

STAR DUST



Volume XLIII

April 1987

Number 8

No Lecture in April; NCA Members to Discuss Activities

In a departure from the normal National Capital Astronomers technical lecture format, the April meeting will hear three NCA members discuss their activities in five organizations.

Dr. Richard Taibi will speak on the American Meteor Society, Dr. Joan Dunham will discuss the International Occultation Timing Association, and Jay Miller will talk on the American Association of Variable Star Observers, the Association of Lunar and Planetary Observers, and the International Amateur and Professional Photoelectric Photometry Association.

National Capital Astronomers serves the science at all levels; it is hoped to offer those who have only a casual interest in astronomy an approach to enjoyable, potentially useful involvement without the necessity of formal training in the field. It is further hoped that this program will stimulate attendance at the mid-monthly discussion groups where such subjects are customarily addressed tutorially at any desired level.

FEBRUARY CALENDAR -- *The public is welcome.*

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

Friday, April 2, 8:00 pm; 17, 9:00 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, April 4, 6:00 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, April 4, 8:15 pm -- NCA monthly meeting in the Einstein Planetarium of the National Air and Space Museum, Seventh Street and Independence Avenue, SW. (Enter Independence Avenue side.)

Saturday, April 17, 8:00 pm -- Discussion group on radio astronomy; possible initiation of an NCA working group. 4250 Connecticut Avenue, NW, Suite 510, alongside the Red Line Metrorail UDC exit. Use the plaza entrance.

Friday, April 24, pm -- NCA visits Hopewell Observatory, occultation of Venus. See page 31.

WASHINGTON ACADEMY AWARDS FOR SCIENTIFIC ACHIEVEMENT

On April 16 at 8:30 pm the annual Washington Academy Awards for Scientific Achievement will be presented in the Mary Gradow Center of American University, Massachusetts and Nebraska Avenues, NW. The meeting will be chaired by Robert H. McCracken, and the awards ceremony will be conducted by Dr. Simon Strauss, W.A.S. President, and Awards Chairman Dr. Frank Yekovich.

The 8:30 pm meeting will be preceded by a reception at 6:45 and dinner at 7:30. It is not necessary to attend the reception and dinner to attend the ceremony, and there is no charge for the ceremony only. For dinner reservations call 320-3621 by Monday, April 13. Important: Park in lot on south side of Nebraska Avenue (\$1.50 if attended) and ask attendant for a car pass for the Academy program.

National Capital Astronomers is an affiliate of the Washington Academy of Sciences; members will find it worthwhile and are encouraged to attend Academy functions. For information, call 320-3621.

U.S. NAVAL OBSERVATORY COLLOQUIUM SCHEDULED.

On Wednesday, 1 April at 3:00 pm, Dr. Robert Etkins, National Climate Program, NOAA, will speak on "Ice Sheet Mass Balance and Thermohaline Ocean Circulation -- an Interactive Mechanism for Cross-Equatorial Heat Transfer." Coffee will be served at 2:40. The colloquia are held in Building 52, Room 300. Parking is available behind the building.

NCA members are welcome. Enter the main gate at Massachusetts Avenue and 34th Street, NW, where the guard will require some identification and provide directions. For further information call 653-1513.

NASA GODDARD COLLOQUIA SCHEDULED

The April GSFC colloquia will be held on Fridays at 3:30 pm in Building 3 Auditorium, Goddard Space Flight Center, Greenbelt, Maryland. Coffee and tea will be served from 3:00 pm. Request car pass and instructions at the main gate.

April 3 -- Baerbel Lucchita, US Geological Survey, will describe "Martian and Terrestrial Global Features."

April 10 -- Herschel B. Snodgrass, Lewis and Clark College, will present "A New View of the Sunspot Cycle."

April 17 -- William K. Hartmann, Planetary Science Institute, will speak on "The Origin of the Moon."

April 24 -- Raymond Davis, University of Pennsylvania, will describe "Solar Neutrino Experiments."

