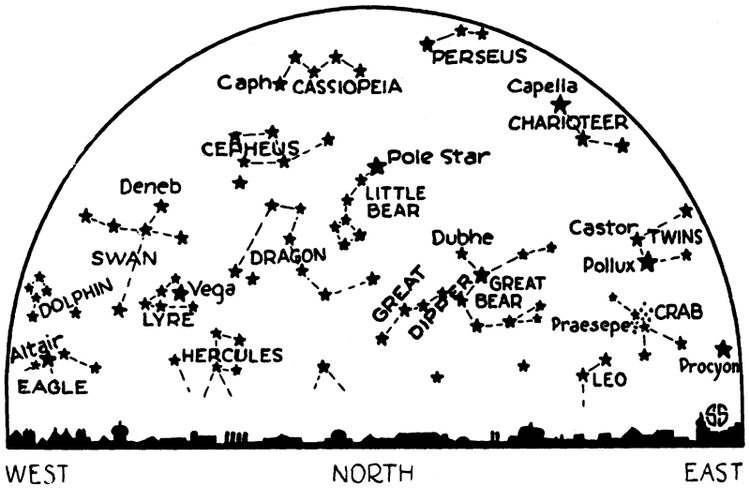
Jupiter With Nine Moons Now in Southern Sky



By James Stokley

Jupiter, the "giant planet," is one of the chief heavenly attractions this month. It is evening, and clear. See that bright star over there in the southwest? Yes, that very bright one. That is Jupiter, and though it looks so small out there, more than 400,000,000 miles away, it is really the largest of our family of planets that make up the Solar System. So large is it that if it were hollow the earth and the moon, Venus, Mercury and Mars could be put inside and still they would rattle around with plenty of room to spare. In fact, there is enough material in Jupiter to make all the other members of the Solar System except the sun from it, and still have some left over.

The earth has a diameter of about 8000 miles, but the average diameter of Jupiter is about 86,720 miles. It has 120 times the surface of the earth and 1312 times the volume. Its mass is 317 times that of the earth, so it is only about a quarter as dense as our planet.

Has Nine Moons

Perhaps the most interesting thing that a visitor to Jupiter from the earth—if he could make the trip—would notice would be the number of moons. In the Jovian night sky would appear not a single moon, like ours, but no less than nine. For that many are known, the last one having been located as recently as 1914. Perhaps there are even more that will come into our view as we continue to get larger telescopes.

Our moon is about a quarter of the diameter of the earth. From another planet, the earth and moon would look more like a double planet than a main body and a satellite. In the case of Jupiter, however, the discrepancy between the size of the planet and of the satellites is much greater. The four largest of the Jovian moons, which Galileo discovered in 1610, range from 2320 to 3220 miles. Thus they compare favorably in size with our own moon, or even with the planet Mercury.

But in the case of the other five moons, the difference is much more marked. So small are they that their diameter canot be measured exactly, but that of number nine is estimated at only about 25 miles. Number six may be as large as a hundred miles in diameter. Number 8 and 9 have another outstanding peculiarity. They are moving backwards! The other moons of Jupiter, like our moon, revolve around the planet in the same direction that the planets move around the sun: that is, from west to east. But numbers 8 and 9 go from east to west.

Number Eight's Eccentricty

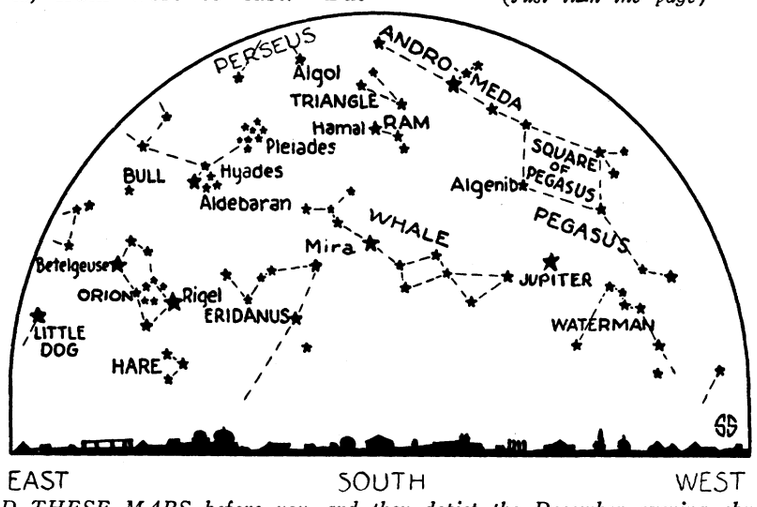
Number 8 misbehaves in another way. Its orbit is extremely eccentric. That is, though it revolves around the planet in two years, it sometimes comes as close to it as 9 million miles, while sometimes it recedes as far as 20 million. But its orbit is not constant. In the eight years following its discovery in 1908 it made all sorts of variations. Sometimes it went around the planet in 713 days, sometimes it took as much as 768, and it varied in other ways as well.

Now it is conceivable that at some time this moon might get about twice as far from Jupiter as it has in recent years. This might occur when it is between the planet and the sun. What would happen? If it occurred, the gravitational pull of the sun on the satellite would be as great as the pull of the planet, and the result would be the loss of a moon. There are already known to be a thousand or so tiny bodies of the same general character as this little moon of Jupiter revolving around the sun. These are called minor planets, or asteroids, and it is this family that moon number eight would join.

Moons Captured Asteroids?

