

ASTRONAUTICS

# Ten Hours to the Moon

A trip to the moon is no longer a dream but a target at which American and Russian scientists are shooting, with good chances of hitting it soon.

**See Front Cover**

➤ A ROCKET trip to the moon could be made in ten hours.

That is about the time required for direct, powered flight to the moon from earth at about 25,000 miles an hour, the speed necessary to escape from earth's gravitational field.

The consensus of astronomers in Washington is that any rocket sent in the near future would be equipped with a homing device to be sure of hitting the moon. This would mean making continuous adjustments in its path, just as it would for Intercontinental Ballistic Missiles. Since the Russians have claimed a new and powerful fuel source, it would be logical to use it for the first moon flight, if they attempt the trip.

Their rocket, it is speculated, will have a hydrogen bomb aboard, so there will be no doubt when it hits the moon.

The impact made by the hydrogen bomb explosion would leave a mark on the lunar landscape, but the crater would be much smaller than many already there.

The photograph on the cover of this week's SCIENCE NEWS LETTER shows how the moon looks at approximately 14 days old. If the picture is held at a distance of about 50 feet (roughly the focal length of the 36-inch refractor telescope used) it will look very much as the moon does in the sky. Tycho at the top (South) is the crater from which the ray system radiates, making the full moon look like a peeled orange. It is necessary to turn the photograph upside down for a non-telescopic view.

Probably the ideal way to send a rocket to the moon would be to launch the vehicle as a satellite. Once it is in orbit and its position well known, then the rocket could be sent off on its space journey by signal from earth at the precise moment computed to be the best to set it on a fuel-saving, coasting course to the moon.

When a space vehicle is sent to the moon by just freeing it from earth's gravity, then allowing it to fall freely in space the rest of the way, the journey will take at least five days. Various paths can be taken to reach the moon.

Dr. J. G. Porter of the Royal Greenwich Observatory at Herstmonceux Castle, Sussex, England, has calculated that in order to reach the moon at 240,000 miles, the initial rate of acceleration must not be allowed to vary more than about five feet per second.

This is another reason why astronomers believe the first rocket to the moon will have a guiding mechanism and therefore use power.

Many details of the moon are visible with field or opera glasses. These bring the

moon, which ranges from 220,000 to 253,000 miles from earth to within about 30,000 miles. Then the surface of the moon, which is 2,163 miles in diameter, becomes much clearer. By mounting field glasses on a tripod or supporting it in some other way, the moon's features can be seen better.

**Dark Plains Visible**

With field glasses the wide, dark plains which Galileo and his contemporaries mistook for seas just after invention of the telescope, can be seen. They are shaded on both maps, and marked on the index map with capital letters.

Today we know there is no water on the moon and practically no air, but we still use the old Latin names for these "seas." Thus Mare Tranquilitas is the Sea of Tranquility; Mare Serenitatis, the Sea of Serenity; and Mare Crisium, the first of the dark areas visible on the new moon, is the Sea of Crises.

The craters can be seen in great detail when the moon is in first or third quarter. Then the sides of the craters near the unilluminated regions of the moon are highlighted by the slanting rays of the sun, just as shadows here are longer in the early morning and late evening than at midday.

