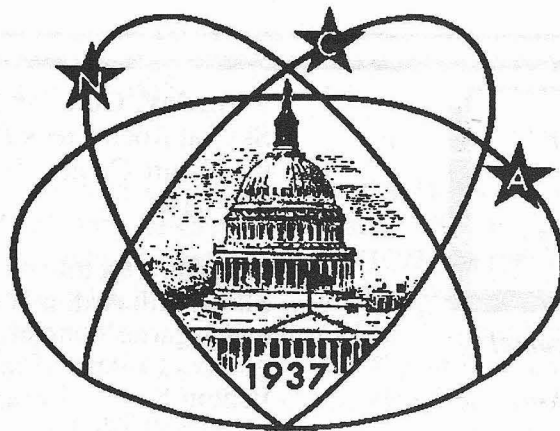


Star



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National Capital Astronomers, Inc.

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David Thompson to Speak on Gamma Ray Sky

Nancy Byrd

The next meeting of National Capital Astronomers is on October 3, 1992 at 7:30 PM at the National Institutes of Health (in the Bunim Room on floor 9 of the Clinical Center (Building 10). At this colloquium, Dr. David Thompson will speak on the subject, "Pulsars, Quasars, and Bursts: Early Results from the Compton Gamma Ray Observatory."

The Compton Gamma Ray Observatory has been surveying the gamma-ray sky since April, 1991. During the early observations, the four scientific instruments have studied a wide variety of astrophysical topics, including solar flares, gamma-ray lines, and unidentified gamma-ray sources. Three topics illustrate the variety of results emerging from the Compton Observatory: (1) The large-scale distribution of gamma-ray bursts appears to be isotropic but not homogeneous, contrary to many expectations. (2) Observations of pulsars provide information about particle acceleration and about supernovae which may have been visible from Earth. (3) Several quasars and

BL Lacertae objects appear to be extremely luminous yet time-variable in high energy gamma rays, suggesting large energy concentrations in jets emerging from the central objects. Dr. Thompson will explore these topics and their significance at the NCA October 3rd meeting.

Dr. Thompson, whose special scientific interest is gamma-ray pulsars, received his undergraduate degree from the Johns Hopkins University and his Ph.D. in physics from the University of Maryland. He is presently a Co-Investigator on the Energetic Gamma Ray Experiment Telescope (EGRET) on NASA's Compton Gamma Ray Observatory. In April, 1992, he received Goddard's Exceptional Achievement Award for his work on EGRET. He lives in Bowie, Maryland, with his wife and two daughters.

Dr. Thompson spoke to NCA in January of 1979. We welcome him back and look forward to another interesting talk from Dr. Thompson.

October Calendar

The Public is Welcome!

Saturday, October 3, 5:30 PM - Dinner with the speaker at Frascati's Restaurant in Bethesda before the monthly meeting. Reservations are for 5:30 Sharp!

Saturday, October 3, 7:30 PM - David Thompson (NASA Goddard Spaceflight Center) "Pulsars, Quasars, and Bursts: Early Results from the Compton Gamma Ray Observatory." 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.

Friday, October 2, 9, 16, 30, 8:30 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 (703) 960-9126.

Saturday, October 17, 8:00 PM - "Exploring the Sky" at Rock Creek Park on Glover Road, NW, near the Nature Center. Information: John Lohman, 703/820-4194.

Saturday, October 17, 8:00 PM - Music/Laser Light Show with Arthur Harrison (tone poems) electronic avant-garde nonmelodic and nonrhythmic at Montgomery College's Planetarium, Takoma Avenue and Fenton Street. Information: Dr. Harold Williams, (301) 650-1463.

Saturday, October 24, 7:00 PM - "Splendors of Star Formation" at Montgomery College's Planetarium, Takoma Avenue and Fenton Street. Information: Dr. Harold Williams, (301) 650-1463.

Saturday, October 24, 5:30 PM to ?? - Open House at Hopewell Observatory. For directions see September Star Dust. Cancelled if it is raining or hopelessly cloudy. For further information call (703) 960-9126 or (301) 320-3621.

Next Month:

Saturday, November 7, 7:30 PM - Dr. Judith Lean (E. O. Hulburt Center for Space Research, Naval Research Laboratory) - "Solar Variability: Implications for Global Change"

Recent Results from the Cosmic Background Explorer

by *John Graham*

On September 12, National Capital Astronomers were privileged to hear a talk by Dr. Gary Hinshaw of the Universities Space Research Association (USRA) about new results from the Cosmic Background Explorer satellite, COBE. Dr. Hinshaw is a member of the analysis team which is working on this project and we were given a truly inside view of the important new results that are now appearing. COBE, the first satellite which is devoted to the study of cosmology was launched on November 18, 1989 with the mission to study the radiation from the early universe. It still orbits the Earth once every 103 minutes and is continuing to collect data.

