

ASTRONOMY

Now Come the Winter Stars

Conspicuous in the Evening Sky This Month Are Famed Pegasus, Andromeda, and the "Northern Cross"

By JAMES STOKLEY

TO THE evening skies of October come the first of the stars that will make the heavens of winter brilliant. A good "sky-mark," with which to start to find them, is seen high in the south, the "great square of Pegasus." This is shown on the accompanying maps, which depict the skies seen from the United States at ten p.m., October 1; nine p.m., October 15; and eight p.m., October 30. The four stars, of similar brilliance, form a square that is easily found. Three are in the constellation of Pegasus, the winged horse, but the one in the upper left-hand corner is Alpheratz, in the next-door constellation of Andromeda, the princess who was chained to the rock.

Below and to the west of the square is the planet Saturn, shining with a steady glow that readily distinguishes it from the stars, most of which it exceeds in brilliance. Saturn is in Aquarius, the water-carrier. The little triangle of stars just above it, with a fourth star at the center, is supposed to represent the pot of water, from which a stream is flowing southward. Below Aquarius is Fomalhaut, about all that can be seen of Piscis Austrinus, the southern fish. If the sky is very clear to the south, you may be able to see, still nearer the horizon, stars marking parts of the constellations of Phoenix and Grus, the crane. In the United States, these never rise any higher than now, but in southern countries they shine overhead.

Fishes and Whale

Below, and also to the eastern side of the Great Square, is the group of Pisces, the fishes. Below them, in the southeast, is Cetus, the whale. Continuing farther to the north, about the same height, is Taurus, the bull. The red star, Aldebaran, is brightest in this group, and marks the animal's eye, and the V-shaped group of which it is part outlines the face. Above is a little cluster of stars, the Pleiades, in his shoulder. Next to Taurus, still farther north, is Auriga, the charioteer, with the first magnitude Capella. Perseus, the champion, is seen over him, and still higher, like a letter W on one side, is

Cassiopeia, the queen of Ethiopia, seated on her throne.

The familiar "Great Dipper" this month is almost at its lowest position in the evening, but because it is closer than the horizon to the north pole of the sky, around which all the stars circle, it never goes below it. In other words, it is one of the "circumpolar" constellations, which never set. The "pointers," to the right, indicate the direction of Polaris, above. This is close to the celestial pole, and is at the end of the handle of the little dipper, which extends to the left. Winding its snake-like body between the two dippers, can be seen the dragon, Draco, with the head in the northwestern sky, just north of Lyra, the lyre, with the brilliant Vega. Below them is Hercules, the strong man.

In the West

Most conspicuous of the constellations in the west is Cygnus, the swan, also called the "northern cross." The cross is nearly vertical, with Deneb at the top, marking the tail of the swan. Directly below is Lyra, the lyre, with Vega, and farther south is the eagle, Aquila, with the bright star Altair. Over it is Sagitta, the arrow, a small and rather faint constellation, and just to the left of that is Delphinus, the dolphin, another small

group in which is the diamond-shaped figure of "Job's coffin."

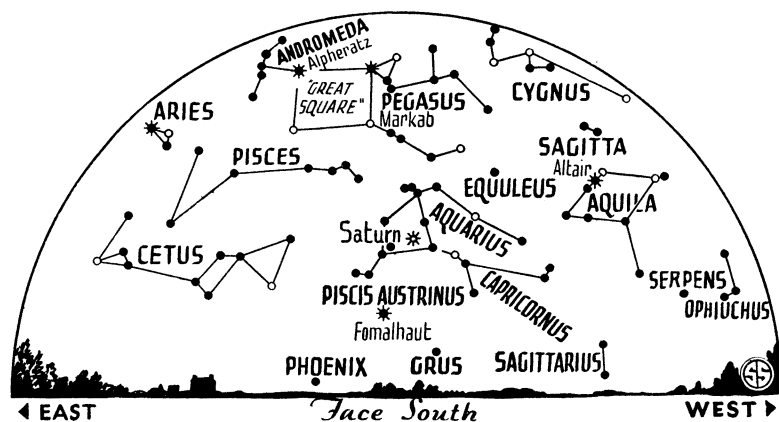
Two other planets can be seen in the early evening this month, though they have set by the time for which the maps are drawn. Low in the southwest, during the first half of the month, Jupiter can be seen when it first gets dark. It is rapidly drawing into line with the sun, though it is much farther beyond, and by the end of October will set so soon after sunset that it will not be visible. Even after it has gone, however, Mars will still be in view, also in the southwest, in the constellation of Ophiuchus, the serpent-bearer.

Morning Star

In the early morning, rising about three and a half hours before the sun, Venus can be seen to the southeast. It reaches its greatest brilliancy on the fifteenth, of magnitude minus 4.3, much brighter than any other star or planet. On the morning of the 23d, the crescent of the waning moon will appear a short distance to its north. Mercury is now drawing to the west of the sun, and will be at its greatest distance on November 2, so during the last few days of this month, it will also be a morning "star," visible in the southeast at dawn.

