

GRAVITY WAVES AND THE CONSTANCY OF THE SPEED OF LIGHT

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ABSTRACT. This paper takes two phenomena in physics, attempts to show that the solutions to them are linked and that these solutions shall require a radical re-think of physics

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1. GRAVITATIONAL WAVES

Einstein's general theory of Relativity predicts the presence of Gravity Waves. Massive objects like planets and stars can warp or bend space. This has been experimentally verified but as of now No gravity waves have been detected despite many ingenious experimental attempts. Of course proving a negative is difficult and the main excuse for the absence of the detection of Gravity Waves is that they decay with distance from the cosmic event that has caused them say Neutron Stars, so much as to be difficult to detect. That though does not sound plausible. We are living in a galaxy filled with huge and spectacular cosmic events , surely there would be some sign of Gravity waves if they do in fact exist? The other conclusion to reach is, of course, that Gravity waves DO NOT in fact exist and Einstein's prediction is false.

2. SPACE AND GRAVITATIONAL WAVES

All normal matter can absorb energy that can cause waves to propagate through it. This is a well known fact. So when Einstein was devising his General Theory he thought that if space can be warped or bent then it should be able to propagate this deformation caused by massive celestial objects as waves. It seems the natural assumption but here we are dealing in Space not Matter and just because matter can propagate waves does not logically follow that Space can do the same . Again perhaps the assumption is wrong and Gravitational waves do not exist though the warping of Space does.

3. ELECTROMAGNETIC WAVE PROPAGATION

There is of course one huge problem with the previous proposals regarding the Non Existence of Gravity Waves. Space is full of propagating waves as in the case of Electromagnetic Waves, the most well known being Light, EMR in the visible spectrum. This would at first glance seem to be an argument stopper. If electromagnetic waves can propagate through Space then why not Gravity Waves - Why not? Firstly before giving up on this logical argument there are some confounding properties of electromagnetic wave propagation that have been found by experimental and theoretical work to be true but to this day have not been explained.

4. THE CONSTANCY OF THE SPEED OF LIGHT

One of Einstein's major insights was to declare that the speed of light was constant and was independent of the state or velocity of its source. At first this seemed, and still to some seems difficult to comprehend. It means that if a beam of light is projected from a moving object, lets say a spaceship moving at half the speed of light, when the speed of the light is measured , it always gives the same value. If the spaceship comes to rest and a beam of light is projected and its speed is measured it is found to be the same value. So as stated the Speed of Light (electromagnetic radiation) is constant irrespective of the state of its source. With this declaration Einstein went on to explain the Special Theory of Relativity.

5. THE COMPLEXITY OF ELECTROMAGNETIC RADIATION

Another property of EM waves is that in order to mathematically describe them, it transpires that they are complex in nature. Needing complex number mathematics to describe them. The mathematical formalism is really quite beautiful and describes EM radiation as existing in a superposition of possibilities until one of the possibilities is acted upon and the mathematics show that the complex numbers that describes the wave is squared and becomes three dimensional in nature. this is part of the formalism at the heart of Quantum Physics.

6. MEANING OF THE ABOVE PROPERTIES OF EM RADIATION

Taking the first property, the constancy of the speed of light, it would suggest that EM radiation is not travelling in the normal sense as we would understand a body travelling through Space after all normal matter does not exhibit anything like this property so there must be something special and different about the propagation of light through our universe.

7. MEANING OF THE COMPLEX NATURE OF EM RADIATION

Again the property of the complex nature of EM must be telling us something. A solution would be this. The universe we inhabit is complex in nature. The universe is constructed of 6 dimensions, our three positive dimension where the square root of negative one does not exist and another negative three dimension part where the square root of negative one does indeed exist. A mirror imaged universe. These two, three dimensional spaces are separated from each other about an origin which is a barrier and exhibits a separating force. Taking this a step further it would mean that Electromagnetic radiation is NOT traveling through our three dimensional space but is travelling along the barrier between these two three dimensional spaces as EMR is mathematically complex in nature. This barrier is often referred to as the origin from the argand diagram of complex numbers. To try to understand this more deeply it is necessary to understand that every point in our three dimensional space would be attached to this origin and consequently the EM radiation could travel from any point A to B along the origin yet NOT in our three dimensional space. Travelling along the border between the two dimensional spaces light could travel in any direction. This, of course would explain the constancy of the speed of light. If light is NOT travelling in our three dimensional Space then its velocity is not referenced to any physical object at motion in that three dimensional space. Hence the speed of light is constant, independent of the state of velocity of its source. This proposal would also give more weight to the argument that Gravity Waves do not exist. If there is no other example of wave energy propagation through our three dimensional Space then the fact that Gravity Waves have never been detected in our galaxy, crowded with celestial events, leads to the conclusion that space DOES NOT propagate waves of any kind.

