

ASTRONOMY

# Foretasting Meteors

## Shooting Stars Seen on November Nights Will Indicate Display to be Expected During the Next Two Years

By JAMES STOKLEY

**A**FTER being bitterly disappointed a third of a century ago, astronomers are hoping that the next few years will bring another brilliant display of the Leonid meteors, or "shooting stars." This month should be a good foretaste of what is to come in 1932 and 1933. On the nights of November 14 to 17, with the assistance of thousands of volunteer amateur observers, they will watch the heavens for meteors. Should there be a good display, that is, should they be seen at the rate of several hundred an hour, it may be indicative of an even finer display next year or so. But if the nights of the fourteenth to seventeenth are only sparingly productive of meteors, it may mean that once again the Leonid meteors have been side-tracked.

It was in the year 1799 that the modern history of the Leonids began, though there are records of numerous shooting stars about the middle of November dating back many centuries before that. In November, 1799, according to one contemporary account, "the whole heavens appeared as if illuminated by sky-rockets, which disappeared only by the light of the sun after daybreak. The meteors . . . appeared at any one instant as numerous as the stars."

In 1833, the display was repeated, on the night of November 12. Prof. Denison Olmsted, of Yale, thus described it: "To form some idea of the phenomenon, the reader may imagine a constant succession of fireballs, resembling rockets, radiating in all directions from a point in the heavens. . . . They commenced their progress at different distances from the radiating point, but the lines they described, if produced upwards, would all have met in the same part of the heavens." This curious fact, that the meteors all seem to radiate from a certain point in the sky, was independently noticed by other observers, and is now recognized as characteristic of meteor showers.

Again, in 1866, there was a brilliant shower seen, though not as fine as the two previous ones. H. A. Newton, of

Yale, had predicted the return of the shower that year, and it afforded a splendid confirmation of his forecast. After this, there seemed little doubt that 1899 would bring another fine shower, and one was expected by astronomers and public alike. But during the crucial nights, only a few scattered meteors were observed, to the disappointment of everyone. As a result, astronomers are very hesitant about predicting another shower in 1932 or 1933, but they are in hopes. At least, they have found out why the meteors did not return in 1899.

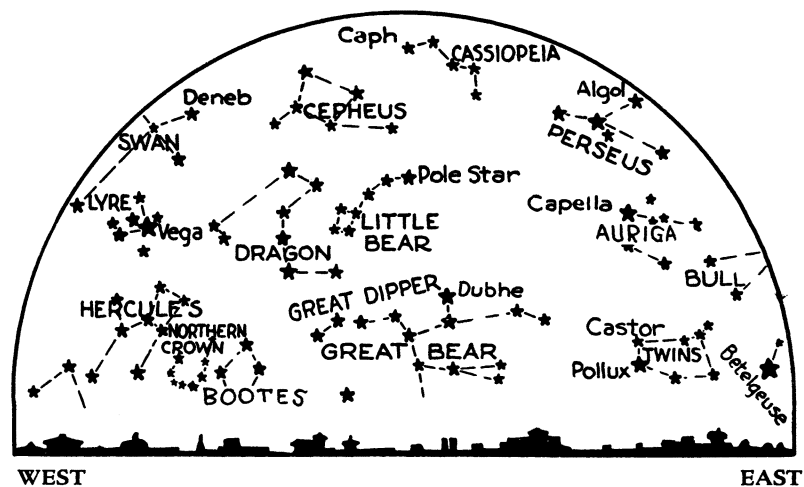
### Moving in Ring

The meteors are moving around the sun in a gigantic ring, partly pulled out in one direction to form an ellipse 1,900,000,000 miles long—about 21 times the distance between the earth and the sun. There are meteors all around this ring, but they are not uniformly scattered. At one place they are particularly concentrated. All of the meteors in the swarm are moving at a speed sufficient to take them completely around the sun in  $33\frac{1}{4}$  years. At one point, this ring crosses the orbit of the earth, and this is the place that the earth occupies in November. Thus every year when we cross the stream some of the meteors enter the earth's atmosphere,

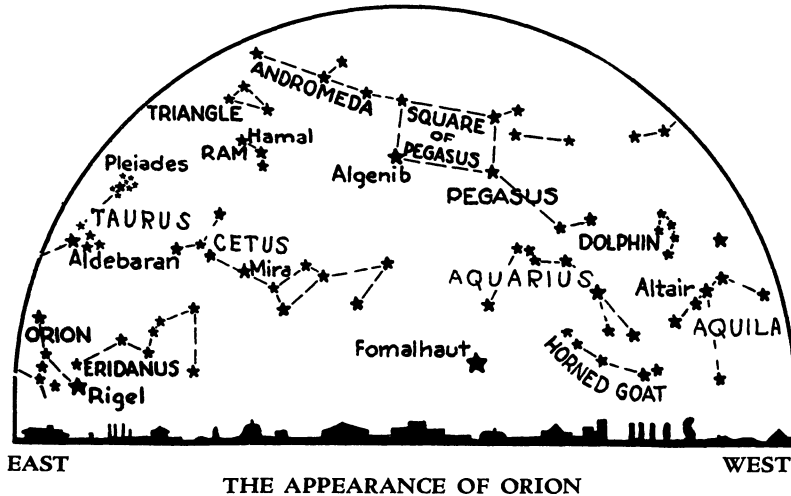
where they are completely burned by the friction with the air, causing the "shooting stars". And when we hit the concentrated part of the stream, the meteors are so numerous as to cause a display like that of 1799, 1833 and 1866. When they reach the earth they are moving in parallel paths, and the vanishing point of their paths in the distance causes the effect noticed by Olmsted, that they seem to radiate from one part of the sky. This radiant is in the constellation of Leo, the lion, and thus they are called the Leonid meteors.

