STAR DUST

National Capital Astronomers, Inc.

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Science Fair Awards; Crawford on Light Pollution

DR. CRAWFORD

Science fair winners in Washington and the contiguous counties will be honored at the National Capital Astronomers Annual Awards Ceremony in the National Air and Space Museum on June 4 at 7:30 pm.

Following the ceremony, Dr. David L. Crawford, Astronomer, Kitt Peak National Optical Astronomical Observatory, Tucson, Arizona, will speak on the activities and progress of the recently established International Dark-sky Association (IDA), organized to provide a unified attack on the light-pollution problem. NCA is the Washington Chapter of IDA.

While the problem is, of course, well known to all astronomers, there is almost no public awareness either of the problem or of its seriousness. Light pollution is not only destroying a fundamental science upon which much of our technological way of life depends, but is also damaging nature, and wasting energy and money. Light thrown into the sky does nothing to help street traffic or to prevent crime.

Proper outdoor lighting is necessary, and can be done sensibly with minimal damage, far more effectively for its purpose, and more economically. Everybody wins!

Among the purposes of IDA is to mount a widespread campaign to raise among officials and the public an awareness and appreciation of the real damage being done by irresponsible outdoor lighting. IDA will publicize the effects of this widely ignored pollution, and will research, assemble, and furnish information to and advise authorities at all appropriate levels of government.

David L. Crawford received his Ph.D. from the University of Chicago in 1958, was assistant professor at Vanderbilt University in 1958 and 1959, Staff astronomer at Kitt Peak National Observatory since 1960, was Project Manager for AURA's two 4-meter telescopes used at Kitt Peak, Arizona, and Cerro Tololo, Chile, and was Associate Director of KPNO. He has held an impressive array of offices and positions in the American Astronomical Society, the International Astronomical Union, the Astronomical Society of the Pacific, the American Association for Advancement of Science, the Illumination Engineering Society of America, the International Society for Optical Engineering, the International Dark-Sky Association, and is a member of National Capital Astronomers.

JUNE CALENDAR — ***The public is welcome.***

Tuesday, June 7, 14, 21, 28, 7:30 pm -- Telescope-making classes at Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 362-8872.

Friday, June 3, 10, 17, 24, 7:30 pm -- Telescope-making classes at American University, McKinley Hall basement. Information: Jerry Schnall, 362-8872.

Friday, June 3, 17, 24; July 1, 15, 22, 29, 9:30 pm — NCA 14-inch telescope open nights with Bob Bolster, 6007 Ridgeview Drive, south of Alexandria off Franconia Road between Telegraph Road and Rose Hill Drive. Call Bob at 960-9126.

Saturday, June 4, 5:45 pm — Dinner with the speaker at the Smithson Restaurant, 6th and C Streets, SW., inside the Holiday Inn. Reservations unnecessary. Use the 7th Street and Maryland Avenue exit of the L'Enfant Plaza Metrorail station.

Saturday, June 4, 7:30 pm — NCA monthly lecture and annual Science Fair Awards in the Einstein Planetarium of the National Air and Space Museum, Seventh Street and Independence Avenue, SW. Enter Independence Avenue side. Dr. Crawford will speak.

Saturday, June 11, July 2, 9:00 pm — *Exploring the Sky*, presented jointly by NCA and the National Park Service, Glover Road south of Military Road, NW, near Rock Creek Nature Center. Planetarium if cloudy. Information: John Lohman, 820-4194.

Saturday, June 18, 7:30 pm — Discussion group on Mars opposition projects. Page 48.

Thursday, June 16, 6:00-9:00 pm — *Fly by Night*, presented jointly by NCA and the National Air and Space Museum. See page 47.

For other organizations' events of interest see elsewhere in this issue.

MAY COLLOQUIUM

Dr. David B. Shaffer, Chief Scientist and co-founder of Interferometrics, Inc., spoke on superluminal sources, in particular, 4C39.25, for the May National Capital Astronomers colloquium at the National Air and Space Museum.

