

It must be remembered that a pair of atoms thus connected may be in a constant state of minute vibration, so to speak, even in still ether, since the ether pressure really consists of rapid impulses.

All the different degrees of chemical affinity may be accounted for by differences between the masses of the atoms, the extents of the faces which can possibly come in contact, the number of faces, and the different degrees of elasticity of the intermediate ether.

It may be objected that the vibrations of the ether are transversal, and those of common air longitudinal, so that the two cannot be analogous.

The undulations of common air consist both of longitudinal and transversal components ; so do those of the ether. The ear is so constructed as to be sensible only to longitudinal vibrations, and the eyes so that the transverse vibrations alone affect it. An objection of much greater force is the following. Experience shows that radiant heat is capable of evincing all the phenomena of polarization, which can only be explained by the transverse vibrations. How is it then that the thermo-electric pile is affected in the same way as the eye. Similarity of construction would scarcely be taken as a satisfactory explanation in this case.

Prof. Challis, in his "Principles of Mathematics and Physics," shows, on the hypothesis of an ether constituted as above, that in certain cases of polarization the direct vibrations become very much reduced in intensity compared with the transverse vibrations. If this should be found to be the case, wherever the polarization of heat corresponds with that of light, the objection would be answered.

One great difficulty which the action by contact theory has yet to solve, is the attraction of gravitation. Astronomical observations, so far, have not shown that gravity has a sensible aberration like light. The inference is, that the velocity of the gravity impulses must be extremely great compared with the velocity of the earth, and much greater than that of light. What is there in the nature of a universe, constructed as we have supposed, to render it self-contained? We must answer, Nothing. We are obliged on the contact theory either to suppose matter to be coextensive with space, or else, if we consider only our own portion of the universe, we may suppose its boundaries to be indefinitely distant, in which case any changes going on at the limits of the universe would be inappreciable to us.

We have thus noticed some of the chief objections to the contact