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Review Article

A Unit of Absolute Universal Time

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Abstract

Unity is the foundation of the design of the universe. This article shows how physicists can overcome the detrimental effects on modern physics of mistakenly removing fundamental unity from the early basics upon which our understanding of the nature of the universe must be built. Unity must be restored. It requires there to be one primary source of control over the various types of action that are currently explained as resulting due to individual forces. When particles of matter are observed to experience changes in speed or direction physicists look for causes. The sources of the causes are always found to be other particles of matter. Matter is believed to contain special ingredients, such as electric charge, that radiate force fields. This resort to a division of cause is not what unity requires. There can be only one primary cause for all physics effects. That cause keeps our universe operating in its continuous orderly manner with all parts contributing to keep the universe in existence. We learn about the universe by means of photons. They deliver our information from the outside world. Photons are activated by acceleration of objects. They end their action by causing other objects to accelerate. There is an ongoing trade of acceleration between light and objects.

Keywords: Physics; Unity; Universe; Time; Absolute

Introduction

Electric charge is credited with being the source of light. However, those two mysterious unknowns that showed up in Coulomb's electric force equation, represented by the letters q, weren't learned what they are by having direct empirical evidence provide a formal definition of electric charge. They were guessed to be the source of light. Their equation positions were like the positions of the masses in newton's gravitational force equation. However, these two equations appear to offer us two different fundamental causes in a universe that can have only one.

Mass is easy to define. It should have been defined when f=ma was introduced. It was made known to us by how direct empirical evidence introduces it as the first property that could be defined. Electric charge is more mysterious. We aren't guided by direct empirical evidence toward learning what electric charge is. It is very important. We can surmise this by recognizing that its magnitude is a universal constant. Mass does not have this honor. There is the separate Universal Gravitational Constant, but the author has elsewhere shown that that constant has a physical origin. It is not a given, i.e., a gift of knowledge from the Universe that is not derivable.

Therefore, our first challenge is to learn what electric charge is. Is it just a number without connection to anything we experience here on the Earth? Or is it so common and so base we do not suspect it. We will learn in this article what electric charge is. The formula for electric force is:

$$f_\xi = \frac{qq}{4\pi\varepsilon r^2}$$

The letter q represents electric charge. I will use the hydrogen atom to analyze electric charge. The letters qq represent the electric charge of an electron and a proton. These values are empirically determined to be of the same magnitude but to have opposite signs. The empirical magnitude of q is:

$q = 1.602 \times 10^{-19}$ coulombs

This value is a fundamental universal constant, and it must appear as such in this new theory. We must look for this number, in the MKS system of units, to show up on its own as the equations of physics are derived. The source of information I am using is the hydrogen atom. When working with the hydrogen atom, I noticed that the time it takes for light to travel its radius is approximately the magnitude of electric charge. I represent the velocity of light by the expression:

$$v_c = \frac{\Delta x_c}{\Delta t_c}$$

The magnitude of the increment of time in the denominator on the right side is this measure of time. The numerator is approximately the size of the hydrogen radius. The numerator divided by the denominator is approximately the speed of light. I found this period appearing elsewhere in solutions. I will apply it to some physics derivations here and show that it is so useful that it unifies physics equations and makes new equations possible.

$$\Delta t_c \cong \frac{\Delta x_c}{v_c}$$

Substituting the measured value for the speed of light and the Bohr radius for the length Δx_c yields:

$$\Delta t_c \cong \frac{5.28x10^{-11}\ m}{2.998x10^{8}\ \frac{m}{s}} = 1.76x10^{-19}\ s$$

The magnitude of the fundamental increment of time is close to the magnitude of q. In fact, if the radius of the orbit for a hydrogen atom is assumed to be:

$$\Delta x_c = 5.0x10^{-11}\ \text{meters}$$

As is indicated by empirical evidence, then:

$$\Delta t_c = 1.67x10^{-19}\ \text{seconds}$$

The existence of electric charge is a theoretical assumption. The electromagnetic effects make it seem like it's real. It is a physics property, but it defies being formally defined. It is from their formal definitions that we learn what each property is. Is electric charge not a force? Is it possible that it is a measure of time? I will substitute this measure of time in place of electric charge. If the change of unit from coulomb to the second is wrong, this mixing of units will not match and the results will be nonsense. That does not happen. Polarity will be addressed later.

