Star Dust

National Capital Astronomers, Inc. Phone: 301/320-3621

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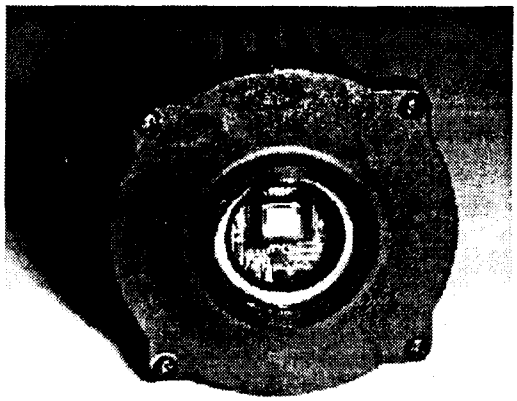
Charge Coupled Device (CCD) Panel Discussion

by Harold Williams

The next meeting of the National Capital Astronomers will be held Saturday, September 9, at 7:30 p.m., in the Lipsett Amphitheater of the Clinical Center (Building 10) at the National Institutes of Health (NIH). We will have an unusually formatted meeting with a panel discussion on CCD cameras and their use in astronomy. The last panel discussion in an NCA meeting that I know about was February 6, 1982, with five pioneers in the field of archaeoastronomy. This panel will include some of the pioneers in CCD imaging.

CCD stands for Charge Coupled Device and it is the heart of a camcorder but is used for astronomical observing. If RAM (Random Access Memory) is arrayed in a rectangular fashion and light is allowed to strike the chip (usually this is not done in a memory chip if you want it to remember accurately), then the light striking the semiconductor will produce charges. The charges will stay in the well until the RAM is read. Each RAM cell is actually a capacitor that holds charges. In a memory bit register, when the charges are greater than a certain amount, then the bit 1; when the charges are less than this amount, then the bit is treated as a 0. In the CCD array, the readout of the chip's charges produces a brightness array. For example, more charge might produce a 255, and much less charge a 0. An intermediate charge might produce some number between 255 and 0 in an 8-bit dynamic-range CCD. This rectangular array of numbers becomes an image when it is displayed on your computer monitor, where the number is reconverted to a brightness level on your screen. The CCD image is a digital image capable of near-infinite manipulation in a computer. In a camcorder, the basically digital readout is analogized to produce a composite video television-compatible image. In astronomy, we just leave it in its digital format. You can change exposure time by changing how often you read the array. Inexpensive CCD cameras are now being home-built for around $250.00 and about 40 hours of labor. This is comparable in price and labor to many home-built telescopes. It is necessary to have a computer to read and manipulate the CCD image. In a certain sense the computer plays the role of the messy chemical process that must be used to produce a more traditional astrophotograph.



A new type of detector called a ? (CID), which works like a CCD, is capable of capturing an image very quickly and over such a large dynamic range that it can be considered a high-speed imaging photometer. It is even capable of resolving spectra during a brief occultation event.

Last September's issue of *Star Dust* had a beautiful image of Jupiter that showed the impact sites of Comet Shoemaker-Levy 9 taken by NCA member Bob Bolster on July 25, 1994. Besides the experts on the panel, we hope to have some of the equipment in the hall so that people can examine for themselves this revolution that has already transformed astronomical observing, making photographic film almost obsolete, and is now transforming even less expensive systems that a large number of people can use. The new disk cameras of Kodak© that display images on your computer screen are the same technology, applied to replace film in a hand-held camera.

Calendar of Monthly Events

The Public is Welcome!

Wednesday, September 6-September "Sky Watch" column , by Blaine P. Frielander, Jr., appears in *The Washington Post* "Style" section. It lists many events for that month.

Thursday, September 7, 14, 21, 28, 7:30 PM-Telescope making classes at Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 202/362-8872.

Saturday September 9, 5:30 PM-Dinner with the panel at the Thai Place Restaurant, 4828 Cordell Avenue, Bethesda, before the monthly meeting. Reservations are for 5:30 PM sharp. See the map on the back page of this issue for directions.

