ASTRONOMY

Three Planets Visible

Three planets can be viewed during August. In order of their brightness they are Venus, Jupiter and Mars. The brightest star on August evenings is Vega.

By JAMES STOKLEY

➤ GONE FROM the evening sky of August is the brilliant display of planets that we enjoyed during the late spring, but three can still be seen in the early evening. Only one of them, Jupiter, remains up long enough to get a place on the accompanying maps, in which the heavens are depicted for 10:00 p.m., standard time, on Aug. 1, and an hour earlier in the middle of the month.

These three planets are all in the constellation of Virgo, the virgin. Venus is the brightest of the trio, about 18 degrees above the horizon at the time the sun sets. With magnitude minus 3.8, it is the first to appear. Next in brightness (of magnitude minus 1.4), and farther to the south, is Jupiter. Mars is considerably fainter, equal only to a second magnitude star. All three planets are somewhat dimmed by reason of their proximity to the horizon, an effect of the greater thickness of air which their light has to penetrate on the way to us.

At the first of August, Venus will be lower than Mars, but Venus moves faster, and on Aug. 9 she passes her fainter brother, at a distance of apparently only a little more than the diameter of the moon. The close approach, however, takes place in the morning, at an hour when they are not visible from this part of the world. The night before, as well as that of the 9th, will show them very close. Not until Sept. 3 will Venus pass Jupiter.

The other two naked-eye planets have both passed into the morning sky. Mercury, in line with the sun, is behind it on Aug. 2, and by the 20th it will reach its position farthest west of the sun. Then it will be seen low in the east before sunrise. Saturn passed behind the sun in July, and is now in the constellation of Cancer, the crab, which rises an hour or so before the sun.

Almost directly overhead, in the constellation of Lyra, the lyre, we now see Vega, brightest of the August evening stars. Second brightest is Arcturus, toward the west, in Bootes, the bear-driver. Then comes Altair, high in the south, part of Aquila, the eagle. Fourth is Antares, distinctly red in color, which is easily located in Scorpius, the scorpion, low in the south. Directly east of Vega is Cygnus, the swan, and in the figure we find Deneb, the fifth of the stars of the first magnitude visible these evenings.

Milky Way Prominent

At this time of year the Milky Way—Milton's "broad and ample road whose path is gold and pavement stars"—comes into its best position. It is hard to see in competition with city lights, but from the country, on a dark, moonless night, it can well be appreciated, extending from the northeastern horizon, upwards through Cassiopeia, Cepheus, and down to the south through Cygnus, Aquila and Sagittarius. Though it looks to the naked eye as a continuous path of light, through a telescope, or even a good pair of binoculars, one can see, as Galileo did in 1610, that it is a swarm of stars.

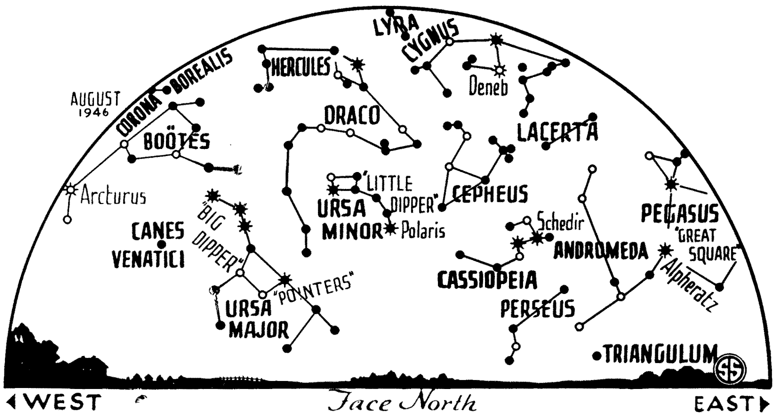
It was much later that astronomers began to understand the Milky Way and the relation of the sun and other stars to it. This was done by statistical methods, which ignore individual differences among the stars. They vary greatly in their intrinsic brightness, or candlepower, so when you see a faint star in the sky it may be a bright star far away—or a really faint one that is much closer. However, when considering large numbers of stars, the individual differences iron out, and we can justifiably assume that the fainter a star appears, the farther away it is.

