Euclid Riemann and TET
sgm, 2018/DEC/04

"i read on a physics forum that you cannot have curvature in a single dimension, like time, only space can be curved because it has 3 dimensions and space-time can be curved because it has 4 but you can't curve only time and not space https://www.physicsforums.com/threads/curvature-of-time.149932/ look at #7 "In Riemann geometry, a 1-dimesional curve or a 1-dimensional manifold cannot be curved. Thus, time as a 1-dimensional entity cannot be curved either. What can be curved is space or spacetime.""

— Doug Lerner

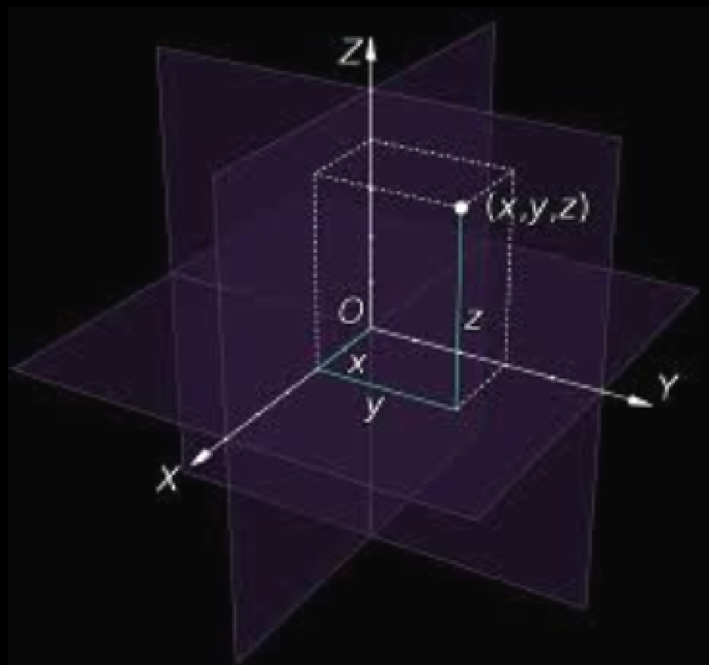
Doug is a power systems engineer I met at Highland Junior High, Michigan around 44 years ago. He used to read Scientific American cover-to-cover. He's always had a level head when it comes to science/engineering and I consider him representative of conventional views. I treasure his friendship and conversations. However, his commentary above tells me I must yet again try to frame TET, temporal elasticity theory, in such a way that conventional physicists will not automatically reject it as his commentary implies they might.

Let me try to explain as I might to a science-minded child .. In early days of science, we used to think of space in Euclidean terms – no attributes and non-deformable. As science progressed and we tried to explain energy propagation in 'empty space', we invented a transmission medium we called 'the aether' which allowed energy propagation at c, the speed of light. But by the time we developed full use of electricity, we realized the required attributes of 'the aether' were incompatible with our understanding of empty space. Before we dismissed 'the aether', engineers had made use of an analogous concept called impedance and even applied it to empty space. But along with 'the aether', physicists also dismissed impedance. Because of the successes of Einstein with regard to General Relativity, we don't model space-time with

Euclidean geometry anymore; we use Riemannian geometry. Confused yet?

Let me try another way: imagine you're a child-god and you're one of my students. Your task: design the *simplest* 3D universe with unidirectional time, causality, and only two properties: impedance and elasticity; you decide how to use those two attributes such that both energy and mass propagation are constrained/finite. You decide global topology but with the restriction anyone inhabiting that universe must perceive space-time as flat, with zero curvature. You realize that you need one attractive force that is *not* scale-invariant, so you correctly realize that if you associate elasticity with time, you can 'kill two birds with one stone' via small-scale / short-range / enormous-time dilations and long-range / large-scale / small-time dilations – and – constrain mass propagation with the same association. That leaves, in the most simplistic scenario, associating impedance with space which constrains energy/photon propagation rate. You present your ideas to me and I mention the fact you need a force that is sometimes repulsive and also scale-dependent – in order to foster life and sentience. You explain to me that impedance has that feature built-in such that permeability and permittivity are components of it and that impedance directly relates charge-moment to spin. I'm impressed and give you an A+.

Difficult to follow? Let me start again..



