

BIOCHEMISTRY

Does Life Exist in Space?

Bacteria-like cells from meteorites may be a life form from space. Evidence gathered on the moon and planets may tell if life exists in space, Tove Neville reports.

► **LIFE FORMS** found in "rocks" falling to earth from the skies may tell if there is life elsewhere in space. This is a question scientists have debated for many years.

Organic materials and pre-life forms found in stony meteorites may give a clue to life in space and also reveal how life and the solar system began.

This exciting quest for the knowledge of life as it evolved in the universe has already begun here on earth and will be continued as astronauts break the earth barrier and explore space.

Now Dr. Frederick D. Sisler, a microbiologist of the U.S. Geological Survey, has succeeded in growing bacteria-like cells taken from the Murray meteorite that fell from space in 1950.

In order to rule out the possibility that the meteorite was "contaminated" by earth bacteria from the ground or atmosphere after it fell, Dr. Sisler sterilized it in a solution of hydrogen peroxide and bichloride of mercury and under ultraviolet light.

He then broke open a piece of meteorite and pulverized small amounts of the inside with sterile mortar and pestle in a germ-free laboratory at the National Institutes of Health, Bethesda, Md.

Part of the pulverized material was inserted in test tubes containing a solution of seawater, peptones and sugar. The cells in this solution grew and reproduced themselves in several generations as only living things do.

Bacteria Can Seep Inside

However, Dr. Sisler told *SCIENCE SERVICE* that bacteria can seep into the inside of the meteorite with water from the outside.

Such bacteria inside a rock or meteorite would stay in an inactive stage, and it might be this kind of cells he has found, Dr. Sisler said. Nevertheless, it is quite possible these particles are from a space source.

To be quite certain living particles found in meteorites actually came from space, satellites could be sent out into space to "catch" a meteor before it became contaminated by the earth's atmosphere.

If a satellite could capture a meteor at about 50 miles altitude (bacteria have been known to exist at 20 to 30 miles) and bring it back to earth in a germ-free condition, it could be examined under sterile conditions on earth and the mystery cleared up, Dr. Sisler suggested.

He also said another way of getting "uncontaminated" meteorites would be to gather them in Antarctica where great falls of meteorites were reported by Admiral Byrd in the 1920's. Bacteria on such meteorites would be inactive—in a state of sus-

pending animation—since they cannot live in Antarctic temperatures.

The meteorite used by Dr. Sisler is a carbonaceous chondrite belonging to a small group of meteorites containing free carbon and sulfur, calcium and magnesium sulfates, and small amounts of organic matter.

Dr. Sisler first examined the Murray meteorite in 1959 with an infrared spectrophotometer (for analyzing the compositions of materials). He became interested in further study when he found in it several organic radicals that occur in living materials, such as amine, nitroso, nitrile and some hydrocarbon.

His findings were checked by Dr. Melvin Calvin of the University of California, both by infrared spectrophotometer and a gas chromatograph (for analyzing the composition of gases).

Dr. Calvin stated that the molecules found in the meteorite are believed by scientists to be part of the evolutionary chain of chemical forms from inert to living materials.

Atoms such as carbon and hydrogen are believed to have been caused to react to

form complex molecules by the energy of cosmic rays, ultraviolet light and electrical storms.

Dr. Calvin said it has been known since the turn of the century that hydrocarbon compounds of the petroleum type exist in stony meteorites. He also said it is reasonable to suppose the compounds inside a meteorite stayed unchanged by the heat generated on the outside of the meteorite as it entered the earth's atmosphere.

