ASTRONOMY

Saturn in Evening Sky

Most brilliant December display is seen in east, where Sirius is the brightest star in the night sky, in constellation of Canis Major, the great dog.

By JAMES STOKLEY

➤ SATURN alone of the planets is visible in the evening during December, joining the brilliant winter stars which are now swinging into view. The positions occupied by these objects, as they appear at 10 p.m. on Dec. 1 and about 9 p.m. at the middle of the month, are shown on the accompanying charts.

It is to the east that we see the brightest display, and of these the most conspicuous of all is the star Sirius, most brilliant that we see in the night-time sky. It is in the constellation of Canis Major, the great dog, low in the southeast. Just above it is the outstanding constellation of Orion, the warrior, marked by two stars of the first magnitude, Betelgeuse and Rigel. Between them is a very prominent row of three slightly fainter stars which mark the warrior's belt.

Above and to the right of Orion is Taurus, the bull, with a V-shaped group of stars (the Hyades) marking the animal's face. In this is Aldebaran, red in color, indicating his eye. Above and to the left of Orion are the heavenly twins, Gemini, with the two bright stars Castor and Pollux. Below them is our evening planet, Saturn, and a little farther to the right is Procyon, in Canis Minor, the lesser dog. Above Gemini is Auriga, the charioteer, in which bright Capella shines.

Bright Area

In the area of the sky occupied by these constellations there are more bright stars than any other of similar size. It is because they happen to be above the horizon in the evening at this time of year that the winter evening skies are so much more brilliant than those of summer, and not for any greater clarity of the atmosphere, as many people seem to believe.

However, there are other bright stars, too. Low in the northwest Vega is indicated, but this is so low that its full brilliance cannot be appreciated. Actually it is second only in brightness to Sirius. Just above Vega, which is part of Lyra, the lyre, is Cygnus, the swan, of which the star Deneb is a member.

In the west we can see another familiar figure, the so-called "Great Square of Pegasus." However, the four stars which form a very good square are not all in the constellation of Pegasus, the winged horse. The one in the uppermost corner is Alpheratz, in Andromeda, who was the princess that was chained to the rock in the old mythological tale. Close to Andromeda is Cassiopeia, her mother, represented by an M-shaped constellation.

Only Saturn Visible

Though only Saturn is now visible in the evening, three other planets may be seen in the early morning hours, before sunrise. Brightest by far is Venus, in the constellation of Libra, the scales, which rises in the southeast about three hours before the sun. Close to it in the same constellation and fainter, though still exceeding any other planet or star, is Jupiter. Also this month, on the ninth, Mercury reaches its farthest west of the sun, and then for a few days it can be glimpsed low in the southeast as dawn is breaking.

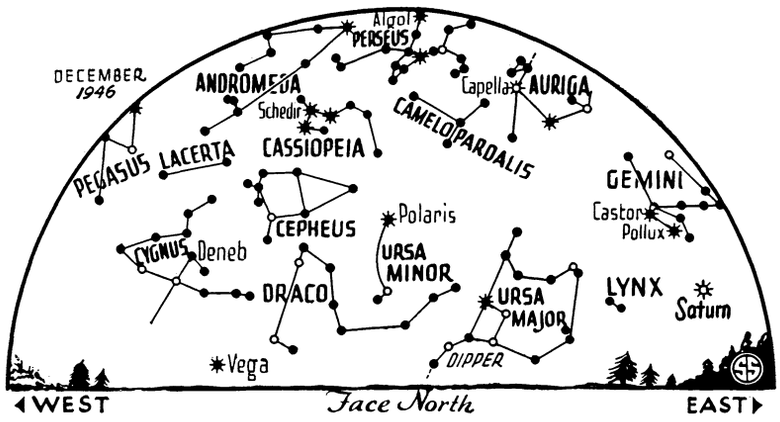
December also brings a total eclipse of the moon, but not to the United States. This comes on the eighth when the moon enters the shadow of the earth. It will be seen from Alaska, most of the Pacific Ocean, Australia, New Zealand, Asia, Africa and most of Europe.

Dec. 14 is important astronomically, especially this year, for 400 years ago on that date there was born one of the greatest—as well as the most colorful—astronomers of all time. This was Tycho Brahe, a Danish nobleman whose labors paved the way for the work of Kepler and Newton in later years. Since he was born in 1546, before Pope Gregory reformed the Calendar in 1582 and dropped 10 days, Dec. 24 will actually be four even centuries after Tycho's birth.

This event occurred in Knudstrup, in the present Swedish province of Skane, which was then Danish. Tycho studied at the Universities of Copenhagen and Leipzig, and was unfortunate enough to have the end of his nose sliced off in a student duel. Thereafter he always wore an artificial one of brass! The traditional pursuits of his noble family were diplomacy and statecraft, but he became interested in mathematics and astronomy. This interest was stimulated in 1572 when a "new star" flashed out in the constellation of Cassiopeia. He studied it and published a book on it in 1573.

Royal Support

Though there was prejudice against a nobleman engaging in such activities, he soon became known as a great astronomer and by 1576 the Danish king, Frederick II, gave him the island of Hveen, in the sound between Denmark and Sweden, and erected a great observatory for him there. The island is not far from Elsinore, scene of Hamlet's



tragedy. In fact, one can stand on the battlements of Elsinore, where Hamlet is supposed to have met his father's ghost, and see Hven, as it is now called, to the south.

