

# ★ S T A R D U S T



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## FRENCH READS PLANETARY HISTORY FROM LUNAR ROCKS



DR. FRENCH

The February 4 meeting of National Capital Astronomers will hear Dr. Bevan M. French, Program Chief for Extraterrestrial Materials Research, NASA Headquarters.

Dr. French will discuss the early planetary processes according to the record preserved on the Moon but long ago eradicated on the Earth.

The Moon's rocks provide direct evidence for early widespread melting, chemical separation, volcanism, and catastrophic bombardment — processes that now appear to have affected all the terrestrial planets. For the last 3 billion years the quiet Moon has been recording in its rocks and soil the flux of matter and energy from space.

Much of the Moon, however, is still unexplored. A lunar polar-orbiter mission, now under study for the early 1980's, would provide

a global scientific data base for the entire Moon. The mission is also planned to test new exploratory methods.

Bevan M. French received an A. B. degree in geology from Dartmouth, an M. S. from the California Institute of Technology, and in 1964 a Ph. D. from Johns Hopkins University. He joined NASA the same year. In 1972 he became Program Director for Geochemistry at the National Science Foundation. Dr. French has served as NASA's Program Chief for Extraterrestrial Materials Research since 1975. He has published widely.

### FEBRUARY CALENDAR — *The public is welcome.*

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

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

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

Monday, February 6, 13, 27, 7:30 PM — Telescope-making classes at the Chevy Chase Community Center, Connecticut Avenue and McKinley Streets, NW. Information: Jerry Schnell, 362-8872.

## JANUARY LECTURE

Dr. Peter Boyce, Program Director for Astronomical Instrumentation, National Science Foundation, spoke to National Capital Astronomers at the January 7 meeting. He is presently working on solar energy problems in the office of Congressman Morris Udall, while on a fellowship. Dr. Boyce's talk surveyed optical and electronic astronomical instrumentation.

The great increase in large-telescope building during the last decade is ending. Only three or four more large telescopes are even planned. They are: Smithsonian-University of Arizona infrared multi-mirror, Mount Hopkins, 1979; NASA 3-m infrared, Mauna Kea, 1979; United Kingdom 3.8-m light bucket, 1979; Proposed large Pyranees telescope, Germany, 1981. Also, the effectiveness of many existing large telescopes is being slowly eroded by light and smog pollution. For both reasons, increased emphasis is necessary on efficient use of large telescopes. Three approaches are: new methods of operation, new optics production methods, and development of improved accessories.

An example of new operational methods is the use of the 200-inch Palomar telescope all day for infrared work except for 4 hours centered on noon. The necessary sky subtraction is done by comparison of alternate object-sky readings made by rocking a 2-foot secondary mirror at 10 cycles per second.

The optical layout of the 84-inch Kitt Peak telescope is such that the Coude and Cassegrain foci can be used simultaneously.

Improved optical production techniques are seen, for example, at the University of Arizona, where a 400-hole Hartman mask is used in mirror testing. With computer aid, same-day test results are available for large mirrors. The 4-meter CerVit mirror is the most accurate large mirror ever made; 99.09 percent of its surface is within 0.5 second of arc accuracy. At Kitt Peak the Harrison-Theiss ruling engine was relocated from MIT and its mechanical feedback changed to electronic with laser control. It can rule 18 x 24-inch gratings with 1200 line pairs per millimeter with an accuracy of 0.01 wavelength of the controlling mercury spectral line. Precise gratings on curved surfaces are now feasible; this fact is revolutionizing instrument design.

The use of modern accessory improvements is exemplified by the prominence in recent years of echelle spectrographs and Fourier-transform spectrometers, especially for infrared. New photographic emulsions with quantum efficiencies of 4 percent, versus 0.4 percent a decade ago, are widely used. Speckle interferometry, which enables use of a telescope to within a factor of 2 of its diffraction-limited resolution on double stars, is under intense development. Application to extended objects is much more difficult. In the Interactive Picture Processing System at Kitt Peak, the output from charge-coupled devices or other solid-state detector arrays are digitized and displayed as isophotes. The astronomer then selectively increases contrast of key features such as faint bridges of gas between galaxies. The concepts of adaptive optics are being developed to change an optical surface in response to ambient seeing. In one method an adjustable phase shifter behind the aperture alters the phase of incoming light waves to remove distortion effects. At present, only bright point sources can be treated. Responses are required to fluctuations at a few hundred per second.