Saturday, September 9, 7:30 PM-The September NCA meeting will feature a panel discussion on the use of CCD detectors in astronomy. Examples of equipment in use and videos of acquired data may be shown. We hope to have a mixture of experts to discuss the topic. Meeting will take place at the National Institutes of Health in the Lipset Auditorium, Room 1c114 in the Clinical Center (Building 10). *See* back page for directions.

Mondays, September 11, 18, and 25, 8:30 PM-Public nights at the 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 National Capital region. Information: USNO Public Affairs Office, 202/653-1541. Closed September 4th for Labor Day.

Fridays, September 15, 22, and 29, 8:30 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, September 16, Night-Last Quarter Moon provides this month's *third longest* Saturday night "deep night" period, including all Moonless skies between dusk and 1:00 a.m. EDT. *See* September 23 listing.

Saturday, September 16, Night-"Exploring the Sky", in Rock Creek Park at Military and Glover roads, NW., featuring Joe Morris. Information: Rock Creek Nature Center, 202/426-6829. *See* March 1995 issue, page 4.

Saturday September 23, Beginning 6:00 PM-Open House at Hopewell Observatory. *See* article on page 5 for directions.

Saturday September 23, 7:00 PM-Montgomery College Planetarium in Takoma Park will present its annual "Falling Skies" program on the first day of Fall and the fact that Chicken Little is sometimes right and things do fall from the sky with large effect on the ground below. This show is guaranteed to raise your existential anxiety.

Saturday September 23, Night-New Moon provides this month's *longest* Saturday night "deep night" period (i.e., continuous time interval with neither daylight, twilight, nor Moonlight), with Moonless skies all night long. Several relatively dark-sky sites are available for NCA members' use. Information: Daniel Costanzo, 703/841-4765.

Saturday, September 30, Night-Waxing crescent Moon provides this month's *second longest* Saturday night "deep night" period, although period doesn't begin until after Moon sets early Saturday night. *See* September 23 listing.

Wednesday, October 4-October "Sky Watch" column appears in *The Washington Post* "Style" section. It lists many events for that month.

Saturday, October 7, 7:30 PM-NCA Meeting to be announced.

NOTE-Other events too numerous to mention here are listed in the publications *Sky & Telescope*, the *Astronomical Calendar 1995*, the *Observer's Handbook 1995*, and in numerous software packages. NCA members can purchase all these at a discount. To join NCA, use membership application on page 7.

New Imaging Sensor Shrinks Cameras to the Size of a Chip

NASA News Release Wednesday, June 21, 1995

A new imaging sensor — virtually a camera on a chip — is in development for NASA's space program and under consideration by several major companies for licensing. The technology makes possible an imaging system that is smaller and cheaper than current state-of-the-art electronic imaging systems, but comparable in performance, according to Dr. Eric Fossum, who led the team to develop the Active Pixel Sensor at NASA's Jet Propulsion Laboratory (JPL), Pasadena, CA.

Fossum said the new technology is a considerable leap beyond the current state-of-the-art electronic sensors — charge-coupled devices or CCDs. "It is a second generation solid state imaging technology," he said.

JPL has signed a technology cooperation agreement with AT&T Bell Laboratories. Several other companies, both large and small, are seeking licensing agreements to commercialize the technology.

Charged-coupled devices were developed by the Bell Laboratories in the early 1970s and have been used mostly in video camcorders and spacecraft. The solid-state devices led to relatively low-cost, compact imaging systems compared to Vidicons and other tube technology. The charge-coupled devices also have advanced as the microelectronics industry has improved its quality and fabrication techniques.

