★ STAR DUST

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BRUNK TO DESCRIBE MAUNA KEA INFRARED FACILITY

DR. BRUNK

Dr. William E. Brunk, Discipline Scientist for Planetary Astronomy, NASA, will address the October 4 meeting of National Capital Astronomers. He will describe the NASA infrared Telescope Facility.

Located near the 13,700-foot summit of Mauna Kea on the Island of Hawaii, the 3-meter telescope of the facility is being used to observe infrared radiation from astronomical objects with primary emphasis on solar system bodies.

The second-largest infrared telescope in the world, it is the only major telescope to have been completely structurally analyzed during design using programs developed and used in the design of planetary spacecraft.

William E. Brunk was born in Cleveland, Ohio, received his B.S. in mathematics, his M.S., and in 1963 his Ph.D. in astronomy from Case Institute of Technology. From 1954 to 1958 he carried out programs in supersonic flow and heat transfer at the Lewis Flight Propulsion Laboratory of NACA in Cleveland. In 1958, when NACA became part of NASA, Dr. Brunk calculated spacecraft orbits. In 1964 he transferred to the Planetary Astronomy Program at NASA headquarters in Washington, DC, where he became Chief of the program in 1967. In his present capacity as Discipline Scientist for Planetary Astronomy since 1977, he manages a national program of research to support and supplement NASA planetary flight missions. He is also responsible for the program management of the Mauna Kea Infrared Facility.

Dr. Brunk has also been associated with the selection of science payloads for both planetary and astronomy spacecraft, and represents NASA on committees for naming of planetary and satellite surface features.

He is a member of the American Astronomical Society, the International Astronomical Union, and other scientific societies.

OCTOBER CALENDAR — *The public is welcome.*

Friday, October 3, 10, 17, 24, 31, 7:30 PM — Telescope-making classes at American University, McKinley Hall basement. Information: Jerry Schnall, 362-8872

Friday, October 3, 10, 17, 31, 8:00 PM — Observing with the NCA 14-inch telescope 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, October 4, 6:15 PM — Dinner with the speaker at the Thai Room II, 527 13th Street, NW. Reservations unnecessary.

Saturday, October 4, 8:15 PM — NCA monthly meeting at the Department of Commerce Auditorium, 14th and E Streets, NW. Dr. Brunk will speak.

Tuesday, October 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.

SEPTEMBER LECTURE

Dr. Gart Westerhout, Scientific Director of the U.S. Naval Observatory, opened the 1980-81 National Capital Astronomers lecture series with a discussion of interferometry in astrometry. He described the adaptation of the 35-km Green Bank interferometer of the National Radioastronomy Observatory to its present use.

The primary concerns of the Naval Observatory are the motions of the Earth and the planets, stars' proper motions and parallax, and the distance scale of the universe. When the Very Large Array (VLA) in New Mexico became operational the Green Bank interferometer had served its prototype function; The Naval Observatory extended its usefulness by adapting it to the Observatory's astrometric program. It is now the only dedicated astrometric interferometer in the world.

In its former use for aperture synthesis the intermediate 80-foot dishes, mounted on 32-wheel trucks, were moved along the baseline to fill in the aperture parameters. The wheels are never to turn again; the positions are to be permanently maintained as closely as can be managed. The individual baselines are used redundantly for confirmation. The positions were stabilized with concrete, and structure deformation has been studied since October 1978.

Signals from the southern receiver, 35 km south, are transmitted to the Green Bank site by microwave link. Differences in path lengths, depending upon the angular position of the source object relative to the antennas, result in differences in arrival times. A compensatory artificial delay is inserted in order to retain phase coherence between the received signals. Simultaneous operation at 2.7 and 8 gHz allows compensation of atmospheric refraction. Both signals from each antenna are hetrodyned with frequencies derived from a common local oscillator to produce intermediate frequencies of about 30 MHz. These are in turn mixed (multiplied) to produce a difference frequency which would be zero if it were not for the slowly changing path length difference resulting from the motion of the Earth, chiefly diurnal rotation. In typical calculations Dr. Westerhout showed that for a source on the equator and a frequency of 3 gHz a typical difference (fringe) frequency of 20 Hz results. For a polar object, the frequency would be near zero. Thus, the interferometer has the capability, unique among astronomical instruments, of absolute declination measurements. Measurements are computer-smoothed by integrating over typically 30 seconds, depending upon signal-to-noise ratio. From about ten of these averages, the phase rate is determined, which yields right ascension.

Accuracies of 4° of phase, yielding angular accuracies of .01 s, are thus achieved. Such phase accuracy seems electrically and mechanically manageable with the techniques that are used. Baseline delays are constantly controlled by direct measurement of a returned signal. All measurements are made at both left and right circular polarizations in alternate 30-second intervals.

Quasars, because they are both very strong and very distant sources, are used for fundamental positions.

