ASTRONOMY

# Jupiter Shines All Night

**Mars and Saturn are the two other planets visible during June. The summer solstice, which will come on June 21, will mark the beginning of the summer season.**

By JAMES STOKLEY

➤ ALTHOUGH the brightest planet of recent months is about to disappear from the evening skies, three others remain visible, along with the stars that accompany the beginning of summer.

All during the spring Venus has shone brilliantly in the west after sunset, and at the beginning of June it can still be discerned, about 22 degrees above the horizon as the sun goes down. However, it is rapidly drawing into line with the sun, reaching that position (called inferior conjunction) on June 24. A number of days before this it will be lost in the sun's glare. By mid-July it will have passed to the west of the sun, so that it will rise about two hours before sunrise, thus changing to a "morning star."

At the very beginning of June one may also glimpse the innermost planet of all—Mercury—in the west as twilight gathers. On May 28 it will be farthest east of the sun, so that it will set the longest time after sunset, and for perhaps a week after this date it can be seen at dusk near the horizon. It reaches inferior conjunction with the sun less than a day ahead of Venus.

### Jupiter in Opposition

Brightest planet that is visible throughout the month of June is Jupiter, in the constellation of Sagittarius, the archer. This orb is at opposition with the sun on June 15. That means that it is in the opposite direction, and rises at sunset, remaining visible through the night. Because, at this position, the earth is on the same side of the sun as that planet, it will then be closest, with a distance of 395,800,000 miles, accounting for its brightness. On the astronomer's scale, it is of magnitude minus 2.2. Its position is indicated on the accompanying maps, which depict the skies as they appear at 11:00 p.m. (daylight saving time) on June 1 and an hour earlier at the middle of the month. Jupiter is in the southeast, above the curved tail of Scorpio, the scorpion, a group marked by the red star called Antares.

The other two planets are seen in the west, close to the star Regulus, in Leo, the lion, which stands at the end of the handle of the sickle, a hook-shaped group of stars. Mars, Regulus and Saturn stand in a row, reading from east to west. Saturn is brightest of the trio, Mars second and the star the faintest.

In addition to Regulus and Antares, seven other stars of the first magnitude are shown. Brightest is Vega, standing in the east in the figure of Lyra, the lyre. Below is the northern cross, which is part of Cygnus, the swan, resting on its side, with the star Deneb at the northern end. To the right is Aquila, the eagle, with Altair as the brightest star.

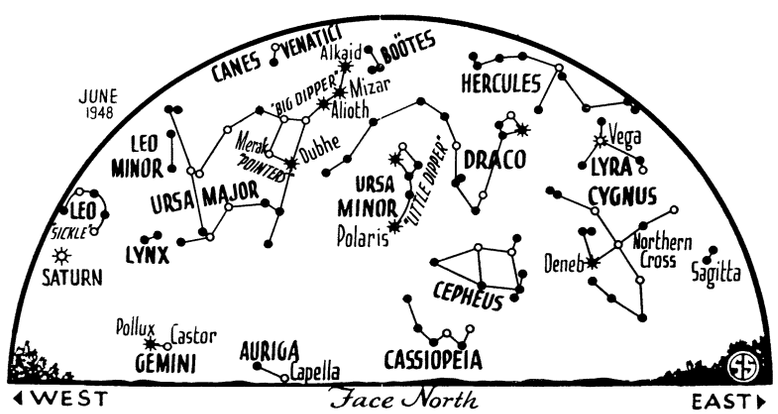
Directly overhead you can see the constellation of Bootes, the bear-driver, which is marked by the star Arcturus. Below this group, and to the left of Leo, we find Virgo, the virgin, of which the brightest star is Spica. The remaining pair of bright stars are low in the northwest, their proximity to the horizon making them seem much fainter than normal, however. One is Pollux, almost all that remains visible of Gemini, the twins, and the other, farther north, is Capella, in Auriga, the charioteer. Earlier in the evening these appear a little higher, while later they have gone below the horizon.

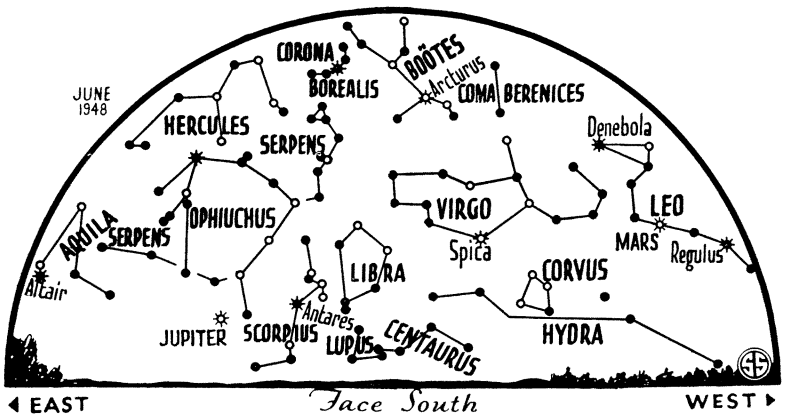
One astronomical event of June comes on the 21st, at 8:11 a.m. EDST. This is the summer solstice. Ever since last December the sun has been moving northward in the sky, the solstice marking the limit. In the northern hemisphere this is the beginning of the summer season, while in southern countries it is the first day of winter.

