

## Extracts from Publications.

### OUR OLD EARTH.

*Some facts and misconceptions.*—From many points of view, remarks the *Leeds Mercury*, there is much of which we are ignorant concerning this old world of ours. Thus, we are not quite certain even as regards its exact shape, and there are many what would appear to be elementary facts regarding which our knowledge is either very limited or at any rate not complete.

Thus the Earth does not spin steadily round a fixed axis, the ends of which are represented by the poles. It has long been known that the magnetic poles of the Earth slowly change their position, but the same is true of the geographical poles. Not only is this the case, but it has been demonstrated that the apparently sedate old Earth is not nearly so steady as she appears, but that she actually executes a kind of waltz, shifting her axis from time to time.

It is true these motions are very slight. The poles never shift above thirty feet from their mean position in consequence of this irregular motion. It has been suggested that the reason for the movements is the changes which take place in the polar ice-caps, according to the severity of the season, a greater or less amount of ice accumulates at the poles and this has the effect of changing the way of the Earth at these portions ; or to speak strictly, of altering the centre of gravity of the Earth.

Then we are taught at school that the shape of the Earth is an oblate spheroid, and this shape is illustrated by stating that it is much the same as an orange, the Earth being flattened top and bottom at the two poles. By accurate measurement it appears that the diameter of the Earth through the poles is twenty-seven miles less than the diameter of the equator. It is believed, however, that the popular statement is not the entire truth ; that is, the flattening is not the same at each pole. Recent polar discoveries tend to show that the flattening is greater at the North Pole than at the South.

*Sea not level.*—Another peculiar discovery is that the equator itself is not a true circle. A good deal of investigation has still to be made in this subject, but sufficient has been established to show that the shape of the Earth is not nearly so simple as was imagined some years ago.

We frequently speak of " sea level " as the basis for measurements, fondly imagining that the sea itself is at

the same level throughout the globe. Investigations have shown that the sea is by no means level; of course, no reference is intended here to the factor of tides and change of this sort.

It has been established now that there are actually mountain ranges of the sea, so that the level varies in different portions of the world. Thus, while most persons would imagine that the Pacific Ocean and the Atlantic Ocean must necessarily stand at the same level, the fact is that along the coast of South America, the Pacific Ocean is actually something like 2,000 feet higher than is the water of the Atlantic touching the land straight opposite.

Again, in the Bay of Bengal the water is heaped to a height of 300 feet above that of the water in the Indian Ocean. The explanation of this heaping-up of the waters is the attraction exerted by the vast land mountains in the neighbourhood. Thus, the American Andes exert an attraction which tends to heap up the South Pacific, while the Himalayas permanently maintain great mountain masses of water in the Bay of Bengal.

Some years ago it was imagined that the atmosphere extended only for somewhat about thirty miles above the mean level of the Earth. At present it is believed that 150 miles is a nearer estimate. All the same, we are quite ignorant as to the real extent of our atmosphere. We are in the same position as crawling creatures would be at the bottom of a deep sea, creatures which could not rise to the surface and had to make more or less shrewd guesses as to the height of the fluid which pressed upon them.

*Depth of the atmosphere.*—The principal method of estimating the depth of the atmosphere is based upon the meteors which visit us. These are pieces of astral matter sent flying through space, but which come within the Earth's attraction and so are drawn to its surface. Owing to the enormous pace at which these pieces of matter travel, they become heated to incandescence as soon as they meet the friction of our atmosphere, and so accurate observations give us some idea of the distances which they travel while in a luminous condition.

Possibly the greatest of all problems concerning this world of ours is what exists beneath the Earth's crust. It is really surprising how little we know of the interior of the Earth. Thus we speak about the crust, although this is somewhat of a misnomer. We know no more about the interior of the Earth than we should know of the interior of an orange from a mere inspection of its skin.

In fact, those small depressions on the skin of an orange are deeper in proportion to its bulk than are the deepest holes in the Earth's surface compared to the bulk of the Earth. Thus, we cannot claim to have done more than merely scratch the surface of the Earth so far, and so we have to guess more or less shrewdly at what is beneath.

*Internal Heat.*—So far as regards the surface of the Earth, we know that the deeper a pit descends the higher becomes the temperature. This is the case in every part of the world, and, generally speaking, for every sixty feet below the surface the temperature goes up 1 degree F.

If this increase goes on with the depth, it follows that at the centre of the Earth there must be a heat terrifically beyond anything with which we are directly acquainted. At a depth of thirty miles the heat would be such as to fuse any rocks at atmospheric pressure. This is why the earlier geologists imagined that we lived on a fiery fluid globe whose crust only had cooled, and that volcanoes were simply taps letting out some of the subterranean fires.

It is tolerably well established now that there is no foundation for such a belief, and that whatever may exist at the centre of the Earth it is not a mass of fire. This fire theory was the earliest of our beliefs concerning the Earth, and strangely enough, in most religions the lower world was supposed to be of fire. Pluto, Proserpine and Vulcan held their sway in the lower world in a region of fire, and it was there where Vulcan forged the thunder bolts of the mighty Jove.

