ASTRONOMY

Winter Stars Shine

The December skies offer the astronomer much to observe: the brilliant planet Mars, several prominent constellations and the Geminid shower of meteors.

By JAMES STOKLEY

➤ ALTHOUGH RAPIDLY drawing away from us, the planet Mars is still conspicuous in the southern evening sky.

From a distance of about 49,700,000 miles on Dec. 1, it recedes to 67,200,000 miles at the end of the month. At the same time it drops in brightness a full magnitude, on the astronomer's brightness scale; that is, about 40% of what it was Dec. 1. But even then it will shine more brilliantly than all but one of the stars now visible.

The accompanying maps show the skies' appearance at about 10 p.m., standard time, on the first of December. By the middle of the month they will look this way at about 9:00 p.m. and at the end they will have the same appearance at eight o'clock. Mars is high in the south, in the constellation of Aries, the ram.

Toward the east and southeast is a group of prominent constellations, containing many bright stars, that will be high in the south on midwinter evenings. This group is responsible for the brilliance of the winter skies.

Hyades and Pleiades

To the left of Mars stands Taurus, the bull, with a first-magnitude star that is distinctly red in color, named Aldebaran. This is part of a smaller, V-shaped, group of stars called the Hyades. Higher and to the right of the Hyades there is another and more compact cluster called the Pleiades. Here six stars can normally be seen with the naked eye, but use of a pair of binoculars will reveal many more.

Below and to the left of Taurus is one of the most prominent of all constellations. This is Orion, the only constellation visible from the United States that contains two stars of the first magnitude. These are Betelgeuse and Rigel, whose positions are shown on the map. Between them are three stars in a row that form the belt of the warrior, the figure that the stars of Orion were supposed to form, as depicted on old star maps.

Low in the southeast and east are two star groups representing Orion's dogs. Canis major, the greater dog, is now rather low, but the star Sirius, which is in this constellation, shines brightly. This is the one star that exceeds the end-of-the-month brightness of Mars. However, when Sirius is as low as it is shown here its brightness is somewhat dimmed by the amount of atmosphere that its light has to penetrate. When it is higher in the sky, it has a shorter path through the earth's layer of air, so there is less absorption.

The other dog is the lesser one, Canis Minor. In it is the star called Procyon. Above it, partly on the map of the northern sky, partly on the southern, are Gemini, the twins. The two bright stars here are Castor and Pollux, the latter the brighter. Still higher in the northeast, is Capella in the constellation of Auriga, the charioteer. And overhead, at the times for which the maps are drawn, is Perseus, the champion, a constellation which includes the famous variable star Algol. Its light is dimmed every few days as a darker companion passes in front of the brighter component, and causes a partial eclipse.

In the northwest there are still visible two stars that were prominent on summer evenings; like Sirius, they are dimmed by reason of their low altitude. Just above the horizon is Vega, all that is shown of Lyra, the lyre. Above it is Cygnus, the swan, in which Deneb is the brightest star.

Another planet, Venus, is just coming into the evening sky. At the end of December it sets nearly an hour after the sun. It may be seen near the southwestern horizon as dusk is falling.

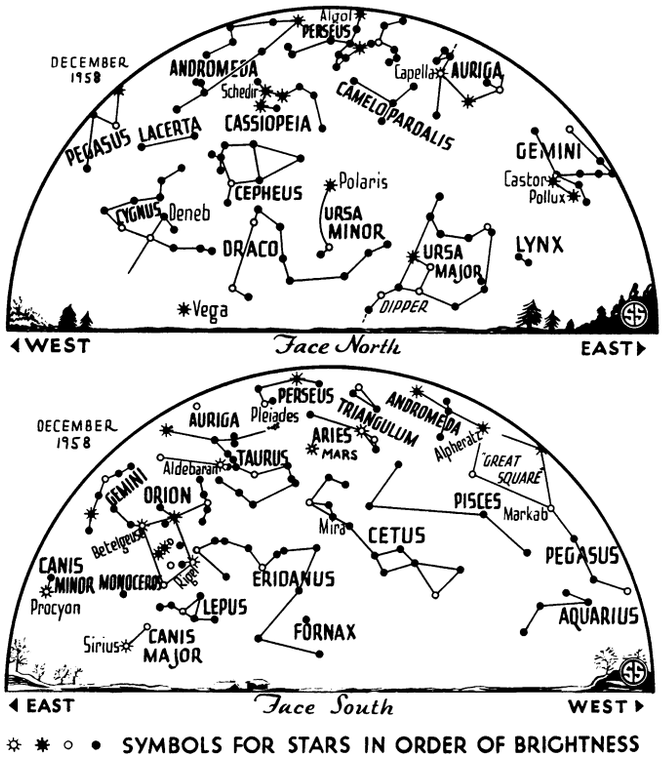
In the early morning, just before sunrise, Jupiter may be seen low in the southeast. It is nearly as bright as Mars is at the beginning of the month.

