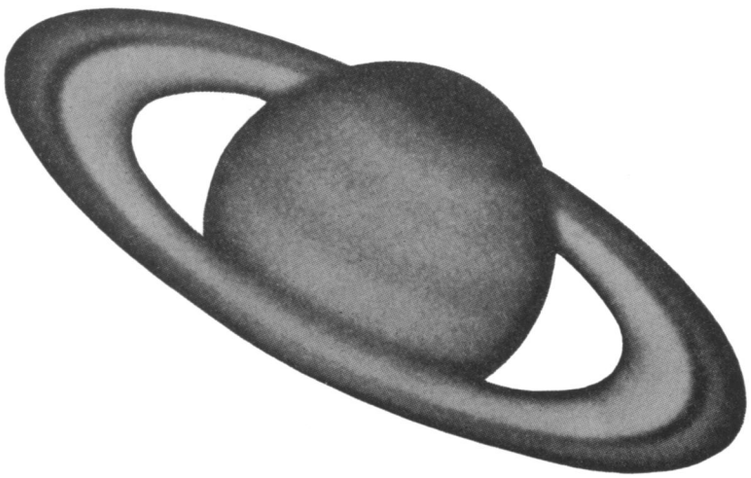
You Can Get a Close-Up Now

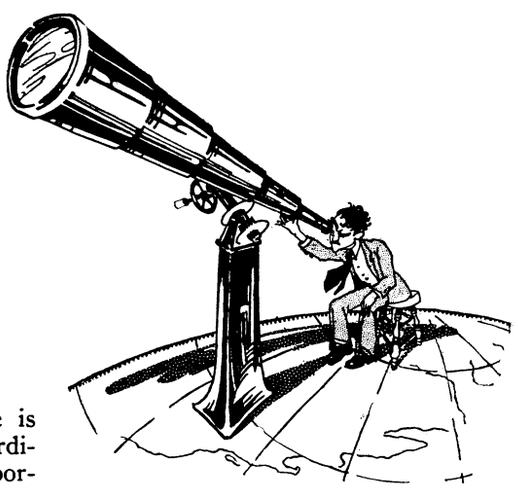


OF THE

Most Popular Planet

By JAMES STOKLEY

WHILE Saturn is visible in September, a small telescope is strong enough to reveal her strange rings. The beginning and end of the month is proper time to look at the moon, because the shadows across its surface are casting the huge craters into strong black relief.



MOST of the country's great observatories set aside certain nights of the week for the use by the public of their great telescopes. The scientists in charge of these institutions realize the need of letting the public know what they are doing, and are generally willing to do all that is possible to aid one who is really interested in the stars.

Unfortunately, there has not been the development in this country of the type of public observatory exemplified by one at Treptow, a suburb of Berlin, with a great telescope used exclusively by the public. But at a leading American observatory, the Allegheny Observatory of the University of Pittsburgh, one telescope is used on every clear night for visitors. Perhaps, as interest in astronomy is aroused still further by the planetarium which is open in Chicago and the one to be built soon in Philadelphia, still more opportunities will be presented to the public to look through a good sized telescope. At both of these it is planned to have telescopes for the use of visitors.

The largest telescope in the world, of course, is the 100-inch reflector at the Mt. Wilson Observatory, near Pasadena, Calif. But so valuable is the time of this instrument that ordinary visitors are not given the opportunity of looking through it. Instead, the 60-inch telescope nearby is used in this way every Friday evening. The largest telescope through which the ordinary visitor can look is at Victoria, B. C., at the Dominion Astrophysical Observatory. Here is located a 72-inch reflector—the second largest in the world. Saturday evenings with this instrument are devoted to the public.

