ASTRONOMY

Jupiter Shines in East

Jupiter is only naked-eye planet visible in December's evening hours. Two of the "brightest" sources of celestial radio waves can also be seen.

By JAMES STOKLEY

➤ TO THE brilliant array of winter-time evening stars that now make their appearance in the eastern sky, an even more brilliant addition has been made. This is the planet Jupiter, which shines high in the east in the constellation of Taurus, the bull.

The only naked-eye planet now visible during the evening hours, it is brighter than any of the stars, hence it is easy to find.

The most characteristic configuration among these brilliant stars of winter evenings is Orion, the warrior, which is just below Jupiter. There are three stars in a row, forming Orion's belt.

Above the belt, as they should be, are two stars marking the giant's shoulders. Betelgeuse, to the left, is a star of the first magnitude; the other, Bellatrix, is somewhat fainter.

On the opposite side of the belt from Betelgeuse is Rigel, also of the first magnitude, in one leg according to the old star maps that depicted the mythological figures around the stars.

First Magnitude Stars

According to these fanciful ideas, Orion was holding a club and a lionskin, protecting himself from the charge of Taurus, the bull, represented by the constellation above and to the right. This is the present abode of Jupiter, the brightest star being Aldebaran, which marks the animal's eye. It is distinctly red in color. The two stars close to Jupiter are the tips of his horns.

The upper horn extends into the constellation of Auriga, the charioteer, where we find another star of first magnitude — Capella. Below Capella are the twins, Gemini, with Castor and Pollux, the latter being the brighter. Going down still farther, and more to the right, we come to Orion's two dogs.

Canis Major, the lower, contains brilliant Sirius, the dog star, most brilliant star visible in the nighttime sky. It is so bright that its magnitude goes into the negative numbers, minus 1.6. But even this does not equal Jupiter, which is minus 2.3 on this magnitude scale, meaning that it is about twice as bright as Sirius.

Because Sirius is much lower in the sky, its light is absorbed to a greater degree than that of Jupiter, and this accentuates the difference in brightness of the two bodies. Procyon, in Canis Minor, the lesser dog, is higher and farther left.

All these stars are indicated on the accompanying maps, which show the appearance of the heavens about ten o'clock, your own kind of standard time, on Dec. 1, about 9:00 p.m. at the middle of December and 8:00 p.m. at the end.

Although no other part of the sky contains as brilliant an array of stars as the region around Orion, even without the presence of Jupiter, two other first magnitude stars can be seen toward the east. Being rather low, they too are dimmed by absorption of the atmosphere.

The symbols which are used to designate them are those for fainter stars, since these symbols are applied in accordance with the way they look. Close to the northwestern horizon is Vega, in Lyra, the lyre, about to disappear for a time. Above it is Cygnus, the swan, with Deneb as the brightest star.

Other Star Figures

Some other well-known star figures can be found in this part of the sky, however. Above Cygnus, a little to the left, is Pegasus, the winged horse, with the large quadrangle of stars called the "Great Square." And about as high, farther to the right, is Cassiopeia, shaped like a letter M.

This is supposed to represent a queen of ancient times, seated on her throne. The king, Cepheus, her husband, is the constellation below, while her daughter, the princess Andromeda, is above.

In the early morning hours of December several more planets come into view. At the beginning of the month Mars, in the constellation of Virgo, the virgin, rises about four hours ahead of the sun. Then, about two hours before sunrise, Saturn appears.

For a few days around Dec. 1, Mercury comes up in the southeast more than an hour and a half ahead of the sun. Still later, as the sky is beginning to brighten, Venus appears, even more brilliant than Jupiter.

One of the most striking developments of astronomy in recent years has been the discovery of celestial broadcasting "stations," definite regions in the sky from which very short radio waves are continuously being emitted. Two of the "brightest" of these radio "stars" are in the part of the sky visible on December evenings.

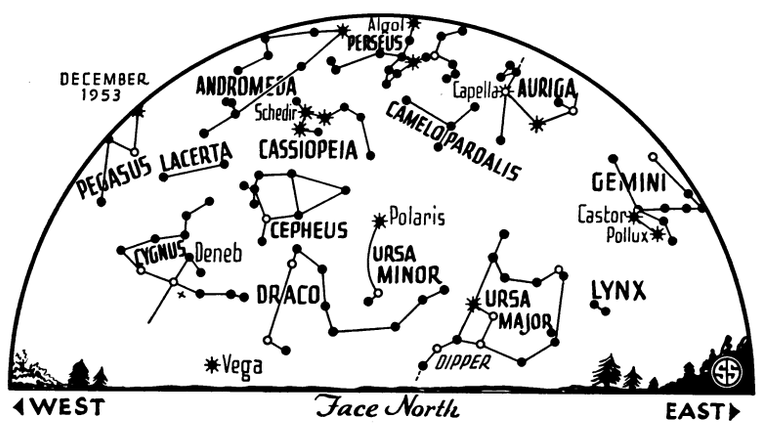
The first discovery of a discrete source was when radio waves were found to be coming from the sun. This was not too surprising, since radio waves are the same as the waves of visible light, though of considerably greater wavelength. Just beyond the visible spectrum, made of waves just a little too long to be detected by the eye, is the infrared, which has long been known in various ways. Short waves can be considered as very long infrared waves.