Superluminal sources, through special circumstances, emit jets of matter that produce the illusion of moving faster than the speed of light (c). One of these, the 18th-magnitude radio quasar 4C39.25 (right ascension 9h 23m, declination 39°, red shift .7c), shows certain individual pecularities which are the subject of Shaffer's studies.

He first discussed the facilities with which the observational data were obtained. These included the 100-m dish near Bonn, Germany, the largest fully steerable radiotelescope in the world. (Green Bank also has a 100-meter dish which is steered in the meridian.) The German facility is one of those used in the world-wide Very Long Baseline Interferometer (VLBI) network with others in Europe, the United States, Australia, and elsewhere. Some of the others Shaffer discussed included the 130-foot CalTech Owens Valley Observatory, where he did his post-graduate work.

Shaffer presented results obtained at wavelengths of 1.2, 2.8, 3.6, 18, and 20 cm.

As a basis for comparison, Shaffer first reviewed some of the common features of known quasars. He showed radio maps of a number of sources having jets of lengths from arcseconds to arcminutes. Issuing from the core of M 87 in Virgo is a well-collimated jet showing bright condensations and terminating in a large, diffuse cloud of material. Cygnus A, one of the earliest-discovered active galaxies, has a 100,000-lightyear-long jet spewing from its core. Another source shows a core with a shorter jet ending in a nebulosity. Quasar 3C120 displays two short, contradirectional jets. In the short time since a 1984 map of quasar 3C245 was made at 10.7gGz (2.8 cm). another core event has been observed. Two 10.7-GHz maps of 3C273, the prototypical quasar, separated by about 18 months, show material issuing from the core at an **apparent** velocity of 5 to 10 times c.

These examples illustrate some of the lingering, tantalizing questions posed by quasars (for some of which we now have answers): What is the source mechanism of their enormous energy? What is the memory mechanism that so accurately collimates the jets and maintains the direction in which matter is ejected for hundreds of thousands of years? What is it that aims all the (observed) apparently superluminal jets directly toward us? Are there others, aimed elsewhere, that we can't observe?

The superluminal illusion is a relativistic effect. If the jet is moving nearly toward the observer at almost but less than the speed of light, the light packet between the object and the light front is highly compressed. Hence, from the observer's position, the transverse velocity seems higher. From the higher transverse velocity and the slight angle of the jet from the line of sight, an apparent velocity greater than c is evident. For high intrinsic velocities and extremely small angles, the apparent velocity can be arbitrarily large.

Light from jets directly approaching the observer is brightened by relativistic focusing; receding jets are similarly dimmed. These brighter jets are the ones observed; there are probably ten to 20 times as many in other directions which are too faint to have been seen. A VLBI survey is being undertaken to detect some of these fainter jets.

Variations seen in these active sources within a few years indicate a core size of only a few light years. These cores are probbly very massive, perhaps spinning black holes, whose magnetic poles provide the steering of the highly ionized material (mostly electrons and protons) in the jets. While several theoretical possibilities are proposed, their nature is still unknown. It is one of today's primary astrophysical questions.

The present subject quasar, 4C39.25, has two fairly stable components separated about 2 milliarcseconds. Its behavior was indistinguishable from that of others and showed no changes for 7 or 8 years. Later, from about 1979 to 1985, VLBI observations at 2.8 and 3.6 cm showed a strange difference: An apparent jet coming from between the two components at an angular rate of 0.16

AIR AND SPACE MUSEUM OFFERS PROGRAMS

The folowing free, public programs will be held in the the National Air and Space Museum during June:

Saturday, June 4, 9:30 am -- Geoffrey Chester, planetarium staff, will present "Probing the Daystar," in the Einstein Planetarium. Although the Sun is a rather ordinary star, it is the only star which affects our lives; inded, our very existence is absolutely dependent upon it. Because it is so close, it is a veritable astrophysicl laboratory. Goeff will tell of some of the clever techniques with which we probe into the very heart of the Sun to learn its internal secrets.

