

THE COMET OF 1881.

"And I looked, and, behold, a whirlwind came out of the north, a great cloud, and a fire infolding itself, and a brightness was about it, and out of the midst thereof as the colour of amber, out of the midst of the fire."—EZEKIEL I. 4.

NIGHT after night the self-same firmament is bent above us, the familiar constellations wheel their courses, and the moon glides through her wonted cycle, until we become so accustomed to the reigning order that we neglect even to gaze upon the celestial scene. The earth becomes our all in all, and we are blinded to the mystery and grandeur of the universe around. At length, however, the sudden apparition of some strange orb in the sky awakes us from our apathy. We look, and, behold! some comet with its luminous train, like a "great cloud, and a fire infolding itself," shines out of the north and seems to open up the heavens to our eyes, as did the vision of Ezekiel the prophet, by the river of Chebar in Babylon.

These, doubtless, were the thoughts of many who witnessed the comet of 1881, which so recently paid us a flying visit. Just as the first appearance of a white explorer to the blacks of Central Africa enlarges their notions of the world, so does the advent of a comet in our night-sky make us reflect on the

for good or evil; and, at all events, both of them are subjected to a curious examination. If the man is carefully investigated from head to foot by the intelligent native, the meteor is none the less inquisitively overhauled by the astronomer. "What is this thing, and where has it come from?" is the question which the man of science and the man of wool are equally eager to get answered.

The telescope, and latterly the spectroscope, have taught us a great deal about these vagrants of the solar system; but we have still much to learn. The telescope reveals their changing form to us, and the spectroscope gives us broad hints as to their chemical ingredients; but the information is by no means full, and their origin and structure still remain a mystery. In fact, although we believe that they are go-

verned by the general laws of nature, their varying shapes are so capricious, and their appearance so rare and unexpected, that there is yet something very mysterious about them. We cannot tell for certain what they are, where they come from, or the purpose for which they are designed.

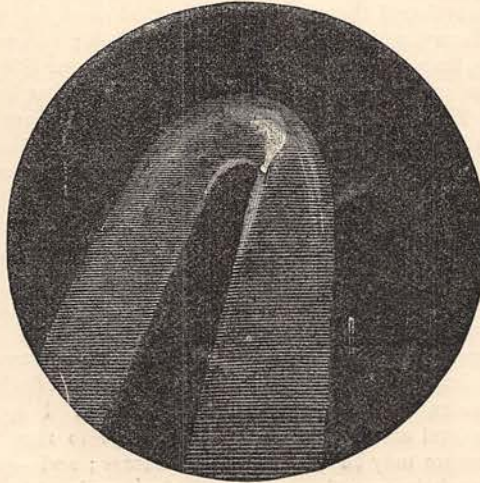


FIG. 1.



FIG. 2.



FIG. 3.

stupendous system of which we form a very insignificant part. The comet, like the explorer, too, is sometimes hailed as a supernatural being—a portent

But for this very reason, perhaps, the story of a comet is even more interesting than that of any staid and sober orb. A planet revolves year after year in

its fixed orbit, describing an elliptic course about the sun. Its velocity varies comparatively little, and the share of solar heat it gets from time to time is fairly constant. These are conditions which fit it for the support of living creatures. Again, the oval paths of the planets are nearly in one plane, that is to say, their general level with regard to the sun is confined to that narrow zone of the heavens termed the zodiac; and all of them sweep round their central luminary in a direction from east to west. There is thus a certain family order and uniformity in their behaviour.

But, on the other hand, the orbits of the comets are at all angles with respect to the sun, and they rush along them indifferently from west to east or east to west. Moreover, their orbits are seldom of the round oval shape common to the planets. When they do form a closed curve, they are very elongated ellipses, and the comet journeys from the immediate neighbourhood of the sun far out towards the confines of the solar system. Thus it experiences a transition from fervent heat to freezing cold, and a corresponding change of speed. More often, however, the orbit of a comet is a hyperbola, or open curve, whose ends stretch outward to infinity and never meet. In such a case the wandering body leaves our system never to return. A Bohemian of the universe, it holds its way towards the distant stars, and falls perchance under the attraction of some other sun, which it forsakes in turn.

It is not only in its motions that a comet differs from a planet, but also in its shape. A planet is usually a globe of solid matter, permanent in form; but a comet has no settled figure. Its typical shape, however, consists of a bright round nucleus, or kernel, surrounded by a glowing "hair" or coma, and attended by a long luminous train. But there are comets which have neither tail nor coma, and others, again, which have no nucleus. Astronomers have actually seen a comet shorn of its hair and tail in a few days. The tail is an appendage which appears to grow out of the head as the comet nears the sun, and to shrink again into the head as it retreats. Curiously enough, it is always extended in a direction away from the sun, whether the comet be approaching to or receding from that luminary, hence it sometimes streams behind, and sometimes in front of the head. The length of these splendid objects is frequently enormous. The tail of the great comet of 1680, for example, was estimated by Newton, at its perihelion passage, to be 41 million leagues, a much greater length than the whole distance

between the earth and sun. The volume of some comets exceeds the volume of the sun, but their total mass is very small in comparison, and even the most brilliant comets would be outweighed by one of the asteroids, or pigmy planets. This arises from the fact that they are principally composed of rarified gases.

