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The Logical and Scientific Impossibility of Time-Travel

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Mathematical fallacies of the modern interpretation of time dilation with respect to physics

Abstract — It is arguably the most popular trope of the science fiction genre, yet over the past couple of decades it has found its way into mainstream science. The concept of time travel, specifically the ability to escape the linear path of time and return to a moment which has already occurred or to preemptively journey to a point in time that has yet to come to pass. The justification of the practical means of this theory come from Eistein's theories and his well-known statement" Time is relative." However, a closer examination of Einstein's theories and the notion of time in relation to the multitude of natural forces acting upon the physical world highlight a misinterpretation of behavior of the property known as time. This paper seeks to mathematically and logically showcase these misconceptions and present an alternative understanding of the functions of time and the impossibility of time travel.

Keywords— Time travel, Time travel impossibility, Scientific impossibility of time travel, Logical impossibility of time travel, Time travel theory, Time travel paradoxes

I. INTRODUCTION

To understand the concept of gravitational and time dilation in current scientific fields and highlight the fallacies of the theory as it currently stands. This paper will also present an alternative interpretation of the practicing properties of time in relation to relativity and the functions of the physical forces acting upon the earth at any given moment.

II. MAIN BODY

The ability to travel backward and forward in time has been a subject of several mainstream movies, television, and books ever since it was popularized in H.G. Wells novel "The Time Machine." Yet today the subject of time travel is no longer only the topic of the entertainment industry. Today the belief that time travel is not only scientifically possible but could be a physical reality in the very near future, if not secretly already existing. Many respectable scientists would agree that time travel is theoretically possible but not feasible with the limitations of technology today. This hypothesis is provided by sound logical proofs; however, they are based on one very large misconception, that being the property of time. The misconception is not the operational nature of time but its fundamental being. More specifically, that time does not technically exist, at least not in the form to which we believe.

No doubt this claim is met with confusion, skepticism, and most probably a bit of ridicule. Understandable as the concept of time is deeply embedded in our culture and our daily lives. The modern perception of time is like a river and all of us are boats traveling down the river in one direction. By far the most popular analogy for time, this image brings forth various questions about the manipulation of time. A strong enough motor can allow a boat to go against the current of a river, therefore there should be a method to go against the "flow" of time. Or find a way to break through the dimensional barrier of time and re-enter the dimension at a previous point. Which makes logical sense if you think of time as a river which you travel down to get to a certain destination, that in this case being death.

Here lies the misconception, not in the belief time is a river, but the concept that time is any sort of physical force. In reality there is no river, no path, as time is a measurement value of momentum. Which admittedly seems ridiculous, time is an ever-present part of life commanding every moment of our day. We have multiple devices to measure time, even wearing it on our wrists. So how can time not be an all-encompassing force of nature? The answer is quite simple… because everyone kept saying it was, so therefore, it was. Again, this statement seems unlikely until you contemplate what time is considered to be.

How can you prove time exists? The first answer would probably be the display of a watch ticking the time away. Yet, this device does not run on time, the hands of the clock move about its face because of the small, mechanized gears which slowly move the hands in preset intervals. It is a device that runs off small batteries, or in older models a wound spring. Even digital clocks are operated by an interval-based program running off a battery. These devices represent time but are not time itself. In fact, when considered, clocks are the worst proof you can offer for the existence of time. As the intervals are completely determined by the operator.

The location of the clock also alters the time it reads depending on the local time zone. And in the United States of America,

clocks are forcibly shifted backwards or forwards twice a year for the sake of convenience. The so-called force is literally changed at will by its operators. Imagine if other fundamental forces were as flexible, such as gravity, wouldn't that make reality interesting? Yet all this argument proves is we change the values of the measuring devices, similar to switching between pounds and grams. Just because the values are switched doesn't change the fact that an object weighs something, therefore changing the hours is not going to change time.

Normally this would be a good argument for the existence of time except for the fundamental difference between time and weight. Weight can exert a physical change, it cannot only be measured but felt, it has influenced the physical world. Which many would argue time does as well, the effects of time can be seen in such incidents as:

- Metal rusting
- The sun rising and setting.
- Food spoiling
- Stars moving
- Seasons changing

To name a few, and most notably, humans ageing and dying. All the aforementioned examples would be a good case for the physical effects of time, and therefore its existence as a fundamental force. However, there is one fatal flaw with this argument, none of these instances are caused by time.

Yes, that sounds strange and even wrong, but consider each case carefully. Does metal rust because there is a force acting upon it? No, rust, or corrosion, occurs when a material such as iron is exposed to oxygen it causes electrons to rise up and form hydroxyl ions which react with the Fe++ to form iron oxide better known as rust. It is the interaction between iron and oxygen that causes rust if the metal is removed from the oxygen, it does not rust. So, it is the chemical reaction between iron and oxygen and not time.

The same can be said of food spoiling, it is not time that spoils the food but a chemical reaction that causes a change in its natural state. Proof that this effect is not time can be seen in common refrigerators used to cool and subsequentially slow down the chemical process. So, unless time can be slowed down by the cold, food spoiling is a chemical reaction and not dependent upon a force such as time. The rising and setting of the sun is in no way dependent on a ticking clock. If your clock stops the sun will still rise and set. The sun rises and sets because the earth rotates around the sun. The stars move because they are moving through their orbit, which is based on the fundamental force of gravity, not time. The same can be said with the changing seasons being various chemical changes not dependent on time, hence why the exact moment seasonal change occurs cannot be accurately determined, only roughly estimated.

Of course, the biggest "proof" that is presented for the existence of time is humans themselves. We age, we grow from adolescence to adulthood and eventually die. So, how can anyone deny time as a force equivalent if not greater than gravity? Again, it must be asked, is time causing this? Is there an external force which causes a person to age a certain rate? The answer is no. The biological reason we get older is our cells divide to make new cells as the others die off and there are only so many times our cells can divide.

