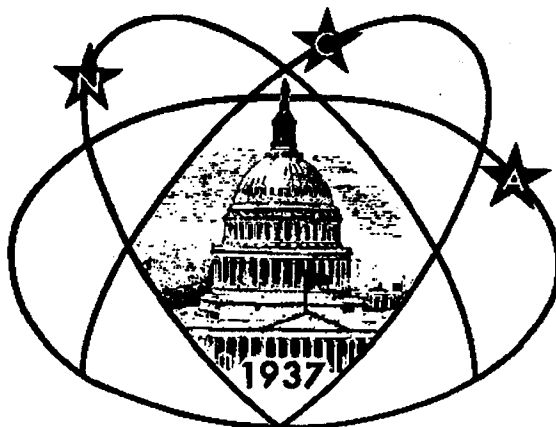


Star



Dust

National Capital Astronomers, Inc.

Washington, DC (301) 320-3621

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Don Hutter to Describe "The USNO Astrometric Interferometer"

*By Wayne H. Warren Jr.
(from abstract by Donald J. Hutter)*

The first meeting of the National Capital Astronomers for 1993-1994 season will be held at 7:30 PM in the Bunim Room of the Clinical Center (Building 10, floor 9) at the National Institutes of Health in Bethesda. We are pleased to welcome Dr. Donald J. Hutter of the U. S. Naval Observatory, who will describe the joint NRL/USNO project to build and operate a new optical interferometer in Arizona.

The U.S. Naval Observatory (USNO) Astrometric Interferometer (AI) will be the dedicated astrometric subarray of the new Navy Prototype Optical Interferometer at Lowell Observatory (NPOI), which is being built in collaboration with the Naval Research Laboratory. The AI, which is being built using the experience gained from the Mark III interferometer on Mt. Wilson, CA, will be in operation on Anderson Mesa, near Flagstaff, Arizona, beginning in December 1993.

The AI incorporates several significant design improvements to increase its astrometric accuracy by an order-of-magnitude over that of the Mark III. These improvements include a greater number of light collecting elements and a new multiway beam combiner to permit simultaneous position measure-

ment in both right ascension and declination, an extensive laser metrology system to allow measurements of the interferometer baselines with respect to an Earth-fixed reference system with submicron error, a dispersed fringe detection technique that allows better correction for atmospherically induced delay fluctuations, increased aperture, state-of-the-art delay lines, and greater detector sensitivity. The combination of these improvements will permit the AI to produce highly accurate catalogs of star positions on a nearly inertial frame. The initial goal of the AI will be to establish a catalog of the order of one thousand stars with statistical and systematic errors in the range of 1 to 3 mas. This catalog will be more than an order-of-magnitude more precise than the best current fundamental catalogs.

Donald J. Hutter received a B.S. (1975) in Astronomy from the Pennsylvania State University, and an M.A. (1978) and Ph.D. (1983) in Astronomy from Indiana University. His interests have varied widely. His doctoral thesis ("An X-ray and Optical Survey of s-Type Markarian Galaxies") was on distant, peculiar galaxies, and he has worked on

See Hutter, Page 35

September Calendar

The Public is Welcome!

Saturday, September 11, 1993, 5:30 PM - Dinner with the speaker at Frascati's Restaurant in Bethesda before the monthly meeting. Reservations are for 5:30 PM.

Saturday, September 11, 7:30 PM - Dr. Donald Hutter, "The USNO Astrometric Interferometer." Meeting will be held in the Bunim Room at the National Institutes of Health. For directions refer to map and description on inside back page.

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

Fridays, September 3, 10, 17 and 24, at 7:30 PM - Telescope making classes at American University, McKinley Hall Basement. Information: Jerry Schnall, 202/362-8872.

Saturday, September 18, 8:30 PM - "Exploring the Sky." on Glover Road, NW, at the open field nearest the Rock Creek Park Nature Center. Information: 202/426-6829 (the Rock Creek Park Nature Center) or 301/320-3621 (National Capital Astronomers). Because of increased attendance, more telescopes are needed!

Fridays 10, 17, 24, 8:30 PM - Open nights with NCA's Celestron-14 telescope with Bob Bolster, 6007 Ridgeview Drive, south of Alexandria off Franconia Road between Telegraph Road and Rose Hill Drive. Call Bob for details 703/960-9126.