By way of introduction, Dr. Hinshaw sketched some background in cosmology. There are three principal observational resources that we can call upon. One is the observed recession of the galaxies, the second the abundance of light elements in the universe and third the cosmic microwave background. The first body of evidence tells us that the universe is expanding now and implies that in the remote past it was in a very high

density state. It sets the scale of the expansion. The other two fields of investigation reveal a surprising amount of information about this early universe during the first several hundred thousand years of its 15 billion year lifetime. The observed abundances of the light elements lithium, beryllium, boron (along with deuterium) in fact cannot be understood without an early high-temperature, high-density stage of the universe and agree well with current models of the expansion. At the end of this period came the stage when matter and radiation decoupled, when photons could propagate freely through matter without interaction and the universe became transparent to light. It is this epoch which is the one of principal interest to the COBE people.

Here, at a redshift of approximately 1100, we see back to the earliest time observable with electromagnetic radiation. COBE's basic task is to map on the sky this surface of last scattering, to measure the temperature of the gas as it appears today and to look for non-uniformities in the background. As the universe continues to cool and evolve, we expect to be able to see the formation of large structures with densities higher than average which will eventually form galaxies and stars. Efforts have been made to detect large scale anisotropies in the background radiation from the

See HINSHAW, Page 3

Excerpts from The IAU Circulars

by R.N. Bolster

1. August 2 - S.J. O'Meara and W. Sheehan, using the 1-m reflector at Pic du Midi Observatory, observed cloud activity on Saturn. An oval cloud with a white core was seen between the Equatorial Belt and the North Equatorial Belt with extensions into the NEB. On Mars they observed dust storm clouds at several locations in the southern hemisphere.

2. August 28 - Howard J. Brewington, Cloudcroft, New Mexico, discovered a comet (1992p) of 10th

magnitude in eastern Auriga with a 40-cm reflector. 3. August 29 - E.F. Helin and K.J. Lawrence discovered a comet (1992q) of 15th magnitude in Cetus with the 46-cm Schmidt telescope at Palomar. Comet Comments: Neither of these comets will be bright enough to observe easily. Comet Brewington passed perihelion in June. Comet Helin-Lawrence will not reach perihelion until March, but will be 2 AU from the Sun and far south in the sky.

HINSHAW From Page 2

ground, aircraft and balloons, but it appears remarkably uniform. It is much better to do this measurement from space. Long flight duration, total sky coverage and elimination of atmospheric background make a satellite a particularly good observer of the background radiation.

COBE has three separate experiments which all have different missions. The Differential Microwave Radiometer (DMR) was designed to obtain definitive measurements of the large angular scale anisotropy. The Far InfraRed Absolute Spectrophotometer (FIRAS) measures the spectrum of the microwave background. Finally, the Diffuse InfraRed Background Experiment (DIRBE) looks for cumulative emission from primeval galaxies and other luminous objects formed at a slightly later stage of the expansion. Results from DIRBE are still being analyzed and it will be some time before we hear about them. FIRAS produced relatively quickly the important result that the spectrum of the background fits very closely a black body with temperature 2.735 ± 0.06 K, exactly the form expected from emission by a thermal source. However, it was the DMR experiment which held center stage in our talk and which Dr. Hinshaw discussed in

the most detail.

In the DMR experiment, 3 telescopes are arranged around the outside of a dewar on the flight deck of the satellite. Each observes at a different frequency, 31.5, 53 and 90 GHz and contains two antennas pointed 60 degrees apart in the sky. The sky is scanned as the satellite spins in its polar orbit giving a full sky coverage every six months. Temperature differences are measured via radiometers attached to the two antennas. Temperature difference maps are obtained by a gigantic least-squares solution to the observed readings as a function of position in the sky. Each radiometer has two channels so that the receiver noise can be calibrated. At each frequency a map is obtained from the sum and from the difference of the two channels. The summed two channel maps provide an estimate of the observed scatter in the signal over the sky, the difference maps provide an estimate of the radiometer noise.

A tremendous amount of computational effort goes into the reductions. Many effects must be allowed for. Systematic radio interference from the Earth and other

See HINSHAW, Page 4

From the Secretary

Since Sky & Telescope (S&T) subscriptions have been uncoupled from NCA membership, it will no longer be necessary for members to pay their dues at the same time they renew their S&T subscriptions. If the two payments come due at about the same time, however, they may continue to pay both simultaneously with combined checks. Up until now, I have been mailing NCA renewal bills over four months prior to membership expiration dates. From now on I will mail NCA bills only three months in advance because members not subscribing to S&T should not be asked to pay their dues too far in advance just for the convenience of S&T subscribers.

When your S&T renewal notice comes, you may immediately send it and a check for \$22 directly to NCA Treasurer, Jeffrey Norman (Phone: 202-966-0739), or you may wait about a month for your NCA bill to come and send a \$46 check to me with your renewal application. If at the time your bill arrives you have already resubscribed to S&T or do not wish to subscribe, you need send me only your NCA renewal application and a check for \$24.

