SPACE

When Man Lands on Moon

The first man to land on the moon will help clear up some of the mysteries baffling scientists since ancient times, Tove Neville reports in an analysis of lunar conditions.

➤ THE YEAR IS 1970. The first astronaut has just landed on the moon after a decade of painstaking technological space progress.

First there was the Mercury program carrying chimps and men around the earth. Then came the Gemini project in which astronauts in a two-man capsule learned how to join spacecraft sent aloft by two Saturn C-5 giant boosters, each hurling 200,000 pounds into space. The Ranger and Surveyor probes have made preliminary studies of the moon.

The first astronaut on the moon has landed in the crater Alphonsus bordering on the lunar "sea" called Mare Nubium. If volcanic action formed this crater and laid down the basalt believed by some to form the floors of the lunar seas, then this will be an ideal spot for a moon base. The lunar seas are dark areas of the moon making up the man-in-the-moon's face and believed by the ancients to be seas.

Colonies at Moon Poles

Another possible spot for later moon colonies will be at one of the moon poles where there is always some light and where men can be partially shielded from the sun's intense heat at the edge of the dark side of the moon.

The astronaut ventures out of his spacecraft onto the crater floor, wearing a soft moon suit conforming to his body movements. Stiff, shielded suits have been found unnecessary on the moon's surface under normal conditions. He carries his own atmosphere inside the suit because there is none on the moon.

He also has his own heat control built into the suit to help him withstand the extreme temperatures, which range from between 212 degrees Fahrenheit on the moon's sunlit side to about 166 degrees below zero in the dark portions.

He hears no sound, even when the sun's fierce heat cracks long rifts in the rocks, nor does he feel any wind. Only when a huge meteor crashes into the surface in a fiery flash will dust be seen billowing upward. Atmosphere is necessary to carry sound waves and wind currents.

He waves at his companion astronaut who has just emerged from the craft. They both carefully shade their eyes from the blinding glare of the waxing moon's lit portion. Their 70-mile diameter crater, located close to the center of the lunar surface seen from earth, is now in deep shadow, but the light will advance day by day until the sun stands overhead. As the moon progresses on its 27-day journey around the earth, the sun will set again only to light up the opposite side of the moon.

One of the most important tasks for the first moon team is finding water sources, indispensable for later manned moon settlements. If the volcanic theory is true, the two astronauts will find water in rocks, in ice of permanently shadowed zones in volcanic craters and in permafrost in dust basins.

Water molecules trapped in the rocks can be freed by heating. Volcanic rocks on the moon would contain about 26 quarts of water per cubic meter.

The astronauts also explore to find materials useful for survival on the moon. In Mare Nubium they find basalt which can be used for water extraction; for pipes and drains; for tiles and bricks to build shelters and moon bases; for furniture, tableware and even wheels; and for tools and scientific equipment. Spun basalt can be made into cloth and bedding, insulation packing materials and filler in sulfur cement.

Sulfur, the most abundant volcanic mineral, will be an ideal raw material for metallurgical and mineral dressing processes. It can be used as a waterless cement, a sealant, for bricks when mixed with volcanic ash or spun basalt fibers, as the working fluid in power plants, as a transport carrier of rocks to a water extraction chamber and as a lubrication fluid for pumps and machines.

Pumice is another raw material the first moon explorers will find in volcanic terrain. It can be easily shaped into building blocks which the sulfur could cement together. A primitive moon base could be built of pumice walls and roofs.

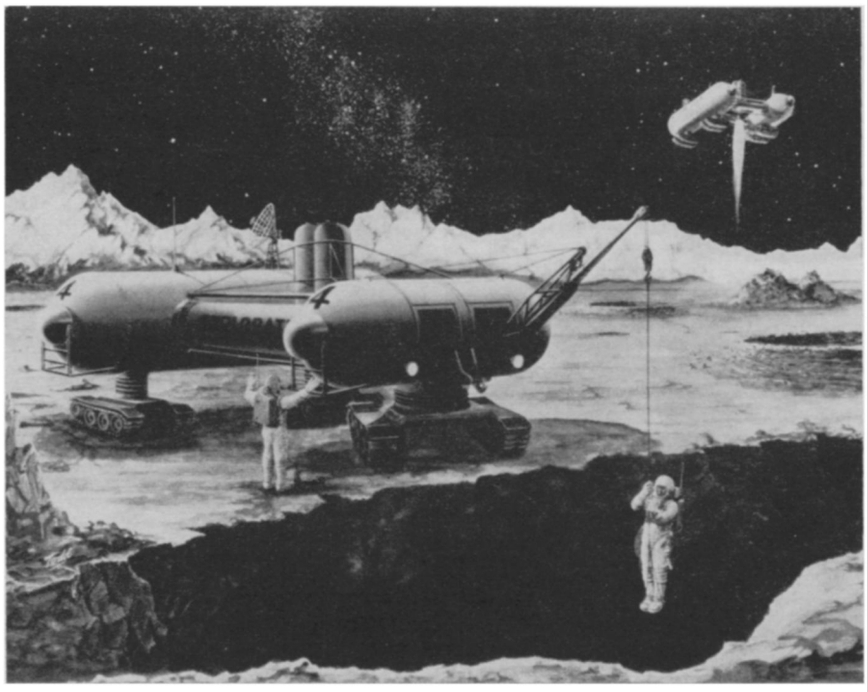
If evidence of volcanic activity is found, lava tubes and caves caused by drainage of subsurface channels of lava would have formed on the moon as they do in volcanoes on earth. These caves can be used by astronauts as shelters and moon bases. Cracks could be cemented by sulfur for better protection.

