

Intergalactic Travel, Riemann Hypothesis, Dark Matter, No Big Bang and Other Physics/Mathematics

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ABSTRACT

The Riemann hypothesis, proposed in 1859 by the German mathematician Georg Friedrich Bernhard Riemann, is fascinating. It seems to fit these ideas on various subjects in physics very well. This text refers to imaginary numbers. “Imaginary” does not mean the numbers don’t really exist. Imaginary numbers are the numbers that give a negative number when squared e.g. $i^2 = -1$.

Unifying gravitation and electromagnetism (mentioned in the first paragraph of "BITS AND TOPOLOGY") requires, according to this paper, a universe composed of mathematics and it has this consequence: the electrical-engineering experiment ^[1] at America's Yale University, together with the ideas of Albert Einstein, tells us how we could travel to other stars and galaxies. The electrical engineering team at Yale demonstrated that, on nanoscales, light can attract and repel itself like electric charges or magnets. This is the Optical Bonding Force. For 30 years until his death in 1955, Einstein worked on his Unified Field Theory with the aim of uniting electromagnetism (light is one form of this) and gravitation. Achievement of this means the quantum components (gravitons) of gravity/spacetime- warps between spaceships and stars could mimic the Optical Force and be attracted together, thereby eliminating distance (this, possibly acting in partnership with repulsion, could produce a wormhole, or shortcut between folds in space and time). If the gravitons are superposed and entangled, distances between both points in space and points in time are totally eliminated.

Most people aren’t accustomed to thinking that the universe is literally composed of mathematics (binary digits, Mobius strips, figure-8 Klein bottles, Wick rotation). I developed these ideas after reading about several professors - John Wheeler, Max Tegmark, Erik Verlinde, Ed Fredkin, and Rafael Sorkin. The Introduction will provide understanding that the Riemann hypothesis doesn’t just apply to the distribution of prime numbers but can also apply to the fundamental structure of the mathematical universe’s space-time. When applied to the universe, it explains - the static universe, dark matter, dark energy, the Higgs boson/field, and aspects of particle physics like the electroweak interaction.

For the purposes of this explanation, “Riemann zeta function” interacts with the term “Hamilton quaternion function” which has already been incorporated into the final paragraph of the following physics hypothesis.

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Elements of the Riemann hypothesis addressed here include its real and imaginary parts, the upper and lower half-planes, and the knowledge that there are infinitely many zeros on the critical line.

Keywords: Riemann Hypothesis; Dark Matter; Dark Energy; Higgs Boson; Higgs Field; Electroweak Interaction; Static Universe; Quaternions; Interstellar Travel; Intergalactic Travel; Time Travel Into The Past And Future

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INTRODUCTION

The first part of my article is a proposal that we live in a mathematical universe (though they might or might not agree with the details I propose, this opinion is shared by the scientists Max Tegmark, Erik Verlinde, Ed Fredkin, John Wheeler, and others).

There are 4 scientists I know of that support the idea of the universe being composed of information/mathematics:

- a) In 1990, John Wheeler (1911-2008) suggested that information is fundamental to the physics of the universe. According to this "it from bit" doctrine, all things physical are information-theoretic in origin^[2].
- b) Erik Verlinde says gravity is not a fundamental force of nature, but an emergent phenomenon. In the same way that temperature arises from the movement of microscopic particles, gravity emerges from the changes of fundamental bits of information, stored in the very structure of spacetime^[3].
- c) Cosmologist Max Tegmark hypothesizes that mathematical formulas create reality^[4]
- d) "Pioneered (in the late 1980's) by Rafael Sorkin, a physicist at the Perimeter Institute in Waterloo, Canada, the theory (causal sets) postulates that the building blocks of space-time are simple mathematical points that are connected by links, with each link pointing from past to future"^[5].

Quaternions were first described by Irish mathematician William Rowan Hamilton in 1843. Hamilton defined a quaternion as the quotient of two vectors. In this case (see the section below titled VECTOR-TENSOR-SCALAR (VTS) GEOMETRY): the quotient of two vectors is $1/2$, the division of the electromagnetic vector (photonic quantum spin of 1) by the gravitational vector (gravitonic quantum spin of 2). Similarly, the real part of every nontrivial zero of the Riemann zeta function is $1/2$.