MARCH LECTURE

Dr. James Kurfess, Head of the Gamma- and Cosmic-ray Astrophysics Branch of the Naval Research Laboratory, addressed National Capital Astronomers March 7 meeting on advances in gamma-ray physics. He discussed recent solar-flare observations by the gamma-ray spectrometer on the Solar Maximum Mission spacecraft (SMM), results of observations of some celestial sources, and some possible observations of the new supernova 1987A in the Large Magellanic Cloud, only about 60 kiloparsecs away. He also described the projected Gamma-Ray Observatory, the next major U.S. mission in this area.

Gamma ray photons are of the highest energy observable. Until recently, progress has been slow because of the low flux levels available. With the launch of the SMM in 1980, much progress has been made. Originally designed as a one-year mission to encompass the solar activity peak, it was repaired in orbit in 1984, and is a valuable asset to gamma-ray astronomy.

The gamma-ray spectrometer consists of an array of seven three-by-three-inch sodium iodide crystals with photomultiplier scintillation sensors. The 120-degree full-width-half-maximum (FWHM) field is defined by surrounding cesium iodide crystals. The observed spectral range is from 300 keV to 10 MeV, with a capability of extension to higher energies.

Prior to SMM some indication of nuclear gamma-ray processes had been observed in only two or three flares. SMM has since yielded data on well over a hundred solar flares.

Kurfess showed examples of SMM flare spectra rich in emission lines produced by energetic proton reactions with material in the chromosphere and photosphere. Lines of C 12, N 14, O 16 nuclei were present. Comparisons of ratios of lines, high-energy gamma rays and neutrons produced, energy spectra of protons and electrons and relative timings yield clues to the acceleration processes in flares.

The SMM gamma-ray spectrometer also directly detected high-energy solar-flare neutrons for the first time.

SMM also carries an X-ray spectrometer. Fourier analysis of X-ray burst arrival times during several years of the extended mission has disclosed a 154-day quasi-periodicity in X-ray flares. These observations have been supported by subsequent analysis of X-ray and even radio data obtained during previous activity cycles. This cyclic behavior, not yet fully understood, is probably a result of some activity deep within the Sun.

Although centered generally on the Sun, the wide field has allowed SMM to detect more than 150 cosmic gamma-ray bursts, some of them extremely energetic, and showing an approximately 8-second periodicity, probably from a neutron star. With SMM, the detected spectra of gamma-ray bursts has been extended to the extremely high energies that now seem typical of such bursts, some as high as 100 MeV. The emission mechanism is not yet well understood.

Extension of gamma-ray spectroscopic capability to these extreme energy levels is hoped to result in detection of lines of Be 7, isotopes of N and O, and Na 22 produced by novae. The short half-lives of these isotopes make detection difficult. Al 26, however, has a half life of about a million years; it has been detected by the High-Energy Astronomical Observatory (HEAO) satellite at 1.809 MeV along the galactic plane. The unknown source may be an accumulation from the 10 to 100 million novae that have occurred during the past million years.

Ti 44, Co 56, and Ni 56 are generated mainly in supernova. The typical light curve of a type Ia supernova displays an exponential decay with a half life 60–70 days. This suggests that the main energy source is the decay of Co 56. If so, strong lines at 0.5 MeV, 847 keV, and 1.238 MeV should be detected following a supernova event.

Another feature previously detected and now sought by SMM is a 0.5 MeV line due to positron annihilation in the galactic plane. First detected from a balloon, later temporarily seen by HEAO-C, the unknown source seems to be smaller than 1/2 light year in diameter. This has led to speculation about a black hole at the galactic center, but several sources are possible.

The search for direct evidence of nucleosynthesis in either novae or supernovae is at this moment blessed with an excellent candidate, 1987A, in the Large Magellanic Cloud. At about 50 kiloparsecs (about 160 kilolightyears), it is the closest supernova in hundreds of years! The 12th-magnitude B3 supergiant Sanduleak -69 202, was originally thought to be the progenitor, but its UV spectrum, subsequently detected by the International Ultraviolet Explorer (IUE) satellite, showed that it was not. The observation was made possible by a dramatic decrease in radiation from 1987A in the 100 to 200 nm range. A search of previous plates of the area indicates that the progenitor probably was several magnitudes dimmer than 12, suggesting a less-massive star, perhaps about 10 solar masses. The spectrum indicates a type II supernova, but it appears not to be a classical type. It seems to have stabilized at about magnitude 4.