At the microscopic level our aging is a result of the shortening of telomers at the ends of our DNA strands. There is not an external force of time compelling these chemical changes. Evidence of this can be seen in the fact that rates of age are not uniform. How fast or slowly people age depends on varied factors such as: genetics, diet, health, lifestyle, and environmental factors to name a few.

Each of the aforementioned factors contributes to human life expectancy in different ways. Destructive health choices such as smoking or the excessive consumption of alcohol damage the cells of the human body. In the case of smoking the toxins are known to damage lung cells, turning them black and disrupting the natural functions of the lungs. Skin can also be affected, losing its elasticity, and producing premature wrinkles. Alcohol has similar effects on the liver. These and numerous narcotics have been shown to speed up the aging process which does not make sense if time is what causes humans to age. More examples of these proofs of time can be presented and literally every single one is in reality a chemical or physical reaction.

This highlights the impossibility of reverse time travel, or going into the past, because there is nothing to go back to. We tend to think of our lives like a movie where we can go back and forth between certain points on the recording. However, we forget it is a recording, the image of the moment is preserved on the disk or tape. The recording is a physical object that is acted on to produce the image. That is the misinterpretation of the concept of time, it is not a recording of any kind. Time would need to be a separate dimension where every moment is stored. Meaning there would need to be some force which moves the entire dimension forward. Or, if preferred, our existence would need to be the disk and time the device that plays the metaphorical disk.

Seemingly this could make sense, however if the comparison is going to be made between time and a recorded movie the question arises… What was the original recording? For this scenario of time to work the recorded images, or in this case existence, would need to have been set down from a source. Meaning existence would be just an after image of what's already taken place. If true, then the question of what that original image was is still present. Movies have to be recorded in a series of events; even animated movies are still recording a manufactured series of events.

This raises more questions which only increase in absurdity. For instance, if we are a recording, what are we a recording of? What were the original creatures who our existence shadows? What laws do they obey? If their existence acts like ours then wouldn't that mean their existence would also need to be a recorded series of events that would also need to have been based on a series of events? And this question would just continue infinitely onward. And it doesn't explain who or how the "images" were first recorded. Not to mention what all powerful forces started the recording in the first place. In the end this scenario becomes a confusing and flawed version of the hologram universe.

This is obviously complicated, but complicated does not necessarily mean wrong. Everything is confusing before it is understood but that does not mean it does not make sense. The problem with this scenario has nothing to do with its complicated comprehension. The problem lies in the non-uniformity of the physical structure of the recorded device versus the known physical structure of the universe. To continue the metaphor a recorded disk has all the information prerecorded on it so it can be played at leisure. While the images move from start to finish, they do so within the confines of the disk. The recorded narrative is printed uniformly on the disk meaning the overall structure of the disk remains constant at any and every point.

Properly paralleling the recorded disk to time, with time being the disk that's played, therefore making the disk the representation of the universe. Implying if this scenario were to accurately represent our dimension of reality, there would be an expectancy of similarity between the universe and the disk. In other words, at any point in history past present or future there should exist a consistency in the physical properties of the universe. That is the problem with the current conception of time, there is no uniform consistency in the universe. Scientists have shown instead that the universe is expanding and running down. In direct contrast to the physical properties of the disk. Even as the disk wears out it does so uniformly across the disk unless it is physically damaged in some way.

So, if our current understanding of time is correct, and it is a river we are traveling on, there should be uniformity in the physical structure of the river or in this case the universe. The fact that there is not, and the universe is in fact expanding and winding down suggests one of two things:

- The dimension of time is so dissimilar to a recorded disk or river that it defies physical uniformity and naturally winds down.
- Our fundamental understanding of time is wrong.

Of course, the most common reaction to this will be "how can our understanding of time be wrong when so many scientists maintain the possibility of time travel?" First off, that statement is a tad erroneous and misinterprets the factual claim of scientists. In reality a majority of scientists do not believe backward time travel is possible. The misunderstanding of populous stems from a difference in definition in the term time travel between the average population and scientists. For the masses, when time travel is mentioned an ability to appear in any point in history is conjured. However, this is not the definition utilized by scientists. When scientists discuss the possibility of time travel, they are referring to the likelihood of forward time travel, or more specifically, time dilation theory.
Time Dilation Theory – The difference in the elapsed time as measured by two clocks due to a different relative velocity or gravitational potential between the clocks.

The presumed scientific fact of time travel is held with a near sacred reverence within the scientific community. This reverence is in no small part due to the theories of special and general relativity. Proposed by Albert Einstein, it is a mainstream belief that Einstein's most famous theories advocated for the possibility of time manipulation and therefore time travel. However, this claim is incorrect, while Einstein's theories are sound the conclusions inferred from them by modern science is incorrect. General and special relativity in no way shape or form suggests the possibility of time travel. Instead, they highlight the factual external forces that affect the perceived measurement of the value of time with respect to precise circumstances of the moment. To understand this suggested misinterpretation by mainstream science, the time dilation theory and more importantly the methods in which it has been proven must be analyzed.

The principle of time dilation discusses time as being altered to certain external properties of forces. In time dilation theory there are two primary forces which are believed to affect the flow of time, velocity, and gravitation. Velocity, the most discussed of the two parameters, is said to generate alterations in the flow of time. The greater the amount of applied velocity through the three dimensions which define physical space, the

more slowly the object will move through the fourth dimension known as time. This decrease in time is not noticed by the object in which the velocity is being applied. Instead, this time variation is noticed in comparison to an object which is not being accelerated as fast.

