



**OPTICAL "SUN"**—A giant optical system produces artificial sunlight similar to the sun as it exists in outer space. This feature of the space environmental test chamber at the California Institute of Technology Jet Propulsion Laboratory was designed by Bausch & Lomb Inc., Rochester, N. Y.

## ASTRONOMY

## Moon Life Seen Possible

It is remotely possible that the moon may contain living organisms or organic matter below its surface where the temperature is moderate with only slight changes.

► **THERE IS A POSSIBILITY**—although a remote one—that the moon contains living organisms or organic matter below its surface.

At some distance below the lunar surface, the temperature is moderate, with only small changes, Dr. Carl E. Sagan of the Institute for Basic Research in Science at the University of California, Berkeley, suggested.

It is therefore possible that water and organic matter produced early in lunar history may be found in the depths.

Dr. Sagan suggested the "appreciable milder conditions" below the moon's surface in the final broadcast of a series on space science being beamed worldwide by the Voice of America. He said that the possibility of life on the moon should not be rejected because no known terrestrial organism could survive more than a few hours' exposure to conditions existing on the lunar surface.

Space exploration and discovery, he reported, are "keys to ancient riddles" that have intrigued mankind since antiquity—the problem of man's origins and the question of life on other worlds. These riddles are intertwined.

Four topics are now being investigated in order to find an answer. They are the origin of life on earth, the physical environments of the moon and planets, the evi-

dence for life beyond the earth, and the prospects for future exploration.

The most widely accepted theory regarding the origin of life on earth is that the primitive earth was rich in hydrogen, methane, ammonia and water. If energy is supplied in laboratory experiments to a mixture of gases similar to such primitive terrestrial atmosphere, simple organic molecules are formed.

When these molecules are dissolved in water, larger organic molecules are formed, Dr. Sagan said. As more energy is supplied, new substances of "impressive complexity and diversity," involved in all living processes on earth today, are produced.

The energy sources used in such experiments—electric discharges, ultraviolet light, heat and high-energy charged particles—were all available in the primitive terrestrial environment. The critical event was the origin of a molecular system capable of synthesizing itself. That occurred some 4.2 billion years ago, Dr. Sagan reported. From then on, natural selection was in operation, and the long evolutionary sequence from molecule to man was underway.

The primitive environments of other planets are believed to have been similar to these conditions. Life must therefore arise on countless other worlds, in our solar system and in other solar systems.

The subsequent physical development of

such planetary bodies would have resulted in a wide range of atmospheric chemistries and planetary temperatures. Therefore, Dr. Sagan said, "the forms of living organisms on other planets must be intriguingly diverse."

By surveying planetary environments, the most likely places in the solar system for life based on organic matter can be determined. Dr. Sagan concluded that life on Venus is "highly improbable" because of the high temperatures observed there by radio waves.

Conditions on Mars place a limit on the nature of any organisms there, but still they are favorable for the growth of familiar organisms. The question of habitability of Jupiter, Saturn, Uranus and Neptune is still open, Dr. Sagan reported.

Although there are several planetary environments in which organic matter or living organisms might flourish, there is as yet no demonstration that life exists in fact beyond the earth.

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## MEDICINE

## One Vaccination Against A Hundred Viruses

► **ONE VACCINATION** against as many as 100 diseases may be possible in the future, Dr. Jonas Salk of polio vaccine fame told a National Press Club luncheon in Washington, D. C.

Dr. Salk, who will be director of the Salk Institute for Biological Studies now under construction at San Diego, Calif., spoke on the present outlook for biology.

He later answered questions on topics ranging from his opinion of the King-Anderson bill (social security for the medical care of the aging) to the possibility of stamping out cancer with vaccines.

The question of how many diseases could be attacked with one vaccination brought the reply that the present three (diphtheria, pertussis and tetanus, now controlled by one shot of DPT vaccine) could be increased to ten. Then ten could be increased to 30. Finally, 30 to 100 viruses could be included in one vaccination without "interfering" effects, Dr. Salk answered.

An indirect attack may be made on certain forms of cancer if they are proved to be induced by viruses, possibly viruses causing other diseases originally, Dr. Salk answered in reply to another question.

"If we were to assume that certain viruses may so disturb the cell—the core of nucleic acid—and be responsible for a cancerous condition," he said, "I can foresee an indirect control over these viruses. I cannot foresee a direct control by vaccine."

He compared the "bewitchment" of cells by ordinary viruses that trigger cancer with the procedure in which the virus of chickenpox can be activated much later in life to cause cold sores (herpes simplex) and shingles (herpes zoster).

Asked about the Sabin vaccine, he said he questioned public health campaigns on a problem already dealt with.

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