Why the Moon Shadows

At all these places there are two celestial objects which are most popular. One, of course, is the moon. Incidentally, the best time to look at the moon through a telescope is not when it is full, but when it is shortly after first quarter, as it will be this September around the first and thirtieth. When it is full, the sunlight which illuminates the lunar features comes from directly behind the earth, and so there are no shadows to throw the features into relief. But at first quarter and after, some of the most interesting of the craters and mountains of the moon are right on the terminator—the line that divides the dark from the light portion. Along this line at such a time the sun is just rising, and being low in the lunar sky the high mountains cast long shadows over the flat plains. These shadows are easily seen with earthly telescopes, and make the peaks and valleys readily apparent.

Though it does not present the variety of aspects seen with the moon, the planet Saturn is just about as popular among observatory visitors. There is nothing else quite like it. The flat rings surrounding the planet's globe are familiar to every one in pictures, but many people seem to think that the pictures are exaggerated. Few believe that it really looks like that until they actually see it for themselves.

This month Saturn is a conspicuous object in the evening sky. In the constellation of the archer, Sagittarius, Saturn is directly south about seven o'clock in the evening, and after that is seen in the southwest.

A large telescope is not necessary to see the rings. One that magnifies as much as fifty diameters shows them, while one magnifying twice as much reveals them plainly. With one magnifying several hundred diameters, smaller details can be seen, such as the bands that cross the globe of the planet and the dark divisions that separate the rings into several parts.

Galileo Saw Rings First

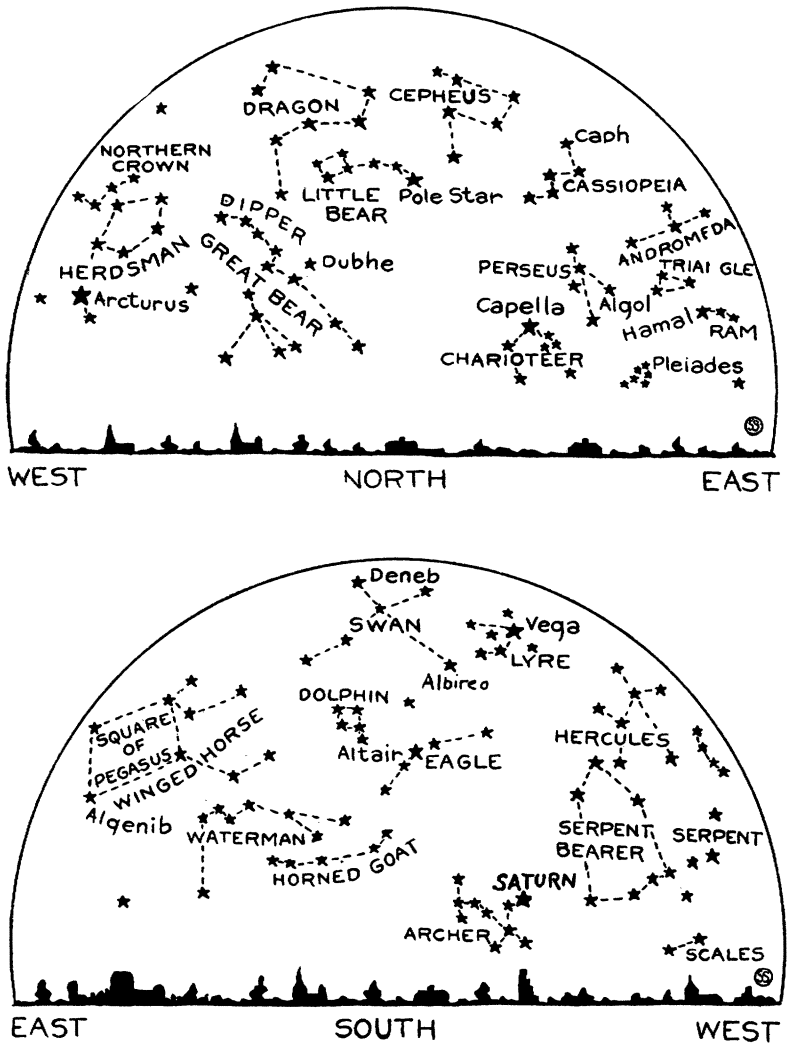
Though Galileo, first astronomer to use a telescope, was the first to observe the rings, he did not interpret correctly what he saw. This is not surprising, because his little telescope was only slightly more powerful, and not nearly as good optically, as a pair of modern binoculars. It remained for the famous Dutch astronomer, Christian Huyghens, to explain what they were. Huyghens, who lived from 1629 to 1695, was one of the greatest scientists of his time. Besides his discovery of the true nature of the rings of Saturn, he invented the pendulum clock and enunciated the wave theory of light, which finally triumphed over the corpuscular theory sponsored by Isaac Newton and has prevailed down to the present day.