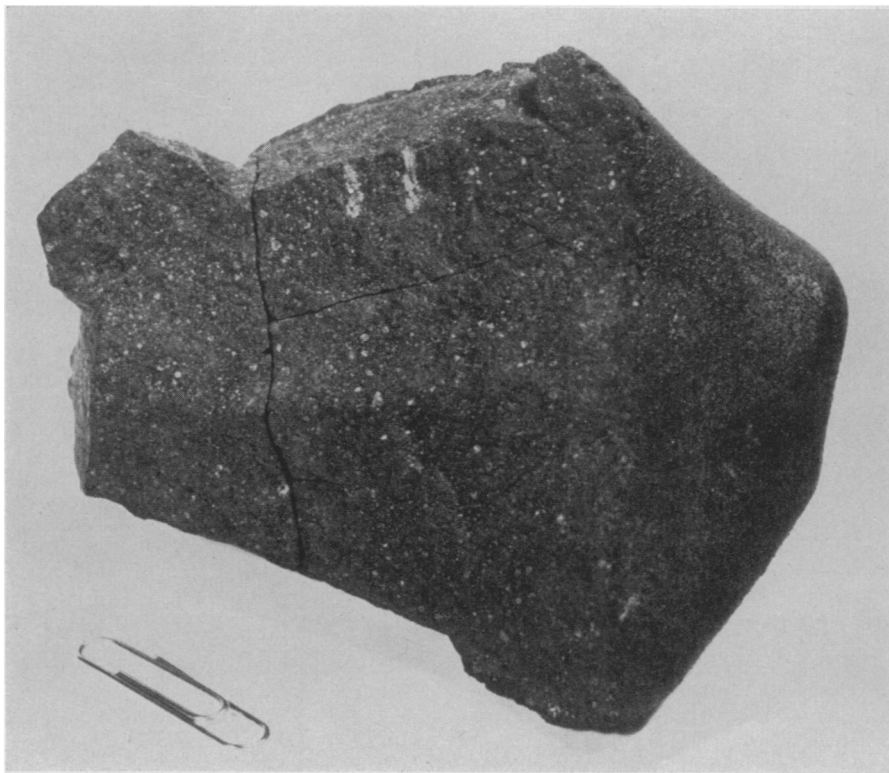
Hydrocarbons in Meteorites

A fragment of another stony meteorite that fell at Orguell, near Toulouse, France, in 1864, has also recently been examined by scientists and found to contain chemical compounds, including hydrocarbons, akin to those only found in living things on earth.

Also believed to be of space origin but not yet found to contain life are tektites, a form of glass. Recently a scientist found a 500,000-year-old tektite from the Philippines contained the same amounts of nickel and iron as found in a meteorite.

The tektite containing the tiny meteorites was probably formed when a meteor hit the moon and sent out a spray of liquid particles that cooled into a glass. Tektites are thought by some to result from comets or meteors hitting the earth.

Many scientists believe that the process of



LIFE-CONTAINING METEORITE—A fragment of the Murray meteorite that contained bacteria-like cells now reproducing themselves in a germ-free laboratory. These cells may be a form of space life.

the creation of life could have taken place on millions of planets traveling around suns (stars) other than our own and that perhaps life is being created all the time. One astronomer has estimated that the known universe could well contain as many as 100,000,000 earth-like planets.

Stars with planets located at such a distance that temperatures are not too hot or too cold might be just as capable of supporting life as is the earth. Other necessary factors for the existence of life are thought to be water and a suitable atmosphere.

The three planets in the solar system believed capable of supporting life are Venus, earth and Mars. However, since no evidence has been found of oxygen on either Venus or Mars, chances are very slim that higher life forms are present there.

Venus, about which very little is known because it is always shrouded in clouds, has been the subject of many conflicting theories. However, although atmosphere of Venus contains water, its surface temperature is estimated to be about 600 degrees Fahrenheit, virtually ruling out any form of life.

The possibility for life on Mars is somewhat better, but only for the lowest forms such as mosses and lichens. Observations of the infrared light reflected from Mars indicate that hydrocarbon-like materials exist

there. Color changes on the planet's surface suggest the possibility of some form of life.

The first experiment to find out if contact could be made with any possible outside intelligent beings was the Project Ozma, named for the queen of the faraway land of Oz in the fairy tale.

Radio astronomers led by Dr. Frank Drake listened to radio signals from deep space, hoping to hear definite patterns that would indicate a system of intelligent communication.

The 85-foot radio telescope at the National Radio Astronomy Observatory, Green Bank, W. Va., was used, but no signals sounding like any kind of a code pattern were heard.

In the past, scientists have reported hearing systematic-sounding radio noises. The inventor Marconi said signals he heard sounded like Morse code. Nikola Tesla reported in 1900 that he had heard signals suggesting "number and order" but was discouraged from publishing any data by public ridicule.

Dr. Drake said the Army has wax records taken of radio noises from space in the 1920's. The study of these records may yield new information about the possibility of life in space.

