Research Article

Riding Electrons: Musings on Reality, Relativity and Other Things

David L Ryan MD

GM, Intel Health and Life Sciences Business - Intel Corporation, San Francisco Bay Area, United States

***Corresponding Author:** Dr. David L Ryan MD, 6920 S. Cimarron Ave., Suite 100, Las Vegas, NV 89113, United States

Received: 15 March 2021; **Accepted:** 23 March 2021; **Published:** 01 April 2021

Citation: David L Ryan MD. Riding Electrons: Musings on Reality, Relativity and Other Things. Journal of Psychiatry and Psychiatric Disorders 5 (2021): 41-46.

Abstract

The purpose is to expound on the mysteries of spacetime, black holes, certain quantum phenomena and why applying special and general relativity to the quantum realm is so problematic. The author then puts forth, by way of thought experimentation, potential considerations for future research and discovery.

Keywords: Energy; Special relativity; Capacity to do work; Time dilation; Energy expenditure; Entropy; Second law of thermodynamics; Speed of light; Perspective; Heisenberg; Newton; Maxwell; Quarks; Electrons; Hidden variables; Entanglement; Gravity; Spacetime warping; Force; Black holes; Matter; Hypotenuse; Sine; Cosine; Granular; Electromagnetic energy

1. Introduction

"Then God said let there be light". – Book of Genesis 1:3 [1].

I am hardly wont to evangelize, but the book of Genesis speaks a profound and simple truth of the essence of the universe and its origin.

Physicists know that existence requires energy. If a thing cannot act on another or be acted upon by another upon it is not real. Indeed, the only way we know something is 'real' is by the forces acting on it, forces which require energy. Energy is defined as the capacity to do work [2].

A body set in motion will remain in motion forever unless acted upon by another [2]. Nothing real can go faster than the speed of light and c is constant no matter what your frame of reference. The laws of physics are uniform everywhere in the universe. This was the breakthrough of Special Relativity out of which arose time dilation and c, a constant speed of light.

2. Methods

Recall from the special theory of relativity that time shortens, passes more slowly, when a body is in rapid motion relative to another. Therefore, if you have ship traveling away from Earth at half the speed of light you would expect time to shorten relative to earth by a reciprocal amount (one wouldn't know this of course unless and until the ship returned- ie the proof requires two points of comparison.) That inverse relationship is given by the Lorentz equation. But what is the passage of time; is it just what the clock says it is? Recall that existence in the known universe requires a cause set in motion, i.e. a force acting on something accelerating it into motion. This in turn requires the expenditure of energy which is established by the equation E=mc2 to be a function of c2. Also, Expenditure of energy by the second law of thermodynamics increases entropy. Because entropy is unidirectional and is an expression of randomness [3] in terms of causes set in motion or rather events unfolding if you prefer, time might be also expressed as an increase in entropy.

3. Discussion

3.1 A matter of perspective

Events that are simultaneous in one frame of reference are not simultaneous in another frame [2]. The only caveat to this is if two events occur at the same time and place then it's essentially considered one event. The Pauli exclusion principle states that no two electrons or particles can occupy the same place at the same time with the same spin. Furthermore, Heisenberg uncertainty principle states that the more accurately you are able to localize a particle the less you know about its velocity or momentum and etc. Our senses requires the particle manifest as a particle which of course, doesn't have the same point of reference as when it manifests as a wave and in any case it exists as neither. To the electron being a particle and having momentum are simultaneous events, but not so from the perspective of the observer. So what if you could ride an electron, what would you see? Well for one thing, on such a microscopic scale, everything would appear to you as a wave including you, the electron AND the observer attempting to locate you. You might see the observer's momentum, his wave that is (remember everything is relative with respect to everything else), before you actually could see him looking at you riding the electron, ie the two events are not simultaneous.

[i]Now consider the instrument the observer uses in order to locate you. A light beam is used which then knocks the electron off its path and on to a screen of sorts, which localizes you frozen in time. In other words, the observer loses the ability to record any information about your momentum [4]. This is because our senses demand that whatever it is we call a 'particle' manifest itself in comprehensible fashion; we do not yet even have the vocabulary to describe how such a thing takes its existence [5]. We just cannot observe something in its totality (as it truly is) let alone describe what it is, that manifestly exists in only one perspective. Remember the instrument's light beam has no perspective. Now consider the measurement of momentum; here light of less energy

(lower frequency) is used and it does not knock the electron off its course and therefore its momentum can be determined but as you continue in motion precise location cannot [6]. Well known therefore, that at such a scale, you cannot measure the thing you wish to without disturbing it in some fashion.