Friday, September 24, 3:30 PM - David Burstein (Arizona State University), "Dark Matter, Galaxies, and the Universe." At NASA Goddard Space Flight Center (GSFC), Building 3 Auditorium. For details, call 301/286-6878.

NOTE: There will be no September "Monthly Sky Lecture" at The Smithsonian Institution, National Air and Space Museum (NASM), Albert Einstein Planetarium.

Wednesday, September 1 - See "Sky Watch" column by Blaine P. Friedlander Jr. in *The Washington Post* "Style" section for other events of astronomical interest.

June Meeting Features Science Fair Winners and Brad Schaefer's "Crescents and History"

by Nancy Byrd

After a pizza dinner at Shakeys, Science Fair winners, Brian Newbury, Kapil Dandekar and Charles Tahan presented their Science Fair projects and were awarded their certificates and gift memberships to NCA. The winners demonstrated well organized scientific studies and impressive grasp of their respective subjects.

Brian Newbury, a junior at Quince Orchard High School presented his study of "Crater Formation on Icy Moons", in which he modeled the formation of craters using "ice" pellets, created a special air gun barrel to fire the pellets and created craters by varying the angle of impact and the velocity of the pellets at impact. This interesting study is long term and represents an effort begun in junior high school.

Kapil Dandekar, a senior at Thomas Jefferson High School for Science and Technology, presented his entry on "Planetary Ring Dynamics: Computer Mod-

eling of Ring Material Gravitational Confinement." In this study, he modeled orbit processes in the neighborhood of the F-ring of Saturn. He tested various theories of shepherding of moons with computer simulations written in C for the ETA 10 Super Computer from Control Data Corp. He obtained the best fit to his data with the theory of Goldreich and Tremaine. He says that now that he has greatly increased his mathematics skills, he hopes to enhance his computer program.

Charles Tahan of McLean, VA presented his Science Fair project, "Observing and Plotting the Moon's Orbit using Astrophotography." Melanie Diez, also a senior at Thomas Jefferson High School for Science and Technology was unable to attend and present her winning Science Fair entry, "Infrared Observations of Early Star Formation."

After the Science Fair presentations, Dr. Bradley Schaefer guided NCA members through a lively and most unusual

1993 Treasurer's Report

By Jeff Norman, submitted by Leith Holloway

1. GENERAL FUND

INCOME

Dues	\$7,354.00
Gift	10.00
Interest	136.49
Sale of <i>Observer's Handbooks</i>	300.00
Telescope-making classes	354.00

Total Income \$ 8,154.49

EXPENSES

Int'l. Dark-Sky Association dues	100.00
Pur. <i>Observer's Handbooks</i>	291.00
<i>Sky & Telescope</i> subscriptions	3,120.00
Secretary	430.96
Speaker's dinners	203.07
<i>Star Dust</i>	4,411.82
Telephone	271.70
Miscellaneous	84.91

Total expenses \$ 8,913.46

Balance on July 1, 1992 6,200.51

Excess expenses over income 758.97

General fund balance June 30, 1993 \$5,441.54

2. NCA TRAVEL

Balance on July 1, 1992 \$2,087.69

Interest in fiscal 1993 62.63

Travel balance on June 30, 1993 2,150.32

3. TOTAL on June 30, 1993 \$7,591.86

Members joining/renewing 7/1/91 to 6/30/92 223

Members joining/renewing 7/1/92 to 6/30/93 184

Drop in membership (17.5%) 39

Magazines, Books Available

Joan & David Dunham - Many books, journals and maps, must pickup; call for details: 301/474-4722

Anthony Frato - *Sky & Telescopes* '82-'91, must pickup; he is moving; call before 10:00 PM: 703/486-0020

Help Needed

In an effort to stop the fall in membership, Jeff Norman has undertaken to follow up personally with calls to members who have not renewed. If you would be willing to help in this effort, please call Jeff at 202/966-0739.

Spring Dark Sky Trip to the Southwest Planned

By Sue Bassett

Tired of the "light-pollution zone"? NCA is planning an astronomy-oriented trip to Arizona and southern California next spring. Here is the tentative itinerary.