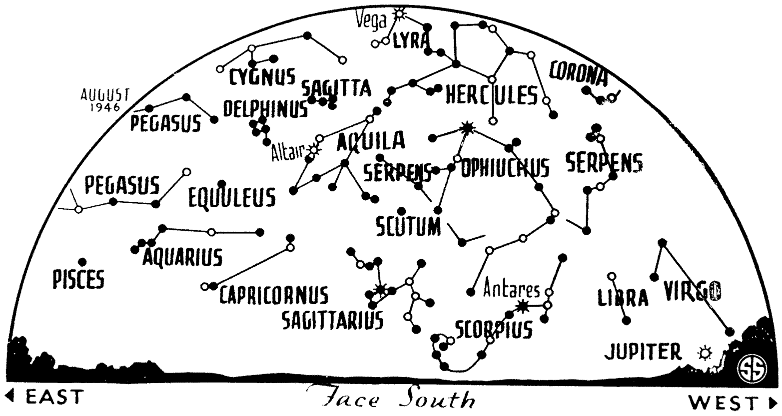
Astronomers classify stars according to their brightness by magnitude and, neglecting differences of individual stars, the average one of the third magnitude is about 1.6 times as far as the average second magnitude star. Thus, every time we go from one magnitude to the next fainter, we reach out 1.6 times as far into space—that is, we are observing a spherical volume of space that much greater in radius. This extra distance of 1.6 times means that we observe about four times the volume. Consequently, if the stars are uniformly distributed, there ought to be four times as many third magnitude stars as those of the second, four times as many of the fourth as of the third, and so on.

Counting the Stars

Some two centuries ago astronomers began to make such counts, of selected sample areas of the sky. There are a total of 40 stars of the first and second magnitudes, and 135 when we include also those of the third. Thus the ratio between two and three is 3.4, not far from the figure of four. There are 4800 stars down to the sixth magnitude, faintest visible to the naked eye, and 15,000 down to the seventh, so here the ratio between magnitudes is only 3.1. The largest telescope will detect stars down to the 20th magnitude, and there are about 1,000,000,000 that are as bright or brighter than this. As there are some 560,000,000 stars down to the 19th magnitude, the ratio, between 19 and 20, is only 1.7, which shows that the farther away we get, the more thinly the stars are distributed.

If we could observe down to the 29th magnitude, we could detect a total of





☆ ✱ ○ ● SYMBOLS FOR STARS IN ORDER OF BRIGHTNESS

about 100,000,000,000 stars and then the ratio would drop to one. That is, a further increase to reveal stars of magnitude 30 would not show any more. Then we would have reached the end of our stellar system.

Not only do such counts tell us that the stars are confined to a limited system—they can also tell us its shape. Among the naked-eye stars there are about four times as many in a given area toward the Milky Way as in other directions. For stars of the 20th magnitude they are about 44 times as numerous, so this indicates that in the direction of the Milky Way we could go much farther before coming to the end. The whole system, which we call the Galaxy, thus has the shape of a vast grindstone, of such a diameter that light, traveling 186,000 miles a second, takes about 100,000 years to cross it. We are out quite a distance from the center, toward the constellation of Sagittarius, which we now see in the south, and that is why the Milky Way is so bright in that direction.

Millions of Galaxies

But although these stars of our own system are limited, there are millions of other such systems—other galaxies— out beyond the borders of ours. One of the nearest can be seen with the naked eye as a hazy spot of light in the constellation of Andromeda. The light from this takes about 700,000 years to reach us. With the 100-inch telescope at the Mt. Wilson Observatory, still the world's largest, galaxies have been detected which are so distant that their light spends about 500,000,000 years on its way to us. The 200-inch instrument, nearing completion on Mt. Palomar, will reach out about twice as far, and it is in the observation of these distant objects that this new astronomical eye will find one of its most important tasks.

