☆ STAR DUST

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LARGE U. S., EUROPEAN TELESCOPES PLANNED

LAWRENCE RANDALL

A number of new ground-based large optical telescopes are planned in both North America and Europe. At the March 4 meeting of National Capital Astronomers, Lawrence K. Randall of the National Science Foundation will discuss these plans and the modern technology which makes them possible.

Mr. Randall is the NSF Program Officer for the Very Large Array (VLA) and the National Radio Astronomy Observatory.

Technology now being developed on telescopes of the 3- to 4-meter class will support not only the construction of much larger instruments but also significant cost reductions, Mr. Randall says.

The capabilities of present large telescopes and the practical limits of gains in detector quantum efficiency indicate that an order of magnitude increase in collecting area will be required to satisfy the science waiting to be done in the last years of this century.

Major achievements have been made in optical figuring and testing, optical support systems, mechanical design and structural analysis, drive systems, and computer controls that can all be applied to new, large-telescope designs.

Lawrence K. Randall received his B.S. and M.S. degrees in mechanical engineering in 1967 and M.S. in management in 1976 from the University of Arizona. Before coming to the National Science Foundation he served in several technical management positions with Kitt Peak National Observatory, Cerro Tololo, Sacramento Peak, and the European Organization for Nuclear Research at Geneva, Switzerland. He is currently involved with the KPNO 25-meter project, the University of California 10-meter project, the NASA-University of Hawaii 3-meter infrared telescope, and the Smithsonian-University of Arizona multiple-mirror telescope.

MARCH CALENDAR — *The public is welcome.*

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

Saturday, March 4, 6:15 PM — Dinner with the speaker at Bassin's Restaurant, 14th Street and Pennsylvania Avenue, NW. Reservations unnecessary.

Saturday, March 4, 8:15 PM — NCA monthly meeting at the Department of Commerce Auditorium, 14th and E Streets, NW. Lawrence Randall speaks.

Monday, March 6, 13, 20, 27, 7:30 PM — Telescope-making classes at Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 362-8872.

Saturday, March 11, 5:00 PM — NCA picnic and observation, Manassas Battlefield Park. See page 27.

FEBRUARY LECTURE

Dr. Bevan M. French, Program Chief for Extraterrestrial Materials Research, NASA Headquarters, summarized the results of 8 years of Apollo lunar rock research, at the February 4 meeting of National Capital Astronomers.

Apollo landings sampled material from both lunar highlands and maria, returning 843 pounds to Earth from six sites. These were split into about 2,000 samples for study by experts around the world, but the bulk of the lunar rocks and soil are stored at the Lunar Sample Curatorial Facility, Houston, Texas. There are no life forms in the samples, but to preserve their priceless records of cosmic events while exposed on the Moon, they are stored in dustfree dry-nitrogen storage and handled only by Teflon, aluminum, and stainless steel probes.

The lunar rocks are mostly hardened lava with bubble holes perhaps formed by the release of H_2S or CO_2, but not by water as in terrestrial lavas. They contain many terrestrial minerals, but no clay or rust; rather than iron oxides, there is much free iron. Small amounts of minerals not found on Earth exist, including one named Armalcolite for the Apollo 11 team (Armstrong, Aldrin, Collins). The highland rocks are lighter in color than terrestrial feldspars, being richer in calcium and aluminum. Lunar and Earth lavas formed in similar ways, however. The oldest rock found, called Genesis, 4.2 billion years old, may be some of the first solid crust. It is much older than any rock found on the Earth because of destructive weathering processes.

Meteorite bombardment played two major roles in lunar surface formation. In the first half-billion years after formation, large asteroidal bodies impacted the molten Moon to form the maria basins (later internal radioactivity created lava which eventually erupted to fill the basins and create the smooth maria). After solidification, major meteoroid impacts formed the largest craters and today continue to act to build up the lunar soil and breccia that cover the maria to 0.3 m deep and the highlands to depths of 100 m to several km. There is no bedrock.

Because highland rock is highly crushed and mixed, unscrambling lunar history there is difficult. Yet the breccia insures a random sampling in depth and area from every site.

The famous orange rocks found by Apollo 17 astronauts are 3.7 billion year-old glass beads formed from lava sprays.

Seismology was a major project on some of the Apollo flights. Because natural quakes are small there, expended spacecraft were impacted on the Moon to create artificial quakes for deep seismic probing. The reactions to these impacts were characterized by a slow rise followed by a decline over several hours. Equivalent impacts on the Earth cause a quick rise and decline.

This picture of the lunar interior results: The crust is 60-100 km thick and rich in potassium and aluminum. It is dry and heavily fractured to 25-30 km. A thick, dense mantle underlies the crust, and a small iron core may exist. There is no general lunar magnetic field now, but rocks show vestiges of an ancient one. Motion within a molten iron core is the only known source of a general, intrinsic planetary magnetic field.

Like the Earth, the moon is somewhat aspheric; its center of mass is offset 2 km toward the Earth. Most of the maria are also on the Earth-facing side.

Mare Imbrium has produced the most radioactive lunar rocks yet found.

The lunar transient phenomena of Alphonsus and Aristarchus are unexplained, but in the lunar vacuum release of a small quantity of gas could form a prominent, spreading cloud.

