Mass, Matter, and Energy: Thoughts of Tom Cuba stimulated by Thoughts of John Galluci

By way of background, I should mention that roughly thirty years ago, I purchased and read a book titled "Relativity." One of the first chapters describes the observation that set Einstein's career into motion. However, I found it unconvincing.

In the observation that included the light on the train and people observing it, Einstein presents an argument for relativity and a constant speed of light, that seems to be circular. Ever since then, I have taken all of his work with a grain of salt. Don't take this to mean that I have discarded it all. I just question and analyze.

Referring to my oversimplified conceptualization that matter is simply frozen energy, the first note to take is that the theories attributed to Einstein already contain the idea that matter can be converted to energy and vice versa. All I have done is to put the idea into a more common frame of reference.

Now, before we get started, let's get some other thoughts on the table.

First, acknowledge that there are no Laws of Physics. Virtually all of what we call physics is born of observation. These observations are repeatable and predictable, and so the human condition is to label these as Law. The reality is that observations are only repeatable and predictable when the observation is made within the boundaries of the first foundational observation. Changing the boundaries, as has been done with everything from observing what a prism does to a light beam to quantum mechanics, can change the nature and limitations of the observation. This statement can easily be conceptualized using the limitations of Fractal Equations or the functional use of the limitation of "Range" in x-y relationships. Simply put, when x or y are out of range, the equation, or the relationship between them, falls apart.

A decent example is that Newton's apple falls to earth when released from a tree, but not when released inside the capsule in outer space. That change in observation was resolved with the mathematics of orbital inertia and momentum.

The conclusion of these statements is that all of what we term "Physics" is "Theory." Whatever is offered as a 'proof' is not universal because the universe is neither defined nor limited by the parts of it that we have, so far, observed.

And so, when we examine the equation,  $E=mc^2$ , we must accept it for what it is: Theory.

Consider the nature of the variable E. It is not defined in the equation itself, but in text form can be read as 'The energy of a body of mass m...'

Energy, while labeled in many ways, can be expressed as either Kinetic Energy or Potential Energy. Radiant energy is in the mix also as a bleed-valve for one of the base categories. That observation creates ambiguity in the equation. Is the E being referred to, the Kinetic Energy or the Potential Energy of the matter in question?

Let's put a pin in that for now. We will get back to it.

Consider matter and energy. The famous double-slit experiment demonstrates that what we commonly refer to as light possesses properties of both matter and energy. What has not been asked or investigated, to my knowledge is whether or not all matter possesses this duality. And yet, it is quite obvious that it does. The structure of atoms and molecules is a composite of neutrons, protons, and electrons. The matter has been well defined, but the energy of the protons and electrons has only been accepted.

Putting this together, we see that E in the equation must be the sum of both Kinetic and Potential energy.

Shift gears now.

It is commonly understood that the Speed of light is constant. What is often overlooked is the qualifier to the statement, which is the "Fractal Range" referred to earlier. The speed of light is constant *in a vacuum*. It is quite obviously not so when other matter, not that of the light itself, is present.

I have used the observation that light impacting a hard surface such as a wall, must stop, bringing Velocity to zero, and reverse course in order for us to see the wall. The counter argument is that the reversal is instantaneous. The range limitation of the instantaneous nature of the argument is the human ability to measure time. The energy portion of the light, being manifested in wave form is just as instantaneous as a wave<sup>1</sup> bouncing off of a seawall, but the matter portion of the light beam must change direction, and in doing so, some energy is lost. Why? Because it takes energy to change direction. While there is no proof of this, there are indications in a simple high school educational tool: The Radiometer. When a beam of light impacts the white face of the radiometer, the matter portion of the light beam imparts kinetic energy to the pinwheel and it turns. The imbalance between the white face and the dark face also supports this observation. The dark face does not reflect as much light, but absorbs the energy as thermal energy. Neither face absorbs the portion of the light energy that exists as matter just as the earth does not increase in mass as a result of solar radiation.

Another problem with the equation  $E/m = c^2$  is in the combination of the two types of energy being described. If mass is the sum of the Kinetic energy of the matter and the Potential energy of what I am calling frozen energy, then the equation falls apart. First, note that the equation has no conformity of units. The speed of light is measured in distance per unit time. Neither of these units is represented in the left side of the equation.

<sup>&</sup>lt;sup>1</sup> See hypothesis of radiant energy formation as it relates to potential energy in the last paragraph.

Furthermore, Kinetic energy has an associated vector. Potential energy comes in two varieties (at least). The first is the Potential energy contained in matter, such as chemical energy. The second is the Potential energy of the mass Relative to other units of mass. These may be large, such as the earth or sun, or small, such as inter-molecular attractions. This second variety of Potential Energy also has an associated vector component. In sum, the Total Energy in the equation is a mixture of energy that is measurable or conceivable only as raw vectorless energy and energy that only exists in relationship to other energy-matter structures.