Perceived acceleration in time can also be viewed in respect to gravitational orientation. Known as gravitational time dilation, states that the normal flow of time is affected as it approaches a large gravitational body. Time will run at a slower rate when in close proximity to a large gravitational body, where time runs faster at a higher altitude from the gravitational body. Simply put, time runs slower the closer you are to the earth and runs faster the farther you are away from earth. Meaning gravitational force directly alters the normal flow of time as it approaches a body large enough to produce a significant gravitational field.

Whether based on velocity or gravity, these theories both rely on the relative perspective of two individuals. One who acts as a control subject, in which the flow of time acts normally, and a second subject who has a force applied to them, which alters the normal flow of time for the second individual. Two subjects are required to explain this theory as, in relation to either singular subject excluding the other subject, the normal flow of time does not change according to the personal perspective of the subject in question. Therefore, the only way time dilation is noticed is through the perspective comparison of two separate subjects as seen in the well documented proofs of these theories.

Both time dilation principles are widely accepted not only due to the assumed endorsement of Albert Einstein and other scientists, but the proof offered by experiments utilizing atomic clocks. The experiment was fairly straightforward and officially known as the Hafele-Keating experiment. Here four cesium beam atomic clocks were placed aboard commercial airliners. The planes then proceeded to circle the globe twice in opposite directions. These atomic clocks were then compared to the time kept by a stationary clock at the United States Naval Observatory. When the comparison was made between the three atomic clocks it was observed that they all disagreed. The clocks revealed a loss of 59+/-10 nanoseconds during the eastward trip. On the westward trip, demonstrated a gain of 273+/-7 nanoseconds. Both of which were in the margin of error for their predicted values of a loss of 40+/-23 and 275+/-21 nanoseconds for the east and westward trips respectively.

This aforementioned experiment was a test of velocity-based time dilation. Experiments for gravitational-based time dilation have also been tested, though it is varied from Einstein's original experimentation proposal. What Einstein originally proposed was that a spring clock positioned at the earth's equator must go slower, a very small amount but slower none the less, than a similar clock situated at one of the poles. He had proposed this experiment before his development of general relatively and failed to realize that the test would have been nullified since the surface of the earth is a gravitational equipotential. Meaning kinetic and gravitational effects would precisely cancel. Yet scientists did find an experiment to test and prove gravitational time dilation.

Similar to the velocity time dilation experiment, two atomic clocks were utilized. In order to prove the gravitational effects on the flow of time one atomic clock was placed at a high elevation level while the other was kept at ground level. Once again, a perceived difference was noted in the nanosecond time range kept by the two clocks at different elevations. Adding further credibility to the time dilation principle. These accepted proofs have given rise to the popular "twin paradox" theory.

Simply stated, the "Twin Paradox" is physics conjecture involving a set of twins. In the paradox, one twin is an astronaut while the other works for mission control. The astronaut is then deployed on a deep space mission traveling at ninety-five percent the speed of light. Upon his return the online clock has registered that the astronaut has been gone for ten years. However, upon returning to earth, the astronaut discovers that the twin who remained in mission control has aged a total of thirty-two years. This is because the astronaut was traveling at relativistic speeds and therefore the clock was slowed down.

This conjecture provides the following explanatory calculation:

$$t = \frac{to}{\left(1 - \frac{v^2}{c^2}\right)^{\frac{1}{2}}}$$

According to this formula at low velocity the speed of light compared is v^2/c^2 approaches 0 and the equation simplifies to (to): t = to/1 which is t. So, at low speeds time dilation is not a factor. At high speeds as velocity increases the quantity v^2/c^2 approaches 1 but never reaches it, causing (1 – v^2/c^2)^(1/2) to become smaller and smaller… causing the time measured by the other observer to become greater thus making our time appear slower.

In light of these experiments and their perceived proof of concept of time dilation, how could the current perception of time be wrong? There is nothing wrong with the method in which the experiments were conducted, neither was their issue

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with the data gathered nor the method in which it was gathered. The fault lies in the interpretation of the data and a failure to address the universal application of physics on the microscopic world. A misconception which can be mathematically experimentally shown in the following explanations, starting with Gravitational Time Dilation.

Gravitational time dilation theory states the further away a body is from a large gravitational force, the faster time will move. This theory was claimed to be proven through the use of an atomic clock which is capable of telling time down to the nanosecond or smaller. With the use of this clock, it was shown that a clock which was further from the gravitational pull of the earth did in fact move slightly faster than the one closer to the earth.

This experimental proof may in fact have been a misconception of the physical properties of gravitational pull on an object while in motion with respect to a constant force. Proof of this misconception can be mathematically demonstrated by firstly understanding the basic workings of the atomic clocks utilized in the experiment. In a simplistic form: a beam of state A cesium atoms are sent through a resonator where they are subjected to microwave radiation. This radiation triggers some of the atoms in the beam to change to state B with a magnet removing the atoms still in state A. finally a detector counts the number of atoms that switched to state B, allowing for small variations of time to be counted.

Figure 1. depicts a simplistic look of the final stage of the beam and counter of a cesium clock.

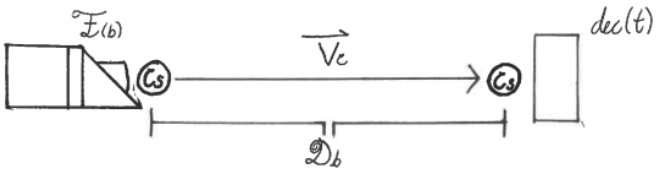

Figure 1.

