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Quantized Space and Time Explain Properties of Relativity and Dark Matter

Rene BJ Remillard M.Sc, B.Sc

Remillard's Science and Math Hobby

***Corresponding author:** Rene BJ Remillard M.Sc, B.Sc, Remillard's Science and Math Hobby, Canada; Tel: 204-895-0581; E mail: BJYH@mts.net

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Abstract

Some thought experiments are used to quantize space and time. This model adopts the idea that space and time are separate but related entities. Space is quantized into a unit called the "speck". When specks are near fermions the interaction increases the rate of gauge boson production near the fermions. The rate of gauge boson production is related to the apparent rate of the passage of time. Specks exist in a standard state (SS speck), which contribute greatly to gauge boson production; however, once the speck produces a gauge boson, the speck shrinks in size and becomes a low energy speck (LE speck). LE specks have a reduced ability to form gauge bosons, but when they do, they shrink in size with each gauge boson produced. These properties and others are used to generate a model for quantized space and time which is then used to explain some of the properties associated with general and special relativity; such as time dilation, and relativistic changes in mass and length. The model provides some insight into how some dark matter observations have arisen. Before dismissing this model the reader should consider the following two issues; it is entirely possible to have an incorrect grammatical description of a phenomenon but a correct mathematical description and that it is easier to prove a mathematical description is correct than it is to prove the grammatical description.

Keywords: Quantized space, Quantized time, Dark matter, Dark energy, Specks, General relativity, Special relativity, Pressure gradient force.

Introduction

If we consider that gravity is caused by changes in the geometry of space-time, then any model that seeks to become a quantum gravity model must first quantize space-time, which would require the definition of time. The model also needs to explain other properties of relativity such as time dilation and relative changes in mass and length.

The model is presented in a number of parts. In each part properties of specks are presented, as are their effects on the appearance of the passage of time and other relativistic properties. Interspersed in the descriptions are thought experiments that are used to justify the premises of the paper. Parts 1 to 3 involve explaining general relativity while parts 4 to 6 involve special relativity, part 7 comments on the expansion of the universe and part 8 relates specks to some quantum mechanical properties of particles.

Introduction to Specks and Quantized Time

As will be presented, the differential flow model for quantizing space requires the creation and naming of a few new interactions/items and their properties.

Imagine the quantized, smallest unit of space-time that contains energy – call it a speck.Make it a small bubble of space that can contain a photon. The speck has the following hypothetical properties:

Specks always exist, in contrast to virtual particles and gauge bosons. The size and shape of the speck is critical to its properties and determines which gauge boson is most likely to be produced. When the standard state specks (SS specks) are near a mass, the specks and the mass interact in such a way that the probability of the creation of gauge bosons is increased near the mass. Hence specks interact with fermions. Further, SS specks can cause bosons and fermions to move as these specks flow.

When specks are near a mass of sufficient size there is a probability that some of the specks will enter a lower energy state (LE state). The LE state is created when the SS specks give up energy to create a gauge boson. An LE speck gets smaller in volume each time its energy is used to create a gauge boson and as the speck gets smaller and smaller, the probability of participating in the creation of a gauge boson gets smaller and smaller. Hence SS specks are larger than low-energy specks (LE specks).

Specks do not enter one another and fermions cannot enter specks. Therefore, there is a force or property that repulses these. Of the bosons, light is able to enter specks, therefore the previously mentioned force does not act on it. It is uncertain if all bosons can enter specks. Specks are attracted to the surface of fermions in such a way that layers of shape-constrained specks occur - so there is an attractive force needed here too.

As for time, the appearance of the passage of time is proportional to the rate of production of gauge bosons in a reference frame. This idea is at odds with the notion that space-time is one unit (de Sitter, 1916 who describes Einstein's and Minkowski's works on space, time and gravity)[1]. Instead the passage of time is related to the rate of gauge boson production as caused by an interaction between space (specks) and fermions. Not all gauge bosons need be affected equally by this property. Going forward this paper will refer to space separately from time, because a principle of this paper is that space and time are related but are not one unit called space-time.

