

ASTRONOMY

Will the Great Shower Return?

A Leading Meteor Authority is Hopeful And Gives Instructions for Observing the November Shooting Stars

By **DR. CHARLES P. OLIVIER**

Professor of Astronomy and Director, Flower Observatory of University of Pennsylvania and President, American Meteor Society.

THE YEAR 1932 promises to be long remembered by all persons interested in astronomy. Already there has been a total eclipse of the sun which was witnessed by multitudes, although tens of thousands of others who traveled to the path of totality were disappointed by cloudy weather. There is, however, a second event scheduled, which, if it comes up to expectations, may be neither less interesting nor less awe-inspiring than the total solar eclipse. It has the added advantage that it should last for hours rather than for only 90 seconds. We refer of course to the return of the Leonid meteors which is predicted for the period from November fourteenth to eighteenth inclusive, with the best chances for the night of Tuesday, November 15, or rather after midnight, on the morning of November 16.

It would be entirely unjust to everyone, however, not to be very frank about one point. As to eclipses of the sun, there is absolutely no doubt of the day, hour,—even the approximate second can be computed for each phase. Such predictions do not fail; they never can or will. Eclipses depend upon the positions of the sun and moon, both of which have been observed daily for centuries. But with meteor showers the case is different. The very fact that a meteor, popularly a "shooting star," is seen means that that particular body is destroyed forever; it has entered our atmosphere and has been burned up; it cannot come back. Hence all our calculations are based upon past experience. As to this shower, we further assume that those meteors in the stream which are going to strike our earth's atmosphere in the future will be sufficiently numerous, at each 33-year return, to give spectacular displays as they have in the past. Also we cannot follow the meteor stream with the telescope, for its particles are too small and too far apart. Further,

we are dealing not with a single large body like a planet, but with a loose aggregation of small particles whose very existence we merely infer. Nevertheless, having given all this warning, we feel reasonably confident that this November will witness another notable meteor shower furnished by the Leonid stream, and we have good reasons for this belief.

Shower Records Since 902 A.D.

In ancient and medieval records we find numerous accounts of great showers of shooting stars. An American astronomer, H. A. Newton of Yale, about seventy years ago gathered up such records as he could find—many more have since been discovered—and found that from the year 902 A. D. brilliant showers had been recurring at about 33-year intervals, and on dates corresponding to the middle of November, that is when certain corrections had been made in the calculations of these dates. Knowing that a great display had appeared in 1833, he confidently predicted one for 1866, which indeed occurred, and was followed by lesser ones in 1867 and 1868. Future showers were then to be expected about 1899 and 1932, of which more will be said shortly.

Turning back to older accounts, we have them from China, Japan, India, North Africa under the Saracens, Rus-

sia, and many countries of western and southern Europe. With the eighteenth century America can be added to our sources of information. One or two of the older accounts may be quoted to show clearly what effect these spectacles had upon people of that day, though their descriptions are scarcely what we would now consider scientific.

The first, from the Arabic, refers to the shower of 1202 A.D., the dates in the narrative being in the old Mohammedan reckoning:

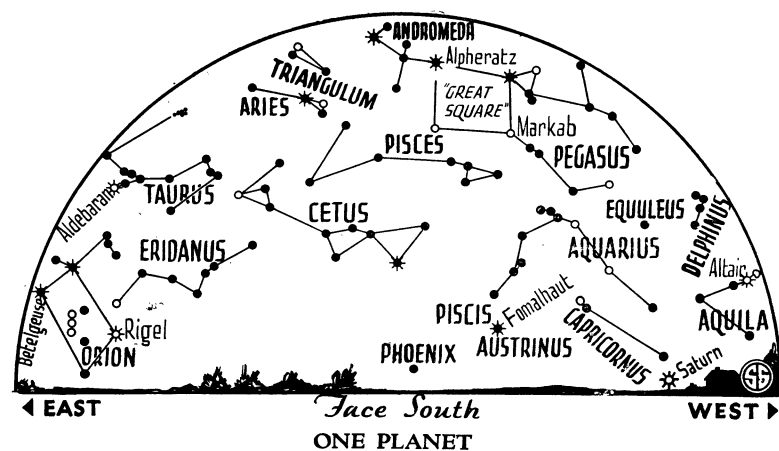
"And in the year 599, on the night of Saturday, on the last day of Muharram, stars shot hither and thither in the heavens, eastward and westward, and flew one against another, like a scattering swarm of locusts, to the right and left; this phenomenon lasted until daybreak; people were thrown into consternation, and cried to God most high with confused clamor; the like of it never happened except in the year of the Mission of the Prophet, and in the year 241."