In this final stage of the clock's operation the time given by the clock is directly proportional to the number of B state atoms that impact the detector (dec(t)) as shown. This number is dependent on the distance (Db) the cesium atoms have to travel and the Velocity (Vc) that they are traveling. The velocity (Vc) of the atoms is therefore determined by the force produced by the beam (Fb) when the clock in in operation. This can be roughly estimated in Equation 1.

$$\text{dec(t)} = \frac{Db(N)}{Vc} \quad \text{Equation 1.}$$

Where:

- dec(t) = Detected cesium atoms in state B
- D_b = The distance traveled by the Cesium atoms.
- N = Number of cesium atoms that impact the detector
- Vc = Velocity of the Cesium atoms from the beam

From this explanation the noted change of the time detected by the cesium clock detector implies the velocity (Vc) of the cesium atoms increased and was represented in a faster recorded time. Understanding the actual process of this occurrence can be shown by utilizing the formula for Newton's Universal Law of Gravity:

$$F = G\left(\frac{M1M2}{d^2}\right) \quad \text{Equation 2.}$$

Where:

- F = Gravitational force between two bodies.
- M1 = Mass of object one.
- M2 = Mass of Object two.
- d = Distance between the two bodies.
- G = Gravitational Constant

Since properties of gravity state that gravity affects everything the same regardless of size, this implies that cesium atoms are also subjected to gravitation pull. this suggests that the gravitational pull between cesium atoms and the earth can be calculated using Newton's Universal Law of Gravity.

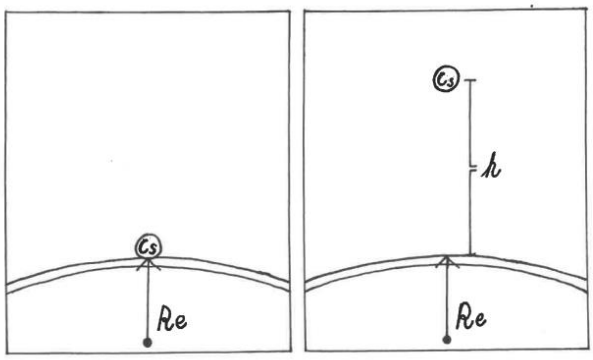

Figure 2

The universal law of gravity demonstrates that the gravitational pull between two bodies decreases as the distance between the two bodies increases. Therefore, as demonstrated in Diagram 1. The gravitational pull on a Cesium atom will be greater on an atom that is resting on the surface of the earth versus one that

is above the earth at height (h) as represented. Applying these properties to Newton's equation yields:

$$F(EM) = G(\frac{(Me*Mcs)}{(Re+h)^2}) \qquad \text{Equation 3.}$$

Where:

- F(EM) = Gravitational force between the earth and the atom.
- G = Gravitational constant.
- Me = Mass of the Earth.
- MCS = Atomic mass of Cesium atom.
- Re = Radius of the earth.
- h = Height from the surface to the earth.

The calculated gravitational force on the cesium atom (F(EM)) can then be used to determine the weight of the cesium atom. As gravity acting upon an object will determine the weight of the object and therefore determine the force needed to move said object for a desired velocity. The weight of the cesium atom can be determined with a standard equation:

$$M(cg) = Wc \times F(em) \qquad \text{Equation 4.}$$

Where:

- M(cg) = Weight of Cesium atom with respect to gravity.
- Wc = Atomic weight of Cesium atom.
- F(em) = Gravitational force between the earth and the atom.

The effect this has on the clock can be represented in this simple example. It takes a certain amount of force to move an object at a certain velocity. If that same force is applied to an object that is half the weight of the first object, then the velocity of the object will increase. Gravity's effect on the weight of an object is also well known as a person will weigh more on earth than a larger planet such as Jupiter. To calculate the changed velocity of the cesium atoms first calculate the acceleration using the weight of the Cesium atom in respect to gravitation pull calculated above.

$$a(c) = \frac{F(b)}{M(cg)} \qquad \text{Equation 5.}$$

Where:

- a(c) = Acceleration of the Cesium atom from the beam.
- F(b) = Force from the beam.
- M(cg) = Weight of Cesium atom with respect to gravity.

Finally, the velocity of the Cesium atoms can be calculated by using a formula that does not use time as a variable. The formula in question is:

$$Vf = u^2 + 2ax \qquad \text{Equation 6.}$$

Where:

- Vf = The final calculated velocity of the object.
- u = The initial velocity of the object.
- a = Acceleration of the object.
- x = The distance traveled by the object.

In this case, the initial velocity (u) is going to be equal to 0. And the velocity (Vc) of the cesium atom can be calculated as follows:

$$Vc = 2 * a(c) * Db \qquad \text{Equation 7.}$$

Where:

- Vc = Velocity of the Cesium atoms from the beam.
- a(c) = Acceleration of the Cesium atom from the beam.
- Db = The distance traveled by the Cesium atoms.

This can be placed into Equation 1. In order to determine the time variation due to gravity. This implies that time is not changing at gravitational intervals. Instead, the velocity of the cesium atoms is increasing as the force of gravity acting on it decreases. No different than an object being easier to move on the moon than it is on the earth. Therefore, it is not time being altered but the natural physical properties of gravity and velocity being manipulated.

In the case of Velocity Time Dilation

Time Dilation theory states as a body approaches the speed of light the time for the body in motion moves slower relative to a body not in motion.

In the case of velocity affecting the passage of time relative to an object standing still, an experiment was conducted using the same type of cesium clock. In this experiment two separate clocks were synchronized with one left on the ground and another placed on a plane. The plane was then accelerated to whatever. The counters on both clocks, which were synchronized to the nano second, reviled that the clock on the plane was slightly slower than the clock on the earth. The experiment reviled a difference of mere nano seconds, but it was a difference all the same. Similar to the gravitational experiment the procedure, data, and method for collecting the data was sound. Once again, the fault is a failure to recognize the physical properties acting on the molecular level.