It is expected that SMM should easily detect Co 56 lines at 812 and 847 keV from 1987A. If the source is a type Ia supernova (a white dwarf which accretes mass in a binary system until the Schwarzschild limit is exceeded), the lines should be observed within about a month after the event, and will be greatly Doppler broadened by the high expansion velocity. A type II supernova (an early-type supergiant, O or B), expanding less rapidly, might require a year or two before the shell has become sufficiently transparent to allow spectroscopy of the core. Much narrower lines should be seen.

Kurfess concluded by describing briefly the next major plans for gamma-ray observations in space: The Hubble Space Telescope (HST), Gamma-ray Observatory (GRO), Advanced X-ray Observatory (AXO), and Infrared Observatory (IRO). Kurfess is Principal Investigator for the Oriented Scintillation Spectrometer Experiment (OSSE), one of the four GRO instruments.

Robert H. McCracken

OCCULTATION EXPEDITIONS PLANNED

Dr. David Dunham is organizing observers for the following occultations. For further information call Dave at 585-0989.

UT	Place	Vis Mag	Pcnt Sunlit	Cusp Angle	Min Aper
Date	Time	Star Mag	Delta Mag	Name	
Grazing Lunar:					
04-07-87 00:51	Hightstown, NJ	6.8	57	10N	5 cm
04-30-87 01:07	Fredericksburg, VA	7.8	09	14N	5 cm
Asteroidal and Lunar:					
04-07-87 03:51	Mexico*	7.6	4.3	(11) Parthenope	5 cm
04-11-87 05:08	Maine	8.5	7.0	(298) Baptista	5 cm
04-13-87 01:07	E. Canada*	9.5	2.4	(19) Fortuna	10 cm
05-03-87 08:39	DC	8.6	2.5	(54) Alexandra	15 cm

* Appulse. Observe for possible satellites or for path change.

NCA WELCOMES NEW MEMBERS

Dr. George J. Fleury
1005 Abbey Way
McLean, VA 22101

Anthony and Claudine Garbe
9999 Old Georgetown Road
Bethesda, MD 20814

David and Emily Johnson
16621 Killdeer Drive
Rockville, MD 20855

Scott and Jacqueline Turnquist
637 Chase Avenue
Annapolis, MD 21401

Todd Ullery
926 North Calvert Street
Baltimore, MD 21202

NCA INVITED TO HOPEWELL CORPORATION OBSERVATORY

NCA members, families, and their guests are invited to explore the spring night sky at Hopewell Observatory on Friday, evening, April 24. Come early (any time after 4:00 pm) and bring your prepared picnic dinner if you wish. (...and stay as long as you like, of course!) Coffee, tea, cocoa, and soft drinks will be provided by the Hopewell Corporation. Dress warmly; observatory is not heated (the operations building is, however).

From the Beltway, go west on I-66, 25 miles to the Haymarket exit, left 0.25 mile to traffic light, right on Route 55, 0.75 mile to County Road 681, right 3.2 miles to end, left on County Road 601 (gravel) 1.2 miles to County Road 629, right on 629, 0.9 mile to narrow paved road on right (Directly across from easier-to-see entrance gate with stone facing on left). Turn right, go 0.3 mile to top of ridge, go around microwave station and continue on dirt road through woods a few hundred feet to the observatory. ⁷⁰³ Carpooling is recommended. Further information? Call NCA: 320-3621.

NCA VOLUNTEERS NEEDED FOR SMITHSONIAN GARBER OPEN HOUSE

On Saturday and Sunday, April 25 and 26, from 10:00 am to 3:00 pm, volunteers are needed to assist NCA in the National Air and Space Museum's Paul E. Garber Facility open house. Members who can devote some time please call President Stanley Cawelti at home: (703) 250-5154 (Clifton, VA), evenings, or NCA: (301) 320-3621 (local, 24 hours).

AIR AND SPACE MUSEUM OFFERS QUASAR TALK, TELESCOPIC SKY VIEWING

On Wednesday, April 15, at 7:30 pm, in the Albert Einstein Planetarium of the National Air and Space Museum, Dr. John Huchra, SAO astronomer and professor of astronomy at Harvard will discuss new data from recent surveys of the distribution and formation of galaxies.