The following brief account of the shower of 1533 comes from the Korean:

"... from the fourth to the fifth watch [2 to 4 A. M.] in the four parts of the heavens, there were innumerable shooting stars, great and small, moving together in straight and oblique lines. This continued until daylight."

Several Japanese records say that, following certain showers of meteors which were visible there, the emperor proclaimed general amnesty to prisoners, so these phenomena brought happiness to some persons at least, even though they too doubtless were equally terrified while "the stars" were falling.

Coming up to more recent times—



If the lights are few, the horizon low and the sky clear you may be able to see the ringed planet Saturn just above the tree tops in the west.

the shower of 1766 was seen in South America, and that of 1799 was the first described in semi-scientific language, by the great explorer Humboldt. We will quote the far shorter and less well-known account of our own countryman, Andrew Ellicott, then at sea:

" . . . about three o'clock a. m. I was called up to see the shooting of the stars. . . . The phenomenon was grand and awful, the whole heavens appeared as if illuminated by skyrockets, which disappeared only by the light of the sun after daybreak. The meteors which appeared at any one instant as numerous as the stars, flew in all possible directions, except from the earth to which they all inclined more or less; and some of them descended perpendicularly over the vessel we were in, so that I was in constant expectation of their falling among us. . . ."

"Nights the Stars Fell"

This shower was followed by a fine one in 1832, which for some reason had little publicity, and then the greater one on the morning of November 13, 1833, which has gone down in literature and folk-lore as "the night on which the stars fell." This display was generally visible over North America; Europe missed it by having the sun rise some hours sooner. We have accounts from the then-inhabited parts of the United States, and also from many ships at sea. It has been described so often that we need give only a few facts. Competent observers estimated that from midnight to dawn a quarter of a million meteors were visible from one place. Many were large and bright, leaving fine and long-enduring trains. Their numbers were likened to snowflakes in a snowstorm, and the display made a lasting impression on those who saw it. Naturally the ignorant, white and black, thought the Day of Judgment had come, and the night was one of untold terror to such persons, for they were sure that the end of the world was at hand. Fortunately, however, the phenomenon was also viewed by numerous men who appreciated its true nature and made observations that laid the basis of meteoric astronomy. The fundamental discovery was that the paths of the meteors seemed to radiate out from a point in the constellation Leo; hence the name Leonid.

The 1866 shower, while fine, was not comparable to that in 1833. The shower missed the earth entirely in 1899, though moderate numbers of Leonids were seen in 1898 and 1901. This failure in 1899 was a great disappointment, even though the probability that the meteor stream would (Turn to Page 297)

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Bright Stars Plentiful in the November Evening Skies

By JAMES STOKLEY

WHILE meteors are awaited in the open this month, astronomers in big observatories will be hunting for Tempel's comet. This object has exactly the same orbit as the path of the meteors and is supposed to be the source of the debris which are the meteors. It was last seen in 1866 and was found to return every 33 years.

But in 1899 it was missed, just as were the meteors. It may be found again.

Dr. A. C. D. Crommelin, a leading British authority on cometary orbits, says that when Tempel's comet crosses the plane of the earth's orbit, it will be about half a million miles nearer than it was in 1899 and a little nearer than in 1866. "There are thus," he stated, "good grounds for hope that the failure of the shower in 1899 will not be repeated."

The stars during these November evenings are beginning to assume a winter aspect. The "Great Square in Pegasus," one of whose corners is really in the adjacent constellation of Andromeda, is high in the southwest. Directly west and near the horizon is Altair in Aquila. To the north in Lyra is Vega, and above that is Cygnus with bright Deneb. This group is sometimes called the northern cross and is now vertical with Deneb at the top.