- Fly to Los Angeles
- Spend several days in the LA/Pasadena area, visiting the Jet Propulsion Laboratory, Mt. Wilson, and Mt. Palomar Observatories. There will be time for a few non-astronomical touristy trips.
- Fly to Tucson
- Spend several days in the Tucson area. Trips include Kitt Peak, the Mirror Spincasting Lab at University of Arizona, and nighttime observing at dark sites outside of Tucson. There will also be time for visits to Tombstone, the Sonora Desert Wildlife Park, and other area attractions.
- Fly to Flagstaff
- Several days in Flagstaff, visiting Lowell Observatory, Barringer Meteor Crater, Indian sites, and the Grand Canyon.
- Return home.

The trip will be about 12 days and will be in either April or May. If we go in May, we may stop en route at some point in the centerline to view the annular eclipse.

We are currently working with a travel agent to get the best price. Plans are still tentative, so now is the time to let us know what interests you. Bring your comments to the next NCA meeting or leave a message for Sue Bassett at 301/953-1665.

The Autumn Sky, Nocturnal Nature and Fall Foliage

Smithsonian Institution Resident Associate Program Tour for Earth Night 1993 - October

by Daniel J. Costanzo

On a dark, clear night far from city lights, Earth can be appreciated for what she truly is: a precious ark of life borne upon the currents of a grand, Galactic ocean. Seeking an experience of truly "deep" ecology on a cosmic scale, this tour to Shenandoah National Park's Big Meadows on Virginia's Skyline Drive observes the natural environments of mountain and sky during nighttime. The tour then lingers into the early morning to savor Autumn's splendor. It offers a perfect compliment to celebrating Earth Day 1993 by making your Earth Day an Earth NIGHT!

Earth Night 1993 - October is offered as the Smithsonian Institution Resident Associate Program (SRAP) tour, "The Autumn Sky, Nocturnal Nature, and Fall Foliage." It is the seventh Earth Night program stemming from an idea originated by the author for celebrating Earth Night in association with the more famous Earth Day. He has subsequently developed and improved it, with assistance from Walter Nissen (NCA), Karen Gray (SRAP), and Rob Gibbs (Brookside Nature Center). This SRAP/NCA Earth Night program, like the National Park Service/NCA "Exploring The Sky" program, draws on NCA's unique blend of multidisciplinary, interdisciplinary, and will aid participants in identifying numerous objects, including meteors, artificial satellites, the planet Venus, the asteroid Ceres, interesting stars, star clusters, gas and dust nebulae, and galaxies of interest. This observing (and "absorbing") will highlight how new knowledge about even our Universe's remotest regions aids in saving our endangered global environment. Discussion of astronomical equipment, nocturnal nature, and Earth's place in the cosmos will occur even if the weather restricts observations.

Naturalist activities include walks to watch and listen for nocturnal animals and observe how flora and fauna are preparing for Winter. Participants may glimpse deer, foxes, skunks, rodents, and ravens. Efforts are made to attract owls by calling, and to detect bats with special sensing equipment. The influence of night on plant and animal evolution, plus environmental degradations from both "light

pollution" and "space pollution," will also be demonstrated.

The tour lasts from Friday, October 15, 11:30 PM to Saturday, October 16, 11:30 AM. The bus leaves from the Smithsonian on The Mall, making an additional stop at the Vienna Metrorail Station's south-side "Kiss and Ride" area. Light snacks will be available during the night, with a morning stop made at the Big Meadows Lodge for purchasing breakfast. This plan will enable viewing fall foliage along Skyline Drive without the pressing crowds.

In the event of weather forecasted mostly to completely overcast, the tour's alternate date is Friday, October 22, 11:30 PM to Saturday, October 23, 11:30 AM (i.e. same times).

Additional details, costs for SRAP members and non members, and registration can be obtained by calling SRAP at 202/357-3030 (Fax: 202/786-2034). SRAP lists this tour as "The Autumn Sky, Nocturnal Nature, and Fall Foliage" (Code: 513-726). Advice on what to wear and bring and procedures for use of the alternate date are mailed prior to the tour. Minimum age is 14.