This being the case, the suggestion has been made that the reverse process occurred at some time in the distant past. An asteroid might have ventured too close to Jupiter, and he, by his gravitational pull, might have adopted the asteroid as a satellite. It is quite common for

(*Just turn the page*)



HOLD THESE MAPS before you, and they depict the December evening sky as it appears to you when you face North or South

December Evening Skies

(*Continued from page* 357)

Jupiter, by his great pull, to put a considerable kink in the orbit of a wandering asteroid or comet that gets too close. It seems quite possible, then, that the smaller satellites of Jupiter might have been acquired by such means. Prof. F. R. Moulton, formerly of the University of Chicago, has worked out in great detail how this might occur, though he does not think that the chances of it happening are very probable.

Jupiter Hides Star

One of the rarest of astronomical phenomena, an occultation of a star by a planet, will take place next Wendnesday night, December 7. Wherever it is clear, and there are astronomers, it will be watched, for, unfortunately, at least a small telescope is required to see it.

The moon, and the planets, move around the sky among the stars. In fact, the very name "planet" means a wanderer. As a result, they occasionally come between the earth and one of the stars, thus temporarily hiding it. This is called by astronomers an "occultation." With the moon so much closer the earth than the planets, and so appearing with a larger area, occultations by the moon are rather common. In fact, scarcely a night passes without the moon occulting some stars at least visible in a small telescope, and occasionally one visible to the naked eye is hidden.

With the planets, which appear to the naked eye as points of light, it is not often that one comes exactly between the earth and a star of any brillance. But next Wednesday, Jupiter, largest of all the planets, in the southern evening sky, occults a star of the seventh magnitude, just a bit too faint to be seen with even the keenest of eyes. As it is not a naked eye star, it has no common name. It is in the constellation of Pisces, but to astronomers it is known by its number in the Bonn *Durchmusterung*, a catalog of stars prepared in Germany many years ago. It is thus referred to as B.D.—3° 5697.

The time that it will take place, and, in fact, the first discovery that it would take place at all, was made by Dr. L. J. Comrie, now of the British Nautical Almanac office in London, and formerly at Swarthmore College, in Pennsylvania. In the last few months, Drs. Seth B. Nicholson and R. S. Richardson, of the Mt. Wilson Observatory in California, have made some new photographs of Jupiter to determine its position more accurately. As a result they have placed a small correction on Dr. Comrie's figures, which were based on the most accurate data then available.

At Washington, D. C., where it will be observed by astronomers at both the U. S. Naval Observatory, and the observatory of Georgetown University, immersion, or the time at which the star vanishes behind the planet's disc, will take place at 6:30 p. m. eastern time. In the middle west it will be a minute or two earlier, but in the far west it will not be seen, as Jupiter will then not have risen in the east. The emersion, when the planet has moved on sufficiently to reveal the star on the other side, will take place, according to schedule, at 10:35 p. m., eastern time, at Washington. It will be visible throughout the country.

Unlike the disappearance of a star behind the moon, the occultation by a planet is gradual. The moon has no appreciable atmosphere, so a star is seen until it reaches its edge, then it vanishes instantaneously. Jupiter, however, has some sort of a gaseous layer around it, so the star gradually gets dimmer as it gets closer and closer to the edge of the planet. Thus it is rather hard to measure the time of disappearance precisely, but from the observations of a number of observatories, useful information can be gained about the nature of the Jovian atmosphere. The reappearance, too, is gradual.

A week later, on December 14, the planet Venus also occults a faint star, but this is only visible from Japan, the East Indies, and the coast of China, so while the star is a little brighter than the one hidden by Jupiter, it will not be of much interest to American astronomers.

The Stars in December

As for the stars in the month of December, they are now in their typical winter aspect. Orion, doubtless the most magnificent of all constellations, is high in the southeast, Cetus, the whale, spreads his huge bulk across the southern sky, not far from Jupiter, while higher is Andromeda, the chained lady, joining to the east with the "great square" of Pegasus, the winged horse.

High overhead is Perseus, with Algol, the demon star, which is ordinarily of the second magnitude, but which fades out for a while at intervals of 2 days and 21 hours. At 8:40 p. m., eastern standard time, on the evening of December 3, for instance, it will be at minimum brightness. Then it will appear to be much fainter than at the same time on the evening before or after. Other times of minimum brightness in the evening this month are at 5:30 on the 6th, 10:20 on the 23rd, 7:10 on the 26th and 4:00 on the 29th. Algol takes about five hours after its light starts to diminish until it is at minimum, and about five hours more to recover to its former brightness.

Frequently Eclipsed

This change in brightness of Algol is caused by the fact that it really consists of two bodies—one bright and one dark, which revolve around each other. At the times of minimum brightness, the dark component comes partly between the earth and the bright one, thus reducing its light. This is called an "eclipsing variable" star, and several hundred like it are now known.

Southeast of Perseus is Taurus, the bull, with the beautiful loose cluster of the Pleiades, and the brilliant red Aldebaran. In the northern sky the Great Dipper is below the pole, and the great W of Cassiopeia above it. The triangle of Deneb, Vega and Altair is over in the northwest, while Castor and Pollux, the heavenly twins, rise in the northeast.

The principal thing that the sun does this month is to reach the tropic of Capricorn at 3:18 p. m., eastern standard time on December 22. At this the sun reaches its farthest south position, and starts travelling northwards again, and according to our chronology, winter commences.

Science News-Letter, December 3, 1927