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The Death of Voltage

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Abstract

Voltage is shown to be a mathematical confection much like electric current and charge were. None of the above entities have ever been measured regardless of the names of the instruments.

Introduction

The sacrificial victims must be summoned to fertilize the fields of Gnosis. So many are gone yet so many eagerly await. Heaviside [1] and Catt [2, 3] already offered up electric charge and its electric current, much to the displeasure of the gods of magical thinking. Those icons were shown to be illusory effects more reasonably caused by the propagating transverse electromagnetic wave called *Energy Current* [4]. Now another victim must tumble down the steps.

Those antiquated notions of *Electric Current* and *Electric Charge* did not shed much light on real physical processes though they were useful for rough engineering work. By the same token, although architects understand that the Earth is round, they commonly assume a flat Earth for our cities. We speak like shamans of the Sun's rising and setting rather than the Earth revolving for similar convenience. All the same, for understanding the natural world, these conjuring tricks are more hindrance than help. They have led to numerous contradictions and endless confusion. Their desiccated mummies are to be put up on the shelf next to the museum exhibits marked *Caloric* and *Phlogiston*.

What is Measured and Known?

There are distinct limits to human knowledge. We don't know how big or how old the Universe is, all creation myths aside, or even if those are valid questions. We don't know what is inside of the Sun or how life actualizes. Those things are outside the purview of

science for various reasons. Perfect knowledge of the nature of light and electricity may also be beyond our limits but we can at least approach the truth on these phenomena, as they are accessible.

We can count after a fashion, but only by making the usually unstated assumptions that the various objects being counted are of the same class and by ignoring all other differences between those objects. For one famous example, there is disagreement on how many planets orbit the Sun.

We can presume to measure length, L, angle, Θ, time, T, force, F, and energy, W, most directly. Which of these overlapping concepts is the more fundamental is the subject of a deeper natural philosophy that has not been resolved. Although mass, M, is often used in a physical units system, this quantity has not been directly measured, nor has it been defined all that well. For example the number of atoms in a volume of PtIr alloy can certainly be counted up and the gravity force presented by that number of atoms can be measured on a scale, while a different kind of force can be measured by the collection's resistance to acceleration, but neither of these methods is directly measuring mass. The mass is mathematically inferred from the measurement of the forces or energies: it is one further step away from direct knowledge.

We know with fair certitude the imagined geometric relationships between various perceived objects- their directions, lengths and the angles between the elements- and so can derive volumes, areas and the other Euclidean constructs. Euclidean geometry is held in constant view as being a most important precursor to physical knowledge. With the above caveats and claims, by no means complete, we have to continue to use the available conceptual tools unless something better comes along.

Properties of the Aethereal Constants

The transverse electromagnetic wave (*TEM Wave*) propagating at 'Mach 1' = $c \sim 3x10^8$ m/sec through the constant *Wave Impedance* [5, p94] of Z_o ~376.73 ohms is claimed to be the fundamental entity that transmits most or all energy and information. The TEM wave is a shock-wave slab of *Energy Current*, obstructed or otherwise- a half-cycle square wave approaching zero thickness. Properties of TEM Waves [6]:
Z_o = impedance of the TEM wave
c = speed of the TEM wave (speed of light)

(3) $$\varepsilon_o = \frac{1}{Z_o \cdot c}$$ and (4) $$\mu_o = \frac{Z_o}{c}$$

(5) $c = \frac{1}{\sqrt{\mu_o \cdot \varepsilon_o}}$ and (6) $Z_o = \sqrt{\frac{\mu_o}{\varepsilon_o}}$

The set {c, Zo} is suggested as more fundamental- closer to the absolute truth- than permittivity ε_o, and permeability μ_o for several reasons. As the speed of light, c, has been measured, Zo is presumed to have been measured as well, a presumption developed in more detail elsewhere. In that development, no fundamental unit is ever divided further into its mathematical root, as occurs when we express c for example in terms of ε_o and μ_o. There is no way to measure the square root of a fundamental physical property or process: if there were, the unit would not be fundamental. This becomes a philosophical question concerning things like what does the square root of length mean physically?

A Mathematical Invention

Consider the relation for voltage, V, called Ohm's Law:

(7) $$V = IR$$

and for electric power, P, in terms of resistance, R, and electric current, I,

(8) $$P = I^2 R$$

Square both sides of Ohm's Law-

(9) $$V^2 = I^2 R^2$$

then substitute (8) into (9) for I^2 to receive the square of voltage,

(10) $$V^2 = PR$$

Divide (8) through by R to express the square of electric current as

(11) $$I^2 = P / R$$

Taking the square roots of Equs. (10) and (11) gives us expressions for voltage and current in terms of power and resistance

(12) $$V = \sqrt{PR}$$

and

(13) $$I = \sqrt{P / R}$$

Notice the algebraic relationships between Equs. (10)-(13) would be identical to those of Equs. (3)-(6) through a simple change of variables. The reason is simple: Equs. (7) and (8) are the basement relations that led to the propositions expressed in Equs. (3)-(6). Of the latter propositions, only Equ. (5) is ever to be found in a conventional textbook or paper on Maxwell's Equations and conventional theory, where it, along with its square root, is held forth as a triumph of reasoning- linking electricity, magnetism, and light. Tellingly, those four key equations are rarely found together on the same page.

Turning now to the claims made in Equs. (12) for voltage and in (13) for electric current, we see that to believe in these concepts requires an additional sacrifice: one has to believe that the square root of power is a valid physical idea. It requires a belief in the reality of the square root of resistance. The magical equations themselves are quite correct mathematically but the concepts they express are as nonsensical as the square root of length.

Conclusion

As Ivor Catt puts it, "Although a cloud cannot exist without edges, the edges of a cloud do not exist" [2]. Voltage and electric current are of the nature of amplitudes, a mathematical device. Amplitudes are always squared to return to a physically meaningful result. The volume of the cloud or the energy passing through the area of the (curvilinear) square is what is real, not its edges or field lines. A voltmeter does not measure voltage: it is one way to measure the energy in the *Energy Current* by using Equ (10).

In other places I present a new system of fundamental physical units [7] and a reformulation of the master equations [8], replacing *Electric Charge* (or *Amps*) with the *Wave Impedance*, Zo. From there we may proceed to a coherent theory of *TEM Wave Electrodynamics*, one in which charge, electric current, and voltage play no part. Gnosis would make an exacting and jealous god.

References

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