

ASTRONOMY

1935 Brings Seven Eclipses

Sun is Darkened First on January Fifth, and Last of These Events Occurs on Christmas; None Important

By JAMES STOKLEY

THE CHIEF claim of the month of January to astronomical interest, as far as can be predicted in advance, is that it brings two eclipses. And in this way it starts out the year well, for 1935 will have seven eclipses, the greatest number possible in a single year. But the two January eclipses are not of great importance, for one is a partial eclipse of the sun, and the other, though total, is of the moon.

The first eclipse is that of the sun, and it occurs on Saturday the fifth. There is no land from which it will be seen as its region of visibility will be included in a small area in the South Pacific Ocean, to the southwest tip of South America. Even if any hardy navigators should be in that region they would probably not notice anything strange about the sun, because when the eclipse is at its maximum, the moon will hide but a thousandth of the sun's diameter. A telescope would be needed to reveal the nick that will be apparently made in the edge of the sun. However, small as this is, the moon does really come partly between the sun and the earth, and so it rates as an eclipse, though one of the smallest on record.

Saturday, Jan. 19, is the date of the moon eclipse which is total, with the moon becoming entirely enveloped in the earth's shadow. But this also will not be visible from any part of the United States, though it will be seen over most of Europe, Asia, Africa and Australia. However, though a lunar eclipse is interesting to watch, it has little scientific value and astronomers generally go to no great pains to observe one.

Largest Possible Number

Not since 1917 has there been a year of seven eclipses, the largest number that can occur in one calendar year. An eclipse of the sun must occur at new moon, when the moon is between the sun and earth. Generally, the three bodies are not quite in line, and then the shadow of the moon sweeps

through space north or south of the earth.

This is because the path of the moon does not exactly coincide with that of the sun, but is inclined to it. At two points, called nodes, these paths cross. Twice each year, therefore, the sun has to pass one of the nodes of the moon's orbit, and always, at or near each of these times, there is at least one eclipse of the sun.

If there happen to be two times of new moon with the sun passing the node about half way between them, then there will be eclipses at each of them. And at the full moon just half way between them, the three bodies, earth, moon and sun, will again be in line and there will be a total eclipse of the moon.

Second in February

This is what occurs this month, for the second solar eclipse occurs on Sunday, February 3. This eclipse will be visible all over the United States, but west of the Rockies the eclipse will already have started when the sun rises. Where it is at its maximum the moon will cover nearly three-fourths of the sun's diameter. Thus there will be no doubt about there being an eclipse, as the sun's light will seem of a peculiar yellowish color, and when seen through

a smoked glass, it will look like a crescent. In the eastern part of the United States it starts about 10 a. m. and lasts for about two hours, so the preachers will have rather strong competition if the weather is good.

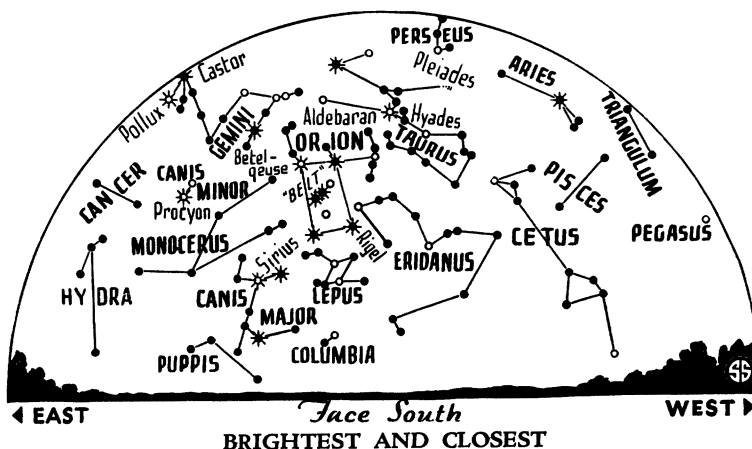
Again in July the sun will cross the node of the moon's orbit, and again there will be three eclipses, two of the sun and one of the moon. First will be a partial eclipse of the sun, visible in Northern Europe, Asia, Greenland, Iceland and around the north Pole. On the night of July 15, the moon will be totally eclipsed, and this will be seen over the entire United States. On July 30, the sun will again be partly covered, this time as seen from the South Atlantic Ocean.

The Seventh

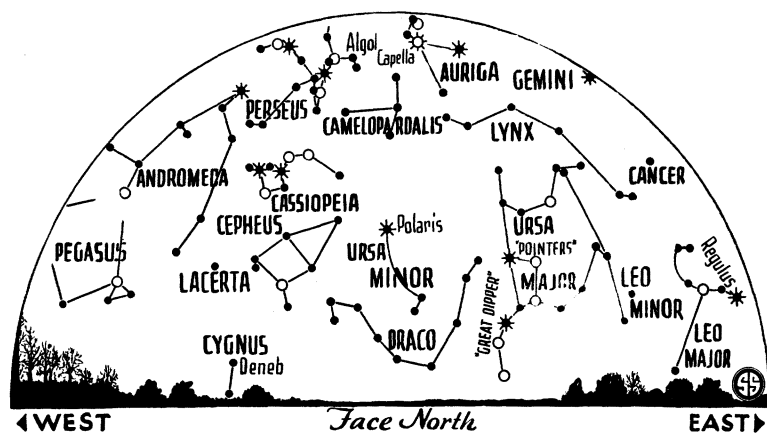
Thus six eclipses are accounted for. But the nodes of the moon's orbit are not fixed on the sun's path, as they slide westward around it once in about nineteen years, and hence the sun returns to a node in some 346 days, instead of a full year. Thus, if the first of one pair of solar eclipses occurs early in January, we may have eclipses at three separate times of the year, the last being in December.

