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Seiler Strasse 29
Hamburg. Dec. 1. 1894

Dear Sir

Many thanks for your letter and for satisfying me that Maxwell had (~~xxxxxxxx~~) given equations for calculating the rate at which the equalization of pressure in different directions about the same point in a gas, takes place. This second paper I had missed, while reading the first.

In regard to your saying, You should like to know what I have to say to Maxwell's objection to a suggestion he attributes to Sir W. Thomson — I may remark on the fact of having considered this point in my second Phil Mag paper of Nov. 1877, page 370 etc.

The working of my mode of harmonizing the difficulty may be clearer perhaps in my doctorate "Dissertation": and possibly the following translation of the passage may facilitate: — viz

"In an article in the Encyc. Brit 1875 (& Scientific Papers Vol 2, p. 476) Maxwell raises the objection that gross matter must be made white hot by the encounters of the aether atoms. Maxwell bases this objection on the theorem that equilibrium of temperature between any atoms or molecules demands that the mean energy of translatory motion of all should be the same. Now the pressure is proportional to the product of the mean energy of translatory motion (call this L), into the number of atoms N, in the unit of volume. If then the mean translational energy of an aether atom were equal to that of a molecule of the atmosphere (say); which, later we can determine by calculation: then N (number of atoms in unit of volume) must have an enormous value for the other, in order to explain the pressure of gravity. Now Maxwell says: we are tolerably certain that N for the aether is small compared with the value of N for gross matter — say for the atmosphere. From this Maxwell concludes that in order to explain the pressure of gravitation, L must be assumed enormously great for the aether. And from the theorem that for thermal equilibrium, L must be the same for all molecules, it would follow that L would assume a value for the molecules of gross matter far greater than that which we find for gases. In other words, that the atoms of gross matter would be raised to a white heat by the collisions of aether atoms.

But, even independently of the above theorem for thermal equilibrium being still disputed in relation to Molecules of very different dimensions — it seems to me that

must certainly no cogent reason exists for Maxwell's assumption, of N being smaller in value for the aether than for gross matter. One can in fact conceive the aether atoms to have any finite size however small; there can be enormous number of them in unit of volume, exact, consistently with an enormously long mean path." (p. 10).

Such is the translation of the means offered for surmounting Maxwell's difficulty, a objection.

Yours very truly
S. Tolver Preston

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Prof. G. F. Fitzgerald FRS.