

ASTRONOMY

Eagle and Graceful Swan Herald the Coming of Summer

By JAMES STOKLEY

CONSTANTLY in a state of change is the starry sky. A couple of months ago we were enjoying, in the evening, the constellations of Orion, the mighty warrior, with his upraised club, about to smite the bull, Taurus, and attended by the two dogs, Canis Major and Canis Minor. Auriga, Perseus, Andromeda and Gemini, as well as others, were conspicuous. But these groups have disappeared. In their place have come other groups, visible in the eastern evening sky. Which are the finest constellations? None can say, for, after all, it is a matter of taste. To some, the magnificence of the winter groups appeals, while the more delicate figures that appear in summer have an attraction for others. But whenever one gazes on the starry sky, whether in winter or summer, or even from countries far to the south, where one looks at constellations known to us inhabitants of northern countries only by hearsay, there is visible one of the grandest, perhaps the grandest, sight that nature has in store for us.

Just now, the constellations of summer are coming into their own. To be sure, it is not strictly correct to say "the constellations of summer" for we could have seen exactly the same groups that now decorate the evening sky last January, if we had taken the trouble to get up before sunrise for a look at the stars. But now it is not necessary to resort to such Spartan measures to see such familiar groups as Scorpio, Aquila and Cygnus.

Let us start with the groups that have been with us for recent months in the evening. Almost directly west is Leo, the lion. Six stars in this group form the "sickle," a good representation of that agricultural implement. The blade is directed downwards, and the handle, marked by brilliant Regulus at the end, points to the southwest. Above Leo, and to the north, is Ursa Major, the great bear, the most familiar part of which is the Dipper, with the two stars at the end of the bowl forming the pointers and indicating the direction of the pole star, Polaris.

At the other end of the dipper is the handle, really the huge tail of the bear. Follow along the handle into the next constellation, and you are looking at Bootes, the wagon driver. Here is the bright star Arcturus, almost directly overhead on June evenings. Below Bootes to the south is the constellation of Virgo, the virgin, marked by the first magnitude Spica. Leo and Virgo are two of the zodiacal constellations, that mark the ecliptic, path of the sun, the moon and the planets. Next to Virgo is Libra, the scales, one of the least conspicuous of the star groups of the zodiac, as its brightest star is only of the third magnitude. However, it is not hard to see, if you know where to look. The five principal stars form a rather rough pentagon. The highest of these, beta Librae, is pale greenish in color, the only naked-eye star of such hue. Its name, seldom used, is Zubeneschamali, an Arabic word meaning "the northern claw." Originally, Libra was not a separate constellation, but part of the next one, Scorpio, representing the animal's claws. Hence the proper name for beta. Scorpio is low in the southeast.

Ruby Rival of Mars

Contrasting greatly in color with beta Libra is the brightest one in Scorpio, Antares, distinctly red in color and marking the scorpion's eye. The name means the "rival of Mars," an allusion to its resemblance in color to that planet. Low in the east, a little above the horizon, is Aquila, the eagle. The bright Altair is the star that marks it. Then, to the north, is the swan, Cygnus, sometimes referred to as "the northern cross." The cross is now horizontal, and at the head, to the north, is the star Deneb. As a swan, however, Deneb marks the tail. The body of the cross is the long neck of the bird, as it flies southward through the Milky Way, and the cross arm represents the wings. Just above the southern end of the cross is Lyra, the lyre, in which the brightest star is Vega.

Above Lyra, though not containing any first magnitude stars, is Hercules. To the south of Hercules is Ophiuchus,

the serpent bearer, while to the north is the head of Draco, the dragon. The tail of this beast wraps around the north pole, passing between parts of the large and small bears. Below Draco, in the north, is Cepheus, the king, and below him the well-known W-shaped group of stars that forms Cassiopeia, the lady in the chair. In the early evening now, Capella, in Auriga, the charioteer, and Pollux, the brighter of the twins, Gemini, can still be seen low in the northwest, the last remnants of the winter constellations.

Mentioned in the Bible

Let us look at Arcturus for a moment, as it shines high overhead, at the bottom of the kite-shaped constellation of Bootes, the wagoner, or the ploughman, as it is sometimes called. Arcturus, incidentally, is mentioned in the Bible, in Job 38:32. However, there is some confusion, as the name was also applied in past times to the Great Bear, and the biblical reference, "Canst thou guide Arcturus with his sons?" probably refers to Ursa Major. The revised version of the Bible renders it "the bear."

Omitting the sun, which is just as much a star as any, Arcturus is the fourth brightest that can be seen from middle latitudes in the United States. Sirius, the dog-star, is the brightest, then comes Vega, now shining in the east and marking the group of Lyra, then Capella, and Arcturus follows with only slightly inferior brilliance. It is rather reddish in color, though not as conspicuously so as Antares, while Vega is distinctly blue. Measures of its distance show that Arcturus is 41 light



WITH WINGS OUTSTRETCHED

The graceful swan was chosen by the ancients to represent the group of stars also known as the Northern Cross.

years away—41 times the six million miles that a beam of light travels in a year—but great as this seems, it is one of the closest stars in the sky. Knowing its distance as well as its apparent brightness it is possible to calculate its actual brightness, or "candle-power." This proves to be 112 times as much as the sun. Also, Arcturus is one of the few stars of which the diameter has been measured by means of the interferometer. Thus it has been found that it is 23 million miles in diameter, 26.6 times the size of the sun. Its volume is, therefore, about 25,000 times that of the sun, but it is only four times as massive, so that it is vastly more diffuse, a great globe of nothingness.

