STAR DUST

NATIONAL CAPITAL ASTRONOMERS

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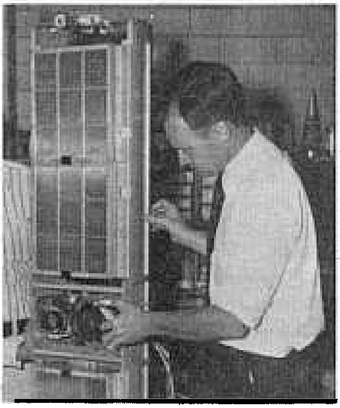
NORTH GALACTIC POLAR SPUR A SUPERNOVA REMNANT?



DR. CRUDDACE

At the January 8 meeting of National Capital Astronomers Dr. R.G. Cruddace, U.S. Naval Research Laboratory, will discuss supernova remnants and the North Polar Spur of the galaxy.

A large number of supernova remnants have been found in the galaxy. They are observed as non-thermal radio sources with diameters of between a few minutes and a few degrees. In some cases, they are revealed also by optical emission from filaments in the nebula, and more recently soft X-ray emission has been detected from the nearer elements. This is consistent with theoretical analyses of the propagation of supernova shock-waves into the interstellar gas. These remnants are less than 100,000 years old, and theories predict that they should persist as radio and X-ray sources for several 100,000 years. Dr. Cruddace will discuss recent X-ray results, which in combination with optical and radio observations, provide strong evidence for the existance of old supernova remnants. Particular attention will be given to the North Polar Spur. This feature appears to be the signature of an unusually powerful supernova which occurred a few 100,000 years ago at a distance of less than 200 parsecs from the Sun.

Dr. Cruddace started his career at the U.K. Ministry of Aviation as a rocket engineer. Later, at the Culham Laboratory, he did research in plasma physics for his doctorate from Oxford. In 1965, he emigrated to the United States to work in the NERVA nuclear rocket engine program. Since 1970 he has worked in X-ray astronomy. He is a member of the American Astronomical Society and the American Institute of Aeronautics and Astronautics, and is a fellow of the British Interplanetary Society.

JANUARY CALENDAR — *The public is welcome.*

Monday, January 3, 10, 17, 24, 31, 7:30 PM — Telescope-making classes at Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 362-8872.

Friday, January 7, 14, 21, 28, 7:30 PM — Telescope-making classes at American University, McKinley Hall basement. Information: Jerry Schnall, 362-8872.

Saturday, January 8, 6:15 PM — Dinner with the speaker at Bassin's Restaurant, 14th Street and Pennsylvania Avenue, NW. Reservations unnecessary.

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

Saturday, January 22, 7:30 PM — Telescope clinic at American University, McKinley Hall basement. Bring your telescope and accessory problems for expert help. Information: Jerry Schnall, 362-8872.

DECEMBER LECTURE

Dr. Richard S. Young, Program Scientist for NASA's Mars Viking project, spoke at the December 4 meeting of National Capital Astronomers.

He began by describing the two orbiters and two identical landers of the twin-Viking mission, and summarizing their instrumentation. Each lander is equipped with multi-mode cameras and is instrumented for analyses of the atmosphere, chemistry, meteorology, and seismology, and for the detection of biota. Mounted on the protective aeroshell enclosing each lander are upper-atmosphere instruments, retarding field potential analyzer, high-altitude mass spectrometer, and several accelerometers. In addition to the lander instrumentation, each orbiter carries two video cameras, infrared thermal mapping, and infrared water mapping equipment.

The Vikings were launched on the 11-month journey in the summer of 1975, and landed about 6,000 km apart in the northern hemisphere of Mars. All four craft, highly successful, continue to yield detailed data on Mars. Both were carefully sterilized during assembly and the complete assemblies were again heat sterilized before launch.

Earth life is reacting with our planet in many ways not fully understood — a matter of concern increasing with population growth. Many of the physical factors involve our planetary environment in the solar system — an environment shared in various relationships with eight other planets and about three dozen natural satellites. We are thus pressed into the era of comparative planetology. Fortunately, our technology has progressed sufficiently to allow acquisition of other data points throughout the solar system. Popular emphasis on the life-detection experiments notwithstanding, biology is but one aspect of a broad scope of planetary investigation to increase our understanding of the Earth's complex relationships with the solar system.

Upon reaching the vicinity of Mars, the orbiters' infrared mappers and cameras inspected the preselected landing areas for safety. After ejection of the lander capsules, the orbiters continued to examine the planet, and are expected to image and map the entire surface during the next year or so.

The high resolution of the images being returned by the orbiter cameras surpasses that of the Mariner 9 photographs both because the cameras are superior and because Mars is near aphelion where the winds are low. As Mars approaches perihelion the high winds and accompanying dust usually arise to cloud the atmosphere.

The orbiters also serve as radio relays for lander-to-Earth data, although data can be received directly from the landers at a much reduced rate.

As the lander capsules were released from the orbiters to descend to the surface, the aeroshell instruments measured atmospheric density profiles, density gradients, atmospheric constituents, electron densities, and gravity gradients. The aeroshells with their instruments were ejected as parachutes were deployed. in the final landing phase the parachutes were jettisoned as the landing rockets were fired.