Enough has been said to show that these magnificent but wayward orbs confer an extraordinary richness on the solar system, and serve to link it, by their timely visitations, to the vast universe of which it is a member. The multitude of comets has been likened by the great Kepler to the fishes of the sea; and Arago calculated that there are over seventeen millions of them careering within the boundaries of our system. Of these some 800 are known to man, by witness and tradition; but the majority of them are quite telescopic. The most celebrated of them are—Halley's Comet, noted in 1682, which returns every seventy-six years, during which time it recedes three billions of miles from the sun. Encke's Comet has a period of three and a half years, and recedes 375 millions of miles from the sun, that is nearly to the orbit of Jupiter. Curiously enough, however, this distance is decreasing, owing perhaps to ethereal friction, and the prospect is that in course of time the comet will fall into the sun. Biela's Comet has a period of six and three-quarter years, and during its visit in 1832 created the keenest apprehension that it would come into collision with our planet. But it crossed our orbit just a month in advance of the earth, and so we were



FIG. 4.

saved from any "brush" with a comet. What the consequences of such an encounter would be, it is rather difficult to say. The cometary mass is so slight, that no great shock would perhaps be felt; but if the incandescent nucleus struck the terrestrial surface, it might scorch a continent or boil a sea, and the glowing gases of the train might exercise a malignant influence upon our atmosphere. Biela's Comet, on reappearing in 1846, was found to have divided into two separate bodies, which travelled together, with ever-widening distance; but now the twin travellers have gone amissing altogether, and it is supposed they have been broken up by the meteor-streams which circle round the sun.

Besides these periodic comets there are several famous non-periodic comets, which have perhaps only been once seen by the human race; for example, the great comet of 1843, which was visible in full daylight; and Donati's Comet of 1858, which presented the appearance of a golden plume athwart the sky.

Comet B, 1881, as the recent comet has been called, is probably either a comet of long period or non-periodic. Admiral Mouchez argues that it is the 1807 comet returned a hundred years before its calculated time; but, although it is difficult to calculate the periods of comets which have long narrow orbits, the error here implied is somewhat dubious, and the concert of opinion is that Comet B is quite a stranger to our history.

It was first seen by Dr. Gould, of the Cordoba Observatory, Buenos Ayres, on May 29th last, and in England on June 22nd, shining in the northern sky a little below the star Capella, which it outvied in brilliance. The tail stretched some 8 degrees across the sphere in a fiery brush, and was computed to be 200,000,000 miles in length. On June 24th, the head seen through a telescope presented the appearance shown in Fig. 1, where a jet of fire is seen to shoot out from the round nucleus towards the sun and mingle with the coma, as if the sun repelled it. Next night the nucleus was rayed round with fiery jets, as shown in Fig. 2, and on the 29th of June the comet had acquired the beautiful shape seen in Fig. 3, and on a larger scale in Fig. 4. The bright jet now appeared like an open fan, and through the nebulous coma a small star, A, shone with almost undiminished lustre, as the stars shine through the violet haze of a tropic evening, or the evanescent flush of the aurora borealis. After this date the comet rapidly grew dimmer, and finally disappeared.

The spectroscope gave the usual spectrum of a comet's head, that is to say, a continuous spectrum crossed by bright bands, and indicating that the nucleus is probably an incandescent liquid, surrounded by a glowing gas. The tail shone partly by its own, and partly by the borrowed light of the sun. Its

spectrum declared it to consist of some hydro-carbon gas in a luminous condition, and one observer found so close a resemblance between its spectrum and that of a blue spirit-flame, that he did not hesitate to consider them identical. Alcohol has been found very widely diffused of late upon the earth, but its presence in a comet is somewhat unexpected!

What the repulsive force is which drives the tail away is yet a mystery. Indeed, having regard to the extraordinary manner in which these appendages grow and shrink, or sweep the sky, it is difficult to believe they are material at all. Dr. Tyndall has supposed that they are merely an appearance caused in the shadow of the comet's head by the chemical rays of the sun. Dr. Tait, again, has likened them to a covey of sea-birds swaying into view as they change their flight. Our own opinion is that the luminosity of the tail is really an electrical effect like the aurora or the glowing gases of the electric arc, and when we consider that both sun and earth are highly charged with electricity, and that the outbreak of a flame upon the sun is sometimes attended by a thrill of all the magnetic needles on the earth, and by an auroral light in the upper atmosphere, we need not wonder if the electric repulsion of the sun acting on the electricity of the comet should render its gaseous tail self-luminous.

What purpose a comet serves is equally unknown. It may be appointed the carrier of fuel to the suns, and the streams of meteoric stones which follow in its wake would seem to bear the theory out; it may be a world in growth which has not found its settled course; it may even, as a famous physicist once suggested, bear the seeds of life from world to world; we cannot tell; but that it serves some wise and most important end we dare not doubt.

J. MUNRO, C.E., F.A.S.



STRAWBERRIES, AND HOW TO GROW THEM.



IT is a very poor house at the present day that has not at least "a bit of garden," and of all the many flowers and fruits that are likely to be suggested to the amateur, there is not one that will pay him better for a little care and attention than the strawberry. Hardy and prolific, it thrives well on most soils, though perhaps a rich stiff loam in which is plenty of clay suits it best. The method of cultivation, too, is exceedingly simple.

In the month of June, July, or August—the earlier the better, but plants may be put out as late as November, and then give a crop the next year—a quantity of well-struck plants should be secured.

The ground on which they are to be planted must be well and deeply dug, and all roots as well as stones carefully removed. After the ground has lain still for a few days, a couple of trenches about fifteen inches apart, parallel to one another, and six or eight inches deep, should be made. At the bottom of these trenches some good old stable manure, well rotted, must be placed; about half the soil previously taken out of the trench should then be raked on the top of the manure. The young plants may be put in six inches or so apart, care being taken to press down the soil firmly about the roots, and to avoid covering up the crowns of the plants. Copious drenchings with rain-water will be necessary in order to give the young