ASTRONOMY

Leonid Meteor Shower Should be Brilliant

Return of 33-Year Maximal Period Makes Astronomers Hopeful For Repetition of Splendors of 1833 and 1866

By JAMES STOKLEY

ONCE AGAIN, the Leonid shower of shooting stars is the main attraction on the celestial calendar for the month. Perhaps this month we shall see a display the like of which can be recalled by few now living. We may see a shower of meteors rivalling that of 1866, or even that of November, 1833, when the whole sky was thick with their flashing light. But, again, we may be disappointed, as we were in 1899. It should be pointed out right here that meteor showers do not appear with the certainty of eclipses and many other astronomical events.

No blame should be attached to the astronomer for his inability to predict them precisely. The uncertainty is inherent in the nature of the beast. Take an eclipse of the sun, for instance. We are riding around on the earth, and can observe its position among the other heavenly bodies at any part of its orbit. The moon, too, we can observe in practically all places of its path around us. The result is that its orbit, and that of the earth, can be calculated with great accuracy, and we know just when the moon is going to come between the sun and earth, producing an eclipse.

Meteors, which are commonly called shooting stars, are vastly different. They are exceedingly tiny bodies, generally no larger than a grain of sand, or at best the head of a pin. We cannot observe them until they enter the earth's atmosphere, where the friction with the air burns them in a flash, destroying them completely. It is only in their last moments of existence that we see them, but from their behavior then the astronomer assumes that others are coming along in a similar manner. From the very short path that he sees, he has to work backwards, and calculate just how they moved to get there. And when this path may extend back millions of miles, to the outer reaches of the solar system, one can readily understand some of the difficulties.

Despite all this, the astronomers who specialize in the study of meteors think there is fair chance for a fine display of shooting stars about the seventeenth of this month. These meteors revolve around the sun in a swarm which describe a huge ellipse. When closest to the sun they are about as far from that body as the earth; when most distant, as far as the planet Uranus, about 1,782,800,000 miles.

But they are not uniformly distributed around this elongated doughnut. There is one clump which contains the vast majority while relatively few are scattered around the rest of the ellipse.

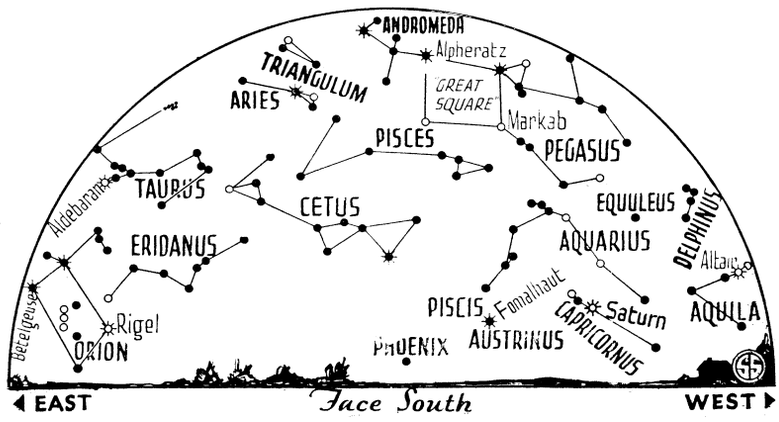
Big Shower From Main Cluster

The result is that while the earth each November crosses their path, producing a few more meteors than on other nights of the year, there is only a great shower when we hit the main cluster. And this cluster takes 33 years to travel once around.

There was a fine shower of the November shooting stars in 1799, again in 1833 and still again, though slightly inferior, in 1866, intervals of approximately 33 years. Naturally, a shower was expected in 1899, but it failed to appear, much to the disappointment of astronomers, both amateur and professional, who looked for it. Later it was shown that a few years previously the swarm had passed close to the giant planet Jupiter, which, by this gravitational attraction had pulled the swarm aside a little so that it detoured the earth. One English astronomer pointed out a few weeks before the scheduled date of the shower that this had happened, but facilities for disseminating scientific information rapidly were not as good then as they are today, and most people confidently expected the meteors.