In mapping the distribution of prime numbers, the Riemann hypothesis is concerned with the locations of "nontrivial zeros" on the "critical line", and says these zeros must lie on the vertical line of the complex number plane i.e. on they-axis. Besides having a real part, zeros in the critical line (they-axis) have an imaginary part. This is reflected

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in the real +1 and -1 of the x-axis in Fig. 3, as well as by the imaginary +i and -i of the y-axis. In the upper half-plane, a quarter rotation plus a quarter rotation equals a half while in the lower half-plane, a quarter rotation minus a quarter rotation equals zero: $1/4 + (-1/4) = 0$. The final sentence states, "This concept of dark energy invalidates (dark energy's) role as the cause of an expanding universe, which could be static." In the Riemann zeta function, it is known that there are infinitely many zeros on the critical line. This suggests the y-axis is literally infinite. To truly be infinite, it cannot be restricted to the up-down direction but must include all directions. That means it would include the horizontal direction and interact with the x-axis.

The universe (which includes the real, four-dimensional spacetime of the x-axis plus the large-scale, extra-dimensional imaginary spacetime* of the y-axis) would then be already infinite spatially and temporally - not potentially infinite. There could be no expansion or contraction of the universe as a whole. And as the final paragraph states, "the counterclockwise rotation of the x- and y-axes in Wick Rotation - which represents rotation of gravitational and electromagnetic waves - can be viewed as either rotation into diagonal form or as a quaternion function. It can also be responsible for the gravitational/electromagnetic energies forming all mass in space-time or, as dark energy acting via Wick rotation, forming all mass in imaginary time - which, since time and space can never be separated, is linked to an imaginary space and can be illustrated by the imaginary number i and its Wick rotation (this imaginary mass is known as dark matter).

* To introduce you to the idea of extra dimensions, consider this – Professor Itzhak Bars of the University of Southern California in Los Angeles says, one whole dimension of time and another of space have until now gone entirely unnoticed by us.

If physicists like Erik Verlinde and Max Tegmark are correct in thinking the universe has a mathematical foundation, that foundation could be the electronic BITS (BINARY digiTS) of 1 and 0, which comprise what is known as base-2 mathematics.

BITS AND TOPOLOGY

Electronics' binary digits can be used to draw a two-dimensional computer image of a Mobius strip. Two united Mobius strips create a three-dimensional* figure-8 Klein bottle (Figure 2)^[6], that acts as a building block of space, time, forces' bosons and matter's fermions. This creates a super symmetry (linkage) between fermions and bosons. A recent paper^[7] says that in a holographic universe, all of the information in the universe is contained in two-dimensional packages trillions of times smaller than an atom. Therefore, trillions of Mobius strips could form a photon and trillions of more complex figure-8 Klein bottles could form a more complex graviton (suggesting union of electromagnetism and gravitation).

* Looking beyond the oversimplified statement "A Klein Bottle is 2-dimensional" - The statement about a couple of two-dimensional Mobius strips uniting to form a three-dimensional figure-8 Klein bottle would benefit from this note - A manifold is a collection of points forming a certain kind of set, such as those of a topologically closed surface or an analogue of this in three or more dimensions. A Klein Bottle is a 2-dimensional manifold whose inside is outside. It can only exist in 4-dimensions! Since the figure-8 Klein bottle referred to in this article can only

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exist in 4 dimensions, it can be termed a structure of 3 space dimensions which includes the 4th (time) dimension described by Wick rotation. These 3+1 dimensions may also be called "an analogue of a topological surface in three or more dimensions".

