

THE GREAT METEOR SHOWER OF 1899.

BY WALTER GEORGE BELL.



NE talks about the great meteorshower which falls due in November next with a certain amount of trepidation. A good many people have been looking out for meteor showers on the nights of

November 14th and 15th for some years past, and being invariably disappointed in their expectations have come to regard those who predict these events with the ill odour which deservedly attaches to the false prophet. In old China they used to decapitate the astronomer who failed in his predictions. I do not anticipate such murderous treatment from the readers of the WINDSOR MAGAZINE, even were the shower to fail us altogether, but it is well to make this reservation at the outset, that as we do not know so much of the movements of the Leonids as could be desired, it is possible that while we have a fine display this November, what is really the best part of the shower may be reserved until next year.

One wide distinction is to be drawn between the disappointments of past years and hopes of the present. What we have been expecting in past years has been merely the forerunners of the Leonid swarm—the heralds, as it were, whose arrival in flashes of light in our skies should bring us the message that the swarm itself is approaching. They might number a few dozens or a few hundreds within the little space of our limited horizon, and their appearance is of great interest to astronomers anxious to determine the length at which the swarm is drawn out, the division of the meteor streams, and the point in the sky from which they appear to come; but as a “shower” none of these could have been a very striking spectacle.

This year we expect the approach of the swarm itself, a vast procession of myriads upon myriads of flying stones, and if we are

fortunate our earth, carrying all its inhabitants, will plunge headlong into the midst of it. Then we may see a spectacle of a lifetime.

Don't be alarmed! If meteors fall as thickly as raindrops from a clouded sky in April, we are amply protected by the atmosphere over our heads, in which the meteors are quickly dissipated into harmless vapour long before they have a chance of reaching the earth. Every night many hundreds of thousands of meteors rush into our atmosphere, but we know nothing of them except when looking skywards we at times may observe a particularly bright “shooting star.” Each little “shooting star” is a meteor, coming from we know not where, to end its course far overhead. Although stones have fallen from the skies in considerable numbers, and, labelled as “aerolites,” are to be seen in many museums, it is a noteworthy fact that with one single exception no stone has been known to fall during a meteor shower, and in that one case there is every reason to believe that it was an accidental coincidence, and had nothing to do with the shower that was in progress.

Two great meteor showers have already occurred in the present century, and the shower now approaching in the month of November will be the last. To convey an idea of what we may ourselves hope to witness, I cannot do better than describe what our fathers and grandfathers saw. An eye-witness in South Carolina of the Leonid shower of 1833 gives this account of it:—

“I was suddenly awaked by the most distressing cries that ever fell on my ears. Shrieks of horror and cries for mercy I could hear from most of the negroes of the three plantations, amounting in all to about six hundred or eight hundred. While earnestly listening for the cause I heard a faint voice near the door, calling my name. I arose and, taking my sword, stood at the door.

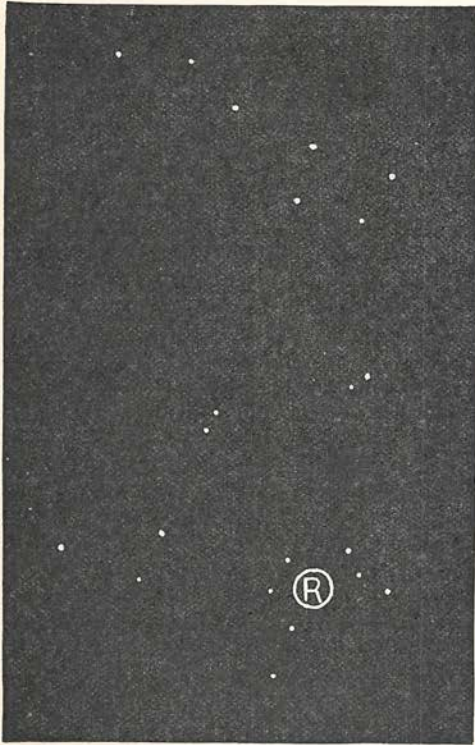
“At this moment I heard the same voice still beseeching me to rise, and saying, ‘Oh, my God, the world is on fire!’ I then opened the door, and it is difficult to say which excited me the most—the awfulness of the scene or the distressed cries of the negroes.

"Upwards of one hundred lay prostrate on the ground—some speechless and some with the bitterest cries, but with their hands raised, imploring God to save the world and them. The scene was truly awful, for never did rain fall much thicker than the meteors fell toward the earth; east, west, north, and south, it was the same."