Exploring the Moon

Astronauts on the moon will use vehicles in exploring the terrain and in gathering samples. When leaving the vehicles, they will be able to jump six feet for each one foot on earth because of the low gravity. They will encounter many phenomena unknown on earth.

Each man will see a halo around his own head whenever the sun is directly behind him and he casts a shadow. The halo is caused by the surface material which reflects light directly back toward its source in the same manner fluorescent paint on sidewalks reflects light.

The astronaut will also have to be careful to see that his rubber boots or con-



MOON CRAWLER—Equipped with caterpillar treads and a rocket system, this hybrid vehicle, as visualized by Northrop Corp., Hawthorne, Calif., is capable of crawling or making short flights.

necting hoses are not attacked and destroyed by free chemical radicals expected to exist in space. These radicals are combined on earth into harmless chemicals. When found alone they are very active and dangerous.

The astronauts of 1970 will again board their craft and take off for earth where they will report their finds and have their samples tested.

Today, in 1962, some scientists believe the lunar craters are of both volcanic and meteoric origin, others are convinced that there was never any volcanic action on the moon and that all the pockmark-like mountains were caused by meteors. Probably no one will have proof until the moon is explored directly.

Most of the experts today agree that there is a dust layer on the moon. Hundred-degree drops in temperature that occur in a few minutes indicate an insulating layer on the moon. If the layer is not dust from scattering meteors, it may be volcanic ash. The temperature changes are measured during lunar eclipses when the earth passes between the sun and the moon.

Some scientists believe the dust is a few inches thick; others see the possibility that the first astronauts and their spacecraft may be engulfed in a hundred feet of dust.

However, one scientist thinks that the moon has lost most of its dust from meteoric bombardment. He believes that the dust would be hurled away at such speeds that it would escape the low gravitation of the moon which is only one-sixth of earth's. It is possible that all the dust escaped from the moon this way since dust particles tend to stick together in a vacuum.

For this reason, another scientist speculates that the dust layer, if present, will more likely be a strong crunchy material. A manned vehicle flying around the moon could possibly be devised as a lunar "submarine" able to dig into this material for protection against deadly radiation from solar flares. The flares are storms on the sun sending giant tongues of hot gas millions of miles into space.

Some scientists now believe that radiation would not be dangerous to man on the moon except during solar flares. However, shielding will be necessary while astronauts fly through the Van Allen belts of trapped particles girdling the earth. The problem of proper shielding has to be met before man can make the trip to the moon.

Scientists hope to get a clue to the origin of the solar system on the moon. One theory proposes the sun and planets, including the earth, were formed side by side from the same nebula; another holds that all the planets and moons of planets were formed from bodies the size of the earth's moon. Some of these broke up, others merged. Other scientists believe the moon has broken off from the earth at a time when the earth had greater angular momentum (was spinning faster).

• Science News Letter, 81:202 March 31, 1962

ASTRONOMY

Seek Planet Clues

➤ MANY OF THE MYSTERIES of the two planets closest to earth, Mars and Venus, could probably be solved by a worldwide observation network.

Existing astronomical observatories around the world may be organized in a cooperative watch of the two planets, a study by the National Academy of Sciences suggested.

Communications procedures, uniform observing practices and a central organization, probably in the United States, to receive the observations would be part of the program. The central organization would also analyze observations and make them generally available.

This would mark the first time that continuous observations of the planets were made. The observations would be of great importance because the daily changes on the planets could be observed without break for long periods. Some of the features to be studied would be the cloud patterns entirely covering the surface of Venus, the white and yellow clouds of Mars and the blue haze that periodically covers Mars.

These features could give clues to the atmospheres of the planets. The program was initially recommended by a study group at the University of California's Jet Propulsion Laboratory. The group also proposed that the following be included in such a program:

1. Additional staff needed at observatories be drawn from scientists of the country where observations were made, but interchange of research workers also be encouraged.

2. The central organization to act as a study center where techniques of the related sciences of geophysics and astronomy could be employed simultaneously.

3. New sites, with exceptionally good seeing conditions for lunar and planetary observations, be established in the U.S.

The observation program is estimated to cost about $1,000,000 a year.

• Science News Letter, 81:203 March 31, 1962

A tiny *radio* device which can report on the acidity of the stomach after it is swallowed has been developed.

A recent study indicates the Interstate *freeways* are about two and a half times safer than the highways of earlier design they are replacing.

The *universities* in the U. S. are granting more graduate fellowships in the physical sciences and mathematics than in any other fields.

While there is a great demand for *meteorologists* from the Government, armed services, private research organizations and industry, only about a dozen Ph.D. meteorologists are produced each year in the U. S.