Mathematical Nature of Reality, Plus Gravitation-Electromagnetism Unification, Derived from Revised Gravitational Tidal Forces and Mass-from-Gravity Concept

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[a]article written in Australia, independently of any institutional affiliation

Abstract -

This article had its beginning with Einstein's 1919 paper "Do gravitational fields play an essential role in the structure of elementary particles?" Together with General Relativity's statement that gravity is not a pull but is a push caused by the curvature of space-time, a hypothesis for Earth's ocean tides was developed that does not solely depend on the Sun and Moon as Kepler and Newton believed. It also borrows from Galileo. The breakup of planets and asteroids by white dwarfs, neutron stars or black holes is popularly ascribed by today's science to tidal forces (gravitation emanating from the stellar body and having a greater effect on the near side of a planet/asteroid than the farthest side). Remembering Einstein's 1919 paper, it was apparent that my revised idea of tidal forces improves on current accounts because it views matter and mass as unified with space-time whose curvature is gravitation. Unification is a necessity for modern science's developing view of one united and entangled universe – expressed in the Unified Field Theory, the Theory of Everything, String theory and Loop Quantum Gravity. The writing of this article was also assisted by visualizing the gravitational fields forming space-time being themselves formed by a multitude of weak and presently undetectable gravitational waves. The final part of this article concludes that the section **BITS AND TOPOLOGY** will lead to the conclusions in **ETERNAL LIFE, WORLD PEACE AND PHYSICS' UNIFICATION**. The final part also compares cosmology to biological enzymes and biology's substrate of reacting "chemicals" - using virtual particles, hidden variables, gravitation, electromagnetism, electronics' binary digits, plus topology's Mobius strip and figure-8 Klein bottle. The product is mass - enzyme, substrate and product are all considered mathematical in nature. Also, gravitation and electromagnetism are united using logic and topology – showing there's no need in this article for things like mathematical formalism, field equations or tensor calculus.

Keywords -

Gravitational Tidal Forces, Mass-from-Gravity, Breakup of Celestial Bodies, Earth's Ocean Tides, Universe's Big Bang, Cosmic Inflation, Eternal Life, World Peace, Matter,

Mass, Mathematical Reality, Gravitational-Electromagnetic Unification, Large-scale Extra Dimensions, Evolution, Virtual Reality, Augmented Reality, Special Relativity

Article -

Section 1 - CELESTIAL TIDES

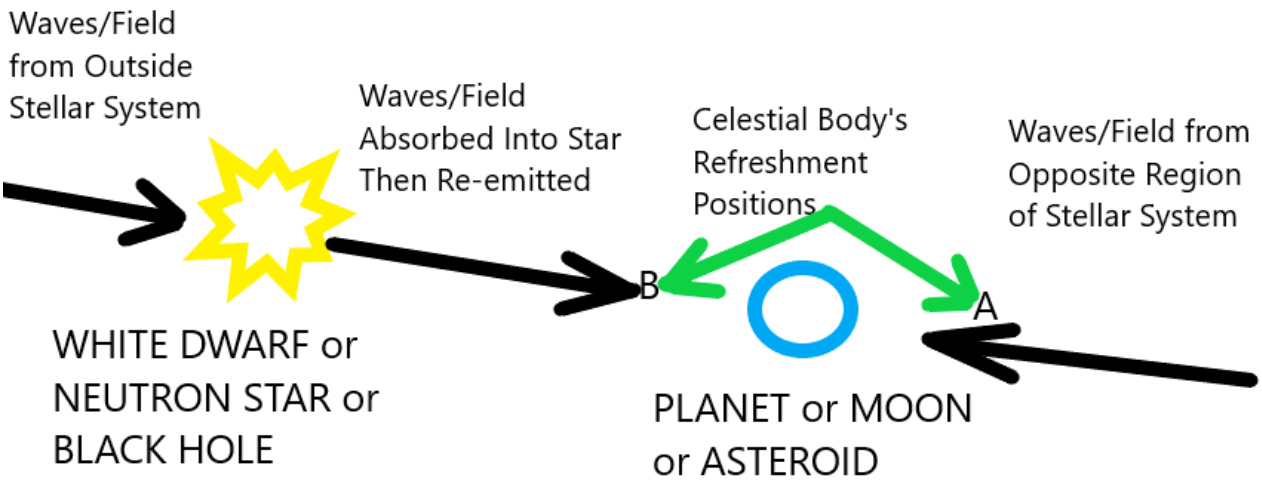


Figure 1 – BIDIRECTIONALITY OF, AND REFRESHING BY, GRAVITATION

(drawn by author using Microsoft's "Paint" program)

