ASTRONOMY

Saturn and Mars Appear

Two planets, one of which has not been seen in the evening sky for over a year, join the bright stars of February evenings. Sirius is the brightest of the stars.

By JAMES STOKLEY

➤ JOINING the bright stars visible on a February evening, this month we have two planets in addition. One of them is Mars, which has not been seen in the evening sky for more than a year. The other is Saturn, and both are indicated on our accompanying maps, which give the appearance of the sky about 10:00 p. m., your own kind of standard time, at the first of February. By the middle of the month, it will look the same way an hour earlier, while at the beginning of March this will be their arrangement about eight o'clock.

Mars just about rises in time to be shown, and unless you have a clear view low in the east, it may be difficult to find it until still later in the evening. Saturn is higher than Mars, and not as bright, though both are more brilliant than most of the surrounding stars.

Sirius and Orion Bright

Of them, the brightest is Sirius, the dog star, in the constellation of Canis Major, the great dog, which we see in the south. This, in fact, is the brightest star in the sky, with the exception, of course, of one that we see in the daytime, which we call the sun!

Above and to the right of Sirius is Orion, a figure representing a great warrior. There are three stars in a row which form his belt. Above are two stars, Betelgeuse and Bellatrix, which indicate the shoulders. Below the belt is Rigel, which is one of his feet, supposed to be upraised. Still higher than Orion, and farther right, we come to Taurus, the bull, which is charging toward the warrior. Aldebaran, a star that is distinctly red in color, marks one of the animal's eyes. It is in a V-shaped group of stars called the Hyades, while another, and still better-known, little group is farther right, in the bull's shoulder. These are the Pleiades—the seven sisters of mythology—which appear as a hazy little patch to the naked eye.

Canis Major is not Orion's only dog, for higher in the south we find Canis Minor, the lesser dog, of which Procyon is the most conspicuous star. And above Procyon are Gemini, the twins, of which the principal stars are Castor and Pollux, the latter being brighter. Still higher, indeed practically overhead, stands Auriga, the charioteer, in which there is another star of the first astronomical magnitude. This is called Capella. Another bright star can be observed over in the eastern sky, above Saturn. This is Regulus, which is part of the constellation of Leo, the lion.

Fainter Stars

Among the stars that are fainter, but still are easily located, we find those making up the familiar figure of the greater dipper in the northeast, with the handle hanging downwards. These stars are actually part of the constellation of Ursa Major, the great bear. The two stars at the top of the dipper are the pointers, which show the direction of Polaris, the pole star, over to the left and in the figure of Ursa Minor, the lesser bear.

In the northwest Cassiopeia, the queen, can be discerned, while lower in the sky is Cepheus, the king. Above Cassiopeia is Perseus, the great champion, in which Algol, the "demon star," blinks. This is a well-known eclipsing variable, with a darker star coming in front of a brighter one every 2 days 21 hours. Those diminutions in light which occur during evening hours are given in the Celestial Time Table at the end of this article.

Between Gemini and Leo stands Cancer, the crab, which is one of the fainter constellations of the zodiac, the path of the sun, moon and planets. Below Cancer, is Hydra, the water-serpent, a long line-up of stars that does suggest a snake of some kind.

Positions of Other Planets

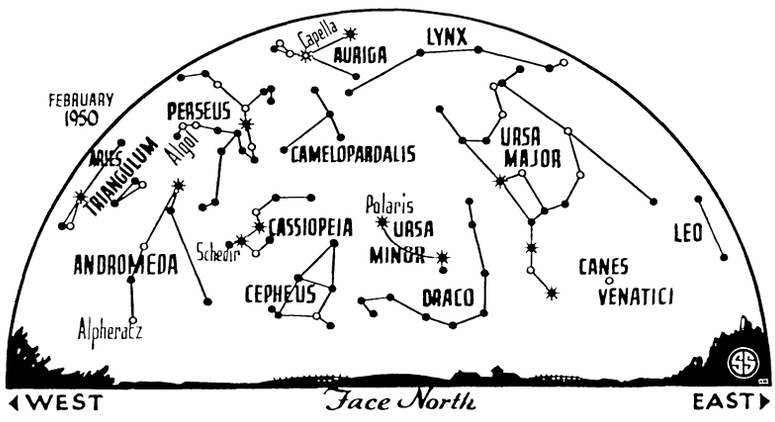
As for the other planets, Jupiter, which has been so bright in the evening sky in recent months, is now so nearly in line with the sun that it is invisible. Venus, which was still brighter and passed Jupiter in the western evening sky early in December, has now gone to the other side of the sun, and can be seen in the morning sky, low in the east just before dawn. It is in the constellation of Capricornus. About Feb. 10 Mercury will be farthest west of the sun, and it too will be seen low in the east at dawn. Venus will be many times brighter than Mercury, and may be followed into the daytime sky.

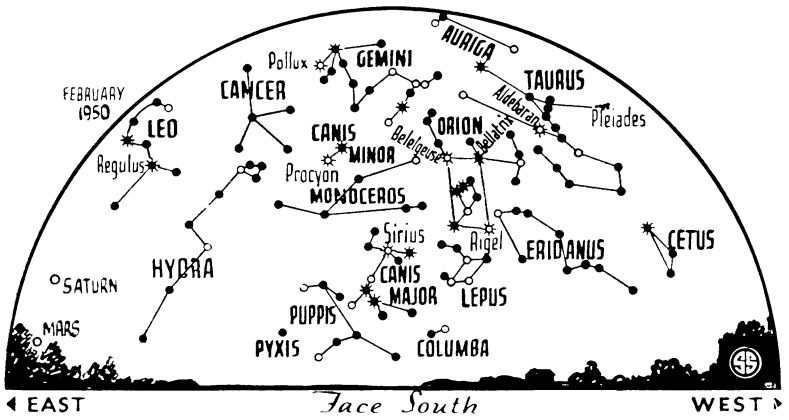
More Stars Photographed

As noted above, Sirius is the brightest star that we can see in the nighttime sky, and from this we go to the faintest stars visible to the unaided eye, on a dark clear night. This is a range of brightness of nearly a thousand times. But even stars of the fifth magnitude—the faintest we can see without a telescope—are many times brighter than most of those observed by astronomers. There are about 5,000 stars of naked eye brightness, but we can only see half the sky at once. Even of those that are above the horizon, it is only when they are far above the horizon that they appear most brightly, and some 2,000 is about the most that are ever visible at once.