Charge-coupled devices with a million pixels, or picture elements, are expensive to make, costing about $1,000 per million pixels when made for low-volume applications. Active Pixel Sensors, by contrast, are made within mainstream microelectronics technology — the way chips for many other applications are made — which can potentially

*See **NEWS RELEASE**, on page 4*

NCA Treasurer's Report

July 1, 1994 to June 30, 1995

by Jeffrey B. Norman

Income		
	Dues	$8,373.00
	Gifts	190.00
	Interest	308.27
	Sale of the *Observer's Handbook 1995*	360.00
	Telescope-making Classes	489.00
Total Income		$9,720.27
Expenses		
	International Dark-Sky Association Dues	100.00
	Miscellaneous	46.29
	Purchase of the *Observer's Handbook 1995*	300.00
	Sky & Telescope Subscriptions	3,400.00
	Secretary	583.20
	Speakers' Dinners	203.51
	Star Dust	4,589.95
Total Expenses		$9,222.95
Balance on July 1, 1994		$10,548.18
Excess Income over Expenses		497.32
Balance on June 30, 1995		$11,045.50*
Total number of paying members joining or renewing from 7/1/93 to 6/30/94		163**
Total number of paying members joining or renewing from 7/1/94 to 6/30/95		201**
Increase on membership (23.3%)		38

*The Balance includes $2, 291.71 from NCA Travel account.

**This does not include life members or science fair winners because they receive free memberships.

NCA Dues Have Been Increased

Sky & Telescope has reaised its subscription rate for astronomical society members from $20.00 to $24.00 per year. Because of this increase, the NCA has been forces to raise its dues from $46.00 to $48.00 per year for regular members who subscribe to S&T. We held the increase in dues to just two dollars by dropping the $2.00 service charge that we have been assessing S&T subscriber members since the last dues increase on September 1, 1992.

Junior member dues with S&T will now be $34.00 per year. Basic NCA dues (without the discount subscription to S&T) will remain the same at $24.00 for regular members and $10.00 for juniors.

NEWS RELEASE, from Page 3

reduce the cost to under $200 per million pixels, according to Fossum.

The technology used to develop the Active Pixel Sensor is called complementary metal-oxide semiconductor, or CMOS. That technology, according to Fossum, is backed by an enormous worldwide research and development workforce and large amounts of capital investments. CMOS is used for nearly all microprocessors and memory chips. The cost of manufacturing a CMOS image sensor is currently three times less than that of a CCD image sensor.

The CMOS Active Pixel Sensor was developed at JPL's Center for Space Microelectronic Technology for space applications in which it has several advantages over CCDs, including a requirement for less power and less susceptibility to radiation damage in space.

Other applications, Fossum said, include personal computer visual communications, high-definition television, electronic still cameras, laboratory-based cameras, medical instruments, nuclear instruments, toys, automotive applications, and space-based surveillance systems.

The use of complementary metal-oxide semiconductors for the new sensors presents an additional opportunity for reducing imaging costs, power and size, and improving reliability. The Active Pixel Image Sensor can be a single-chip camera system. It can communicate directly with a microprocessor or computer and allows for reduced component count. A black & white image is available to news media representatives by calling the Broadcast & Imaging Branch at 202/358-1900. Jim Cast, NASA Headquarters, Washington, DC (Phone: 202/358-1779)

(Downloaded from Compuserve and reprinted in its unedited form by Alisa Joaquin—editor 8/31/95)

NCA Welcomes These New Members

Charles D. Bolan
10015 Portland Road
Silver Spring, MD 20901

Richard A. Golden (Member)
Erica & Alexander Golden
(Junior members)
9437 Wooded Glen Avenue
Burke, VA 22015