If gravity is a pull from Earth's centre, its effect on surface crust that has been heated and made mobile would be to pull it directly downwards toward the centre without any sideways deviation (apparent stretching). But if gravity follows Einstein's General Relativity theory, it'd be a push caused by the local curvature of space-time. The gravitational waves in this curvature would strike the crust from all angles. Some come vertically from directly above, pushing it down and causing flattening. Other waves come obliquely from very low angles, giving the heated and mobile crust a nearly horizontal push and resulting in sideways deviation (apparent stretching). Such interaction with matter implies that gravity does not simply penetrate everything but is absorbed and re-radiated. It also says "yes" to the question asked by Einstein's 1919 paper "Do gravitational fields play an essential role in the structure of elementary particles?" (the paper also speaks of electromagnetism – implying that electromagnetism is the other contributor to mass). (1)

If enough gravitational waves travelling from outside the solar system to the stellar body are absorbed then re-emitted, they could alter gravitational fields and push a planet away. If a star only received the input of gravitational waves from deep space entering it, there would be no limit to its potential growth. Since it also radiates mass-forming gravitational waves, there is a limit to the growth. 99% of the solar system's mass / gravitational waves / gravity are associated with our star, so the gravitational push on Earth from the solar sphere may be slightly greater than the push from the waves originating from deep space on the other side of the solar system. The gravitational fields and waves from deep space would exert a push on a body and are a possible unrecognized contributing factor to the Pioneer anomaly, where the Pioneer spacecraft near the solar system's edge are a few thousand kilometres closer to the Sun than predicted. The re-emission of gravity by the Sun could be misinterpreted as gravity originating within the Sun and exerting a pull which keeps planets in orbit (this neglects the gravitational push coming from regions of space opposite the Sun). In the end, our planet's orbit would be growing slowly larger. There is a science paper that concludes the distance between Sun and Earth is growing by approx. 15 centimetres per century. (2) The two authors attribute this increase of the AU or Astronomical Unit (AU = the average distance between Earth and the Sun) to dark energy. As this article has shown, the increase may be gravitational.

In the diagram above, the different parts of the planet/moon/asteroid are accelerated – waves and fields from the left attempt to push it to refreshment position A (the word "refresh" is taken from computers and means the updating of the celestial body's display). Gravity does more than try to relocate the body to A: it also attempts to re-form the body at A. Simultaneously, waves and fields from the right attempt to push it to (and reform it at) refreshment position B. The stresses resulting from being reformed at A and B at the same time are the cause of the planet's/asteroid's being torn apart. Though this disintegration can occur in any stellar system, it's more likely to happen in a system dominated by a white dwarf or neutron star or black hole ie a system where a multitude of powerful waves/fields contribute to the great mass at the centre and create intense gravitation in all regions.

Reorienting of all astronomical orbits is inevitable in the long run (unless prevented by intervention) because gravitational waves and fields are dynamic and constantly changing. This article's revision of tidal forces is similar to the currently accepted model. But instead of focusing on gravitation from the stellar body being a pull that has a

greater effect on the near side of a planet/asteroid than the farthest side, it states that a celestial body's breakup results from gravitation being pushes from opposite directions.

Section 2 - OCEAN TIDES

How, then, can repelling or pushing gravity account for the apparent attraction of ocean tides towards the Moon? I believe such an idea of gravity requires the idea of 17th-century scientists Isaac Newton and Johannes Kepler that the moon causes the tides, to be joined with Galileo's idea that the Earth's movements slosh its water.

