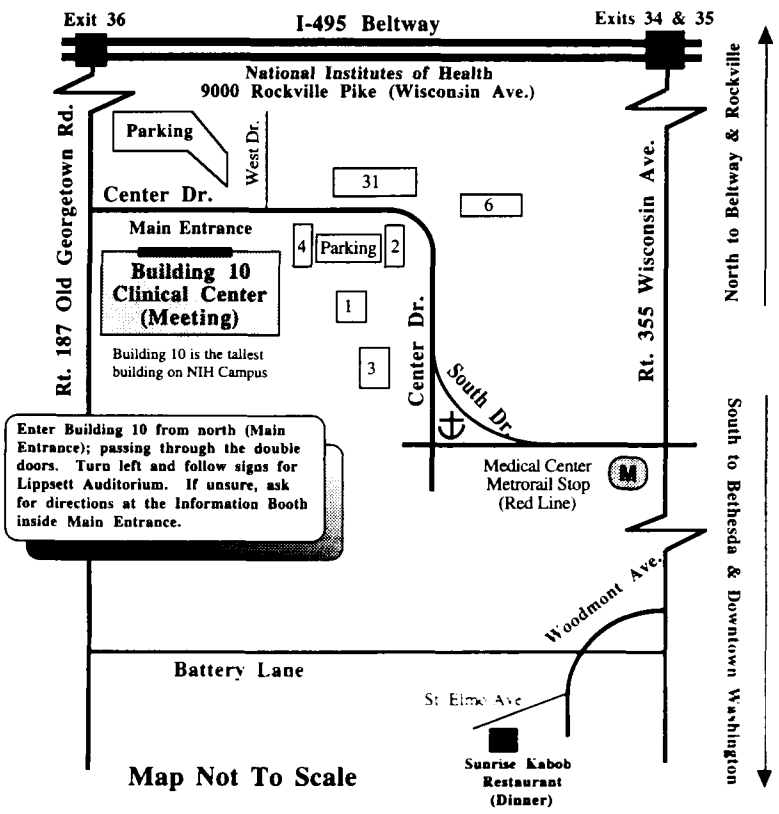
The following information is optional. Please indicate briefly any special interests, skills, education, experience, or other resources which you might contribute to NCA. **Thank you, and welcome to NCA!**

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 (walking time about 10 minutes), the tallest building on campus. Also, the J2 bus line connects the Bethesda (7:16 PM) and NIH (7:23 PM) Metro stops with Building 10 (7:25 PM).

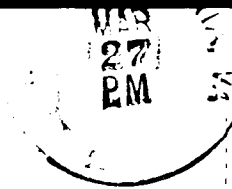
Sunrise Kabob Restaurant - Take Wisconsin Avenue toward Bethesda and bear right onto Woodmont Avenue (or take the next right onto Battery Lane). Follow Woodmont to St. Elmo (3 blocks south of Battery) and make a right. Proceed one block and cross Norfolk Avenue. The restaurant is just up the street (4910A St. Elmo Avenue). There should be adequate parking in the garage (free on weekends) just past the restaurant. Seats are not guaranteed after 5:30 PM.

Star Dust is published ten times yearly (September through June) by the National Capital Astronomers, Inc. (NCA), a non-profit, astronomical organization serving the entire National Capital region, and beyond. NCA is the astronomy affiliate of the Washington Academy of Sciences and the National Capital region's representative of the International Dark-Sky Association. NCA's Phone Numbers: 301/320-3621 or 703/841-4765. President, Wayne H. Warren, Jr., 301/474-0814. Deadline for *Star Dust* is the 15th of the preceding month. Editors Alisa & Gary Joaquin, 7821 Winona Ct., Annandale, VA 22003, 703/750-1636/71561.1747@compuserve.com. *Star Dust* © 1995 may be reproduced with credit to National Capital Astronomers, Inc.



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Addendum

Earth Night 1995



Give Earth Day's 25th Anniversary a cosmic connection by celebrating Earth Night with NCA at the Arlington Planetarium, 1426 North Quincy Street, Arlington, Virginia (next to Washington & Lee High School, and within walking distance of the Ballston Metrorail Station). Learn how the night sky is part of the environment, what creatures depend on the night, and how you can protect our common dark-sky heritage. Features planetarium programs, slide shows, telescope displays, and equipment demonstrations.

Saturday, April 22

Earth Night 1995 will be held rain or shine! Just drop by any time between 10:00 a.m. and 5:00 p.m., for this **FREE** event. Note that these are daytime hours. However, depending on interest, there will be a public observing program after dark, weather permitting. Earth Night 1995 is a joint presentation of NCA and the Arlington Planetarium. NCA needs volunteers to assist in Earth Night. Information: Daniel Costanzo, 703/841-4765.

About the Image: December 22, 1992. Eight days after its encounter with the Earth, the Galileo spacecraft was able to look back and capture this view of the Moon in orbit about the Earth, taken from a distance of about 6.2 million kilometers (3.9 million miles), on December 16. The picture was constructed from images taken through the violet, red, and 1.0-micron infrared filters. The Moon is in the foreground, moving from left to right. The brightly colored Earth contrasts strongly with the Moon, which reflects only about one-third as much sunlight as Earth. Contrast and color have been computer enhanced for both objects to improve visibility. Antarctica is visible through clouds (bottom). The Moon's far side is seen; the shadowy indentation in the dawn terminator is the south pole/Aitken Basin, one of the largest and oldest lunar impact features, extensively studied from Galileo during the first Earth flyby in December 1990. The Galileo project, whose primary mission is the exploration of the Jupiter system in 1995-97, is managed by NASA's Office of Space Science and Applications by the Jet Propulsion Laboratory.

Public Information Office
Jet Propulsion Laboratory
California Institute of Technology
NASA
Pasadena, CA 91109

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