



## ALLEY: LASER LUNAR RANGING - PROGRESS AND PLANS



DR. ALLEY

Dr. Carroll O. Alley, Professor of Physics at the University of Maryland, will speak at the January meeting of National Capital Astronomers. He will review the lunar laser ranging program and present recent results.

Since July 1969 when Astronaut Neil Armstrong emplaced the first laser-ranging retro-reflector on the surface of the moon during the Apollo-11 mission, there have been continuing laser range measurements from Earth to it and to other reflector arrays carried on later lunar landings, two American: Apollo 14 and Apollo 15; and two Russian: Luna 17 and Luna 21.

Most of the measurements have had a typical uncertainty of only 10 to 15 cm and have been made with equipment designed and constructed at the University of Maryland and the Goddard Space Flight Center, and attached to the 2.7-m

telescope of the McDonald Observatory of the University of Texas. The accuracy achieved in this experiment has allowed the motion of the Moon to be used once again (after the time of Newton) as a test of various theories of gravitation, and has also provided much new information on the dynamics of the Earth and of the Moon. The experimental techniques will be described and the major scientific results will be summarized. New equipment designed to produce a range accuracy of 1 to 2 cm will be discussed.

Born in Richmond, Virginia, Carroll O. Alley, Jr. majored in mathematics and physics at the University of Richmond and was elected to Phi Beta Kappa. He received the Ph.D. from Princeton for his work on radio-frequency resonances in rubidium vapor — work which contributed importantly to the development of the rubidium atomic clock. He taught physics at Richmond, Princeton, and Rochester Universities before coming to Maryland University as Director of Research in atomic physics and quantum electronics. In 1973 he was awarded the NASA Medal for Exceptional Scientific Achievement as Principal Investigator for the Apollo-11 Laser Ranging Retroreflector experiment, and has received several other honors and awards. He has served as advisor to several agencies and is active in the International Astronomical Union and other professional societies and committees.

### JANUARY CALENDAR — *The public is welcome*

- Friday, January 6, 13, 27, 8:00 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, January 7, 6:15 pm — Dinner with the speaker at the Thai Room II, 527 13th Street, NW. Reservations unnecessary.
- Saturday, January 7, 8:15 pm — NCA monthly meeting at the Department of Commerce Auditorium, 14th and E Streets, NW. Dr. Alley will speak.
- Tuesday, January 10, 17, 24, 31, 7:30 pm — Telescope-making classes at Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 362-8872.
- Friday, January 13, 20, 27, 7:30 pm — Telescope-making classes at American University, McKinley Hall basement. Information: Jerry Schnall, 362-8872.
- Saturday, January 21, 8:00 pm — Discussion group on celestial photography with Bob Bolster. This will be a "how-to" session. See page 19.

## DECEMBER LECTURE

The December meeting of National Capital Astronomers heard Dr. Roy S. Clark, Jr., Curator, Division of Meteorites, Smithsonian Institution, speak on the history of the study of meteorites. His talk concentrated on two periods: around 1800, when the significance of meteorites was first recognized by the scientific community, and the last 15 years.

Dr. Clark pointed out that the National Museum of Natural History has an excellent meteorite collection. While the display was prepared several years ago, it is well worth a visit.

Meteorites have been collected for thousands of years. Many cultures have made tools from meteoritic iron. Clark showed a slide of a dagger and a broad-axe in the collection of the Freer Gallery.

In the late 18th century it was believed by the scientific community that space was empty. It logically followed that stones couldn't fall from the sky. Despite this belief, meteorites were collected by a number of people, including James Smithson, the founder of the Smithsonian Institution.

P.S. Pallas, exploring Russia east of the Volga at the invitation of Catherine II, heard in the early 1770's about a large mass of natural iron. A few years later this meteorite, the Pallas iron, was moved to St. Petersburg. The Pallas iron aroused considerable interest, and samples of it were widely distributed in Europe. One of these was examined by William Thompson, an acquaintance of James Smithson, in 1783. In 1794 the physicist E.F.F. Chladni published descriptions of the Pallas iron and of a number of other iron meteorites, together with meteorite falls.

By 1803 it was clear that meteorites in fact fall from the sky. William Howard in 1802 performed chemical analyses on several meteorites, and found nickel, rare on Earth, to be present in considerable quantities. The meteorites which fell on the French town of L'Aigle in 1803 provided final, conclusive proof.

Starting with the fall of the Allende, Mexico meteorite in early 1969, the chemistry of meteorites has been studied intensively. Up to the present, the Allende meteorite alone has been the subject of over 260 papers. This meteorite is a carbonaceous chondrite, formed at the origin of the solar system and little changed since.

In January 1973 a meteorite fell near Lost City, Oklahoma. Its passage through the atmosphere was recorded by a network of cameras operated by the Smithsonian Astrophysical Observatory. From the photographs, both the impact point and the preencounter orbit could be determined. When the indicated impact point was searched, several fragments were found. The meteorite's original orbit was typical of those of Earth-crossing asteroids, with perihelion inside the Earth's orbit and aphelion between the orbits of Mars and Jupiter.

Two other meteorites have been sufficiently well observed while passing through the atmosphere to allow determination of their original orbits. The Příbram, Czechoslovakia meteorite fell before the Lost City meteorite, and the Innisfree, Canada meteorite fell later. Both of these also had orbits similar to those of Earth-crossing asteroids.

Chemical analysis suggests that a few meteorites come not from the asteroid belt, but from the Moon and Mars.

