

suggestion of a beginning of a theory of dispersion, with directions how to make theories ad lib by an electrical analogue, & H's was only a little different in its final eqns, so I began my criticism of it instantly, sending off a paper last Sunday. It is the 1st part, the theory, that I criticize. My suggestion was simply this

$$\text{We have } \text{curl } \underline{H} = \underline{\dot{D}} + \underline{uP} = \kappa \underline{\dot{E}} + \underline{uP} \\ - \text{curl } \underline{E} = \kappa \underline{\dot{H}}$$

where  $\underline{uP}$  is the convection current. Assume that the mechanical force  $\underline{EP}$  on  $P$  is resisted electrically, frictionally, and mechanically, without going into molecular details & speculations. Then the assumption makes

$$\underline{EP} = a \int_0^t \underline{uP} dt + b \underline{uP} + c \underline{uP}$$

In the eqns of  $\underline{uP}$ ,  $a, b, c$  constants.

Or, say  $d = \int_0^t \underline{uP} dt$ , then, equivalently

$$\left. \begin{aligned} \text{curl } \underline{H} &= \underline{\dot{D}} + \underline{\dot{d}} \\ - \text{curl } \underline{E} &= \underline{\dot{B}} = \kappa \underline{\dot{H}} \end{aligned} \right\} \underline{D} = \left( A + B \frac{d}{dt} + C \frac{d^2}{dt^2} \right) \underline{d}$$

Eliminate  $\underline{d}$ , and you have two circuital eqns for  $\underline{E}$  and  $\underline{H}$  on a very simple hypothesis, giving some general results as Helmholtz's.

I pointed out several inconsistencies & unintelligibilities in H's theory, & cast great doubt on the theoretical system, & suggest the rejection of his "electromagnetic energy", & of his estimate of the electric energy; in fact reducing to the above.

One of my objections I find is wrong, but I shall alter that ~~where~~ before it is printed, unless the Ed. puts it in this week. If so, & you see it, I may say that it is the part from eqns (12) to (18) that wants a lot of revision.

He is an old  
boy of 70.

As regards "on and off" I found it was the longitudinal vibrations  
or wave that was referred to. I answered by a brief sketch of the  
way longitudinal waves were rejected, & again suggested, & again rejected.

[ I certainly think something must be done about the strain in  
the ether, forces, pressures etc.; it does not seem to me that  
longitudinal motions are excluded, even though the electric &  
magnetic vibrations be transverse. ]

Yours sincerely  
Oliver Heaviside

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