Wednesday, June 15, 7:30 pm -- Rudolph E. Schild, Astronomer, Harvard-Smithsonian Center for Astrophysics, will present "The Color of the Universe" in the Einstein Planetarium. He will discuss the charge-coupled device (CCD), and its use in measuring wavelengths of starlight too faint for classical spectroscopy.

Thursday, June 16, 6:00-9:00 pm -- The Air and Space Museum presents "Fly by Night," one of a series of aviation and astronomical free family activities in which National Capital Astronomers features astronomical exhibits and activities.

AMERICAN ASTRONOMICAL SOCIETY MEETING SCHEDULED

The American Astronomical will hold its 172nd meeting June 5-9 in Kansas City Missouri. In conjunction will be the annual meeting of the AAS Solar Physics Division, and on Thursday and Friday, June 9 and 10, AAS and NASA's Solar Maximum Mission Project will host a special workshop featuring papers and working group sessions. The annual AAS Business Meeting will be held on Tuesday, June 7.

A wide range of interests will be addressed by many hardware demonstrations, papers, and discussions in sessions on federal funding, telescope instrumentation, polarimetry, recent results in stellar and solar physics, heliosphere structure, and astronomical software.

Special events will include an opening reception, AAS Recognition Night at the Kansas City Royals vs. Oakland A's game, with block seating, AAS picnic in Liberty War Memorial Park, and a banquet cruise on the Mississippi River Queen. Day care for children ages 2 to 12 can be arranged with the University. These extras are not included in the registration fee.

Registration for students, $30; AAS member before May 15, $85; nonmember before or after May 15, and AAS member after May 15, $105; Spouse, $20. Solar Max workshop, $25. For further information, call the AAS Executive Office, 328-2010.

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milliarcsecond per year, or an apparent velocity of about 4c. Previously, both of the outer sources were of about equal strength. Maps in 1985 and 1986 showed that the middle component was approaching the eastern one, and had become far the strongest, while the others had become weaker.

The two original components seemed too diffuse for either to be a real core. An effort was made to find the core with VLBI observations at a higher frequency, about 22 GHz, or 1.3 cm, where the real core was expected to appear more dense. Still neither component was dense enough to be a real core. The middle component was still the brighrest one.

Subsequent observations at various frequencies have not definitely identified the core source of the moving matter. The eastern component seems to be in the right place for the core, but doesn't look like a core. The source of the moving matter has a brightness spectrum which doesn't peak at high frequencies -- anothre puzzle.

The bright spot may be a result of standing shock waves or Kelvin-Helmholtz instability, and may slowly migrate down the jet. By about 1991 the bright component should arrive at the eastern component. Then perhaps further observations will tell more. It probably will pass in front of the eastern component with no interaction, but if there is a collision it should brighten.

Shaffer is looking forward to 1991, hoping to find answers to some of the questions and put to rest many of the speculations about the nature of 4C39.25, and perhaps about quasars generally. Robert H. McCracken

NCA ELECTS FISCAL 1989 OFFICERS

At the 7 May meeting, National Capital Astronomers elected the Nominating Comittee slate of fiscal 1989 officers: President, Walter I. Nissen, Vice President: Kenneth R. Short, Secretary: Patricia B. Trueblood, Treasurer: Ruth S. Freitag, Trustee: Robert H. McCracken, Sergeant at Arms: Eric O. Nystrom.