Fine structure constant and electric permittivity

The Coulomb equation for electric force, shown below, contains two quantities that have not had clear physical explanations. There is the product of two quantities of them in the numerator. What we know about electric charge is that it is measured simply by counting particles. It is an electric current, the ampere, that is measured for its force. Electric charge is accepted by theoretical physics as a given. Magnetic permeability and electric permittivity are measured and calculated but neither is understood what it is physically. It is known that the square root of the inverse of their product is equal to the speed of light. Also, the inverse of their product is a part of the constant of proportionality k in the coulomb equation for electric force. However, since permittivity does vary, it might be possible to establish that k is not constant and may have a physical role in the force equation.

This is a convenient point for temporarily turning my attention to the fine structure constant. Fundamental unity brings all of physics closer together as it reveals itself. We will form an expression for permittivity that may demonstrate the physical origin of the fine structure constant.

The formula for electric force is:

$$f_\xi = k\frac{q_1\, q_2}{r^2} = \frac{q_1 q_2}{4\pi\varepsilon r^2}$$

The proportionality constant k is:

$$k = \frac{1}{4\pi\varepsilon}$$

And electric permittivity is ε.

We are not actually deriving an equation; we are forming it. We will replace electric charge with that measure of time having the same magnitude and change the unit from coulomb to the second. If this step proves to be a correction to the interpretation of electric charge, then a crucial block to achieving a unified theory will have been removed. It will have been discovered that there is no such thing as electric charge. The example will deal with electromagnetic effects of the hydrogen atom. We make the substitution. For atomic dimensions, it cannot be represented as a differential quantity. Therefore, we use incremental values, symbolized by Δ:

$$f_\xi = \frac{\Delta t_c \Delta t_c}{4\pi\varepsilon r^2}$$

Force is generally defined as:

$$f = \frac{\Delta E_K}{\Delta x}$$

The force felt by the electron in orbit at the distance of the radius of the hydrogen atom is:

$$f_\xi = \frac{m_e v_c \Delta v_c}{\Delta x_c}$$

Setting the modified Coulomb force equal to the hydrogen's electron force equation:

$$\frac{m_e v_c \Delta v_c}{\Delta x_c} = \frac{\Delta t_c \Delta t_c}{4\pi\varepsilon r^2}$$

For the first energy level of the hydrogen atom:

$r = \Delta r = \Delta x_c$

Substituting:

$$\frac{m_e v_c \Delta v_c}{\Delta x_c} = \frac{\Delta t_c \Delta t_c}{4\pi\varepsilon \Delta x_c^2}$$

Simplifying:

$$m_e v_c \Delta v_c = \frac{\Delta t_c \Delta t_c}{4\pi\varepsilon \Delta x_c}$$

For convenience, I replace the left side energy expression with a general expression for kinetic energy:

$$E_K = \frac{\Delta t_c^2}{4\pi\varepsilon \Delta x_c}$$

Solving for permittivity:

$$\varepsilon = \frac{\Delta t_c^2}{4\pi E_{Kc} \Delta x_c} = \frac{\Delta t_c}{4\pi E_{Kc} C}$$

Multiplying by unity:

$$\varepsilon = \left(\frac{\Delta x_c}{\Delta x_c}\right)\left(\frac{\Delta t_c}{4\pi E_{Kc} C}\right) = \frac{\Delta x_c}{4\pi E_{Kc} C^2}$$

Yielding:

$$\varepsilon = \frac{1}{4\pi f_{\xi H1} C^2}$$

Where H1 represents the first energy level of the hydrogen atom. The proportionality constant of the electric force equation is:

$$k = \frac{1}{4\pi\varepsilon}$$

Substituting the expression for permittivity into this equation:

$$k = \frac{1}{4\pi \frac{1}{4\pi f_{\xi H1} C^2}} = f_{\xi H1} C^2$$

The proportionality constant of the Coulomb electric force equation is equal to the product of the increment of force felt by the electron and the speed of light squared.