Mercury, on Dec. 29, will be at the position called "greatest western elongation," when it is farthest west of the sun, and rises well before sunrise. About that time, it is possible to glimpse it also in the southeast, as dawn is breaking. Saturn cannot be seen at all in December; on the 20th it is in the same direction as the sun, far out beyond it.

The name "planet" really means a wanderer. They were so-called in ancient time when men noticed that, unlike the stars, which seem to remain in the same relative positions, they move around among the constellations.

Actually the stars also are moving, and some at high speeds, but they are at such vast distances that even a whole lifetime is not enough to show a perceptible change as seen with the naked eye. From accurate astronomical measurements, however, their motions across the sky have been determined. Because of these movements, the constellation figures are all changing. Fifty thousand years ago they looked very different, to the primitive cave men in Europe and other parts of the world, from the appearance they present today. And 50,000 years hence, our descendants will see them still differently. Orion, the great dipper, Taurus and all our familiar groups, will be gone completely, superseded by entirely different configurations.

The sun is also a star, the nearest of all, and it, too, is moving through space, in the general direction of the star Vega. But as it goes, at a speed of about 12 miles per second, it carries the earth, as well as the other planets, along with it. Therefore it is not entirely correct to say, as we often do, that the path of the earth is an ellipse,



nearly circular. Actually we are moving in a helix, a three-dimensional figure like that of a spring, or a corkscrew. However, relative to the sun, the paths of the planets are ellipses.

Mercury, innermost planet, travels around the sun most rapidly, at a speed averaging nearly 30 miles per second, while Pluto, most distant, has an orbital velocity of a little less than three miles per second. The earth's speed is 18.5 miles per second, and that of Mars slightly more than 15.

Because of this, the apparent motions of the planets in the sky, against the background of distant stars, is a combination of their movement and ours.

"Retrograde" Mars

On Oct. 1, Mars was close to the Hyades, the little group in Taurus in which Aldebaran is found. Now it is well over towards Aries. That is, apparently it has been moving toward the west, although actually all the planets move around the sun in an easterly direction. Now, since the earth has gone past, Mars will cease this backward, or "retrograde," movement. On Dec. 20, it will be stationary; after that it will resume its "direct" motion, toward the east.

About Dec. 13, there will be a favorable opportunity, if the skies are clear, to observe meteors, or "shooting stars," of the Geminid shower. They will be seen to best advantage after midnight, when perhaps as many as 40 an hour may be detected. These will seem to radiate from the constellation of Gemini, hence the name. Actually, these meteors, which are not much larger than grains of sand, are moving in parallel paths around the sun in a huge swarm, which we encounter every December. Sometimes the bright moon may interfere with them. This month, however, the moon is new only three days before the date of the maximum. It will therefore set early in the evening, and be well out of the way before the hours when the Geminids are at their best.

Celestial Time Table for December

Dec.	EST	
2	9:43 p.m.	Algol (variable star in Perseus) at minimum brightness.
3	8:24 p.m.	Moon in last quarter.
8	7:00 p.m.	Moon nearest, distance 224,600 miles.
9	10:00 p.m.	Mercury in inferior conjunction (between earth and sun).
10	12:23 p.m.	New moon.
13	early a.m.	Meteors of Geminid shower visible.
17	6:52 p.m.	Moon in first quarter.
20	2:38 a.m.	Algol at minimum.
	7:00 a.m.	Saturn in same direction as sun.
	4:00 p.m.	Moon farthest, distance 251,600 miles.
21	11:56 p.m.	Moon passes Mars.
22	3:40 a.m.	Winter solstice—winter begins in Northern Hemisphere.
	11:27 p.m.	Algol at minimum.
25	8:16 p.m.	Algol at minimum.
	10:54 p.m.	Full moon.
29	9:00 a.m.	Mercury farthest west of sun —visible low in southeast just before sunrise for a few days about now.

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