SCIENCE FAIR AWARDS IN 88 JUNE

Nine winners of the annual National Capital Astronomers High School Science Fair Awards will be presented one-year junior NCA memberships at the June lecture meeting:

Christopher Bass, J.F. Cooper Intermediate School, McLean, VA: **Sunspots and Radio Waves;**

Steve Chien, Takoma Park Intermediate School, Takoma Park, Maryland: **A Study of the Harmonic Convergence;**

Jeanne Chesley, McDonough High School, Pomfert, Maryland: **Saturn's Rings;**

Andrea Dickens, Lake Braddock High School, Burke, Virginia: **Differential Rotation of the Sun;**

Jennifer Lombard, Robinson High School, Fairfax, Virginia: **Locating "Planet X" using the Computer;**

Louisa Rebull, Yorktown High School, Arlington, Virginia: **Watching the Heavens from My Basement;**

Eric Schierer, Jefferson High School, Alexandria, Virginia: **Chaotic Manifestations in 3-differential Forms of the Planar Circular Restricted Problem;**

Rosemary Stuart, Nicholas Orem Middle School, Hyattsville, Maryland: **Sunspots and their Movement;**

Jonathan Worsley, McDonough High School, Pomfert, Maryland: **Can a Jovian Satellite Reveal the Speed of Light?**

We welcome these young people, and thank NCA Science Fair Judges, Robert Bolster, Stanley Cawelti, Anthony Frato, John Lohman, Jay Miller, and Walter Nissen, for their contributions to tomorrow's scientific leadership.

DISCUSSION GROUP ON MARS OPPOSITION

The June 18 NCA discussion group will consider observational projects for this summer's close opposition of Mars.

NCA discussion groups are multipurposed. They serve not only to unite those who are technically involved in the subject, but also as an opportunity for any interested person to learn at any level. Working groups on support areas often have their beginnings in these discussions.

Everyone is encouraged to attend and feel free to participate, whether to contribute technically or simply to **learn and enjoy!**

The group will meet at 7:30 pm at the University of DC, in Building 42, Room A06, just behind Building 44, which is on the north side of Van Ness Street, just west of Connecticut Avenue, NW, near the Metrorail Red Line Van Ness-UDC station.

Park under Building 44. (Tell the attendant you are attending a meeting.) Walk out the back of the garage a few feet to building 42. Take the elevator one floor up.

From Metrorail, as you emerge to the sidewalk, go to the left between the columns to the stairway on the left, up four short flights to the elevated walk to building 42. A06 is on the same floor.

If you have questions, call NCA: 320-3621.

MAY DISCUSSION GROUP

The May 21 discussion group proved to be of great interest to those who attended to discuss principles, techniques, methods, and devices for spectral imaging, primarily of the Sun. Several approaches were proposed, many interesting, useful ideas were exchanged, and several presented their designs for new equipment.

While the emphasis was on observation of the Sun in white light, hydrogen alpha, or the lines of other elements, many of the ideas expressed, exchanged, and developed will undoubtedly stimulate a much wider range of useful thoughts.

U.S. NAVAL OBSERVATORY TOURS IN JUNE

The Monday night public tours of the Naval Observatory will begin at 8:30 pm (EDT) on June 1, 8, 15, 22, and 29. Passes will be issued to the first 100 persons in line at the main gate at 34th Street and Massachusetts Avenue, NW, beginning at the scheculed time.

Visitors will see various observatory facilities and, weather permitting, appropriately selected celestial objects with the historic 26-inch Clark refractor with which the satellites of Mars were discovered.

For details, call the taped Observatory message: (202) 653-1543.

NASA GODDARD SCIENTIFIC COLLOQUIUM SCHEDULED

Friday, June 10, 3:30 pm, in Building 3 Auditorium: **"Rotating Fluids in Geophysics and Planetary Physics,"** Raymond Hyde, Meteorological Office, United Kingtom.

Coffee and tea will be served from 3:00. Enter the main gate and obtain a visitors pass from the guard. Call Jaylee Mead, 286-8543, for further information.

UNIVERSITY OF MARYLAND OPEN HOUSE SCHEDULES IN JUNE

The Astronomy Program, University of Maryland, holds open house on the 5th and 20th of each month at the University's Observatory on Metzerott Road in College Park. Talks and slide shows are presented, followed by telescopic sky viewing, weather permitting.