This occurs in 1935, and the fifth solar eclipse comes on Christmas day. This will not be partial, but annular, with the moon coming squarely in front of the sun, but failing completely to cover it. This eclipse will occur near the time of the month when the moon

☼ * ○ • SYMBOLS FOR STARS IN ORDER OF BRIGHTNESS



Sirius, the dog star, with the bright belt of Orion above dominates the southern skies this month.



GUIDEPOST TO THE SKY

Low in the northeast, with the handle hanging down, is the familiar dipper, convenient guide for locating other constellations in that region of the heavens.

is farthest from the earth, and hence of smallest diameter, so that its apparent diameter will be less than that of the sun. The result will be that from a region near the South Pole, the dark disk of the moon will be seen surrounded by a ring of sunlight. In the southern tip of South America and in the south Atlantic and Pacific Oceans, this will appear as a partial eclipse.

What 1935 gains in quantity of eclipses it loses in quality, as so often is the case, because not one of the seven will be of such a character as to attract astronomers to remote parts of the earth to study it. The year 1936 with but four eclipses, two of the sun, will be much better, for a total solar eclipse on June 19 will be visible over a path beginning in Greece, and crossing Siberia, Japan and the Pacific Ocean. Before the end of 1935 many astronomers will have completed their preparations for expeditions.

Occultations Coming

Some other interesting events will take place during 1935 in the form of eclipses of stars and planets, more accurately called "occultations." On May 5 the moon will pass in front of, or "occlude," the planet Venus, an event that will be seen all over the United States except in the far west. In the early morning hours of May 19 it will do the same to the bright star Antares, in the constellation of Scorpius. Antares will again be occulted on July 12, and then again the western states will be left out of the picture. But they will be recompensed on the night of October 31, when the planet Mars will be occulted, for this will be visible only in the west.

No planets will be well placed for observation during the whole of the January evenings, but low in the west just after sunset will be seen the brilliant Venus. During the spring and early summer it will rise higher becoming the most brilliant object in the evening sky, except for the moon. In about a month or so Mars will come into view in the evening, and Jupiter will follow in the spring.

Saturn and Mercury

In the early part of January Saturn can be glimpsed low in the western twilight, but he is soon to disappear as he passes behind the sun. In the summer he will return to the evening sky. Mercury may also be seen briefly in the west after sunset about February 1, May 26 and Sept. 23, the dates when he is at his farthest to the east of the sun, and sets the longest time after it.

Though the sun is now so low in the sky, this month the earth is closer than at any other time of the year. On the second we are at perihelion ("closest the sun") and about 91,345,000 miles away, or more than three million miles closer than we shall be in July. On January 6 the earth is farthest from the moon (at "apogee") with a little less than 256,000 miles separating us. Perigee, the time of closest approach, comes on Jan. 22, when the two bodies are 226,000 miles apart. The moon is new on Jan. at 12:20 a. m. E. S. T.; at First Quarter on Jan. 11 at 3:55 p. m.; Full on Jan. 19 at 10:44 a. m.; at Last Quarter on Jan. 27 at 3:59 p. m.

More bright stars are now visible in the evening skies than for months. Dominating these groups, in the south,

is Orion, the great Warrior of the sky, easily recognizable from the three stars in a row that form his belt. Below and right of the belt is Rigel, in one leg, and at an equal distance opposite appears Betelgeuse, only slightly inferior in brightness. Above Orion is red Aldebaran, marking the eye of the bull, Taurus, which is supposed to be charging at Orion. This star is in a V-shaped cluster of stars, the Hyades, that outline the animal's face. West of the Hyades, almost overhead, is another famous cluster of stars, the Pleiades, of which most people can see six, forming a tiny dipper, that should not be confused with the real "little dipper," to the north, with the Pole star at the end of the handle.

Bright Jewel

Below Orion is the brightest star in the sky, Sirius, the dog-star, marking the jewel in the collar of Canis Major, the greater of the two dogs which accompany the warrior. This is the closest of the stars that can be seen from most of the United States without benefit of telescopes. Its light, travelling at the speed of ten million miles a minute, takes about nine years to get across to us. The other dog is a little higher and farther east, and in this group, Canis Minor, we find the star Procyon. Still farther around, to the north and higher, is Pollux, one of the twins, Gemini. Just above Pollux is Castor, and the figures of the two boys are formed by the stars just to the south. A second magnitude star, Propus, above Procyon, forms the foot of Pollux.