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In this procedure there are four separate forces acting on the Cesium atom which affect its overall velocity. These forces are the same that any object experiences while in high velocity flight and include:

- F(b) – Force on Cesium atom provided by the clock beam.
- Fe(cs) – Force on Cesium atom from the Gravitational pull of the earth with respect to the distance from the core.
- F(d) – Drag force from accelerating the plane transporting the clock.
- Lp – Lift provided by the plane transporting the clock.

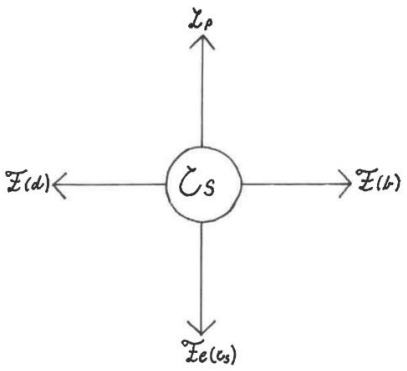

Figure 3

As with gravitational time dilation these forces need to be considered when evaluating the observed time variation with respect to velocity. This can be mathematically viewed utilizing the aforementioned simplified understanding of a Cesium clock where: a beam of state A cesium atoms are sent through a resonator where they are subjected to microwave radiation. This radiation triggers some of the atoms in the beam to change to state B with a magnet removing the atoms still in state A. finally a detector counts the number of atoms that switched to state B, allowing for small variations of time to be counted.

Figure 1. depicts a simplistic look of the final stage of the beam and counter of a cesium clock.

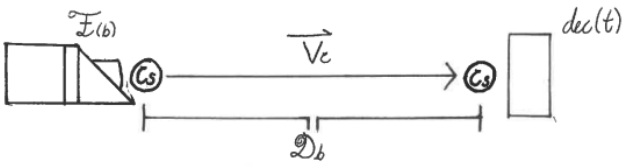

Figure 4.

In this final stage of the clock's operation the time given by the clock is directly proportional to the number of B state atoms that impact the detector (dec(t)) as shown. This number is dependent on the distance (Db) the cesium atoms have to travel and the Velocity (Vc) that they are traveling. The velocity (Vc) of the atoms is therefore determined by the force produced by the beam (Fb) when the clock in in operation. This can be roughly estimated in Equation 1.

$$dec(t) = \frac{Db(N)}{Vc} \quad \text{Equation 1.}$$

Where:

- dec(t) = Detected cesium atoms in state B
- Db = The distance traveled by the Cesium atoms.
- N = Number of cesium atoms that impact the detector
- Vc = Velocity of the Cesium atoms from the beam

As before in this explanation the noted change of the time detected by the cesium clock detector implies the velocity (Vc) of the cesium atoms decreased and was represented in a slower recorded time. Identifying the actual process of this occurrence can be shown by utilizing the following formulas and procedures: First calculating the velocity of the plane (Vp).

$$Vp = \sqrt{\frac{2mg}{pCA}} \quad \text{Equation 8.}$$

Where:

- m = Mass of the plane carrying the clock.
- g = Gravity constant
- p = Density of the air
- C = Drag Coefficient
- A = Cross sectional aera of the plane
- Vp = Velocity of the plane carrying the clock

Next calculate the Acceleration of the plane:

$$ap = \frac{Vp^2 - Vop^2}{2S} \quad \text{Equation 9.}$$

Where:

- ap = Acceleration of the Plane
- Vop = Initial velocity of the plane
- S = Displacement

Determination of these values permits the calculation process needed to determine the overlooked G-forces acting upon the cesium atoms.

G-Force – A measure of acceleration or deceleration. Rapid acceleration or deceleration increases or decreases the G-forces acting on the body making the body feel heavier or lighter

respectively as it pushes against a greater or lesser force acting upon it.

During flight the cesium atom will experience a G-force acting on it. This g-force will increase its relative weight as it fights the drag force experienced by the plane and the bodies and material within its interior. This can be demonstrated by using a weight ratio comparison to known G-forces acting on bodies in order to approximate the weight of the Cesium atom's weight with respective G-forces acting on it. The calculations are as follows:

$$Gf(cs) = \frac{ap}{g} \quad \text{Equation 10.}$$

$$\frac{Gf(cf)}{Wcf(\%)} \cong \frac{Gf(cs)}{Wcs(\%)} \rightarrow Wcs(\%) = \frac{Wcf(\%) \times Gf(cs)}{Gf(cf)} \quad \text{Equation 11.}$$

$$Wcs(Total) = Wcs + \left(Wcs \times \left(\frac{Wcf(\%) \times Gf(cs)}{Gf(cf)}\right)\right) \quad \text{Equation 12.}$$

Where:

- Gf(cs) = G-force of Cesium atoms at increased flight speed
- Gf(cf) = G-force of a commercial flight felt by passengers
- Wcf(%) = Relative weight increase due to G-forces experienced by passengers
- Wcs(%) = Relative weight increase due to G-forces experienced by Cesium atoms
- Wcs(Total) = Approximate weight of Cesium atoms during flight
- Wcs = weight of Cesium atoms

Though minor the increase relative weight of the Cesium atoms within the Cesium clock will decrease the speed of said atoms of the beam resulting in a slower count, representing the observed slower time variation. Which can be seen when using this value for Equation 1. First the force of gravity acting on the cesium atom at the height due to the plane can be found with Newton's Universal law of gravity:

$$Fe(cs) = G\left(\frac{Me \times Mcs}{(Re+h)^2}\right) \quad \text{Equation 13.}$$

Where:

- Fe(cs) = Gravitational force generated by the earth with respect to the earth's core.
- G = Gravitational constant.
- Me = Mass of the earth.
- Mcs = Mass of the Cesium atoms.
- Re = Radius of the earth
- h = height of the airplane from the surface of the earth.