From this it would seem as if there were no reason why the meteors should not come every 33 years, with just as much certainty as an eclipse of the sun. But the earth is not the only planet that they approach. At one part of their path, they also cross the orbit of Jupiter, largest of all the planets. The main swarm of Leonids takes about three years to pass a single point. Before it had reached the earth in 1899 it had passed close to Jupiter, and by his great gravitational attraction, he had pulled it aside, or perturbed it. This happened as the center of the group passed Jupiter, the head and the tail having passed on with little perturbation. The result was that in 1898 and 1901 moderately large numbers of meteors were seen, but in 1899 and 1900, when the heart of the swarm went by, it missed the earth completely.

What Jupiter may have done since then nobody knows. Possibly the me-



Here is visible Auriga the charioteer, in which group the brilliant Capella shines. Cygnus, or the northern cross, and Vega, marking the Lyra constellation, are also prominent. The Great and Little Bears occupy the center of the picture.



THE APPEARANCE OF ORION

Over the southeastern horizon signals the coming of winter. Just at this time the mighty warrior holds an undignified pose. The three stars that mark his belt are upright, while he is preparing to strike the bull, represented by Taurus, above him.

teors may have been switched still farther aside, or possibly they may have been switched back again. In any event, last November did bring a better display of meteors than any time since 1901, a fact which indicates that the head of the main swarm was at least aimed the right way. But 1898 brought a more brilliant shower than for many years previously, so the astronomers are rightly cautious about putting too much faith in last year's display as a forecast of an even finer one this year.

### Crucial Nights

In any event, it is important that the sky be watched on the critical nights. November 14 and 15 is usually regarded as the time of the maximum, but last year the good display was seen, where clouds did not interfere, on the night of the sixteenth. Because of the way the earth is turning, we meet meteors head-on after midnight, while those that we see before midnight are only the ones that can catch up to us. Therefore, the early morning hours are always the best, and it is the mornings of November 15, 16 and 17 on which the sky should be carefully scanned. After midnight, at that time, Leo shines in the eastern sky, and it can be recognized from the familiar sickle, with the star Regulus at the end of the handle. The point of the sickle is directed upwards and to the left. The moon, at first quarter on the sixteenth, will have set about midnight, so the night will be dark.

The most important fact that the astronomers want to know is how many meteors occur, and during what hours. So if you want to aid in this work, all

you need to do is to watch the sky, and count the number of meteors seen during half-hour periods, say from midnight to 12:30, from 12:30 to 1:00, from 1:00 to 1:30 and so on. With several people cooperating, each can look in one direction, and the whole sky can be covered. If one person is working alone he should watch the eastern sky. With the aid of a flashlight, notes on all meteors seen should be made immediately, as well as any passing clouds that may interfere. If any meteor appears particularly bright, or leaves a glowing train after it, this also should be noted. The times of all occurrences should be set down accurately. After the night is over, and you have these records, send them to Prof. Charles P. Oliver, at the University of Pennsylvania, Philadelphia, who is one of the world's leading meteor authorities, and who welcomes amateur assistance in his work. Perhaps one part of the country may be cloudy, so the more people there are out observing, and the more widely are they scattered, the better the chances for securing the information wanted.

The origin of meteors is a question that has not yet been finally answered, but it appears certain that they are the remains of comets, in many cases at least. The Leonid meteor swarm follows almost exactly the same path as Tempel's comet, which was discovered in 1866. Probably the comets, and the meteors as well, are the debris of the evolution of the solar system, which almost certainly occurred when a passing star pulled from the sun the matter which since formed the planets. The connection between meteors and comets

is even more clearly shown by a shower that occurs a little later in November, but which now seems pretty well exhausted. This shower is called the Andromedes, because it radiates from the constellation of Andromeda, and it appeared right after Biela's comet, first discovered in 1826, had disappeared, and in the place where the comet was expected. It is between November 17 and 27 that the Andromedes can now be seen.

