ASTRONOMY

Arcturus Shines in Southern Sky

Several bright stars can be seen on June evenings. Most prominent is Arcturus in the constellation Bootes. Others are Spica, Deneb, Vega and Capella, James Stokley reports.

➤ LOOK TOWARD the south on a clear evening in June, and you will see several bright stars—bright enough to be ranked by the astronomer as "first magnitude." Perhaps the most prominent is Arcturus, in the constellation of Bootes, the herdsman, which is high in the south.

The accompanying maps show its position, along with other stars of the evening, as it appears about 10 p.m., your own kind of standard time at the first of June. By the middle of the month they will be similarly located about an hour earlier. (Add one hour for daylight saving time.)

Just below Bootes you will see Virgo, the virgin. This is one of the 12 constellations of the zodiac, the belt through which the sun, moon and planets seem to move. The brightest star in Virgo is Spica.

To the right of this group stands another zodiacal constellation, Leo the lion. Denebola, which is indicated on the map, is supposed to mark the animal's tail; it is second magnitude. Farther down, toward the west, is Regulus. This is actually a first magnitude star, but is dimmed on account of its low altitude. It marks the end of the handle of the sickle, a group of six stars shaped like that agricultural implement.

The blade of the sickle is shown on the northern sky map. Close to it is Mars, the only planet shown. This is now quite faint, mainly because of its distance. On June 20 it will be just twice as far as the sun—about 186,000,000 miles away.

Libra Seen in the South

Low in the south you can see Libra, the scales. These stars, none very bright, are arranged in the form of a somewhat distorted pentagon. And just to the left Scorpius, the scorpion, is partly visible, with the first magnitude star Antares. It is noticeably ruddy in color.

Above Scorpius is the large constellation of Ophiuchus the serpent-bearer, along with Serpens, the serpent that he is supposed to be carrying. And in the east, just to the left, you find Aquila, the eagle. In it is the star Altair, also somewhat dimmed because it is so near the horizon.

A little farther to the left and you come to Cygnus the swan, with Deneb as the brightest star. (This is shown on the map of the northern sky.) Above this group is Lyra, the lyre, with Vega, which is similar in brightness to Arcturus. Above it is Hercules, another well-known group, although it has no stars of the first magnitude.

High in the northwest is Ursa Major, the great bear, of which the familiar "great dipper" is part. And in this, in turn, are the two stars—Dubhe and Merak—known as the "pointers." A line through them, extended toward the east, brings you to Polaris, the pole star which stands almost directly over the north pole of the earth. It is at the end of the handle of the little dipper, which is part of Ursa Minor, the lesser bear.

Although Mars is the only planet shown on our maps, three others are visible later in the night. Before midnight at the first of June, and two hours earlier at the end of the month, brilliant Jupiter appears in the southeast. It is preceded by Saturn, about a twelfth as bright, but still ranking as first magnitude. And Venus, about 5.25 times as bright as Jupiter, appears low in the east about an hour before the sun rises.

Although Sirius, the dog-star, which shines so brilliantly on winter evenings and is the most brilliant star we can see at night, is gone from view, two very bright stars are visible in June. These are Vega and Arcturus. In the list of bright stars, the sun, of course, is first and then comes Sirius. Next are Canopus and Alpha Centauri, which are so far south that they cannot be seen from most parts of the United States.

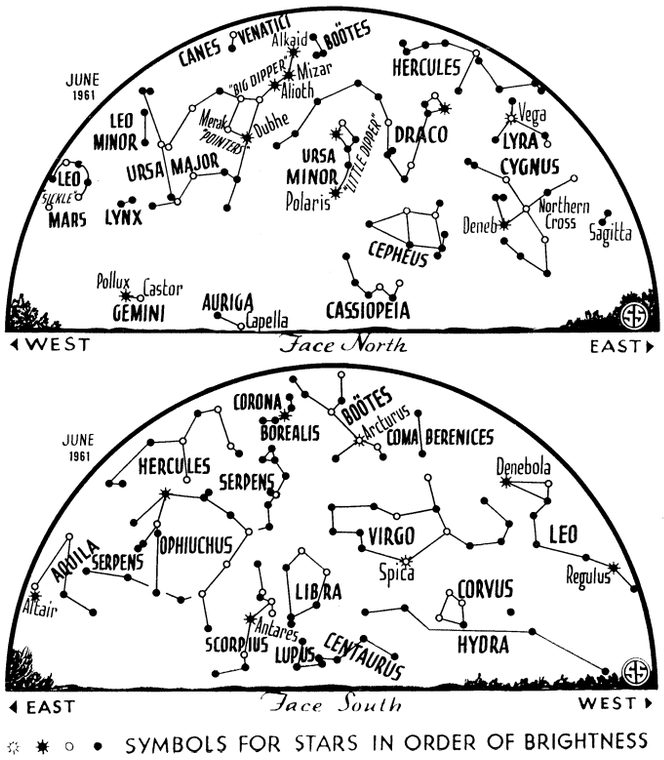
These are followed by Arcturus, Vega and Capella. The latter shines high overhead on winter evenings, in Auriga, the charioteer. It is still visible, just above the northern horizon where its normal brilliance is greatly dimmed by the great amount of air through which its light has to travel.