The approximate relative weight of the cesium atom while in flight can be calculated with the following formula:

$$Mcs(t) = Wcs(Total) \times Fe(cs) \quad \text{Equation 14.}$$

Where:

- Mcs(t) = Weight of Cesium atom with respect to applied G-force.
- Wcs(total) = Approximate weight of Cesium atoms during flight.
- Fe(cs) = Gravitational force generated by the earth with respect to the earth's core.

Next calculate the approximate acceleration of the Cesium atoms with respect to the forces above acting on them.

$$a(cs) = \frac{Fb}{Mcs(t)} \quad \text{Equation 15.}$$

Where:

- a(cs) = Acceleration of the Cesium atom.
- Mcs(t) = Weight of Cesium atom with respect to applied G-force.
- Fb = Force of the beam on the Cesium atoms.

Finally, these calculated values can be placed in the same equation for detecting the number of Cesium atoms that move to state B in the atomic clock.

$$det(t) = \frac{db(N)}{a(cs)} \quad \text{Equation 16.}$$

Where:

- det(t) = detected Cesium atoms in state B from the beam.
- db = The distance traveled by the Cesium atoms.
- N = Number of cesium atoms that impact the detector.
- a(cs) = Acceleration of the Cesium atom.

What can be seen is the assumed observed change in time can be represented as the effect of normal physical forces acting at the molecular level. In the case of the velocity time dilation experiment; the acceleration is increased due to the lesser force of gravity but decreased due to G-forces experienced by the cesium atoms traveling in the beam of the atomic clock. An example of this would be attempting to throw a ball against the wind. As it takes more force to throw a ball the same distance when going against a strong wind than throwing a ball the same distance with no wind present. Similarly, if a ball is thrown with a set force over a set distance with atmospheric resistance

presence it will arrive at a certain speed. If that same force and distance are used while removing the original stated resistance, the ball will reach the end of the prenoted distance at a faster rate of speed.

This can be further explained with a look at the Global Positioning Satellites. Better known as GPS, works by utilizing a series of satellites that circle the earth twice a day in precise orbit. Each satellite transmits a unique signal and orbital parameters that allow GPS devices to decode and compute the precise location of the satellite. GPS receivers use this information and trilateration to calculate a user's exact location. The satellite uses atomic clocks and due to the orbital location scientists must make an adjustment to the clocks so that they properly sync with the clocks on earth.

The differential of measured time of the Global Positioning Satellites system has been explained as another example of gravitational time dilation. The equations above suggest an opposing reason for the variant in the GPS clock. A practical example of the challenging explanation can be observed by utilizing the known parameters of the atomic clock used by the National Research Council of Canada.

First the formulas are as follows:
Calculate the acceleration using the formula:

$$Vf = u^2 + 2ax$$

Where:
- Vf = The final velocity of the Cesium atom.
- u = The initial velocity of the Cesium atom.
- a = Acceleration of the Cesium atom.
- x = Distance traveled by the Cesium atom.

Solve for acceleration(a):

$$a = \frac{Vf - u^2}{2x}$$

Next find the approximate mass with respect to gravitational pull via Newton's Universal law of gravity:

$$Fg = G\frac{Mm}{R^2}$$

Where:
- Fg = Force of gravity applied
- G = Gravitational constant
- M = Mass of the earth
- m = Mass of the Cesium atom
- R = Distance between the two masses.

Plug that value into the following equation:

$$m = W \times Fg$$

Where:
- W = atomic weight of Cesium atom
- m = Mass relative to gravity
- Fg = Force of gravity applied

Next utilize the formula:

$$F = ma \rightarrow F(b) = \frac{W}{Fg}a$$

This gives us the force applied by the beam (F(b)) of the atomic clock. This can be used to calculate the acceleration of the Cesium atom at a known height(h) from the earth's surface. First find the new gravitational force (Fo) using Newton's equation:

$$Fo = G\frac{Mm}{(R+h)^2}$$

Next find the new relative mass (m(o)):

$$m(o) = W \times Fo$$

Then solve for the new acceleration(a(o)) with respect to height(h) previously calculated:

$$F(b) = m(o)a(o) \rightarrow a(o) = \frac{F(b)}{m(o)}$$

Finally, the new velocity (Vo) can be determined:

$$Vo = u^2 + 2a(o)x$$

According to the National Research Council of Canada the Cesium atoms in their clock move at a rate of 250(m/s) over a distance of 5 meters. Plugging those values into the aforementioned equations with an assumed initial velocity of zero.

$$250 = 2 \times a(cs) \times (5) \rightarrow a(cs) = 25\ m/s^2$$

In order to calculate the atomic weight of a single atom of Cesium:

Atomic weight of Cesium = 132.905 g/mol mol = $6.022 \times 10^{23}\ atoms/mol$

Weight of 1 Cesium atom m(cs) $= \frac{132.905\ g/mol}{6.022 \times 10^{23}\ atoms/mol} = 2.206991032 \times 10^{-22}\ g$W ith know values:

mass of the earth *Me* = $5.97219 \times 10^{27}\ g$, radius of the earth *Re* = $6{,}378.1 \times 10^{3} km$, the gravitational constant *G* = 6.674×10^{-11}

The force of gravity for a cesium clock located on the earth:

$$Fg = (6.674 \times 10^{-11}) \frac{(5.97219 \times 10^{27})(2.206991032 \times 10^{-22})}{(6{,}378.1 \times 10^{3})^2}$$

Which gives *Fg* = $2.183792814 \times 10^{-18}$

The relative mass *m(cs)* can then be calculated:

$$m(cs) = (2.206991032 \times 10^{-22}) \times (2.183792814 \times 10^{-18})$$
$$m(cs) = 4.819611156 \times 10^{-40}$$

With the known mass with respect to gravity on the earth surface, the force administered by the beam F(b) of the atomic clock can be calculated. This force of the beam will remain constant regardless of the location of the atomic clock.