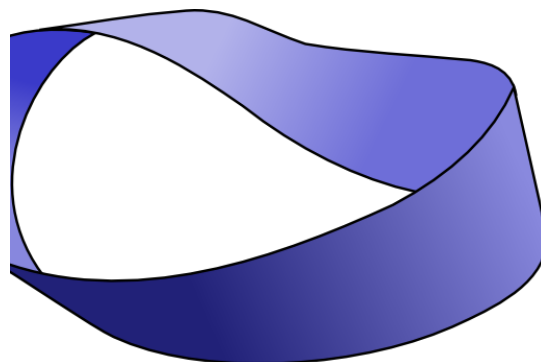


Figure 1 -The Möbius Strip

The strip is two-dimensional and only has one surface (source: http://www.clker.com/cliparts/3/7/a/9/1220546534781713951lummie_Mobius_Strip.svg.hi.png). The Möbius strip is a closed surface with no distinction between inside and outside. Thanks to quantum mechanics' entanglement applying on macroscopic scales,* this doesn't refer only to the surface itself. This results in the space-time of our universe existing everywhere and every when. The inside and outside of the universe's energy and mass are continuous when it's composed of Möbius strips and figure-8 Klein bottles acting macroscopically - there cannot be other universes outside our infinite and eternal universe, and there's no universe with different laws of physics (such a state of supposed multiple universes is called the multiverse).

*"Physicists now believe that entanglement between particles exists everywhere, all the time, and have recently found shocking evidence that it affects the wider, 'macroscopic' world that we inhabit^[8]. Though the effect is measured for distances in space, the inseparability of space and time means that moments of time can become entangled too^[9].

The physicist and science historian Abraham Pais wrote that "In 1924 the scientist Wolfgang Pauli was the first to propose a doubling of electron states due to a two-valued non-classical "hidden rotation"^[10]. Extending the ideas of "doubling", "two-valued" and "hidden rotation" from the quantum spin Pauli had in mind to the Möbius strip being a basic, fundamental unit of reality; it can be seen that Pauli's proposal has an analogy to this article. The doubled Möbius strips (doubled to form a figure-8 Klein bottle) could be produced by the two-valued binary-digit system used in electronics. The bottles possess a hidden rotation, now identified as adaptive Wick rotation, which gives a fourth dimension to space-time.

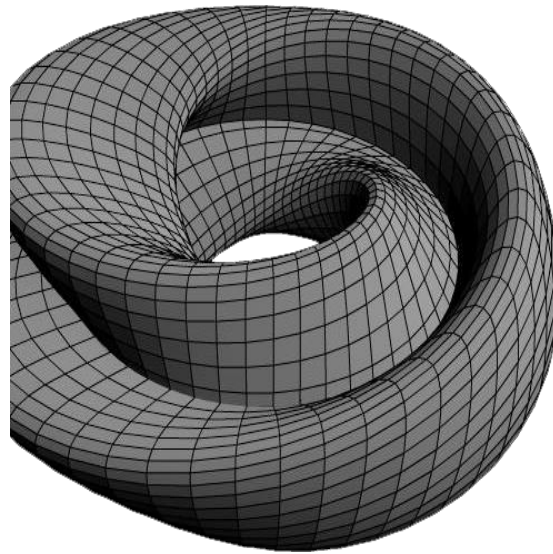


Figure 2 -Mobius Doublet

(figure-8 Klein bottle)(source: <https://upload.wikimedia.org/wikipedia/commons/7/73/KleinBottleFigure2-01.png>). Note that the positive curvature fits together with the negative curvature to produce the outline of a doughnut which is technically flat - see the reference to Vanessa Janek^[11]. When many doublets are placed together, binary digits can fill in any gaps or voids in the same way that computers can morph a picture on a screen and extrapolate a small patch of blue sky to make a sky that's blue from horizon to horizon. Morphing by bits can also delete a single doublet's central "hole". But the doublet doesn't become multiply connected like the doughnut. Merely the doughnut's outline is adopted - the doublet retains the property of being simply connected, a property necessary for space-time's infinity. (Informally, if an object in space consists of one piece - the constituent two Möbius strips now have the outline of one doughnut - and no longer has any "holes" that pass all the way through it, it is called simply-connected. A flat universe that is also simply connected implies an infinite universe^[12].

