

ASTRONOMY

Seven Bright Stars

In an area only about a tenth of the entire sky, nearly half the most brilliant stars are concentrated with three in Orion's belt to aid you in finding them.

By JAMES STOKLEY

► OF THE FIFTEEN brightest stars in the sky, seven are contained in a small region which, on December evenings, is seen to the east and southeast. This area is perhaps a tenth of the entire sky, and no other of comparable smallness includes so many bright stars. And during December, 1942, it is made even more brilliant by the presence of two bright planets, now passing through these constellations in the course of their wanderings around the heavens.

The dominant star group of this region is Orion, the warrior, in the southeast. The three stars in a row, forming the belt of this great warrior, make it easy to find. Above and to the left of the belt is the star Betelgeuse; below and to the right is Rigel. Both of these stars are of the first magnitude, though Rigel, the brighter, is exceeded by four other objects nearby.

Most brilliant star or planet now visible is Jupiter, almost directly east, just to the right of the first magnitude star Pollux, which is one of the twins—Gemini. Second to Jupiter is the star Sirius, the dog star, in Canis Major, the great dog, which is below Betelgeuse. Sirius is the brightest star in the whole sky. Then, in order of brilliance, comes the other planet, Saturn, which is in Taurus, the bull, above and to the right of Orion, and close to the bright star Aldebaran. The next brightest object is the star Capella, in Auriga, the charioteer, high above Gemini, in the east. The last of our brilliant seven is Procyon, in Canis Minor, the lesser dog, which is between Gemini and Canis Major. Procyon is only slightly fainter than Rigel.

Deneb and Vega

Two other bright stars are to be seen in other parts of the sky. To the northwest is Cygnus, the swan, a group often called the northern cross, because of the way the stars are arranged. The cross leans a little to the right, and the star Deneb marks its top. Below this figure is Vega, of Lyra, the lyre. Though this is a brilliant star, it is now seen so low in the heavens that it appears quite faint

—of the second magnitude—on account of the absorption of its light by the earth's atmosphere.

Now that we can find these splendid ornaments of the December evening sky, it might be interesting to learn something about them individually.

First there is Jupiter. Like all the planets which revolve around the sun, this shines by reflected sunlight. It is the largest of the planets; its volume, though more than 1,300 times that of earth and more than the total of all the other planets, is still only about a thousandth that of the sun. Its diameter is 86,720 miles (the earth is 7,927 miles) and its average distance from the sun is 483,200,000 miles (compared with 93,000,000 for earth). Its surface is very cold, about 200 degrees below zero, Fahrenheit. The visible surface, however, is not solid, but the top of a thick layer of clouds of frozen methane and ammonia. These compounds are gases on our planet.

Four Large Moons

Jupiter has four large moons, seen even with a small telescope, and seven small ones, some of which are visible only with the most powerful instruments. This month its distance from earth is about 410,000,000 miles—quite close, which accounts for the planet's great brilliance.

Saturn, our other December planet, is about 751,000,000 miles from earth at present, much closer than usual. Its distance from the sun is 885,900,000 miles as an average, though the actual

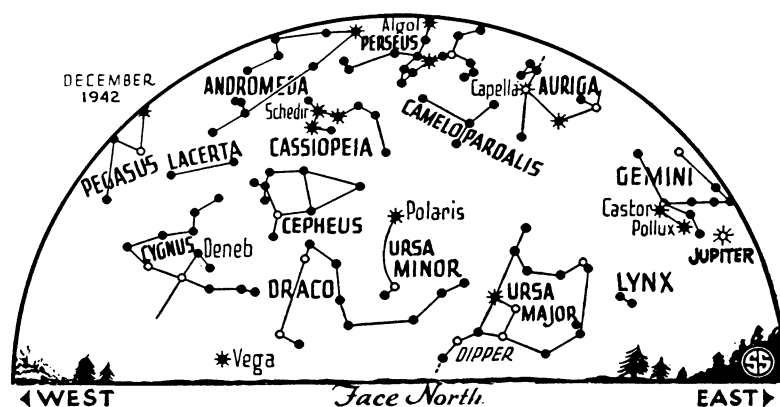
figure may vary nearly 50,000,000 miles from this value. Saturn's diameter is 71,500 miles, and its structure is similar to that of Jupiter and even colder, because of its remoteness from the sun.