$$F(b) = (4.819611156 \times 10^{-40}) \times (25\, m/s^2) = 1.204902789 \times 10^{-38}$$

Now calculate the force of gravity acting on a single Cesium atom with respect to height (h) the orbital GPS satellite, which is approximately 12,550 miles or 20197.267 km.

$$Fg(o) = (6.674 \times 10^{-11}) \frac{(5.97219 \times 10^{27})(2.206991032 \times 10^{-22})}{\left((6{,}378.1 \times 10^{3}) + (20197.267)\right)^2}$$

Through Newton's equation the force of gravity acting on the Cesium atom from the orbital satellite is approximately = $2.148778051 \times 10^{-18}$

Therefore, the relative mass of the Cesium atom with respect to the orbitational gravitational pull is going to equal too:

$$m(cs)o = (2.206991032 \times 10^{-22}) \times (2.148778051 \times 10^{-18})$$
$$m(cs)o = 4.742333888 \times 10^{-40}$$

Next this number can be used to calculate the acceleration with known force of the beam.

$$a(cs)o = \frac{1.204902789 \times 10^{-38}}{4.742333888 \times 10^{-40}} = 25.407379941$$

Therefore, the new velocity of the Cesium atom, with initial velocity (u) of zero, can be calculated as:

$$Vf(0) = 2 \times (25.407379941) \times 5 = 254.07379941 \left(\frac{m}{s}\right)$$

These equations show that Cesium atoms in orbit will move with a velocity of 254(m/s) over the same distance of 5 meters. Which demonstrates an increased velocity of the cesium atoms. This increase will affect the atomic clock's outcome as it will register increased speed, giving an appearance of an accelerated rate of time. Which matches the observed parameters of the principle of gravitational time dilation.

The National Research Council of Canada's cesium clock example demonstrates that the denoted value of time is not as the mainstream view presents. Time is not a fundamental force such as gravity nor is it a special dimension. Rather, time is better described as the existence of change, the phenomena that all physical matter within the known universe will not remain stagnant. Everything within existence is in a state of motion or a constant state of reaction. Acknowledging these revelations alters the definition of the value of time from fundamental force to that of reactive response. Instead demonstrating a clear representation of Newtons third law "for every action there is an equal and opposite reaction" with time being the measurement of reaction rather than cause.

A fact which holds true even when applying it to molecular motion. The natural state of molecules is motion, a state which can be stopped only through the process of putting molecules at absolute zero. A temperature so cold that molecular movement stops, yet it does not completely lose energy. Even at absolute zero the frozen structure retains its shape due to the molecular chemical bonds remaining intact. Implying that if reverse time travel were possible, you would first need to stop the various chemical bonds existing in all matter. Making it necessary to drop all of existence to absolute zero. If done, here another fundamental problem presents itself. Removing molecules from this absolute zero state requires the addition of energy. However, when energy is applied to stopped molecules, they will return to their fundamental state of being, which is forward motion.

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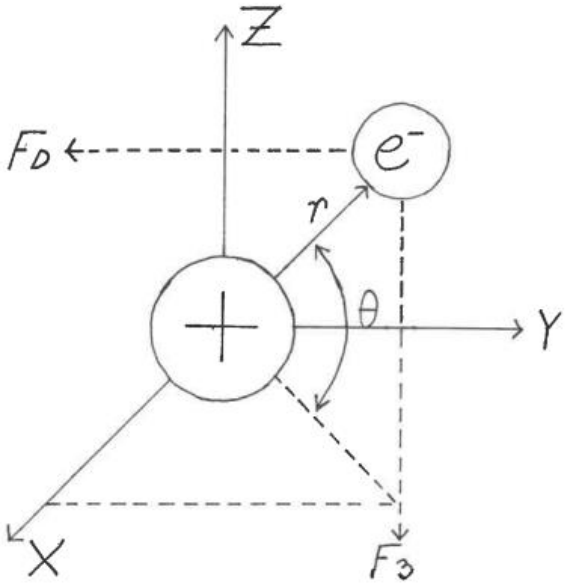


attempt to reverse this may cause a fundamental breakdown of the molecular structure and therefore the very structure of existence. As demonstrated by the calculations regarding time dilation, the state of everything is dependent on every force and factor acting upon the object at any given point. In the case of a single electron on earth, there are at least three forces constantly acting upon it. The gravitational pull of the earth (Fe), pull between the electron (e^-) and the atoms nucleus. As well as the drag coefficient (FD) due to the rotation of the earth. Meaning orbital velocity of an electron must overcome all these forces as well as the attraction and repulsion from other protons and electrons respectively.

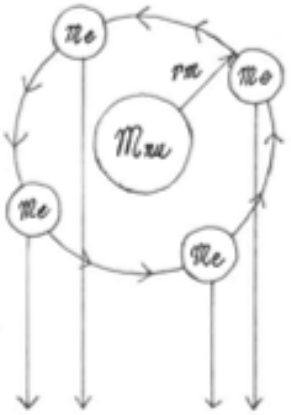
This highlights that various forces are constantly acting on even the smallest particles and more importantly not acting uniformly. In the case of an electron circling a nucleus, while the exact orbital path of electrons is disputed, it is agreed that the electrons do circle the nucleus instead of crashing into it. Reviewing electron movement coupled with the gravitational properties presents changing levels of gravitational pull with respect to the electrons orbital position.

For example, in the case of an atom with a single electron circling it in a two-dimensional plane, the potential gravitational force and Newtonian gravitational force present a differential in force with respect to position when calculated:
For potential gravitation force utilizing the formula: PGEp1 = Me*g*h1

Where:

- Me = Mass of the electron.
- h = the height from the earth with respect to the electrons orbital position.
- g = The Gravitational constant.
- rm = Radius of electron orbit.