Wick Rotation, Causality and Uniting Time

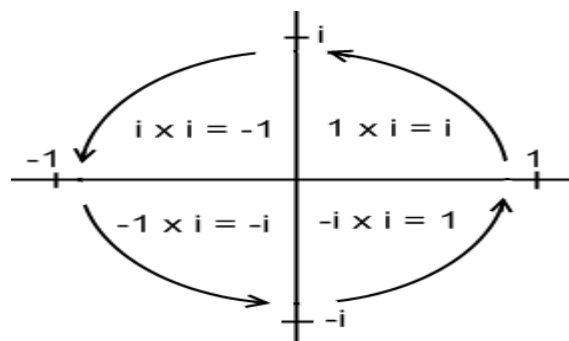


Figure 3 - Wick Rotation

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The complex plane reveals its special relationship with cycles via the circle of i , also known as Wick rotation. Whenever a point on the complex plane is multiplied by i , it moves a quarter rotation around the origin or center of the plane.” (Figure 3) and quote from^[13] Wick Rotation’s applications aren’t restricted to soon-to-be-mentioned time dilation, dark matter and dark energy. Electromagnetic waves are described by science as transverse, as are water waves. If a stone is dropped into a pool of calm water, many circular waves soon cover the surface of the water, and the water appears to be moving outwards from where the stone was dropped in. Actually, the particles of water simply rise then fall - it’s the wave motion that moves outward. Similarly, there is little movement of photons - they simply rise and fall like corks bobbing up and down in the ocean’s waves. Energy is transferred from photons in one place to photons in the next place by travelling space-time disturbances, and this wave motion is what is referred to as an electromagnetic wave. This process is described one or two pages after dark matter and dark energy. In (Figure 3), photons rise from the positive branch of the x -axis (to the right of the origin or centre) to the positive y -axis (extending above the origin). Then the photons fall to the negative x -axis, and continue falling to the negative y -axis. Then they rise to the positive x and resume their rotation. The conclusions are (1) electromagnetic and gravitational waves composing space-time rotate in a circle, giving rise to other large-scale dimensions, and (2) if there is little movement of photons (and gravitons*), the universe could not be expanding (or contracting) but its space and time is static. The Big Bang has impressive points leading to the idea that it’s a necessary stepping-stone. For example, the Big Bang’s supposed origin from quantum fluctuations is reminiscent of bits switching between 1 and 0.

* Einstein’s equations say gravitational fields carry enough information about electromagnetism to allow Maxwell’s equations to be restated in terms of these gravitational fields. This was discovered by the mathematical physicist George Yuri Rainich^[14]. Therefore, gravitational waves also have advanced components going back in time (see reference to Michio Kaku on p. 10). 1’s and 0’s composing electromagnetic and gravitational waves would compose both “advanced” waves going back in time and “retarded” waves going forward in time. The retarded components with $+x$ motion in time can obviously cancel the advanced components with $-x$ motion in time, producing entanglement. 17th century scientist Isaac Newton’s idea of gravity acting instantly across the universe could be explained by gravity’s ability to travel back in time, and thereby reach a point billions of light years away not in billions of years, but in negative billions-of-years. That is; the negative/advanced component of a gravitational wave would already be at its destination as soon as it left its source**, and its journey is apparently instant.

** Arriving at its destination billions of years before it left its source is an absurd impossibility if we cling to the traditional view of time flowing in one direction from cause to effect. But it’s plausible if we accept the Block Universe theory which developed from Special Relativity’s non-simultaneity of events for different observers. In the Block Universe, all time coexists (the entire past, the present, and every point in the future all exist at once) - in the same way that every period of time in a movie exists simultaneously on a store-bought DVD. Time can be visualized as a Cosmic DVD where our brains and consciousnesses take the place of the DVD player’s laser. Everything in the Cosmic DVD’s time exists at once*** but we’re only aware of an extremely limited number of events at any instant (these make up our present). Gravitational waves arriving billions of years prior to emission can be compared to playing part of the Cosmic DVD in reverse. Waves travel from a later frame of the cosmic movie to an earlier frame.

