

FEBRUARY LECTURE

Dr. Gerald A. Soffen, Biologist of NASA Goddard Space Flight Center, spoke on the search for extraterrestrial life at the February meeting of National Capital Astronomers. He discussed the theoretical possibilities, the *Viking* landers' findings on the surface of Mars (for which he was the Project Scientist), and programs which seek intelligence-bearing radio transmissions from beyond the solar system. He noted at the beginning that as a biologist he had expected to find life on Mars, but he concludes reluctantly that it is not there.

"It has become orthodoxy among biologists today," Soffen said, "that what we know as life developed through a sequence of events that happened on Earth only once." He cited examples of evidence: All life forms are very closely related. Hundreds of amino acids can be laboratory-synthesized; their molecules occur in both left- and right-hand forms. Only 21 are found in living things (there are a few "bizarre" known exceptions), always left-hand forms. The same genetic DNA "language," which determines the characteristics of the individual, is found in all forms of life, although the *message* is, of course, different.

Life is found to have existed on Earth for at least four billion years. When processes are carried out in the laboratory which closely resemble what must have occurred on the early Earth, chemical precursors of life are produced. Urey's famous experiment subjected a simulated primitive atmosphere to electrical discharges representing lightning. Amino acids were produced, along with a material which is still being studied without much success. Membranes and pieces of DNA molecules are prepared in the laboratory with little difficulty. The next steps, synthesis of complete DNA molecules and self-replication of the products, have not been accomplished. Most workers in the field expect it to be done within 20 to 100 years. "Given self-replication," Soffen said, "biology is simple."

Ten years ago Mars seemed a likely site for life. The basic questions were, does Mars support life? if so, is it like that on Earth or different? Accordingly, the *Viking* landers carried out three tests for life: pyrolytic gas release, labeled release, and gas exchange. Labeled release produced a promising release of gas. However, it should have been possible to repeat this on the same soil sample, and it was not; life was not found. The dust on Mars is strongly oxidizing, and sterilizes the soil.

Soffen illustrated many points in his discussion of Mars with a selection of the remarkable photos and data that the project yielded.

Titan's environment is strongly reducing, contrary to that of Mars. However, it looks more promising to take the search for life outside the solar system altogether. "Most workers now believe that life exists in many places outside the solar system," Dr. Soffen said.

Such a search is conducted by listening for radio signals judged to contain intelligence rather than the random noise generated by natural sources. This has been done by several groups at Arecibo and elsewhere without positive results. However, only a part of the sky has been covered. Also, far more powerful techniques exist, including simultaneous monitoring of many frequencies.

It is to be hoped that a successful search will reach more advanced beings than ourselves--we'd like to find that our stage is not terminal!

Mars cannot support a dense atmosphere; the pressure of the present one is only about one-hundredth that of the earth's, and it is mostly carbon dioxide. long ago, however, it must have had an atmosphere similar to that of the Earth. Did it have life at that time?

Who knows?

John B. Lohman

NASM OFFERS ASTRONOMICAL HISTORY COURSE AT CAMBRIDGE UNIVERSITY

The National Air and Space Museum will offer a joint course on the history of astronomy with the University of Cambridge, England, during July 10-28, 1985. Participants will reside at Newham College, Cambridge, England. The course will feature the works of Galileo, Kepler, and Newton, growth of astronomical technology, radio astronomy at Cambridge, contemporary breakthroughs, and cosmology. For details call 287-3362.

OCCULTATION EXPEDITIONS PLANNED

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

UT	Place	Vis	Pent	Cusp	Min	
Date	Time	Mag	Sunlit	Angle	Aper	
03-01-85	06:25	6.3	62	4N	5 cm	
03-01-85	07:37	5.0	63	3N	5 cm	
03-01-85	07:41	5.0	63	3N	5 cm	
03-14-85	08:05	7.4	43	14S	10 cm	
03-30-85	02:34	8.1	54	6N	8 cm	
03-30-85	05:23	7.9	55	6N	8 cm	
03-31-85	01:41	5.9	64	5N	5 cm	
03-31-85	04:41	9.0	65	7N	20 cm	
04-02-85	06:22	3.6	85	8N	5 cm	
Asteroidal:						
03-04-85	23:24	E. Coast USA	Star Mag 8.9	Delta Mag 2.5	Name (51) Nemausa	8 cm

NCA WELCOMES NEW MEMBERS

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BLOCH TO ADDRESS JOINT ACADEMY-NCA DINNER MEETING

Dr. Richard Bloch, Director, National Science Foundation, will speak at a joint meeting of the Washington Academy of Sciences and National Capital Astronomers on March 28 in the Faculty Dining Room at American University. The 7:30 pm dinner will be preceded by a reception at 6:45. Dr. Bloch will speak at 8:30.

To reserve your place, make your check for \$10.00 payable to the Washington Academy of Sciences, and mail to the Academy, 1101 North Highland Street, Arlington, VA 22201 in time to be received by 25 March.

NCA GREEN BANK TRIP PLANED

National Capital Astronomers will again visit the National Radio Astronomy Observatory at Green Bank, West Virginia, on the weekend of May 11-12. Mark your calendar for a memorable experience. Plan to bring your camera and plenty of film for both the unique opportunities at the Observatory and the beauty of the West Virginia mountains in the spring. Further details will be forthcoming.