With the 100-inch telescope at Mt. Wilson it is possible to photograph stars down to about the 21st magnitude. This is about a millionth as bright as one that we can just see under ordinary conditions. There are about a billion stars within reach of the 100-inch instrument, while the new 200-inch, recently placed in operation at Mt. Palomar in southern California, will go about a magnitude farther. This will add approximately another billion stars to those within reach of astronomers. However, as there are an estimated 30,000,000,000 in our own system, the Galaxy, there is still room for plenty of further advance. And in addition, beyond the limits of our own Galaxy, there are millions of others, each made of millions or billions of stars.

There are two reasons for variation in the brightness of stars. They may actually be of different luminosity, or candlepower, just as a 100-watt lamp is brighter than





☼ ✸ ○ • SYMBOLS FOR STARS IN ORDER OF BRIGHTNESS

one of 15 watts. But if we compare two 100-watt lamps, one a few feet away and the other at a distance of a mile, the latter looks fainter because it is so much farther away. The same thing is true of the stars. The sun is a star, similar to those we see at night, but it seems so bright because it is not far away, only about 93,000,000 miles, which is right on our door-step, astronomically speaking. Sirius is at a distance of about 52,000,000,000,000 miles, and looks about one ten-billionth as bright. However, the sun itself at the same distance would look still fainter, for Sirius is actually about 27 times the sun's luminosity. Since it is only about 80% larger than the sun in diameter, its surface area is about ten times as great. Therefore, each square inch of the surface of Sirius must emit more light than a square inch on the sun, which means than its surface temperature must be higher. Astronomical studies show that it is—nearly twice as hot as the sun, which is around 11,000 degrees Fahrenheit.

Rigel Is Luminous

Of the conspicuous stars, one of the most luminous is Rigel, in Orion. As we see them in the sky, Rigel looks about a sixth as bright as Sirius, yet measures of its distance show it to be at 540 light years, or about 63 times as far. Its luminosity is about 18,000 times as much as the sun's. It is a little hotter than Sirius, but far bigger, with a diameter about 42 times that of the sun. Thus, there is much more of Rigel to shine, and that is why it is so brilliant. Even this does not hold the record, but a comparison of the sun, Sirius and Rigel does give us some idea of the great range that exists among the stars in their physical characteristics.

Time Table for February

Feb.	EST.	
2	5:16 p. m.	Full moon
3	3:00 p. m.	Jupiter in same direction as sun
5	1:55 a. m.	Algol at minimum
	4:47 a. m.	Moon passes Saturn
6	7:00 p. m.	Moon nearest, distance 228,-850 miles
	9:10 p. m.	Moon passes Mars
7	10:42 p. m.	Algol at minimum
9	1:32 p. m.	Moon at last quarter
10	10:00 a. m.	Mercury farthest west of sun
	7:30 p. m.	Algol at minimum
13	4:25 p. m.	Algol at minimum
14	1:01 p. m.	Moon passes Mercury
	3:33 p. m.	Moon passes Venus
16	5:53 p. m.	New moon
22	1:00 p. m.	Moon farthest, distance 251,-520 miles
24	8:52 p. m.	Moon in first quarter
25	3:40 a. m.	Algol at minimum
28	12:30 a. m.	Algol at minimum

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

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RADIO

Video Growth Reported

➤ OVER 3,000,000 television receivers are now in use, and 71 television stations are serving 42 cities and metropolitan districts, the Federal Communications Commission states in its annual report. TV network facilities link 24 cities.

In addition to these 71 stations, more than 200 television stations are in experimental operation. At the end of the fiscal year covered by the report, June 30, 1949, there were 175 experimental TV stations licensed by the Commission and 30 outstanding construction permits.

Included in these figures were 136 relay stations operating in the microwave region and used primarily as television pick-up, television studio-transmitter link, and interim television intercity relay stations. Thanks to these relays, television is no longer limited by the horizon.

The principal development in the expansion of TV network facilities was the linking of the eastern and midwestern coaxial cable systems, bringing 14 metropolitan areas into the coaxial cable and microwave relay chain, the Commission declares. Simultaneous networking of programs could make possible the viewing of a program by about one-third of the population of the country.

When the Commission came into being in 1934, standard broadcast was the only form of radio program service, and non-broadcast stations were few in number. Today the radio spectrum is crowded with about 50 different classes of stations engaged in radio communication. They represent more than 700,000 radio licenses and other authorizations, not including 200,000 associated mobile units. Even with the advent of FM (frequency modulation) and television broadcasting, non-broadcast stations outnumber program stations by about 36 to one.

FM service, the static-free type of ordinary radio programs, is available over almost all of the eastern half of the United States, over most of the west coast area, and in a number of cities and adjacent rural areas in the West. More than 100,000,000 people are now within range of FM stations. The past year was the first in which facsimile was operated on a commercial basis, FM stations being used.

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