8. NEGATIVE FREQUENCIES AND ENERGIES

During the last century many of the quantum theories put forward would lead to inconsistencies such as negative frequencies or negative energies. Physicists went to great lengths to mathematically disprove these unwanted occurrences and the great physicist Paul Dirac even proposed his "sea of occupied negative energy states"

which was based on the Pauli Exclusion Principle. He proposed that all the negative energy states of the electron are filled and due to the PEP other electrons would be prevented from falling in and being annihilated in great numbers and introducing a catastrophic collapse of the universe. I personally, though having great respect for Dirac, always thought that this particular proposal was extremely unlikely. The "Dirac Sea", I do not think exists but the problem of negative energies does. If they are separated as I suggest then they are not the catastrophic problem envisaged.

9. THE WAVEFUNCTION PROBLEM

When trying to unite relativity and quantum mechanics, one of the main problems is to be invariant under the Lorentz transform. The problem is the Lorentz Transform has a square root and square root signs carry an implicit sign ambiguity and can lead to negative energies. Paul Dirac managed to get round this with his famous equation of the electron but this led him to propose not only the existence of anti particles but that they were safely locked up in the Dirac Sea. This tension between relativity and Quantum physics has never really been solved. With the model proposed here, negative energies could obviously be tolerated. In fact the constant processes involved in such a universe, just touched upon here, could be responsible for the production of matter.

10. THE SHAPE OF THE UNIVERSES?

To be clear. In this article it is proposed that the universe is in fact mirror imaged about a central origin, exactly as is described by the mathematical formalism called complex numbers

The Big Bang should have produced equal amounts of matter and antimatter if CP symmetry was preserved; as such, there should have been total cancellation of both- protons should have cancelled with antiprotons, electrons with antielectrons, neutrons with antineutrons, and so on for all elementary particles. This would have resulted in a sea of radiation in the universe with no matter.

The Standard Model contains only two ways to break CP symmetry. The first of these, is in the QCD Lagrangian, which has not been found experimentally; but one would expect this to lead to either no CP violation or a CP violation that is many, many orders of magnitude too large. The second of these, involving the weak force, has been experimentally verified, but can account for only a small portion of CP violation. It is predicted to be sufficient for a net mass of normal matter equivalent to only a single galaxy in the known universe.

Since the Standard Model does not accurately predict this discrepancy, it would seem that the current Standard Model has gaps (other than the obvious one of gravity and related matters) or physics is otherwise in error.

This article gets round the CP violation by saying that not only were equal amounts of mirror image particles created(anti-matter) but also an anti-matter dimension (mirror image dimension) which is separated by a barrier and thus they do not annihilate each other.

11. A RADICAL THEORY

This is of course a most radical theory but there are many who believe that a new radical theory is exactly what is needed to move physics along. So how does it stand up to scrutiny. One of the most studied phenomena in physics is the electron.

How would these new ideas stand up to the latest theory that describes the electron. The next section shall take the theoretical description of the electron described in Quantum Field theory (QFT) in the Standard Model, to discover how it fits , or not.

12. THE ELECTRON AND THE PROPOSED UNIVERSAL MODEL

The Electron is probably the most studied of the members of the Sub-atomic particles known as the Zoo. Even after decades of study it remains enigmatic , even its mass is a subject for dispute. This section shall give a brief explanation of how the Standard Model using Quantum field Theory (QFT) understands the electron today. After this, using the ideas proposed in this paper an alternative view of the electron, and all sub-atomic wave/particles shall be presented.