Dr. Boyce illustrated his talk with slides.

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## OCCULTATION EXPEDITIONS PLANNED

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

February	UT	Place	Vis Mag	Pent Sunlit	Cusp Angle	Min Aper
17	02:41	Washington, DC*	5.3	70	75N	2"
19	08:56	Washington, DC*	3.6	87	80N	2"
22	06:12	Olney, MD	3.8	99	29N	2"

\*Total occultation, disappearance. Times are for Washington, DC.

## LIVING ORGANISMS FOUND INSIDE ANTARCTIC ROCKS

Scientists working on NASA-NSF grants have discovered living organisms hidden inside rocks in the frozen deserts of the Antarctic. The region has long been regarded as lifeless; no plant or animal life is visible on the bare cliffs, and microbiological investigations of the soil have indicated that they lack any native life.

The discovery, made in a region where conditions resemble those found on Mars, significantly extends the known limits of life on Earth, and also carries important implications for the search for extraterrestrial life.

The discovery was made by Drs. E. Imre Friedmann and Roseli Ocampo Friedmann of Florida State University, a husband-and-wife team who has been searching for microbial life in rocks for more than 15 years. The Friedmanns had found living cells inside rocks from warmer regions of the Earth.

The newly discovered microorganisms — bacteria, algae, and fungi — have been isolated and are growing in laboratory cultures, where they are being studied for clues to their remarkable durability.

The organisms colonize light-colored semi-translucent rocks which sunlight penetrates several millimeters. Within this layer, they occupy the microscopic interstices near the surface of the rock. Dr. Friedmann points out, "The microclimate between the minute grains of the rock may be quite different from the macroclimate outside." Dr. Friedmann said that wherever the "proper" rock types occur, it is most likely that they are colonized by microorganisms.

Dr. Richard S. Young, NASA's Chief of Planetary Biology, points out that the dry Antarctic valley conditions in many ways approach those found on Mars by the 1976 Viking landers. The landers' search for life in the Martian soil yielded ambiguous results, leaving the question tantalizingly unresolved.

"This interesting (if speculative) analogy," said Young, "is of considerable interest to NASA in designing future attempts to study planetary surfaces for evidence of life.

"If under these conditions of environment life is most likely to reside in the interiors of certain rock types, the design of the spacecraft would be influenced accordingly. For example, we would search out specific rock types and design a sampler which can open such rocks and provide subsurface samples which can be examined for life forms and organic molecules. This would lead to quite a different mission sequence than was done in Viking."

Dr. Young has addressed NCA on past occasions regarding the Viking program.

Dr. Friedmann expects that studies of the newly discovered life forms now under way will yield further information on their distribution and way of life.

## EXCERPTS FROM THE IAU CIRCULARS

1. August — Schnopper, Center for Astrophysics, and Cash, University of California at Berkeley, detected X-ray emission from the type I Seyfert galaxy III Zw 2 in Cetus with the SAS 3 spacecraft. A radio outburst from the galaxy was detected by Wright, et al. in November.

2. December 30 — Holt and Kaluziensi, Goddard Space Flight Center, detected the appearance of an X-ray flare in Cassiopeia with the Ariel 5 all-sky monitor. Clark and Cominsky, MIT, detected the source on January 5 with the SAS 3.

3. January 12 — R. M. West, European Southern Observatory, discovered a comet (1978a) in Libra on plates taken by Pizarro with the 100-cm Schmidt telescope at La Silla. A spectrum of the 17th-magnitude comet taken with the 360-cm reflector showed C<sub>2</sub> and C<sub>3</sub> bands, but the CN band at 3883 Å was absent. Comet West is moving slowly northeastward.

This listing courtesy R. N. Bolster.

## FIRST ANNUAL WERNHER VON BRAUN LECTURE JANUARY 31

The National Air and Space Museum of the Smithsonian Institution has inaugurated a Wernher von Braun Memorial Lecture Series to be given each year on or about January 31, the anniversary of the launching of Explorer I.

The inaugural lecture, "The Story of Explorer I," will be given by Dr. Ernst Stuhlinger, retired Associate Director of Science, Marshall Space Flight Center, NASA. Stuhlinger was a long-time, close associate of von Braun.

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