Discussing Displacement Current

Greg recently indicated that he and others did not understand the transmission line.
I would like him to say whether pp 134, 135, 136 of http://www.ivorcatt.co.uk/x18j134.pdf are clear to him. Here we have a battery; close the switch; energy travels from battery to lamp; remove the lamp; energy reflecdts back in a continual dance; cut both wires half way, and then to the right we have a "steady charged capacitor", with energy continually dancing right and left.
If you say this is unintelligible, I will rewrite it, but I need guidance as to which stages of the process are unintelligible.
Battery. Close switches. Energy proceeds at the speed of light. Remove lamp. Energy reflects in a continual dance of energy. Cut the wires half way. Then to the right we have a "steady charged capacitor."
Please tell me which stages are unintelligible.
If all this makes sense and is obviously true, then we have removed the steady field in the case of the "steady charged capacitor". We are on the massively important principle that electric field and magnetic field do not exist on their own. The only possible field is electromagnetic. The next step is to realise/accept that such a field cannot be stationary. It can only travel at the speed of light.

Recap.

We start with "A capacitor is a transmission line." Following that principle, which no professor or text book writer can afford to understand/know, we develop totally different theory across the board.
The reason why a professor must not notice that a capacitor is a transmission line is that the two are treated in mutually incompatible ways in classical theory. With this realisation, Displacement Current is destroyed.
http://en.wikipedia.org/wiki/Displacement_current
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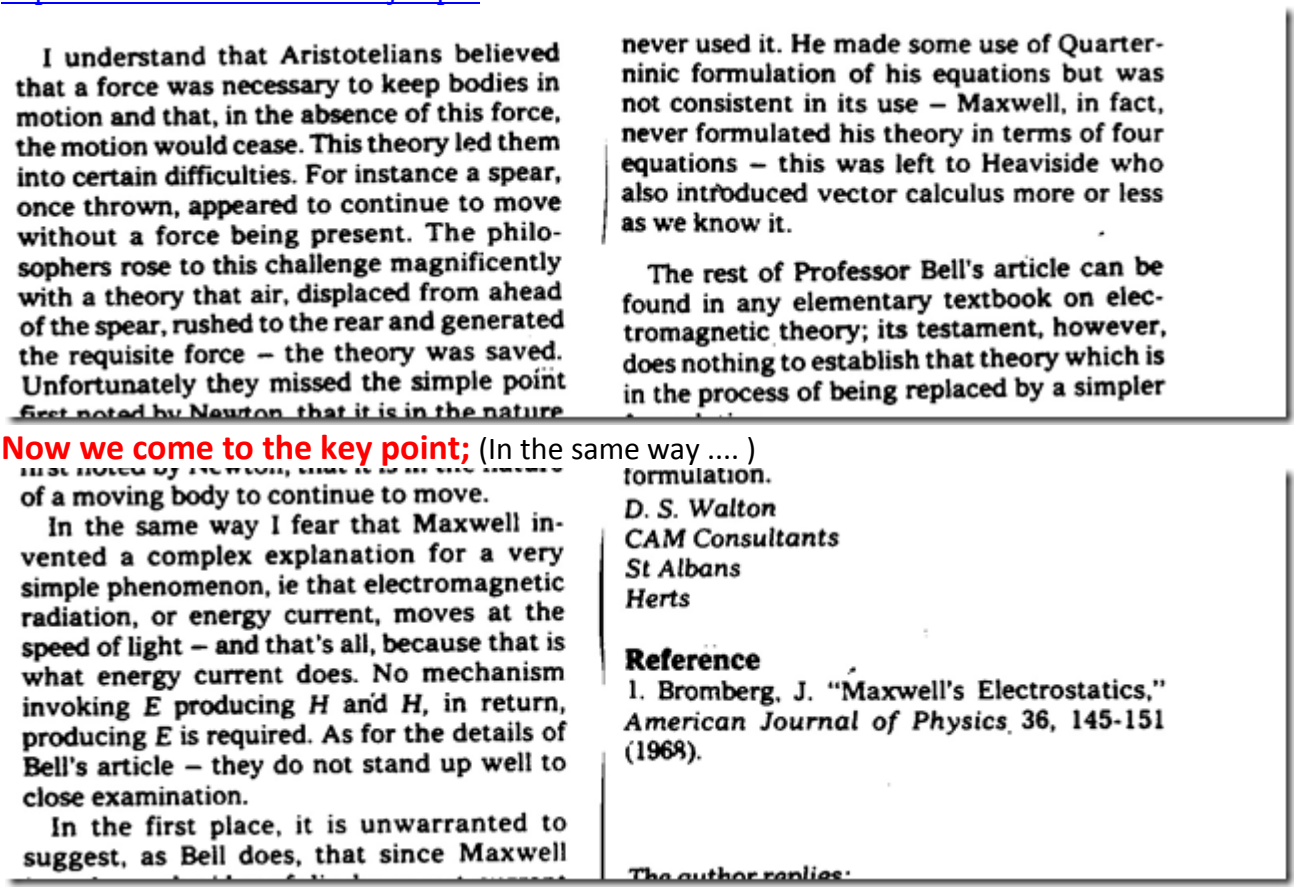
In electromagnetism, **displacement current** is a quantity that is defined in terms of the rate of change of electric displacement field. Displacement current has the units of electric current density, and it has an associated magnetic field just as actual currents do. However it is not an electric current of moving charges, but a time-varying electric field. In materials, there is also a contribution from the slight motion of charges bound in atoms, dielectric polarization.
The idea was conceived by James Clerk Maxwell in his 1861 paper On Physical Lines of Force[*citation needed*] in connection with the displacement of electric particles in a dielectric medium. Maxwell added displacement current to the electric current term in Ampère's Circuital Law. In his 1865 paper A Dynamical Theory of the Electromagnetic Field Maxwell used this amended version of Ampère's Circuital Law to derive the electromagnetic wave equation. **This derivation is now generally accepted as an historical landmark in physics** by virtue of uniting electricity, magnetism and optics into one single unified theory. The displacement current term is now seen as a crucial addition that completed Maxwell's equations and is necessary to explain many phenomena, most particularly the existence of electromagnetic waves."
Displacement current has to behave differently in a capacitor (when it was invented to create magnetic field) and in a transmission line (when it must not create magnetic field). This **historical landmark in physics** marked the starting point of multiple errors encompassing most of today's science. Does Greg still say; "Who cares?"?