"If a barge (carrying a cargo of freshwater) suddenly ground to a halt on a sandbar, for instance, the water pushed up towards the bow then bounced back toward the stern, doing this several times with ever decreasing agitation until it returned to a level state. Galileo realized that the Earth's dual motion—its daily one around its axis and its annual one around the sun—might have the same effect on oceans and other great bodies of water as the barge had on its freshwater cargo." (3)

Gravity's apparent attraction can be summarized by the following - gravitation is absorbed into wave packets and the inertia of the gravitons (united with far more energetic photons) carries objects towards Earth's centre at 9.8 m/s or 32 ft/s. The volume of the oceans on Earth is estimated at nearly 1.5 billion cubic kilometres. (4) All this water is being pushed towards Earth's centre at 32 feet per second every second. But the seafloor prevents its descent. So there is a recoil, noticeable offshore (it is only where oceans and continents meet that tides are great enough to be noticed). This recoil is larger during the spring tides seen at full and new moon because sun, Earth and moon are aligned at these times.

The previous paragraph's alignment of Sun, Earth and moon refers to their being lined up where the gravitational current is greatest (in the plane where planets and moons are created) - and to more of the gravitational waves travelling from the outer solar system being captured by solar and lunar wave packets, and less of them being available on Earth to suppress oceanic recoil (there are still enough to maintain the falling-bodies rate of 32 feet per second per second). At the neap tides of 1st and 3rd quarter; the sun, earth and moon aren't lined up but form a right angle and our planet has access to more gravity waves, which suppress oceanic recoil to a greater degree. We can imagine the

sun and moon pulling earth's water in different directions at neap tide but suppression is a more accurate description. If variables like wind/atmospheric pressure/storms are deleted, this greater suppression causes neap tides which are much lower than spring tides.

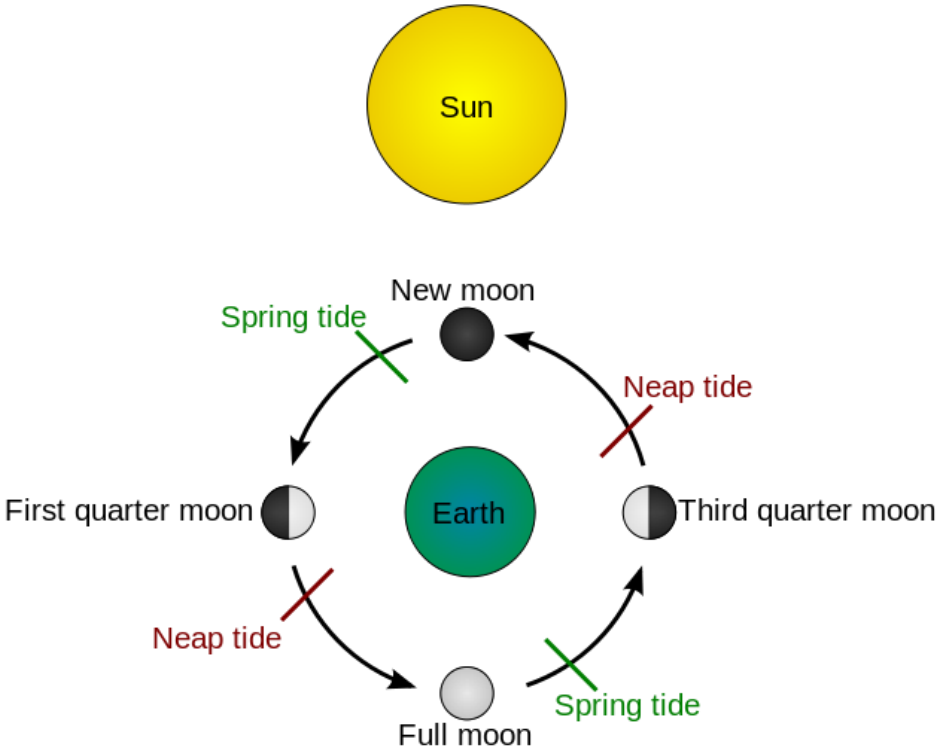


Figure 2 – TIDE SCHEMATIC

public domain image from https://en.wikipedia.org/wiki/File:Tide_schematic.svg

After absorption (whether in oceans, in space, or anywhere else), the gravitational waves are used in refreshing mass plus, possibly, refreshing the strong and weak nuclear forces associated with matter. This refers to theories where the role of the mass-giving Higgs field is fulfilled by particular couplings (5). This theory has lost popularity since the Higgs boson was discovered. But rather than discard it as worthless, it will be turned into a simultaneous duality of couplings here. The couplings are, as explained in the following text, of (b) electromagnetism's photon/gravitation's graviton (these two particles are, respectively, trillions of Mobius strips and trillions of Mobius doublets aka figure-8 Klein bottles), and (a) the 1's and 0's of binary digits aka virtual particles^ aka hidden variables*. Virtual particles, according to **Section 3 - BITS AND TOPOLOGY**, create photons and gravitons. They would act like a cosmic catalyst

