A Dynamic Theory of the Electromagnetic Field

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The theory presented in this paper is called a theory of the Electromagnetic Field, because it has to do with the space in the neighborhood of the electric and magnetic bodies, and it may be called a Dynamic Theory, because it assumes that in the space there is matter in motion, by which the observed electromagnetic phenomena are produced.

We have some reason to believe, from the phenomena of light and heat, that there is an aethereal medium filling space and permeating bodies, capable of being set in motion and of transmitting that motion from one part to another, and of communicating that motion to gross matter so as to heat it and affect it in various ways.

Now we know that the luniniferous medium is in certain cases acted on by magnetism. We discovered that when a plane polarized ray traverses a transparent diamagnetic medium in the direction of the lines of magnetic force produced by magnets or currents in the neighborhood, the plane of polarization is caused to rotate.

It can be pointed out that no distribution of forces acting between the parts of a medium whose only motion is that of the luminous vibrations, is sufficient to account for the phenomena, but that we must admit the existence of a motion in the medium depending on the magnetization, in addition to the vibratory motion which constitutes light.

On our theory energy resides in the electromagnetic field, in the space surrounding the electrified and magnetic bodies, as well as in those bodies themselves, and is in two different forms, which may be described without hypothesis as magnetic polarization and electric polarization, or according to a very probable hypothesis, as the motion and the strain of one and the same medium.

The conclusions arrived at in the present paper are independent of this hypothesis, being deduced from experimental facts of three kinds:

1. The induction of electric currents by the increase or diminuion of neighboring currents according to the changes in the lines of forces passing through the circuit.
2. The distribution of magnetic intensity according to the variations of a magnetic potential.
3. The induction (or influence) of statical electricity through dielectrics.

We may now proceed to demonstrate from these principles the existence and laws of the mechanical forces which act upon electric currents, magnets, and electrified bodies placed in the electromagnetic field.

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