How Specks Flow (Part 1)

To understand how specks flow, imagine the universe was comprised of a single planet and a universe of specks, with no stars or other fermions. As specks interact with the mass of the planet, some are converted to the lower energy state through the creation of gauge bosons, thus they occupy a smaller volume. So as some specks become smaller in volume other specks move in towards the center of the planet in order to maintain a space that is constantly filled with specks. The fermions are pushed to the center of mass of the planet by the SS specks that flow past them. This suggests that fermions are not capable of entering specks. As an aside, of the bosons, at least light iscapable of entering specks.As there is no other large mass near our solitary planet, the flow of SS specks to the center is uniform around the whole sphere of the planet.The mechanism for reversion of LE specks to SS specks is explained in Part 7, but the smallest LE specks are expected to diffuse out of massive bodies.

There is experimental evidence that space is capable of flowing. The issue of the flow of space-time has been addressed by the Gravity Probe B experiment.In 2011, Gravity Probe B detected frame dragging in the experimental satellite in orbit around the Earth[2]. Frame dragging is a form of flow, as the motion of the planet is pulling space along.If this differential flow model is representative, then it is likely that frame dragging is a process that occurs all the way to the center of any massive moving body.

Specks and Time (Part 2)

A thought experiment that separates time and space from space-time is presented and is used to justify relative changes in the passage of time due to gravity. Imagine that we make a machine that can eliminate a hundred percent of the production of gauge bosons in the entire body of a person. All the motions and radioactive decays that occur in this person's body stop, because gauge bosons are the force carriers in particle physics [3,4]. There is no mechanism to convey motion from one part of the body to another, as there are no forces acting to move the body parts – no forces either repulsive or attractive. In the absence of forces the body's momentum would keep the particles moving in a straight path. As gravity is not mediated directly by gauge bosons, then it may press the body into a puddle - so let's not include gravity. Of interest is this person's quartz watch, which is an allegory for all mechanisms of keeping time. The vibrations of the quartz crystal that are used to keep time have stopped. So in a simplistic explanation of time, the passage of time has stopped for this gauge-boson-frozen individual.

Now tweak our machine so that gauge boson production is half the natural rate. In this case the vibrations of the quartz crystal occur at a slower rate than those vibrations in a watch belonging to someone outside the effect of the machine because there are fewer gauge bosons to mediate the vibrations. If there is a linear relationship between the rate of gauge boson production and the apparent passage of time, then the affected watch shows one second passing for every two seconds on a watch that is outside the machine.

Hypothesize then that the rate of gauge boson production is related to the apparent rate of the passage of time and think about conditions in the universe that would change the apparent rate of the passage of time. Note that conditions in general and special relativity allow for changes in the apparent rate of the passage of time.

Specks and Time Dilation in General Relativity (Part 2b)

To understand how specks influence the passage of time, imagine there is now a small baseball in orbit around the solitary planet. To understand how the passage of time is affected by altitude, compare the status of the specks when the ball is in orbit to that status when the ball is near the surface. In orbit, the proportion of SS specks to LE specks is high in favour of SS specks. SS specks interact with fermions with a higher probability to produce gauge bosons, which themselves interact with fermions to alter their motion by mediating all the forces. At the surface of the planet, the proportion of SS specks to LE specks is not as high as at altitude, because a higher proportion of SS specks have converted to LE specks. Therefore, there are relatively fewer SS specks to interact with fermions. Hence there are fewer gauge bosons produced at the surface and processes such as nuclear decay, or changes in motion of the fermions at the surface occur at a slower rate. Hence it appears as though time passes more slowly at the surface of the planet than in orbit, which is consistent with Einstein's Theory of General Relativity as described in his book that was reprinted in 2015 [5] and which is consistent with the Hafele-Keating experiment of 1972 [6].