Constellations Changing

We speak of the "fixed stars" as separate from the planets, which wander around the sky, but actually this is only relatively correct. Though they seem to move much more slowly than the planets, because of their vastly greater distances, the stars are all speeding through space, with the result that the present constellation figures are only temporary. Within a few thousand years they will be appreciably different from their present arrangements, and by the time 50,000 years have elapsed, a very short time in the history of the universe, they would be quite unrecognizable to us. Our own sun is going along with the others. Every second it has advanced twelve miles.

The English astronomer Halley, best known, perhaps, from the comet that bears his name, was the first to show that the stars are moving. In the year 1718 he announced, as a result of studying contemporary observations with

ancient records, that Sirius, Procyon and Arcturus had changed their position within historic times. Modern research shows that Arcturus is going along at the rate of 77 miles a second. This is the most rapid speed of all the bright stars we can see, but the record speed is more than 600 miles a second.

With so many stars, moving more or less promiscuously at such speeds, it might seem that the traffic problems would be great, and that interstellar space must be something like Times Square without any policemen to regulate it. True enough, two stars may hit, but such a catastrophe would be exceedingly rare and nearly as infrequent would be the close approach of two stars, such as that which apparently brought the solar system into existence, when a passing star pulled out of the sun the stuff which later formed the planets. Of course, the reason is found in the sparseness of the stars. In his

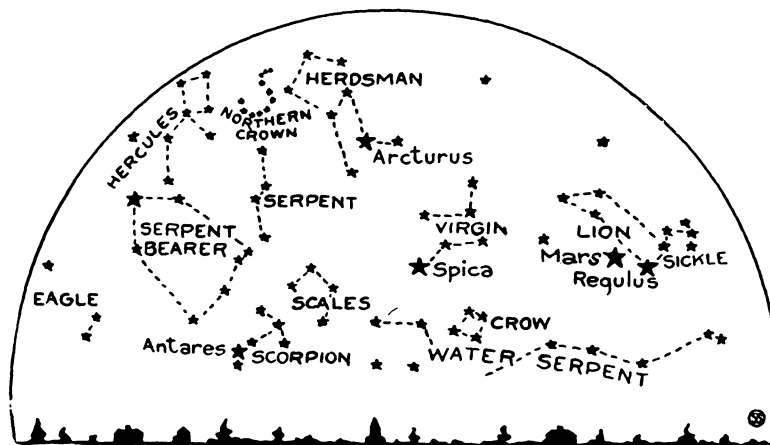
recent book, "The Stars in Their Courses," Sir James Jeans has given a vivid picture of the emptiness of space. "Leave only three wasps alive in the whole of Europe," he says, "and the air of Europe will still be more crowded with wasps than space is with stars, at any rate in those parts of the universe with which we are acquainted."

In addition to the stars visible next month, three planets are to be seen during the evening. Jupiter, which has been so conspicuous in recent months, is in the constellation of Gemini, low in the northwestern sky, where its brightness makes it apparent in the early part of the evening. Higher, in Leo, is Mars. In the middle of June, it will set about four hours after the sun. Saturn is the most conspicuous of the planets now to be seen. It rises about two hours after the sun sets, and is in the constellation of Sagittarius, the Archer, the zodiacal constellation next to Scorpio. By two o'clock it is directly south. Saturn is not indicated on the map.

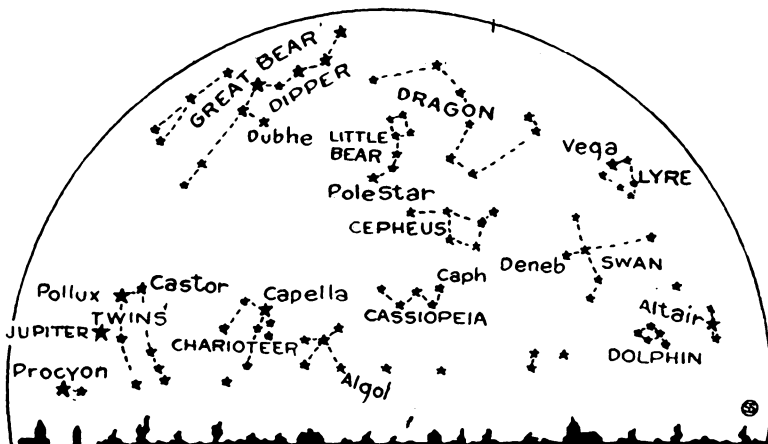
One particularly interesting event of June occurs at 4:28 A. M., eastern standard time, on Monday, the twenty-second. That is the time when the sun enters the sign of Cancer, the crab, which marks the beginning of summer. This is the summer solstice, when the sun is farthest north in the sky, and the day longest and the night shortest.

During June, the moon is at last quarter on Monday, the eighth, new on Monday, the fifteenth, at first quarter on Monday, the twenty-second, and full on Monday, the twenty-ninth. Thus, the last ten or twelve days of the month will have bright moonlight evenings.

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THE SOUTHERN EVENING SKIES
 Contain many of the beautiful constellations which are the familiar attendants of balmy summer evenings.



THE SWAN OF THE HEAVENS
 May be located with the aid of this map of the northern skies.