## MATTER AND MOTION.

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The attraction of a body is greatest in its own immediate neigh-The attraction has also a reference, not to the surface bourhood. of the body, but to its whole mass, the centre being the point where the influence is strongest. At a point twice as far from the centre as the surface is, the attraction is diminished to a fourth of what it is at the surface ; at three times the distance it is only a tenth ; at four times a sixteenth; at five times a twenty-fifth; and so on, the diminution being always as the squares of the distances; that is, the distances multiplied by themselves. The distance from the centre of any mass of matter to its surface is called its semi-diameter: that is, the half of its diameter or thickness. When we wish, therefore, to ascertain the relative amount of the attraction which any mass of matter exercises over another, we have to inquire how many semi-diameters of the larger the smaller is distant from it, and to multiply that number by itself. The result shows how many times the attraction at this distance is less than at the surface. The moon. for instance, is distant 240,000 miles from the earth, or as much as sixty semi-diameters of the earth; 60 multiplied by 60 gives 3600; consequently, the attraction exercised by the earth upon the moon is a 8600th part of what it would exercise upon the same mass at its own surface.

When the particles of a body can be suspended in the air in a fluid state, they will, if not under the attractive influence of some other body, arrange themselves, by virtue of the same law, around a centre, and take a spherical form. Thus a small quantity of dew suspended on the point of a thorn or leaf becomes a globule, because, in that case, the attraction of the particles towards their own centre is greater than the attraction of any neighbouring body. In consequence of this law of nature, it is considered probable that the globes of space, including our own earth, were originally in a fluid state—that, in that state, they unavoidably assumed a spherical shape, and were then hardened into their present consistency.

Attraction also bears the name of gravitation, from a word signifying weight, for weight is entirely a result of the laws of attraction. The attractive influence of the earth pulls down and holds bodies to it. Thus the falling of a body to the earth is only an effect of attraction, and the weight of a body is only a pressure downwards, in obedience to the same law of gravitation. As gravitation acts upon all the particles or atoms of matter in a body, and not upon the mere surface or superficial bulk, those bodies in which matter is most dense, or have the greatest number of particles, are the heaviest. All falling bodies tend in a direct line to the centre of