Sunday, June 5, 9:00 pm -- **"The Solar System,"** Dr. J.D. Trasco.
Monday, June 20, 9:00 pm -- **"Results from Comet Halley,"** by Dr. M.F. A'Hearn.

The public is invited; there is no charge, and no reservations are necessary for individuals. Groups larger than ten should call (301) 454-3001 at least 5 days prior to the program.

PAMELA CAWELTI

National Capital Astronomers extends deepest sympathy to NCA Trustee Stanley Cawelti and his family in the recent loss of his daughter Pamela in an automobile accident while she was vacationing in Mexico. Our hearts are with you, Stan.

EXCERPTS FROM THE IAU CIRCULARS

1. APRIL 26 -- The Ginga team reported that the Ginga spacecraft has detected an X-ray nova in Vulpecula. Not detectable on the 22nd, the source was six times as intense as the Crab Nebula at 2-7 keV on the 27th. Patrol photographs by McNaught showed no new optical objects brighter than magnitude 11.5.

2. April 30 -- The Berkeley Automated Search discovered a supernova of 16th magnitude in NGC 5480. Infrared photometry of the object on May 4 with the 5-m Hale telescope indicated that it was a type Ia supernova 10 days past maximum.

3. May 2 -- Neugebauer and Matthews, Palomar Observatory, found that quasar 3C289 was brighter in the near infrared than it has ever been in the past 20 years.

4. May 13 -- C. and E. Shoemaker and H. Holt discovered a comet (1988g) of 11th magnitude in Pegasus with the 46-cm Palomar Schmidt. Robert N. Bolster

FOR SALE

Celestron C-11, one of ten special precision telescopes made for NASA Halley Watch. "Motofocus" declination motor, wedge, tripod, special ATA-approved hard cases. $6500. Write: PO Box 5500, Washington, DC 20016, or call (202) 547-6911.

Criterion Dynascope, 6-inch f/8.3 pyrex mirror, solid equatorial mount, all metal tripod, electric drive, 6x30 finder, 9-mm and 12.7-mm eyepieces. Bought in 1981 for $280 + tax and shipping. Never used. Asking $225. June A. Cross, Evening: (301) 283-6379; Day: (301)753-9201. (Indian Head, MD.)

OCCULTATION EXPEDITIONS PLANNED

Dr. David Dunham is organizing observers for the following occultations. For further information call (301) 495-9062 (Silver Spring, MD).

Date	UT Time	Place	Vis Mag	Pcnt Sunlit	Cusp Angle	Min Aper
Grazing Lunar:						
06-27-88	04:15	Dreahook, NJ,	4.8	91	10N	5 cm
Asteroidal appulses*:			Star Mag	Delta Mag	Name	
06-09-88	02:50	Mexico	8.1	6.0	(426) Hippo	10 cm
06-13-88	06:54	Venezuela	7.1	6.0	(498) Tokio	5 cm

*Appulses to be observed for possible satellites or path changes.

NCA WELCOMES NEW MEMBERS

Charles M. Biggar
14746 Wycomb Street
Centreville, VA 22020

Michael G. Byrne
8160 Ships Curve Lane
Springfield, VA 22153

Camille C. Connolly
1717 Swann Street, NW
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Iron Mountain, MI 49801

Jeffrey D. Grant
PO Box 569
Chesapeake Beach, VA 20732

Andre Lehovich
5024 Macomb Street, NW
Washington, DC 20016

James E. Neff, Code
NASA GSFC Code 681
Lanham, MD 20771

ASTRONOMY AND PERSONAL COMPUTERS by Joan B. Dunham

New Computer Magazine -- The American Astronomical Society has started a combination magazine/scientific journal called **Computers in Physics.** This is intended to fill the gap between the magazines on computers, such as Byte and the scientific journals like the AAS Astrophysical Journal. The first issues have contained articles on science software for the Macintosh, on a survey of technical work processore, and on application of graphics to data processing. The May-June 1988 issue contained a paper on using spreadsheets in physics, and another on software for modeling nuclear processes.