– similar to the biological catalysts called enzymes - accelerating the refreshing of mass without undergoing any permanent change themselves. They are then “re-radiated” from stars, planets, interstellar gas and dust etc, exciting[#] gravitons and forming what are referred to as gravitational waves (they form a Gravity Wave Background, challenging the idea that the traditional form of Cosmic Inflation was necessary to generate gravitational waves). The virtual particles filling space-time, mass and matter also excite photons when they’re “re-radiated” and form all types of what are called electromagnetic waves**:** including an infrared background whose heat output exceeds that of the stars alone, in addition to a microwave background. The latter challenges the idea that existence of the cosmic microwave background proves the universe began with the Big Bang.

^ A virtual particle is a transient fluctuation that exhibits some of the characteristics of an ordinary particle but cannot be detected in experiments. However, they’re known to exist because they have the measurable effect of giving rise to forces between particles of matter. This article equates them with the electronic binary digits that are transient and only exist as either a 1 or 0 for an extremely brief time eg as a computer image changes.

*Binary digits are proposed to be the Hidden Variables which "are an interpretation of quantum mechanics based on the belief that the theory is incomplete and that there is an underlying layer of reality that contains additional information about the quantum world. This extra information is in the form of the hidden variables, unseen but real quantities. The identification of these hidden variables would lead to exact predictions for the outcomes of measurements and not just probabilities of obtaining certain results." (6)

[#] Drop a stone into calm water: the particles of water simply rise then fall. It's the wave motion that moves outward. Like water waves, electromagnetic waves are transverse: the particles called photons would have little movement. As Paul Camp, Ph.D. in theoretical physics, writes -

"A photon is a quantum of excitation of the electromagnetic field. That field fills all space and so do its quantum modes." (7)

It's the disturbances from sources of electromagnetism (excitations of fluctuating amplitudes and frequencies caused by virtual particles) that travel at the speed of light, not photons. Gravitation also fills all space, so motion of gravitational waves could be

due to virtual-particle fluctuations causing excitations called gravitons. The above ideas of gravitons and photons displaying no relocation are a new interpretation of physicist John Wheeler's geon or "gravitational electromagnetic entity", an electromagnetic or gravitational wave which is held together in a confined region by its own nature. (8) THE VOLUME COMPOSED OF GRAVITONS AND PHOTONS (SPACE-TIME) ALWAYS REMAINS CONSTANT.

Subsection 2.1 -

WAVE-PARTICLE DUALITY AND $E=mc^2$

This subsection is devoted to giving more detail about that last sentence and paragraph, as well as about the final paragraph of **Section 3 – BITS AND TOPOLOGY:**

Wave-particle duality can be described by starting with $v=f\lambda$ (wave velocity, m/s). Velocity of particles like a car equals distance divided by duration. Since distance is a measure that has to do with space while duration is a measure that has to do with time, it equals space divided by time. (9) Gravitational and electromagnetic wave motion (space-time motion) travels at c, the speed of light ie

$v= f\lambda$ = distance/duration = space/time = c (equation 1)

A particle's velocity, whether the particle be a boson or fermion, is directly dependent on its energy – so it may be said that

$E = v = f\lambda$ = distance/duration = space/time = c (equation 2)

This is not quite right since c represents energy alone, and space-time deals with mass-energy, so it's better to say

$E = v= f\lambda$ = distance/duration = space/time = mc (equation 3)

What about the "squared" in E=mc2? In later papers Einstein repetitively stressed that his mass-energy equation is strictly limited to observers co-moving with the object under study. And this co-movement is what the exponent 2 refers to (see equation 4).

