CASSIOPEIA'S TOE

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TIME

WE can measure it, but we can't hold it in our hand. And that makes it hard to visualize. Time is always and inextricably related to the speed of light in our mathematical theories. But what is it?

We also know that the speed of light is related to a quantity called *permittivity* as well as another quantity called *permeability*. Permittivity can be thought of crudely as a measure of the resistance that a medium generates to the formation of an electric field. And permeability is the same sort of measure for a magnetic field. The lowest possible permittivity (and permeability) is that of a vacuum. The permittivity of space, sometimes called the electric constant, is represented by $\boldsymbol{\varepsilon_0}$ and has a value of approximately 8.85×10^{-12} F/m. And the permeability of free space is represented by $\boldsymbol{\mu_0}$. But why does free space offer **any** "resistance" to the formation of these fields? What exactly is happening?

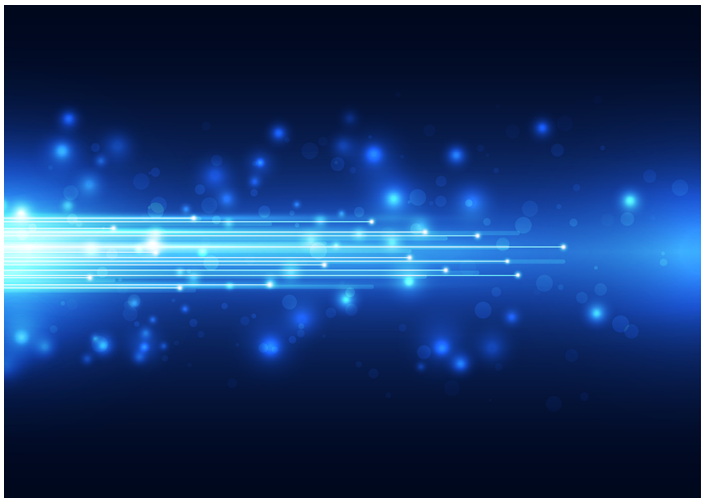
In the wormhole view, a photon must create other wormholes as it travels. It creates transverse electric and magnetic fields – which are actually wormholes connecting space quanta -- as it travels. And it is the speed of the formation process of these wormholes that ultimately determines the speed of light…

$$C = (\boldsymbol{\varepsilon_0}\,\boldsymbol{\mu_0})^{-1/2}$$

Permittivity and permeability are a measure of how quickly wormholes can form in space.

And a strong gravitational field dramatically affects these same two quantities – permittivity and permeability. Near a black hole particularly, these quantities increase without bound so that at the event horizon, they are effectively infinite. And of course this means the speed of light drops to zero.

In Einstein's version of space-time, a Minkowski manifold, the fourth dimension is not just time, but rather time multiplied by the speed of light, **c.** And in the wormhole view, these quantities are similarly related as well. Time is simply a measure of the rate of wormhole formation. If that rate slows down, then time slows down as well. If time stops, that means wormhole formation is no longer possible (and vice versa). Picture an emergent wormhole reaching out from one space quantum towards another, growing longer until it reaches its target – another space quantum.



As the permittivity and permeability of space increase, that wormhole formation slows and eventually cannot be completed.

A strong gravitational field, operates on the energy inside each wormhole, and a strong enough gravitational field completely prevents wormhole formation in the outward direction.

We should also mention that the direction of the flow of time corresponds to the direction of permissible flow through the wormhole. (Remember wormholes have a one-way direction).