The Moon holds a permanent record of solar and cosmic bombardment by particles and radiation. Rock crystals trap cosmic-ray tracks; minute craters of various sizes on rocks reveal interplanetary dust impacts; solar wind exposure has increased the adhesion of lunar soil particles. The latter is a clue to how the formation of planetary bodies proceeded before enough matter was present to produce sufficient gravity fields.

The greatest dividend of the Apollo flights may be a better understanding of planetary system formation and history. ww

OCCULTATION EXPEDITIONS PLANNED

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

March	UT	Place	Vis Mag	Pcnt Sunlit	Cusp Angle	Min Aper
20	02:32	Jarratt, VA	5.9	80	9N	2"
21	02:19	Emporia, VA	6.3	87	9N	2"

A total occultation of the 9.8-magnitude asteroid, 15 Eunomia, will occur at 03:08 on March 19 UT. PA, 49 N; CA, 42 N; PS, 72. If the diameter of Eunomia is 272 km as believed, it will subtend 0.18 second arc corresponding to a duration in the Washington area of 0.93 second time. The event can be observed locally; no expedition is planned.

NCA PICNIC, OBSERVATION OUTING IN MARCH AT MANASSAS

On Saturday, March 11, from 5:00 PM, members will have another opportunity to get acquainted, compare telescopes and other equipment, and enjoy a dark rural sky. Bring your guests, telescopes, and ready-to-eat picnic dinner. There are no fireplaces.

Go west on I-66 approximately 17 miles from the Beltway to Route 234, right on 234 1.7 miles to the site on the left. Follow the dirt road to the picnic tables. The picnic will be held regardless of weather short of precipitation or snow cover at the time. NCA thanks Dick and Nancy Byrd for the arrangements.

BRAZILIAN ASTRONOMER DEVELOPS NOVA-PREDICTION METHOD

"There is a relation between the eruption magnitude and the time interval between two eruptions for individual recurrent novae," writes J. E. Steiner, of the Instituto Astronômico e Geofisico, Universidade de São Paulo.

"With this relation it is possible to predict the next eruption epoch and to infer some conclusions about the nature of the eruptions of recurrent novae."

Writing in *Astronomy and Astrophysics*, Vol. 62, 273 (1978), Steiner cites previous workers and offers his hypothesis, based on a nova model in which a white dwarf accretes matter from a non-degenerate red dwarf. When the accreted boundary layer reaches the critical temperature-pressure threshold, a nuclear detonation ejects a portion of the boundary layer. The mass ejected is related to both the magnitude of the eruption and mass replacement time, through accretion, necessary to reach again the critical condition.

According to Steiner, the interval should be:

$$\Delta t(i, i+1) = \frac{\Delta M(i)}{\dot{M}}.$$

where the index i refers to the ith eruption, and $\dot{M}$ is the accretion rate. Steiner gives the derivation of the functions and the necessary constants for certain known stars.

On the other hand, Steiner points out, for a known interval, the relation will yield the accretion rate.

COMET BRADFIELD BRIGHT, BUT MAY BE DIFFICULT

Comet Bradfield (1978c) will rise at about 5:30 AM — about the beginning of morning twilight — during March, Walter Nissen reports. Right ascension and declination will increase during the month from 21h03m, -20° 53m on March 3, to 22h59m, 9° 53m on March 23. It will thus remain near the southeastern horizon until daylight and will probably be difficult even at the expected mid-month integrated magnitude 3.9.

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EXCERPTS FROM THE IAU CIRCULARS

1. January 6 — P. Wild, Astronomical Institute, Berne University, discovered a 14th-magnitude comet (1978b) in Taurus with the 40-cm Schmidt telescope at Zimmerwald. Orbital elements by Marsden indicate that it is periodic, with a period of 6.15 years.

2. January 17 — S. O'Meara, Cambridge, Massachusetts, observed a dust storm on Mars, bordering Mare Acidalium and Mare Boreum and extending into Tempe. The observation was made with the 23-cm refractor at Harvard Observatory.

3. January — Share, et al., Naval Research Laboratory, reported the detection of new X-ray sources near Cen X-3 and Cas A with the HEAO-1 spacecraft.

4. February 4 — W. Bradfield, Dernancourt, Australia, discovered an 8th-magnitude comet (1978c) in Telescopium. Orbital elements by Candy and Herald indicate the perihelion date is 18 March, and an ephemeris by Ashbrook indicates that the comet will move rapidly northward, becoming visible in the morning sky with a maximum brightness of magnitude 3.9.

5. February 11 — K. Tritton, U.K. Schmidt Telescope Unit, Coonabarabran, discovered a 20th-magnitude comet (1978d) in Sextans with the 122-cm Schmidt telescope.

This listing courtesy R. N. Bolster.

FOR SALE

Two telescopes: 1. Six-inch Dynascope RV-6 with 3X Barlow and camera mount with sunscreen and 35-mm T-mount adapter, $275. 2. Edmund 3-inch reflector with literature and hardware, $40. Edwin Kennedy, 4806 Harvard Road, College Park, MD 20740, 277-9252 after 6:00 PM.

WANTED

Telescope, prefer catadioptric, will consider others. Best offered for $500 or less. Stu Lieberman, 1470 Chelton Drive, Silver Spring, MD 20904, home: 384-7502, office: 394-3190.

* STAR DUST WASHINGTON, D. C.

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