12.1. Current understanding of the Electron. The electron, like all other particles exhibits dual wave/particle properties. The latest picture of a free electron represents it mathematically as a two component wavefunction composed of

$$(12.1) \quad \Psi_0, \Psi_1$$

. These can be represented as a pair of two spinors :

$$(12.2) \quad \psi = (\alpha A, \beta B)$$

the Dirac equation than then be re-written to show that these two spinors are held together by a coupling force and act as "each as a kind of source for the other".

The strength of the interacion between them is given by the coupling constant $2^{1/2} M$ which describes the strength of the interaction between the two.

$$(12.3) \quad \Delta \frac{a}{b} \alpha A = 2^{1/2} M \beta B, \Delta \frac{b}{a} \beta B = 2^{1/2} M \alpha A$$

From this description of the electron many physicists take the image of the electron composed of

$$(12.4) \quad \alpha A, \beta B$$

. These two parts of the electron exhibit the phenomena, which has, until now, NOT been observed , "zitterbewegung" which means that the are continually changing direction back and forth but the direction of spin remains in the same direction as seen in the diagram. The theory also states that at any instant the velocity of the electron is the speed of light but that the average motional velocity is less than the speed of light.

This means that the current view is that each particle is constantly changing into the other particle, using some as yet unknown process. Using the ideas presented in this paper I shall present a different explanation. One other very important and revealing property is that the average rate at which this occurs relates to the mass coupling paramater M which is in fact the De Broglie Frequency. One extreemly important fact that I have purposley left out is the superposition of "zitterbewegung" which are infinit and together add up to the total wavefunction of the electron. I will explain this in the next part of the paper. This was indeed

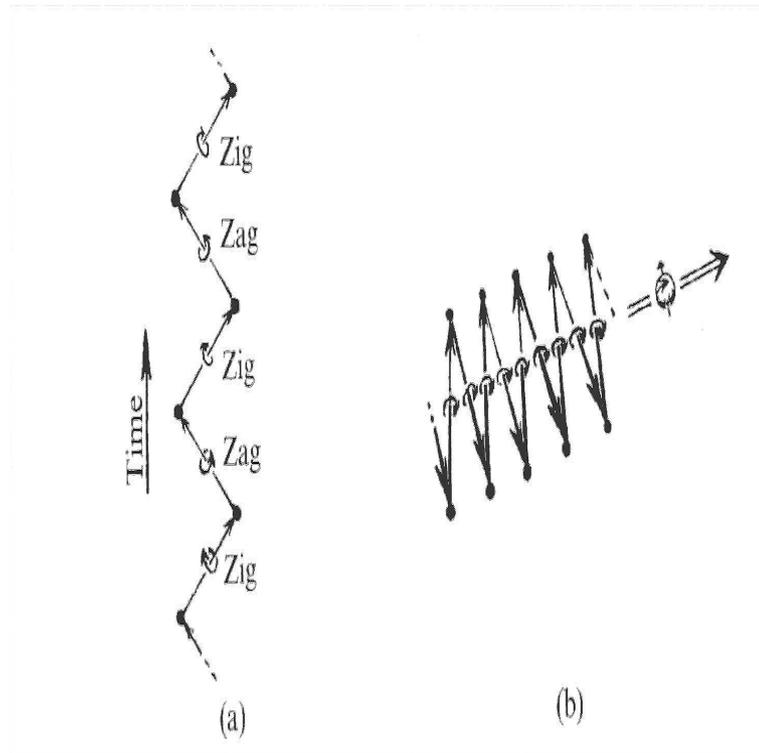


FIGURE 1. Electron Motion: The current view of the electron as a kind of dual particle moving in a zig-zag ("zitterbewegung") motion

a very brief but more or less accurate picture of how the electron is viewed in the Standard Model. Now let's look at it from a new perspective.

12.2. Understanding the Electron in the Proposed Model of the Universe.

Using the model presented previously, the free electron is indeed initially composed of two parts, one the mirror image of the other but separated by a barrier between the two mirrored three-dimensional spaces. In this model the phenomenon "zitterbewegung" does not exist. What happens in the mirrored image universe is that a particle and an anti-particle from each part of the mirrored image spaces are attracted to each other and meet at the barrier or origin. The two mirrored particles' energy is transformed into wave energy which causes a wave to propagate along the barrier's origin as a complex wavefunction.