Specks and The Force of Gravity (Part 3)

To understand how specks cause fermions to fall to a center of mass, imagine that the baseball is no longer in orbit, but is falling towards the planet. The mass of the baseball is much, much smaller than the mass of the planet. There is still a flow of SS specks towards the center of the baseball, but this flow is much smaller than that of the planet. The baseball is competing for specks with the planet (competitive flow). In Part 1, the flow of SS specks was uniform from all directions; however, in Part 3, there are now two objects that are competing for SS specks, and the flow of specks is no longer uniform from all directions. This causes a pressure-gradient force.

Consider first the baseball, which has two halves. One half is closer to the planet and one half is closer to the vast universe. The ball is some distance, d, from the planet. The universe-facing half (outer side) is receiving SS specks at the rate that it would if there were no other objects nearby; however, the planet-facing half (inner side) does not have a vast universe's supply of SS specks - it only has the amount that is contained in the space between the ball and the planet, which is proportional to the distance, d. As this is a limited distance, there is a limited amount of SS specks as compared to the universe facing side. Therefore, there is a differential flow rate of SS specks from one side versus the other. The rate of motion of the baseball towards the planet is related to the difference in pressure between the two sides of the baseball that is created by the speck's flow – hence gravity is a pressure gradient force.

As the distance between the planet and the ball decreases, the amount of SS specks available to the baseball's inner side diminishes and the value of the differential increases, hence the ball experiences an acceleration until it comes to rest on the planet. This small differential is likely the explanation as to why the force of gravity is 36 to 42 orders of magnitude smaller than the electromagnetic force as calculated on the plasma-universe.com website [7].

Further to the above idea of competitive differential flow, the baseball is moving through a gradient of SS specks that is set up by the mass of the planet wherein LE specks diffuse out of the planet and SS specks move in. The outer edge of the base ball has a higher amount of SS specks, while the inner edge of the baseball has a lower amount due to being closer to the planet and these SS specks are largely moving towards the planet to replace all the LE specks that are being produced inside the planet. In a sense, the baseball is swept up by this gradient (gradient flow). This gradient flow also creates a pressure differential that would move the ball. Without a mathematical version of the differential flow model, it is hard to reason which pressure differential is the major contributor to the motion of the ball. The consequence of this second flow, which does not rely on competitive flow between objects with mass, is that particles with no mass such as light could still be pushed by the gradient flow. There would also be acceleration due to the gradient flow because – like a bathtub where the water flows faster near the drain and slower at the far end of the tub – the specks would flow faster near the planet than they would further away.

Now consider the motion of the planet. The flow of SS specks to the planet has been disrupted by the presence of the baseball; however, the baseball is attracting a miniscule amount of what would otherwise be the planet's SS specks. Therefore, the motion of the planet is not affected much by the ball.

Specks and Mass in Special Relativity (Part 4)

Special relativity involves relativistic changes in: mass, the rate of the passage of time, and length. The relativistic change in mass can be explained simply by the existence of a shock wave of specks that build up at the front of a fast moving object. The shock wave opposes the motion and increases the apparent mass of the moving object, but only if fermions are incapable of entering specks.

Specks and Time in Special Relativity (Part 5)

To explain how a fast object experiences a time dilation two properties of specks need to be considered at once. As stated earlier, the two properties in question are: 1) when the specks are near a mass, the specks and the mass interact in such a way that the probability of the creation of gauge bosons is increased near the mass and 2) the appearance of the passage of time is proportional to the rate of production of gauge bosons.

In the explanation for general relativity, LE specks were involved in the time dilation. This may not be the case for special relativity. When fast moving fermions move past specks, the interaction that produces gauge bosons becomes impaired. The faster the fermion the greater the impairment. Due to the impairment, fewer gauge bosons are produced, so the traveling fermions experience a slower passage of time. This means that a fermion travelling very near the speed of light continues to move through space, even though the traveling fermion fails to note the passage of time as compared to a relatively motionless fermion. Particles don't need to experience the passage of time, in their reference frame, in order to continue moving. Furthermore, all high-energy processes that require gauge bosons to occur take longer to occur when observed by a stationary observer because there are fewer gauge bosons to mediate those processes. This is consistent with atmospheric muon experiments that showed the half-lives of muons created in the upper atmosphere are increased due to their high speed and due to relativistic effects [8,9].

