ASTRONOMY

Jupiter Now Prominent

But planet, Venus, which is brighter, is seen early on August evenings. Vega, in Lyra, the lyre, is the most brilliant of the stars.

By JAMES STOKLEY

➤ THOUGH Venus, seen early on August evenings, is brighter, it is the planet Jupiter that is most prominent now during the night. Venus, of magnitude minus 3.4 on the astronomical scale, is some 12 degrees above the western horizon at sunset, so it can be seen in the gathering dusk, but by the time the sky is fully dark it has dropped from sight. Not until October will it remain in the sky much after the end of twilight.

Jupiter is now only about a third of Venus' brightness, of magnitude minus 2.2. However, it is seen against a dark sky background, and that makes it more conspicuous. Its position is shown on the accompanying maps. These give the appearance of the skies at about 10:00 p. m., your standard time, at the first of August, an hour earlier at the middle of the month, and two hours earlier at the end. (Add an hour if you are on daylight time).

Teapot Shape

The planet is in the constellation of Sagittarius, the archer, in which the stars can be seen to outline the shape of a teapot. Towards Jupiter (just above the U in the word Sagittarius) are four stars which mark the handle. The spout is to the right, just above the curved row of stars which form the tail of Scorpius, the scorpion. Also, in Sagittarius, is a dipper, the so-called "milk dipper." The four stars that make up the handle of the teapot are the bowl of the dipper, and the handle extends up toward the M in the name of the constellation of Scutum, the shield.

In Scorpius is the bright star, characteristically red in color, Antares. The name means "rival of Mars," because that planet, which is not now visible, is also famous for its redness.

Most brilliant of the stars, rather than planets, which can now be seen, is Vega, in Lyra, the lyre, practically overhead for the times of the maps. Just east of this group we see Cygnus, the swan, part of which forms a cross-shaped figure often called the northern cross. The star Deneb is at the northern end of the cross. Lower than Cygnus, in the south, we can find Aquila, the eagle, with first-magnitude Altair.

Looking toward the northwest, we can see the big dipper, part of Ursa Major, the great bear. As is well known, the two lowest stars in the dipper, as it now stands, are the pointers. They indicate the direction of the north star, Polaris, which is at the end of the handle of the little dipper, and this, in turn, is part of Ursa Minor, the lesser bear. Following the curved handle of the large dipper around toward the west, we come to the bright star Arcturus, which is in the figure of Bootes the bear driver.

Many features lend interest to Jupiter. For one thing, it is the biggest of the nine major planets that revolve around the sun. Its mean diameter is 86,850 miles, as compared to 7,927 miles for the earth. Thus its volume is more than 1,300 times that of the earth, yet its density is much less, and its mass is only 318 times that of our home planet.

Through a telescope, Jupiter has a noticeably oblate, or "door-knob," shape. Its diameter from pole to pole is 5,760 miles less than at the equator, and the reason for this is found in its rapid speed of rotation. Even though it is so big, it makes one turn on its axis in 9 hours 55 minutes and the centrifugal force throws the material at the equator relatively far from the center. There is a similar effect with the earth, but because of our smaller size and slower rotation the bulge is much less. Our equatorial diameter is only about 27 miles greater than that measured between the two poles.

Knowing the mass of Jupiter, and its rotation, astronomers have been able to calculate how much the bulge should be, if the mass were uniformly distributed, and they find that it should have a much larger bulge than it does. This indicates, therefore, that the planet is not uniform in density, but that there is a considerable concentration toward the center, surrounded by outer layers so low in density that they must be gaseous.

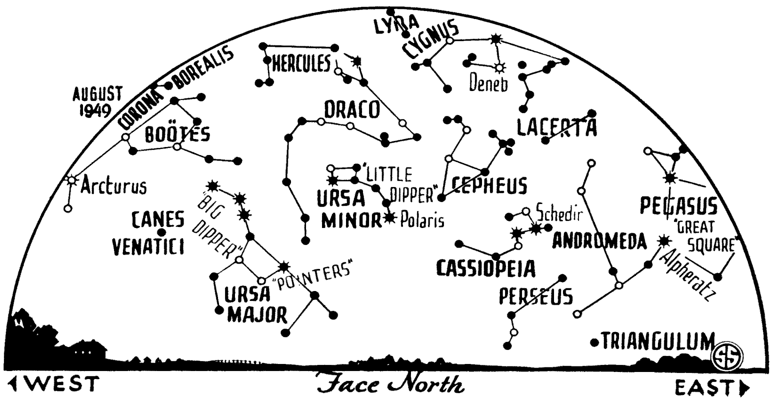
This is confirmed by the changes that are observed on the surface of Jupiter, and which could not occur in a solid planet. There are red and brown belts, which cross its face parallel to the equator but which vary from time to time both in width and number. Other marks have come and gone, particularly the "Great Red Spot," an elliptical region some 30,000 miles from east to west and 7,000 miles from north to south. This first appeared in 1878, and was brick red in color. Later it faded, although the outlines can still be detected. It did not remain fixed but drifted around, and also shifted in latitude. No one knows its cause, but it was certainly part of a gaseous surface.