As a result of these experiences, astronomers are properly very cautious about predicting a shower for this year, but there is some hope that we may have one. After rather feeble displays of the November meteors for a number of years, 1930 brought a fairly good one, and this was followed by a shower even more brilliant in 1931. It was supposed that this might indicate that the earth was approaching the outskirts of the swarm. Then studies of the orbit of Temple's comet, which has not been seen for many years, but which is closely associated with the November meteors, indicated that that body would make a close approach to the earth in November, 1932. This increased the probabilities for a fine shower last year, but the astronomers remained cautious in their predictions.

Finally the night of November 16 arrived, the same date as that of the little showers of the two previous years. All over the country professionals and volunteers watched the eastern sky after midnight. A nearly full moon illuminated the sky so brightly that the fainter meteors were lost in the glare. But even so, a fairly large number were seen, and, making allowance for the moon, the



SEA-CREATURES ENTHRONED

The Whale, the Fishes, the Dolphin, Aquarius the Waterman and Capricornus the Sea-Goat brighten the southern sky.

shower compared well with 1930 and 1931, even though it was nothing like 1833. From any one place where it was clear, several hundred might be observed in a few hours.

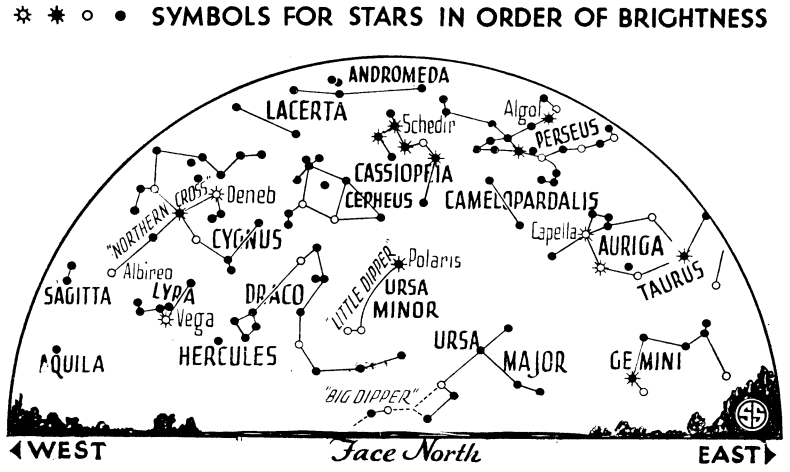
Perhaps this might seem like a small number, but it should be remembered that the meteors are not visible until they enter our atmosphere, a few hundred miles or less above the earth's surface. From any one spot, you can only observe about a hundred thousandth part of the earth's atmosphere, so if you multiply the number of meteors that you see by that figure, you will have some idea of the total number that are striking the earth.

This year the astronomers are still hoping. Fortunately, the moon is new on the crucial night, November 16, which means that the sky will be dark all night. Of course, the lights of a city can produce as much glare as the moon, so if you want to see them you had better go as far out into the country as possible. Most of the meteors are seen after midnight because then they meet the earth head-on. Those that appear in the evening sky have to catch up with it. The constellation of Leo rises in the northeast about midnight, and can be identified by the sickle, formed of its bright stars. That implement hangs with the handle pointing down and to the right, and blade to the south.

From a Point?

Look in this direction, and you will find that the meteors seem to radiate from a point in the sickle. This point is called the radiant, and because the meteors seem to come from this constellation they are called the Leonids. Actually the meteors are moving in parallel paths, which seem to converge in the distance, like railroad tracks.

Unless the shower is far more feeble than we expect, you will see them at the rate of several a minute, and occasionally you will see a brilliant "fire ball" which will be more brilliant than any star or planet, and which may leave a trail visible for several minutes. But you need have no fear that any of these will hit you. Even such a brilliant one is perhaps no larger than a golf ball when it enters the atmosphere, and it is completely burned in its passage long before it comes near the earth's surface. The usual ones are as large as a pea, and the fainter ones no bigger than a grain of sand. Sometimes meteors are much larger, and actually reach the ground, when they are called meteorites.



