



UPI Telephoto

**THROUGH RANGER'S EYES**—The last two pictures made by the Ranger 9 spacecraft before impacting on the moon's surface on March 24 are shown here. The photos were taken (left) eight miles above the surface and 5.1 seconds before impact and (right) sixteen miles above the surface and 10.2 seconds before impact. Ranger 9 impacted on the moon's Alphonsus crater.

## ENGINEERING

## Disposables Scan Sea

Underwater instruments which would be compact and accurate and, once thrown into the ocean, never have to be retrieved may be developed—By William McCann

► TINY "THROW AWAY" packages of instruments that could be dropped into the sea, then left there when the job is done, may soon make oceanographers pardonable litterbugs.

The hot-dog-shaped package could contain as many as three or four instruments and make a number of measurements at the same time, cutting costs and increasing the accuracy of scientific data, an oceanographer reported.

James M. Snodgrass of the Scripps Institution of Oceanography, La Jolla, Calif., called the successful development of such expendable instruments one of the most exciting advances in oceanography.

Microelectronics, the use of extremely small circuits to replace larger and more costly tubes and transistors, will make such throw-away devices "economically useful," he said.

Oceanographers are already using one disposable instrument, a bathythermograph, which measures ocean temperatures in relation to depths. Mr. Snodgrass proposed, however, that more instruments be added to the unit. The additional pieces could measure underwater conductivity, oxygen and light.

The entire package could be as tiny as two inches in diameter and less than a foot long. Attached to equipment on board by a thin wire, it could be dropped overboard while the ship is speeding along. Data would then be transmitted over the

wire as the package sinks to the sea bottom.

The non-disposable instruments now being used have several disadvantages, according to Mr. Snodgrass. Since instruments that have to be recovered are often subject to damage from rough seas, rough handling or pressure, a boat must often be slowed down or stopped completely while instruments are being used and retrieved. Such practice is very costly to oceanographers and could be quite detrimental in military operations, he said.

Mr. Snodgrass suggested the expanded use of the throw-away instruments at a meeting of the Institute of Electrical and Electronics Engineers in New York.

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## TECHNOLOGY

## 'Hot Paint' Withstands Hot Pipe Temperatures

► A "HOT PAINT" for coating hot pipes can withstand temperatures as high as 1,100 degrees Fahrenheit indefinitely.

The pigment, which dries quickly and does not discolor with heat, may be used for such high-temperature applications as manifold pipes, blowers, mufflers or headers.

Developed by R C Industries Inc., Medina, Ohio, the "hot paint" can withstand repeated heating and cooling cycles with one coat.

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## SPACE

## Live Television Comes From Moon to Earth

► SEVERAL MILLION persons across the country saw the first live television broadcast ever sent from the moon!

The ninth and last Ranger spacecraft crashed into the moon at 9:08 a.m. (EST) on March 24, after transmitting a series of photographs of the approaching lunar surface back to earth. A television link with California Institute of Technology's Jet Propulsion Laboratory carried the images across the country.

The success made it three in a row for the Ranger program, which has had many delays and failures prior to Ranger 7.

"The purpose of the Ranger program was to get details of the moon and learn of possible landing sites for Apollo and to gather scientific information about the lunar surface. We have successfully achieved this," said Dr. William H. Pickering, director of JPL.

He said that Rangers 7, 8 and 9 had photographed three different types of terrain: Ranger 7 took pictures of valleys and relatively smooth regions of the western part of the moon's visible side near Mare Cognitum. Ranger 8 hit the Sea of Tranquility. Ranger 9's impact point was in the crater Alphonsus, an area of great mountains and pock-marks.

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## BIOTECHNOLOGY

## Atom-Powered Heart Forecast by Researcher

► EQUIPPED WITH an atom-powered heart and a transistorized ear, a man may one day last as long as his motor and electronic circuits hold out.

A reciprocating atomic steam engine, weighing four and a half pounds and measuring six by three inches, could be implanted in the abdominal cavity with a heat exchanger attached to the external iliac artery, reported Dr. Yukihiko Nose, Cleveland Clinic Foundation, Cleveland, Ohio. He described the device to the international convention of the Institute of Electrical and Electronics Engineers.

One capsule of atomic fuel would power the engine and its human carrier for as long as two years.

A prototype of the nuclear-mechanical heart is now being built by the Thermo-Electron Engineering Corporation, Dr. Nose said.

A hearing device that operates from inside the ear has also been under study.

Experiments have been performed in which electric probe simulators were placed in various portions of the vestibule and cochlea of the human ear, reported J. H. Doyle, General Data Corporation, Garden Grove, Calif.

It is hoped that the device will ultimately produce intelligible sound through direct contact with the eighth cranial nerve, he said.

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