A depiction of Euclidean space, non-deformable, old-school, our ‘ancient’ view of space BUT – append to that – Z_0, the impedance of space – as engineers accept:

$$Z_0 = \frac{E}{H} = \mu_0 c_0 = \sqrt{\frac{\mu_0}{\varepsilon_0}} = \frac{1}{\varepsilon_0 c_0}$$

μ_0 = the magnetic constant

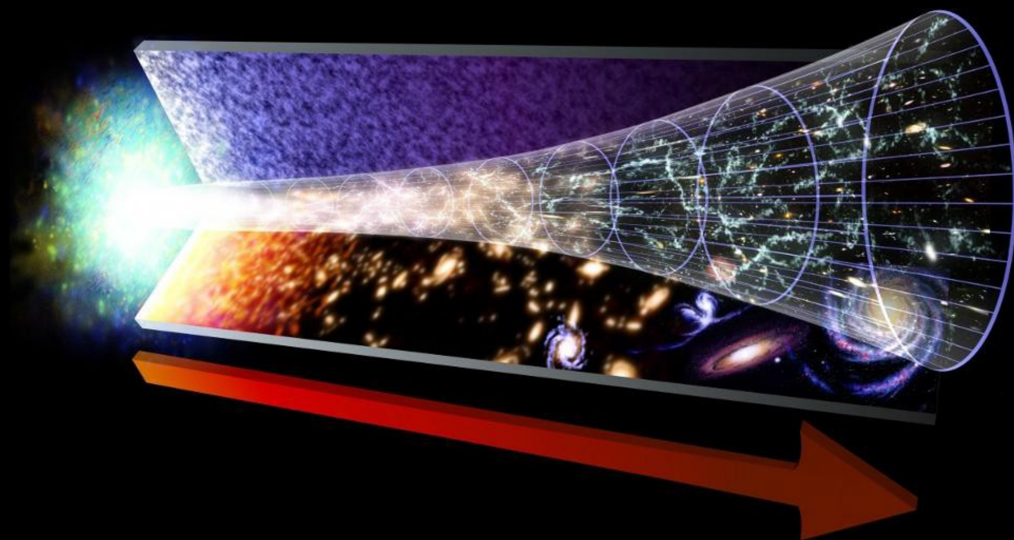
ε_0 = the electric constant and

c_0 = the speed of light in free space

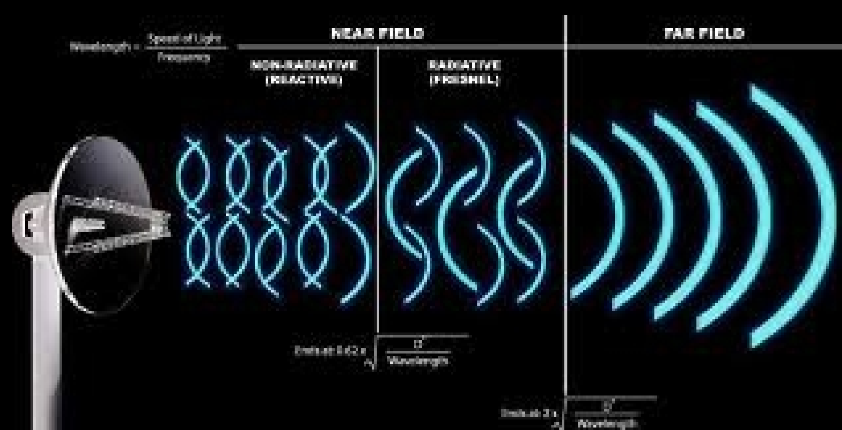
S = {x, y, z, Z_0}

And time is not just time; it’s appended with elasticity, Y_0:

$\boldsymbol{T} = \{t, Y_0\}$



illustrating the arrow of time



illustrating how temporal elasticity can mediate both the strong nuclear force and gravitation

$Y_d = 10^{12}\ N/m^2$
Young's elastic modulus for diamonds

However..

$$Y_0 = 10^{21}\ N/s^2$$

Which shows us how *inelastic* time really is.

So when I use the expression "space-time", I'm really talking about

$$\boldsymbol{S} \cup \boldsymbol{T} = \{x, y, z, Z_0\} \cup \{t, Y_0\}$$

[*spaces* is italicized in this paragraph because we're talking about *general spaces* not specific 3D space in paragraphs below] So that's why I object to Doug's casual dismissal using the Riemann geometry argument – I'm obviously using another kind of geometry – one where *spaces* have *attributes* not just metrics / units of measure. The associated attributes impose restrictions on *spaces* depending on:
1. nature of attribute
2. relationship to *space*
3. nature of *space*

So elasticity affects time differently than it would space because time is unidimensional and unidirectional. And because elasticity is about deformation, we need to adjust our intuitions to accommodate temporal deformations rather than spatial. This allows us to visualize temporal deformations in a meaningful way.

The relationship between impedance and space is a little more difficult to visualize because impedance has two components and space has three. However, if we initially visualize static electric and magnetic fields individually, as related to their respective components of impedance, we can begin to understand the total impact of impedance on space, electromagnetic propagation, and electromagnetic interactions. Taking an *engineering* course in fields and waves most certainly would not hurt.

So in mathematics, we need to develop a *theory of attribute spaces* – for two reasons:
1: as a rigorous foundation for TET and impeded space
2: because physical reality may just be that way

This essay is dedicated to Arthur Micheal, my son, who's 11th birthday is today.