To simplify these calculations the heights used will be in respect to the 90-degree position of the electrons assumed circular orbit. With the radius (rm) equal to .794 A according to the Bhor radius. Therefore, the respected heights are as follows:



h1 = (.5)+(.794)=1.294
h2 = (.5)=.5
h3 = (.5)+2(.794)=2.088
h4 = (.5)+(.794)=1.294

First utilizing a simple formula for potential gravitational force.

$$PGEh1 = (9.11 \times 10^{-28}) \times (9.8) \times (1.294)$$
$$= 1.16 \times 10^{-26}$$
$$PGEh2 = (9.11 \times 10^{-28}) \times (9.8) \times (.5) = 4.46 \times 10^{-27}$$
$$PGEh3 = (9.11 \times 10^{-28}) \times (9.8) \times (2.088)$$
$$= 1.86 \times 10^{-26}$$
$$PGEh4 = (9.11 \times 10^{-28}) \times (9.8) \times (1.294)$$
$$= 1.16 \times 10^{-26}$$

Using Newtons gravitational formula:

$$F(P1) = (6.674 \times 10^{-11}) \times \frac{\left((5.972 \times 10^{24}) \times (9.11 \times 10^{-28})\right)}{\left((6{,}378.1 \times 10^{3}) + (1.294)\right)^2}$$
$$= 8.924877782 \times 10^{-27}$$

$$F(P2) = (6.674 \times 10^{-11}) \times \frac{((5.972 \times 10^{24}) \times (9.11 \times 10^{-28}))}{((6{,}378.1 \times 10^{3}) + (.5))^{2}} = 8.92488 \times 10^{-27}$$

$$F(P3) = (6.674 \times 10^{-11}) \times \frac{((5.972 \times 10^{24}) \times (9.11 \times 10^{-28}))}{((6{,}378.1 \times 10^{3}) + (2.088))^{2}} = 5.06545328 \times 10^{-15}$$

$$F(P4) = (6.674 \times 10^{-11}) \times \frac{((5.972 \times 10^{24}) \times (9.11 \times 10^{-28}))}{((6{,}378.1 \times 10^{3}) + (1.294))^{2}} = 8.924877782 \times 10^{-27}$$

Potential Gravitational Force

$F1 = 1.16 \times 10^{-26}$
$F2 = 4.46 \times 10^{-27}$
$F3 = 1.86 \times 10^{-26}$
$F4 = 1.16 \times 10^{-26}$

Newtonian Gravitational Force

$F1 = 8.924877782 \times 10^{-27}$
$F2 = 8.92488 \times 10^{-27}$
$F3 = 5.06545328 \times 10^{-15}$
$F4 = 8.924877782 \times 10^{-27}$

Properties of general and special relativity support these factors as they represent the perceived perception of the assumed value of time. One of Einstein's most famous examples of relativity was said to a student and how one hour talking with an attractive woman seems to go by quickly while an hour listening to a professor can seem like an eternity. While the student's interest in the subject matter may alter their perception of an hour passing, in reality the hour remains unchanged. The reason for the change of perception to the student comes from a mindset. In one case where the content is desired to continue and the other where the content is desired to quickly end.

Because the student wants the undesired content to end, they tend to hyper focus on each passing second, meaning they notice the full hour. Where in the case of desired content the fleeting seconds are largely ignored so the ensuing hour is not noticed by the student. This example, though basic, highlights that change of perception is determined with varied external factors. Meaning to properly interpret any change of state every acting factor must be addressed.

This can explain the previously mentioned examples of time, such as food spoiling. Food spoiling is a chemical reaction and the amount of time it takes depends on the chemical structure of the food. When the external factor of cold is introduced the chemical process of spoiling is slowed, not halted, because of the new natural state affecting the process. The natural progression altered due to an introduced external circumstance needing to be accounted for in the calculations. The same holds true for the alterations observed in the Cesium clocks.

What proper understanding of the Cesium clock experiments, as well as relativity, demonstrate is the connectivity of existence. Time or more fitting the rate of forward molecular motion is relative to the forces being applied to the object being observed. If preferred that Newtons Third law of motion holds true even at the molecular level. Furthermore, this demonstrates that the fundamental nature of time is forward motion, outward expansion, and constant change. For existence to function it remains ever in motion. Nothing in existence remains stagnant, everything, even inanimate objects are moving at the molecular level in response to the various forces constantly acting upon them. Suggesting that reversing time is not only impossible but goes against the fundamental nature of existence itself.

From this it can be noted that even at the subatomic level, not only are several forces acting at any one time, but these forces are also not acting uniformly. Instead, being dependent on various other factors including the position of the measured particle. Therefore, accurately calculating just the gravitational pull from the earth on a single electron requires the exact three-dimensional coordinates of the electron within the spherical orbit of the electron shell of the nucleus of any given element.

III. CONCLUSION

The conclusion that can be made from these observations highlights a scientifically accurate way of examining the property denoted as time. Properly evaluating any value of time must be done with respect to molecular properties. That being atoms are in a state of constant forward motion. Atoms are never stagnant being in a continuous struggle to overcome the forces acting upon them. Applying greater forces or additional forces can impede the molecular movement as it attempts to achieve a stabilized state. Yet whatever force is acting upon the atom, molecules, compound, or particles will not terminate their forward motion.

Therefore, what must be understood is that while modified the various forces acting on any particle at any one time may be, the fundamental properties of these particles will remain unaltered. The fundamental property of the universe down to

the subatomic particles is forward motion. What this paper shows is that applied forces cannot halt or reverse this motion in can only hinder it. The natural forward momentum and expansion of existence is absolute.

So, when contemplating time, it should not be considered as an external dimension of force. Rather time should be seen as a precise section of three-dimensional Euclidian space. A singular reactive measurement of ever-changing external factors acting upon constant forward molecular motion.

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