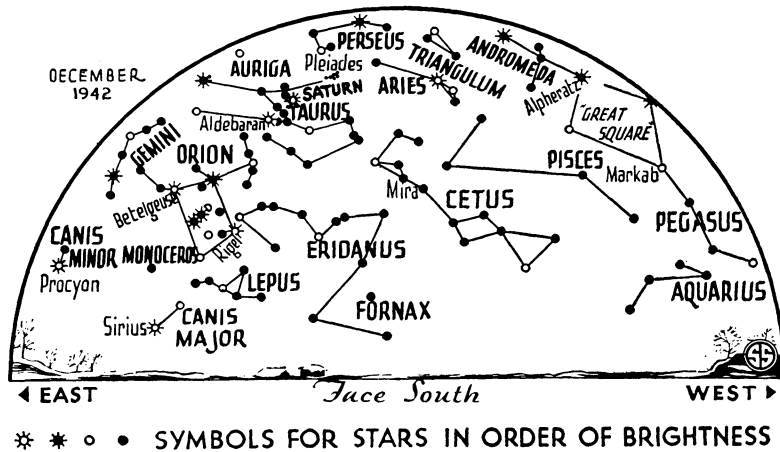
The most famous feature of Saturn is the system of rings surrounding it, which can be seen through a telescope of moderate power. The system has an outside diameter of 171,000 miles, it is 41,500 miles wide, and there is a space of about 8,250 miles between the inner ring and the planet's surface, about enough to squeeze the earth through. These rings are not solid, but are made up of swarms of myriads of tiny moonlets, all going around together. In addition, Saturn has nine moons of more conventional size.

Each a Sun

The seven bright stars that we mentioned are vastly farther away. Each is a sun, like ours, shining by its own light. Not only the brightest, Sirius is also the closest, with a distance of about 52,000,000,000,000 miles. Another way of expressing this is to say that its distance is 8.6 light years. One light year is the distance (about 6 trillion miles) that light (with a speed of 186,000 miles per second) will travel in one year. Sirius is about thirty times as bright as our sun, and is attended by a curious smaller star companion visible only through powerful telescopes. Of the class of "white dwarfs," this companion is made of stuff so dense that a handful would weigh many tons.

Capella is farther away, about 42 light years, and is 150 times the sun's brightness. It also is attended by a small companion, which revolves around it every 104 days. No telescope reveals this com-





panion though the spectroscope, which analyzes star light, reveals its presence.

In actual candlepower, Rigel is by far the brightest of our stellar septet, for it exceeds the sun some 21,000 times. Its distance is 540 light years; if it were as close as Sirius it would be brighter than any planets ever appear. The spectroscope shows that it also has a companion, that goes around it once in about three weeks.

Procyon, which comes next, is shown by a large telescope to be a double star, and the two parts revolve around their center of gravity in 40 years. The larger member contains about 1.4 times, as much matter as the sun, and the smaller about 0.4 as much. Most of the light of the system comes from the larger one, which is 6.9 times the sun's candlepower. Procyon's distance is 11.1 light years, one of our close neighbors.

Points of Light

The stars are so far away that even when magnified with a powerful telescope they still appear only as points of light, not as disks like the sun or full moon. However, a few are so big and close that, with an instrument called the interferometer, it is possible to measure the diameter. Betelgeuse was one of the first measured, and its diameter is about four times the distance of the earth from the sun—some 270,000,000 miles. (The sun's diameter is only 864,100 miles!) In contrast to the companion of Sirius, it is a giant star, with very low density—so low, in fact, that if we had some on the earth we should call it an excellent vacuum! It varies in brilliance, but, intrinsically, its average brightness is 3,600 times that of the sun. Its distance is 300 light years.