Specks and Length in Special Relativity (Part 6)

In Part 5 the fast rate of motion of the fermion reduces the probability of a complete interaction with specks such that the rate of gauge boson production is reduced in the vicinity of those fermions. The phenomenon of length contraction in special relativity requires further understanding of the impaired interaction between specks and fast moving fermions.

Specks transfer energy from distant objects to local observers – hence light can enter specks. In effect energy is transferred through specks to fermions, which allows for an inference of distance – call it "data". As the speed of travelling fermions increases, the probability that those fermions will receive the data is reduced because of the impaired interaction. Faster speeds mean less data.

A thought experiment provides insight into how length contraction occurs. For this counter-example, imagine a large computer image where each pixel is a colour that contributes to a clear image. If we change some of those pixels to grey such that they no longer contribute to a clear image, the image becomes grainy and has some holes in it. However, if we query all the colored pixels and ask what colours are next to them, some pixels would report that a pixel next to them is grey. Therefore, this is NOT a situation where some data has gone missing. It is a situation where some data has changed in value. Hence the only way for some data to go missing in the picture is for some of the pixels to cease to exist. Thus the picture would get smaller and if the missing pixels were uniformly distributed the smaller image may not appear much distorted.

Therefore, when considering special relativity and the length contraction associated with it, the failure of a speck to transmit its data to a fast moving observer results in an image of the external world that is a smaller complete image with no holes as compared to a stationary observer. It is as though the failure of transmission causes the speck to not exist in the reference frame of the fast moving fermions.

Conversely, when a stationary observer sees a fast moving object, that object is failing to transmit its data to nearby specks and likewise appears to be a smaller version of its stationary self. Regardless of the reference frame in which the observer sits there is a size contraction which gets more pronounced the faster an object moves because some specks have failed to transmit or receive data.

Specks, Dark Matter and an Expanding Universe (Part 7)

An explanation for the expansion of the universe is presented. The re-inflation of LE specks to SS specks is a slow process, due in part because of their extremely small surface area. It is so slow that LE specks can diffuse all the way out of a galaxy. During the diffusion, LE specks absorb some energy from the photons that pass through them. This absorption lengthens the wavelength of light, and inflates the LE speck to a larger size.

Conditions within the galaxy cause the rate of re-inflation of LE specks to be slower inside than outside it. Though there is a lot of light within the galaxy to inflate LE specks, there are also a lot of fermions that make up the regular matter of the universe [10]. The presence of the fermions promotes the formation of smaller LE specks through the creation of gauge bosons. Inside the galaxy the rate of re-inflation is reduced by the continual creation of gauge bosons. Outside the galaxy, there are fewer fermions and the rate of re-inflation is significantly higher. Hence most of the complete re-inflation of LE specks to SS specks occurs outside galaxies.

There are two effects due to this differential rate of LE speck re-inflation, inside versus outside the galaxy. One, because re-inflation occurs mostly outside of galaxies, this causes galaxies to move apart, which is consistent with Slipher's and Hubble's separate observations [11,12]. Two, a pressure gradient force is produced near the boundary of galaxies due to the differential pressure created by LE speck re-inflation. This force compresses the galaxies and allows for star systems within them to orbit within the galaxy at a faster rate than gravity alone would allow, as evidenced by the observations of Rubin & Ford, 1970 [13].

This explanation does not completely obviate the need for dark matter. It only explains how matter within galaxies can orbit the galactic center faster than gravity would allow.It does not explain evidence for dark matter that is provided by gravitational lensing [14]. Furthermore, it is difficult to determine what percentage of dark matter and dark energy is explained, without a mathematical version of this model.

