



WESTERHOUT TO ADDRESS JOINT NCA - ACADEMY MEETING



DR. WESTERHOUT

Dr. Gert Westerhout, Scientific Director, U. S. Naval Observatory, will address a joint meeting of National Capital Astronomers and the Washington Academy of Sciences, of which NCA is an affiliate, on 4 February, at 8:15 pm, at the U.S. Department of Commerce Auditorium. He will discuss new and exciting results of and prospects for greater accuracy in astrometry through the use of optical and infrared interferometry, very-long-baseline interferometry (VLBI), charge-coupled-device (CCD) arrays, and various astrometric satellites.

He will describe what has been done and the results of recent achievements of greater accuracy in positions, proper motions, and parallaxes, and the new horizons anticipated from the accuracy of what lies ahead.

Born in the Netherlands, Dr. Westerhout received his Ph.D. in astronomy from Leiden University in 1968. He immigrated in 1962 to become Professor and Director of the new Astronomy Program of the University of Maryland, and became a United States citizen. He built the Maryland astronomy program to one of the top ten.

In 1967 he left the University to become Scientific Director of the U.S. Naval Observatory. Dr. Westerhout's primary interest has been radioastronomical determination of the structure of the Milky Way Galaxy. He published the first catalog of radio sources in the galaxy, and scores of papers on radioastronomy. At the U. S. Naval Observatory he is in charge of the Nation's fundamental astronomy effort, both radio and optical, including astrometry and time determination.

Among the many functions he has served, he is a recent past-president of the Commission on Radioastronomy of the International Union of Radio Science.

FEBRUARY CALENDAR — *The public is welcome.*

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

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

Friday, February 3, 10, 24, 8:00 pm — NC^A 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, February 4, 6:15 pm — Dinner with the speaker at the Thai Room II, 527 13th Street, NW. Reservations unnecessary.

Saturday, February 4, 8:15 pm — Joint monthly meeting of National Capital Astronomers and the Washington Academy of Sciences. U.S. Department of Commerce Auditorium, 14th and E Streets, NW. Dr. Westerhout speaks.

Saturday, February 18, 8:00 pm — Discussion group with Dave Dunham: Plans for the solar eclipse of 30 May in Virginia. See page 23. Department of Commerce Auditorium, 14th and E Streets, NW, Conference Room D.

JANUARY LECTURE

Dr. Carroll O. Alley, Professor of Physics at the University of Maryland, addressed the January meeting of National Capital Astronomers on the use of laser lunar ranging to test theories of gravitation.

Just as Newton used the observed motion of the Moon to test his theory, general relativity and its competitors have been tested in recent years by measuring the time required for a laser pulse to travel to the Moon and return.

In Newton's time it was known that the Moon's angular motion corresponds to motion in a varying ellipse. The plane of the Moon's orbit is inclined to the ecliptic, the orbital plane of the Earth, by approximately 5 degrees. The line of intersection of these planes rotates westward around the ecliptic in 18.61 years. Relative to the vernal equinox, the perigee of the Moon's orbit rotates eastward around the orbit in a period of 8.85 years. Additional motions were known, including monthly variations in the eccentricity of the Moon's orbit and in its inclination to the ecliptic. Newton established that these variations in the Moon's orbit were effects of the Sun's gravity predicted by his theory.

Arrays of corner reflectors were placed on the Moon during the American Apollo program and the Russian Lunakhod program. These reflectors have made it possible to measure the range from the McDonald Observatory 2.7-meter telescope to several points on the Moon with an accuracy of 10 centimeters. A 1-Joule pulse from a ruby laser, with a duration of 3 nanoseconds, is sent through the telescope toward the Moon. At arrival on the Moon, the pulse has spread to a diameter of several kilometers. A reflector array sends a small part of the light back in precisely the direction from which it was received. The reflected pulse spreads to about 16 kilometers in diameter during its 1.3-second return to the McDonald telescope. Out of 10^{20} photons sent to the Moon in 10 pulses, only about one is observed by the photomultiplier used to detect the returning pulses. To separate the returning pulses from ambient light, only light within a 1-Angstrom wavelength band, arriving near the expected time from a 6-arcsecond-diameter region of the Moon, triggers the detector.

Range observations have been compared to a numerical integration of the motion of the Moon. The equations of motion include the effects of general relativity, as well as parameters with which it would be possible to adjust for deviations from general relativity.

The observed ranges are in accord with the predictions of general relativity. Einstein's principle of equivalence implies that all bodies accelerate at the same rate in a gravitational field. To be consistent with the observations, any difference between the accelerations of the Earth and Moon toward the Sun must be less than five parts in a trillion. This contradicts the predictions of the Brans-Dicke gravitational theory.

Laser ranging may eventually establish whether the gravitational constant, G , varies with time, as predicted by Dirac. The secular acceleration of the mean longitude of the Moon has been determined from laser range measurements. T. Van Flandern has compared the results of this method to secular acceleration values determined by classical dynamical techniques. His comparison suggests, but does not prove, that G varies. As range observations are gathered over a longer time, additional tests for variations in G will become possible.

Laser ranging equipment presently under construction at the University of Maryland is expected to permit range measurements accurate to one centimeter.

Suggested further reading is Dr. Alley's article, "Lunar Ranging to Retro-reflectors on the Moon as a Test of Theories of Gravity," published in the volume, *Quantum Optics, Experimental Gravity, and Measurement Theory*, edited by Meystre and Scully, Plenum Publishing Corporation (1983).