Actually, Arcturus, Vega and Capella are so nearly alike in brightness that some find one and some another to be the brightest of the three. The fact that they are of different color makes them difficult to compare. Vega is bluish, Capella yellowish, and Arcturus has a ruddy tinge. However, one recent and authoritative listing puts Arcturus first and Vega second

This, of course, refers to their apparent brightnesses, which depend both on their actual brightnesses or candlepowers and their distances. The same law that determines the relative brilliance of two lights at different distances on earth applies equally in the sky. If two stars are of equal brightness and one is twice as far as the other, the more distant will appear a quarter as bright as the nearer one. Or, if the distant one is four times as bright as the other, they will appear the same.

Arcturus Brighter Than Vega

Arcturus is so distant that its light (which travels 186,000 miles per second) takes 36 years to reach us; we say that its distance is 36 light years. Vega is 26.5 light years away, so evidently it is not as bright intrinsically as Arcturus, which is 100 times as bright as the sun. Vega is equal to 50 suns. But Capella is still farther, 47 light years, and exceeds the sun's brightness 130 times. Now look below Vega at Deneb, in



Cygnus the swan. As they appear in the sky, Vega is about 3.3 times as bright as Deneb, yet Deneb's distance is 1,500 light years or about 56.6 times as far. This means that it must actually be exceedingly brilliant, in order to shine so brightly across such a gap. And so it is. Deneb is about 50,000 times as luminous as the sun.

Another distinction of Arcturus is its rapid motion across the sky—rapid, that is, compared with other stars. While the planets change their positions from year to year—even from week to week—the stars seem to stay in the same place. A hundred years ago—a thousand years ago—the stars were arranged about as they are now. The constellations looked to William the Conqueror in 1066 about the same as they do to us. But the stars are moving across the sky. Fifty thousand years ago the seven stars that now form the great dipper were arranged very differently; and 50,000 years in the future they will have a still different arrangement.

It was in 1718 that the English astronomer Edmond Halley (of comet fame) announced that Sirius, Arcturus and some other stars were in a little different position in the sky from where they had been charted in ancient times. Among the stars bright enough to be conspicuous in our skies, none that is visible from these latitudes changes its direction as rapidly as Arcturus. But even this is slow compared to a human lifetime. It will take more than 700 years for its direction to change as much as the apparent diameter of the full moon.

Celestial Time Table for June

June	EST	
1	10:00 p.m.	Moon nearest, distance 227,000 miles
2	1:00 p.m.	Moon passes Saturn
3	1:00 a.m.	Moon passes Jupiter
5	4:19 p.m.	Moon in last quarter
9	4:00 a.m.	Moon passes Venus
13	12:17 a.m.	New moon
17	5:00 p.m.	Moon farthest, distance 251,800 miles
18	5:00 a.m.	Moon passes Mars
19	9:00 p.m.	Venus farthest west of sun
21	4:02 a.m.	Moon in first quarter
	10:30 a.m.	Sun farthest north; summer commences in Northern Hemisphere
28	7:38 a.m.	Full moon
29	7:00 p.m.	Moon passes Saturn
	8:00 p.m.	Moon nearest; distance 224,000 miles
30	7:00 a.m.	Moon passes Jupiter

Subtract one hour for CST, two hours for MST, and three hours for PST

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Questions

ASTRONOMY—What is believed the source of half the material of new stars? p. 328.

PUBLIC HEALTH—How long is the preparation period for Peace Corps volunteers? p. 323.

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