The magnitude of the fine structure constant is the ratio of the speed of an electron in the first energy level of a hydrogen atom to the speed of light. It is also called alpha 'α'. What is of great interest about it are the values that make up its definition. It contains constants that come from electromagnetic theory, relativity theory and quantum theory. I have previously redefined some of these constants using expressions from this new theory.

I will demonstrate how these new interpretations offer a clear, simple physical origin to the fine structure constant. The standard formula defining the fine structure constant is:

$$\alpha = \frac{2\pi k e^2}{hC}$$

And in this theory is:

$$\alpha = \frac{2\pi k e^2}{h v_c}$$

Where, e is electron charge. I have previously redefined each expression on the right side except for h or Planck's constant. For the purposes of this section, I will use Planck's constant as it would normally be used. Apart from Planck's constant, I substitute expressions from this new theory for the constants contained in the equation. The expression I derived for k is:

$$k = f_{\xi H1} C^2 = \frac{E_{Kc}}{\Delta x_c} C^2 = \frac{E_{Kc}}{\Delta x_c} \frac{\Delta x_c^2}{\Delta t_c^2} = E_{Kc} \frac{\Delta x_c}{\Delta t_c^2}$$

The expression for e is:

$e = \Delta t_c$

Therefore:

$$ke^2 = E_{Kc}\frac{\Delta x_c}{\Delta t_c^2}\Delta t_c^2 = E_{Kc}\Delta x_c$$

My expression for the velocity of light is:

$$C = \frac{\Delta x_c}{\Delta t_c}$$

The normal use of h is:

$$h = \frac{E_{Kc}}{\omega}$$

This says: The energy of a photon divided by its corresponding frequency is equal to Planck's constant. Substituting all the above expressions into the equation for the fine structure constant gives:

$$\alpha = \frac{2\pi ke^2}{hC} = \frac{2\pi ke^2}{hv_c} = \frac{2\pi E_{Kc}\Delta x_c}{\frac{E_{Kc}}{\omega}\frac{\Delta x_c}{\Delta t_c}}$$

Simplification yields:

$\alpha = 2\pi\omega\Delta t_c$

This suggests that the fine structure constant is a measure of a specific angle in radians of something moving in a circular or sinusoidal motion for the period of time required for light to travel the radius of the hydrogen atom. Since the fine structure constant appears to relate in some direct way to the properties of the hydrogen atom, then I might expect the use of my theory to produce a result pertaining directly to the hydrogen atom.

The frequency of this motion can be calculated from the above result. Solving for frequency:

$$\omega = \frac{\alpha}{2\pi\Delta t_c}$$

Substituting the appropriate values:

$$\omega = \frac{7.299x10^{-3}}{2\pi(1.602x10^{-19}\ second)} = 7.25x10^{15}\ sec^{-1}$$

This answer is close to the frequency of the electron that is orbiting in the first energy level of the hydrogen atom. Most significantly, I made a radical change of units from coulombs to seconds; yet, the units that appear in this result fit properly. It leads to the interpretation that the fine structure constant is the angle in radians moved by the electron during the time required for light to travel the radius of the hydrogen atom. The distance around the hydrogen atom circumference that the electron travels for the time it takes for light to travel the radius of the hydrogen atom divided by the radius of the 1st energy level yields a ratio of lengths. Divide each of those two lengths by the amount of time it takes for light to travel the radius of the hydrogen atom and we get alpha, the fine structure constant.

$$\alpha = \frac{\Delta x_{pe}}{\Delta x_c}$$

Dividing the numerator and denominator of alpha by the special increment of time we have the ratio of velocities that alpha is based on:

$$\alpha = \frac{\frac{\Delta x_{pe}}{\Delta t_c}}{\frac{\Delta x_c}{\Delta t_c}} = \frac{v_p}{v_c}$$

The units of this result fit properly. The result shows that the distance traveled by the electron, during a period of time equal in seconds to the magnitude of fundamental electric charge, is relevant to the physical origin of the fine structure constant.