Warning: The site is purposefully kept unlighted and participants assume responsibility for safely moving about in the dark.

Note that these "Earth Night" tours have sometimes been completely sold out, resulting in a long waiting list of standbys. So please sign up early!

June meeting from Page 2

history lesson, one wherein the events of history, from the winning of battles to the fall of kingdoms, were controlled by astronomical events. He also described a search for the origin of the star and lunar crescent symbol which is often seen in Arab countries. A full description of Dr. Schaefer's talk will appear in next month's issue of Star Dust.

Asteroidal and Lunar Grazing Occultations This Month

submitted by Nancy Byrd

Date	Day	EDT/ EST	Star	Mag	Sp	%	CA	alt	Aper.	Location
Sep 6	Mon	23:33	0467	6.7	K5	70-	2N	15	5	Darnestown, MD
Sep 9	Thu	0:27	752	4.7	A5	50-	3N	16	2	Streetsboro, OH
Sep 13	Mon	5:05	098240	8.4	F8	11-	-5N	14	8	Dale City, VA
Sep 13	Mon	4:58	1341	4.3	A3	11-	3S	8	1	Texas City, TX
Sep 28	Tue	0:11	039807	7.5	B5	94+	44	32	2	FL, WV, OH?
Oct 7	Thu	5:11	881	5.9	B9	65-	4S	71	2	Carmel Church, VA
Oct 9	Sat	3:01	128735	8.4	K0	45-	29	36	2	nw PA, NY

For more information and for joining the expedition(s), call David Dunham on 301/474-4722 or 953-5609. Occultation recorded message: 301/474-4945

Hutter from Page 1

binary stars and in astrometry. He was an Assistant Professor of Physics at Rose-Hulman Institute of Technology from 1982 to 1984, and held a postdoctoral research position at Georgia State University (1984-1985), where he worked on the application of speckle interferometry to the study of binary stars. From 1985 to 1988 he participated in the development of the Mark III Interferometer while at the Applied Research Corporation. Since 1989 he has been on the staff of the Astrometry Department of the U.S. Naval Observatory, working on the development of the Astrometric Interferometer (with particular emphasis on the baseline metrology system). He has served as codirector of the NPOI project since December 1991, and was appointed chief of the Interferometry Division in May 1992.

We look forward to an exciting talk by Dr. Hutter on the applications of modern astronomical instrumentation to the classical discipline of positional astronomy, a hot subject of late because of the eminently successful European Space Agency's Hipparcos mission. Please come and welcome Dr. Hutter as our NCA

guest.

From the Secretary of NCA – by Leith Holloway

Some NCA members have written me about the discrepancy between the \$20 amount that the S&T renewal reminder states is the cost of a subscription through an astronomy club and the \$22 that the NCA actually charges for renewing S&T. The extra two dollars is a service charge that the NCA Board of Directors has levied on S&T subscribers to cover the additional work that these subscriptions impose on the treasurer.

Finally, along with your S&T renewal notice you receive a Business Reply Mail envelope. If enough renewing NCA members returned this envelope with their renewal check and form, we would always have enough of these to prevent ever having to use our stamps to mail in your subscription renewals. The officers make every effort to save your society's money so as to keep NCA dues as low as possible. You can reach Leith at 301-564-6061

NCA WELCOMES THESE NEW MEMBERS!

Ted Joseph Breyere
15115 Interlachen Dr., #904
Silver Spring, Md 20906-5643

Janet Kathryn Davis
6744 - 2nd Street, NW
Washington, DC 20012-2113

Nelson R. Wallace, Jr.
3124 Brinkley Road, #302
Temple Hills, MD 20748

Voyager II - Dynamic Sky Simulator *by Richard Byrd*

A cloudy night need not keep you from viewing the sky; not being in Peru need not keep you from viewing the Southern Cross, nor must you be transported to a point in space of heliocentric longitude 90° , 50 AU from the sun and 15 AU above the ecliptic plane to view the universe from this location. These capabilities are available in color for the Macintosh computer, with the Voyager II program from Carina Software, San Leandro, California. With Voyager II you can observe the universe from any location on Earth, in any season, at any time from 3,600 BC to 6,400 AD or from any planet in the Solar System or from any point in space up to 200 AU away. You can view and scan the sky in celestial coordinates, altazimuth or using the coordinates of the ecliptic or galactic plane. You can even design your own local custom horizon to show as the screen horizon.