This certainly is not lacking in picturesqueness.

Just thirty-three years after—in 1866—there was a return of the great shower. Many descriptions of it are preserved. I

THE GREAT BEAR.



RADIANT POINT OF THE LEONIDS.

give that by Sir Robert Ball, whose genius for the popular exposition of astronomy is unsurpassed, and whose name has been made a household word. This is what he says:—

"I shall never forget that night. On the memorable evening I was engaged in my usual duty at that time of observing nebulae with Lord Rosse's great reflecting telescope. It was about ten o'clock at night, when an exclamation from an attendant by my side made me look up from the telescope, just in time to see a fine meteor dash across the sky. It was presently followed by another, and then again by others in twos and threes.

"For the next two or three hours we witnessed a spectacle which can never fade from my memory. The shooting stars gradually increased in number until sometimes several were seen at once. Sometimes they swept over our heads, sometimes to the right, sometimes to the left, but they all diverged from the east.

"As the night wore on the constellation Leo ascended above the horizon, and then the remarkable character of the shower was disclosed. All the tracks of the meteors radiated from Leo. Sometimes a meteor appeared to come almost directly towards us, and then its path was so foreshortened that it had hardly any appreciable length, and looked like an ordinary fixed star swelling into brilliancy and then as rapidly vanishing.

"Occasionally luminous trains would linger on for many minutes after the meteor had flashed across, but the great majority of the trains in this shower were evanescent. It would be impossible to say how many thousands of meteors were seen, each one of which was bright enough to have elicited a note of admiration on any ordinary night."

Such, then, is the great Leonid shower which, thirty-three years having elapsed, is due to return again in November, and for which we shall all have turned astronomers and be eagerly on the look out. I do not wish to appear pessimistic, but the admission must be made that the shower of 1833, by all accounts, was more brilliant than that which followed in 1866, but this is not necessarily evidence that the shower is appreciably dwindling. And, lest it be said that I am prone to exaggerate, it is well to mention that all the falling meteors shown in the accompanying drawing were not seen at the same moment.

The periodicity of the Leonid shower is a comparatively recent discovery. It occurred in the year 1799, and again in 1833, and then for the first time the prediction seems to have been made that it had a period of about thirty-three years, and would be returning in 1866. The verification of the prediction in that year led to old records being hunted up, and numerous instances of the appearances of the shower were found, dating back several centuries. Historical records commence in 902 A.D. In that year King Ibrahim Ben Ahmed died, and Arabian chroniclers tell us "that night there were seen, as it were lances, an infinite number of stars, which scattered themselves like rain to right and left, and that year was called the Year of the Stars."

A veracious Portuguese chronicle gives a picturesque account of the shower which occurred in the year 1366 :—

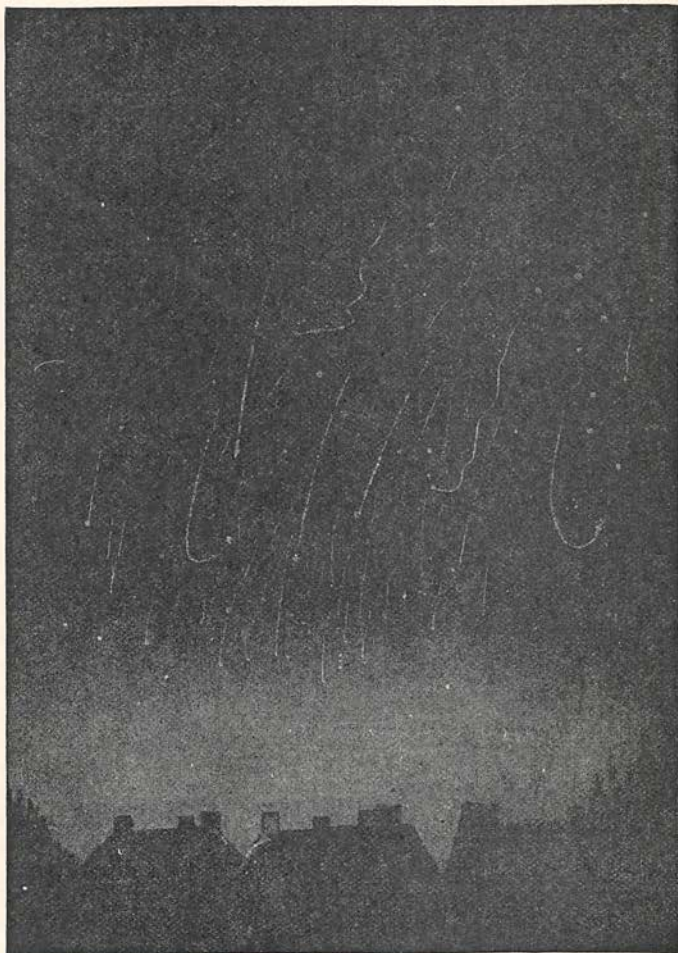
“There was in the heavens a movement of the stars such as men never before saw or heard of. At midnight, and for some time after, all the stars moved from the east to the west, and after being collected together they began to move, some in one direction, and others in another. And afterwards they fell from the sky in such numbers and so thickly together that as they descended low in the air they seemed large and fiery, and the sky and air seemed to be in flames, and even the earth appeared as if ready to take fire.”

