

ASTRONOMY

Bright Stars Fill The Sky

Season of Brilliance in Heavens Brings Interesting Stars and Constellations to Attract Sky Gazers

By JAMES STOKLEY

THE WINTER evening skies, which contain more bright stars than those of any other part of the year, are seen this month in all their glory.

High in the south is a circle of seven first magnitude stars, with another, Betelgeuse, at the center. Above Betelgeuse is Capella, part of Auriga, the charioteer; then comes Aldebaran, the eye of the bull, Taurus, whose face is marked by the V-shaped group called the Hyades. Below is Rigel which, like Betelgeuse, is part of Orion, the giant warrior. This group can be identified by the row of three stars forming Orion's belt.

Towards the southeast is Sirius, the dog star, which helps to make up Canis Major, the greater dog. Sirius is the brightest star in the sky and the nearest of those ordinarily seen from the United States. Above is the lesser dog, Canis Minor, with the star Procyon; and still higher are the twins, Gemini, with Pollux, below, and Castor above.

High in the west, to the right of the Hyades, are the Pleiades, the famous "Seven Sisters" of mythology. Six stars can be seen with the unaided eye, a pair of opera glasses reveals several more, and photographs made with modern telescopes show thousands.

In the east is Leo, the lion, in which can be found the "sickle," the blade of which forms the lion's head and with the brilliant Regulus at the end of the handle, which points downwards. To the northeast is the great dipper, with the handle also downwards, and the pointers above. Actually this is the constellation of Ursa Major, the great bear, and the handle is the bear's tail; Following a line from the pointers to the left, we come to Polaris, the pole star, at the end of the handle of the little dipper, and beyond, to the west, is the W-shaped group of Cassiopeia.

Though Venus, and possibly Saturn, can be glimpsed low in the west just after sunset at the beginning of January, no planets are well placed now to

be seen throughout the evening. The presence of a number of the most interesting constellations, however, more than makes up for their lack.

Without doubt the finest of all the star groups is Orion, the mighty hunter. This evening you can see it in the southeast. First of all, look for the row of three stars of nearly similar brilliance; the row is not quite vertical but slants a little to the south. Above the three is another star, a little brighter than any of the belt stars. Farther to the left and a little lower is a very brilliant star with a distinctly ruddy hue. About the same distance from the belt on the opposite side is still another of nearly equal brightness, but bluish in color.

Imaginative Ancients

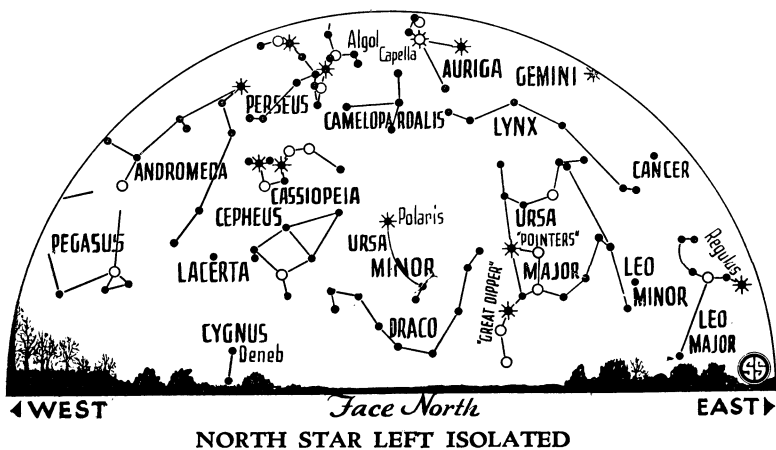
These are the most familiar stars of Orion. The star above the belt is Bellatrix. The bright reddish one is called Betelgeuse; the other bright one Rigel. The three stars of the belt, beginning with the upper one, are named Mintaka, Anilam and Alnitak.

To us unimaginative moderns, almost any figure could be drawn around this group of stars, and probably the last thing that we would think of would be a giant hunter, with a lion's skin thrown over one arm, and an uplifted club in the other. Yet this is just the way the ancients pictured the constellation, and they invented an elaborate story about the hunter, Orion, as they did about so many of the star groups.