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*** All mass is composed of gravitational and electromagnetic waves, according to vector-tensor-scalar geometry. Both types of waves possess retarded and advanced components which entangle all masses. Wick rotation (time) is built into the Mobius strips and figure-8 Klein bottles composing electromagnetism's photons and gravitation's gravitons. Therefore, all time (the entire past and present and future) is united into one thing just as all space and all mass are united into one thing. VTS geometry says space and mass are united and physics already accepts that space and time are united. If space, mass, time, electromagnetism, gravitation, plus the VTS-derived weak and strong nuclear forces are all aspects of the same thing; that suggests the theory of quantum gravity truly exists. Mathematical equations would be just another aspect of the one thing - a tool - which people deem necessary to prove quantum gravity.

Wick Rotation and Time Dilation

This Wick rotation is consistent with Special Relativity's slowing of time (a.k.a. time dilation) because -

Today, so-called imaginary numbers (such as i , which equals $\sqrt{-1}$) describe so-called imaginary time. Imaginary time is a concept derived from special relativity and quantum mechanics. Geometrically, imaginary numbers are found on the vertical axis of the Complex Number Plane, allowing them to be presented perpendicular to the real axis of space-time as we know it. One way of viewing imaginary numbers is to consider a standard number line, positively increasing in magnitude to the right, and negatively increasing in magnitude to the left. At 0 on this x-axis (the so-called real axis), a y-axis (the so-called imaginary axis) can be drawn with "positive" direction going up - "positive" imaginary numbers then increase in magnitude upwards, and "negative" imaginary numbers increase in magnitude downwards.

The ultraviolet catastrophe, also called the Rayleigh-Jeans catastrophe, is a failure of classical physics to predict observed phenomena: it can be shown that a blackbody - a hypothetical perfect absorber and radiator of energy - would release an infinite amount of energy, contradicting the principles of conservation of energy and indicating that a new model for the behaviour of blackbodies was needed. At the start of the 20th century, physicist Max Planck derived the correct solution by making some strange (for the time) assumptions. In particular, Planck assumed that electromagnetic radiation can only be emitted or absorbed in discrete packets, called quanta. Albert Einstein postulated that Planck's quanta were real physical particles (what we now call photons), not just a mathematical fiction. From there, Einstein developed his explanation of the photoelectric effect (when quanta or photons of light shine on certain metals, electrons are released and can form an electric current). So it appears entirely possible that another supposed mathematical trickery (imaginary time and the y-axis) will find practical application in the future. Since quantum mechanics says particles can, according to our frame of reference, be in two or more places at once; the photons and gravitons which make up the waves in space-time can be on the x- and y-axes simultaneously and thus interfere with themselves, causing time to slow down significantly near the speed of light in a vacuum or under intense gravity. A Mobius strip only has one surface (**Figure 1**) Therefore this loop must intersect, and interfere with, itself. It has been proposed that a photon is composed of trillions of Mobius strips (1st paragraph of **BITS AND TOPOLOGY**). When two or more photons meet, the interference continues and is increased. It's proposed that electromagnetic and gravitational waves rotate in a circle, giving rise to dark matter on the y-axis via vector-tensor-

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scalar geometry. Near what is called the speed of light, rotational speed is increased significantly and more photons interfere with each other more often, causing time to slow down. The extremely powerful gravity associated with a black hole will also significantly slow time, for two reasons referring to **Figure 3**: (a) Photons will “fall” faster from the positive y-axis to the negative y-axis (rotational speed is increased significantly and more photons interfere with each other more often), and (b) each quantum within the black hole - which this article says is a graviton - can, according to our frame of reference, be in two or more places at once and cause photons to simultaneously “rise” faster from the negative y-axis to the positive y-axis (again, interference between photons is increased and time dilation occurs).

Vector-Tensor-Scalar (VTS) Geometry, with Dark Matter and Dark Energy and the Higgs

“Dust grains assemble by chemical bonding. Once they are sand or gravel sized, how they continue to stick is a mystery (**Figure 4**). Metre-sized rocks should spiral into the star rapidly due to disk drag (the gas orbits a little slower than the rocks as a pressure gradient partially supports it). Once rocks somehow get past these barriers, they collide with each other in a chaotic and random way assembling the planets^[15].