Auriga Overhead

Auriga, the charioteer, is almost overhead in the eastern sky, seen as an irregular pentagon of stars and in it is the brilliant Capella. The Great Dipper can be seen low in the northeast, the handle hanging downwards, and above the Pointers, the two stars at the side of the bowl farthest from the handle, which indicate the Pole star by the direction of the line joining them. Quite low in the east, where it does not fully arise until later in the evening, is Leo, the lion. First can be seen the animal's head, formed by a hook-shaped group of stars sometimes called the Sickle. The star Regulus is at the end of the handle of the Sickle.

In the southwest can be seen the figure of the whale, Cetus, with the second magnitude star Deneb Kaitos near the

horizon marking his tail. A quadrilateral of fainter stars above marks his body and still higher is his neck and head. In the neck you may now be able to see the star Mira, but if you had looked at this same part of the sky a few months ago no star would have been visible. Mira is a famous long period variable star, usually too faint to be seen without a telescope, but every eleven months increasing to naked eye visibility. Directly west appear the four stars that outline the corners of the Great Square in Pegasus.

The upper one is Alpheratz, in Andromeda, and the three lowest ones are part of the winged horse, Pegasus. Just north of Andromeda is the W-shaped group representing her mother, the queen Cassiopeia. Low in the northwest can be seen Deneb, all that remains of Cygnus, the swan, visible for the past few months.

The maps picture the January skies as seen at 10 p. m. on the first of the month, 9 p. m. on the fifteenth, 8 p. m. on the thirty-first.

Science News Letter, December 29, 1934

PHYSICS

Revolutionary Method of Power Transmission Urged

Chairman of Science Advisory Board Proposes Use Of Electrostatic Generator With Vacuum "Pipes"

ELECTRICITY generated by enormous disks spinning in vacuum and "piped" unlimited distances along vacuum surrounded rods, carrying cheap energy from great water power developments or coal and oil fields to the centers of population, is the possibility held out by Dr. Karl T. Compton, chairman of the Science Advisory Board, in a research project recommended to President Roosevelt for federal financing.

This revolution in both the making and the transporting of electricity has been in the making for the last five years. Young Dr. Robert J. Van de Graaff is the scientist mainly responsible. The 10,000,000 volt electrostatic generator built by the Massachusetts Institute of Technology at Round Hill, Mass., is the first step toward an electrostatic generator suitable for commercial power production. The transmis-

sion system proposed, an airless pipe with a rod running through it, has probably been tested but no experimental results have been announced.

Dr. Compton in a description originally prepared over a year ago and just made available as a part of the Science Advisory Board report proposed "a radically new scheme for electric power transmission" because present methods of transmitting electrical power are limited by practical reasons of efficiency, complexity and cost to about 250 miles.

The new system should be "cheaper to install than present systems and should be capable of transmitting power to unlimited distances without appreciable loss."

It is known that there is some hope that the Tennessee Valley Authority with its large power developments may benefit from this radically new development. Several hundred thousands of dollars would finance a serious effort to develop the new scheme to the stage of useful application. The project is described as "planned and ready to start under competent supervision on short notice."

Instead of alternating current that the now-standard electromagnetic generators produce at high voltage, the new proposed generators would give out direct current at about a million volts.

The giant disks of the electrostatic machines would be surrounded by

vacuum because of the necessity of preventing tremendous sparks that might wreck the whole equipment if they were allowed to occur. The great progress that physicists have made in recent years in producing high vacuum in large spaces will contribute materially to the success of the new scheme.

If this new power production dream is realized, it will be a case of progress turning the clock back, in a sense. For the electrical machines that were used in the eighteenth-century by Benjamin Franklin and others were of the electrostatic type. They generated electricity by friction on large disks. All modern electrical generators and motors employ the principle of electromagnetics instead of electrostatics.

In the experiments with the ten million volt electrostatic generator already built, the accent has been upon its usefulness for producing artificial lightning to smash atoms and conduct research in physics. The commercial application of the scheme has been an objective about which there has been little discussion and still less definite announcement.

Science News Letter, December 29, 1934

ARCHAEOLOGY

Unearth Gold Mill of Ancient Mexican Indians

WHERE did the ancient Mexican Indians get their huge supply of gold?

Millions of dollars' worth as bars and jewels left America for Spain right upon the heels of the Conquest. Yet little is known of its production.

The wealthy Aztec monarch, Montezuma, told Cortez that most of his supply came from Oaxaca and other parts of southern Mexico. The Conquistadores immediately investigated his story to find Indians busy panning gold in river sands there.

Practically all of the important gold mines in Mexico today, abandoned or producing, have traditions of having been exploited by Indians in pre-Spanish times. Stone tools are even found as evidence, some hundreds of feet in the mines.

Rock was apparently broken by heating and throwing on water, fire-marks being plentifully encountered. There also appears evidence that the ancient miners used burned lime, packing it into cracks and then expanding it by slacking with water. (*Turn to page 409*)

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