Aldebaran, with characteristic red color, is 53 light years away and 91

times the brightness of the sun. In diameter it is about a third of the distance between sun and earth. It also has a faint companion, about 46,000,000,000 miles away from it.

Pollux, finally, is at a distance of 29 light years, and exceeds the sun in luminosity 25 times. As far as we know it is a single star like our sun.

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Celestial Time Table for December

Dec.	EWT	
1	4:00 p.m.	Saturn closest, 751,000,000 miles.
7	9:59 p.m.	New moon.
8	6:30 a.m.	Moon passes Venus (not visible).
	8:00 p.m.	Moon nearest, 222,600 miles.
9	2:57 a.m.	Algol at minimum.
11	11:46 p.m.	Algol at minimum
12	Early a.m.	Meteors of Geminid shower visible.
14	1:47 p.m.	Moon in first quarter.
	8:35 p.m.	Algol at minimum.
20	12:43 p.m.	Moon passes Saturn.
22	7:40 a.m.	Sun farthest south, winter begins in northern hemisphere, summer begins in southern hemisphere.
	11:03 a.m.	Full moon.
23	7:00 p.m.	Moon farthest, 252,500 miles.
24	9:22 a.m.	Moon passes Jupiter.
29	4:41 a.m.	Algol at minimum.
30	2:37 p.m.	Moon in last quarter.

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NUTRITION

Watch for Vitamin A In Butter Substitutes

➤ IF BUTTER is rationed, and the prospect is already being discussed, more of us will be wondering what to spread on our bread and put in our cakes.

Most of us will turn to one of the margarines as a butter substitute for table use, though other fats may be substituted for butter in cooking. The margarines are made by churning bland fats other than butterfat in ripened milk, generally skim milk. The fats may be vegetable, nut or animal or a combina-

tion, but it is required by law that the product be labelled oleomargarine.

Butter furnishes fat, and therefore calories, and also vitamins A and D. Oleomargarine furnishes the same amount of fat (81%) and the same number of calories (3,325) per pound as butter, according to U. S. Department of Agriculture tables giving the composition of American food materials.

The amount of vitamins A and D furnished by butter varies widely, and depends largely on the cow's feed. Summer butter usually has more vitamin A than winter butter unless the cow's winter ration is reinforced with the vitamin. The amount of vitamin A in butter may vary from less than 1,400 to more than 27,000 International Units per pound. Butter in Washington, D. C., retail markets in winter has about 13,650 International Units per pound, according to U. S. Department of Agriculture figures.

Oleomargarine is not considered a good source of vitamins A and D unless it has been fortified by the addition of vitamin concentrates. Some vegetable oleomargarines have been fortified. The label tells whether they have and how much vitamin A has been added. Manufacturers of oleomargarines that contain animal fats inspected under the Federal Meat Inspection Act are not permitted to add vitamin concentrates.

The national nutrition yardstick, drawn up by leading scientists in the field of health, medicine and nutrition, calls for some butter daily, or margarine with vitamin A added.

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PALEONTOLOGY

"Strange Skull" Fossil Is Now Identified

➤ WITH TWO great bulbous projections above the middle ear region, one of the most singular mammalian skull fossils ever seen has been described at the Academy of Natural Sciences in Philadelphia with a scientific name that means "strange skull": Xenocranium. The name was bestowed by Dr. Edwin H. Colbert.

The extinct creature, represented only by a skull and lower jawbone, lived in what is now Wyoming some 60,000,000 years ago, near the beginning of the Age of Mammals, in the period called Oligocene by geologists. It belonged to the class known as edentates, which includes modern armadillos and their relatives.

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