THE TENDENCY OF MATTER AT THE SURFACE OF THE EARTH.

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IT is a very popular belief, and one that is taught by all elementary text books bearing on the subject, that matter at the surface of the earth has a tendency towards the poles, because, as it is said, of the greater value of gravity there. That this belief is held by others than the unscientific the following quotation from Mr. R. A. Proctor's "Saturn and His System" will sufficiently prove, and it will serve to point out how general and unquestioned this belief is as well. He says: —"It appears probable that fluid masses on the surface of such a planet would tend to form two vast polar oceans, since gravity is so much greater at Saturn's poles than equator." Mr. Proctor is, of course, speaking of the tendency of matter at Saturn's surface; but the conclusion is equally applicable to the case of any heavenly body having a motion of rotation and, presumably, "compression," as he points out in the first part of the quotation I have used. It is evident that he attributes this tendency to the fact of Saturn's polar being less than its equtorial diameter, although he states it as though the effect were produced by the single fact of gravity being greater at the poles than the equator, a result that is present in every rotating sphere and which, as we know, does not produce a poleward tendency.

Mr. Proctor's statement rests on the assumption that, if an oblate spheroid is rotating about its minor axis, matter at its surface will have a tendency towards that point that is nearest to the centre of gravity of the assumedly homogeneous mass. Is this an invariable law? If it is true that because a planet's polar is less than its equatorial diameter matter at its surface will have an unbalanced tendency towards the poles, it is equivalent to saying (no argument having been advanced to prove a lessening of the diurnal motion), that matter having reached a certain position, in response to certain well-known forces and therefore more near to a condition of equilibrium, that then it will move, or have a tendency to move, towards the outline of the perfect sphere. When a sphere is rotating about an axis, we know that a result has been the shortening of the polar axis and a relative increase to the equatorial diameters; and further, if the particles of its matter are free to move in response to the forces thus generated, that they will have attained their position of equilibrium when the normal to the curvature at every point coincides with the vertical at these points. If the particles have not reached this condition of equilibrium their tendency must be equatorwards, and only in the case where we can assume that they have passed beyond, would it be possible to infer the poleward tendency. It is not reasonable to assume a poleward tendency as the result of a lessening of the diurnal motion, as we might, with equal certainty, assume an increasing value for it, as far as any evidence one way or the other shows. On the other hand, it seems probable that the diurnal motion is of a fixed value—fixed in so far as the most careful observations, admitting of the greatest exactitude, can dis-