



ASTRONOMY

Saturn Shines at Night

Saturn, the only planet clearly visible on early October evenings, is joined by Capella and Aldebaran, stars that hail winter's approach

By James Stokley

➤ **SHINING** in the south with a brilliance equal to a first magnitude star, Saturn is the only planet clearly visible on October evenings. Several others, however, appear later, beginning about midnight.

The accompanying maps show the appearance of the skies about 11:00 p.m., your own kind of daylight saving time, at the beginning of October. They look about the same an hour earlier at the middle of the month and two hours earlier at the end.

Saturn is high in the south, in the constellation of Pisces, the fishes. Directly above is the Great Square, not a constellation, but part of Pegasus, the winged horse. Such distinctive star groups that are not constellations are called "asterisms." Low in the north is another—the best known of all. This is the Big Dipper in Ursa Major.

Andromeda Is Chained Princess

Actually Alpheratz, the star in the upper left corner of the Square, is not in Pegasus at all. It is part of Andromeda, the chained princess, whose stars are divided between the southern and northern sky maps.

Also divided on the maps is Cygnus, the swan, directly west of Andromeda. Here shines the bright star Deneb, which marks the top of another prominent asterism, the Northern Cross. Below the Cross stands Vega, in Lyra, the lyre. Vega is the brightest star visi-

ble in evenings of early autumn. To the left of Vega is Aquila, the eagle, (shown on southern sky map) in which Altair is located.

To the southeast of Aquila is Aquarius, the water carrier. This constellation is in the zodiac. Other zodiac constellations now visible are Taurus, the bull, Aries, the ram, Pisces, the fishes, Capricornus, the horned goat and Sagittarius, the archer. They are part of the belt of 12 constellations through which the sun, moon and planets seem to move.

Fish Shines in South

Below Aquarius is the southern fish, Piscis Austrinus, with the first magnitude star Fomalhaut. Actually, Fomalhaut is slightly brighter than Deneb, but looks much fainter because it is so low on the horizon and the atmosphere absorbs so much of its light. It now stands about as high as it can get for our latitude. From 30 degrees south

(the latitude of Porto Alegre, Brazil, or Durban, South Africa) it passes through the zenith, and shines more brilliantly.

Low in the northeast is Auriga, the charioteer, with the bright star Capella. To the right is Taurus, with Aldebaran.

The appearance of these two stars is a herald of winter. They are part of a group of bright stars that decorate the southern sky on evenings of January and February.

If you want a preview of the winter skies, look overhead at about 4:00 a.m. in mid-October. Each month the stars present the same appearance as they did the previous month two hours later. The October skies of 5:00 a.m. (in daylight time, which is 4:00 a.m. by standard time) appear the same as November at 2:00 a.m., December at midnight, January at 10:00 p.m. and February at 8:00 p.m. The planets move against the background of distant stars, and so their positions constantly change.

Saturn, now so prominent, is prob-

THE PLANETS IN OCTOBER		DISTANCE	
		Oct. 1	Oct. 31
Mercury	Not visible	125,000,000 miles	86,600,000 miles
Venus	Visible in early October low in east just before sunrise,	156,000,000	159,000,000
Mars	In east in morning, rising about four hours before sunrise	203,000,000	184,000,000
Jupiter	Rises about midnight; in southeast sky during early morning hours	514,000,000	472,000,000
Saturn	In southeast at dusk, remains visible until early morning	798,000,000	819,000,000

ably most famous for its remarkable system of rings, which are visible through a telescope of at least moderate size. But if you look at Saturn now, you will hardly see the rings. On Oct. 29 they will be invisible with small telescopes and will be seen only as thin bright lines through big instruments.

The ball of Saturn is about 75,000 miles in diameter. From its equator to the innermost of the rings is a gap of nearly 9,000 miles—enough space for the earth to pass through with a little to spare. The rings extend for about 38,000 miles farther, making their outside diameter about 170,000 miles.

Ring System Thin

But despite this huge diameter, the ring system is exceedingly thin—10 miles or less. Thus, when our view is below or above their plane, the rings are quite easily visible—with a large enough telescope. But when they are exactly on edge as viewed from earth—a condition lasting but a few hours—they seem to disappear.

Saturn's year, the time it takes to revolve once around the sun, is equal to 29.5 earthly years. During half of this period, seen from the sun at the center of the solar system, the upper side of the rings is visible, with the under side on view in the other half of Saturn's year. Between these periods comes the time when the rings are seen exactly on edge.

The earth is about 93 million miles from the sun—about a tenth as far as Saturn. During the year in which the earth passes through the plane of the ring system, there are usually three occasions when the rings are seen edge-wise. This happened last in 1950, and is occurring again in 1966.

This year, the first time the rings were seen on edge was on April 2, when Saturn rose just before sunrise. This occurs again on Oct. 29, and for the last time on Dec. 17.

But what is the nature of the rings? Astronomers showed long ago that they could not be solid. If they were, they would suffer strains that would quickly demolish them.

They consist of a vast swarm of tiny particles. Some may be as large as golf balls, others no bigger than sand grains or dust particles. Perhaps they are made of ices—or if solid, are covered with ice. They may have resulted from the break-up of a former large satellite which ventured too close to Saturn. According to an alternative theory, they are due to raw material for a satellite which never condensed to form one.

Nine Satellites Orbit

In addition to the rings, Saturn has nine full-sized satellites. One of these is Titan, the most massive in the solar system, with about twice the mass of our moon. Its diameter is 2,980 miles (compared with 2,160 miles for ours). At a distance of 759,000 miles from Saturn, it goes around once in a little less than 16 days.

Nearer to Saturn are five others, named Mimas (innermost), Enceladus, Tethys, Dione and Rhea. Out beyond Titan revolve the rest: Hyperion, Iapetus and Phoebe. The latter was discovered from Peru in 1898 by W. H. Pickering of Harvard Observatory. In 1904 he announced discovery of another, still more distant, which he named Themis. Unfortunately no one else has ever located it, and many astronomers consider that it does not exist.

Celestial Timetable for October

OCT.	EDT	
7	9:09 a.m.	Moon in last quarter
8	2:00 p.m.	Moon passes north of Jupiter
10	11:00 a.m.	Moon passes north of Mars
12	3:50 a.m.	Algol, variable star in Perseus, at minimum brightness
	11:00 p.m.	Moon nearest, distance 223,000 miles
13	11:52 p.m.	New moon
15	12:40 a.m.	Algol at minimum
17	9:30 p.m.	Algol at minimum
21	1:35 a.m.	Moon in first quarter
25	6:00 a.m.	Moon farthest, distance 252,000 miles
	5:00 p.m.	Moon passes south of Saturn
26	Noon	Mercury farthest east of sun
29	6:01 a.m.	Full moon (From 3:53 a.m. to 8:31 a.m. the moon passes through the outer part of the earth's shadow, but with little noticeable effect on its brightness).

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