In order for E=mc2 to apply to the universe (and it does), observers must be able to co-move with anything being studied (even a light beam). Moving in the same direction is no problem but how can anyone or anything move at the same speed? Present-day observers can never move at the speed which light is reported to cover in the vacuum of space-time, so the only way for observers and light to co-move is for the nature of electromagnetism to be revised.

'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.' (10)

Though the effect is measured for distances in space, the inseparability of space and time means that moments of time can become entangled too. (11)

The link between the quantum and macroscopic worlds means the transverse wave motion of electromagnetic waves is identical to the transverse wave motion in a body of water. Therefore, waves in both water and electromagnetism are consistent with energy being transferred from one place to another as wave motion without involving an actual transfer of particles. General Relativity says gravitation IS space-time ie the gravitational field also fills all space, so the seeming motion of gravitational waves could also be due to virtual particles causing excitations (called gravitons) in the field. These excitations cover 186,282 miles every second. The speed of light - or according to this article, coverage of excitations - is based on an inch of exactly 2.54 cm and is exactly 186,282 miles, 698 yards, 2 feet, and 5 21/127 inches per second. (12)

Since Einstein's mass-energy equation is strictly limited to observers co-moving with the light beam under study, "squared" must be added to the mass/light-speed part of this article's equation -

$E = v = f\lambda$ = distance/duration = space/time = mc^2 (equation 4)

Simplified by removal of the middle elements, this becomes $E=mc^2$

(any other result would suggest the inventor of Relativity was wrong)

To sum up, photons can be at rest in an electromagnetic wave. Since $E=mc^2$ only applies to the photon when it's at rest, the equation does indeed apply to the cosmos – and consequently, so do $E=0$ and $m=c^2$ (see final paragraph of next section) which negate distance in space-time as well as stating the universe cannot be expanding or contracting.

What about the Cosmic Microwave Background that supposedly proves the Big Bang theory? Or what about the astronomical redshift that supposedly means the universe is expanding? The answer to the microwave objection can be summed up in one sentence - "The quantum entanglement of microwaves with all of space-time means the Cosmic Microwave Background radiation fills the entire sky and is not produced by the Big Bang as most scientists believe (quantum entanglement has been repeatedly confirmed experimentally)."

To answer the redshift problem almost as briefly - In astrophysics, gravitational redshift or Einstein shift is the process by which electromagnetic radiation originating from a source that is in a gravitational field is reduced in energy and in frequency / increased in wavelength, or redshifted to the red end of the spectrum. Since General Relativity says gravity is just another term for the curvature of space-time, the gravitational field out of which proceeds a particular measurement of electromagnetic redshift is not limited to a particular galaxy or galaxy cluster but spans (indeed, is) the whole of space-time. The farther away a galaxy is, the greater is the amount of gravitation which any electromagnetic radiation has to traverse. So the electromagnetism weakens more than expected and the gravitational redshift, which is larger than anticipated, naturally increases with distance. All of the redshift not due to the Doppler effect is gravitational redshift, which is always grounded in space-time-spanning gravity. It never indicates universal expansion, which would make it what is called cosmological redshift and would require space-time and gravitation to be separate things.

Section 3 – BITS AND TOPOLOGY

There are four 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.(13)

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.(14)

c) Cosmologist Max Tegmark hypothesizes that mathematical formulas create reality. (15)

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."(16)

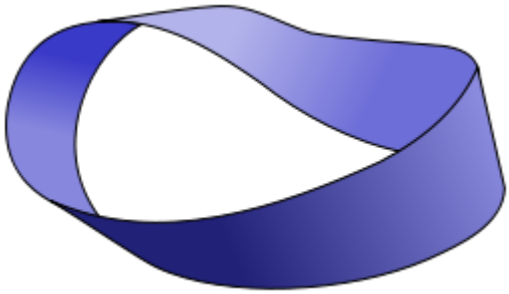
Stephen Hawking writes, "What the spin of a particle really tells us is what the particle looks like from different directions." (17) Particles of matter like the proton and electron have spin 1/2, which means these particles must be turned through two complete revolutions to look the same – and, not coincidentally, you must go around a Mobius strip twice to reach your starting point. This is an excellent starting point in the quest to unify electromagnetism and gravitation, since it tells us that the Mobius strip is a basic, fundamental unit of reality. **It seems plausible that the particular values of quantum spin could be determined by another set of particular values viz those in electronics' binary digits, which always take the form of either 1 or 0. (Electronics could thus insert Artificial Intelligence and defiance of the Uncertainty Principle into everything from the subatomic scale through the biological to the astronomical.)** First, the 1's and 0's are programmed to form the shape of a Mobius strip, which is merely two-dimensional (2-D). To use words from a recent paper -