U.S. NAVAL OBSERVATORY COLLOQUIUM TO HEAR MARKOWITZ

On Thursday, February 28 at 3:00 pm Dr. William Markowitz, Nova University, Ft. Lauderdale, Florida, and former Director of the Naval Observatory Time Division, will speak on the relationships between the several kinds of time and a reported discrepancy. The colloquia are held in Building 52, Room 300. Parking is available behind the building.

NCA members are welcome. Enter the main gate at Massachusetts Avenue and 34th Street, NW, where the guard will require some identification and provide directions. For further information call 653-1513.

EXCERPTS FROM THE IAU CIRCULARS

1. December -- W.B. Hubbard, Lunar and Planetary Laboratory, reported that his analysis of several observations of the July 22 Neptune appulse indicate the presence of a ring around Neptune. The ring appears to be of variable width and have a radius of 76,400 km. The postulated ring also fitted a single event seen on 1983 June 15.

2. December 20 -- Birkett and Green, Leicester University; Longmore, Royal Observatory, Edinburgh; and Zarnecki, University of Kent; reported the first infrared detection of Comet P/Halley. They used a photometer on the 3.8-m U.K. Infrared Telescope, and inferred a nuclear radius of 6 km. Similar results were obtained by Hanner and Tokunaga on January 18 with the 3-m NASA Telescope Facility, Mauna Kea.

3. January -- Spectra of Comet P/Halley obtained with the 4-m telescope at Kitt Peak and with the 4.5-m MMT at Mt. Hopkins continue to show only the reflected solar spectrum, with no molecular or atomic emission features.

WEILER TO ADDRESS PHILOSOPHICAL SOCIETY; NCA INVITED

Dr. Edward J. Weiler, NASA, will speak on *The Universe Through the Eyes of the Space Telescope* at 8:15 pm Friday, March 22, in the John Wesley Powell Auditorium of the Cosmos Club, 2170 Florida Avenue, NW. There is no charge. Note, however, that the parking lot is restricted to members of the Cosmos Club.

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FIRST CLASS

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MUSHOTSKY: X-RAY CONSTRAINTS ON MISSING MASS



DR. MUSHOTZKY

The March meeting of National Capital Astronomers will hear *The Missing Mass in the Universe? Constraints from X-Ray Observations*, as Dr. Richard Mushotzky of NASA Goddard Space Flight Center discusses his current data and interpretations.

The problem of the "missing mass" is one of the main problems in astrophysics. It has long been known that the dynamical mass inferred for clusters of galaxies is about 10 times larger than the sum of the masses of the galaxies composing the cluster. In addition, the observation of flat rotation curves in spiral galaxies has implied the existence of dark matter at large radii in these systems. The latest grand unified cosmological theories (GUTS) imply that the matter density in the universe should be the closure density, while observations of luminous material show a density only 0.03 as large.

Because both clusters of galaxies and some elliptical galaxies seem to be filled with hot X-ray-emitting gas, one can use this gas to trace the potential well of these systems and thus measure their mass in a manner independent of the optical properties of the systems. In addition, use of the X-ray properties of the gas allows one to relax many of the assumptions necessary in the analysis of optical luminosity and velocity data. X-ray observations also reveal information on the evolutionary history of clusters and thus can provide unique information on how the clusters form and when the elements heavier than helium were created. This type of data can also constrain some of the proposed GUT models for the creation and evolution of the universe.

Dr. Mushotzky will review the present status of the X-ray observations and indicate how future missions, in particular the Advanced X-Ray Astronomical Facility (AXAF), will help solve the riddle of the missing mass.

Dr. Mushotzky received his B.S. in physics from M.I.T. and his Ph.D. in physics from the University of California, San Diego. He joined the X-ray astronomy group of Goddard Space Flight Center in 1977. His main research interests have been in the analysis and interpretation of X-ray emission from extragalactic objects, particularly, active galactic nuclei, (e.g. quasars and Seyfert galaxies) and clusters of galaxies. Dr. Mushotzky has analyzed data from the OSO-7, OSO-8, HEAO-1, Einstein, and EXOSAT missions. Last year Dr. Mushotzky received the NASA Exceptional Service Achievement Award for his work with X-ray emission from active galaxies.

MARCH CALENDAR -- *The public is welcome.*

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

Saturday, March 2, 6:00 pm -- Dinner with the speaker at the Ding-How Restaurant, 1221 E Street, NW. Reservations unnecessary.

Saturday, March 2, 8:15 pm -- NCA monthly meeting at the Department of Commerce Auditorium, 14th Street and Constitution Avenue, NW. Dr. Mushotzky will speak.

Tuesday, March 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.

Friday, March 1, 15, 22, 29, 8:00 pm -- 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, March 16, 8:00 pm -- Discussion group at the Department of Commerce, Conference Room D.

Thursday, March 28, 6:45 pm, reception; 7:30, dinner; 8:30, Dr. Richard Bloch speaks. Co-sponsored by NCA and Washington Academy of Sciences. Reservations: See page 23.