ASTRONOMY

Bright Stars of Winter

The most brilliant stars of evening can be seen in December. Brightest of all is Sirius, the dog star, shining low in the southeast.

By JAMES STOKLEY

➤ THE MONTH of December brings us, on the 21st at 5:34 p.m., EST, the beginning of winter, for then the sun, which has been moving southward in the sky since last June, reaches its southernmost point, called the winter solstice. This, of course, is true only in the northern hemisphere, for south of the equator summer begins at the same time.

But besides winter, December brings us a view of our most brilliant stars of evening. Low in the southeast shines Sirius, the dog star, the brightest of all. Its position is indicated on the accompanying maps, which show the appearance of the skies at 10:00 p.m., your own kind of standard time, at the beginning of the month and an hour earlier around the 15th.

Sirius is in Canis Major, the great dog, one of two such animals among the constellation figures. The other is Canis Minor, the lesser dog, which is seen almost directly east, and a little higher. But above these two figures there can be seen one of the most familiar of all star groups—Orion, the giant warrior. He is typified by the three stars of similar brightness in a row which form his belt. To the left of the belt and a little higher is Betelgeuse, and on the other side is Rigel. Both of these are classed as of the first stellar magnitude in brightness. Orion, incidentally, is the only constellation visible from these northern latitudes which contains two first magnitude stars. The only other of which this is true is Centaurus, the Centaur, which is seen from more southerly latitudes.

The Twins

In the east, directly above Canis Minor, we find Gemini, the twins. Pollux, lower of the two brightest stars, is first magnitude, but his brother Castor, is not. Passing above Orion, we come to Taurus, the bull, with brilliant Aldebaran. Still higher, in the east above Gemini, is Auriga, the charioteer, with Capella, which is brighter still.

The only other first magnitude stars shown in the December maps are low in the northwest, where their splendor is somewhat dimmed. One is Vega, of Lyra, the lyre, shown close to the horizon, while the other is the nearby Deneb, in Cygnus, the swan.

Among somewhat fainter constellations now in good position we have Perseus, the champion, directly overhead. In this is Algol, the "demon" a famous variable star. It consists of two seperate globes, revolving around their center of gravity. One is much brighter than the other, but every two days, 21 hours, the darker orb comes in front of it, and makes it appear fainter. Such a pair is called an "eclipsing variable." Some other stars are truly variable, that is, there is an actual change of the amout of light which they emit.

Though no planet appears on the maps, Saturn, about as bright as Betelgeuse, appears a little later in the evening in the east in the constellation of Leo, the lion. Venus, many times as brilliant, rises in the east shortly before the sun. At sunrise it stands about 20 degrees above the southern horizon. Mercury, Mars and Jupiter are all too nearly in the same direction as the sun to be observed. In the constellation of Gemini is the planet Uranus, but even though it is closest on December 20, it still requires some optical aid to reveal its presence.

Full Moon

The night of Dec. 15-16 brings the full moon of December. As it rises that night in the east just as the sun goes down in the west, many people will see it—and wonder why it looks so big. This apparent enlargement of the moon near the horizon, which also occurs with other celestial bodies, is one of the most familiar of sky-effects, and also one of the least understood.

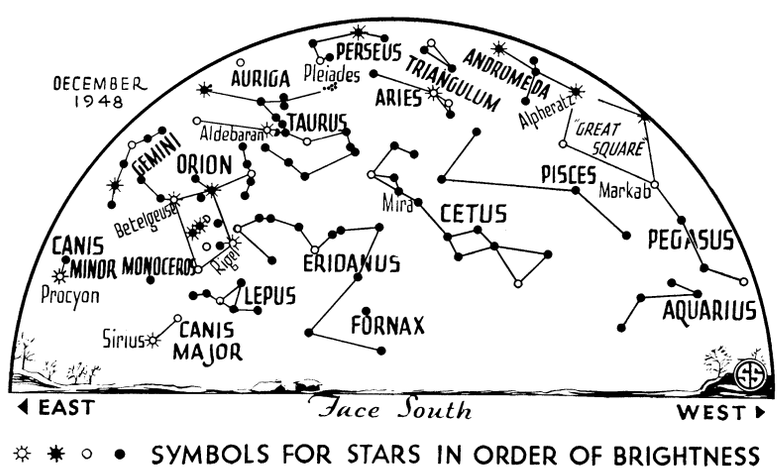
One of the most common explanations ascribes it to the fact that when the moon is near the horizon we compare it with terrestial objects such as houses or trees. However, no one has ever been able to explain why such a comparison should make it look big, rather than small, and furthermore, the effect is observed with the moon rising at sea. Then there is a perfectly plain horizon with no objects for comparison.