In this article last month we told how Galileo announced his discovery that Venus undergoes a complete series of phases like the moon, by publishing it first in the form of an anagram. Like many other scientists of that day, Huyghens used the same method to announce his discovery of the rings of Saturn. In March, 1656, he published, in connection with some other material on Saturn, the following apparently meaningless combination of letters:

"a a a a a a a c c c c c d e e e e e g h i i i i i i i l l l l m m n n n n n n n n o o o o p p q r r s t t t t u u u u u."

Three years later, in 1659, he felt sure enough of his discovery to make a full announcement, so in that year he published a little book called the "Systema Saturnium," in which he transposed these letters into their correct order, which was:

"Annulo cingitur, tenui, plano, nusquam cohaerente, ad eclipticam inclinato." This Latin sentence is translated into English as "It (Saturn) is encircled by a ring, thin, plane, nowhere attached, inclined to the ecliptic." Even today it would be hard to give a more concise description of the Saturnian ring.



THE HEAVENS IN SEPTEMBER

But this did not answer the natural question as to what the rings were made of. They appear solid, but since Saturn is at a distance of eight hundred million miles from us, we cannot see it well enough, even with the largest telescopes, to tell by looking at it. Just two centuries after Huyghens published the Systema Saturnium, the English physicist, James Clerk Maxwell, published a mathematical paper which demonstrated that a solid ring would soon break to pieces, so great would be the stresses within it. His paper concluded as follows:

Swarm of Moons

"The final result, therefore, of the mechanical theory is, that the only system of rings which can exist is one composed of an indefinite number of unconnected particles, revolving around the planet with different velocities according to their respective distances."

In other words, according to Maxwell's theory, the rings consist of a swarm of myriads of tiny moons, all moving around the planet together, and so close that from our distance they appear continuous. In accordance with a famous law of the great astronomer Kepler, who lived in the seventeenth century, the inner moons, or particles, would revolve more rapidly than those farther out from the main body. Of course, if the rings were solid, the outer portion would move with the greatest speed, just as the outer part of a wheel moves more rapidly than the inner part.

In 1895 an American astronomer, James Edward Keeler, then director of the Allegheny Observatory in Pittsburgh and later of the Lick Observatory in California, proved that

the rings were made as Maxwell had supposed. The spectroscope, which analyses light, reveals whether the source of the illumination is moving towards us or away from us. If the source is approaching, the light waves are squeezed together and the light is made bluer than if the source is stationary. If it is receding, then the waves are spread out, and made redder.

By photographing the spectrum of the star or planet on the same plate with the spectrum of a terrestrial light, as an arc struck between two rods of iron, such measurements can be made. The dark lines which appear in such a photograph may be shifted one way or the other in the spectrum of the celestial body, and indicate either approach or recession.

Keeler photographed the spectrum of Saturn to show which parts were approaching and which receding. The lines from the ring were slanted in such a way as to indicate that the inner part of the ring moved fastest, either when it was approaching us on one side or receding on the other. The outer part lagged behind, and thus a mystery first detected by Galileo was finally solved after nearly three centuries.

Venus Brighter

Saturn is not the only planet visible in the September evening sky, however. Venus, now even brighter than last month, is shining brilliantly in the southwest for an hour or so after sunset. On September 13 it reaches greatest eastern elongation, which is the time when it is farthest to the east of the sun. After that date it will begin to approach the sun again, finally to be lost completely in its glare by November. Though farthest east this month, Venus is not in a good position to view, because it is far to the south. The ecliptic, the path of the planets, is inclined least to the horizon in the evenings at this time of year. When an eastern elongation of Venus comes in the spring time, as it did a couple of years ago, then the planet shines high in the west and is much more conspicuous than now.

