

## IV.

*On the Relation assigned by Newton between the Density of the Planets and the Degrees of Heat to which they are exposed.*

IN p. 145. I remarked, that, notwithstanding the regard due to the conjectures of Newton, I cannot help thinking that the densities of the planets have a nearer relation to their celerities than to the degrees of heat to which they are exposed. From calculating the action of the solar heat upon the planets, it appears that this heat, in general, is inconsiderable, and that it has never produced any great change in the density of each planet; for the action of the solar heat, which is weak in itself, has no influence on the density of the matter of which the planets are composed, except at their surfaces. It cannot act on the internal parts, because it penetrates to a very small depth only. Hence the total density of a planet has no relation to the heat transmitted to it by the sun.

It appears to be certain, therefore, that the density of the planets has no dependence on the solar heat, but, on the contrary, that their densities have a necessary relation with their celerities, which last increase or diminish in proportion to their

their distances from the sun. We have seen, that, at the general projection, the more dense parts were not removed so far from the sun as the less dense. Mercury, which is composed of the most dense matter projected from the sun, remained in the neighbourhood of that luminary; while Saturn, which consists of the lightest matter, is removed to a great distance from the sun: And, as the most distant planets revolve round the sun with greater celerity than those that are nearer, it follows, that their density has a direct relation with their celerity, and still more with their distance from the sun. The distances of the six planets from the sun are as 4, 7, 10, 15, 52, 95; and their densities as 2040, 1270, 1000, 730, 292, 184. And, if we suppose the densities to be in the inverse ratio of the distances, they will be as 2040, 1160, 889½, 660, 210, 159. This last relation between their respective densities is perhaps more just than the former; because it seems to be founded on the physical cause which must have produced the difference of density in each planet.