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GENERAL SCIENCE

China's Science Behind

► DESPITE heavy propaganda alleging rapid progress, science and technology are still in their infancy in Communist China, and "the introduction of a metal plow is considered a scientific achievement and a technological advance."

The report comes from Leo A. Orleans, senior research analyst at the Library of Congress, who spent two years evaluating material on mainland China from Communist and other sources.

The words "science" and "technology" are used so freely by Red China's press and people that "one is just as likely to encounter them in connection with manure collecting and hog raising as with the construction of the much-talked-of atomic reactor," Mr. Orleans said.

The drive to bring "science" down to mass level goes to such absurd lengths as the Kuang-Ming Daily's 1958 description of recruitment efforts for 700,000 farm workers and 300,000 factory, mine and school workers as the building of "a one-million-man army of scientists" in Kiangsi Province.

Aware that China will not reach Western technological levels for many years, the Communists have stressed Chinese accomplishments while down-grading Western progress and influence. A vivid illustration is the fact that physicians trained in Western medicine "have been required to adapt many of the procedures and cures utilized by the old herbists" in traditional Chinese medicine, Mr. Orleans said.

The country's scientific effort is geared to meet immediate technological demands. The few scientists capable of high-level re-

search find it more expedient "to borrow existing knowledge from the more advanced nations and convert it to the special needs and the present level of Chinese technology."

Most of the serious scientific work in China is being conducted in the Chinese Academy of Sciences, Mr. Orleans said. The figures "most frequently encountered" show 170 scientific research institutes attached to the Academy as of 1958—compared with only 31 six years earlier. Total staff (1958) is listed as 28,300, including 5,900 engaged in research. Each institute has a Communist Party branch office whose secretary decides on finances and personnel.

"The rapid growth in the Academy's personnel has been concentrated in the total staff and not in the research personnel," Mr. Orleans noted.

He said the Chinese "rely heavily on their cooperation with the Soviet Union" in scientific and technological matters, but "hope gradually to decrease their dependence."

Generally, Communists are raising the educational base of the Chinese masses, and have made impressive progress toward increased industrial productivity, Mr. Orleans found.

His report is contained in the book, Professional Manpower and Education in Communist China, released by the National Science Foundation. (Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.) (See p. 316)

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TECHNOLOGY

Shakespeare's Words Spoken by Computer

► SHAKESPEARE'S WORDS have been spoken by a computer. The machine also sang a song. It was all done electronically.

The synthetic speech was produced by instructing the computer to change the symbols for sounds, corresponding to the quotation from Shakespeare, into the audible sounds of speech.

The "talking" computer will say only what it is instructed to say by means of punched cards. The recitation and music were produced at the Bell Telephone Laboratories, Murray Hill, N. J.

Development of the artificial talker was reported to the Acoustical Society of America meeting in Philadelphia by Drs. John L. Kelly Jr. and Louis J. Gerstman.

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VIROLOGY

Spherules in Liver Cells Thought Hepatitis Virus

► A VIROLOGIST in Nigeria believes he has visible evidence to support the theory that infectious hepatitis is caused by a virus. The cause of hepatitis is a medical mystery.

Dr. W. G. C. Bearcroft of the West African Council for Medical Research in Yaba, Lagos, Nigeria, found, with the help of an electron microscope, spherical bodies that are larger than any seen previously in infectious hepatitis cells. They are not found in normal persons.

These bodies, Dr. Bearcroft reported in *Nature*, 190:541, 1961, may be the causative virus.

Usually, he said, they are confined inside the liver cells, but occasionally they appear to be passing from the cells into the spaces that lead to the liver veins and are present in the blood serum.

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PHOTOGRAPHY

8mm Sound Film Picture Industry Boon

► EIGHT-MILLIMETER sound film is expected to extend the motion picture industry much as paper-bound books have enlarged the publishing field, the Society of Motion Picture and Television Engineers was told in Toronto, Canada.

John Flory, Eastman Kodak Company, Rochester, N. Y., predicted that by the year 1976 there will be 15,500,000 8mm sound-on-film projectors in use throughout the world.

An estimated total of 727,000 16mm sound projectors are now in use in the United States, whereas almost 4,000,000 8mm silent projectors are estimated to be in use in the United States.

Mr. Flory said every family in the U. S. with an income of more than \$5,000 per year should be a potential prospect for 8mm sound equipment.

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