

ASTRONOMY

Moon Has 'Hot Spots'

More than 300 places on the moon have temperatures higher than their surroundings, perhaps because their surfaces are more dense or more uneven than their surroundings.

► THE MOON is peppered with hundreds of "hot spots," although the temperatures are well below zero Fahrenheit.

More than 300 places having temperatures higher than surrounding areas were discovered during the total lunar eclipse last Dec. 19.

Even though a very fast electronic computer was used to help with the calculations, only preliminary results of the infrared scan of the moon could be reported to the American Astronomical Society meeting in Lexington, Ky.

Many of the hot spots can be identified with the small ray craters easily visible as bright pinpoints of light on the full moon, J. M. Saari and Dr. R. W. Shorthill of Boeing Research Laboratories, Seattle, found.

Large ray craters, such as Tycho, are blinding bright through binoculars at full moon and have rays extending in all directions from them many times longer than the diameter of the crater itself. The small ray craters are miniature versions of the large ones.

Ray craters are lunar features formed much later than the moon itself, which is some four and a half billion years old. They probably have higher temperatures than regions around them because their surfaces consist of material either more dense or more uneven than the rest of the moon.

Temperatures of the hot spots range from 10 to 86 degrees Fahrenheit higher than the surrounding areas, Dr. Shorthill

told SCIENCE SERVICE. He said they were now in the process of plotting these temperature differences on lunar maps in order to compare them with surface features, using the International Business Machines 7094 computer.

Completing this work will take six months to a year, Dr. Shorthill said. No pattern has yet been found linking the hot spots to a particular kind of feature on the lunar surface.

Temperatures higher than average have been detected over extended areas of several seas, or maria, Mr. Saari reported to the astronomers meeting at the University of Kentucky.

A fast infrared device mounted on the 74-inch Kottamia telescope of Helwan Observatory in Egypt was used to scan the lunar surface blacked out by the earth's shadow during the Dec. 19 total eclipse. A complete scan took 16 minutes, so three could be made during totality.

The highest temperature difference found was in the Tycho crater, which had a temperature of 53 degrees below zero Fahrenheit during totality while surrounding areas had dropped to minus 139 degrees.

Many of the hot spots, including the eight most prominent, are not outstanding visually, although Tycho is. One of the eight, Dionysus, was photographed by the Ranger 7 cameras before the probe smashed into the moon.

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'Dark Star' Discovered

► A "DARK STAR," the unseen companion in a double stellar system, has been discovered in the large but faint constellation of Pisces, the fishes.

The invisible star is much too faint to be seen even on photographs taken with the world's most powerful telescope, the 200-inch instrument atop Mt. Palomar in California. However, its existence can be detected from the wobble it causes in the space paths of its two fellow travelers.

Discovery of the third member of the triple stellar system was reported to the American Astronomical Society meeting at the University of Kentucky by Wallace R. Beardsley of the University of Pittsburgh's Allegheny Observatory.

This observatory houses a 30-inch refractor, the largest telescope of its kind in the world designed particularly for precise photographic measurements.

Only from such highly precise measurements can astronomers discover unseen stellar companions—possible planets.

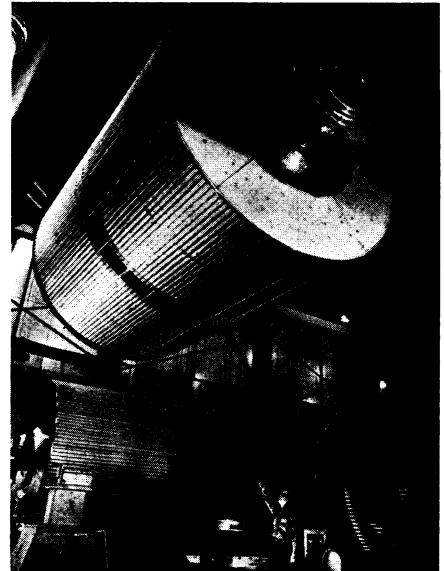
One of the other invisible members of a star system, a giant half again as heavy as the planet Jupiter, is believed to be a planet some 36 million million miles from earth in the constellation of Ophiucus, the serpent holder. Barnard's Star B, as the planet is known, was found with similar measurements made at Swarthmore College's Sproul Observatory.

Only a few observatories in the world, such as Allegheny and Sproul, are actively engaged in the fundamental measurements of star distances by which dark members traveling through space with visible stars are discovered from photographs taken at intervals over decades.

Mr. Beardsley reported to the astronomer's meeting that the triple system, known as omega Piscum, is moving through space at a speed of 15 kilometers per second as viewed from earth.

Only about a dozen stellar systems having unseen companions are known.

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Titanium Metals Corp. of America

TITANIUM WASHER—The paper industry's first washer made of titanium is expected to improve pulp quality and save money. Developed by Titanium Metals Corporation of America, it was made by Improved Machinery Inc., Nashua, N.H.

ASTRONOMY

Moon Once Had Life-Like Forms, Water From Earth

► THE MOON once had life-like forms and water captured from earth billions of years ago, Nobelist Dr. Harold C. Urey of the University of California, San Diego, believes.

Either of two models for the origin of the moon are in agreement with the proposal that earth's only natural satellite was long ago splashed with biological materials and water. The two theories of lunar origin are that the moon escaped from earth or that it was captured by earth.

Dr. Urey reported that there is now "considerable evidence" from many sources indicating that some, if not most, of the stony meteorites found on earth's surface come from the moon. Included could be the ones containing carbon compounds, Dr. Urey stated in Science, 147:1262, 1965.

One such carbon-containing meteorite, known as Orgueil for the place where it fell in France a hundred years ago, has been found to contain chemicals characteristic of biological materials, Dr. Urey reported.

Its composition, he said, "is consistent with what might well be expected to be present in the primitive oceans of the earth at a time during which primitive life was evolving from inanimate matter."

This indicates the moon was once contaminated with earthly water. However, since river valleys are not present on the moon, the amount was small and the time was short.

The small effects resulting from the water could have been destroyed by the erosion processes shown to be present by the Ranger 7 lunar photographs, he said.

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