Since everything that exists is in relative motion, an observable event requires *two* perspectives to record its occurrence. In point of fact, it takes two perspectives to measure events that are simultaneous in at least one of those perspectives. Everything is relative except light which has no perspective; t=0 (does not exist) therefore Einstein riding his light wave sees nothing in motion, nothing happening at all as photons knock you and the electron off kilter onto the screen, providing from *the observer's* perspective visual evidence of its location. Lower the energy (frequency) of the photons, repeat the experiment and you get momentum measured from *the observer's perspective* and only the electron's probable location, expressed as a range of probabilities. There is no in between frequency of light that can give you both. There's another problem however. Supposing there was a way to accomplish this, ie suppose you could aim another particle, like a quark for example, of energy insufficient to knock an electron off track but with enough energy to be in superposition with it hypothetically giving you information about its position. What then? Extrapolating Bell's theorem of quantum entanglement to the Heisenberg uncertainty principle might save the electron (and us) here:- forget about simultaneity, simply put the momentum of a particle cannot be determined by its location (read: if its location is known); so even if it's theoretical to measure both, quantum physics says it cannot be done. There are no hidden variables, at least with our current understanding of quantum mechanics, that suddenly convert the quantum realm into a Newtonian one. Why include *us* in the discussion? Because it saves us from having to live in a Newtonian world where all our actions words and thoughts are predetermined, and what a hellish world that would be [7].

3.2 Maxwell's Silver Hammer

We know from Maxwell's laws that a magnet can generate electricity and an electric field and vice versa. We also know from quantum theory that Newton's laws specifically do not apply to the microscopic or quantum realm. In this realm, quantum theory says only probabilities govern here [8]. Considering Einstein again. Since $E=mc_2$ c remains constant the accelerated object's mass increases with the energy expenditure as proven by the general theory of relativity and it stays that way in motion forever until acted upon by another expenditure of energy. Energy expenditure at high speeds is only partially expressed as kinetic energy. Since the laws of the physics apply everywhere [2], it ought to be the case that gravity can be produced by electromagnetic forces. After all what is electricity but the rapid flow of electrons across a conductive surface. Now isolate a charged atom or molecule, an ion, not a point particle but small enough to accelerate through a particle accelerator. Physics says it's mass must increase in keeping with the constancy of the speed of light. This necessarily then should generate a change however minuscule or tiny in its gravitational field. Consider the next paragraph.

3.3 Of quarks, electrons and matter

Immediately after the big bang, electromagnetic waves of such high energy were produced that quarks, the elementary particles of matter were formed. Photons of such high energy would have frequencies (given by E=hf) so great that the elementary particle of light, the photon could not sustain itself as a light particle and becomes quantized as matter. Recall that the minimum size of any particle is given by h, Planck's constant. There are only certain wave lengths that can fit into a finite length (h) just as only certain notes can be played on a violin string of a given length. When the energy, ie frequency of the photon reaches this limit, it quantizes into mass particles and accommodates energy beyond this limit by the production of particles. Electromagnetic energy of the quantized matter is itself then quantized in the particle as electrostatic charge, giving rise to valences of quarks and electrons. The high energy particles collide with each other almost instantaneously producing states of superposition or entangled quarks. This entanglement gives rise to the color force gluing quarks to each other. This can be inferred to be the case because of the nature of entanglement; no matter how far away an entangled particle is from its counterpart, the properties of both predetermining each on the other remain the same, they do not diminish with distance, which also describes the color force, as it turns out. Therefore, the color force may derive from superposition but since the color force requires energy and cannot draw it from quantized matter (the matter would then rapidly decay otherwise) the matter then must be "shed" (from light) by slowing down to a speed less than c, giving it perspective, allowing the arrow of time to emerge. A portion of this energy must also be used for warping or bending spacetime, otherwise the particle would be unstable and decay back into electromagnetic energy. Since entropy is ever increasing, stable mass must increase the entropy around it by bending spacetime. This warping of spacetime can be viewed as a sort of 'turbulence' surrounding a mass that is required to prevent its decay. In a process not unlike the Bernoulli effect, mass acquires gravity. This is the force of gravity and accounts for time dilation effects also. Hence gravity, insofar as the color force dictates that quantized energy (matter) travel less than speed c, owes its existence to the color force as does the emergence of time, all of which derive from electromagnetic forces. Thus the color-electroweak-gravitational force is the wellspring of everything in existence.

