

A Study of a Remarkable Meteor

A. J. James, M. D.

Houston, Texas

Twenty miles north of Peoria, the Illinois river is skirted on the east by a belt of timber about ten miles wide. In the midst of this forest, in the winter of 1875-76, there stood a large school house. A night session of a revival meeting was in progress with a crowded house. Although eight inches of snow covered the ground, a large, red hot stove made the house uncomfortably warm, the windows were open; time about 8:15 P. M.

The service is interrupted by cries "The house is on fire!" Looking through the windows it appears as light as day out of doors. The jam at the door delays the hurried exit. "Don't crowd, there is plenty time" the minister calls. Finally we are outside.

It seems really daylight, but everything is robed in a mantle of deep saffron. The crowd is gazing at an object in the heavens which appears to be nearly the size of the full moon. It is moving rather leisurely toward the east and is now very near the meridian. It's elevation from the southern horizon is between 50 and 60 degrees. The body shows a reddish-yellow disc with a distinct, circular limbus. No trail of light follows it.

We glue our eyes to the remarkable spectacle for a long while, maybe a full minute. It has now reached a point about half way between the meridian and the eastern horizon. There is an explosion, the body has divided into three large sections and a shower of sparks. The sparks quickly cease to emit light, and the large sections move forward at a considerable angle to each other. In a few seconds these sections explode again and the showers of sparks resulting cease to emit light quite a distance above the horizon.

The crowd has now gathered into groups listening to arguments, pro and con, as to the probability of this being the sign in the heavens which shall presage the end of the world. While many were talking excitedly, this absurd yet interesting comment was heard.

"I was sitting in a window and I saw the thing when it rose in the west, but I paid it no mind. I just thought it was the moon cutting up capers."

Finally the crowd reassembles in the house and the minister resumes his discourse. It is probably fifteen minutes since the meteoric display terminated. It begins to thunder, a soft deep toned rumble, but loud enough to make it difficult to hear the speaker. This continues for more

than a minute, and thus passes into history a meteoric visitation remarkable and awe inspiring in the extreme.

The newspapers reported observations of the meteor, but no account of its falling to the earth is remembered.

The above description is crude and, no doubt, inexact, but it is not imaginary, and it may serve, if considered with good judgment, as a basis for answering many intriguing questions in regard to the nature of this visitor to our planet.

Was the thunder caused by the flight through the atmosphere or by the explosions? If we grant that the thunder began fifteen minutes after the disappearance of the meteor, it must have been caused by the explosions. Sound travels about 180 miles in fifteen minutes and that is probably about the distance from us at the time of the explosions.

How high in the heavens was it when crossing the meridian?

It seemed to be moving leisurely—an indication of great distance. It had been in a state of incandescence and was therefore moving through the atmosphere for some minutes before reaching the meridian. The thickness of the atmosphere is variously estimated by different authorities. An encyclopedia published in 1925 estimates it from 300 to 500 miles. Other authorities estimate it 150 to 200 miles. It may be that the meteor was 200 miles from the earth when first seen in the west. It was constantly losing speed ahead and gaining acceleration of descent. After it crossed the meridian it traveled forward for something like 150 miles and exploded still quite high in the atmosphere. Probably an elevation of thirty miles and a distance of forty miles from the place of observation would be a fair estimate.

What dimensions may the meteor have had?

It was compared in size to the full moon. Even when hundreds of miles away in the western sky, it was mistaken for the moon by one spectator. The moon has an angular diameter of thirty minutes. A body at forty miles with an angular diameter of thirty minutes, must have a diameter of 1800 feet. Far beyond all reason. No doubt the glowing surface produced an exaggerated impression upon the retina. Still the body must have had considerable size. It produced a flood of light much greater than that of the full moon. It was incandescent for some time before the heat penetrated the core. A body forty feet in diameter at forty miles distance will have an angular diameter of four-tenths of a minute or about $1/75$ of the angular diameter of the moon. A body of less diameter could hardly show a disc with a distinct limb to the naked eye.

What was the probable constitution of the meteor?

The brightness of the light which shone on the earth suggests incandescent calcium or magnesium or both. The deep saffron coloration was quite certainly caused by glowing sodium vapor. A meteor composed of the heavy metals, as most meteors are, would hardly have occasion to explode. This meteor evidently had an inexplusive shell sur-

rounding an explosive core. The fact that the fragments ceased to emit light quickly after the explosions, indicates that they were of very low density, probably of a marked vesicular character. What could have caused the explosions anyway? Most likely the meteor was of homogeneous composition, a distinctly vesicular mass whose vesicles originally contained an explosive gas. Through long existence in empty space, the vesicles of the outer portion had evaporated their explosive contents, but, on account of the magnitude of the body, the core had not completely dried out.

Pumice stone is a mineral which fits the demands of the case quite perfectly. What gas fills the vesicles of pumice during its formation? LeConte's geology, page 85, says "Pumice is a peculiar, vesicular, variety of feldspathic lava". On page 86 he says "The gases expelled by volcanoes are steam, H_2S , SO_2 , HCl , and CO_2 . By far the most abundant of these is steam". Another author states "99 per cent of the gases escaping from volcanoes is steam". The explosive character of steam needs no comment.

If we grant that the meteor was of volcanic origin, we may still wonder if it was of earthly or lunar origin. There is evidence of the inconceivable violence of volcanic forces on the moon as well as on the earth. A mass of low density like pumice would be seriously hampered in its escape from the earth by the atmosphere. A given force acting on a projectile would drive it six times as high on the moon as on the earth. At the apex of its ascension, on the moon, the feeble lunar gravity would be opposed by a perceptible earth pull, which might be the deciding factor favoring a separate existence.

Why did the meteor move so leisurely in the heavens in apparent defiance of gravity?

To enter into this most interesting problem fully would prolong this discussion beyond reasonable bounds. Let it suffice to briefly mention a few of the factors operating, and anyone so inclined may elaborate them to his own enjoyment.

(1) If we grant that it was a satellite, it had very recently passed its perigee, and at this time it and the earth were relatively moving in opposite directions. For a while, gravity was entirely expended in overcoming this divergence.

(2) As gravity pulled it into a curved path, it had considerable head-on velocity; therefore much of gravity was consumed in overcoming its tangential stress.

(3) The meteor was observed by the people at the school house for 5 minutes or longer. In that 5 minutes, the earth rotated eastward 83 miles, thus prolonging the view.

(4) The meteor was evidently a large mass of very low density. Its glowing surface produced a strong current of ascending air. The buoyant force of which retarded to some extent gravitational acceleration.