Magnetic permeability

It is known through empirical evidence that there is a direct connection between the existence of a varying electric field and the existence of a varying magnetic field. The varying electric field is credited with bringing into existence the varying magnetic field. The magnitude and behavior of the varying magnetic field are functions of the varying electric field. The varying magnetic field is said to then, in turn, cause the varying electric field. In other words, the electric field and magnetic field are said to be continuously producing each other as both move through a given distance.

The relationship between the electric and magnetic fields will be described later. For now, it is the known relationship between electrical permittivity and magnetic permeability which is of specific interest. Electrical permittivity is related to the proportionality constant of the electrical force equation. Magnetic permeability is related to the proportionality constant of the magnetic force equation. It is known, in the case of electromagnetic radiation, that the two are related to each other by the formula:

$$\frac{1}{\mu\varepsilon} = C^2$$

Or, for this theory:

$$\frac{1}{\mu\varepsilon} = v_c^2$$

Solving for permeability:

$$\mu = \frac{1}{\varepsilon v_c^2}$$

I have derived:

$$\varepsilon = \frac{1}{4\pi f_{\xi H1} v_c^2}$$

Substituting this gives:

$$\mu = \frac{4\pi f_{\xi H1} v_c^2}{v_c^2} = 4\pi f_{\xi H1}$$

This equation says permeability is a function of the force felt by an electron in the first energy level of the hydrogen atom.

I postponed my derivation of detailed electromagnetism for the purpose of first introducing our concept of electric charge as incorrectly interpreted. Besides, I will need to account for electromagnetic effects without the support of electric charge. It is proposed that what physicists say is electric charge is a specimen of absolute time provided to us by the Universe as a universal constant. Introducing this finding early was necessary to properly use this increment of time in the differential equations that make up the following analyses. I will next derive equations showing the connection between my definitions of photon momentum and photon energy to a new electromagnetic theory.

Origin of electromagnetic radiation

Electromagnetic radiation is a phenomenon physics associates with particles of light called photons. However, the particles of charged matter are the sources for all electromagnetic photons. The properties of the charged particles, in general, give rise to the properties of the emitted photons. Therefore, mathematics describing the properties of photons should be translatable into expressions using the properties of the charged particles that emitted them.

Varying Electric Field

The fundamental properties which are of principal use in describing particles are: mass, velocity, and rate of change of velocity. The rate of change of velocity can be measured with respect to either time or distance. Two very useful higher-level properties are energy and momentum. These two properties are complex forms of the fundamental properties of mass and velocity.

It is commonly accepted that energy and momentum are qualities applicable to both material particles and photons. I will use these properties to derive equations analogous to electromagnetic field theory. For convenience in comparing mathematical expressions from electromagnetic field theory with analogous expressions from this theory, I will take the liberty of using differential instead of incremental expressions in the following analysis.

Since photons are themselves incremental and not so small as to be defined by differential values, this approach is not entirely correct. However, the true incremental values are of sufficiently small size so that, for macroscopic purposes, using this approach loses nothing of significance. The benefit gained will be clarity when showing correlation with electromagnetic field theory.