Acceleration in the rate of expansion of the space between galaxies as observed by Frieman, et al., 2008 [15] can be explained by fusion. As atomic nuclei become larger, there are more opportunities for gauge bosons to be produced. This results in greater LE specks production. So greater numbers of LE specks exit galaxies and in turn this results in a faster Hubble constant.

Specks and Quantum Mechanics (Part 8)

The properties of two electrically charged particles that repel each other can be commented on within the context of this model. Two charged particles that are brought closer together will experience the following: at a great distance there is nearly no repulsion as the probability of gauge boson production is low. As they are moved closer together there is an increasing amount of force that is needed to overcome the repulsion because SS specks predominate and gauge boson production is highly probable. Further movement of the particles together results in a new region of space. This new region has the property that the force needed to move them together decreases, because the particles have entered a region in which the proportion of LE specks to SS specks begins to increase. In the final region LE specks predominate and there is nearly no force needed to move the particles together. This model is likely more representative at small distances than models where force varies inversely to r^2, where r^2 is the distance between the objects. Because at small distances r^2 laws show that the force goes to infinity. Experimental validation of this closing remark is required but may be of interest to those who study Morse Potentials [16].

If specks and fermions interact to generate gauge bosons then a model for the generation of repulsive and attractive electric forces is possible. For instance, when two electrons repel each other, these fermions and specks interact in such a way that the probability of gauge boson production (photons) is increased in between the electrons. The electrons would absorb these photons and their net motion would be away from each other. Conversely, when an electron and proton attract one another, the probability of gauge boson production shifts to an area outside the particles (as opposed to in between) and the net motion would be towards one another.

A brief model on how gauge boson production can shift from inside to outside a pair of particles is provided. Surface features on the fermions may influence the shape of close packed specks and may influence which gauge bosons are most likely to be produced. For instance a SS speck in intergalactic space may be roughly spherical. While the SS speck may be conical when adjacent to an electron due to a force of attraction and the need to close pack with other specks. The conical shape could activate the speck towards gauge boson (photon) production and result in more rapid gauge boson production. The shape or geometry of the SS specks around a proton could be different from those around the electron such that close packing is disrupted between the two particles – which in turn results in greater gauge boson production outside of the particles, and lesser gauge boson production between the particles. Specks that produce the strong and weak force gauge bosons could adopt different close packed geometry such that those bosons get preferentially produced by those specks. Finally close packing does not only occur at the surface, but it occurs in layers surrounding each fermion. As each outer layer occupies a greater volume than its nearest inner layer, the close packing becomes less strained and as the shape of the speck deviates from the most close-packed shape, the probability of gauge boson production is lowered.

As an aside, strings of gluons may occur in particle accelerators [17] because specks can bind gluons and quarks at the same time such that a string of gluons is bookended at each side by a quark. Amongst the gauge bosons, this property could be unique to gluons. Could it be that outside the bookends, gluons, whose absorption would push the quarks back together, appear so briefly that they are not observed or that their observation has erroneously been determined to be one hundred percent inside the bookends? The role of specks in the production of weak force bosons and the color characteristics of quarks requires further consideration.

Conclusion

The essential features of this model are that gravity is due to a pressure gradient force caused by the differential flow of quantized space (specks) and that specks exhibit properties of fluid flow and volume contraction. Though no math was presented to support the model, it could be that the needed math will only involve 4 dimensions as pressure gradient forces and fluid dynamics have been extensively used in science and historically have not required more than 4 dimensions in space and time.

The agreement amongst aspects of this paper and observed experimental data which occur in such a broad spectrum of physical issues from the quantum to the cosmological scales, and the simplicity with which the model explains properties of general and special relativity, all point toward the notion that specks are more than just an hypothesis.

Further consideration of specks may allow for hypotheses to explain how large, old black holes could explode in a Big Bang.

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