★ STAR DUST

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ALLEY TO DISCUSS EINSTEIN AND NEW RELATIVITY TESTS

DR. ALLEY

Dr. Carroll O. Alley, Jr., Professor of Physics, University of Maryland, will address the April 5 meeting of National Capital Astronomers. He will describe current work and recent experiments that give considerable insight into the foundations of general relativity. Dr. Alley will interweave biographical remarks on Einstein with the fundamental mathematical and physical concepts of curved space-time.

The first observational support for general relativity was the advance of the perihelion of Mercury. Nowadays, the relativistic effects of motion and gravitational fields on the rate of time flow can quite accurately be measured with atomic clocks at aircraft altitudes and speeds.

Dr. Alley will describe recent experiments by the Quantum Electronics Research Group of the Department of Physics and Astronomy of the University of Maryland, and discuss their implications to the understanding of phenomena such as the cosmic thermal radiation, quasars, active galactic nuclei, rotating neutron stars, and possible black holes.

Carroll O. Alley, Jr. was born in Richmond, Virginia, majored in mathematics and physics at the University of Richmond and was elected to Phi Beta Kappa. He received the Ph. D. in physics 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 has taught physics at the Richmond, Princeton, and Rochester Universities before coming to the University of Maryland in 1963 as director of the research group in atomic physics and quantum electronics. In 1973 he was awarded the NASA Medal for Exceptional Scientific Achievement as Principal Investigator in the Apollo-11 Laser Ranging Retroflector experiment, and has received several other honors and awards. He has served as advisor to several scientific agencies and is active in the International Astronomical Union and other professional societies and committees.

APRIL CALENDAR — *The public is welcome.*

Friday, April 4, 11, 18, 25, 7:30 PM — Telescope-making classes at American University, McKinley Hall basement. Information: Jerry Schnall, 362-8872.

Friday, April 4, 11, 18, 25, 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. 960-9126.

Saturday, April 5, 6:15 PM — Dinner with the speaker at the Thai Room II, 527 13th Street, NW. Reservations unnecessary.

Saturday, April 5, 8:15 PM — NCA monthly meeting at the Department of Commerce Auditorium, 14th and E streets, NW. Dr. Alley will speak.

Monday, April 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.

MARCH LECTURE

Dr. Maurice M. Shapiro, Chief Scientist of tne Laboratory for Cosmic-Ray Physics, U. S. Naval Research Laboratory, addressed a small group who braved the snowstorm for the March 1 meeting of National Capital Astronomers.

Because of the small audience, Dr. Shapiro made his remarks brief and informal.

Dr. Shapiro's current research is a challenging attempt to detect high-energy cosmic neutrinos. No neutrinos from beyond the solar system have apparently been previously detected. The experiment is unique because of the difficulty of detecting cosmic neutrinos and the apparatus proposed to be used.

Neutrinos are probably as abundant as nucleons. They are released in many different kinds of nuclear reactions, such as those occurring in stars and in other types of celestial objects. They have effectively no rest mass, and will penetrate thousands of miles of the densest known matter without interacting with it. Thus it is very unlikely that one will ever be detected, but it is not impossible. The higher the neutrino's energy, the easier it is to detect. The neutrinos of cosmic origin that Dr. Shapiro is trying to detect are higher in energy than solar neutrinos which other experimenters seek to detect.

Since neutrinos interact with matter so rarely, Dr. Shapiro has chosen a unique laboratory apparatus to detect them — the ocean! The experiment is the Deep Underwater Muon and Neutrino Detector (DUMAND). The plan is to place detectors in roughly a cubic kilometer of deep ocean water. Most cosmic neutrinos will simply pass through the ocean, all the way through the Earth, and keep going as though there were no matter there at all. A very few will penetrate most of the ocean above the detectors and decay into muons. These muons will then interact with the water and produce photons and a small acoustic pulse. The primary detector is an array of columns of fluorescent dye with photomultiplier tubes evenly spaced along the columns. The ultraviolet photons produced by the muons are converted to visible photons by the dye. The visible photons are detected by the photomultiplier tubes. By using timing and coincidence circuitry coupled to the thousands of photomultiplier tubes in the array, the direction of the incoming neutrinos may be established with sufficient certainty to distinguish among several possible sources of the neutrinos.

The ocean serves two purposes in this experiment: First, it filters out light so well that it is absolutely dark at the depths of the experiment, thus preventing undesired photons from the surface from being detected by the photomultiplier tubes, second, it filters out muons generated by reactions in the upper atmosphere and from sources other than the neutrinos.