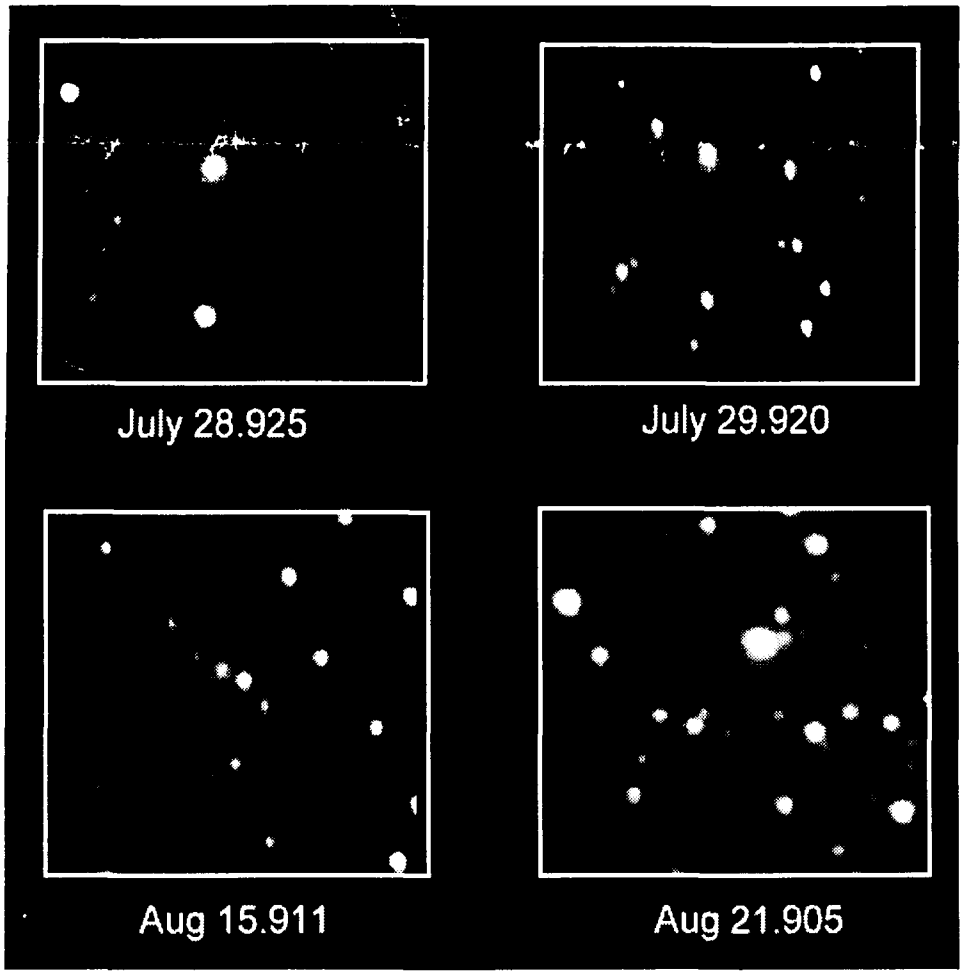
David & Stephen Hunter
1800 N. Kenmore Street
Arlington, VA 22207-3743

Barbara Lewis
8114 Thoreau Drive
Bethesda, MD 20817-3160

Martin Short
(Junior member)
1619 Fieldthorn Drive
Reston, VA 22094-1596

Gregory D. Trygg
1600 S. Eads St., Apt. 725S
Arlington, VA 22202

George & Dolores Vermont
10122 Vanderbilt Circle
Rockville, MD 20850



Comet Hale-Bopp
(Discovered July 23, 1995 by Alan Hale and Thomas Bopp)

0.5m (20") f/4 Newtonian + SX CCD imager. Each image 4 x 40sec. exp. Although at a low altitude and under differing seeing conditions, this series of images shows the comet undergoing an outburst.

D. Strange
Worth Hill Observatory
Dorset, U.K

Hopewell Observatory Open House

by Bob Bolster

NCA members, families, and guests are invited to the autumn open house at Hopewell Observatory on Saturday evening/Sunday morning, September 23-24, to observe the fall sky, the Milky Way, numerous Messier objects, Jupiter, Saturn, Uranus, and Neptune. Sunset will be at 7:07 p.m., and astronomical twilight ends at 8:36. If you wish, come any time after 6:00 p.m., and bring your prepared picnic dinner. Coffee, tea, and cocoa will be provided by the Hopewell Corporation.

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 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 Road (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 gates, 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 within the trees along the road short of the buildings wherever space is available.