I will now derive equations for this new theory to describe the effects attributed to electromagnetic fields. Force can be expressed as a function of a change in energy:

$$f = \frac{dE}{dx_p}$$

The force can also be expressed as a function of a change in momentum:

$$f = \frac{dP}{dt}$$

Combining these two expressions:

$$\frac{dE}{dx_p} = \frac{dP}{dt}$$

This formula has a form like this next one from electromagnetic field theory:

$$\frac{d\xi}{dx} = \mu \frac{dH}{dt}$$

And since:

$B = \mu H$

I compare it also with:

$$\frac{d\xi}{dx} = \frac{dB}{dt}$$

The similarity in form between this formula and the one above expressed in terms of energy and momentum is striking. I will show there is an indirect connection. Before I can show this, I will develop new formulas that will account for electromagnetic effects. It is known that electric force is defined as electric charge multiplied by the electric field:

$$f = q\xi$$

That can be rewritten, for this new theory, as:

$$f = \xi dt_c$$

Solving for the electric field gives:

$$\xi = \frac{f}{dt_c}$$

And since:

$$f = \frac{dP}{dt_c}$$

I can write:

$$\xi = \frac{d^2P}{dt_c^2}$$

This formula suggests our concept of electric field is equivalent to the second derivative of the emitting particle's momentum with respect to time. Taking the derivative of the electric field with respect to time yields:

$$\frac{d\xi}{dt_c} = \frac{d^3P}{dt_c^3}$$

I have presented this formula because it, along with three others to be derived next, begins the process of expressing the phenomenon described by electromagnetic field equations in terms of the properties of the emitting particle. I will now derive the three other equations. Returning to the equation:

$$\xi = \frac{f}{dt_c}$$

I can substitute:

$$f = \frac{dE}{dx_p}$$

Making the substitution:

$$\xi = \frac{d^2E}{dx_p dt_c}$$

Taking the derivative of the electric field with respect to time:

$$\frac{d\xi}{dt_c} = \frac{d^3E}{dx_p dt_c^2}$$

This is the second equation that I will be using for the purpose expressed above. The remaining two equations are:

$$\frac{d\xi}{dx_s} = \frac{d^3P}{dx_s dt_c^2}$$

And:

$$\frac{d\xi}{dx_s} = \frac{d^3E}{dt_c dx_s dx_p}$$

These two equations result from taking the derivative of the electric field with respect to distance. In the first case I take the derivative of the electric field where it is expressed as a function of particle momentum. In the second case, I take the derivative of the electric field where it is expressed as a function of energy.

The increment of distance used in taking the derivative cannot be the same increment of distance the particle moved during the same increment of time. This new increment of distance has to do with observing the motion of photons after they have been emitted from the particle. The increment of distance is not yet a specific value. It represents a moving observer making measurements of the motion of photons as they move away from their source.

Also, the incremental change of distance cannot be equal to the length of a photon. In that case the observer would necessarily be moving at the speed of light. The observer would be traveling at the same speed as the photons. The observer could not then detect a change in the motion or even orientation of the photons with respect to time.

The observer also cannot stand still or there could be no change observed with respect to distance. Therefore, the observer is assumed to have a magnitude of velocity between zero and the speed of light and is moving in the same direction as the photons. Further development of electromagnetic effects will offer an interesting identity for the observer's magnitude of velocity.

The work of Maxwell has been interpreted to prove the existence and the uniting of a varying electric field and a varying magnetic field. He produced equations that are credited with fundamentally defining electromagnetic radiation effects. I will now derive analogous equations from this new theory.

Definition of electric field

The equations I will derive are not just symbolic substitutes adding nothing to Maxwell's discoveries. The very first step in this derivation goes to the heart of separating the results of this theory from electromagnetic field theory. The electric field is defined as:

$$\xi = \frac{f}{q}$$

I will use this equation as it applies to a force caused by a single charged particle. Since I am seeking to form equations using concepts developed for this theory, I substitute:

$q = dt_c$

In this theory, the fundamental quantity of electric charge is the fundamental time period for passage of a photon:

$$\xi = \frac{f}{dt_c}$$

With this substitution, I separate the work that follows from any theoretical connection with electromagnetic field theory. The resulting equations will be analogous in form but will have interpretations very different from field theory.