Peter C. Kammeyer

## NAVAL OBSERVATORY COLLOQUIUM SCHEDULED

Dr. Catherine Turon, Observatory of Meudon, France, will speak on the Hipparcos Input Catalog on Monday, 16 January, at 3:00 pm in Room 300, Building 52, U.S. Naval Observatory. Coffee and tea will be served following the talk.

NCA members are welcome. Enter the Observatory at the main gate, 34th Street and Massachusetts Avenue, NW, where the guard will require some identification and provide directions.

## 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
01-09-84	01:15	Mercersburg, MD	6.8	28	12S	6 cm
01-10-84	23:05	Oraville, MD	9.0	45	16S	20 cm
01-22-84	07:24	St. Augustine, FL	4.2	80	14S	6 cm
01-25-08:39		Columbia, MD	6.3	48	15S	6 cm
ASTEROIDAL:			Star Mag	Delta Mag	Name	
01-20-84	07:04	S.E. U.S.A.	9.3	3.1	(194) Prokne	6 cm
01-25-84	04:39	(Appulse)	9.1	3.9	(46) Hestia	6 cm

## SPECIAL ELECTION TO BE HELD

The Nominating Committee, Nancy Hueper, Chair, with Pat Trueblood and Jerry Schnall, offer the following candidate for the special election to be held at the January meeting, pursuant to the bylaws, to fill two vacancies left by the resignation of Wolfgang Schubert, Trustee, and Frank Baffa, Sergeant at Arms. Schubert's term expires on 30 June, 1985, Baffa's on 30 June 1984.

For Trustee, Robert N. Bolster; Sergeant at Arms, Pat B. Trueblood.

Other nominations may be made by petition of ten full members in good standing, presented to the Secretary prior to the January 7 election.

## DISCUSSION GROUP ON ASTROPHOTOGRAPHY 21 JANUARY

In response to numerous expressions of interest, the January discussion group will be a "how-to" session emphasizing techniques, equipment, results to be expected, and illustrative examples by Bob Bolster, an accomplished astrophotographer. This will be a discussion, not a lecture; ask or answer questions, discuss at any level, or just listen and learn.

## ELANORA B. DAVIS, LEO SCOTT, LONG-TIME MEMBERS

We are saddened to report the passing during the past month of two long-time members of National Capital Astronomers. Elanora B. Davis was a Charter and Life member (NCA was founded in 1937). Leo W. Scott was a past president of NCA and served in many capacities during the past 30 years.

We extend our sympathy to their families.

## REMINDERS OF SOME NCA MEMBERSHIP PRIVILEGES

Regular members in good standing may use the NCA 5-inch Alvan Clark refractor at the Naval Observatory, with guest privileges, at any time, after a familiarization checkout on the instrument and the rules. To receive your checkout and key pass call National Capital Astronomers at 320-3621.

Members may purchase at a substantial discount publications distributed by Sky Publishing Corporation, through NCA Treasurer Ruth Freitag, 1300 Army-Navy Drive, Arlington, VA 22202, telephone 521-7831. For a list of the many publications available, with prices and discounts, (members only) send a long (number 10) self-addressed, stamped envelope to NCA Secretary Stanley G. Cawelti, 11621 Chapel Road, Clifton, VA 22024, or see him at any NCA meeting.

## O'KEEFE TO ADDRESS PHILOSOPHICAL SOCIETY; NCA WELCOME

John A. O'Keefe, NASA Goddard, will speak on "The Coming Revolution in Planetology" at 8:15 pm, Friday, January 13, in the John Wesley Powell Auditorium of the Cosmos Club, 2170 Florida Avenue, NW. Parking in the Cosmos Club lot is restricted to members of the Cosmos Club.

## EXCERPTS FROM THE IAU CIRCULARS

1. November 1 — M. Hartley, U.K. Schmidt Telescope Unit, discovered a comet of 15th magnitude in Aquarius. On November 10 a comet was discovered by the IRAS spacecraft, and the Schmidt Telescope Unit was asked to confirm it. They suggested that the two objects were the same, and a plate obtained on November 23 showed that this was so. The orbital elements of Comet Hartley-IRAS (1983 v) by Marsden indicate that it is a periodic comet with a perihelion distance of 1.28 au.

2. November 14 — Cowley, Arizona State University, and Hutchings and Crampton, Dominion Astrophysical Observatory, noted that the AM-Herculis-type system 0139-68, normally of magnitude 14.9 to 16.4, was fainter than 18, with almost no emission seen, indicating that accretion was almost turned off. They suggested that this would provide an opportunity for study of the underlying white-dwarf star.

3. November 25 — R. Evans, Maclean, New South Wales, discovered a supernova of magnitude 13.5 in NGC 1365. Spectra obtained by T. Cragg, Anglo-Australian Observatory, indicated that the supernova was of type II, with radial velocity of 6000 km/s. An independent discovery was made on November 27 by Lindblad and Grosbol at La Silla. Robert N. Bolster

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★ S T A R D U S T

WASHINGTON, D. C.



Published eleven times yearly by NATIONAL CAPITAL ASTRONOMERS, INC., a non-profit, public-service corporation promoting astronomy and related sciences through lectures, expeditions, discussion groups, tours, classes, public programs, and publications. President and Editor, Robert H. McCracken. Deadline 15th of preceding month. Information: (301) 320-3621. Material for publication: *STAR DUST*: 5120 Newport Avenue, Bethesda, MD 20816.

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