Voyager II has a database of over 51,000 celestial objects, including 47,000 stars down to eighth magnitude, 4,000 deep-sky objects, the planets, major moons, asteroids, comets, artificial satellites, etc. One of the nicest features of this software is the ability to display in *your* sky only the objects of your interest. For example, you could display only stars down to a pre-selected magnitude, or only deep-sky objects, or planets or many different types of objects at once. Within the deep-sky objects you can select to view spiral galaxies, elliptical galaxies, planetary nebulae, globular cluster, quasars, etc. You can display any combination you wish of constellation boundaries, names, NGC number, Messier numbers, Flamsteed numbers or Greek-letter constellation numbers. Since your desktop sky can easily get too crowded for comfortable viewing, this impressive list of viewing options is very worthwhile.

The database engine in this software is very fast. A click of the mouse on any object in the sky instantly brings up a window showing the object's name, Messier/NGC number, type, distance, right ascension and declination, and much more. The database can also be accessed by the Find & Center menu command, which locates the object by your choice of criteria: name, Yale Bright Star Catalog number, Greek letter and constellation, Flamsteed number, Messier number, etc. Once found, a click on *Center* brings the object to the center of the screen.

The system time clock can be set to step at any rate allowing one to observe astronomical phenomena in motion. For example, you could observe the Sun's analemma by centering the sun on the screen and stepping time at an appropriate rate. By showing Mercury and Venus also, you can vividly demonstrate their looping paths. Likewise, you could select Saturn, magnify it 1,000 times, select a time rate and observe the changing tilt of the ring structure; if this doesn't excite you then try the observation from Uranus! You can set up occultations or eclipses and observe the paths of the objects at any time rate you choose.

The Planet Gallery feature allows viewing each planet and its moons in motion, and this can be observed from any point. You could view the motion of Jupiter's moons from Saturn, something you must have been waiting years to do. There is a view of the Solar neighborhood that displays a dynamic three-dimensional view of the Sun and its 300 closest neighbors (from 5 to 40 parsecs) in full motion. The view is from an observer outside of the whole system looking toward the Sun, and you can choose the viewing distance.

If you need more astronomical objects to play with, there are additional datasets that can be purchased for a nominal price. You could add 6,000 deep sky objects or a three disk set of 210,000 stars from magnitude 8 down to 10 from the SAO catalog, or 28,400 variable stars or 20,000 double stars. It boggles the mind.

The features of Voyager II are too numerous to detail here. I haven't discovered all of them myself. It is fun, very useful and is a wonderful learning tool. Coming soon from Carina is a control link to your telescope, so that you can click on any object on the screen and your telescope will slew over and lock onto it - a gadgetmeister's dream! The basic Voyager II lists for \$120 and is available at a street price of \$99. — Its a bargain.

National Capital Astronomers, Inc.

is a non-profit, public-service corporation for advancement of the astronomical sciences and is the astronomy affiliate of the Washington Academy of Sciences. For information, call NCA: (301) 320-3621.

SERVICES AND ACTIVITIES:

A Forum for dissemination of the status and results of current work by scientists at the horizons of their fields is provided through the monthly NCA Meeting. (See monthly *Stardust* for time and location.) All interested persons are welcome; there is no charge.

Expeditions frequently go to many parts of the world to acquire observational data from occultations and eclipses which contribute significantly to refinement of orbital parameters, the coordinate system, navigation tables and timekeeping. Other results of this work under continuing study include the discovery of apparent satellites of some asteroids, discovery of apparent small variations in the solar radius, and profiles of asteroids.

Discussion Groups provide opportunities for participants to exchange information, ideas, and questions on preselected topics, moderated by a 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.

The NCA Public Information Service answers many astronomy-related questions, provides predictions of the

paths and times of eclipses and occultations, schedules of expeditions and resulting data, assistance in developing programs, and locating references.

Astronomical Telescope & Binocular - Public Seminar, for Selection, Use, and Care, held annually in November, offers the public guidance for those contemplating the acquisition of a first telescope, and dispels the many common misconceptions which often leads to disappointment.