3.4 On gravity, black holes and matter approaching the speed of light

We know from the theory of general relativity that time dilation occurs with gravity. What this means is that the further away an object is from a much larger object (a planet for example) the faster the passage of its time. As gravitational forces act on a body, the distance between the center of the source of gravitational pull r, shortens. This occurs due to Newton's law of gravitation. Time dilation dictates that time slows down as the object nears the planet but as time slows down the mass of the object also increases because $E=mc_2$ where the energy exerted is just the potential energy of the gravitation field expressed as a force acting on the object. This will occur theoretically until the object passes through the center of the source of gravitation (for example the center of the earth). Since its mass is increasing, it would require greater and greater effort, force, to push towards the center of the earth. Gravity itself solves this problem since with the shortening of r2, the squared distance between the two objects, the mass exerting gravitational force on the smaller object as it passes through the center decreases, thereby slowing its acceleration. Therefore, gravitational forces in general occur without the impossibilities that occur with gravitational forces in a blackhole. With gravitational inertia as you accelerate a mass towards the speed of light its inertia increases meaning that its mass must increase and must do so ad infinitum, requiring an infinite amount of energy until the speed of light is achieved. This is an impossibility. However, there is another reason why such a thing is impossible and that has to do with the acquisition of entropies from ever increasing perspectives. Recall that time is relative and is different in every point of reference. These points of reference can be expressed hypothetically, as angle rotation of the hypotenuse of a right triangle. How does a hypotenuse's angle rotate in purely geometric terms? It does so by tilting, i.e. foreshortening either one side or the other, varying the angle such that sine and cosine of the rectilinear triangle vary. The two sides, adjacent and opposite, which together with the hypotenuse form the right triangle are assigned to space and time respectively. Thus, when the sine of the right triangle is zero, there is no passage of time meaning what? The speed of light has been achieved. But what else? It also means that time has merged with space and its passage can no longer be measured. T is zero. It has not gone away just merged with space. Why is this not possible, but according to Einstein, must also be true? Because of mass.

Recall the hypothesis that mass, entropy, energy, gravity, force, space and time itself, the very medium through which all things occur, are all interchangeable. Everything except for light energy requires a perspective, a point of view; for mass, entropy, energy, gravity, time, etc. to 'exist' requires perspective. (This is a conundrum since physicists also know that if a thing is relative, it can be made to go away in somebody's point of reference and therefore has no independent existence) [9] . Gravity in the macroscopic world (Newtonian gravity), because it has a center, provides a sanctuary or relief if you will, from the burdens of an object getting multiplicity of perspectives as an object gets closer to the source of gravitation. This may be viewed is an incomplete process for as the body passes through the center of gravity, as I mentioned previously, its acceleration decreases and thus it never approaches the speed of light. A body in motion requires an infinite amount of energy expenditure to be accelerated to the speed of light but the object would have to acquire energy (increasing entropy). The energy requirement to a mass the speed of light is infinite and would require entropy to increase to a state of complete randomness.. So what about black holes? There are some equivalents here because what you see in black holes is matter of extreme density such that now you do have very strong gravitational forces.

4. Conclusion

4.1 Speed of light: arbiter of all perspective

According to Einstein's laws time must end; the laws of physics and relativity demand this. This poses the aforementioned impossibility that matter gets infinitely dense. We know this can't be because of the granular nature of matter [3]. There is a limit to how dense matter can get. What if granular matter, say of a blackhole, is represented as a function of c, then what? Then the blackhole crunches down to ever-increasing density and begins to lose properties that make it up, chiefly the property that gives each unit of density a separate perspective from its granular neighbors in spacetime. Space between granules if any, charge, gravity, spacetime, in summary everything, until all granules heretofore distinguishable by what they now lack – perspective- are collapsed, vanishing and evaporating into the eternal singularity, electromagnetic energy traveling at c. To say that a granule is a function of or can be in some way described by or correlated to c is to say that it is itself an abstraction. How then can anything ever be real? Perhaps our notion of what is abstract is just a product of our perspective?

Acknowledgements

Much of the inspiration for this article comes from The Great Courses, a lecture series from The Teaching Company, Chantilly VA.

References

1. The Holy Bible. NKJV. 1982. Thomas Nelson Inc. Nashville TN.
2. Richard Wolfson PhD "Einstein's Relativity and the Quantum Revolution", 2000.
3. Rovelli, Carlo. The Order of Time. 2018. Penguin Random House LLC. New York NY
4. Styer, Daniel F. The Strange world of Quantum Mechanics 2000. Cambridge University Press. New York NY.
5. Daniel N Robinson PhD, "Great Ideas in Philosophy", 2nd edition 2004.
6. Benjamin Schumacher PhD, "Quantum mechanics: The physics of the Microscopic World", 2009.
7. Stapp, Henry P. Quantum Theory and Free Will. 2017. Springer International Publishing. Switzerland.
8. Tegmark, Max. Our Mathematical Universe. 2014 Random House LLC, New York NY.
9. Rovelli, Carlo. Reality is Not What It seems: The Journey to Quantum Gravity. 2016. Penguin Books Ltd. New York NY.