ASTRONOMY

Stars Are Not Countless

Although They May Seem Innumerable on a Summer Night You Can Really See Only 2500; Watch for Meteors

By JAMES STOKLEY

AS THE moon travels around the sky once every 27 1/3 days, it sometimes comes between the earth and the sun, causing an eclipse like that seen in June. Again, it sometimes comes in front of a star or planet. This kind of eclipse is properly called an occultation. The moon seems to take up considerable space in the sky; the stars, on a dark night, seem pretty thickly strewn; so it might be thought that one would often be hidden in this way.

This, however, is an illusion. True, every day one or more faint telescopic stars will be hidden as it goes around, but occultations of those visible to the naked eye are much more rare. Let us consider a few figures. Apparent distances between celestial objects are given in degrees of arc: the angle that would be made at the observer's eye between two straight lines from the objects.

Thus, Dubhe and Merak, the "pointers" in the great dipper, are said to be about 5¼ degrees apart, because that is the angle between straight lines from each star, coming together at the earth. The distance from the horizon to the zenith, the point directly overhead, is 90 degrees, while the distance completely around the horizon is 360 degrees.

Measure by Degrees

We measure terrestrial distances by miles, and areas by square miles; so in the sky we can measure areas with square degrees. The moon is half a degree in diameter, which means that four moons could be placed in one square degree, like four cookies in the bottom of a square box whose sides were twice the diameter of the cookies. In the interstices between the four cookies and the box edge would just fit the broken pieces of a fifth.

Similarly, one square degree is just five times the area of the full moon. In the whole sphere of the sky there are 41,253 square degrees, but that includes the part below our horizon, and there are only 20,626 in the visible hemisphere. Thus, it would take 103,130 full moons to fill the visible sky completely, without any gaps.

On the darkest night, with the clearest sky, we cannot see more than about 2500 stars without a telescope, even though they may seem innumerable. If the stars were uniformly distributed there would be only one to every 8.25 square degree area. This is 41.25 times the area of the moon, and so it would take that many, on the average, to cover one star.

It is apparent that there is plenty of room for the moon to travel around the sky, without coming in front of a naked eye star. However, the moon does not wander about at random, but its motion is confined to a definite path. Neither are the stars uniformly distributed, but in some places they are more thickly strewn than others. But on the average the figures above cited are correct.

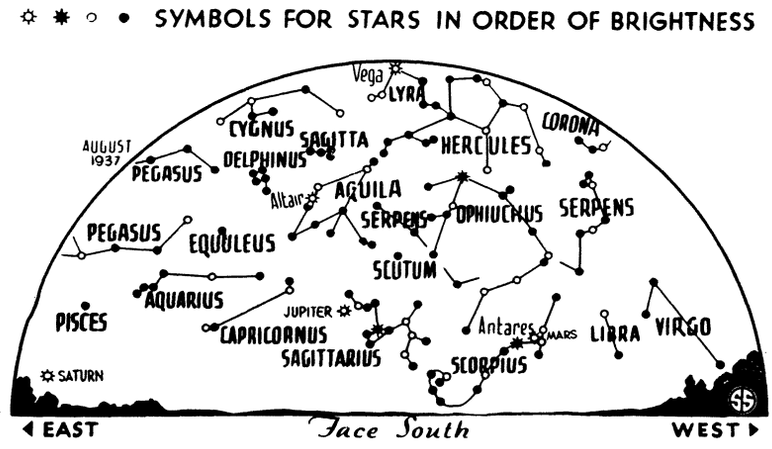
Move in Same Belt

The planets move about the sky in the same belt as the moon, and occasionally it hides one of them; though, because of their motion, the chances are even less. In August, it happens, there will be an occultation of Venus, in the early morning of the third, the first to be seen in America since 1923. Unfortunately, only the northeastern states will be able to view it, as the planet will be uncovered before it and the moon have risen over most of the country. But if, on that morning, you look to the east before daybreak, you will be able to see the two objects, brilliant Venus, and the moon, as a narrow waning crescent, still close together. The farther east you are, the closer they will be.

Visible Over Ocean

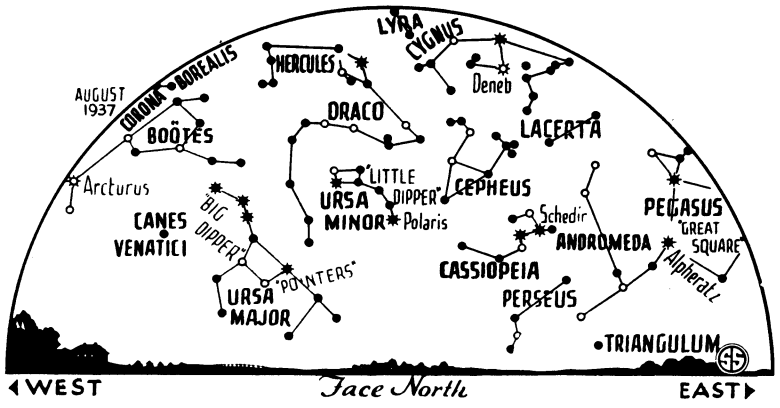
It will also be visible over most of the northern part of the Atlantic Ocean, over eastern Canada, Labrador, Greenland, Iceland, the northern half of the British Isles, the Scandinavian peninsula and northern Europe, though in practically all of this area it will happen in full daylight. Venus is so brilliant that there will be no difficulty in seeing it even so, if a small telescope is used.