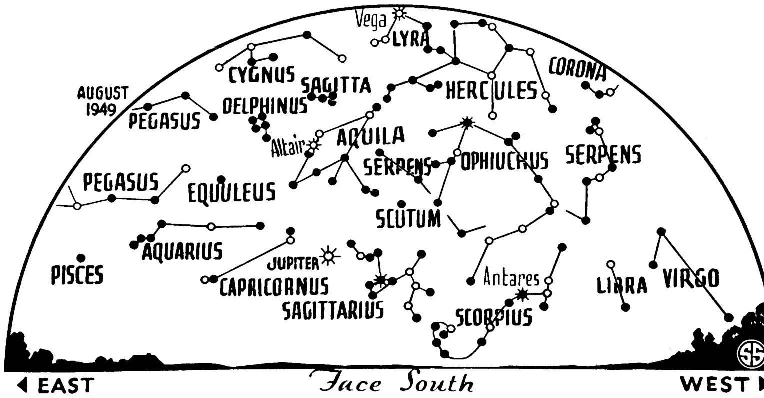
Jupiter Is Cool

Until a few years ago astronomers thought Jupiter was quite hot, and that heated currents of gases caused turbulence which accounted for the changes. Measurements, however, have shown it to be quite cool, about 184 degrees below zero, Fahrenheit. If it received heat only from the sun, it should be still colder, about 220 degrees below zero, so possibly there is some internal source of heat, such as volcanic activity, which may account for the change.

Analysis of the light of Jupiter through the prisms of the spectroscope, showed it to be mainly reflected sunlight, though dark bands were observed in the orange and red parts of the spectrum. The explanation of these came in 1932 from a young German astronomer, Rupert Wildt, who is now at Princeton.. He showed that these absorptions would be caused by methane, or marsh gas, and ammonia. This was confirmed shortly afterwards by Dr. Theodore Dunham, at Mt. Wilson Observatory, who produced similar bands in the laboratory when he passed light through these gases in a pipe 60 feet long.

In addition to methane and ammonia, the atmosphere of Jupiter is also believed to contain hydrogen, though the bands that gas would produce cannot be observed. If there were ever any nitrogen, which constitutes the bulk of the earth's atmosphere,





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it has probably all been combined with hydrogen to form the ammonia. Any oxygen would have probably combined with the hydrogen to form water, which in turn has probably frozen and fallen far out of sight.

Thus, according to Wildt's hypothesis, the structure of Jupiter is as follows: At the center is a rocky-metallic core, with a radius of about 37,000 miles. Then comes a layer of ice, a frozen ocean 34,000 miles deep and then the outer layer of gases, some 16,000 miles deep, of frozen ammonia in an atmosphere of hydrogen and methane. Dr. F. L. Whipple, of Harvard, has suggested that there may be no sharp transition between these layers, but that the clouds gradually become thicker with depth, finally turning into a layer of ammonia slush which still farther down becomes solid. Surely not a very attractive home for any imaginary inhabitants!

Time Table for August

Aug.	EST	
1	7:57 a. m.	Moon in first quarter
6	9:48 p. m.	Moon passes Jupiter
8	2:33 p. m.	Full moon
12	early a. m.	Meteors of Perseid shower visible
13	3:00 p. m.	Moon farthest, distance 251,600 miles
16	5:59 p. m.	Moon in last quarter
23	10:59 p. m.	New moon
26	9:58 a. m.	Moon passes Venus
30	2:16 p. m.	Moon in first quarter

Subtract one hour for CST, two hours for MST, and three for PST.

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ASTRONOMY

Survey Milky Way Stars

➤ BRIGHTEST stars of the Milky Way are being surveyed by wide-eyed Schmidt telescopes in the United States and Mexico, the American Astronomical Society was told in Ottawa, Canada.

A 48-inch Schmidt telescope on Palomar Mountain in California is to be used in photographing the sky for a new astronomical atlas (*See SNL,* June 25, p. 406), but the survey of the Milky Way's bright lights is already well along elsewhere, American and Mexican scientists reported.

Schmidt cameras at the Warner and Swasey Observatory of the Case Institute of Technology, East Cleveland, Ohio, and at the Tonanzintla Observatory in Mexico are being used to search for high luminosity stars of the Milky Way galaxy. Collaborating with Dr. J. J. Nassau, director of the Warner and Swasey Observatory, are Dr. W. W. Morgan, Yerkes Observatory of the University of Chicago, and Dr. Paul Annear of Baldwin-Wallace College. The Mexican research is directed by Dr. L. E. Erro.

Because the Mexican observatory is farther south, it can search areas of the sky invisible or too low for satisfactory observation from Cleveland. Photos made by both the observatories are expected to cover most of the Milky Way.

Results of the survey will give a fairly good picture of the intrinsically brightest stars up to distances of 32,000 light years from the earth. (A light year is the distance light, with a speed of 186,000 miles per second, travels in a year.)

The Schmidt telescopes in this survey photograph a field of stars through what is called an objective prism, a huge piece of optical glass whose two sides are inclined to each other a few degrees. The telescope photographs short rainbow-colored bands of starlight, known as star spectra. From these spectra, the brightest stars can be easily picked out from those of less luminosity.

The program at Case is carried out jointly with the Yerkes Observatory and is financially supported by the Office of Naval Research.

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