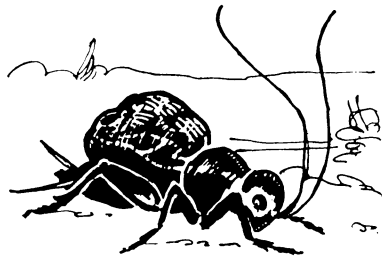
### Brilliant Aldebaran

Aside from the meteors, nothing extraordinary is scheduled for November in the heavens. As always, in this month, the stars show the coming of winter, when Orion appears over the eastern horizon. Now the giant warrior is on his way back in a very undignified posture. The three stars that mark his belt are upright. To their right is Rigel, and to the left Betelgeuse, both first magnitude stars. Directly above Orion can be seen the stars of Taurus, which are supposed to represent a bull, which Orion is about to strike with his up-raised club. The most brilliant star in Taurus is the red Aldebaran, which marks the bull's eye. Adjoining Taurus, to the north, is the group of Auriga, the charioteer, in which shines the brilliant Capella. In the western sky is Cygnus, the swan, also called the northern cross, now upright, with Deneb at the top. Below it and to the right is Vega, which marks Lyra, the lyre; and to the left is the star Altair, in Aquila, the eagle. Low in the southwest is a bright star, Fomalhaut, which is in the constellation of Piscis Austrinus, the southern fish.

A characteristic star group of late autumn evenings is the "Great Square in Pegasus," high in the south. Actually only three of the stars in the square are in the constellation of Pegasus, the winged horse. The northeasternmost one is called Alpheratz; it is in the neighboring constellation of Andromeda. To the north of Andromeda is Cassiopeia, who according to mythology was her mother. Perseus, the hero who rescued her from death, is represented by the star group to the east.

The moon, during November, is at last quarter on the third, new on the ninth, at first quarter on 16th and full on the 25th. Thus there will be bright moonlight evenings from about the thirteenth to the twenty-seventh.

Several planets can be seen during the evening, or at least before midnight, but none is (Please turn to page 303)



Crickets

**F**ROST has stilled almost all of the great insect chorus that filled the summer air, but the crickets are still with us. They sing more slowly now than they did then, for crickets chirp according to the temperature, faster when they are warm and slower when they are cold. But they are still at it: "Cree-i—i, Cree-i—i". Those that come into our houses become a little livelier after they have the chill thawed out of them.

The tradition of the cricket as the type and symbol of domesticity has been transplanted to this country from Europe. With little reason; for the true house cricket is not found at all abundantly on this continent, except in some parts of Canada. The black field cricket is, to be sure, sometimes found in houses in the United States, but that is not his natural habitat. And any kind of cricket in the house is not a sign of good luck—unless holes gnawed in carpets and upholstering are kinds of good luck.

One species of cricket that few people ever see, but from whose depredations many suffer, especially in the South, is the mole cricket. He is a permanent subterranean dweller, mining about just beneath the surface, like a little insect mole. Mole-like, too, are his curiously flattened forelegs, which he carries up close to his face. The mole cricket is a most unwelcome guest when he appears in numbers in a lawn or pasture for he feeds entirely on the roots of forage plants, and can do immense amounts of mischief.

*Science News Letter, November 7, 1931*

Centuries ago, a tribe of Mexican Indians is said to have lived for more than fifty years without salt, when hostile Aztecs cut off outside supplies.

PSYCHOLOGY

## Farm Student Appears More Radical than City Cousin

**C**ONTRARY to public opinion, the boy from the farm is not more conservative than his city cousin in his views on social problems such as divorce, a single moral standard, capital punishment, and women smoking in public, it would seem from a survey made at Louisiana State University by Dr. Charles Homer Bean. Of the students at that institution, those who came from large cities were the most conservative, and the most radical group had lived both on farms and in small villages.

### Men Less "Modern"

High school students, he found, are much more conservative than university students. Men are less "modern" than women. The high school boy is on the average more progressive than his male parent, but is less progressive than is his mother.

A complication which Dr. Bean found in the study of conservative and progressive attitudes in either a group or in an individual is that either may be progres-

sive or even radical in some matters, and conservative or decidedly static in others.

"For example," he says, "the United States of America, which prides itself on being much more up to date, especially in industrial and commercial matters, than her European and Central and South American competitors, familiar, as most of them are not, with a decimal monetary system, has resisted decades of effort on the part of the government and the schools to introduce the now almost universal metric system of weights and measures."

So also he found that 50 per cent. of the men students and 40 per cent. of the women approved of women's smoking in public, but only 33 per cent. of the men and 7 per cent. of the women allowed men to take their coats off in public places.

*Science News Letter, November 7, 1931*

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well placed; and they do not appear on the maps. Mercury is an evening star all month, and on the fifteenth is about five degrees above the western horizon at sunset, where it will be difficult to locate, because of the bright sky. At the same time Venus, next planet in order from the sun, will be a little higher, and also difficult to locate. Mars at the middle of the month, will set about an hour after the sun, and may be glimpsed at dusk. Saturn is low in the southwest in the constellation of Sagittarius, the archer, and sets about four hours after the sun. Brightest of all the planets this month, however, is Jupiter, which rises about eleven o'clock.

*Science News Letter, November 7, 1931*

A department of chiropody has recently been opened in an English hospital, to treat certain types of foot disabilities.



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