AN OCTET OF GLORY

Eight first magnitude stars, four in each celestial hemisphere, make the heavens brilliant in November.

But so far as we know none of the Leonids has ever come to earth.

If a really great shower does appear, rivalling those of the past, you will experience the thrill of a lifetime. Even a modest shower will be a magnificent spectacle, so everyone is advised to watch. Though the night of the sixteenth, or rather the early morning of the seventeenth is the most likely date, the uncertainty of shooting stars should be remembered. The shower may come a day or two earlier or later, so one who is really interested should watch for several nights, beginning on the fourteenth. But the astronomers are not merely interested in it as a spectacle, though they can appreciate its grandeur just as much as anyone.

If you want to aid the astronomers in their vigil, count the number of meteors you see during each half hour period, say from 12 to 12:30, 12:30 to 1, and so on. Note the time of any particularly brilliant meteor, estimating its brightness, if possible, as compared to nearby stars. If you are able, make a diagram of its path among the stars, and if it leaves a trail, note how long it persists. When you get this, send your records, together with a description of your location, amount of cloudiness, if any, and any other facts that you think relevant, to Dr. Charles P. Olivier, Flower Observatory, Upper Darby, Pa. He is the president of the American Meteor Society, and is always glad to receive reports from volunteer observers.

The stars and planet that are visible in the November evening sky are shown on the accompanying maps which show them as they appear about 10 p. m., on the first, 9 on the fifteenth and 8 on the thirtieth. High in the south is the Great Square in Pegasus, a convenient guide from which to start a study of the constellations. The northeasternmost star is the square, called Alpheratz, is in the neighboring constellation of Andromeda, which runs off from it. Just north of Andromeda is the W-shaped constellation of Cassiopeia. The Great Dipper is low in the north, under the pole star.

Eight first magnitude stars can now be seen. Directly west is Aquila, the eagle, with the brilliant Altair; and nearby, higher and to the north, is Cygnus, the swan. This is also called the Northern Cross. The Cross is now vertical, and the star Deneb is at the top. Next to Cygnus, farther north, is Lyra, with Vega to mark it. In the east appears Taurus, the bull, with the red star Aldebaran, and directly below it is magnificent Orion, now on his side. The three stars of the warrior's belt are now vertical. To the south is Rigel, to the north is Betelgeuse. North of Taurus is Auriga, with Capella. The eighth star of the first magnitude now to be seen is low in the south. This is Fomalhaut, in Piscis Austrinus, the Southern Fish.

Three Planets

The planet Saturn can be seen low in the southwest in the constellation of Capricornus. Two other planets can be seen earlier in the evening. Shortly after it gets dark, Venus is low in the southwest, more brilliant than any other planet or star. On the twenty-fifth it is at greatest eastern elongation, its position farthest to the east of the sun. Aft-

er that it will start approaching the sun again, to disappear from the evening skies in a few months.

Mars, much fainter than Venus, is still nearer the sun, but may be glimpsed in the late evening twilight. On the twentieth, Venus makes a close approach to the moon, then a slender crescent, three days past new. At 8:19 p. m., eastern standard time, Venus will be just two minutes of arc, about a fifteenth of the moon's diameter, to the south, so that it should make a most interesting sight. On the twenty-second at 2:48 p. m., eastern standard time, the moon passes almost as close to Saturn, the planet then being seven minutes north of the moon. This will happen in the afternoon, for people in the eastern part of the country, when the planet is not visible, but after dark the two will still be close together.

The moon is full on the second, at last quarter on the tenth, new on the seventeenth and at first quarter on the twenty-fourth. This will mean moonlit evenings from the first to the fourth and from about the twenty-second to the end of the month.