There are six issues of the magazine per year. Individuals who are not members of AIP societies may subscribe for $25 per year for domestic mail delivery. For more information contact the AIP Marketing Services, 335 East 45th Street, New York, NY 10017-3483.

Editorial -- Recently I received two announcements of commercial software for astronomical computations, one being sold by a publisher, one being sold by the author. Both of them made me feel slightly uncomfortable, since they are similar to software I have written for myself in the past. One of them in particular, the simulation of n bodies interacting gravitationally, I find both amusing and slightly appalling. I used such a program for my dissertation research, and I could not then (and still cannot) imagine any reason to expect large numbers of people to pay $39.95 for a copy of the software. On the other hand, I was happy to provide a copy to anyone who was interested, and spent more than a few hours helping others get it to run on their computers. (This software no longer exists.) Many researchers give each other software, considering it no different from the exchange of ideas through papers and lectures, and many, myself included, use software in our research which has passed through many hands in the course of its development. Charging each other for this software, beyond perhaps a nominal charge for the media and for mailing expenses, would not seem advisble. There are not enough potential buyers of such specialized software to pay for the work of producing it if the charge is low (and I consider $39.95 to be low), and no one would pay the price if all the development costs were to be paid by a few buyers. The n-body program is being marketed as educational software, but I consider its educational value as marginal. I would think it a far more educational experience for the student to program the equations, rather than to run somebody else's package. I think the author of this package would have provided a much better service by preparing a package to assist students in writing their own programs.

Floppy Almanac Blues -- If you own a "true blue" IBM PC and have a version of USNO's Floppy Almanac that does not work on your machine, request another copy from USNO. The problem that causes IBM PC's to fail to run FA has been corrected. Those of us who bought clones instead of the real thing have no problems.

Public Domain Software -- To obtain this software, you may send me either diskettes and stamped, self-addressed mailers, or $1.00 for each floppy ($1.50 for two). These are MS-DOS DSDD diskettes. These are all public domain or freely distributable software packages from PC SIG or bulletin boards.

1. Generate total occultation predictions, written in GWBasic (two diskettes).
2. Asteroids II data base (three diskettes).
3. Six diskettes of public domain or shareware astronomy software, including ACE, Deep Space, Cluster, and ProCalc.
4. Six diskettes of C software, some designed to help learn C, some for designing windows in C, and, from Jeff Guerber, a copy of MicroEMACS and a spelling checker.

National Capital Astronomers, Inc.

is a non-profit, public-service corporation for advancement of the astronomical sciences. NCA is an affiliate of the Washington Academy of Sciences.

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 colloquia held at the National Air and Space Museum of the Smithsonian Institution. 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 *Sky & Telescope* magazine and the NCA *Star Dust*.

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.

The Telescope Selection, Use, and Care Seminar, held annually in November, offers the public guidance for those contemplating the acquisition of a first telescope, and dispells the many common misconceptions which often lead 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 and other astronomical items.

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

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( ) Junior (Only open to those under age 18.) Date of birth_____

Junior members pay a reduced rate and may elect not to receive Sky & Telescope.

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Street or box Apartment City State Zip

The following information is optional. If you would like to participate actively in NCA affairs, please indicate briefly any special interest, talent, skills, vocation, education, experience, or other qualifications which you might contribute. Thank you, and welcome!

NOTE: If you already subscribe to Sky & Telescope, please attach a recent mailing label, or indicate expiration date:_____. An adjustment will be made. Make check payable to National Capital Astronomers, Inc., and send with this form to: Patricia B. Trueblood, Secretary, 10912 Broad Green Terrace, Potomac, MD 20854.

LIGHT POLLUTION IS A CURSE!

. . . but it is better to extinguish a light than to curse the brightness! Join the International Dark-sky Association. Ask National Capital Astronomers: (301) 320-3621.

STAR DUST

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FIRST CLASS