Leith Holloway, NCA Secretary
Phone: 301-564-6061

NCA Treasurer's Report for July 1, 1991 to June 30, 1992

1. GENERAL FUND

INCOME

Dues	\$9,106.00
Interest	224.22
Sale of Observer's Handbooks	300.00
Sale of Telescope	200.00
Telescope-making classes	698.00
Miscellaneous Income	97.00

Total Income	\$10,625.22
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EXPENSES

Insurance	\$ 328.00
Int'l. Dark-Sky Association dues	100.00
Purchase of Observer's Handbooks	291.00
Secretary	1,094.01
Sky & Telescope subscriptions	4,374.00
Speaker's Dinners	117.77
Star Dust	3,696.19
Telephone	253.23
Miscellaneous Administration	253.13

Total Expenses	\$10,507.33
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Excess Income over Expenses	117.89
Balance on July 1, 1991	6,082.62

Balance on June 30, 1992	\$6,200.51
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2. NCA TRAVEL

Balance on July 1, 1991	\$1,993.04
Interest in Fiscal 1992	94.65

Balance on June 30, 1992	2,087.69
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GENERAL FUND BALANCE	6,200.51
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3. TOTAL NCA BALANCE on June 30, 1992	\$8,288.20
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HINSHAW From Page 3

nearby objects must be taken into account, for example. After they are removed, a dipole anisotropy remains the largest component. This is almost certainly due to the doppler motion of the solar system with respect to the cosmic microwave background. At the next level, the Milky Way contributes a substantial excess which can be removed by modelling with the knowledge of the radiation spectrum. When this is done we are left at each frequency with a blotchy, all-sky pattern which is mostly but not entirely noise. Comparison between the summed two-channel and the difference maps can quantify this small inequality. It is not possible to point to any one of these features and say whether it is real or not. One only can say that there is an excess in the fluctuations which cannot be accounted for by instrumental noise or any other effect. If one smooths these structures over the whole

sky a quadrupole excess/deficiency is seen which represents what is probably the largest observable feature in the our universe.

The size of the fluctuations agrees well with that expected from the inflationary theory of the universe which predicts that they should result from quantum fluctuations in its early microscopic stage. It is disturbing to note that another prediction of the inflation model is that we have to regard 98% of the matter in the universe as still unseen.

Data are still coming in from COBE. Only the first year's crop has been looked at so far. Up to four years of data will ultimately be combined to give measurements of higher precision. Then we have the DIRBE observations to look forward to. It is an exciting time to be around.

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 *Sky & Telescope* magazine and the monthly publication of NCA, *Star Dust*.

The NCA Public Information Service answers many as-

tronomy-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 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 and other astronomical items.

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

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Note: If you already subscribe to *Sky & Telescope*, please attach a recent mail label, or indicate the expiration date: _____. A prorated adjustment will be made. Make check payable to National Capital Astronomers, Inc., and send with this form to:

Leith Holloway 10500 Rockville Pike Apartment. 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

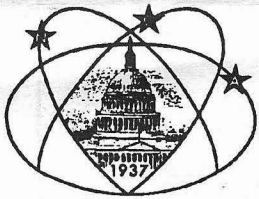
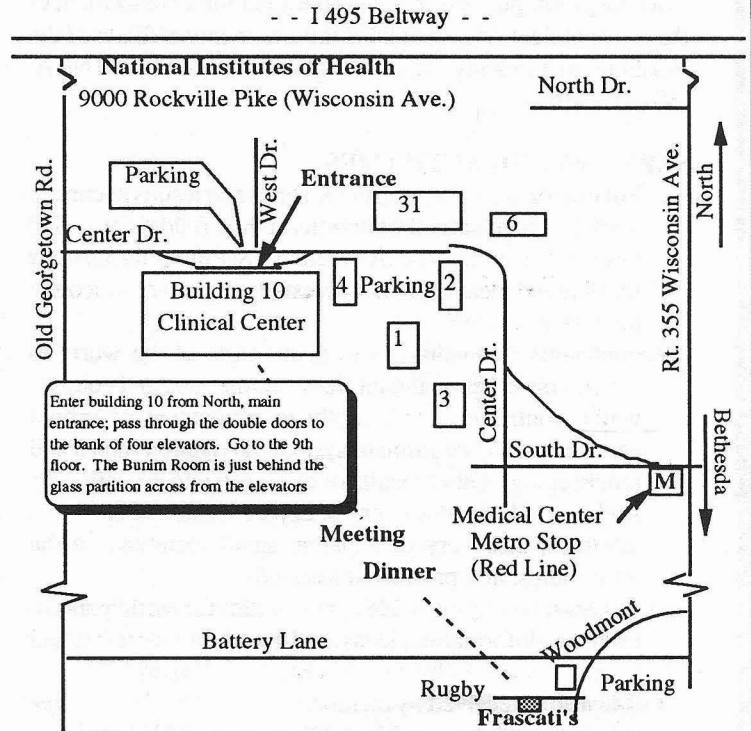
Thank you, and welcome!

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.

•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, Nicoletta Stephanz, 202-332-7756. NCA Phone Number is 301/320-3621.



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