transcend what is called the practical limit of the atmosphere. Hence no one thinks it a strange thing that the clouds should be moving above us while the air at the surface is nearly still. But when we observe the heavenly bodies we see in their motions an imposing regularity, and we know that their motions are in no way influenced by the wind. From parallax and the properties of light we learn that amongst the heavenly bodies the earth is so insignificant that its very existence is known only to a very few, and that the differences in the distances of the heavenly bodies are immensely great. We can also easily observe that at least a few of them have motions relatively to the rest. From such facts combined with the observation that the axis of rotation, be it of earth or heavenly sphere, has nearly a constant direction, and that appearances would be the same whether it be that the earth rotates or the sphere of the heavens, we are almost forced to conclude that while the clouds form essentially a part of the earth, and that their motions with respect to it are real, the heavenly bodies are in no close way connected with it, and that their daily uniform rotation from east to west is merely apparent, the effect of a real rotation of the earth itself. (Illustrated by travelling in a railway carriage or steamboat.)

But the axis of rotation is not absolutely fixed in direction (phenomena of precession and nutation), and if it be the sphere of the heavens which rotates, we must allow that whilst the relative positions of the stars remains the same, the axis of rotation moves amongst them, or that the earth keeps moving a little, so that the axis of the heavens might always coincide with the same diameter. Surely such phenomena are much more naturally explained by a change in the direction of rotation of the axis of the earth.

Having proved the earth's ellipticity by actual measurement, the laws of hydrostatics require that to keep the waters of the ocean on the earth's surface as they really are, there must be something influencing their weight. This is most satisfactorily explained by a diminution of weight as we go towards the equator, owing to a rotation of the earth. (Illustrated by experiment.) But Foucault's pendulum actually shows us the rotation of the earth. (This was explained by a model. Time of rotation of plane of oscillation of a pendulum in the latitude of Kingston = $34\frac{1}{2}$ hours nearly. The gyroscope was also explained and precession illustrated by experiment.)

Another palpable proof of the earth's rotation is found in the fact that a stone let fall from the top of a tower will fall somewhat to the east of the vertical. This arises from the top of the tower having to describe a larger circle than the bottom in the same time, and having therefore a greater linear velocity from west to east.

The earth's rotation being now satisfactorily proved, let us investigate what would be the effects of such a rotation, and see if they actually exist.

Unless the earth were a rigid body such a rotation would make the earth's figure that of an oblate spheroid, which we have just proved by measurement to be its form. Another necessary consequence would be a gradual diminution of the weight of a body in going from either pole to the equator. It is easily calculated that on this account the weight of a body at the equator is to that at either pole as 288:289. But we found that owing to the earth's ellipticity alone the weight of a body was diminished by $\frac{1}{591}$st part in going from either pole to the equator. Now, $\frac{1}{289} + \frac{1}{591} = \frac{1}{194}$, and by actual experiment and calculation it is found that the weight of a body at either pole is to that at the equator as 194:193.

The trade winds can be most satisfactorily accounted for by a rotation of the earth from east to west, combined with a greater heating of the atmosphere at the equator over that at the poles. These winds, too, preserve, according to the laws of fluids, equal pressure in all parts of the atmosphere, blow from the poles towards the equator, but having less velocity from west to east, than bodies at the equator appear to blow likewise towards the east, and are therefore north-east and south-east winds. The monsoons, hurricanes, as well as the ocean currents, like the Gulf-Stream and Kuro Shiwo or Japan Stream, are explained in a similar way. The phenomena of procession and nutation are explained by a change of the direction of the earth's axis of rotation, caused by the action of the sun and moon on the protuberant matter at the equator. These bodies tend, according to the law of universal gravitation, to make the earth rotate about an axis in the plane of the equator, perpendicular, therefore, to its axis of daily rotation. (Illustrated by experiment.) Such an action can alone alter the direction of the axis of rotation, not the angular velocity. Hence precession and nutation cannot alter the length of the day. Indeed, this motion of the earth by which we reckon time is the most uniform of all motions known to us. Laplace having made a careful comparison of modern with ancient observations of eclipses, has asserted that the length of the sidereal day cannot have altered so much as the $\frac{1}{100}$th part of a second in upwards of 2,000 years. But we know that the friction of the tides on the earth's surface and its secular cooling must at length, however, slowly alter even this element,

To these proofs of the earth's rotation, it is interesting to add the evidence we obtain from the analagous motions of the other heavenly bodies. Those few which can be so closely examined, viz., the sun, moon, and a few of the planets, are found to rotate like the earth about a fixed axis and in the same direction as the earth does.

REVOLUTION OF THE EARTH AROUND THE SUN.

If, for several days and nights, the rotation of the sphere of the heavens about the earth be closely observed, it is found that whilst the apparent rotation of the stars is performed uniformly, that of the sun or moon is not uniform. Hence in addition to a daily rotation, these bodies have a motion relative to the earth. On account of this new motion of the sun, it is found to describe a great circle of the sphere of the heavens inclined to the equinoctial at the angle of about $23\frac{1}{2}°$ in $366\frac{1}{4}$ sidereal days. This path of the sun amongst the stars is called the Ecliptic and is practically fixed. You must not confound a heavenly body's apparent path in the sphere of the heavens with its real path in space. Thus, while the sun's apparent annual path in the sphere of the heavens is a great circle, its path relatively to the earth is an ellipse with the earth in one of the foci. This is proved in the following way. It is found that in this its new orbit the sun's apparent size varies. The most natural inference to be drawn from this fact is that the sun's distance from the earth varies in the inverse proportion, and on this assumption the path is found to be an ellipse with the earth in one of the foci. But the sun and moon are not the only bodies which seem thus to move amongst the stars. There are a few others called planets, the motions of which seem to be in no way connected with the earth, and although apparently more closely connected with the sun, yet, even with respect to it, their apparent paths are by no means ellipses or any other known curves. Let us now ask ourselves the question, "May not this annual motion of the sun relative to the earth be an apparent motion arising from a real motion of the earth around the sun?" The rotation of the sphere of the heavens having been proved to be similarly accounted for, it is very justifiable to suspect that such may be the case. As regards the sun, phenomena would be the same in either case, a positive revolution of the earth around the sun would produce an apparent positive revolution of the sun around