

14/11

Paignton Devon
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My dear Fitzgerald, What I said was (p. 131) that it was "only an analogy in virtue of similitude of relations. We cannot for instance, deduce the Maxwellian stresses and the forces on charged or currented bodies. The similitude does not extend so far." Observe that the analogy $H = \text{a velocity (or proportional)}$ applies merely to a dielectric which is nonconducting. You want an additional hypothesis to account for conductivity after Ohm's law. As regards the stresses (Maxwells) I do not see how the rotational ether is to give them. It is not obvious. Larmor goes so far as to say that they don't exist. I am open to any good evidence he may have. As regards ^{the} forces, it is clear you can't derive them from the stresses if you don't have the stresses. You must adopt some other plan. Now I thought what Larmor had to say on this point was rather thin, his accounting for electrostatic attraction by electromagnetic waves. But then I have only seen his abstract. No doubt he has done his best to work it out. Then also it is not a question of conductors only, but

of dielectrics as well. A special hypothesis may be elaborated to apply to conducting bodies, & break down for dielectrics. It would I think be quite unreasonable to suppose that a body experiencing electric and magnetic force was not subject to mechanical force, because it did not happen to be a conductor. Then there is the nutch force on magnets; and altogether it is a rather difficult matter, I think, to make the rotational ether do exactly all that Maxwell's equations do, with their interpretations to make such or such quantities energy, & so on. I wish Larmor success, I am sure, as he is so hot upon it.

[See also pp. 243 to 256, *Proc. Roy. Soc. El. mag. Th.* where I have considered the rotational ether again in more detail in some respects, both as regards $H = \text{velocity}$, ^{and} $E = \text{velocity}$, as was suggested by Lord Kelvin. (Paper vol 3. on Ether & Electricity) & which is I presume what Boltzmann has been working at. See my pp. 255, 6, in the latter case, & observe the very peculiar way the analogy works out. I consider them only analogies, so far. But if the range of the analogy be extended, it may lead to something so close as to suggest identity.]

If you make boundary assumptions, to help to explain, do they really belong to the rotational ether? Are not they auxiliary hypotheses? I am myself intensely sceptical in matters

of this kind; I never swallowed the electric fluids, nor even the elastic solid ether; and now, in spite of my having helped to develop the rotated ether depending on elastic resistance to absolute rotation, I must decline to swallow it, except as a provisional hypothesis, on trial.

I think Larmor's paper, & papers generally, ought to be accepted, even when you may, as a critic, see impossibilities, (to you), provided there is a substantial amt of good in the paper. E.g. I thought what Larmor said about gravitation in his abstract was nonsense, & I thought him not very good on some other points, but that would not prevent my accepting the paper. I wouldn't say anything about it, if I were referee, unless I had instructions to criticize. There have been some shocking cases of good and original work rejected. What does it matter even if there is some nonsense in a paper? It will die, and the good will live. The R.S. need not be too particular; they have accepted some precious rubbish in their time.

So far as I know, the rotated ether is the only mechanical analogy that has been proved to work, within limits. This is of course, suggestive of a future for it, or for something similar.

I am sorry to have insulted you about

elementary physics, as I must have unwittingly done. Once, as you say, Lodge insults you!

When I had an aurrometer at command, I used to see some very fine auroras; about 1870-2. I have never seen any since. I used to see them all over the sky; wonderful the way the bands sprung into existence and disappeared suddenly. I cannot say I ever made observation of the velocity of motion of a band, though of course they do move. It may be that there is very little energy concerned in these gorgeous displays; that in a band of rose or crimson light hundreds of miles long the energy concerned may be quite small, considering the size of the band. But there is a good deal of energy concerned in the accompanying magnetic disturbances, as the strong "earth currents" show. But even here, it would only need a change in the earth's magnetism by a very small fraction of itself to produce disturbances of the magnitude, I think.

What is going on in highly rarefied media puzzles me. The recent work on cathode rays is extraordinary!

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P.S. Scarle of Cambridge has sent me some capital work relating to moving charges, the equilibrium surfaces, etc. I have urged him to publish, but he is backward at that.

Yours sincerely,

Olin Heaviside