

the air's elasticity by vapor; condensation by its various causes; and other phenomena.

But Mr. Dalton also made experiments to prove his fundamental principle, that if two different gases communicate, they will diffuse themselves through each other;¹³—slowly, if the opening of communication be small. He observes also, that all the gases had equal solvent powers for vapor, which could hardly have happened, had chemical affinity been concerned. Nor does the density of the air make any difference.

Taking all these circumstances into the account, Mr. Dalton abandoned the idea of solution. "In the autumn of 1801," he says, "I hit upon an idea which seemed to be exactly calculated to explain the phenomena of vapor: it gave rise to a great variety of experiments," which ended in fixing it in his mind as a true idea. "But," he adds, "the theory was almost universally misunderstood, and consequently reprobated."

Mr. Dalton answers various objections. Berthollet had urged that we can hardly conceive the particles of an elastic substance added to those of another, without increasing its elasticity. To this Mr. Dalton replies by adducing the instance of magnets, which repel each other, but do not repel other bodies. One of the most curious and ingenious objections is that of M. Gough, who argues, that if each gas is elastic with regard to itself alone, we should hear, produced by one stroke, four sounds; namely, *first*, the sound through aqueous vapor; *second*, the sound through azotic gas; *third*, the sound through oxygen gas; *fourth*, the sound through carbonic acid. Mr. Dalton's answer is, that the difference of time at which these sounds would come is very small; and that, in fact, we do hear, sounds double and treble.

In his *New System of Chemical Philosophy*, Mr. Dalton considers the objections of his opponents with singular candor and impartiality. He there appears disposed to abandon that part of the theory which negatives the mutual repulsion of the particles of the two gases, and to attribute their diffusion through one another to the different size of the particles, which would, he thinks,¹⁴ produce the same effect.

In selecting, as of permanent importance, the really valuable part of this theory, we must endeavor to leave out all that is doubtful or unproved. I believe it will be found that in all theories hitherto promul-

¹³ *New System of Chemical Philosophy*, vol. i. p. 151.

¹⁴ *New System*, vol. i. p. 188.