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FORESTRY

Warfare Ends Against White Pine Disease

PROTECTION of thousands of acres of white pine from the ravages of blister rust is one of the accomplishments of the Civilian Conservation Corps in the past few months.

Blister rust control was the major job of 35 conservation camps in northern Idaho, where vast acreages of western white pine are threatened. Seven thousand young Conservation Corps workers were distributed through the heart of the best white pine country in and adjoining the Coeur d'Alene, St. Joe, and Clearwater National Forests, working on government, state and private lands.

Control work was also done in the Lake States and in the Northeast, on national, state and private forest lands, and to some extent in portions of the national forests in Pennsylvania, Virginia, West Virginia, and Tennessee.

In the northern Idaho operations each strip covered was marked by a string line and the crews working in that section this season used 40 tons of cotton twine, laying out some 56,000 miles of line.

Science News Letter, November 4, 1933

ARCHAEOLOGY

Mayan History Revised By Mexican Archaeologist

Expedition to Inaccessible, Majestic Ruins of Palenque Convinces Authority There Was Only One Empire

By SR. LUIS ROSADO VEGA,

Director of the Archaeological and Historical Museum of Yucatan and Director of the Expedition of Palenque.

A RESEARCH expedition has just been completed to the remote ruins of the Maya city of Palenque, in the heart of the jungle in the State of Chiapas, Mexico. The ruins represent the most interesting and beautiful group of the very ancient Maya-Quiche civilization, perhaps the most notable on the American continent.

The expedition was organized and directed by myself, accompanied by Miguel Angel Fernandez, archaeologist of the Department of Monuments in Mexico City; Alberto Escalona, civil engineer and author of notable works on Mexican native civilizations; and the painter, Carlos Camara, who is especially interested in Mayan art.

The expedition's main object was to establish the route followed by Mayan Indians in their pioneer and colonizing migrations, and to rectify certain mistaken theories.

Palenque's ruins, whose beauty has been compared to that of the Parthenon of Greece, rise majestically at the foot of the southern Sierra Madre, a range of mountains crossing from Guatemala into the Yucatan peninsula where they disappear. The ruins offer an imposing sight in the midst of that wild scenery.

Over Forty Temples

More than forty temples are in the group of ruins, and there is the famous so-called "Cross of Palenque," subject of an extensive bibliography by archaeologists of all the world. Many opinions about Palenque and the cross are based on references or data not altogether correct, as difficult traveling in the jungle makes it uncomfortable to reach Palenque and few have visited it. Among these few are professors of Tulane University and the Carnegie Institution of Washington.

Much has been said about the "Cross of Palenque," a beautiful structure simulating a perfect cross, wonderfully carved. Some have asserted it to be a Christian cross. But after this expedition, I refuse to accept this possibility, considering it entirely superficial. It is more likely a representation of the four cardinal points, which would be logical considering that the Mayas were devoted to astronomy and were highly developed in that line.

From studies by the expedition, certain opinions heretofore considered as facts by modern archaeology are rectified. We found reason to deny the existence of a division splitting the great Maya civilization into an Old Empire and a New Empire, which supposes the archaeological groups to be, first the Old Empire in Central America, including Palenque, and later the New Empire in the Yucatan peninsula.

Not Older Than Yucatan

That Palenque by no means represents a period older than monuments found in Yucatan is sufficiently demonstrated by many points: the general characteristics pertaining to Mayan monuments such as pyramidal construction on terraces or truncated pyramids, the hieroglyphs entirely alike in all the groups, the shape of the ceilings, the seats placed according to astronomical calculations, and last, the perfect construction of the monuments in Palenque which is the cause of the beauty of fresco, sculpture, and carving.

What seems probable is that the Mayan tribes lived in the same period of art and civilization, not those of the north following those of the south. This does not deny that cities were built or lost at different times, but the artistic and structural rhythm is always the same.

There was only one civilization with slight differences manifested according to environment.

From Mexico City, we followed the logical route that would have been taken by the Mayan tribes from Central America to Yucatan. From a starting point called Nine Hills, the group of