Celestial Time Table for August

Aug.	EST	
2	10:00 a.m.	Mercury in line with sun
	7:53 p.m.	Moon passes Jupiter
4	3:55 p.m.	Moon in first quarter
6	7:00 p.m.	Moon farthest, distance 251,300 miles
9	9:00 a.m.	Venus passes Mars
12	Early a.m.	Meteors of Perseid shower visible
	5:26 p.m.	Full moon
19	8:17 p.m.	Moon in last quarter
20	3:00 p.m.	Mercury farthest west of sun
22	5:00 a.m.	Moon nearest, distance 229,000 miles
24	10:59 a.m.	Moon passes Saturn
25	5:44 a.m.	Moon passes Mercury
26	4:07 p.m.	New moon
29	12:38 p.m.	Moon passes Mars
30	5:35 a.m.	Moon passes Venus
	1:06 p.m.	Moon passes Jupiter

Subtract one hour for CST, two hours for MST, and three for PST. Add one hour for the corresponding Daylight Saving time.

Science News Letter, July 27, 1946

SURGERY

Surgery Aids Cancer Of Prostate Gland

➤ CHANCES OF one kind of cancer patients surviving five years, the customary period for appraising results of cancer treatment, have been increased from 14.1%to 20%, it appears from a report of Dr. Charles Huggins of the University of Chicago (*Journal of the American Medical Association,* June 15).

The patients Dr. Huggins reported were all elderly men with cancer of the prostate gland. The treatment was surgical removal of the sex glands.

Of the 21 patients operated on five years ago, one died of pneumonia within eight days of the operation. One is alive but has a slowly advancing prostatic cancer. Four, including one man who was 71 years old and dying at the time of operation, are now alive and well with no clinical or laboratory evidence of cancer.

Reports quoted by Dr. Huggins of other methods of treating this kind of cancer show that the highest five-year survival rate was 14.1%, with some as low as 1.3%.

In spite of general acceptance of five years without recurrence as a cure for cancer, Dr. Huggins states that it is premature to suggest that any of his patients has been cured.

The effectiveness of the operation is apparently dependent on whether the cancer is dependent on male sex hormones and whether the sex glands are contributing functionally significant amounts of the total production of these.

The 15 patients who did not survive the five-year period lived from three and one-half to 63 months after the operation.

Among the five-year survivors, signs of spread of the cancer to the bones are either absent or equivocal, although all had signs of bone cancer at the time of the operation.

Science News Letter, July 27, 1946

PHOTOGRAPHY

Timing Devices Make X-ray Photography Safe

➤ X-RAY PHOTOGRAPHY has had its guess-work removed by two timing devices on which U. S. patents have just been issued to a pair of Chicago inventors, Russell H. Morgan and Paul C. Hodges.

The first device consists of a photocell with suitable electrical hookup to swing a pointer over a graduated scale. A trial "shot" of X-rays is sent through the subject onto the photocell; their remaining intensity determines the amount of current and hence the swing of the pointer. The scale is graduated directly in seconds needed for proper exposure of the film.

The second device improves on the first, in that a preliminary "shot" is not necessary. The photocell receives the X-rays after they have passed through both the subject and the photographic film. Current from the photocell, instead of moving a pointer, builds up a charge on a condenser. When it reaches a predetermined level it acts through a thyratron-controlled relay to break the X-ray circuit and end the exposure. The whole operation is automatic; the roentgenologist does not even need to know what the proper exposure time is.

Rights in both patents, Nos. 2,401,228 and 2,401,229, are assigned to the United States of America, as represented by the Director of the Office of Scientific Research and Development.

Science News Letter, July 27, 1946