Working Groups support areas such as computer science and software, photographic materials and techniques, instrumentation, and others.

Telescope-Making Classes teach the student to grind and polish, by hand, the precise optical surface that becomes the heart of a fine astronomical telescope.

NCA Travel offers occasional tours, local and world-wide, to observatories, laboratories, and other points of interest. NCA sponsored tours for comet Halley to many parts of the southern hemisphere.

Discounts are available to members on many publications, products, and services, including *Sky & Telescope* magazine.

Public Programs are offered jointly with the National Park Service, the Smithsonian Institution, the U.S. Naval Observatory, and others.

PLEASE ENROLL ME IN NATIONAL CAPITAL ASTRONOMERS MEMBERSHIP

☐ 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:

Leith Holloway 10500 Rockville Pike Apt. M-10, Rockville, MD 20852.

The following information is optional. Please indicate briefly any special interests, skills, vocation, education, experience, or other qualifications which you might contribute to NCA.

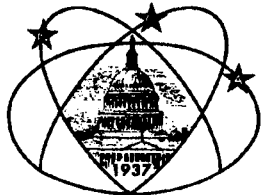
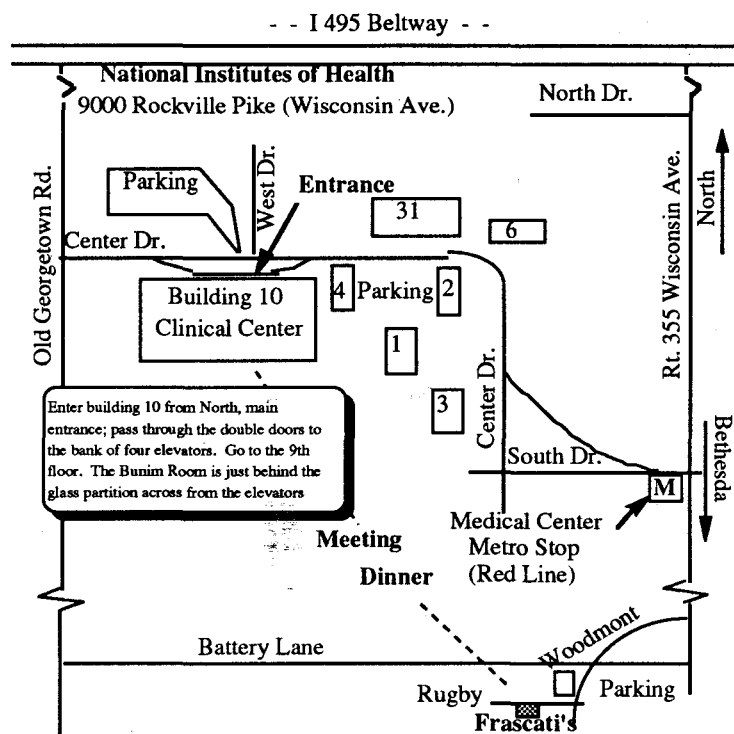
Thank you, and welcome!

Getting to the NCA Monthly Meeting

•Subway 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 largest 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).

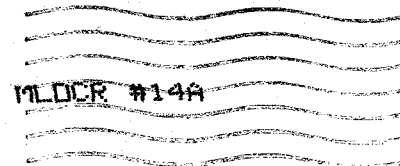
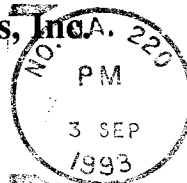
•To Frascati's: Proceed down Wisconsin Avenue toward Bethesda. Bear right onto Woodmont (or the next right onto Battery Lane), follow Woodmont across Battery, take a right onto Rugby and park. The restaurant will not guarantee seats after 5:30.

Stardust is published ten times yearly (September - June) by National Capital Astronomers, Inc. (NCA), a non-profit, public-service corporation for advancement of astronomy and related sciences through lectures, expeditions, discussion groups, conferences, tours, classes, public programs, and publications. NCA is an affiliate of the Washington Academy of Sciences. President John Graham. Deadline for *Stardust* is the 15th of the preceding month. Editor September issue, Nancy Byrd, 703/978-3440. NCA Phone Number is 301/320-3621.



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