

THE LAST GLACIAL EPOCH

On the Cause, Date, and Duration of the Last Glacial Epoch of Geology, and the Probable Antiquity of Man.

With an investigation and description of a new movement of the Earth. By Lieut.-Colonel Drayson, R.A., F.R.A.S. (London: Chapman and Hall, 1873.)

THE author of this work allows the existence of the motion of rotation of the earth on its axis and its revolution round the sun. That motion, however, of the axis of the earth, to which is due the precession of the equinoxes, is to him a great stumbling block. He denies the possibility of this motion as generally accepted, and gives us a theory of his own, which is very novel, and the results of which are startling in the extreme.

Lieut.-Colonel Drayson either knows nothing of dynamics or despises the science: the one key he makes use of to unlock the secrets of astronomy is geometry; he does not believe in the existence of a change in the plane of the ecliptic, and apparently is not aware that the attractions of the other planets on the earth *must* produce periodic changes in the plane of the earth's orbit. In consequence of this he persuades himself that all astronomers teach (and perhaps believe) that while the pole of the earth is describing a circle round the pole of the ecliptic, the obliquity of the ecliptic, which is the angular distance between these poles, is constantly changing. He calls this a geometrical impossibility, and nobody would hesitate to agree with him that it is; but astronomers would at once deny that they either teach or believe anything of the kind. The popular belief is that the pole of the earth describes a circle of radius $23^{\circ} 28'$ round the pole of the ecliptic as a centre, and that the whole circle would be described in something over 25,000 years.

Lieut.-Colonel Drayson tells us that the true motion of the pole of the earth is in a circle whose radius is $29^{\circ} 25' 47''$, and whose centre is at a distance of 6° from the pole of the ecliptic. He attempts to prove this, and, we believe, has succeeded in persuading himself that he has proved it. He does this by showing that this particular circle will satisfy all the necessary conditions, as he puts them, and also (we assume) as he understands them. The author next proceeds to deduce the consequences of this motion. His circle would be described in 31,840 years, so that at intervals of 15,920 years the obliquity of the ecliptic would vary as much as 12° . The consequence of this would be that about 13,700 B.C., Great Britain would have had during the winter an arctic climate, the sun in lat. 54° not being 1° above the horizon at the winter solstice, and during the summer a tropical climate. This is supposed to have been the last glacial epoch, and the author has such confidence in his theory that he promises us glacial epochs every 31,840 years.

The book, as a whole, we look upon as most unsatisfactory. Had the author mastered the principles of dynamics, he probably would not have been led by a mistaken interpretation of movements which he only partly understood, into the fatal error of attempting to solve one of the most abstruse problems in astronomy by mere geometry. The days of such attempts were, we hoped, past for ever.

The motion of the earth's axis is well illustrated by the motion of a boy's top when it is spinning with its axis inclined to the vertical. Every one has seen a top while spinning on its own axis, revolve round the vertical with approximately constant speed, while its axis remained inclined to the vertical at an approximately constant angle: but who has seen a top spinning so that its axis revolved with constant speed round a line inclined to the vertical at an angle of 6° , or any other angle? Till Lieut.-Colonel Drayson produces a top which will do this, thereby proving experimentally that such a motion is possible, or till he demonstrates by analysis the possibility of such a motion, we shall feel confident in rejecting his theory of the earth's motion, as the theory of a paradoxer, and in regarding the cause of the last glacial epoch as a secret still unknown.

DR. SMITH ON FOODS

Foods. By Edward Smith, M.D., F.R.S. (Henry S. King and Co.)

THE tendency during the last thirty years or so to the equalisation, throughout the country, of the prices of the several articles employed as food, has done much to make the subject of Foods one of much greater interest to a larger class of the community than heretofore. The products of a district being now scarcely, if at all, cheaper than those that can be obtained from a considerable distance, a knowledge of the relative nutritive value of foods becomes essential to a larger number. We therefore look with great interest to the results of Dr. Edward Smith's considerable experience, especially with regard to some of the articles of more modern introduction.

The classification adopted is the following. Foods are first divided into solid, liquid, and gaseous, an arrangement which has the disadvantage of separating closely-allied substances from one another, milk having to be considered removed from cheese and butter. The solid foods are then divided into animal and vegetable, and each of these are subdivided into nitrogenous and non-nitrogenous. The source, composition, and alimentary properties of each article are then discussed in detail. The analyses are mainly those of Fresenius, Frankland, Wanklyn, and other well-known chemists. The author in most cases is able to introduce the results of his own observations on the physiological action of each substance, which are also to be found in the Transactions of the Royal Society. Taking arrowroot as a fair example of the manner in which the subject is treated, after a short account of its origin we find that "the proximate elements in 100 parts are water 18.0, and starch 82.0; so that it is or should be free from nitrogen. There are 2,555 grains of carbon in 1 lb. . . . Ten grains of arrowroot when thoroughly consumed in the body produce heat sufficient to raise 10.06 lbs. of water 1° F., which is equal to lifting 7,766 lbs. one foot high." The author observes that when eaten alone on an empty stomach it gives no sense of satisfaction, but one of malaise. Eating 500 grains increased the emission of carbonic acid 0.154 grains per minute. The rate of respiration was somewhat lessened, and the pulse was increased four beats per second (*sic*). As each subject is similarly described, it is evident that