The following method of building planets is preferred to collisions between rocks and dust in the disk because most planetary systems seem to outweigh the protoplanetary disks in which they formed, leaving astronomers to re-evaluate planet-formation theories^[16].

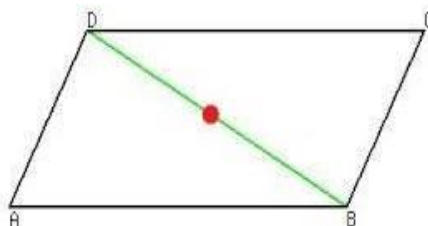


Figure4- VTS (Vector-Tensor-Scalar) Geometry-Interaction of Gravitation and Electromagnetism Produces a Momentum in Gravitons and Photons (and a Pressure which is known as Mass).

Explanation of geometric display of mathematics’ vectors, scalars, and tensor calculus adapted from^[17] A vector is a quantity which possesses both magnitude and direction. Two such quantities acting on a point may be represented by two adjoining sides of a parallelogram, so that their resultant is represented in magnitude and direction by the diagonal of the parallelogram (AD and CD, for example, can symbolize the electromagnetic and gravitational vectors while the resultant green diagonal of DB substitutes for the interaction of those two forces). A scalar variable is representable by a position on a line, having only magnitude e.g. the red dot on the diagonal, symbolic of the Higgs boson. A tensor is a set of functions which, when changing from one set of coordinates to another, are transformed in a precisely defined manner (e.g. changing from the coordinates of AD and CD to those of the green diagonal, or of the red dot, is a transformation performed in a particular way).

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Two sides thus illustrate the graviton's spin 2 and the photon's spin 1. The resultant diagonal represents the interaction of the sides/vectors ($1 \div 2 =$ the spin $\frac{1}{2}$ of every matter particle). Tensor calculus changes the coordinates of the sides and diagonal into the coordinates of a single (scalar) point on the diagonal. This scalar point is associated with particles of spin zero^[18]. If the mass produced during the photon-graviton interaction (the energy and momentum of photons and presently hypothetical gravitons produces a pressure we call mass*) happens to be $125 \text{ GeV}/c^2$, its union with spin 0 produces the Higgs boson. $125 \text{ GeV}/c^2$ united with spin 0 means the central scalar point of the Higgs boson is related to the vector of the graviton's spin 2, and the Higgs field is therefore united with the supposedly unrelated gravitational field (together with the latter's constant interaction with the electromagnetic field).

* Material from a star could fall onto a neutron star, heating it up and causing it to emit radiation. Then the energy and momentum of the photons and presently hypothetical gravitons would be the interaction of electromagnetism (the charged particles and strong magnetism) with the neutron star's powerful gravity. This results in wave-particle duality. The heating could produce gravitational and electromagnetic radiation which would produce the mass and quantum spin of subatomic particles - instead of only radiation being emitted, jets of matter would be emitted too (normally, the matter would be emitted as beams or jets from the neutron star's magnetic poles).

Bosons of the Nuclear Forces and Planet/Black-Hole Formation

It must be remembered that referring to space alone is incomplete. Living in space-time, it's necessary to add some sentences about the time factor. The photon must interact with the graviton to produce the mass of the weak nuclear force's W and Z bosons. To produce their quantum spin, the photon's spin 1 needs to react with the graviton's spin 2. That is, the photon's turning through one complete revolution needs to be combined with the graviton's being turned through two half-revolutions*. Incorporating the time factor as a reversal of time (Richard Feynman, 20th-century winner of the Nobel Prize in Physics, used reversal-of-time to explain antimatter) in the middle of the interaction: a gravitonic half revolution is subtracted from the photonic full revolution then the graviton's time-reversal adds a half revolution ($1 - \frac{1}{2} + \frac{1}{2} =$ the spin 1 of W and Z bosons). The strong nuclear force's gluon's quantum spin of 1 could arise in the same way as the spin 1 of weak-force bosons. Most reactions in this section may be explicable purely by the retarded** portions of waves interacting. But the masslessness of gluons might be produced by retarded and advanced waves cancelling. They neutralize each other, producing a mass of zero and relating gluons to the Higgs boson whose zero quantity is its quantum spin.