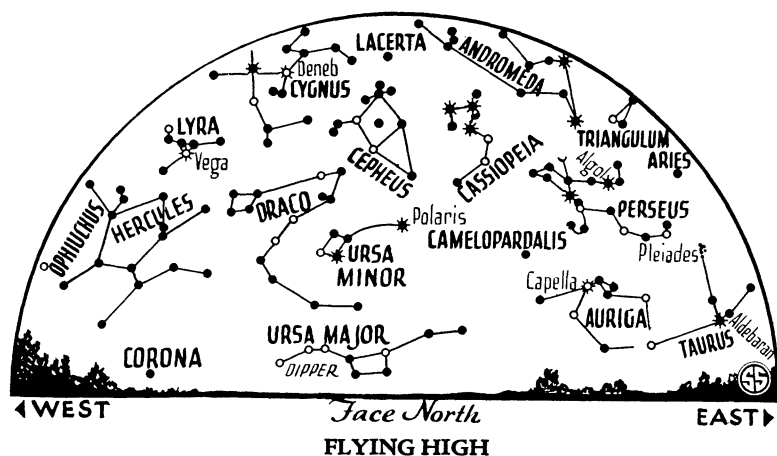
The moon is at first quarter this month on the fifth, full on the eleventh, at last quarter on the nineteenth and new on the twenty-seventh, so that the evenings during the first two weeks will be moon-lit. On October 10, at 11:36 p.m., E.S.T., the moon will be closest, at "perigee,"

☼ * ○ • SYMBOLS FOR STARS IN ORDER OF BRIGHTNESS



A "SKYMARK"

The "great square of Pegasus" is an easily located pattern among the stars from which others can be traced.



This month Cygnus, the swan, also known as the "Northern Cross" is high in the northern heavens.

222,800 miles away. It will be farthest, at "apogee," on the twenty-third, at 8:24 a.m., when 252,100 miles will separate us.

The brightest star to be seen this month in the evening is Vega, in the constellation of Lyra. Just below it, near a faint star in Hercules, is the point towards which the sun, and the rest of the solar system with it, is traveling at a speed of 12.3 miles per second. The great English astronomer of the 18th century, Sir William Herschel, was the first to detect this movement, from a study of the motions of the stars across the sky. Suppose that you are driving in an automobile through a long tunnel. Pick out two points on opposite walls some distance ahead, perhaps two lights. As you approach, they seem to separate, but after you have passed them, and look back (if you are not driving the car yourself!) you will find them apparently to be drawing together.

Similarly With Stars

The same thing happens with the stars. In the direction towards which the solar system is moving, they appear to be drawing apart, and in the opposite direction, that which we are leaving, they tend to draw together. Of course, the stars have their own motions, which may mask the effect in individual cases, but if we consider large numbers, these average out. Another English astronomer, James Bradley, had pointed out that this would happen, and a German, Tobias Mayer, had sought for it, though his data were insufficient. But Herschel, in 1783, announced that from a study of thirteen stars, he had found such an effect, when he wrote, with characteristic modesty:

"Now, since the apparent motions of these stars may be accounted for, either by supposing them to move just in the manner they appear to do, or else by sup-

posing the sun alone to have a motion in a direction, somehow not far from that which I have assigned to it, I think we are no more authorized to suppose the sun at rest than we should be to deny the diurnal motion of the earth, except in this respect, that the proofs of the latter are very numerous, whereas the former rest only on a few though capital testimonies."

Since Confirmed

Since that time, however, it has been abundantly confirmed. In 1837, a German astronomer, Argelander, obtained similar results from the study of many more stars. In recent years, in addition, the spectroscope has checked it in another way. By observing the exact position of the dark lines that appear crossing the band of color, or spectrum, that is obtained when a star's light is passed through the prisms of a spectroscope, it is possible to tell whether the distance between that star and the earth is getting greater or smaller. In the former case, the lines are shifted to the red end of the spectrum, but in the latter, the shift is towards the blue. Here, again, various stars have their own individual motions of approach or recession, called radial velocities, but these average out in large enough numbers.

If a shift to the red is observed, it means either that the star is moving away from the earth, or the earth away from the star; in either event the distance is increasing. Similarly, a blueward shift may mean that the earth is approaching the star, or the star the earth. If it is found that most of the stars in one direction show the red shift, while most in the opposite have their spectral lines moved to the blue, the reasonable assumption is that we are moving towards the latter direction. This is especially convincing if it is found that this is the same part of the sky towards

which the transverse motions of the stars show us to be traveling.

The most complete studies of the motion of the solar system, from radial velocities, has been made at the Lick Observatory in California, by Dr. W. W. Campbell and Dr. J. H. Moore. After more than thirty years of research, with stars observed from the observatory in California as well as from a southern station in Chile, they announced their final result in 1928, and it is almost the same as that obtained by the other method.

Earth Moves in Helix

Of course, if the earth is moving around the sun in a circle, and the sun itself is moving through space, it is perfectly obvious that our motion in space is not that of a circle, but a helix, the same as that of a man ascending a spiral stairway. Surely so keen a thinker as Herschel could not have failed to notice this, though he does not seem to have mentioned it in any of his writings. But since then many other writers, of the past and present century, have described it. In spite of this, however, some one will occasionally realize it for the first time, and, because they may have seen a statement in a book that the earth's orbital motion is an ellipse, almost circular, they think that they have made a great discovery. How can the book be correct, in saying the earth moves in a circle, when it really moves in a helix? They totally overlook the fact that the author was referring only to motions within the solar system, when it is perfectly correct to say that the earth's motion, around the sun, is in an ellipse.

Presenting "New" Truth

Having made this "discovery," a frequent procedure is to attempt to present a paper on the subject before some scientific body, an offer which is quite naturally rejected. Then delusions of persecution are apt to develop, and the "great thinker" may publish a pamphlet at his own expense, setting forth how ignorant the astronomers have been for so many years, and how backward they are in not accepting a "new" truth when he offers it to them. Interest in astronomy, and popular knowledge of it, has increased tremendously in the last few years, but it will have to be spread much further yet before we have seen the last of these "discoverers."

Science News Letter, September 28, 1935

Southern California is trying a new venture—perfume farming.

The census of 1931 credits India with almost 353 million people, which is nearly one-fifth the world's population.