I now think I was wrong to classify this Catt advance on the level of the removal of phlogiston and caloric but below Newton's Laws of Motion. Still below Newton, I think we should classify this advance above the removal of phlogiston and caloric, for a number of reasons, one being that since science itself is so much bigger today, such an advance is more important.
Note that this advance, the demise of Displacement Current, is independent of "Theory C", which came later. Theory C says that when a battery lights a lamp, electric current is not involved.
http://www.ivorcatt.co.uk/x18j51.pdf see D S Walton



I understand that Aristotelians believed that a force was necessary to keep bodies in motion and that, in the absence of this force, the motion would cease. This theory led them into certain difficulties. For instance a spear, once thrown, appeared to continue to move without a force being present. The philosophers rose to this challenge magnificently with a theory that air, displaced from ahead of the spear, rushed to the rear and generated the requisite force – the theory was saved. Unfortunately they missed the simple point first noted by Newton, that it is in the nature of a moving body to continue to move.

In the same way I fear that Maxwell invented a complex explanation for a very simple phenomenon, ie that electromagnetic radiation, or energy current, moves at the speed of light – and that's all, because that is what energy current does. No mechanism invoking *E* producing *H* and *H*, in return, producing *E* is required. As for the details of Bell's article – they do not stand up well to close examination.

In the first place, it is unwarranted to suggest, as Bell does, that since Maxwell never used it. He made some use of Quarterninic formulation of his equations but was not consistent in its use – Maxwell, in fact, never formulated his theory in terms of four equations – this was left to Heaviside who also introduced vector calculus more or less as we know it.

The rest of Professor Bell's article can be found in any elementary textbook on electromagnetic theory; its testament, however, does nothing to establish that theory which is in the process of being replaced by a simpler formulation.

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Reference

1. Bromberg, J. "Maxwell's Electrostatics," *American Journal of Physics* 36, 145-151 (1968).

The author replies:

Now we come to the key point; (In the same way ....)

Does Greg still say; "Who cares?"? Do we care that there is now no theory as to why a brick, once thrown, continues on its travels? Why get rid of the idea that the air displaced in front runs round to the back and pushes it to keep it going? What is the practical value of getting rid of such a notion? Surely only an entrenched scholastic would worry about such things.

Ivor Catt. 31 December 2011