Regarding the theory that matter cannot be pushed far enough to exceed the speed of light, it is worth noting that speed is only valid when there is an associated vector and an associated reference point. Observing matter with a velocity at or beyond the speed of light creates a self-defeating conundrum. Due to the nature of our observational tools, light and other Electromagnetic waves, we may never be able to make such an observation. I first wrote about this in 1982. Rather than include a reiteration here, I am putting that paper in the appendix.

In my, as yet, very cursory examination of the properties of limited speed and the phase conversion of matter to energy and back, what has become apparent is that these subsequent relationships are not based in direct observation as I have noted earlier, but are derived from the core equation, E=mc<sup>2</sup>. They are theories based on a theoretical equation containing unresolved ambiguities. They exist, not because of observation, but only to avoid violating the equation [End Note 1].

One attempt to reconcile some of these derivatives is in the concept of the Spacetime Continuum. In that theory, the second derivative of the equation, Space and Time, are considered to be the same. This allows for the supposition that all matter is travelling at the speed of light, a portion of it in Space and a portion of it in Time.

Another conundrum is the conflict of logic between the next two statements: Mass increases because a portion of the energy is converted to mass. Or

*Mass decreases as energy (force) is exerted on the mass to accelerate it, converting mass to Kinetic Energy.* 

The first is derived from the core equation, simply to avoid violating it.

The second is derived through the logic of conservation of the combination of matter and energy contained in the mass under consideration.

The intriguing part of these thoughts is that the proposed relationships and phase shifting can explain electric charges of protons and electrons, as well as the absence of charge on neutrons, while retaining the micro-gravitational attraction of neutrons to each other, as well as the wave-cancelling effect seen in the double-slit experiment. The proposal also explains the common reference that is used by chemists regarding a single atom or molecule's 'energy state' or 'reactive state' commensurate with orbitals.

What it does not explain is this: Is Radiant energy a *release* of the potential energy in matter, or is it simply the result of the "vibration" of potential energy in the matterenergy matrix that makes up Mass? Is Radiant energy similar to sound waves? If it were not, then a mass that is emitting radiant energy, such as light, x-rays, gamma rays, and so on, should be losing total mass over time. If these wave forms and frequencies are the result of an internal oscillation in the mass, then there would be no loss of mass.

## SUMMARY CONCEPTS

Mass is the combination of Matter and Energy.

Matter is Frozen Energy. It is not at absolute zero, but is simply energy in a different phase.

The Frozen Energy in Matter is Potential Energy that can be released as Kinetic Energy or expressed as Radiant Energy in wave form. Energy, even in the phase we call matter, leaks radiant energy as a wave.

Energy exists in three phases, much like the solid, liquid, gas phases we are all familiar with. These three states are Matter (Potential Energy), Kinetic Energy, and Radiant Energy (wave form).

Radiant Energy is also released in exothermic reactions.

## END NOTE:

 $E/m = c^2$  – as Energy of the particle increases mass must as well in order to keep the equation valid.

## APPENDIX

Light and the Red Shift Thomas R. Cuba, Ph.D. 1982

Consider the Red-shift as the observation which precipitated the Big Bang Theory of the origin of the Universe. In simple terms, astronomers searching the sky found white stars and stars with a red tint. Explaining the phenomenon was complicated by the fact that light travels at a constant speed in a vacuum such as outer space. It was the wave properties of light that gave us an explanation. Each color of light has its own specific wavelength, or the length from one peak of the oscillation to the next. While the speed of the light itself did not change, objects travelling away from us at high rates of speed would have their wavelengths stretched. In that manner, light emitted as white light from a fast-moving object would be observed as a reddish light from a stationary observor, provided the emitter was moving away from the observor.

Theoretically, however, if the observor were in the path of the fast-moving emitter, the object would appear blue or violet in color because the wavelength would be compressed.

Red-shifted objects are common. Blue-shifted objects are unheard of.

Now consider the same scenario while including the theory of physical relativity.

In the vacuum of space, there is an observor and an emitter. The emitting object is seen by the observor as a white light. As the object moves away from the observor, the wavelength shifts to red. Should that object also increase in speed, the wavelength is stretched further. Should the object actually reach the speed of light, the wavelength becomes infinitely long and the object disappears; The observor can no longer see it.

The relationship between the emitting object and the emitted light changes at the point that the object exceeds the speed of light. In that scenario, the object is travelling faster than the speed of light and emitting light, travelling at the speed of light. Relative to the observor, the light then is no longer originating from the object, but appears to arrive at the observor from the opposite direction, 180 degrees relative to the actual object. The observor would see a red-shifted object going away from the observor, but in the opposite direction of the actual emitting object.

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