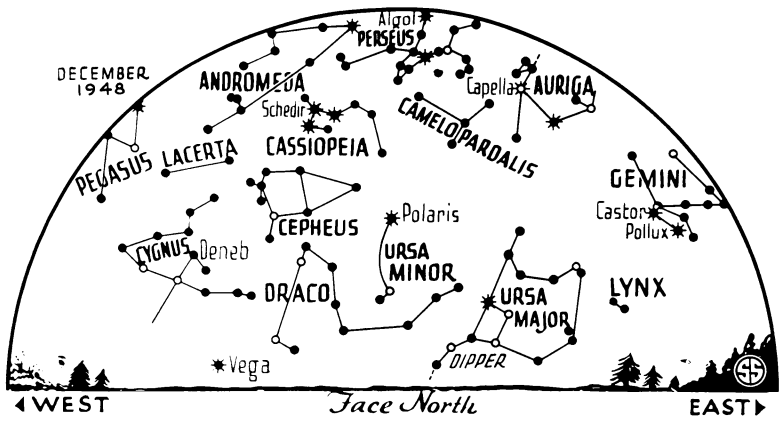
Explore Illusion

Some of the most exhaustive of recent researches to determine the cause of this illusion have been made by a Harvard psychologist, Dr. Edwin G. Boring, in collaboration with A. H. Holway, L. M. Hurvich and D. W. Taylor. They made careful experiments indoors and out, with artificial moons as well as the real thing, looking at it directly and in mirrors, etc. Several papers have appeared in scientific journals reporting their results, and these have been clearly summarized by Dr. Boring. Writing in a chapter in FOUNDATIONS OF PSYCHOLOGY (John Wiley and Sons, 1948), which he edited with Dr. Herbert S. Langfeld of Princeton and Dr. Harry P. Weld of Cornell, he uses this as an example of the scientific use of hypothesis. He says:

"When an hypothesis is verified, you are very likely to find that it sets up new problems. So now you think up new finer hypotheses to direct you toward finding out why the hypothesis just verified is true, and that process of refinement can go on practically forever.

"This study of the moon illusion shows this process operating. It was early observed that the moon looks larger on the horizon than up in the heavens. Many hypotheses were advanced—that the difference is due to refraction at the horizon, or due to the atmospheric haze at the horizon, or due to the fact that the moon looks farther away at the horizon and thus would have





to be big in order to give the normal-sized image on the retina.

"The first two hypotheses fail when tested by the camera. A photograph of the horizon moon is as small as the photograph of the moon in elevation. The third hypothesis fails because the horizon moon no longer looks large when you bend over and view it between your legs. The next hypothesis is that the illusion depends on looking up, and that hypothesis has been proved. It holds even for experimental moons only 30 meters away.

"So now you know; the phenomenon is an illusion and not an astronomical change, and it depends on looking up. But why, you ask at once. That needs another hypothesis. Perhaps what shrinks the moon is raising the eyes, or perhaps it is bending the neck. That question has been answered. The raised-eyes hypothesis is right, the bent-neck hypothesis is wrong. So, by forming and testing new hypotheses, you have refined your knowledge.

"Now you want to know why raising the eyes shrinks the moon, but no one has yet been clever enough to formulate for test the crucial hypothesis that will answer that question. Sometime it will be done."

Time Table for December

Dec.	EST	
1	10:27 p. m.	Algol at minimum
4	7:16 p. m.	Algol at minimum
8	6:00 a. m.	Moon farthest, distance 251,200 miles
	8:57 a. m.	Moon in first quarter
12	early a. m.	Meteors of Geminid shower visible
16	4:11 a. m.	Full moon
20	7:00 a. m.	Uranus nearest distance 1,675,000,000 miles
	12:00 noon	Moon nearest, distance, 229,100 miles
21	3:51 a. m.	Moon passes Saturn
	5:34 p. m.	Sun farthest south, winter commences in northern hemisphere
22	12.11 a. m.	Algol at minimum
23	12:12 a. m.	Moon in last quarter
24	9:00 p. m.	Algol at minimum
27	5:49 p. m.	Algol at minimum
28	1:20 a. m.	Moon passes Venus
30	4:44 a. m.	New Moon

Subtract one hour for CT, two hours for MT, and three for PT.

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PLANT PATHOLOGY

Uranium Found To Cause Hereditary Changes

➤ URANIUM, the atom-bomb element, is able to cause hereditary changes in plants when supplied in the form of its nitrate salt. Experiments demonstrating such changes in two widely different kinds of fungi are described in SCIENCE (Nov. 19), by Dr. E. C. Stakman, professor of plant pathology at the University of Minnesota and president-elect of the American Association for the Advancement of Science, together with Drs. J. M. Daly, M. L. Gattani and I. Wahl.

When supplied to the spawn of ordinary mushrooms, it produced mutants that grew from five to seven times faster than the original mushroom strains from which they were derived. Another fungus on which the uranium compound wrought hereditary changes was the one that causes smut disease in corn.

Dr. Stakman feels that these same effects may be obtained in other plants and perhaps animals. The uranium used in these experiments was of the ordinary kind, not the highly radioactive U236. The culture medium containing it is described as "mildly radioactive".

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