Electric field varying with distance

I now proceed to derive electromagnetic equations analogous to the Maxwell equations. Since force can in general be expressed as:

$$f = \frac{dE}{dx_p}$$

Then I can substitute this definition into the electric field equation given above:

$$\xi = \frac{d^2E}{dx_p dt_c}$$

Taking the derivative with respect to an increment of distance which a photon would move during a fundamental increment of time:

$$\frac{d\xi}{dx_c} = \frac{d^3E}{dx_c dx_p dt_c}$$

I want to convert this equation into a form analogous to the Maxwell equation:

$$\frac{d\xi}{dx} = \mu \frac{dH}{dt}$$

I begin with:

$$dE = v_p dP$$

I change the incremental length of distance of particle motion to a measure of photon motion. I do this by multiplying the right side by unity:

$$dE = \frac{v_c}{v_c} v_p dP$$

Or:

$$dE = \frac{dx_c}{dt_c} \frac{v_p}{v_c} dP$$

Rearranging terms:

$$\frac{dE}{dx_c} = \frac{v_p}{v_c} \frac{dP}{dt_c}$$

I will change this equation, using its left side as a guide, into the form shown above on the right side of my expression for the electric field varying with distance. I rewrite it as:

$$\frac{dE}{dx_c} = \frac{dx_p}{dt_c} \frac{1}{v_c} \frac{dP}{dt_c}$$

Rearranging:

$$\frac{d^2E}{dx_c dx_p} = \frac{1}{v_c} \frac{d^2P}{dt_c^2}$$

Multiplying by particle velocity:

$$v_p \frac{d^2E}{dx_c dx_p} = \frac{v_p}{v_c} \frac{d^2P}{dt_c^2}$$

Or:

$$\frac{dx_p}{dt_c} \frac{d^2E}{dx_c dx_p} = \frac{v_p}{v_c} \frac{d^2P}{dt_c^2}$$

Rearranging

This equation is analogous to the Maxwell equation given above. To see this more clearly, I will manipulate its form. I have previously derived:

$$\frac{d^3E}{dx_c dx_p dt_c} = \frac{v_p}{v_c}\frac{d^3P}{dx_p dt_c^2}$$

I submit that

$$\frac{d\xi}{dx_c} = \frac{d^3E}{dx_c dx_p dt_c}$$

Substituting this into the equation above:

$$\frac{d\xi}{dx_c} = \frac{v_p}{v_c}\frac{d^3P}{dx_p dt_c^2}$$

Rewriting this equation:

$$\frac{d\xi}{dx_c} = \frac{v_p}{v_c}\frac{d}{dt}\left(\frac{d^2P}{dx_p dt_c}\right)$$

Comparing this result to Maxwell's:

$$\frac{d\xi}{dx} = \mu\frac{dH}{dt}$$

The magnetic field is seen to be a function of the emitting particle's changing momentum:

$$H = \frac{d^2P}{dx_p dt_c}$$

Of special interest, by analogy, it is suggested the physical basis for magnetic permeability is represented here by:

$$\mu = \frac{v_p}{v_c}$$

Magnetic permeability is a ratio of the magnitudes of two velocities. One is the velocity of light and the other was introduced as the velocity of an observer moving in the same direction as the photons, but with an unspecified magnitude. Its appearance as part of magnetic permeability indicates it is not just any magnitude. Its magnitude is fixed according to the measured permeability of a particular substance.

Interpreting Magnetic permeability

The equation for magnetic permeability contains a particle velocity that must be explained. Clearly this velocity cannot be a variable representing an observer's velocity in general. It must have a specific magnitude. This magnitude can easily be calculated:

$$v_p = \mu v_c$$

Substituting the appropriate values:

$$v_p = \left(12.6x10^{-7}\frac{newton \cdot second^2}{coulomb^2}\right)\left(2.998x10^8\frac{meters}{second}\right)$$

Solving and assigning the units of velocity:

$$v_p = 378\ \frac{meters}{second}$$

I stated at the beginning of this work that all units must be expressible as, i.e., equal to, a combination of meters and seconds. I will show that the units for the work above are correct. I have already replaced the units of coulombs for seconds. I still need to redefine the units of newtons with units from this theory. The answer above gives a clue to what is to come.

