

THE MYSTERY OF COMETS' TAILS.

From the Scientific American.

There is nothing in nature more mysterious than that growth and motion of the trains of comets. When a comet is first discovered by a telescope it generally has no tail, appearing like a faint star seen through a haze. As it approaches the sun the tail is developed, starting out on the side next the sun, but being immediately turned back, as if it were a flame acted on by a powerful blast coming from the sun. The nucleus or head of the comet is matter, though lighter than the thinnest fog, but the tail is either not matter at all, or it is acted on by forces which do not manifest themselves on this earth. If the train were simply matter, acted on by gravitation, it would follow the head in its track around the sun, consequently bending, as the head sweeps around the part of its orbit nearest the sun, into nearly a semicircular curve. Instead of this, the train *always points from the sun*, swinging around as the stream of light from a lantern in the fog does when the lantern is turned. As the trains are sometimes of such length that they would reach from the sun to the earth, and as the comet when nearest the sun moves through many degrees of its orbit in a few hours, the end of the train is swept around with a velocity which forbids the belief of its being matter possessed with the property of inertia.

The velocity, too, with which the tail is shot forth is irreconcilable with the idea of its being subject to the law of inertia. The tail of the great comet of 1680, immediately after its perihelion passage, was found by Newton to have been no less than sixty millions of miles in length, and to have occupied only two days in its emission from the comet's body.

One of the most singular phenomena of comets' tails is the violent commotion observed in them. Flames stream forth from the nucleus in fan-shaped and various other and swiftly changing forms, toward the sun at first, but bending quickly back as if encountered by a furious blast, and then streaming away millions of miles into the sky. This may be owing to the intense heat to which they are exposed from their proximity to the sun. The great comet of 1843 approached the sun within about a seventh part of the sun's radius. Sir John Herschel calculates that at this distance the heat of the sun would be 47,042 times greater than it is at this

earth, and at least $24\frac{1}{2}$ times greater than the heat in the focus of Parker's great lens, which melted cornelian, agate and rock crystal.

Usually, as the comet moves away from the sun, the train, which it is now pushing partly before it, gradually diminishes till it disappears altogether. Sometimes, however, the train is obliterated in the vicinity of the sun, the comet emerging from the sun's light without any tail whatever. At other times the tail is the longest, just after the perihelion passage; at others there are two or three or more tails branching out like a fan. They are frequently curved like Donati's in 1858, and exhibit a great variety of singular phenomena, which are an incomprehensible mystery to the students of astronomy.

At about the same time, Bessel and Prof. Pierce, each independently of the other, offered the suggestion that the trains of comets may be electricity. Perhaps they are simply light; the sun's rays, in their passage through the unknown substance of the nucleus, may acquire the power—analogue to polarization—of producing the vibrations which constitute light.

The heads of comets are unquestionably formed of material substance, as they are acted on by gravitation; and reflect the sun's light, but this substance is generally of extreme tenuity. Stars of the smallest magnitude have been seen through the densest portion of the head, and, in the language of Sir John Herschel, "The most unsubstantial clouds which float in the highest regions of our atmosphere must be looked upon as dense and massive bodies compared with the filmy and all but spiritual texture of a comet." In some, however, a very minute stellar point has been seen, indicating the existence of a solid body.

Among the mysterious phenomena presented by the head, is its diminution in size as it approaches the sun, and its expansion during its retreat. It also throws off nebulous envelopes one after another, during the formation of the train, in a very curious manner.

Many of the comets move in elliptical orbits, and continue to revolve around the sun. But the orbits of a few have been ascertained to be hyperbolas, and these consequently will never return. Light, ethereal volumes of vapor, they come from unmeasured distances above, below, or on either hand, with constantly accelerating velocity, rush in strange turmoil around the sun, and then move more and more slowly away on their solitary courses into the depths of space.

CHILDREN SHOULD BE TAUGHT TO THINK FOR THEMSELVES.

The moral cultivation of children belongs mainly to parents, at home; and is achieved more by example than by precept. The boy whose father abhors a lie, seldom becomes a liar. Children are imitative beings; and as imitation soon becomes habit, parents cannot be too careful what examples for imitation they set.—We do not pretend to lay down rules for moral training; a sufficiency of them for every practical purpose will be found between the covers of that ancient and much neglected book, the Bible, and it is for parents to make the application clear to their children. We would have the young taught to think for themselves and assisted to think justly, and to do this, the parent must himself think justly.

To think for themselves! And how are they to be taught to think for themselves? In various ways, and if we may be allowed to recommend any branch of education, particularly, by the study of the exact science; at least to some extent. It is true that every boy is not qualified by nature to become a great mathematician, but almost every one is capable of being taught that twice two are four, and we would cultivate whatever mathematical talent a pupil has, were it ever so little. And why, we may be asked, should he study algebra and geometry, if he is to be a farmer or a shopkeeper? For this reason: it will teach him to think, to weigh every thing, to take nothing for granted without sufficient reason, to examine whatever is doubtful or suspicious, to detect error, and very often to arrive at truth. It will make him in a measure independent of the opinion of others; for he who thinks much and deeply is of healthy mind, competent to form opinions of his own. The elements of Euclid is an easy and delightful book, which it does not require any extraordinary capacity or much time to master; but we will venture to affirm that the few days or weeks spent upon it will give the student a habit of thinking and close reasoning that will never depart from him, and that will be of inestimable advantage to him through life.—Miss C. E. Beecher.

Q. A bothering fellow, meeting a coal merchant, inquired what a chaldron of coals would come to. The coal merchant began to consider, and knowing that the question was put to him for mere idle curiosity, deliberately answered, "Sir, if they are well burnt they'll come to ashes."