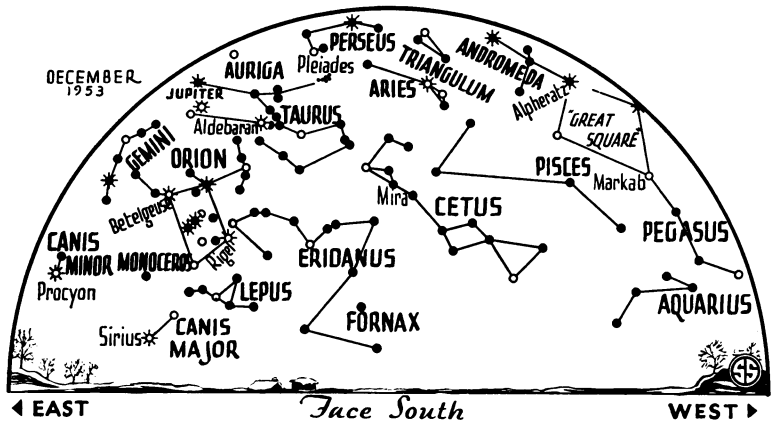
However, there was a discrepancy in that the surface temperature of the sun has been found, in various ways, to be about 11,000 degrees Fahrenheit while it was calculated that nearly a million degrees would be needed to produce the radio effects that had been observed. It was also determined that the radio waves came from a larger area in the sky than the visible disk of the sun.

It is known that the sun is surrounded by a much more extensive region, the corona, which can be seen at the time of a total eclipse, and so it looked as if the corona might be the source of the solar radio waves.

Moreover, from other considerations, it had been found that the corona seemed to have a temperature of something like a million degrees. Just how it gets to be so much hotter than the solar surface underneath is something for future research to reveal.

Wartime work on electronics, particularly





☼ ✱ ○ • SYMBOLS FOR STARS IN ORDER OF BRIGHTNESS

in the development of radar, led to many new techniques for detecting faint radio waves and determining the direction whence they are coming.

Some of these same methods have been applied in "radio telescopes," which have revealed, in various parts of the sky, a number of discrete radio sources, called radio "stars." Two of the most intense of these in the northern hemisphere are in parts of the sky now visible in the evening, and shown on the maps.

Strongest Radio Source

The strongest of all is one in Cassiopeia, between the western part of the M and Cepheus, below. The first A in the name Cassiopeia marks its approximate position. The other, the second most intense, is in Cygnus, at the position indicated by a small X on the map of the northern sky.

While the radiation from the sun varies in intensity as much as a million times, that from the radio "stars" is much more constant. But even an average radio "star" emits radio wave radiation that is a hundred times as great as that from the sun when most disturbed, and the source in Cassiopeia is perhaps a hundred times stronger than the average radio "star."

Using light waves, the position of a source can be determined with a telescope with great precision. This depends on the size of the telescope lens or mirror, as measured in terms of the wavelength of light. Green light, about average, has a wavelength of 1/50,000th of an inch.

With a ten-inch telescope, which is of moderate size, the diameter of the objective is about half a million wavelengths. Radio telescopes may employ waves of about 15 feet wavelength. For the equivalent resolution of a ten-inch optical telescope, the dish —the concave reflector to collect 15-foot radio waves—would have to be some 7,500,000 feet, or more than 1,400 miles, in diameter!

Actually the largest radio telescope, at the Jodrell Bank Station in England, operated by the University of Manchester, is 250 feet in diameter. The 50-foot radio telescope at the Naval Research Laboratory in Washington, however, has a resolving power of more than 50 times the 250-foot giant, because it tunes in on a shorter wavelength.

Thus, in the last few years, a whole new field in astronomy has been opened. In the opinion of many, application of radio techniques to the study of the heavens will rank in importance with the introduction of the spectroscope about a century ago.

This instrument has yielded a vast amount of knowledge as to what the stars are made of and the processes going on inside them.

Radio astronomy is so new, in fact, that much of the most important work has been done by radio engineers rather than astronomers. However, as the latter learn the new techniques, and as the engineers learn more about astronomy, they should be able to combine effectively in ferreting out many new facts about our universe.

Celestial Time Table for December

Dec.	EST	
1	1:00 p.m.	Mercury farthest west of sun.
	11:29 p.m.	Moon passes Mars.
3	7:15 a.m.	Moon passes Saturn.
4	4:01 p.m.	Moon passes Mercury.
5	4:33 a.m.	Moon passes Venus.
6	5:48 a.m.	New moon.
8	3:33 a.m.	Algol (variable star in Perseus) at minimum brightness.
11	12:22 a.m.	Algol at minimum.
12	early a.m.	Meteors visible radiating from Gemini.
13	11:30 a.m.	Moon in first quarter.
	12:00 noon	Jupiter opposite sun and nearest earth, distance 391,900,000 miles.
	9:11 p.m.	Algol at minimum.
16	9:00 a.m.	Moon nearest, distance 228,700 miles.
19	5:44 p.m.	Moon passes Jupiter.
20	6:43 a.m.	Full moon.
21	10:32 p.m.	Sun farthest south, winter commences in northern hemisphere.
28	12:43 a.m.	Moon in last quarter.
	10:00 a.m.	Moon farthest, distance 251,300 miles.
30	5:36 p.m.	Moon passes Mars.
	8:31 p.m.	Moon passes Saturn.

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

Science News Letter, November 28, 1953

FORESTRY

Bark Beetles Are Most Serious Forest Enemy

➤ BARK BEETLES that destroyed 700,000,000 board feet of lumber in Montana and Idaho alone last year are perhaps the nation's most serious forest problem, the Forest Research Advisory Committee has reported.

The committee recommended to the U. S. Department of Agriculture that research on bark beetle control be expanded. In Colorado, 4,000,000,000 board feet of timber has been destroyed by beetles in the last 10 years.

The report also placed emphasis on study of diseases attacking seedlings in forest nurseries, study of root diseases of conifers, tree improvement and range reseeding.

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