The magnitude of v_p for magnetic permeability is approximately the speed of sound. I anticipate that it is representative of the speed of sound in air. I will shortly achieve more accuracy by using the speed of sound in a solid. For this reason I will identify v_p as v_s:

$$\mu = \frac{v_s}{v_c}$$

It may seem strange to relate the speed of sound to the speed of light; however, the speed of sound must have a physical cause. In this theory all physical causes are somehow related to the nature of light. I will be offering a physical interpretation of this result. What has been accomplished is to show that a physical relationship between the speed of light and the speed of sound could become established by this theory.

Interpreting electric permittivity

The solution for magnetic permeability allows for a quick solution of electrical permittivity. It is known:

$$v_c = \frac{1}{(\mu\varepsilon)^{\frac{1}{2}}}$$

Or:

$$v_c^2 = \frac{1}{\mu\varepsilon}$$

Solving for electrical permittivity:

$$\varepsilon = \frac{1}{\mu v_c^2}$$

I have a suggested identity for magnetic permeability of:

$$\mu = \frac{v_s}{v_c}$$

Substituting:

$$\varepsilon = \frac{v_c}{v_s v_c^2}$$

Or:

$$\varepsilon = \frac{1}{v_s v_c}$$

This result suggests electrical permittivity is inversely proportional to the product of the speed of light and a speed approximately that of sound. I will interpret this result shortly. There is a related equation I wish to offer currently. It gives another representation of this particle velocity in a form spanning this new theory and electromagnetic theory. I use the equation:

$$\frac{d\xi}{dx_c} = \frac{v_s}{v_c}\frac{d}{dt_c}\left(\frac{d^2P}{dx_p dt_c}\right) = \frac{v_s}{v_c}\frac{dH}{dt_c}$$

Or:

$$\frac{d\xi}{dx_c} = \frac{dt_c}{dx_c}\, v_s \frac{dH}{dt_c}$$

Simplifying:

$$d\xi = v_s\, dH$$

Solving for v_s:

$$v_s = \frac{d\xi}{dH}$$

This says the speed of sound is the rate of change of the electric field with respect to the magnetic field. In electromagnetic field theory, there is nothing moving at the speed of sound. What then is the origin of this relationship between the speed of sound and electromagnetic radiation? Since electromagnetic radiation consists of discrete photons that are carrying increments of acceleration given to them by an accelerating particle, then I can look back to the emitting particle for an answer.

I have derived for this theory analogous expressions for both the electric field and magnetic field of electromagnetic theory. I will use these to trace the speed of sound back to the emitting particle. The definition of the electric field of a single photon is:

$$\xi_c = \frac{d^2E_p}{dx_p dt_c}$$

And this theory's definition of the magnetic field of a single photon is:

$$H_c = \frac{d^2P_p}{dx_p dt_c}$$

I substitute these two expressions into the formula for the speed of sound:

$$v_s = \frac{\xi_c}{H_c} = \frac{\frac{d^2E_p}{dx_p dt_c}}{\frac{d^2P_p}{dx_p dt_c}} = \frac{dE_p}{dP_p}$$

So, the photon's increment of electric field divided by its increment of magnetic field is equal to the rate of change of the kinetic energy of the emitting particle with respect to the rate of change of the momentum of the particle. Furthermore, they are both equal to the speed of sound:

$$\frac{\xi_c}{H_c} = \frac{dE_p}{dP_p} = v_s$$

I want to extend the meaning of this formula directly to the emitting particle. It is known an incremental change of kinetic energy of the particle is given by:

$$dE_p = m_e v_p dv_p$$

And an incremental change of momentum of the particle is given by:

$$dP_p = m_e dv_p$$

Dividing the first by the second:

$$\frac{dE_p}{dP_p} = v_p$$

I have already shown the rate of change of the kinetic energy with respect to the rate of change of the momentum is equal to the speed of sound. Therefore, I can write:

$v_p = v_s$

This says the free electrons in a metal, those producing electromagnetic radiation, move at the speed of sound. For an electron in space v_p may be a variable, but not for an electron roaming relatively free inside a metal. For example, electrons inside an antenna are suggested to be roaming randomly around at the speed of sound.