According to Homer, Orion was "the tallest and most beautiful of men," and apparently he himself admitted it without question. To punish him, the gods sent a scorpion which stung him in the foot and killed him. Possibly because Orion also was a hunter, Diana interceded for him, and so he was placed in the skies. The scorpion was placed in the opposite part of the sky, as far away from Orion as possible. Thus Scorpius is a conspicuous constellation of summer evenings, just as Orion adorns the skies now.

Betelgeuse is in Orion's right shoulder, Bellatrix in his left. Rigel is his uplifted left foot, the right one is not represented. The double row of faint stars extending northwards from Betelgeuse is the club, and a curved row to the west of Bellatrix is the lion's skin. The row of three stars is the belt, and hanging from it is the sword. Saiph, a fainter star about as far below the belt as Bellatrix is above it, marks the right knee.

These fancies about the constellations are no longer taken seriously, and small wonder, because the facts that astronomical science has revealed about them are far more romantic and wonderful. Take Betelgeus, for instance. The astronomer calls this alpha Orionis, which means that it is the brightest star in this constellation. About 1918 two famous astronomers, one an American, Prof. Henry Norris Russell, of Princeton, the other an Englishman, Dr. (now Sir) Arthur Eddington, of Cambridge University, announced that their calculations showed that this star was so vast that, if it were hollow with the sun at its center, the earth could



continue to revolve in its accustomed orbit, 186 million miles in diameter, without passing through the imagined shell of Betelgeuse.

In making this deduction the astronomers used an important physical principle, the Stefan-Boltzmann law, by which it is possible to calculate the energy sent into space by every square inch of a star's surface, if the star's temperature is known. Modern astronomical instruments permit a measure of the temperature. Other measurements reveal actual brightness (sometimes different from apparent brightness because a bright star far away may not look so brilliant as a fainter star much closer), and color.

Measurement Checks Calculation

From these data the astronomer can compute the total energy that the star's entire surface is radiating. When he knows the amount given out by each square inch and the radiation from the entire star, it is easy to find out the total area in square inches. Then, because all stars are spherical, the diameter can be found.

When these results were first announced, they caused considerable surprise. Can there be stars so much larger than our sun, which, after all, is a typical star, it was asked. But any skepticism was silenced in 1920 when Dr. F. G. Pease, of the Mt. Wilson Observatory in California, applied the interferometer, an instrument invented by the late Dr. A. A. Michelson, to the problem. Used as an attachment to the 100-inch reflecting telescope there, still the largest in the world, the actual diameter of Betelgeuse was measured, and found to be about 215 million miles, thus amply justifying the predictions. After the first success of the interferometer, it was applied to several other stars, two of which were found to be

even larger. It was also applied again to Betelgeuse, and thus the discovery was made that this remarkable star does not remain of the same diameter, but seems to be pulsating like a huge heart. When largest, its diameter is about 260 million miles; and when smallest, about 183 million.

Another interesting fact about Betelgeuse is that it is possible to calculate the star's mass, that is, the total amount of matter that it contains. Knowing mass and size, we may find the density; and this turns out to be hundreds of times less than that of the air we breathe. If we had a piece of Betelgeuse on the earth, it would be according to our standards a pretty good vacuum, yet this body is sending out light all the time, about 1600 times as rapidly as the sun. Even though it is so far away that its light takes 240 years to reach us, it is still one of the brightest stars in our sky.

Betelgeuse is not the only interesting thing about Orion. If the night is dark and clear, look at the row of stars hanging downward from the belt, which forms the sword. Perhaps you can see that one of them seems a little hazy.

Great Nebula of Orion

Seen through a telescope, there is visible a hazy area which is called the great nebula in Orion. This is a mass of glowing gas of which photographs made with the greatest telescopes reveal a wealth of detail. Apparently the gas is made to glow by the energy radiated from a group of stars in the heart of the nebula, called the trapezium. The nebula proper is so large that a beam of light takes about three years to cross it. But even this is not the whole story.

