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Ryan: Quasars, VLBI Track Earth Crust Shifts

MR. RYAN

Mr. James W. Ryan, of the new Space Geodesy Branch, NASA Goddard Space Flight Center, will discuss a currently active, effective application of astronomy to an important, down-to-Earth problem at the December 2 National Capital Astronomers colloquium in the National Air and Space Museum. He will describe the joint NASA/NOAA use of Very Long Baseline Interferometry (VLBI) with quasars, the farthest known objects in the universe, for tracking tectonic plate motions in the Earth within a centimeter. He will present latest results from the San Francisco and Alaska earthquakes, and measurement of a 9-cm per year motion of Hawaii toward Japan.

He will also discuss measurements of nutation and various other components of polar motion, and the techniques with which the effects of atmospheric refraction and ionospheric dispersion are compensated.

James W. Ryan received his B.S. from John Carroll University in Cleveland and his M.S. in mathematics from George Washington University. In 1963 he joined NASA Goddard Space Flight Center, where he calculated Apollo orbits for the next decade. Since the Apollo Program he has been engaged in the VLBI Program, the basis of the current Space Geodesy Program which he will descuss.

DECEMBER CALENDAR — ***The public is welcome.***

Friday, Decembeer 1, 8, 15, 22, 29, 7:30 pm — Telescope-making classes at American University, McKinley Hall basement. Information: Jerry Schnall, 362-8872.

Friday, December 8, 15, 22, 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, December 2, 5:45 pm — Dinner with the speaker at the Smithson Restaurant, 6th and C Streets, SW., inside the Holiday Inn. Reservations unnecessary. Use the 7th Street and Maryland Avenue exit of the L'Enfant Plaza Metrorail station.

Saturday, December 2, 7:30 pm — NCA monthly colloquium in the Einstein Planetarium of the National Air and Space Museum, Seventh Street and Independence Avenue, SW. Enter Independence Avenue side. Mr. Ryan will speak.

Tuesday, December 5, 12, 19, 26, 7:30 pm — Telescope-making classes at Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 362-8872.

The January NCA colloquium will be held on January 6.

A gift NCA membership will last all year!

CALL NCA: (301) 320-3621 for details.

NOVEMBER COLLOQUIUM

Dr. Paul D. Lowman, NASA Goddard Laboratory for Terrestrial Physics, spoke at the November National Capital Astronomers colloquium in the Einsteiun Planetarium of the National Air and Space Museum. He presented his proposal for a lunar-based observatory site in the Mare Orintale Basin.

He first outlined some of the main crustal evolutionary features of the Moon which he considered in selecting the site.

In recent years it has become clear that the formation of the Moon was a very high-temperature process. The first major event in the Moon's crustal evolution was the first differentiation, the formation of the highland crust. It is now known from seismic data that this high-albedo feldspathic crust also extends globally underneath the maria as well as in the highlands. The next significant stage was the late heavy bombardment, the series of impacts which excavated the maria basins. The source of the impacting bodies is not known.

The second differentiation was the eruption of the maria basalt. This was a prolonged process, in which basaltic magma was produced during several billion years. Its eruptive flow produced the darker floors of the maria basins.

Considering the Moon as one of the silicate planets, Lowman compared the Moon, Mercury, Mars, Venus, and the Earth. This is the order not only of increasing mass and size, but also of geologic activity, and increasing tectonic evolution. The Moon is thus the most primitive, a "fossil planet," having never reached the stage of plate tectonics.

Establishment of a permanent lunar base would provide for lunar research, all-spectrum astronomy, surveillance, and, in the nearby, low-gravity lunar environment, economical low-energy mining of materials for space use, and development of interplanetary travel technology. The station would be capable of both manual and remote control operation from the Earth.

To serve these purposes, Lowman proposes a site in the Mare Orientale basin, on the lunar equator at 80° selenographic longitude. There is an interesting variety of lunar features nearby to be explored. There, the Earth would always be in view, but near the lunar horizon, where line-of sight communication would always be available. Being equatorial, the site would be exposed to the entire cosmos in each sidereal month. The slow rotation period allows a 14-day exposure in dark sky; precise tracking, when needed for long exposures, would be very easy. A very long-baseline, super-resolution interferometer could be established between the Moon and the Earth.

For very long-wave, less directional radioastronomy, however, diffraction could bring both artificial and auroral interference from the Earth into the antenna side lobes. If complete shielding is needed, the far side is only a few hundred kilometers away.

The far side of the Moon, completely shielded from Earth-based radio interference, is protected by international law as a radio-silent zone, in anticipation of the establishment of radioastronomy observatories there.

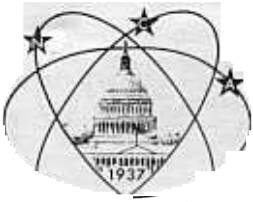
Relative to a spacecraft-based observatory, the experiment-integration problems of equipment space, power supply, mutual isolation of experiments, major design problems on spacecraft, are far easier on the Moon. Space debris, while not yet a problem in geosynchronous orbit, is becoming a significant problem in low Earth orbit; only meteorites would be a slight impact hazard on the Moon. The Apollo 12 visit to the Surveyor 3 site found the equipment still in excellent condition, essentially unchanged, after about 30 months on the Moon.