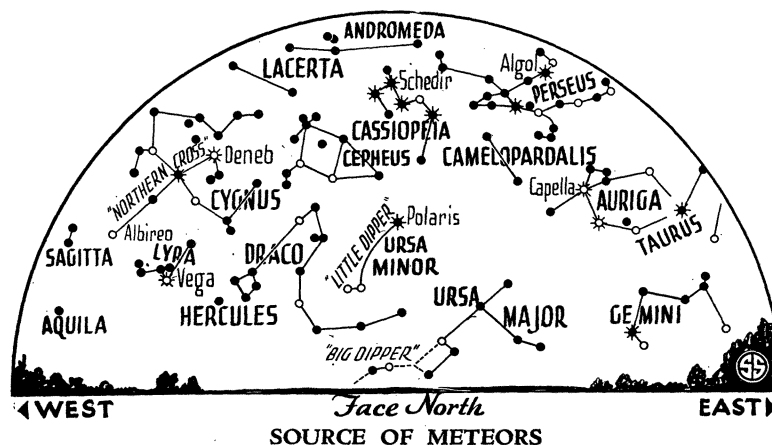
Fomalhaut can be seen low in the

southwest in Piscis Austrinus, the southern fish. Over in the east can be seen the three stars that form the belt of Orion, close to the horizon and in a vertical row. To their right is Rigel, in the same constellation and to their left is Betelgeuse. Above Orion is Taurus, with the red Aldebaran as its brightest star. To the left of Taurus is Auriga, in which is the first magnitude Capella. Thus, eight first magnitude stars can now be seen in the evening sky.

During November the moon is at first quarter on the fifth. On the thirteenth it is full, on the twenty-first at last quarter, and on the twenty-seventh it is new. Thus, during practically the entire first half of the month, the evenings will be moonlit.

On November 5, the moon occults, or passes in front of a star of the 2.9 magnitude, known as delta Capricorni. This will be visible from Washington, and can be seen with a small telescope or possibly with the naked eye, though it is rather hard to see a star of this brightness when so close to the bright moon. At Washington, in local time, it will pass behind the bright edge of the moon at 8:41 p. m. At 9:45 p. m. it will emerge from in back of the dark lunar limb. When such an occultation occurs, the star disappears and emerges instantaneously, for there is no lunar atmosphere to cause a gradual diminution in brightness.

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This map pictures the skies as they appear in the early evening. In the morning hours of days in mid-November, the constellation of Leo will occupy Gemini's position. The Leonid meteors will appear to radiate from a point in the "Sickle" of Leo.

GEOGRAPHY

Explorer Finds New River In Jungle of Brazil

By OTTO W. ULRICH, leader,
Ulrich Expedition.

IN CAMP on the Rio Brown, we are preparing to follow its course, with the expectation of reaching ere long the territory of the Kulu Indians. The Rio Brown does not appear on any of the maps and atlases heretofore published and has apparently not been seen by white men prior to our coming.

As the discoverer of this river, I have taken the liberty of giving to it the name of "Rio Brown," in honor of Dr. William Moseley Brown, of Ballston, Va., under whose auspices, along with several others, the expedition is being conducted. I have already notified the Brazilian government of this action, which will undoubtedly be promptly approved.

From the Rio Brown our journey now takes us into the territory of the Kulu Indians. This is the locality where Colonel Fawcett was last heard from and where more than one attempt has been made to discover his fate. Further reports will be made on our trip into this territory and our explorations along the Rio Brown. From Pirapora, Estado de Minas, Brazil, which is the last railroad station and the "jumping off" place into the jungle, the journey was by canoes along the following rivers: Rio San Francisco, Rio Carinhanha, Rio Paran, Rio Tocantin, Rio Gurupi, Rio Araguaya and Rio Brown.

The route traversed has been somewhat different from that which we intended. In order to press forward as rapidly as possible, we depended chiefly upon the waterways. We refrained from traveling by Para (Belem), going direct from the Rio Tocantin into the Indian territory of the Gurupi River, and thus saving much time.

Indians Killed Two

The trip up to this point has been at times beset with greatest difficulties. Powerful rapids and waterfalls impeded our progress tremendously. The hostile Indians, too, caused us much distress. Two of my traveling companions (natives) were killed through enemy bowshots.

Many wild animals, snakes, and beasts of prey crossed our path. I personally shot as many as seven jaguars, all of large size and black in color.

The trip from the Rio Tocantin to the Gurupi River was full of hardships. On the Tocantin River we were compelled to leave our canoes behind. Our outboard motor, cans of gasoline, and baggage were dispatched in forced marches to the Gurupi by native carriers. On the Gurupi we built a raft and made our way into the territory of the Urubu Indians.

Our return journey from the Rio Gurupi to the Araguaya River was just as difficult. The Indians living in this territory gave us canoes fashioned from logs, which had been hollowed out with fire, so that we could press on without delay.

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miss the earth had been predicted. What then are our present chances? In 1928 many Leonids appeared; in 1929 very few; in 1930 the numbers increased greatly; in 1931 we had a very fine display. Meantime calculations made by expert English and Russian astronomers show that the stream of particles should have been shifted back since 1899 into such a position that the earth will pass through it again, probably as well as in 1866, though not right through the densest part which we met in 1833. It

is on the basis of this information that astronomers feel hopeful that we shall see a shower of considerable brilliance.