A second detection scheme is to use very sensitive hydrophones to detect the characteristic "pop!" sound caused by the neutrinos. This would help to confirm events detected by the photomultipliers, but here the ocean serves as a hindrance rather than a help — the hydrophones will pick up many fish and ship noises as well as the neutrino sounds. Dr. Shapiro believes that with the necessary extensive signal processing and analysis the hydrophones can eventu-

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GRAZING OCCULTATION EXPEDITIONS PLANNED

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

UT Date	UT Time	Place	Vis Mag	Pcnt Sunlit	Cusp Angle	Min Aper
04-06-80	06:53	Mount Holly, NJ	6.6	72	12S	8 cm
04-18-80	00:44	Doswell, VA	6.4	11	3S	5 cm
04-18-80	01:58	Mount Holly, NJ	4.0	12	2S	5 cm
04-19-80	03:07	Ludwigs Corner, PA	6.6	20	1N	10 cm

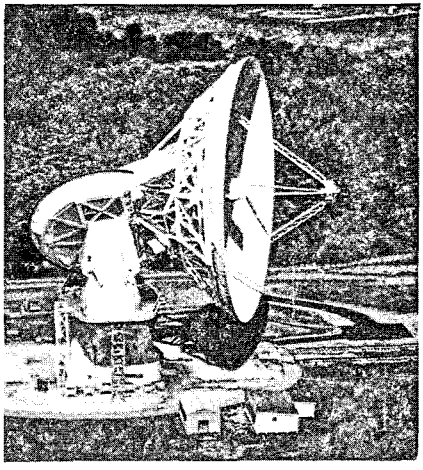
NCA GREENBANK TRIP PLANNED

National Capital Astronomers is planning a trip for its members to the National Radio Astronomy Observatory at Greenbank, West Virginia, during the weekend of May 10-11, 1980.

One of the world's outstanding astronomical institutions, the NRAO is located in the scenic Deer Creek Valley, surrounded by mountains which shield the sensitive deep-space instruments from much of the radio interference — spectral pollution — that is as damaging as light pollution is to optical astronomy.

at the entrance are displayed two historic instruments — a reconstruction of the directional antenna with which Karl Jansky discovered cosmic radio noise in 1932, and Grote Reber's original radiotelescope with which he alone for the decade of the 30's mapped the radio cosmos at his home in Wheaton, Illinois (*Star Dust*, June 1975). Having subsequently come to the National Bureau of Standards, Reber was vice president of NCA in 1948!

The tour will include the electronics laboratories, where advanced microwave engineering is being done, the computer facilities, the 35-km baseline interferometer — a series of 85-foot movable dishes, the calibration horns, the 140-foot equatorial, and the 300-foot parabolic dish — the length of a football field! It is truly impressive to see an entire stadium moving overhead.



In October 1974, Bob Bolster and Bob McCracken visited NRAO. On takeoff, Bolster took this photo of the 140-foot telescope from McCracken's plane.

When NCA last visited the observatory in 1957, the foundation for this instrument was under construction. Mechanical difficulties later delayed completion for several years.

We will leave late Saturday morning, May 10, by chartered Gold Line bus and spend the night at the Hermitage Motel in Bartow, West Virginia, where, Saturday night, conditions permitting, participants may enjoy the use of telescopes which designated members will provide. Bring your binoculars, camera, and color film to be prepared for the scenic opportunities. The tour will begin at 10:00 AM Sunday after breakfast at the Hermitage, and we will return to Washington Sunday evening.

Transportation cost, depending upon participation, may be as low as $20. For a minimum of 20 participants, cost will be $40. Meals and motel are additional. Motel rates are $23.69 for single rooms, $25.75 for doubles with two double beds, and $3.00 for each additional person. Nancy Hueper and son Paul are making all arrangements for you. Phone (301) 229-7328 (Bethesda).

A deposit of $20, refundable before April 20, will secure your reservation. Make checks payable to National Capital Astronomers, Inc. and send to Paul F. Hueper, 5504 Christy Drive, Bethesda, MD 20016. Early reservations will be appreciated, but must be made before April 20. Non-NCA members may be accepted on a space-available basis. More details will be forthcoming.

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ally be used in the DUMAND experiment.

if the experiment is successful, it will shed new light on deep-space high-energy processes, such as those believed to be taking place in quasars, BL Lac objects, and Seyfert galaxies. mt

EXCERPTS FROM THE IAU CIRCULARS

1. January 29 — A. Dollfus, Observatoire de Paris, obtained confirming plates with the 1-m Meudon reflector of a ring extending westward from Saturn's ring A 7 radii.

2. February 19 — D. Pascu, U.S. Naval Observatory, obtained 3 photographs of a possible new satellite of Saturn with the 66-cm refractor. Designated 1980 S 1, it was of 14th magnitude.

3. February 23 — Smith, Reitsema, and Larson, Lunar and Planetary Laboratory, detected a satellite of Saturn designated 1980 S 2, with a CCD on the 1.5-m reflector. Further observations and orbit determinations indicate that this object is 1980 S 1 and also 1966 S 2, 1979 S 1, 1979 S 2, and 1979 S 7. Its period is 16h 38.4m.

4. February 26 — D. Cruikshank, University of Hawaii, obtained a vidicon image of a satellite, 1980 S 3, with the 2.2-m reflector. The following day a possible object 1980 S 4 was detected.

5. March 1 — P. Laques, Pic du Midi Observatory, and J. Lecacheux, Meudon Observatory, obtained 4 images of a satellite designated 1980 S 6 with an electronographic camera on the Pic du Midi 1.5-m reflector.

6. March — F.L. Whipple, Harvard-Smithsonian Center for Astrophysics, analized observations of Comet P/Halley made in 1910 and 1835-36 and found a rotation period of 10h 19m. rnb

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