The earliest historians of the shower speak of its coming in October. The institution of the New Style calendar has since picked up eleven days, and there has besides been a progressive shift of the orbit, as shown in the diagram overleaf.

One recalls the story of the old Northamptonshire farmer who, after the Leonid display of 1866 went out next night to see “if any of the stars were left in the sky.” Of course, the meteors are entirely distinct from the fixed stars, which stand apart from them many millions of miles distant in the deep vault of the heavens, but this fact was not always grasped. All the old chroniclers write as though the stars themselves in their courses were showering down upon the earth.

The Leonids always arrive in our skies in the month of November, and for this reason are commonly known as “the November meteors,” to distinguish them from the numerous other meteor streams which yield us inferior displays in all months of the year. On the nights of November 13th, 14th, and 15th the earth, in its journey round the sun, crosses the broad track of the meteors. These are the nights on which watch must be kept. It is a spectacle which

anyone may enjoy, without need of telescopes or other paraphernalia. Any place where there is a good horizon and a clear sweep of sky—a hill for preference—will serve as an observing station. Meteors dash in lines of light in all directions across the sky, but all of them enter the earth’s atmosphere as if coming straight from a point in the constellation Leo, so that anyone who watches

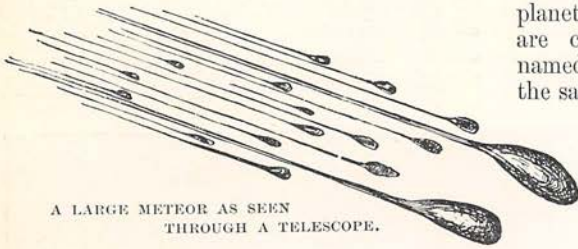


METEORS SEEN ON THE EARLY MORNING OF NOVEMBER 14TH, 1866.

this area of the sky is assured the best view of the display.

It is easily found. I take it that everybody knows the familiar constellation of the Plough, or Great Bear—or Charles’s Wain, as it is called in some counties—which towards midnight is seen high overhead. This constellation is of great value in mapping the sky, because the last two stars in the Plough—those known as “the

pointers"—point up to the Pole Star, around which the whole heavens revolve. If the line of the pointers be carried, not upwards, but down towards the horizon, there will be seen a large group of bright stars, arranged



A LARGE METEOR AS SEEN THROUGH A TELESCOPE.

in the form of a sickle. This is the sickle of Leo, from which the Leonids take their name.

Leo rises above the horizon shortly before midnight, and as every hour passes climbs higher in the sky. Near the centre of the sickle is the radiant point from which all the Leonid meteors emerge.

I may add that the culmination of the shower is expected in the early morning hours of Tuesday, November 14th, and a night free from clouds is, of course, essential if the spectacle is to be viewed in its full grandeur. There will be a thin crescent moon.

We should have a display every year on these November nights when we cross their track if only the Leonids were about, but they cluster in a great swarm, and it is only when we plunge into the thick of the swarm that we get this brilliant spectacle in our skies. We cannot handle a meteor, because, as has been said, none fall to earth, but meteoric dust, the *débris* of meteors which have been destroyed over our heads, abounds, and from the larger aerolites which descend to earth we can form a pretty good idea of what their substance must be.

The Leonid swarm is composed of many myriads of flying stones, tiny specks of gravel or dust, and few of them probably larger than a pea, which are grouped in a great cluster some hundred thousand miles in thickness. Each moves on its separate path, and at a considerable distance from its neighbour—an atomic world complete in itself, obedient to the same forces which control the earth in its journey round the sun.

