the general science journal

A Short Note on the Nature of Electric Current

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6th March 2024

Abstract. **In a steady state electric circuit, it is assumed that the current emerging from one terminal is equal to the current which returns back into the power source at the other terminal. This assumption sits alongside the belief that electric current is primarily a flow of charged particles, but this belief doesn't sit well with transmission lines. An alternative proposal for the deeper physical nature of electric current will now be considered such as to take into account the energy that is dissipated due to ohmic resistance and radiation.**

The Electric Fluid

I. At any one instant, electric energy can only realistically emerge from one of the two terminals at an electric power source, and it then travels along the outward conducting channel at a speed in the order of the speed of light. Electrons can't start to flow until the energy, whatever its actual physical form takes, has completely occupied the circuit, right round to the return terminal. In the case of an AC transmission line, however, by the time the energy reaches the far end, we could have already passed the first half-cycle, and so electron flow is simply not significant when it comes to electric power transmission. Electric current must therefore be primarily something of a deeper physical nature than merely the flow of charged particles, with the latter being merely a side effect. Even if a pylon is supporting twelve cross-country high voltage AC power cables, the electric current, whatever its true physical nature, will be flowing in the same direction, from the power station to the consumer in every case. It doesn't make any sense that electrons would be returning back into the power source again at any time during the AC cycle, and neither does it make any sense that electrons would be continually transported from the power station to the consumer. If that were to happen, then since electrons can't dissipate, they would accumulate in the household appliances. It's only in a closed laboratory AC circuit that electrons actually swish back and forth, being pushed every half-cycle from the opposite terminal.

To explain the deeper physical nature of electric current, we therefore need to identify a substance that can radiate into space as electromagnetic waves, and which can be absorbed into ponderable matter without altering the electronic structure of the atoms and molecules. We must look to the velocity field that is associated with Coulomb's law of electrostatics, and we must link it to a fundamental aethereal electric fluid that flows out from positive particles and

into negative particles, **[1]**. It's this electric fluid flowing between oppositely charged particles that constitutes electric current, and not the charged particles themselves, and had the 1855 Weber-Kohlrausch experiment been correctly interpreted at the time, it would have been evident that electric current travels at a speed that is very close to the optically measured speed of light, **[2], [3], [4], [5].** Weber, Kohlrausch, and Kirchhoff, failed to make this conclusion because they were focused on the two-way flow of charged particles which they believed, as per the Fechner hypothesis of 1845, was the primary essence, rather than the secondary essence, of electric current, **[6]**.

When electric current circulates in a closed circuit, more electric fluid emerges from the outgoing terminal than goes back in again at the return terminal. The difference is due to ohmic losses and radiation. Meanwhile, positive electric particles are accelerated with the flow, but never to anywhere near the speed of light, while the negative particles, being aether sinks, eat their way in the opposite direction. In the case of a laboratory capacitor circuit, the electric fluid crosses the gap between the plates until the capacitor is fully charged.

It will be explained in the next article, ***"A Short Note on the Nature of Light"***, **[7]**, how EM waves are in fact simply a fine-grained relay of electric current through a dense sea of electron sinks and positron sources, **[8], [9], [10].**

References

[1] Tombe, F.D., ***"The Deeper Physical Nature of Electric Current"***, (2022)
https://www.researchgate.net/publication/363887411_The_Deeper_Physical_Nature_of_Electric_Current

[2] Kirchhoff, G.R., ***"On the Motion of Electricity in Wires"***, Philosophical Magazine, vol. XIII, Fourth Series, pp. 393-412, (1857)
English translation by Professor A.K.T. Assis, vol. 3, chapter 8
https://www.ifi.unicamp.br/~assis/Weber-in-English-Vol-3.pdf
See page 214 regarding the connection between Weber's constant and the speed of light. Meanwhile, a summary by Professor A.K.T. Assis can be found on pp. 280-282 in this link,
https://www.ifi.unicamp.br/~assis/Weber-Kohlrausch(2003).pdf