A few years ago Dr. Frank E. Ross of the Yerkes Observatory designed a new astronomical lens that makes photo-

graphs which were quite impossible with the older lenses. One of his pictures is of the whole constellation of Orion and was made with an exposure of many hours, giving the faint light plenty of chance to sink into the plate. On this photograph a nebulous cloud can be seen permeating the entire constellation, and the "great nebula" is merely the brightest part. It has also been found that some of this nebulosity is not bright, but dark, and can be seen in silhouette against the luminous background. One particularly striking piece has the shape of a horse's head and seems to be pushing through a sheet of bright nebulosity.

Much more might be said about Orion and the interesting bodies that the constellation contains, but surely these are enough to give some justification to its title as "the finest constellation in the sky." And surely these facts which modern astronomical science reveals about it are even more romantic than the old mythological stories.

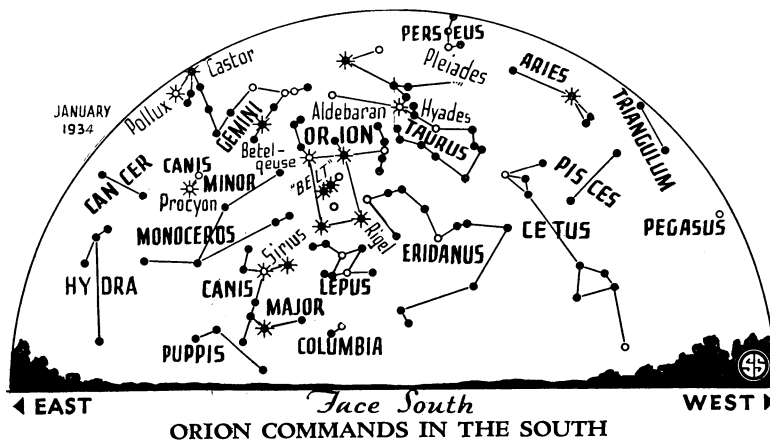
Orion is not the only conspicuous group of stars now in the evening sky. Above this group is a reddish star, Aldebaran, marking the heavenly bull, Taurus, that Orion is about to strike with his club. Aldebaran is part of a famous loose cluster of stars called the Hyades, which have the shape of a V.

Numerous Pleiades

A little higher still is an even more famous cluster, the Pleiades, six of which can be seen easily with the naked eye. Even a small telescope shows more than a hundred, while as many as two thousand have been counted on a photograph of the region. Astronomical photographs also show a cloud of nebulous material surrounding the stars, apparently shining with light reflected from these stars. It is estimated that the center of the Pleiades is about 350 light years away, and that the distance across the cluster is about a tenth as large.

Below Orion is the most brilliant star in the heavens, Sirius, the dog star, marking the constellation of Canis Major, the greater dog. This canine is one of the two that accompany the hunter. Canis Minor, the other, is to the east and higher, with the brilliant Procyon to distinguish it. Continuing around to the north, and a little higher, are Gemini, the twins, Pollux is the brighter of the two; Castor, the fainter, is located just above his twin.

Nearly overhead and to the north of Aldebaran is Capella in Auriga, the



Charioteer, another first magnitude star.

Now let us look at the western sky. Half way from horizon to zenith, resting on one corner, is the great square of Pegasus, the upper star of which is in Andromeda. Just north of Andromeda is Cassiopeia, the familiar W-shaped constellation, which is supposed to represent a seated woman. In the southwest is Deneb Kaitos, part of Cetus, the sea monster that was sent to devour the fair Andromeda while she was chained to a rock, but from which Perseus rescued her, with the aid of Pegasus, on which he was mounted. In the northwest is Cygnus, the swan, sometimes called the northern cross. The cross is now vertical, with the brilliant Deneb at the top. To the north of Cygnus and close to the horizon can be seen Vega, part of Lyra, which is soon to disappear from the evening sky for a few months.