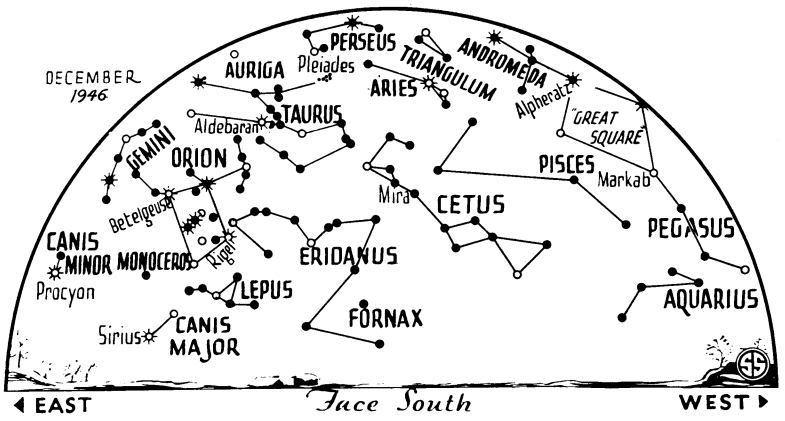
Tycho called his observatory Uraniborg—city of the heavens. Though this was prior to the invention of the telescope, it was here that modern observational astronomy really began, for the instruments that he designed and built were the most accurate that had ever been made and he knew how to use them to secure the greatest precision.

A great comet appeared in 1577 which he observed and showed that it was not in our own atmosphere, as people thought such objects to be. He demonstrated that it was more distant than the moon, and so definitely placed these visitors among the celestial objects. At Uraniborg he had his own printing plant, and from here his results were spread among learned men in all countries.

Support Continued

Even after the death of Frederick II in 1588 royal support continued. The next ruler was Christian IV, who was only 11 when crowned, so a regency ruled until he was 20. One of the regents was a good friend of Tycho's and realized the importance of his work, so the fame of Uraniborg still spread. In 1590 King James VI of Scotland, who later was James I of England, paid him a visit. But in 1594 Tycho's friend died, and when the young king began to rule in his own right Tycho's pension ceased. In the spring of 1597 he left, taking his instruments with him.

Today on Hven, which is Swedish, there is nothing left of the buildings which Tycho built, though the cellars remain, like a sunken garden, and the well which supplied running water to the house, is still there. Nearby is a small museum, erected about a dozen



☼ ✱ ○ • SYMBOLS FOR STARS IN ORDER OF BRIGHTNESS

years ago, to house some of the stones of the building which have been recovered, and a few other relics.

From Hven, Tycho and his retinue first went to Copenhagen, but in June they moved on to Rostock, in Germany. In October he went to the Castle of Wandsbeck, near Hamburg, where he finished and printed with his own presses, which he had brought along, his great work describing the instruments he had used at Uraniborg. Next his wanderings took him to Dresden, and thence to Wittenberg. Finally, in 1599, he went to Prague, where he found the protection of the Emperor Rudolph II.

He was given a castle about 22 miles from the city, where he re-erected his instruments. It seemed as if his great work might continue, but he died in October, 1601, a little less than 55 years of age. On order of the Emperor he was given an elaborate funeral and was buried in the Teynkirche, in Prague, where his tomb may still be seen.

During his brief activity in Prague, however, students and scholars came to him. Among them was the young German astronomer, Johann Kepler, whose work had already won him renown and had brought an invitation from Tycho to join him "not as a guest but as a dear friend and colleague." Thus it was that Kepler fell heir to Tycho's observational data, a most happy circumstance. As a skillful observer, Tycho probably never had a superior; Kepler, on the other hand, was a brilliant (*See next page*)

Do You Know?

Potted *orange plants* often have a black coloration due to a sooty mold which is growing on sweet material exuded by scale insects.

One-fourth of all *patents* registered in the United States Patent Office relate to automobiles.

Curare, the arrow tip poison used by some primitive people, is now employed in the treatment of infantile paralysis.

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mathematician, though poor eyesight made observational astronomy a difficult task. But Kepler's analysis of Tycho's data led to the former's great laws describing the movements of the planets, and these in turn were generalized by Newton in his theory of gravitation. Thus it is that the name of Tycho Brahe ranks among the first half dozen or so of the greatest astronomers of all time, and this December learned societies throughout the world are commemorating the Four Hundredth Anniversary of his birth.

Celestial Time Table for December

Dec.	EST	
1	4:47 p.m.	Moon in first quarter
8	12:52 p.m.	Full moon (total eclipse of moon visible in Eastern Hemisphere)
	7:00 p.m.	Moon nearest, distance 221,600 miles
9	4:00 a.m.	Mercury farthest west of sun
11	10:56 p.m.	Moon passes Saturn
12	early a.m.	Meteors of Geminid shower visible
	4:00 a.m.	Planet Uranus nearest, 1,688,000,000 miles
15	5:57 a.m.	Moon in last quarter
17	2:34 a.m.	Algol (variable star in Perseus) at minimum
19	4:07 p.m.	Moon passes Jupiter
	8:40 p.m.	Moon passes Venus
	11:23 p.m.	Algol at minimum
22	5:54 a.m.	Sun farthest south, winter begins
	7:00 p.m.	Moon farthest, distance 252,600 miles
	8:12 p.m.	Algol at minimum
23	8:06 a.m.	New moon
	3:00 p.m.	Venus at greatest brilliancy
25	5:01 p.m.	Algol at minimum
31	7:23 a.m.	Moon in first quarter

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

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