The baseline comprises three unknowns: two directional components relative to inertial space, and length. The right ascension and declination of the source are two more. If time, phase, and declination are measured for each of three sources, nine measurements are obtained for the nine unknowns. Thus, the baseline length, a constant, can be accurately determined, and variations in its position can be measured in three dimensions relative to inertial space. Actually, about 20 sources are measured during 24 hours each day for a least-squares solution. Baseline variations of less than 1.5 mm must be measured for an accuracy of .01 arcsecond in stellar position, which is now obtained.

Many basic problems are also opportunities for measurements. These include stars' proper motions and variations in the Earth's motions: period of rotation, nutation, and polar wobble. There is an annual increase of about 1 second in the length of the year.

Some present accuracies: the photographic zenith tube, 5 to 8 ms; the International Time Bureau 70-observatory averages, monthly, 1.2 ms, 5-day, 2 ms;

OCCULTATION EXPEDITIONS PLANNED

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

UT Date	UT Time	Place	Vis Mag	Pcnt Sunlit	Cusp Angle	Min Aper
10-03-80	07:22	Threemile Island, PA	8.1	28	10N	10 cm
10-29-80	04:19	Hagerstown, MD	7.3	65	12N	5 cm

		Star Mag	Magnitude Decrement	Name of Asteroid	
10-26-80	10:28	Quebec (NE U.S?)	9.8	3.0	(12) Victoria	10 cm

NCA MEMBERS INVITED TO SPSE LECTURE

On Wednesday, October 22, the Washington, DC Chapter of the Society of Photographic Scientists and Engineers will present Dr. Guy W.W. Stevens, emminent photoscientist recently retired from Kodak Research Laboratories in Harrow, England. He will speak on grainless emulsions and their applications.

Dr. Stevens will discuss the central role of silver halide materials and the parameters important in system selection. While these emulsions are not primarily intended for astronomical use, the principles are fundamental and are of interest.

The meeting will be held at 8:00 PM at George Washington's Old Club, 555 South Washington Street, Alexandria, VA, and will be preceded by cocktails at 6:15 and dinner at 7:00. Reservations for dinner, at $9.00 each, payable to Washington, DC Chapter, SPSE, must be received before October 17 by Joseph Kitrosser, 5726 Larpin Lane, Alexandria, VA 22310. Write for further details, or call Bob McCracken, 229-8321.

NCA–SPSE JOINT OUTING A SUCCESS

Photographic scientists and astronomers exchanged information and experience and made new acquaintances on September 13 at the joint NCA-SPSE outing sponsored by the Hopewell Corporation. Following a picnic at Manassas National Battlefield Park the group caravanned to Hopewell Observatory under incipient cloudiness that cleared after dark. At the observatory Bob Bolster illustrated several types of his excellent astrophotography with slides. The group was then given the opportunity to participate in celestial photography and light refreshments until the affair was interrupted by the sunrise.

FAIRFAX COUNTY REQUESTS PARK PROGRAM ASSISTANCE

Fairfax County Park Authority is planning two public programs at Huntley Meadows Park on October 3 and 10, for which assistance is desired from a few people with telescopes or binoculars. Contact John Lohman, 820-4194.

ACADEMY SCHEDULES DINNER, MEETING

The Washington Academy of Sciences will meet for dinner and a talk by Dr. Paul Lowman on comparative planetology, at Kenwood Country Club on October 16. National Capital Astronomers is a member society; members are invited. Call 527-4802 for dinner reservations, costs, and schedule.

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the radiointerferometer, 1.9 ms in 8 hours. Polar motion, .01 arcsec per month; the radiointerferometer should soon achieve .01 sec in 8 hours. Stellar positions, typically known to about .1 or .2 seconds; the radiointerferometer, .01 second now.

The technique seems capable of measuring tectonic plate motion! jl, mt

EXCERPTS FROM THE IAU CIRCULARS

1. June — D. Bonneau, Cen. d'Etudies et de Recherches Geodynamiques et Astro., Caussols, and R. Foy, Observ. de Paris, resolved Pluto and 1978 P 1 using speckle interferometry with the 3.6-m Canada-France-Hawaii telescope on Mauna Kea. They derived diameters of 4000 and 2000 km respectively, an orbit radius of 1".02, and total mass .0033 that of the Earth.

2. August — Gull and Pooley, University of Cambridge, detected at 2.7 GHz a source less than 3" in diameter within 40" of the center of the remnant of Tycho's supernova of 1572 in Cassiopeia. Morbey and van den Bergh, Dominion Astrophysical Observatory, could find no stellar image on red plates taken with the 5-m Hale telescope.

3. August 16 — Bouchet, Perrier, and Sicardy, European Southern Observatory, observed a stellar occultation by Uranus with the 3.6-m reflector at La Silla. Seven unexpected occultations, mostly outside of the known rings, were detected after the occultation by the planet.

4. September 6 — Kenneth S. Russell, U.K. Schmidt Telescope Unit, discovered a comet (1980 l) of 17th magnitude in Fornax. Parabolic elements by D.W.E. Green indicate that it will reach perihelion in February.

FOR SALE

New University Optics 32-mm Erfle eyepiece, 50-mm diameter, $50.00. Celestron 5.5-inch Schmidt camera with extra filtered film holder, $500.00. Pat Walker, O: (703) 664-1741, H: 565-8850.

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