The event will be cancelled if it is raining or hopelessly cloudy. For further information call 703/960-9126 or 301/320-3621.

Fully Equipped Telescope for Sale or Trade

20 centimeter (8 inch) aperture Meade 2080/LX Schmidt-Cassegrain telescope fully equipped with everything needed for conducting astrophotography, including 8 x 50 [illegible] for equatorial mount tripod, delux latitude adjuster, complete set of eyepieces, camera adapter, off-axis guider body, along with other accessories, instructions, literature, and star charts. Offered for sale or trade to the highest bidder. Information: Gene Jenkins, 703/385-9344.

For Sale

Prism Collection, 20+, all different. Some tiny, simple prisms to a many as Seven Cemented Together in rangefinder Prism. $35.00

Lyle Johnson
118 Robin Street
Hendersonville, NC 28739
704/697-5325

Audio/Visual Engineer Wanted

A volunteer is needed to assist with A/V responsibilities during NCA meetings and to look after our A/V equipment. This job consists mainly of tape recording lectures and looking after slide projection. As long as we are meeting at NIH, all equipment is available on-site except a tape recorder for the lectures; therefore, this job can be shared among several members and we do have a few people who are willing to record the lectures. However, we still need to find someone willing to store our A/V equipment, consisting of a few wooden boxes. If you would be willing to help the NCA in this way, please contact Wayne Warren at 301/474-0814. If no one is available for this position, we need someone to at least store the equipment in a better place than where it is right now. If you can assist NCA in this way, it would be greatly appreciated.

Computer Readable NCA Directory

Any NCA member who prefers to have a computer-readable version of the NCA database, instead of a hard copy of the directory, may now order this by enclosing a NEW 3.5 inch IBM preformatted disk with his or her renewal form and check. (Postage for mailing a disk is 55 cents.)

This disk will be returned to the NCA member with a tab-delimited ASCII file (about 21,000 bytes) that can be imported into his or her IBM compatible system for use as a reference. Unfortunately I cannot produce a Mac version of the NCA database. A computer readable directory may be preferable for members who have computers because this file can be electronically searched, and it cannot be lost as easily as a hard copy.

I can also provide a README file and a simple search program (an EXE file or QBASIC program) for members who do not already have software for searching. The NCA database can be scrolled by using the "type b:filename|more" command. Of course, a hard copy of the database can also be printed from this file. The user can import the database into his favorite text editor, spread sheet, or DB software. For more information, please call me at 301/564-6061.

Leith Holloway, NCA Secretary

Newsletter Deadline for October *Star Dust* September 15, 1995

Send Submissions to Gary & Alisa Joaquin, at 7821 Winona Ct., Annandale, VA, 22003, Leave a message on voice mail 703/750-1636 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.

A Note From the Editors:
We will soon have our own InterNet account. Look for more information in this space within the next month.

Bolide Reports Needed

by Daniel J. Costanzo

The *Sky & Telescope* "Skyline" information service for August 11 reported the following appearance of an extremely bright meteor (bolide) over the Mid-Atlantic States:

> The U.S. Air Force announced last week that a military satellite recorded a brilliant meteor on July 7th with a peak brightness of magnitude -20.2. That's one thousand times brighter than the Full Moon. The daylight bolide exploded in the atmosphere above Lancaster, Pennsylvania at 17:33:37 Universal Time (1:33:37 p.m. EDT). And there's at least one eye witness report from the Washington area, one hundred fifty kilometers to the southwest. Air Force analysts say the meteroid struck the atmosphere at 14 kilometers per second, and given certain assumptions about how much kinetic energy was converted to light, it's estimated mass was at least 1,300 kilograms. A solid stone that massive would have been about one meter across.
>
> Satellites have been recording air bursts of this magnitude for up to two decades. And they occur surprisingly often, dozens of times per year.

If anyone observed this brilliant meteor, knows someone who did, or has any other information on this event, then please contact me as soon as possible (Phone: 703/841-4765). If at least one observer situated in the Washington area witnessed this event, then others most likely did too.