The Mare Orientale site is very near the western limb, beyond and slightly north of the crater Grimaldi, just west of Oceanus Procelarum. The equitorial site provides a continuous launch window and the most economical rendezvous, as changes in orbit inclination are energy intensive. Within a reasonable drive of the region are many unusual structures and features, and a variety of useful mineral resources, that make the region a prime candidate for exploration.

Lowman recommended that if only one site must be selected, the region around the northeast rim of the Mare Orientale basin seems to be the best candidate. He recommended that intensive site evaluation be begun using Earth-based techniques, detailed examination of lunar orbiter photographs, infrared and radar, and a precurser orbiting mission, perhaps two or more, using the lunar-observer radar altimeter for fine-scale topographic mapping of the surrounding region. Ideally, these should be folowed by unmanned rovers, remotely-controlled from the Earth, and carrying high-resolution video and other exploratory equipment. These could be modified Apollo LRV's, obviating the cost of new designs. When the survey is completed, these would be driven to the selected site, where they would be ready for use by the crew upon arrival.

Lowman believes the simplicity of instrumentation and deployment, mainly using available technology and equipment, would result in a cost far less than that of an equivalent orbiting spacecraft in which all the instruments must be designed to fit into limited space, developed, and coordinated, which typically requires years.

Robert H. McCracken



National Capital Astronomers, Inc.

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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 colloquia held at the National Air and Space Museum of the Smithsonian Institution. 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 NCA newsletter, *Star Dust*.

The NCA Public Information Service answers many astronomy-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 dispells the many common misconceptions which often lead 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.

PLEASE ENROLL ME IN NATIONAL CAPITAL ASTRONOMERS MEMBERSHIP

[ ] Regular ($32 per year) Each regular member receives ***Sky & Telescope*** and ***Star Dust***.

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NOTE: If you already subscribe to ***Sky & Telescope***, please attach a recent mail label, or indicate expiration date:_____. A prorata adjustment will be made.

Make check payable to National Capital Astronomers, Inc., and send with this form to: Patricia B. Trueblood, Secretary, 10912 Broad Green Terrace, Potomac, MD 20854.

The following information is optional. If you would like to participate actively in NCA affairs, please indicate briefly any special interest, skills, vocation, education, experience, or other qualifications which you might contribute. Thank you, and welcome!

OCCULTATION EXPEDITIONS PLANNED

Dr. David Dunham is organizing observers for the following occultations. For further information call the NCA-IOTA Information Line: (301) 474-4945 (Greenbelt, MD).

Date	UT Time	Place	Vis Mag	Pcnt Sunlit	Cusp Angle	Min Aper
Grazing Lunar:						
12-01-89	22:48	Rockville, MD	9.5	12	20S	20 cm
12-06-89	01:07	Seabrook, MD;	8.8	49	16S	20 cm
12-22-89	09:33	Mattawpman, MD.	9.3	27	17S	20 cm cm
Asteroidal:			Star Mag	Delta Mag	Name	
12-02-89	06:53	IN, OH, Ontario	10.9	2.0	(895) Helio	15 cm
12-28-89	01:16	Georgia, Florida	10.2	2.0*	(150) Nuwa	13 cm

*Appulse to be observed for possible satellites or path shifts.

NCA WELCOMES NEW MEMBERS

Frederick A. Dieter
7836 Greeley Boulevard
Springfield, VA 22152

Patrick McNally
11735 Summerchase Circle
Reston, VA 22094

Lois H. Sibenik
8442 Snowden Oaks Place
Laurel, MD 20708

Felicia Wach
5375 Duke Street, #119
Alexandria, VA 22304

EXCERPTS FROM THE IAU CIRCULARS Robert N. Bolster

1. February 23 - The Kolar Gold Fields air-shower array in India detected a burst of PeV-energy radiation from the Crab Nebula. The array detected 35 events against a background of 17.8. This confirms a similar observation made by the Baksan array on the same day.

2. October 18 - Wolszczan, Anderson, Kulkarni, and Prince reported the discovery of 2 millisecond pulsars in globular cluster M5. Their periods are 5.5 and 7.9 ms.

3. October 26 - Helin, Roman, and Alu discovered another comet (1989y) of 16th magnitude in Aries with the 46-cm Palomar Schmidt telescope. The orbital elements by Green indicate that the comet has a period of 9.1 years.

4. November 2 - Manchester, Lyne, Johnston, D'Amico, Lim, and Kniffen reported the discovery of a pulsar with a 5.76 ms period in globular cluster 47 Tucanae. The detection observations were made with he Parkes radio telescope at 640 MHz and 1.4 GHz.

FOR SALE

Eight-inch homebuilt Newtonian telescope on Cave Astrola mount, clock drive, with three mounted finder/guide scopes, electric slow-motion controls, several eyepieces, $400.00. Jack Gardner, (202) 775-7355 (Office).

STAR DUST

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