Whence the meteors originated one hesitates to suggest. Some astronomers have thought that they may be matter shot out from the depths of the earth at some

remote age when volcanoes much more powerful than any that now survive were active, from some other world, or perhaps from the moon; but it seems more likely that they are an earlier form of matter out of which the sun itself and all its attendant planets were fashioned. We know that they are closely allied to comets. A comet, named after its discoverer Tempel, moves in the same path as the Leonids, and probably is the parent of the swarm.

Some hopes had been entertained that photography would enable us to get a picture of the swarm approaching, but apparently the meteors are too small in themselves, and too far apart, to reflect sufficient sunlight to leave its trace on the most highly sensitive plate, as failure has so far attended all efforts at the end.

We see the Leonids only after such long intervals by reason of the vast extent of the orbit along which they travel. We need some celestial milestones to convey an idea of what it is. On a fine night the planets stand out by their superior radiance among the stars, marking off distances in the great vault of the heavens. That nearest to us is Mars, "the ruddy god of war," easily to be distinguished as a bright speck of reddish light in the sky. Next comes Jupiter, the largest and brightest planet of them all.

Farther out still is Saturn, much fainter and less easy to identify, and then Uranus, too remote to be visible to the unaided eye—a goodly host. Out beyond these, beyond Uranus, towards the confines of the solar system, to a distance of 1,750,000,000 of miles from the earth, the meteors travel, sweeping in an ellipse so vast that they take thirty-three and a quarter years to pass over it.

When beyond Uranus the long outward journey of the meteors ends, and they turn again towards the sun, moving slowly at first, but each day increases their speed until they rush into our atmosphere with a velocity which makes the Leonids the brightest of all the systems of shooting stars. When they pass the earth they are travelling at a speed of about twenty-six miles a second. Remember that our earth is itself moving round the sun at a speed of eighteen miles a second. On this journey the earth encounters the meteors "front on," so that when they dash into our atmosphere they are moving at the almost inconceivable velocity of forty-four miles a second. Little wonder, then, that the intense heat which is set up by friction with the atmosphere dissi-

pates each of them in a second or two into a wisp of glowing vapour.

Of course, only a small proportion of the bulk are destroyed in our atmosphere; the rest travel round the sun and onwards in their interminable journey.

The Leonids have rather a romantic story. Little as it is that we see of them—for the flash of light which first tells us of their existence at the same moment tells us that they have ceased to exist—one of the most surprising discoveries made concerning them is that they are comparatively new-comers to the sun's family, and that probably at no distant time their splendour will have departed—distant, that is, as astronomical time is reckoned.

Ages ago they moved freely about in outer space, until their journeyings, or the movements of the sun itself, brought them within the sphere of the sun's attraction. The great French astronomer, Leverrier, calculated that in the year 126 A.D. the swarm approached the sun on a path very different from that in which they now move, and if undisturbed they would have circled round the sun and thence passed out of our system, probably never to return.

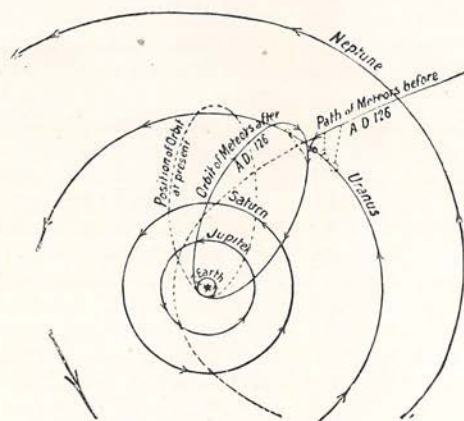
What, then, detained them? It happened that their path brought them very near to Uranus, so near as almost to graze him, and

the gravitational force of that big planet dragged them out of their orbit and sent them off on a new journey round the sun in a closed ellipse in which they can never escape from the sun's dominion. The sun will hold them captive for all time, but the influence of that original pull by Uranus is still making itself felt on the swarm. Some of the stones were diverted into closer orbits than others, so that the swarm is ever extending in length along its path.

Dr. Stoney estimates that seventeen centuries hence the train of the Leonid meteors will have doubled its present length. That being so, it must follow that in the lapse of ages the swarm will be entirely broken up, and the meteors, instead of clustering as at present, will form a complete ring around the whole orbit.

Still there will be a Leonid shower, but it will be every November, instead of at intervals of thirty-three years, as at present, and its proportions will have so shrunk that it will have entirely lost its old magnificence, and one of the most striking glories of the heavens will have departed.

So, like much else in the skies, the great Leonid shower, which we anticipate with such great interest next November, can only be ranked as a temporary phenomenon, having its day and passing into the unseen.



PATH OF THE LEONIDS.