Peter Kammeyer

OCCULTATION EXPEDITIONS PLANNED

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

UT	Place	Vis	Pcnt	Cusp	Min	
Date	Time	Mag	Sunlit	Angle	Aper	
02-09-84	02:33	Clinton, MD	9.8	39	5S	20 cm
02-10-84	02:37	Columbia, MD	10.2	49	5S	20 cm
02-12-84	01:29	Newton Square, PA	6.7	71	3N	8 cm
02-23-84	04:08	Englishtown, NJ	5.1	53	16S	5 cm
ASTEROIDAL:		Star Mag	Delta Mag	Name		
02-10-84	02:33	NE USA	13.2	0.8	(154) Bertha	20 cm
02-14-84	07:10	Mid Atl. States	11.5	0.6	(324) Barberga	20 cm
02-14-84	19:55	SE USA	11.8	0.6	(12) Victoria	20 cm

NCA WELCOMES NEW MEMBERS

Richard N. Carpenter
12022 Trossack Rd.
Herndon, VA 22070

Dr. David H. Dvorkin
9611 Bexhill Dr.
Kensington, MD 20895

David Healy, Apt 1-A
3010 Wisconsin Ave.
Washington, DC 20016

James R. Holden
2618 Claxton Dr.
Herndon, VA 22071

Christopher C. Ison
5513 Trent Ct, #212
Alexandria, VA 22311

Mike Montana
5889 North 9th Rd.
Arlington, VA 22207

Dale D. Robertson
1639 Hiddenbrook Dr.
Herndon, VA 22070

Daniel M. Roy
9502 Battler Ct.
Columbia, MD 21045

FEBRUARY DISCUSSION GROUP: MAY ANNULAR SOLAR ECLIPSE PLANS

The 30 May solar eclipse across Southern Virginia is unusually interesting. Listed as annular, it actually will be so nearly total in Virginia that at no time will there be a complete ring; a continuous procession of Baily's beads will be visible. It will be interesting to see how much corona will show.

NCA is planning a multi-purpose trip for members. The circumstances present a unique opportunity for the photosphere-measurement project, casual viewing, or photography.

Come to the 18 February discussion group meeting at the Department of Commerce Conference Room D, at 8:00 pm and discuss or question at any level, offer suggestions, or just listen and learn. Dr. David Dunham will moderate.

JANUARY DISCUSSION INITIATES WORKING GROUP ON PHOTO SUPPORT

The January discussion group on photographic techniques, materials, and equipment, led by Bob Bolster and attended by more than two dozen members, provided the basis for initiation of a working group on photographic techniques, equipment, and materials, to be chaired by Joseph Macrie. Macrie demonstrated cold-camera and gas-hypersensitization equipment; Bolster showed results of his work with uncooled film and simple tracking, and Jim Gilfillan showed what can be done with simple equipment.

The Working Group on Photographic Techniques, Equipment, and Materials will support NCA project work and fill other needs as they arise.

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EXCERPTS FROM THE IAU CIRCULARS

1. December — Stella and White, European Space Agency, report that EXOSAT observations of X-ray source VO332+53 on November 21, 22, and 26, showed it to be emitting double sine-wave pulses with a period of 4.4s. Parmer, Blissett, Courvoisier, and Chiappetti, EXOSAT Observatory, Darmstadt, found that the object was again bright in X-rays on December 25 and 26. Williams, Burnell, and Webster, U. K. Infrared Telescope Unit, Edinburgh University and Royal Observatory, Edinburgh, observed that the object's infrared brightness was greater on December 23 than it had been during the previous flaring a month earlier. Ilovaisky and Chevalier, Observatoire de Besancon, reported that high-speed optical photometry of the only star visible at that position with the 1.9-m Haute Province Observatory reflector during November 29 to December 8 showed no variation.

2. January 8 — William A. Bradfield, Dernancourt, Australia, discovered a comet of 11th magnitude in Norma. R. N. Bolster

TRUSTEE, SERGEANT AT ARMS VACANCIES FILLED

At the special election in January, two officers were elected to fill vacancies: Robert N. Bolster, Trustee, for the term expiring 30 June 1985, and Pat B. Trueblood, Sergeant at Arms, term expiring 30 June 1984.

NAVAL OBSERVATORY TOUR NIGHTS SCHEDULED

Each month, the U.S. Naval Observatory holds public tours on selected nights. On 9 and 10 February at 6:30 or 8:00 pm (two groups each night), the guests will see an introductory film, visit the display area, the 12-inch refractor, and view with the 26-inch refractor with which the moons of Mars were discovered in 1878.

Come early; only 110 will be admitted, first-come first-served. Enter at the main gate, 34th Street and Massachusetts Avenue. Information: 653-1543.

FOR SALE — Custom 5.25-inch F/17 Maksutov-Cassegrain telescope, optics by Oscar Knab. 6-inch primary, 4.25-inch solar filter, three oculars, four color filters, handmade mount with slow-motion controls, \$700.00. Further information: Geoff Chester, 357-1529, weekdays 9 to 5.

FREE — Back issues of *Sky and Telescope*, many from 1978 to 1981, some from 1967. First come. Dan Lewis, 654-2679

★ STAR DUST

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