What should you expect to see if you watch for the Leonids? A description of last year's shower should give you some indication of what we hope this year's will be. On the night of November 17, 1931, a party of eleven of us was at a country home high up in the Catskill mountains. The sky cleared beautifully about 11 o'clock, just as Leo was rising. Immediately meteors began to shoot across the sky, almost the first being a brilliant red Leonid. A total of 2,600 was counted before dawn by our group; making allowance for duplicates, at least 1,000 different meteors were seen. A very large number of these were bright, and dozens left fine trains, some of which remained visible from one to twelve minutes. Such trains, when they lasted for some minutes, changed their forms and drifted with the winds of our upper atmosphere, adding greatly to the beauty of the spectacle. The bright meteors were of various colors, and sometimes as many as four came one after the other so quickly that the observer could not make a record of the first without missing all the others. Last year there was no moonlight to interfere.

We hope, as I said, for a far better display in 1932, probably on the night of November 15-16; but the main shower may occur on the preceding or following night. Also we may have the bad luck of having the richest part come during our daylight hours, which would make it visible to either Europe, the Pacific, or Asia. These contingencies, like cloudy weather, cannot be helped. Unfortunately also, the moon will be bright this year, and its light will cut down the number of the fainter meteors seen.

(Turn Page)

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Despite these facts, the American Meteor Society is organizing a campaign to cover all parts of the country, so, if it is cloudy in some states, we will still have chances of getting good observations from our members in others. More particularly we are concentrating on the observation of those meteor trains which endure for more than a minute and show some movement or drift in the interval. Accurate drawings on star maps of the same train as seen from two distant stations will permit the calculation of its height, and, if series of drawings are made, of the wind velocities higher than any sounding balloon can penetrate—far higher than Prof. Piccard recently was able to go.

For the casual untrained observer, we ask that they make half-hour counts of all meteors seen, each person, if several are present, making *his count separately* and quite irrespective of his companion—in other words, counting what he sees, even if his companion also notes the same meteor. Those who know the constellations well enough should also plot the paths of very brilliant meteors and particularly of long-enduring trains left by them. For such observations, it is essential to record the time accurately,

as well as the color and magnitude of the meteor.

Eleven o'clock is about as early as there is hope of seeing these meteors, and their numbers usually increase steadily up to four or five o'clock in the morning.

In closing, let me once more assure my hearers that if the Leonids return even as well as in 1866 and if the sky is clear on the critical night, they should furnish a spectacle which will richly repay everyone who takes the trouble to watch it.

EDITOR'S NOTE: Dr. Olivier's article was written as a radio talk for delivery through the Columbia broadcasting system.

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Mercury and iodine disinfectants were the most effective for killing fungus growths similar to the one suspected of causing athlete's foot, Dr. Chester W. Emmons of the College of Physicians and Surgeons, Columbia University, New York City, found from studies which he reported to the American Public Health Association. Dr. Emmons reported the action of a number of other disinfectants, among them copper and sulphur ones, which were surprisingly ineffective on funguses he studied.



Mountain Aristocrat

SNOWSTORMS are already swirling down the canyons of the Rockies, and the tourists ride along the roads no more until next spring. Little concerns the mountain goat his shaggy head about that, however. Winter is a better time than summer, so far as he is concerned, provided only that the snow does not get so deep that he cannot get at his food. Within his thick coat of wool he is secure from the cold, and there are no insects, tourists in smelly gasoline cars, or other troublesome pests to annoy the solitude over which he reigns.

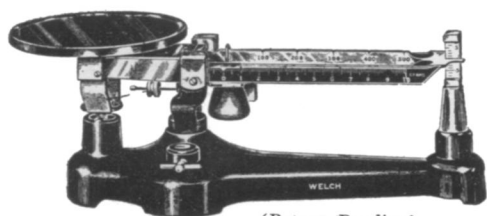
The white mountain goat is the sole American representative of the wild goat tribe, whose species are more numerous in the old world. Though he goes alone, however, he need not go ashamed. He is as fine a specimen of the animal which Solomon once ranked even with the lion as "exceeding majestic" as can be found anywhere in the world, with his high-humped, powerful shoulders and his short but beautifully polished black horns.

Our mountain goat is decidedly an animal of the North. He is common in Alaska and British Columbia, but does not get farther south in the United States proper than the region of Mount Rainier and Glacier national parks. Even there he haunts the skyline during the summer and descends into the lower valleys only when the snow fills them.

The mountain goat is a really big animal, as goats go. Walter P. Taylor of the U. S. Biological Survey, states that an average male specimen stands about three feet high at the shoulder, and is more than five feet in length.

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