Following the talk, weather permitting, NCA President and NASM Docent Stanley Cawelti will offer telescopic sky viewing on the east deck.

On Saturday, April 4, at 9:30 am, John T.H. Callen II, NASM staff, will conduct an armchair tour of the observatories on Kitt Peak.

Weather permitting, Stanley Cawelti will provide safe telescopic viewing of the Sun in hydrogen alpha.

ASTRONOMY AND PERSONAL COMPUTERS

When transferring programs in BASIC from one computer to another it is nice to avoid retyping, but it is not always obvious how to transfer it to another machine.

The BASIC language is the most widely used language on personal computers, but it has no discernible standards. A look at the various implementations of the language shows that while there are elements common to all BASICs, each implementation has its own special features. This can make conversion of Basic programs from one machine to another double the work, since you need to know both of the BASIC language implementations.

Before work begins on conversion of the statements, however, the program must be physically transferred to the new BASIC, whether on the same or another machine. This is complicated by the use of tokens (numbers) to store BASIC keywords. Instead of spelling out the command "END," Applesoft BASIC, for example, uses "128." The use of tokens reduces the amount of space needed for program storage, as well as the time needed to load the programs. But it also means that any given BASIC cannot read directly any other BASIC's programs (there are exceptions), since different tokens are used in each BASIC. The programs must be stored in non-token form. GW BASIC has an ASCII (American Standard Code for Information Interchange) option on the SAVE command, but Applesoft BASIC requires that the user run a small program that LISTS the program to a disk file. Once the program is stored in an ASCII text file, it can be transferred from one machine to another as a text file.

Joan B. Dunham

EXCERPTS FROM THE IAU CIRCULARS

1. February 24 -- Ian Shelton and Oscar Duhalde at the Las Campanas Observatory discovered a supernova (see also March issue) of 5th magnitude in the Large Magellanic Cloud. F.M. Bateson in New Zealand independently discovered it a few hours later. Photographs taken the previous night showed Supernova 1987A at 8th magnitude. It brightened to 4th magnitude, where it remained at last report. Early spectra showed a strong continuum with broad H alpha, beta, and gamma absorption lines. During March, emission lines and other broad absorption lines appeared, and the H absorption-to-emission ratios changed. The expansion velocity initially was 18,300 km/s, decreasing by 780 km/s/day. The progenitor star has not yet been identified. The closest candidate appears to be still intact, as its spectral lines are seen along with those of 1987A. Neutrino detectors in Japan and near Cleveland, Ohio, observed simultaneous bursts of 11 and 8 neutrinos during a period of a few seconds on February 23. A similar burst reported at the Mont Blanc detector a few hours earlier was not confirmed.

2. February 24 -- R. Evans, New South Wales, discovered a supernova of 15th magnitude in NGC 5850.

VENUS OCCULTATION EARLY ON 25TH

Those who are at Hopewell Observatory on April 24-25 (see page 31) will have an opportunity to see an occultation of Venus about 5:25 Saturday morning. The gibbous Venus will be occulted by the bright, thin crescent of the Moon. About an hour later, Venus will emerge from behind the dark, western limb of the Moon.

Venus will be bright enough to be seen in the daylight with the telescopes, but a deep yellow to red filter will increase the contrast either visually or photographically.

Of course, if you have moderate optical aid and a southeastern horizon below about 15 degrees, you don't have to be at Hopewell Observatory, but you are welcome to join the NCA visit.

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WASHINGTON, D.C.



Published eleven times yearly by NATIONAL CAPITAL ASTRONOMERS, INC., a non-profit, public-service corporation for promotion of astronomy and related sciences through lectures, expeditions, discussion groups, tours, classes, public programs, and publications. NCA is an affiliate of the Washington Academy of Sciences. President, Stanley G. Cawelti. *Star Dust* deadline 15th of preceding month. Information: (301) 320-3621. Material for publication: Robert H. McCracken, Editor, 5120 Newport Avenue, Bethesda, MD 20816.

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