When a potential is applied to the antenna, some of these electrons are impacted by incoming energetic photons. The electrons accelerate in an organized manner by the same average incremental amount. When they are accelerated, they cause other photons to carry away their incremental change in velocity. This explanation is a simplified interpretation I offer to suffice for now.

To support this idea as applying to at least the solid materials in general, I will use the speed of sound in glass to calculate the magnetic permeability of glass. I use the formula:

$$\mu = \frac{v_s}{v_c}$$

A typical speed of sound in glass is:

$$v_{sGL} = 6.0x10^3 \frac{meters}{second}$$

Substituting this into the equation above:

$$\mu = \frac{v_s}{v_c} = \frac{6.0x10^3 \frac{m}{sec}}{3.0x10^8 \frac{m}{sec}} = 2.0x10^{-5}$$

This is the correct magnetic permeability of glass. I will perform the analogous calculation for the metals of gold, copper, and steel. The speed of sound in gold is:

$$v_{sAU} = 2.0x10^3 \frac{\text{meters}}{\text{second}}$$

Substituting:

$$\mu_{AU} = \frac{2.0x10^3 \frac{\text{m}}{\text{sec}}}{3.0x10^8 \frac{\text{m}}{\text{sec}}} = 6.7x10^{-6}$$

The speed of sound in copper is:

$$v_{sCU} = 3.5x10^3 \frac{\text{meters}}{\text{second}}$$

Substituting:

$$\mu_{CU} = \frac{3.5x10^3 \frac{\text{m}}{\text{sec}}}{3.0x10^8 \frac{\text{m}}{\text{sec}}} = 1.2x10^{-5}$$

The speed of sound in steel is:

$$v_{sST} = 5.0x10^3 \frac{\text{meters}}{\text{second}}$$

Substituting:

$$\mu_{ST} = \frac{5.0x10^3 \frac{\text{m}}{\text{sec}}}{3.0x10^8 \frac{\text{m}}{\text{sec}}} = 1.7x10^{-5}$$

Each of these answers gives the empirically measured value of magnetic permeability of the material in question.

The relationship developed between the speed of sound and both electrical permittivity and magnetic permeability allows for the speed of sound to be theoretically introduced into the dynamics of a single atom. The force attracting the first energy level electron is given by:

$$f_{\xi e1} = \frac{q^2}{4\pi\varepsilon r_1^2} = \frac{\Delta t_c^2}{4\pi\varepsilon \Delta x_c^2} = \frac{1}{4\pi\varepsilon v_c^2}$$

I have derived:

$$\varepsilon = \frac{1}{v_s v_c}$$

Substituting:

$$f_{\xi e1} = \frac{v_s v_c}{4\pi v_c^2} = \frac{v_s}{4\pi v_c}$$

This equation suggests the existence of a relationship between the speed of sound and a single atom. This possibility is not pursued in this article. There is however an immediate use for this formula. It shows force is dimensionless. The units of velocity cancel each other out. This possibility has been pursued and utilized in another article by this author titled Calculating the Universal Gravitational Constant[3].

Conclusion

It is argued that it has been shown to a creditable degree that the magnitude previously used as electric charge is a universal con-

stant period of absolute, universal time. It is claimed that this period is the single most unifying item when used in the denominator of rates of change of events. It is to be used in place of the derivative of duration in physics equations making calculations on the scale of the hydrogen atom. In those cases, the letters dt represent a constant incremental measure of absolute, universal time supplied to us by the universe [1-3].

Bibliography

1. http://newphysicstheory.com

2. College Physics, Sears and Zemansky, 3rd. Ed., (1960).

3. James A Putnam. "Calculating the Universal Gravitational Constant". ACTA Scientific.