

Optics professionals, get involved in fundamental physics, both in teaching and in research

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Abstract: Physics has been strongly guided by optical science and engineering since ancient times. However, modern physics is ignoring the reality of parameters, permittivity and permeability of vacuum, which define light velocity, refractive index, dispersion, etc.

1. Why should modern optical scientists and engineers start leading fundamental physics research?

1.1. Optical science and engineering have been the key guides for fundamental physics: Starting from the 1600 through the very end of 1800, optics was the dominant guide for physics. However, since the beginning of the 1900, fundamental physics has been guided dominantly by mathematical theories, supported by experimental validations. However, the progress in physics has now slowed down [1]. *The prevailing tendency is to avoid describing the invisible physical interaction processes that give rise to the physical transformations.* These transformations finally appear as data in our instruments. For successful evolution, all species are functionally engineers at the molecular levels and at the macro levels of interacting with our biological environments. Nature itself, at the fundamental level, a marvelously creative system engineer, driven by inviolable causal rules. None of us knows these rules in complete detail. Only those attempted engineering functions are successful that emulate nature allowed rules. We now know that we can keep thriving as engineers even in the absence complete understanding of the laws of nature. We still do not know exactly what electrons are, or the photons are [1]. Yet, we have been successfully utilizing our limited knowledge about electrons and photons to generate, manipulate, propagate and detect them in our desired ways to create the modern Global Village by building a global communication system.

1.2. Cosmic space is Cosmic Ether. It is a well-behaved physical medium [2]. We need to figure out what are the fundamental lever (action) parameters nature uses to make the orderly and perpetual evolution going. The perpetual velocity of light waves (Maxwell's wave equation) through the entire cosmic space dictates that the space has to be an *electromagnetic tension field to sustain wave propagation*. As engineers, we need to understand which physical parameters in the mathematical theories represent nature's engineering lever parameters for direct manipulation and which are secondary or tertiary parameters that can be manipulated only via the primary parameter. We know that for free space, $c_0^2 = 1 / \epsilon_0 \mu_0$ and within a material medium is $c^2 = 1 / \epsilon \mu \equiv c_0^2 / n^2$, where c_0 , c and n are secondary derived parameters. In other words, nature's primary lever parameters are ϵ_0 & μ_0 ; they represent real physical properties of the free space, *electric tension and magnetic tension*, respectively. Collective dipolar properties of atoms, molecules and meta-materials determine the effective values of ϵ & μ within a material medium. Thus, optical scientist and engineers have been manipulating the values of the *local* primary parameters of the Cosmic Ether without openly acknowledging it. *They need to expand their roles in reconstructing fundamental physics.*

1.3. The energy in the universe appears to be "ethereal"! Energy is universally conserved, only its mode of manifestation changes. We have accepted Einstein's relation, the inertial mass, $m_0 = E_0 / c_0^2 = E_0 \epsilon_0 \mu_0$. Therefore, our perception of mass is its inertia to motion of a certain quantity of energy, facilitated by ϵ_0 & μ_0 . Even the emergence of electric charge of elementary particles can be seen to emerge out of ϵ_0 & μ_0 , when the expression for the fine structure constant α is reorganized, $e^2 = 2\alpha h(\epsilon_0 / \mu_0)^{1/2}$. For these reasons, we postulate that 100% of the energy of the universe is contained by the stationary Cosmic Ether as its electric (ϵ_0) and magnetic (μ_0) tensions [2]. Inter-convertibility of gamma radiation and elementary particles imply that the manifest universe is built out of diverse kinds of oscillation of the cosmic tension field, or the old ether.

Maxwell's electromagnetism should be enhanced to incorporate the generation of elementary particles as various localized vortices of the Cosmic Ether and all the forces as various potential gradients of the same Cosmic Ether [2].

References:

[1] Hossenfelder, Sabine, *Lost in Math: How Beauty Leads Physics Astray*, Hachette Book Group (2019).

[2] C. Roychoudhuri, "Cosmic Ether, possessing electric-tension and magnetic-resistance, is the unified field for physics", *Journal of Modern Physics*, 2021, 12, 671-699; <https://www.scirp.org/journal/jmp>