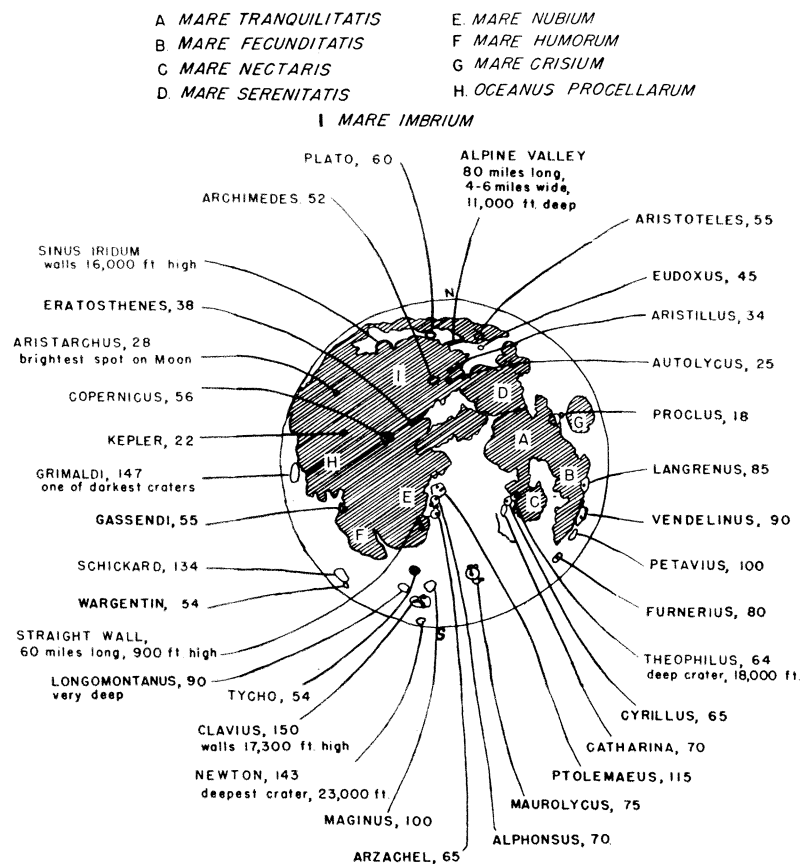
The craters vary in size from pits but a few hundred feet across to great rings of mountains enclosing plains more than 150 miles from side to side. In the center of many craters you will notice a single sharp peak, rising almost as high as the walls. The craters were named after famous scientists of the past, such as Archimedes, Kepler, Copernicus and Newton.

Mountain ranges on the moon, rising as high as 26,000 feet above the surrounding plains, are named after mountain ranges on the earth.

The Apennines are found at the upper right of the crater Eratosthenes along the edge of Mare Imbrium, and the Alps, bordering the same sea, are at the lower right of Plato.

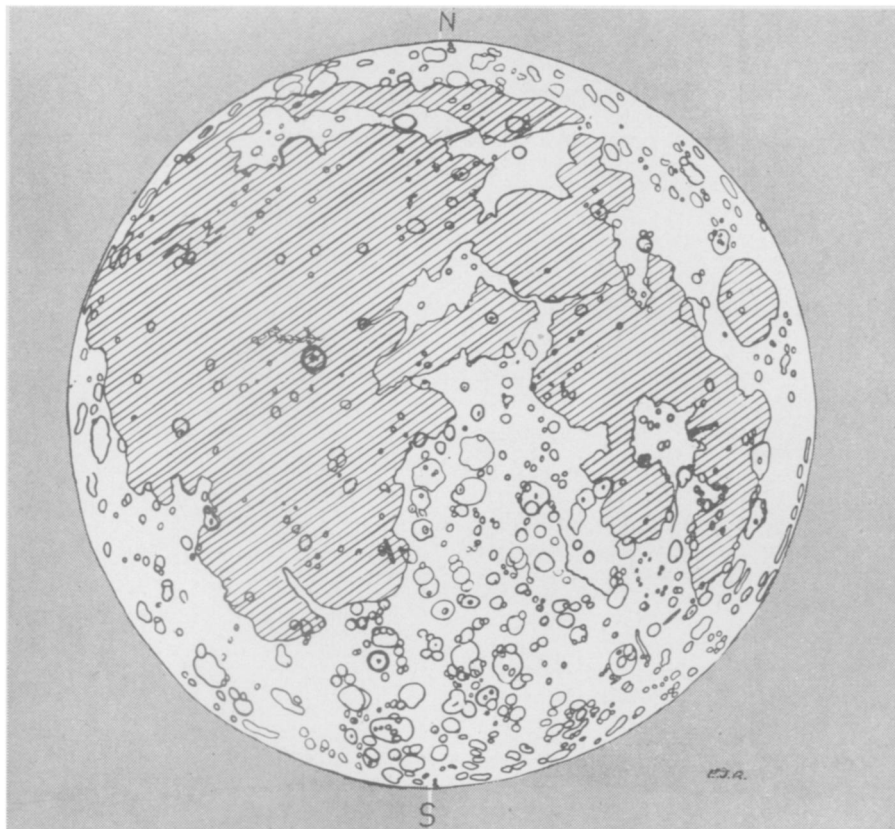
Several craters, especially Tycho and Copernicus, have light streaks called "rays" radiating from them. These are best seen at full moon. There are also many cracks in the moon's surface called "rills," but none are shown on these maps because a large telescope is needed to see them.