August should provide an excellent opportunity to see the famous "tears of St. Lawrence," the meteors, or "shooting stars," that come at this time. On any dark, clear night during the latter half of the year, it is possible to see an average of a dozen or so an hour, but at certain dates these numbers are greatly increased. About August 11th they come at an average of about one a minute. Then, instead of flashing across the sky at random, all seem to radiate from one particular place, the constellation of Perseus, low in the northeast. By midnight this constellation has risen higher, and then the meteors are seen in even greater numbers than during the earlier hours. Because of the direction from which they



THREE IN A ROW

Almost lined up are the three bright planets visible in the evening sky during August. The bright star Vega is almost overhead.



STAR GUIDES

In the north are the two dippers that serve as such good guides for locating other stars and the new comet. See page 69 for map showing its location.

seem to come, these are called the "Perseid" meteors.

However, they do not really radiate from this point, but are moving around the sun in parallel paths, in a great swarm which the earth crosses every August. This swarm follows Tuttle's comet, last seen in 1862, so it is believed that the meteors are the comet's debris. Other showers of meteors, which appear at other times of year, also follow the orbits of comets of the past.

The darker the sky, the more meteors are seen and it sometimes happens that the moon is bright, and the brilliance of the shower is dimmed. This month the moon will not have reached first quarter. It will have set by midnight, providing a dark sky during the morning hours when the shooting stars are seen to best advantage.

Amateur Observers

Amateur observations of these meteors, particularly the numbers seen during half hourly periods, and the paths through the sky and times of unusually bright ones, are desired by astronomers. Such reports should be sent, in the United States, to Dr. Charles P. Olivier, Flower Observatory, Upper Darby, Pa., and, in Canada, to Dr. Peter M. Millman, Dunlap Observatory, Richmond Hill, Ontario.

With the coming of August, three bright planets appear among the stars of the evening sky. Their positions are shown on the accompanying maps, which depict the appearance of the heavens at 10:00 p. m., standard time, at the first of the month, 9:00 p. m. on Aug. 15, and 8:00 p. m. Aug. 31. Brightest of these is Jupiter, which exceeds in brilliance any of the stars. It shines in the constellation of Sagittarius, a group seen directly south.

Next to this, farther west, is the scorpion, Scorpius, in which the first magnitude star Antares marks the animal's heart. But close to Antares is a somewhat brighter orb, its steadier light suggesting its non-stellar character. This is the planet Mars, now fainter than it has been in recent months, for it is drawing away from the earth.

For Early Risers

The month's third evening planet is Saturn, faintest of the trio, though exceeding all but two of the stars. It also is fainter than average this year, because the ring system is turned nearly directly on edge to us, and so we are only getting light from the inner ball. When the rings are spread out to a considerable angle, as they will be in a few years, the reflected sunlight from them makes the planet much more brilliant, even though the rings cannot be seen without a telescope. Saturn now stands in the constellation of Pisces, the fishes, low in the sky, a little north of the eastern point. Finally, in addition to the three mentioned, a fourth planet shows itself during the night. Venus appears in the southeast several hours before sunrise, and then it is considerably brighter than any other planet or star.

Four other first magnitude stars, besides Antares, are to be seen during August evenings. Brightest of all is Vega, in Lyra, the lyre, almost directly overhead. To the east is Cygnus, the swan, or the "northern cross." The vertical member of the cross runs north and south, and the star Deneb marks the northern end. Farther south is Altair, in Aquila, the eagle.

The fourth is in the west. This is Arcturus, in Boötes. A good way to find it is to look for the well-known figure of the "great dipper" in the northwest. Then follow the curve of the handle to the south, and you come to Arcturus.

The moon's phases are given in the table below. From about the 12th to the 23rd the evenings will be moonlit. On August 2 at 11:00 p. m., eastern standard time, it will be at perigee (closest the earth), with a distance of 227,740 miles. Then it will recede to its greatest distance (apogee) on the 15th, at 10:00 p. m., when all of 251,110 miles will separate us. After that it approaches and is again at perigee on the 28th, at 10:00 p. m., though it will be 229,840 miles away. After that it recedes once more.

Phases of the Moon

		E. S. T.
New Moon	Aug. 6	7:37 a.m.
First Quarter	13	9:28 p.m.
Full Moon	21	7:47 p.m.
Last quarter	28	6:54 p.m.

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PHYSIOLOGY

Whales Immune to Dreaded Compressed Air Illness

COMPRESSED air illness or caisson disease is the chief hazard of workers, such as divers and tunnel excavators, under high air pressure. The condition is caused by the release of bubbles of nitrogen which may form in any part of the body, or block any of the blood vessels. It can take many forms, but the cause is always the same, namely, change from a higher to a lower air pressure. The symptoms may arise from a long dive at a moderate depth or a short dive at a great depth.

It has been assumed hitherto that all mammals were susceptible to compressed air illness. However, Laurie of the "Discovery" Expedition of the British Colonial Office, concludes that the whale is immune, as a result of certain remarkable biological studies. The work was carried out in the vicinity of the island of South Georgia in the South Atlantic.

The whales in this region live mainly on lower animals which exist at great depths, and therefore have to make long and deep dives to secure their food. The whale can descend to a depth of about 300 feet, remain there for 15 minutes and return rapidly to the surface without developing symptoms of compressed air illness. The human diver, under similar conditions, would un-