Within a few minutes of landing number 1, the first photographs were sent from the surface of Mars. With the exception of the first seismometer, which failed to uncage, the mission has been a complete success. An identical lander in a sandbox at JPL in Pasadena aids in the diagnosis and correction of the few problems that arise.

Differing from the two video cameras on each orbiter, the two facsimile cameras on each lander, spaced about 80 cm apart, use scanning mirrors and selectable point detectors for black and white, color, infrared, and various focal distances.

Soil samples were delivered to the three biology instruments, the gas chromatograph mass spectrometer for organic analysis, and the X-ray fluorescence spectrometer for inorganic analysis. The biology instruments seek photosynthesis, metabolism, and respiration. In the first, a sample is inoculated with

OCCULTATION EXPEDITIONS PLANNED

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

Raymond Finkleman plotted the graze paths.

January	EST	Place	Vis. Mag.	Min. Aper.	Meeting Time	Meeting Place
4	7:25P	Springfield, VA	6.2	6"	9:00P	Garfield H. School
9	10:42P	Benson, NC	5.7	2"	8:30P	I-95 and NC Rt. 50
16	5:52A	Monroe Center, CT	6.3	2"	3:30A	CT Rts. 110 & 111
25	7:15P	Hyattstown, MD	8.0	4"	5:00P	NE cor. I-270 Exit
February						
4	7:25P	White Plains, MD	7.1	8"	6:00P	US301 & MD Rt.227

Total occultations observable locally: (D = disappearance, R = reappearance)

January	EST	Mag.	Phase	January	EST	Mag.	Phase
16	6:04A	6.3	R	27	7:54P	7.3	D
21	6:09P	6.6	D	28	10:18P	6.0	D
23	6:54P	5.8	D	30	8:29P	4.7	D

TELESCOPE AND ACCESSORY CLINIC TO BE HELD

Expert advice and help with your telescope, accessory, or observing problems will be available at the free NCA clinic on Saturday evening, January 22, at American University, McKinley Hall basement. From 7:30 PM, under the direction of Jerry Schnall, assistance will be offered in adjustment, cleaning, collimation, and use of your equipment.

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radioactive $C^{14}O_2$. After incubation, all gas is flushed out and the sample is heated to release any labeled gas incorporated into organic molecules by photosynthesis. In the metabolic analysis, C^{14}-bearing nutrients are offered, and any waste $C^{14}O_2$ is measured. Respiration is detected by analysis of changes in the gaseous environment.

Organic analysis of the Martian soil and atmosphere by the gas chromatograph mass spectrometer, if positive, would seem to confirm any marginal responses of the biology instruments. As it happens, the Martian soil was found to be so highly oxidative that any biological activity was entirely masked, and the apparently positive results were denied by the molecular analysis which found no organic matter in the soil or atmosphere.

The superoxide chemistry of the Martian surface seems extremely complex; nothing analogous has been found in terrestrial soil. Inorganic analyses by the X-ray fluorescence spectrometers indicate similar soil composition at the two sites, both dominated by Si, Fe, Ca, Mg, S, Ti, and Al. A record of the trace elements is gradually developing. Very dry by terrestrial standards, the Martian soil contains about 1 or 2 percent bound water. A sample from beneath a rock showed somewhat more water, less CO_2.

Mars' atmosphere is 95 percent CO_2, 2 or 3 percent N_2, less than 1 percent O_2, with traces of CO, A, Kr, and Xe.

The highest winds recorded to date have been about 20 km/h. Barometric pressure declined from 7.5 mb to a minimum of about 6 mb while CO_2 was freezing out of the atmosphere at the South Polar cap but has begun to increase again. Daily temperatures range from -80°C to about 0°C.

Mars is a strikingly heterogeneous planet which clearly has been extremely active in its history. Its varied surface is covered with craters, plains, large mountains, and much evidence of previous fluvial activity.

The Viking mission is expected to continue for a Martian year — about two Earth years — when it will be buget limited. rm

EXCERPTS FROM THE IAU CIRCULARS

1. August 16 — A group of radio astronomers in Italy observed a radio burst one minute after a gamma-ray burst had been detected by other satellite and balloon experiments. The source was observed at four frequencies from 151 to 408 MHz, and appeared to be close to the Sun.

2. October 27 — Miklos Lovas, Konkoly Observatory, Budapest, discovered a 17th-magnitude comet (1976k) in Ursa Major.

3. November 19 — H. E. Schuster, European Southern Observatory, La Silla, discovered a fast-moving asteroidal object of 13th magnitude in Phoenix. Orbital elements by Marsden indicate that 1976WA is an Apollo-type object with a period of 2.67 years.

4. November 22-25 — Feldman and MacLeod, Herzberg Institute of Astrophysics, observed an intense radio flare from HR1099, an RSCVn-type binary star. At 10.5 GHz the maximum, on 24 November, was 135 mJy.

This listing courtesy R. N. Bolster.

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* S T A R D U S T

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