

and south across the field of view, the middle line marking the meridian.

When a time observation is to be made, the observer first selects a suitable star from a printed star list, which gives the exact time at which each of the principal stars crosses the meridian. He then sets the telescope at the proper points on the meridian to intercept the star, and, putting his eye to the eye-piece, waits for the star to appear.

As the star crosses each of the lines before mentioned he presses an electric key which he holds in his hand. The signals thus given are recorded electrically on a registering instrument called a chronograph, on which are also being recorded the seconds of the sidereal clock. The chronograph consists of a cylinder made to revolve by clockwork at the rate of about once a minute.

A paper wrapped around this cylinder receives the record traced by a pencil, which is connected by an electric magnet in such a manner that any signal, made either by the operator or by the clock, causes the pen to make a mark on the paper.

By examining this paper the observer is able to tell within the tenth of a second the time which the normal clock indicated when the star crossed the meridian.

Comparing this with the time taken from the star list shows the error of the clock. A comparison is then made between the sidereal and mean time clocks, which, after allowing for the difference between the mean and sidereal time, shows the error of the mean time clock.

If the clock is slow, a slight weight is placed on the top of the pendulum bob, which causes the clock to gain slightly. If, on the other hand, the clock is found to be fast, a corresponding weight is removed, making the clock lose slowly. In this way the standard signals are kept within a few tenths of a second of the correct time.—*The Ohio Valley Manufacturer.*

THE ORIGIN OF METEORITES.

In former times it was thought that meteorites were of terrestrial origin, thrown out by volcanoes, or condensed vapors, or else that they hailed from the moon.

These suppositions do not hold good when we consider the enormous initial velocity, the great number, direction and periodical recurrences of these phenomena. For the same reasons, is it impossible that they should be fragments of a destroyed satellite—a second moon—supposed to have revolved around our planet in past ages, or yet that they are diminutive, independent planets of our solar system.

The hypothesis that they are identical with shooting stars and comets is the one accepted almost universally by scientific men.

Most important discoveries tending to prove this assumption were made by Schiaparelli, showing that shooting stars, as well as meteorites, are solid bodies, which enter the atmosphere of our earth with an immense velocity and become luminous because of the resistance offered by the air.

It has been calculated that they usually appear at a height of about seventy miles above the earth and disappear at a height of fifty miles. The cause of their disappearance or extinguishing is to be looked for either in their once more leaving our atmosphere, or that they are atomized by the fierce heat generated by their extremely rapid flight and the great resistance offered by the atmosphere. The latter assumption would account for the continuous fall of cosmic dust upon the surface of our globe.

The velocity with which they enter and pass through our atmosphere is enormous. It is many times faster than sound, the flight of a cannon ball, and even the planets revolving around the sun.

The earth travels through space at the rate of 19 miles per second. Mercury, the fastest planet, covers 29.87 miles per second, while a meteorite which fell at Pultusk, Russia, had a velocity of 33.78 miles per second, although it had to overcome the resistance of the air. In space, consequently, it must have travelled still faster.

To clearly understand the high degree of velocity implied by these figures, it is well to add that the fastest cyclone scarcely reaches 150 feet per second, at which rate it exerts a pressure of about fifty pounds per square foot.

It now remains to explain the assumption that meteorites and shooting stars are identical, and to quote the facts upon which this assumption is based.

We know that both are solid bodies which enter our atmosphere from without, and that they become luminous for the same reason. Furthermore, the cosmic iron dust observed in localities where its origin could not be doubted has been found to have the same chemical composition as larger pieces of meteoric iron seen to fall by unimpeachable witnesses.

It cannot be denied that there is a very great contrast between the little star that silently glides through space and noiselessly disappears and the terrifying appearance of a ball of fire, that, approaching with deafening detonations, sends down on us a hail of stones.

Both spectacles, however, are but the extremes of a chain of closely connected phenomena. Considering with what extreme velocity these bodies pass through the atmosphere, it is not difficult to comprehend that particles, and those having the greatest momentum, are destroyed long before they reach the earth, and at such a height that the noise of their passage and disintegration becomes inaudible to us here below.

We find a further confirmation for the belief that both of these phenomena have the same source in the well established fact, proved in many instances, that the direction of the meteorites corresponds to that of shooting stars observed at the same time, and points to a common point of radiation.

The detonations accompanying the fall of a meteorite have three distinct causes: The whizzing is caused by its rapid passage through the air; the crackling, by the combustion of the materials composing it; and the thundering, by columns of air rushing into the vacuum which it leaves behind.—*F. C. Von Petersdorf, in Great Divide.*

WONDERS IN BONES.

Exhibited in a glass case at the National Museum, in Washington, there is a bone—a human tibia—tied in a knot. It has been rendered thus flexible by soaking it in acid, which has dissolved out of it all its mineral parts, leaving only the animal portion. This portion makes about one third of the bone, which fact might surprise some people who suppose that their bones are almost wholly lime.

“There are funny things about bones other than funny bones,” said an osteologist connected with the Smithsonian Institution to a writer for the *Washington Star*. “For example, the bones of birds are hollow and filled with warm air from the lungs, so it may be said that a bird breathes down to its very toes and to the tips of its wings. In fact, if you