

127,000 times the distance of the Earth from the Sun, and its velocity in approaching the Sun was so enormous, that it moved through 880,000 miles in an hour, reaching, at its perihelion, to within 144,000 miles of the Sun's surface, a proximity so great that it may one day be drawn into its devouring furnace. Sir Isaac Newton computed that its heat was then 2000 times that of red hot iron, from which it would take a million of years to cool! Dr. Halley having been the first who observed this great comet, when he was travelling from Calais to Paris, endeavoured to represent its motions by an elliptic orbit, with a period of 575 years. Hence, he was led to believe that this was the comet which terrified the Romans at the death of Cæsar, in the year 44 before Christ, and which re-appeared in A.D., 531, and 1106, but this opinion does not seem to be adopted by modern astronomers, for Humboldt states that Encke has ascribed to it a period of 8800 years.

While Halley was occupied with the study of comets, his attention was arrested by the appearance of the remarkable comet of 1682, and having determined its elements, he was led to the conclusion that it was the same as that which appeared in 1531 and 1607, with a period of about 76 years. In consequence of the period before 1682 being fifteen months longer than the preceding one, this delay in its appearance was ascribed to retardations produced by the action of the planets near which it passed, and astronomers were accordingly induced to compute these influences before it re-appeared in our system. The celebrated Clairant, assisted by Lalande, found that it would be retarded 100 days by the attraction of Saturn, and 561 by Jupiter. In the month of November, 1758, when the comet was expected, he announced that it would reach its perihelion on the 13th of April, 1759. It actually made its appearance in December, 1759, having been discovered by George Palitzsch, a Saxon farmer, and it arrived at its perihelion on the 13th March, 1759, only *thirty* days before the predicted time.

This remarkable body was again expected in 1835, and it was discovered at Rome on the 5th of August of that year. It reached its perihelion about the beginning of November, only eight or nine days from the predicted time. In 1531, the colour of the comet was bright gold yellow: in 1607, it was dark and livid: in 1682 it was bright, and in 1795 it was pale and obscure, and in 1835 it was pale and faint. Captain Smith made a very interesting drawing of it, in which a bright central point stands in the middle of a sharp crescent, having its concavity turned towards the Sun, a round nebulosity extending a little beyond the cusp of the crescent, and running out into an obscure tail of no great length. M. Arago had stated in his able treatise on comets, that in those which have tails the luminous ring encircling the nucleus is closed only on the side next the Sun, that is, it has a crescent form, with its convex side towards the Sun, whereas, in Captain Smith's drawing, the crescent was turned in the opposite direction.*

Long as is the journey which this comet performs in each century, it is short compared with that of 1811, to which Bessel has ascribed a period of 3383 years, and Argelander one of 2888 years. The comet of 1763 is supposed to have so long a period as 7334 years, and Encke, as we have already stated, ascribes to that of 1680, a period of 8800 years; but we cannot place much confidence in these numbers. The periods of comets can only be deduced from their successive re-appearances.

While it was the universal belief among astronomers that every comet wandered far beyond the limits of our system, the shortest period being 76 years, the celebrated Professor Encke, in 1819, announced the discovery of a comet of such a short period, scarcely $3\frac{1}{2}$ years, that its orbit was included in our solar system, its remotest part extending a little beyond the orbit of Pallas, and the other reaching to that of Mercury. The eccentricity is nearly the same as that of the planet Juno, and it moves almost in the plane of the ecliptic. Its periods between the years 1786 and 1838, have been regularly diminishing by 1 day and 20 hours in each revolution. This comet is a very faint one, being just visible with the naked eye, and destitute of a tail.†

* M. Langier has lately demonstrated that Halley's comet of 1682 is identical with the comet of 1378, recorded in Edward Biot's Chinese Catalogue of Comets, and that its period between 1378 and 1835 has varied between 74.91 and 77.58 years, the mean being 76 years and a quarter.—Humboldt's *Kosmos*, p. 119.