It is comparatively easy to weigh the Earth as a whole, and this has been done within the limits of reasonable accuracy with the result that we know that the Earth is about five and a half times heavier than it would be were it composed of pure water. Also experiments have shown that the weight of the portion of the Earth which we can handle is something less than three times as heavy as water. Hence the density of the whole Earth is roughly twice as great as that of the rocks at the surface. In other words, the inside of the Earth is much heavier than the outside.

*Beliefs concerning the Earth.*—Some have believed that the earth is built up of layers after the fashion of an onion. Others that between the centre of the crust there was an ocean of fused material. All the best authorities, however, long have discarded the notion that there is a great central fluid mass.

The late Lord Kelvin showed that the attraction of the Sun and Moon, which produces our tides, would have caused the Earth to burst were the interior fluid, unless the Earth's crust were 2,500 miles thick. He showed that the tidal force

is so enormous that if the crust of the Earth were continuous still it would yield as much as if it were india-rubber to the Sun's and Moon's attraction.

The whole subject is still in a somewhat mixed-up condition, but the latest belief is that the Earth's central mass is metallic, and that it is as hard and solid as so much steel. At our earthquake-recording observatories, tremors have frequently been recorded which have come from Japan right through the centre of the Earth, and it is known that such a tremor could not possibly pass unless the earth had a rigidity approaching that of steel. We are perfectly ignorant, however, as to what the metal is which forms the bulk of our Earth. Very probably it is a combination of metals, but it is impossible here even to hazard an opinion, or to do anything else than to record our complete ignorance of the matter.

[*English Mechanic.*

At the monthly meeting of the Royal Meteorological Society held on the evening of Wednesday, March 20th, Prof. Otto Patterson delivered a lecture on "The Connection between Hydrographical and Meteorological Phenomena." He began by saying that the mediæval age was characterized by frequent violent climatic changes, which seem to have culminated in the 13th and 14th centuries, when hot summers accompanied by draughts (which nearly dried up the rivers of Europe) alternated with cold summers and excessive rainfall. In winter violent storm-floods occurred, which entirely remoulded the coasts of the North Sea or frost set in so severely that the entire Baltic and even sometimes the Kattegat and the Skagerak were frozen. The lecturer showed that such phenomena may be ascribed to alterations in the oceanic circulation caused by the influence of the Moon and the Sun. Experiments carried on during the last four years at Borneo, in Sweden, have shown that the inflow of the undercurrent from the North Sea into the Kattegat—which brings the herring shoals in the winter to the Swedish coast—is oscillatory, the boundary surface of the deep water rising and sinking from 50 to 80 feet about twice a month. The phenomenon is governed by the Moon's declination and proximity to the Earth.

From astronomical data Prof. Pattersons concludes that the influence both of the Sun and of the Moon upon the waters of the ocean in winter about the time of the solstice must have been greater 600 to 700 years ago than at the present time. This must have caused a more intense circulation, of which we have conclusive evidence in the fact that the migrations of the

herring, which now only reach as far as to the Kattegat, in those centuries extended into the Baltic. The bank water or deep water of the Kattegat in winter time must then have attained a higher level and entered the Baltic through Crescent. The surface-layer must have been thinner, and as a thin surface-layer is much more easily cooled in winter and heated in summer than a thicker one, it is evident that the controlling temperature influences of the ocean must have been different at least in North and North-Eastern Europe, whose climate in mediæval time must have had, on the whole, a more continental character than now. In conclusion the lecturer showed that the hypothesis, first proposed by A. W. Ljungman in 1879, that the great secular periodicity of the herring fishery of Bohusland should agree with that of the sun-spots, is by no means incompatible with the phenomena here described, since the 14th century is noted in Chinese annals as an epoch of maximum solar activity, and since the sun-spot frequency curve of Wolfer can be reconstructed by harmonic analysis, using the Moon's apsidal and nodal periods as the basis of the analysis.

## Memoranda for Observers.

Standard Time of India is adopted in these Memoranda.

*For the month of June 1912.*

Sidereal time at 8 p.m.

			H.	M.	S.
<i>June 1st</i>	...	...	...	12	38 49
„ <i>8th</i>	...	...	...	13	6 25
„ <i>15th</i>	...	...	...	13	34 0
„ <i>22nd</i>	...	...	...	14	1 36
„ <i>29th</i>	...	...	...	14	29 12

From this table the constellations visible during the evenings of June can be ascertained by a reference to their position as given in a Star Chart.

Phases of the Moon.

			H.	M.
<i>June 8th</i>	Last Quarter	...	...	8 6 a.m.
„ <i>15th</i>	New Moon	...	...	11 54 a.m.
„ <i>22nd</i>	First Quarter	...	...	2 9 a.m.
„ <i>29th</i>	Full Moon	...	...	7 4 p.m.