

# 'Telepuppet' to Aid Man

A "telepuppet" controlled from earth may be able to efficiently assume some of the routine, tedious chores of space flight—By Ann Ewing

► A "TELEPUPPET" whose actions in an orbiting satellite are controlled from earth by the invisible strings of radio waves can replace man for many chores in space.

To give the best performance, such a telepuppet would resemble a human skeleton, but it could take other forms. However, for operations during which unexpected or suddenly startling action is needed, a remotely controlled puppet is no substitute for man.

The actions of a telepuppet would be directed by an earthbound operator viewing a television tube attached to his head and wearing electrically wired gloves. The operator's TV screen would show exactly the same view as the distant puppet's camera.

## Radio Waves Control Focus

Radio waves transmitted as the operator moved his head would control the focus of the telepuppet's camera. They would also tell the earth-orbiting puppet how to move its "fingers" and to take other action. Whatever motions the controller made on earth would be reflected without noticeable time lag by the telepuppet in a satellite orbiting no more than 25,000 miles from earth's surface.

The concept of this form of robot in a near-earth space environment is not a far-out vision, but a reality possible with the instruments and technology available today. How such systems could be used to extend man's observations from heavily instrumented satellites in orbit for a long time has been investigated by William E. Bradley of the Institute for Defense Analyses, Arlington, Va.

Not only the person controlling the telepuppet's movements but a national, or international, television audience could watch a space operation being performed from the satellite as it actually happens.

The telepuppet is merely a long-distance version of two devices already in use, Mr. Bradley told a meeting at Goddard Space Flight Center in Greenbelt, Md.

It is a combination of master-slave "hands," such as the ones used to handle radioactive materials from behind a protective barrier, and a head-controlled television in which a remote camera automatically follows the operator's head movements.

A telepuppet would be ideal for the prolonged flights of such satellites as those from which earth's cloud cover and other weather factors are surveyed, for relaying communications or serving as research platforms to monitor space

conditions. Such a puppet is technically called a telefactor.

Because remotely controlled telefactors do not require life-support systems, they can observe space through open windows. They are also, for the same reason, less expensive to launch into orbit and much less costly to maintain than manned vehicles making routine observations. The satellite "crew" can be replaced at will merely by substituting a new controller on earth.

Mr. Bradley noted that the telefactor is actually a general purpose remote-control system with two important interfaces—one between the human operator and the control, the other between the control and the remote environment. The telefactor system is designed so that the operator is scarcely aware of the first interface, while his whole attention is focused on the second. The effect is that the operator feels as if he were on the spot.

The operator, however, whether ma-

## BIOLOGY

# Venus' Heat Is Lethal

► FEARS that the crash of the Soviet Venus 3 might damage life on Venus are unfounded in the opinion of at least one space medicine authority.

Although National Aeronautics and Space Administration officials told SCIENCE SERVICE they were making no comment on British scientists' statements made at Jodrell Bank, Dr. Constantine D. J. Generales Jr., chairman of the New York State Medical Society's section on space medicine, said that it is "inconceivable" to him that earth germs could contaminate a planet with the estimated heat of Venus.

"With Mars you have a different situation," said Dr. Generales, "but if the estimated temperature of Venus is 800 degrees Centigrade, the heat would break up proteins."

Sterilizing instruments on earth is done at no more than 250 degrees C., he pointed out, and said he could not "get excited" about sterilizing hardware to protect Venus.

Dr. Generales coined a Greek-derived word, "kenoplane," to describe astronauts moving around in space. If they kenoplane to the moon and land there, he cannot conceive of serious contamination, and he does not approve of using taxpayers' money to sterilize everything connected with the flight.

However, he was one of the first to raise the issue of stowaway germs while

neuvering a telepuppet or handling radioactive materials in a nuclear reactor, can react effectively only when there is a feedback mechanism by which he can feel objects grasped in the same way a mechanic can feel a bolt with a pair of pliers. This has been accomplished already in handling "hot" materials in a reactor.

The electromagnetic waves used for communications, which could be either radio waves or possibly laser light, must operate in both directions. The changes made by the controller to the remote manipulator have to be coordinated with the television view and feedback information from the telefactor.

## Speed of Turtle

For surveying the moon, Mr. Bradley reported, the telefactor system could be moved only at about the speed of a turtle. The reason is that, even though electromagnetic waves travel at light's speed of 186,000 miles a second, there is a noticeable delay between the time a motion made on earth can be transmitted to the moon and the results of such motion received on earth.

However, a telepuppet system could be used effectively for surveying the surface of either the moon or Mars if it were controlled by a man in a nearby space vehicle.

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astronauts were kenoplaning. He was involved in some of the first space-minded biomedical experiments with Dr. Wernher von Braun as early as 1931 on the effects of acceleration on mice.

In May 1958, he spoke in Washington, D.C., on the possibility of contamination of the earth by extraterrestrial microorganisms "stowing away" aboard some returning space vehicle.

One of his interests is the possibility that certain microbes, viruses and their toxins have natural properties that can break down or absorb tumors. These oncolytic properties could effect permanent cure of cancer in animals and humans, he believes. This is what he thinks takes place in the so-called spontaneous regression of cancer.

The New York State Medical Society is the only one in the 50 states of the Union that has a space medicine section, but Dr. Generales believes the idea will spread. The ordinary clinical physician should be helping in space medicine, he said, since it is he who has the "final say" on the welfare of man.

Officials at the National Cancer Institute do not rule out the theoretical possibility that some viruses could have an effect on some types of cancer, but there are many problems in the way of conclusive evidence.

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