† A very full account of this comet will be found in the *Edinburgh Journal of Science* for October, 1827, No. xiv., p. 273.

In the year 1826, astronomers were again surprised at the discovery of another comet by Captain Biela, which has a period of $6\frac{3}{4}$ years, and whose orbit extended beyond that of Jupiter, but did not reach the orbit of Saturn. Its light was still fainter than the comet of Encke. Its orbit came so near the ecliptic, that it passed within 18,000 miles of a point in the earth's orbit, on the 29th October, 1832, the previous announcement of which in Paris, created such alarm, that M. Arago was called upon to allay the fears of the community. The earth arrived to that point of its orbit about a month after the comet had passed it, but the distance of the two bodies was then 55 millions of miles.

A third comet, moving within the bounds of the planetary system, was discovered at Paris, on the 22d of November, 1843, by M. du Fayo. Its periods is 7 years and 3-10ths, and it is remarkable for its orbit, which approaches nearer to a circle than that of any other comet, and which is included between the orbits of Mars and Saturn. There is reason to believe that this comet is the *lost comet of 1770*, which appeared from the computations of Lexell, to have had its orbit changed by the action of Jupiter, from an elongated ellipse to an oval, with a period of $5\frac{1}{2}$ years. Although it ought to have re-appeared *thirteen* times since 1770, it has never till lately been seen by astronomers. Burckhardt was of the opinion that it might have become a satellite to Jupiter, from the proximity of its aphelion to that planet, and others conjectured that it might have passed near the minor planets, and imparted to Ceres and Pallas those large atmospheres which surrounded them, and which do not exist in Juno, or Vesta, or Astræa. But its re-appearance in 1843 show that, if the last hypothesis be true, it has only given a portion of its vapour to Ceres and Pallas.

When we consider the great number of comets which have been actually seen, and recollect that on the hypothesis of their being equally distributed in space, there would be nearly 250,000 of them that would approach nearer the sun than Uranus, we can scarcely conceive that any real comet belongs to our own system, and are therefore led to imagine some rational origin for the three small and almost telescopic comets which we have now been describing as denizens of the solar system. These three bodies are as remarkable anomalies among comets as the five fragments of one planet are in the planetary system; and when we consider their proximity to the new planets, and the similarity of their orbits, we think it is not a very wild supposition that they may have been formed when the great planet between Mars and Jupiter was burst, and may be part of the gases or vapours which either had been imprisoned in its interior, or which had entered into the composition of its atmosphere.

Comets have, in all ages, excited terror and alarm among nations, and we can scarcely venture to say that the knowledge which we now possess of their nature and movements has a tendency to dissipate these fears. Comets have passed near the earth and may pass still nearer; but even if they should not produce those tremendous effects which even Laplace has indicated, and if their great rarity and rapid motion should hinder them from acting upon our seas, or changing the axis of our globe, a sweep of their train of gas or of vapour would not be a pleasing salutation to living beings. We know nothing of the gases or the exhalations which seem to compose these anomalous bodies; they may be acrid, or they may be poisonous, and we should dread more being suffocated by their breath, than stunned by their blows.

We have already had occasion to state that a planetary system, attended with such a mass of comets as ours, must appear, when seen from a distance, as a nebulous mass containing stars. When we consider the great length and breadth of the tails of comets when they are within our system, and the strange and unexpected fact, that the nebulosities of comets increase in proportion as they recede from the sun, in place of contracting, as we might have expected, when they reach a colder region, it became a matter of certainty that our cometary system must have the appearance of a nebula, and that the matter which composes comets may be the unresolvable nebulous matter in many parts of the heavens.

* Encke's comet, for example, was nearly three times farther from the sun on the 23th October than on the 24th December, and the diameter of its nebulosity was, at the first date, 316,440 miles, and at the second only 24,530 miles, or it was increased by a triple distance 28 times.