Later in the night the planets Mars and Jupiter can be seen. Mars is in the constellation of the twins, Gemini, and rises about 11:30 p.m., so that its ruddy glow can be seen in the eastern sky in the early morning hours. Jupiter comes along less than half an hour later in the middle of the month, so that if you get up early enough, or stay up sufficiently late, you can see these two planets close together. Jupiter is the brighter of the two, though both are very bright. Jupiter is brighter than any star, and though Mars is exceeded in brilliance by several stars, its steady red light makes it easy to identify.

Six first magnitude stars are to be seen this month in the evening skies. Low in the south is Fomalhaut, in Piscis Austrinus, the southern fish. Almost directly overhead is Deneb, at the head of the cross of Cygnus, the swan. To the west of Deneb is Vega, in Lyra, the lyre, and to the south is Altair, in Aquila, the eagle. The constellation of Bootes, the herdsman, is low in the northwest, with the brilliant Arcturus, while low in the northeast is Auriga, the charioteer, with Capella to mark its location.

The moon is full this month on the seventh, in last quarter on the fifteenth, new on the twenty-second and in first quarter on the twenty-ninth. This means that the first week or so of the month will enjoy bright moonlight evenings, as will the last few days, but in the middle of the month the evenings will be dark.

Science News-Letter, August 30, 1930

River Obeys Prediction

THE PREDICTION by Dr. Sven Hedin, noted Swedish explorer of Central Asia, that in 25 years the River Tarim in Chinese Turkestan would abandon its course and return to an ancient channel farther north has now been fulfilled, according to a communication received here. The river is running now where it did 1,600 years ago.

Dr. Hedin's attention was called to the wandering stream when he tried to follow a Chinese map 1,600 years old. It appeared that the Chinese geographers had made a mistake, for the river on the map was not on the landscape, but instead there was a "new" river to cross 550 miles away. After studying geological conditions, Dr. Hedin justified the Chinese scholars and their map, by explaining that the southern branch of the Tarim apparently swings back and forth like a pendulum. He predicted then that the accumulating silt would soon drive the river to seek its old course.

Geography

Science News-Letter, August 30, 1930

Prehistoric Mystery City in Mexico

Archæology

A PREHISTORIC city of which little is known except that it was one of the vassal-kingdoms of the Aztec Empire before the Spanish Conquest, is now being explored. The mysterious city is near the modern Otomi village of Calixtlahuaca in the State of Mexico.

One pyramid structure larger than the rest, is surrounded by ten smaller ones, all swathed in an ancient covering of earth and vegetation. The main pyramid once housed a temple on top. The base is surrounded by a series of four terraces, now cornfields, which formed a graduated ascent.

Excavations have already revealed that the city was built many centuries ago. Various cultural groups occupied the site up to the time of the Aztecs whose pottery remains attest to their influence there, if not to actual occupation.

The main pyramid has a stairway on the east fairly well preserved, and the walls still retain portions of the plaster facing with traces of red, blue, black and yellow paint.

The Christian church of Calixtlahuaca, an Aztec name which might be interpreted as "Prairieville," was built with pagan building materials, as stones carved in hieroglyphs show. Natives of neighboring villages treasure idols of clay and stone and old pottery which they find in their cornfields. A new road leads for the first time in their history from the state capital at Toluca, opening this area to modern traffic.

Archaeological work at Calixtlahuaca is under a unique local department of archaeology established by Governor Filiberto Gómez. All other archaeological investigation in Mexico is maintained by the federal government. José García Payón is directing excavations, while Dr. Manuel Gamio, well-known Mexican scientist who has known of the existence of the site for some years, has been "consulting archaeologist."

Archæology

Science News-Letter, August 30, 1930