[3] Weber, W., and Kohlrausch, R., ***"Elektrodynamische Maassbestimmungen insbesondere Zurueckfuehrung der Stroemintensitaetsmessungen auf mechanisches Maass"***, Treatises of the Royal Saxon Scientific Society, Volume 5, Leipzig, S. Hirzel, (1856)
See chapters 5, 6, and 7 in this link,
https://www.ifi.unicamp.br/~assis/Weber-in-English-Vol-3.pdf
Prof. A.K.T Assis has written an excellent summary of this work in an article entitled ***"On the First Electromagnetic Measurement of the Velocity of Light by Wilhelm Weber and Rudolf Kohlrausch"***.
https://www.ifi.unicamp.br/~assis/Weber-Kohlrausch(2003).pdf
Weber and Kohlrausch wrote a short precis of their paper, and this can be found in Poggendorf's Annalen, vol. XCIX, pp. 10-25. An English translation of this precis is presented in the appendix at the end of Prof. Assis's paper.

[4] Tombe, F.D., ***"The Commonality between Light and Electric Current"***, (2022)
https://www.researchgate.net/publication/364337354_The_Commonality_between_Light_and_Electric_Current

[5] Tombe, F.D., ***"The 1855 Weber-Kohlrausch Experiment"***, (2019)
https://www.researchgate.net/publication/332411168_The_1855_Weber-Kohlrausch_Experiment_The_Speed_of_Light

[6] Fechner, G.T., ***"On the Connection of Faraday's Induction Phenomena with Ampère's Electrodynamic Phenomena"***, (1845)
https://www.ifi.unicamp.br/~assis/Fechner.pdf

[7] Tombe, F.D., ***"A Short Note on the Nature of Light"***, (2024)
https://www.researchgate.net/publication/378793932_A_Short_Note_on_the_Nature_of_Light

[8] Whittaker, E.T., ***"A History of the Theories of Aether and Electricity"***, chapter 4, pp. 100-102, (1910)
"All space, according to the younger Bernoulli, is permeated by a fluid aether, containing an immense number of excessively small whirlpools. The elasticity which the aether appears to possess, and in virtue of which it is able to transmit vibrations, is really due to the presence of these whirlpools; for, owing to centrifugal force, each whirlpool is continually striving to dilate, and so presses against the neighbouring whirlpools."

[9] O'Neill, John J., ***"PRODIGAL GENIUS, Biography of Nikola Tesla"***, Long Island, New York, 15th July 1944, Fourth Part, paragraph 23, quoting Tesla from his 1907 paper ***"Man's Greatest Achievement"*** which was published in 1930 in the Milwaukee Sentinel,
"Long ago he (mankind) recognized that all perceptible matter comes from a primary substance, of a tenuity beyond conception, filling all space, the Ākāśa or luminiferous ether, which is acted upon by the life-giving Prana or creative force, calling into existence, in never ending cycles, all things and phenomena. The primary substance, thrown into infinitesimal whirls of prodigious velocity, becomes gross matter; the force subsiding, the motion ceases and matter disappears, reverting to the primary substance."
http://www.rastko.rs/istorija/tesla/oniell-tesla.html
http://www.ascension-research.org/tesla.html

[10] Lodge, Sir Oliver, ***"Ether (in physics)"***, Encyclopaedia Britannica, Fourteenth Edition, vol. 8, pp. 751-755, (1937)
http://gsjournal.net/Science-Journals/Historical%20PapersMechanics%20/%20Electrodynamics/Download/4105
See pp. 6-7 in the pdf file in the link above, beginning at the paragraph that starts with, ***Possible Structure. −***, and note that while the quote suggests that the ether is incompressible, this is almost certainly not the case. The quote in question, in relation to the speed of light, reads,
"The most probable surmise or guess at present is that the ether is a perfectly incompressible continuous fluid, in a state of fine-grained vortex motion, circulating with that same enormous speed. For it has been partly, though as yet incompletely, shown that such a vortex fluid would transmit waves of the same general nature as light waves— i.e., periodic disturbances across the line of propagation—and would transmit them at a rate of the same order of magnitude as the vortex or circulation speed"