*Professor Stephen Hawking writes^[19] -

"What the spin of a particle really tells us is what the particle looks like from different directions."

Spin 1 is like an arrow-tip pointing, say, up. A photon has to be turned round a full revolution of 360 degrees to look the same.

Spin 2 is like an arrow with 2 tips - 1 pointing up, 1 down. A graviton has to be turned half a revolution (180 degrees) to look the same.

Spin 0 is like a ball of arrows having no spaces. A Higgs boson looks like a dot: the same from every direction.

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Spin $\frac{1}{2}$ is logically like a Mobius strip, though Hawking doesn't specifically say so. This is because a particle of matter has to be turned through two complete revolutions to look the same, and you must travel around a Mobius strip twice to reach the starting point.

**"When we solve (19th-century Scottish physicist James Clerk) Maxwell's equations for light, we find not one but two solutions: a 'retarded' wave, which represents the standard motion of light from one point to another; but also an 'advanced' wave, where the light beam goes backward in time. (^ note by author of "Riemann Hypothesis") Engineers have simply dismissed the advanced wave as a mathematical curiosity since the retarded waves so accurately predicted the behavior of radio, microwaves, TV, radar, and X-rays. But for physicists, the advanced wave has been a nagging problem for the past century^[20].

^ Stars and galaxies etc. send us retarded light which, through spectroscopy's redshift, gives an approximate measurement of how long that light has been travelling (the distance to the astronomical body). The light includes an advanced component that reaches back into the past, producing a measurement that significantly exceeds the real distance. The farther away a star or galaxy is, the more the advanced part of waves from it will reach into the past, giving us a greater inaccuracy regarding its true distance. This increase is analogous to redshift increasing with distance. We might call it readshift - re(tarded) ad(vanced) shift. Readshift would explain the astronomical results which were interpreted as accelerating expansion of the universe. Supernovas would be fainter, therefore apparently farther away, because "The light includes an advanced component that reaches back into the past, producing a measurement that significantly exceeds the real distance".

The interacting gravity and electromagnetism produce mass e.g. they can form a Higgs boson or the strong/weak nuclear forces' bosons as well as matter. On a cosmic level - if gravitational and electromagnetic waves focus on a protoplanetary disc surrounding a newborn star, the quantum spin of the particles of matter in the disc ($\frac{1}{2}$) could imprint itself on the waves' interaction and build up a planet layer by layer from vector-tensor-scalar geometry's $1 \div 2$ interaction. If the waves focus on a region of space where there's no matter, the opposite interaction occurs and the graviton's spin 2 is divided by the photon's spin 1 to produce $2 \div 1$. The mass produced has the spin inherent in each of the gravitons composing spacetime - and could be an alternative, or complementary, method to supernovas for producing the gravitational waves making up black holes.

Quaternions were first described by Irish mathematician William Rowan Hamilton in 1843. Hamilton defined a quaternion as the quotient of two vectors^[21]. In this case: the quotient of two vectors is $\frac{1}{2}$, the division of the electromagnetic vector (photonic quantum spin of 1) by the gravitational vector (gravitonic quantum spin of 2). In other words, the term "diagonal"(like $\frac{1}{2}$, the result of these 2 vectors interacting) in VTS Geometry can be replaced with the term "quaternion". And the counterclockwise rotation of the x- and y-axes in Wick Rotation - which represents rotation of gravitational and electromagnetic waves - can be viewed as either rotation into diagonal form or as a quaternion function. It can also be responsible for the gravitational/electromagnetic energies forming all mass in space-time or, as dark energy acting via Wick rotation, forming all mass in imaginary time - which, since time and space can never be separated, is linked to an imaginary space and can be illustrated by the imaginary number i and its Wick rotation (this imaginary mass is known as dark matter). And this concept of dark energy invalidates its role as the cause of an expanding universe - which could now be static.

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