This is an excellent example of how significant and useful observations can be made with the unaided eye from the Washington area in broad daylight. All it requires is being aware enough to look up at the sky, to know what you are looking at, and to properly report it..

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 [illegible] radiation index. Covers Washington, DC and vicinity. [illegible]

NCA Artificial Satellite Prediction Service [illegible] opportunities. Satellites frequently are clearly visible to unaided eyes or [illegible] even from heavily light polluted areas. Contact Walter L. Nissen, Jr., (voice phone) 215/243-4980, (e-mail) dk058@cleveland.freenet.edu

NCA Jupiter Galilean Moon Prediction Service [illegible] viewing opportunities for Jupiter's four Galilean moons. [illegible] small telescopes and binoculars, even from heavily light-polluted [illegible] Lohman (voicephone) 703/820-4194 at least one week prior to anticipated [illegible]

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 Hustler": Completely non-technical, frequently outrageous, but always informative presentations 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*. ($48 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*. ($34 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 $24 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!**

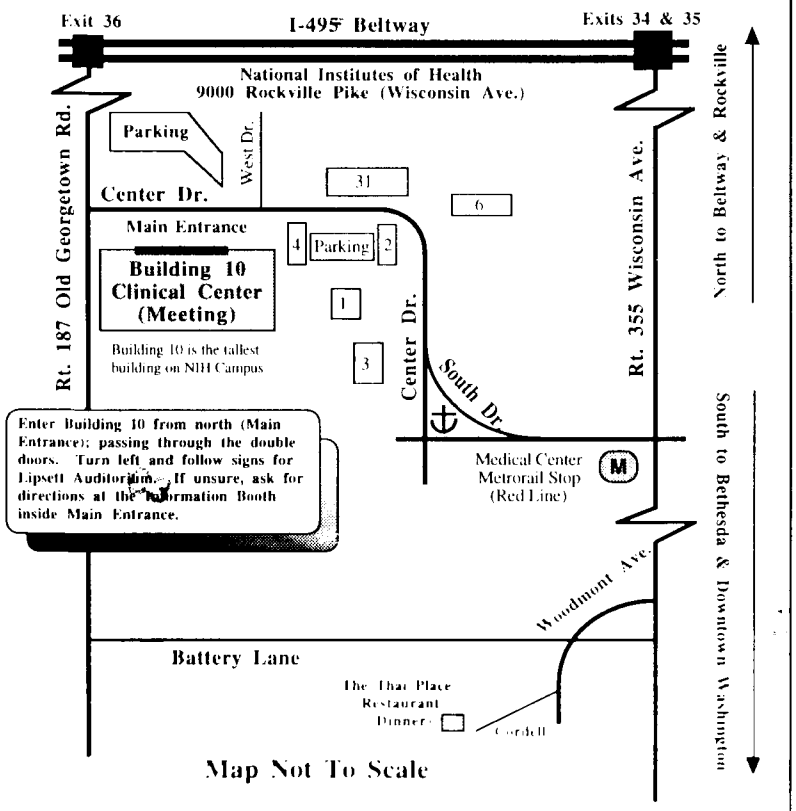
_____

_____

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).

The Thai Place Restaurant - Take Wisconsin Avenue toward Bethesda and bear right onto Woodmont (or take the next right onto Battery Lane). Follow Woodmont to Cordell (2 blocks south of Battery) and make a right at the Thai Place Restaurant. Look for parking immediately. There should be adequate space on the street outside the restaurant. The parking lot across the street may be available, but be sure to check signs. Cars may be ticketed, even on weekends. Seats are not guaranteed after 5:30.



***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, E-mail-71561.1747@compuserve.com. *Star Dust* © 1995 may be reproduced with credit to National Capital Astronomers, Inc.**

National Capital Astronomers, Inc.

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10500 Rockville Pike
Rockville, MD 20852-3331

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September 1995