The wave, taking the special case of an electron orbiting a proton, is generated along the complex border as the De Broglie Wave. The quantum superposition that makes up the total wavefunction can now be looked at in a different light. As stated before, any wave/particle at the complex barrier is in fact connected to all points in space, and it is this fact that provides the infinite probabilities of states that can be realized when the wave/particle undergoes the process known as the collapse of the state vector. What this entails in this theory is that, again taking the electron

as an example, when a strong attractive force like a proton is close enough to the wave the wave energy is attracted to the proton away from the barrier. Since we have stated that waves cannot exist in three dimensional space it is immediately crushed to a point particle of energy. The same process happens on the other side of the barrier to the antielectron. This then provides a very good answer to the wave/particle paradox in physics. Particles attracted to their anti-particles on the other side of the barrier, creating complex waves that propagate until an attractive object causes them to separate out of the wave and immediately assume particle form. The mathematics that describes this has been known for many years and involves taking the squared modulus of the wavefunction and creating non-complex probabilities. This then gives the probability of finding the particle at any particular location. As stated before this is infinite in theory as the barrier or origin is connected to every point in space. What we have described is what is sometimes called the collapse of the state vector or when the wavefunction changes from complex probabilities to real probabilities, and wave to particle. These quantum jumps, are what Schrodinger referred to as the "mysterious quantum jumps" have remained a complete mystery for nearly a century. This should tell one that something radical is needed to explain them and this is a radical attempt to find a theory that does explain them. This shall be explored more in the next section especially to try and give an explanation for another bothersome physical phenomenon sometimes called the "measurement paradox".

13. THE MEASUREMENT PARADOX AND THE MIRROR IMAGED UNIVERSE

Physicists have been grappling with a phenomena in Physics which has come to be known as the "Measurement Paradox". There are many experiments that produce the effects of the paradox, the famous 2-slit experiment along with the less famous Mach-Zehnder Interferometer. These experiments demonstrate the quantum jumps where a quantum entity seems to instantaneously change from its wave characteristics to its particle characteristics. That is not all, these effects are non-localised which means that different parts of the experiment, sometimes separated by great distances have an effect on each other, almost as if there is instantaneous communication (i.e. faster than light). Until now physicists have had no real answer to the measurement paradox so how does the model of the universe presented in this paper stand up to scrutiny under the effects of the famous measurement paradox. First let's approach the non-local nature of the experiments. In one type of experiment a particle, say a photon is sent to a beam splitter, split and then sent equal long distances to detectors operated by humans. The results are that one and only one detector can register the photon but it can be either. One could take the view that the photon actually selects which path to take at the beam splitter and that is when the decision as to which detector receives the photon is made. This is not what happens as there are other, more complex versions of this experiment that disprove it. The photon seems to travel both paths but only one detector registers it. Non-localisation, instantaneous communication and wave particle duality, these are the key questions behind such experiments. In our theory what would happen is this. At the beam splitter, the photon is not split in half, its wavefunction, as it is travelling as a wave along the Barrier between the proposed two, three dimensions, is sent one way and another at the same time but is still connected. When the wavefunction reaches the detectors, which could be say Protons, the original

photon and its ant-photon on the other side of the barrier separate from the barrier and its wave is instantly collapsed. It can be one and only one detector as there is only one photon and the non-locality is because the wavefunction is never separated and exists outside normal space and functions as a single entity, remember in our universe, at the barrier there is no locality as the barrier and therefore the wave function is connected to every point in the universe. One other fact to remember is this. the wavefunction is operating outside our space and therefore, travelling at the speed of light it experiences no time. Time is injected into the proceedings by our own measurement of it.

Conclusion 1. *There is of course no physical evidence as yet to support this theory. It grew out of the desire to try and find answers to some mysterious, bizarre and unanswered questions in physics which I have mentioned. The constancy of light being high amongst them and the prevalence of complex mathematics at the very heart of experimental quantum events. There are just too many holes in our present theories and it seems to me at least that "tinkering" with them just will not work. What is needed is a revolution in our way of thinking about reality and that is what I have tried to do here.*

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