No planets are well placed in the evening sky this month. Venus is in the constellation of Capricornus, which sets soon after sunset. It is so bright now, however, of the minus 4.3 magnitude, that it can easily be seen in the gathering dusk. No other star or planet is so bright. Mars is in the same constellation, but much fainter and still closer to the sun, so that it is now quite invisible. The same thing is true of Saturn, which is close to Mars. On the seventeenth, these two planets are within nine minutes—less than a third the diameter of the full moon, of each other. If they were in a part of the sky where they could be seen, this would be a beautiful spectacle.

Jupiter, largest of the planets, is in the morning sky, near the star Spica, in Virgo, which rises about 1:00 a. m.

Phases of Moon

In January the moon goes through its phases as follows: on the 8th it is at last quarter, on the 15th new, on the 22nd first quarter and on the 30th full. On the latter date it will partly enter the shadow of the earth producing a lunar eclipse, which, unfortunately, will not be visible from this country.

On January 2 the sun was in perihelion, which means that it was closer to the earth, by several million miles, than at any other time of the year. Despite its proximity, this time of the year is cold. This is because the sun is so low in the sky that its light and heat reach us in the northern hemisphere at a glancing angle. Thus the heat is more widely dispersed than in the summer when the sun, though further away, is more nearly overhead.

During the coming year there are several interesting astronomical events scheduled. Most important, perhaps, is a total eclipse of the sun, visible from the middle of the Pacific Ocean, on the 13th and 14th of February. More details of this will be given next month.

On August 10 there will be another solar eclipse, visible in South Africa, but this will be annular, with a ring of the sun's disc remaining visible around the moon even while the eclipse is at its height. Another partial eclipse of the moon will occur on July 26 and will be visible in the western part of the United States.

The brightest star to be eclipsed, or occulted, as seen from the United States, is sigma Sagittarii, of the second mag-

nitude. On April 6, the moon will pass in front of this body for the people in the western states. But those in the East need not feel disappointed, for it will be occulted again on July 25, and this time they will see it. On November 21 the moon passes in front of a number of the Pleiades.

Several comets are expected to make their return this year, among them being Encke's, which was discovered in 1786, and returns every three and a third years. It has been observed on nearly every return since it was first found, but it never becomes brilliant enough to be seen without the aid of a telescope. In addition, several hitherto unknown comets are certain to make their appearance.

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PSYCHIATRY

Need for Affection May be Cause of Stomach Ulcers

THE CAUSE of stomach ulcer and other gastrointestinal disorders is often mental; they are brought about by a continuous exciting of the functions of the digestive organs by the unconscious mental processes of the patient, Dr. Franz Alexander, of the Chicago Institute of Psychoanalysis, reported to the American Psychoanalytic Association meeting at Washington, D. C.

A study of the personality of sufferers from peptic ulcer revealed to Dr. Alexander that they are typically of the go-getter, independent, efficient, successful type. They are those who delight in doing for others, in giving to others and having others dependent upon them. But underneath all this successful and independent exterior, there is suppressed an overwhelming desire for love and affection from others, he found. Although they do not admit it even to themselves, these individuals have a vital need for the care and affection such as a mother gives.

Since this need for love and protection is associated in very early life with the receipt of nutrition, it automatically sets off the digestive functions of the stomach which normally are dependent upon the process of nutrition. Dr. Alexander explained. When the need is overwhelming and suppressed, the stomach and digestive organs are kept constantly in the state normally aroused only when food is taken or about to be taken.

The irritation from this constant overwork of the digestive processes produces the ulcer.

One patient, cited by Dr. Alexander, was cured of his trouble when he fell in love with a quiet, motherly type of woman who was ardently devoted to him.

Another type of personality was found by Dr. Alexander to be characteristic of the patient suffering from elimination diseases such as mucous colitis. These individuals are aware of their need for service and affection and in fact are constantly complaining that they do not receive all they deserve in view of what they do for others. The service given by these persons is most generally confined to lip-service instead of real doing.

Still another type is found in the chronic sufferer from constipation. These persons excuse their lack of willingness to do for others by saying that no one does anything for them. They do not expect anything and so do not need to give. They cannot relax because of a real, although unconscious, fear of "starvation."

Dr. Alexander told of one patient who was afforded relief from her symptoms when her husband unexpectedly brought her home a gift—the first he had given her in many years of marriage.

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