the caloric. But the doctrine of latent heat again modifies[7] the hypothesis, and makes it necessary to include latent heat in the calculation; yet there is not, as we might suppose there would be if the theory were the true one, any confirmation of the hypothesis resulting from the new class of laws thus referred to. Nor does it appear that the hypothesis accounts for the relation between the elasticity and the temperature of steam.

It will be observed that Laplace's hypothesis goes entirely upon the materiality of heat, and is inconsistent with any vibratory theory; for, as Ampère remarks, "It is clear that if we admit heat to consist in vibrations, it is a contradiction to attribute to heat (or caloric) a repulsive force of the particles which would be a cause of vibration."

An unfavorable judgment of Laplace's Theory of Gases is suggested by looking for that which, in speaking of Optics, was mentioned as the great characteristic of a true theory; namely, that the hypotheses, which were assumed in order to account for one class of facts, are found to explain another class of a different nature:—the consilience of inductions. Thus, in thermotics, the law of an intensity of radiation proportional to the sine of the angle of the ray with the surface, which is founded on direct experiments of radiation, is found to be necessary in order to explain the tendency of neighboring bodies to equality of temperature; and this leads to the higher generalization, that heat is radiant from points below the surface. But in the doctrine of the relation of heat to gases, as delivered by Laplace, there is none of this unexpected confirmation; and though he explains some of the leading laws, his assumptions bear a large proportion to the laws explained. Thus, from the assumption that the repulsion of gases arises from the mutual repulsion of the particles of caloric, he finds that the pressure in any gas is as the square of the density and of the quantity of caloric;[8] and from the assumption that the temperature is the internal radiation, he finds that this temperature is as the density and the square of the caloric.[9] Hence he obtains the law of Boyle and Mariotte, and that of Dalton and Gay-Lussac. But this view of the subject requires other assumptions when we come to latent heat; and accordingly, he introduces, to express the latent heat, a new quantity.[10] Yet this quantity produces no effect on his calculations, nor does he apply his reasoning to any problem in which latent heat is concerned.

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[7] *Méc. Cél.* t. v. p. 93.

[8] $P=2\pi H K \rho^2 c^2$ (1) p. 107.

[9] $q'\Pi(a)=\rho c^2$ (2) p. 108.

[10] The quantity i, p. 113.