Density or Specific Gravity.—If we compare the weight of a cubic foot of any substance with an equal volume of water we obtain directly the density or specific gravity of the former, as water is the unit of measure. Now this process can be followed for all substances or matter on or near the surface of the earth, but as we cannot penetrate any distance into the earth we cannot directly measure the density for such depths, nor weigh the earth as a whole. However to arrive at the latter several methods are open to us. Here we may first postulate Newton's Law of Gravitation, which declares that "any particle of matter attracts any other particle with a force inversely proportional to the square of the distance between them and directly to the product of their masses."

Our first method is that of the deflection of the plumb-line—or Mountain Method, first applied by Maskelyne in 1774.* Now the direction of the plumb-line is the resultant of all forces acting upon the freely suspended bob or mass. In reality we do not use a plumb-line, but which amounts to the same thing, we use a very sensitive level which owes its position of equilibrium exactly to the same causes as does the direction of the plumb-line. What Maskelyne did was this, he made a topographic survey of Mt. Schehallien and its surroundings, a volumetric survey one may term it, furthermore he determined what the average density of the mountain was, this combined with the volume gave him the mass with which he had to deal outside of the earth itself. Observing, then, zenith distances on the south side of the mountain and again on the north side of it, it is evident that the two would differ by twice the amount that the mountain would deflect the plumb-line from the direction given to it by the attraction of the earth. We have in this case two forces pitted against each other, both forces subject to the same law, *i.e.*, of the inverse squares of the distances and directly as the masses—the unknown quantity being the mass of the earth. From these observations the mean density was found to be 4·5. Now this is an important

* *An Account of the Calculation made from the Survey and Measures taken at Schehallien* by Charles Hutton, F.R.S., 1779.