Some 20 maps and 30 photographs of the moon were examined, and the image of



**INDEX MAP**—The names of the leading craters, mountain ranges and seas on the moon are shown in this Ladd Observatory, Brown University, map prepared, together with the one on the next page, under the direction of Prof. C. H. Smiley. The approximate diameter of each crater in miles is listed beside the crater's name.





**MOON'S SURFACE**—With a good pair of field glasses or a small telescope, many of the interesting features of the surface of the moon are revealed. This view shows the South pole and the crater Tycho at the bottom in contrast to the telescopic view of the moon shown on the cover.

the moon as actually seen through a small telescope was also studied so that the maps would be useful to those with little or no equipment.

### Map Is Turned

The map is turned to show the moon as it is seen with the naked eye or through field glasses. A telescope will magnify the features of the moon but turn them upside down. North will appear in the position now occupied by south and the sides likewise will be interchanged.

Month after month, as we look at the moon, which shines only in the reflected light of the sun, we see about the same features. The moon revolves about the earth once every 29.531 days on the average, and this is the interval from full moon to full moon, or between two new moons.

When a thin crescent moon is visible in the skies, the remainder of the disk can be seen faintly illuminated by earthshine, sunlight reflected by the earth to the moon.

### Just One Revolution

The moon makes just one revolution on its axis during the journey around the earth, thus the same portion always faces us. But frequently it is slightly out of its average position and we are able to peek into the little-known regions, seeing first

a little farther around one side and then an extra portion around the other side.

By repeated observations with the telescope and studying photographs taken at different times, astronomers have become familiar with almost 60% of the moon's surface.

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### TECHNOLOGY

## Sound Waves Improve Chromium Plating

► **BRIGHT CHROMIUM** plating is improved by passing sound waves through the plating solution, the Electrochemical Society meeting in Buffalo, N. Y., was told.

Joseph S. Dereska of National Carbon Company Research Laboratories, Parma, Ohio, reported that sound waves make the chrome plate harder, stick better to the base metal, increase brightness and make the plated surface less porous. The effects were only slight, but described as definitely beneficial.

Waves of 10 kilocycles per second, sonic, and 260 Kc. per second, ultrasonic, produced essentially the same effect.

Mr. Dereska believes the sound wave vibrations have the effect of agitating, or stirring, the plating solution at the surface to be plated.

Science News Letter, November 16, 1957

### GEOPHYSICS

## Sputnik I Rocket Visible In Early December

► **NEARLY EVERYONE** on the face of the earth should be able to see the first Russian satellite rocket in early December.

The rocket's orbit will lie in the twilight band of the earth during these days and will be "highly visible" between Dec. 1 and 3, Dr. Karl S. Henice, senior astronomer at the Smithsonian Astrophysical Observatory, Cambridge, Mass., reported.

It will be visible over New England and many other areas on the evening of Dec. 1.

"It will be glowing much brighter," he said, "because it will be much closer to the earth."

Dr. Henice said that everyone from southern Canada to Argentina and from Great Britain to South Africa should be able to see the rocket in either morning or evening passing. The rocket will be circling the earth every 93 minutes then, traveling north to south in the evening and south to north in the morning.

The rocket will not be easily visible in November and ships at sea have been requested to make observations of the first sputnik and its rocket.

Both the Naval Research Laboratory in Washington and the Smithsonian Astrophysical Observatory in Cambridge, Mass., as well as the Russians, are computing orbits for the second Soviet satellite. Officials expected to have enough accurate sightings to compute the satellite's position more than a few days in the future by mid-November.

Science News Letter, November 16, 1957

### EDUCATION

## Reds Better Schooled In Math and Science

► **LITTLE IVAN**, when he enters a Russian university, has five times more science and mathematics than the minimum needed to enter a school like Massachusetts Institute of Technology.

Sputnik is a direct result of Soviet Russia's stressing the tough, hard subjects of mathematics and sciences.

Because of this intensive training, the Russians have a tremendous pool of well-trained secondary students from which it is easy to select future scientists.

Dr. Nicholas DeWitt of the Russian Research Center, Harvard University, Cambridge, Mass., told a conference on Engineering and Scientific Education—Foundation of National Strength meeting in Chicago that Red schools teach in 10 years what we take 12 years to do.

With the American public aroused by sputnik, however, educators should be able to "sell" the necessity for a tougher curriculum and better training at all levels of education for U.S. high school students.

For 30 years Russia has been educating boys and girls in mathematics and science, subjects American students are so willing to shun. Now Mr. and Mrs. Average American may be awakened to the methods and achievements of Russian education.

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