The planet Jupiter, closest to the earth on June 15, is by far the largest in the solar system—in fact, it is bigger than all the other planets together. With a diameter of 86,700 miles, or nearly 11 times that of the earth, it has more than 1300 times the earth's volume. However, its mass is only some 300 times that of our home planet, which means that it is much less dense, on the average. Although it is so big, it rotates far more rapidly than our planet, for it turns on its axis once in 9 hours 55 minutes. This is so rapid that the equatorial regions move at a speed of 25,000 miles an hour. Thus there is considerable centrifugal force, tending to throw these regions farther from the center, so that the diameter measured at the equator is about a fifteenth greater than that from pole to pole.

### Red Spot Persists

The surface of Jupiter that we see in a telescope shows characteristic markings in the form of red and brown bands. There is one large red spot that has persisted, on and off, for more than a century. The changes in detail show that this is not a solid surface, but of clouds. With Jupiter so far away from the sun, however, these are not clouds of water, like those we see on Venus. The work of Rupert Wildt, now of Yale University Observatory, has indicated that they are clouds of frozen gases—






methane and ammonia. This theory has been confirmed by laboratory experiments.

Passing light through a long pipe containing these gases, then analyzing the light through the prisms of a spectroscope, dark bands are seen in the colored spectrum on account of the fact that certain wavelengths have been absorbed. Observations at the Mt. Wilson Observatory have shown the same bands present in the light reflected from Jupiter, proving beyond doubt that these gases are present. The colors in the clouds seem to come from compounds of metals such as sodium or potassium.

Since there are good reasons for believing that the ratio of density in Jupiter from the center to the outer part is much greater than in the earth, it seems that there must be something solid under the atmosphere. Dr. Wildt has pictured it as having a core 36,000 miles in diameter, of iron and rock, with a density of about six times that of water. Around this he assumes an ocean of compressed ice (density about 1.5) perhaps 20,000 miles deep. Around this is a layer of hydrogen and other gases, 6,500 miles thick, also compressed to a density a quarter that of water. The clouds of ammonia and methane form the outer skin.

### Has Most Moons

As far as we know, Jupiter is the best provided of all the planets when it comes to moons, for 11 have been observed. There are four large ones which were discovered by Galileo in 1610—the first astronomical discoveries to be made with the then newly invented telescope. Possibly he was anticipated by a German astronomer, Simon Marius, who observed them a few months earlier, though there seems to be some doubt as to whether Marius realized that they were stars in the same direction. This was Galileo's first opinion, but it was dispelled after he observed them for a few nights and found that they moved along with the planet, encircling it as they traveled. The names which Marius proposed for them—Io, Europa, Ganymede and Callisto—are still used today. Two are larger than our moon, that of Ganymede being 3,270 miles and Callisto 3,140 miles. (The moon's diameter is 2,162 miles.)

### Lick Discovery

An American astronomer, Edward E. Barnard, discovered the fifth satellite of Jupiter in 1892 while looking through the great telescope at the Lick Observatory. It is the innermost of all, with a diameter of about 150 miles. It was at the same observatory, in 1904 and 1905, that Dr. C. D. Perrine discovered photographically (as were all the rest) the sixth and seventh, which are next out from Galileo's quartet, and have diameters of 100 and 35 miles respectively. An astronomer named Melotte, at the Greenwich Observatory in England, found the eighth in 1908. Its diameter is only about 35 miles.

In 1914 Lick Observatory scored again, when Dr. Seth B. Nicholson found number nine, the diameter of which has been estimated at 17 miles. By 1938 he had become a distinguished member of the staff of the Mt. Wilson Observatory, and was taking photographs with the 100-inch telescope to record his 1914 discovery. On these plates he found two star-like objects which seemed to be travelling along with Jupiter. Further observation proved that they really were satellites, and they are numbered ten and eleven. Their diameters seem to be about 15 and 19 miles. Their orbits around Jupiter are between those of satellites five and eight. Perhaps there are still more, which will be found on future photographs.

### Time Table for June

| June | EDST | |
|---|---|---|
| 7 | 8:55 a. m. | New moon |
| 8 | 6:50 p. m. | Moon passes Mercury |
| 9 | 12:24 a. m. | Moon passes Venus |
| 10 | 3:00 p. m. | Moon nearest, distance 227,600 miles |
| 11 | 1:18 p. m. | Moon passes Saturn |
| 13 | 3:45 a. m. | Moon passes Mars |
| 14 | 1:40 a. m. | Moon in first quarter |
| 15 | 3:00 p. m. | Jupiter nearest, distance 395,800,000 miles |
| 20 | 8:31 p. m. | Moon passes Jupiter |
| 21 | 8:11 a. m. | Sun farthest north, summer commences |
| | 8:54 a. m. | Full moon |
| 23 | 11:00 p. m. | Mercury in line with sun |
| 24 | 10:00 a. m. | Venus in line with sun |
| 26 | 9:00 a. m. | Moon farthest, distance 251,700 miles |
| 29 | 11:23 a. m. | Moon in last quarter |

Subtract one hour for CDST, two hours for MDST, and three for PDST.

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Dry ice was found successful in creating an artificial snowstorm when sprinkled by plane in a super-cooled cloud a year ago; now 15 different types of finely-divided soil have been found to be capable of producing *snow* in the laboratory.

The world's first successful *liquid-fuel* rocket was fired 22 years ago.