In a holographic universe, all of the information in the universe is contained in 2D packages trillions of times smaller than an atom.(18)

(Just as the interference between two laser beams produces a three-dimensional holographic image, "holographic" would also have the accepted cosmological meaning

of the entire universe being seen as two-dimensional information – from Mobius strips, according to this article - projected into the three dimensions we're familiar with.)

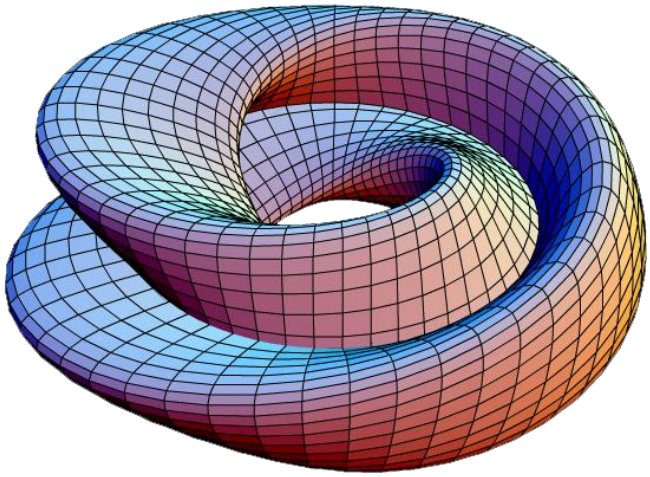
Figure 3 - MOBIUS STRIP (source: http://www.clker.com/cliparts/3/7/a/9/12205465347817139 51lummie_Mobius_Strip.svg.hi.png)



Then two strips must be joined to make a 4-D Klein bottle(19) which has length, width, depth and, when Wick rotation is programmed^ into the strips as a subroutine (see Figure 5), the 4th dimension of movement in time. The type of Klein bottle formed would appear to be the figure-8 Klein. A diagram of many figure-8 Klein bottles would show that their positive curvature (on the spherical parts) fits together with their negative curvature (on saddle-shaped parts) to cancel and produce, on a cosmic scale, the flat curvature of space-time(20). When you have trillions of Mobius and figure-8 Klein elements assembled, you can follow the theory of the mass-giving Higgs field being the result of various couplings. This theory has lost popularity since the Higgs boson was discovered. But rather than discard it as worthless, it will be turned into a simultaneous duality of couplings here. An implication of a 1919 paper by Einstein is that the (first) coupling is between gravitons and photons. Here, that's slightly modified to the virtual particles (binary digits or hidden variables) that are the most fundamental units composing gravitons and photons. The second coupling is between the Mobius strip and the figure-8 Klein bottle (these exist on a level between photons/gravitons and 1's/0's, being built up into the particles and composed of the binary digits). With trillions of Mobius and figure-8 Klein elements assembled, an appropriate number of photons and gravitons must be included in the assembly to give the matter what we call the emergent property of mass - similar to hydrogen and oxygen combining to give water what we call wetness. (Subatomic particles must possess quantum mechanical wave-particle duality if they're composed of gravitational plus electromagnetic waves. Duality also says waves possess particle-like properties ie the waves are composed of gravitons and photons.)

^ In a science TV program, (21) Dr. Graham Phillips reported that "the physicist and writer Paul Davies thinks the universe is indeed fine-tuned for minds like ours. And who fine-tuned it? Not God but minds from the future, perhaps even our distant descendants, that have reached back through time ... and selected the very laws of physics that allow for the existence of minds in the first place. Sounds bizarre, but quantum physics actually allows that kind of thing."

Figure 4 - MOBIUS DOUBLET (FIGURE-8 KLEIN BOTTLE) (source: https://upload.wikimedia.org/wikipedia/commons/7/73/KleinBottle-Figure8-01.png) Note that, when considering many bottles, the reddish positive curvature fits together with the bluish negative curvature to produce the flatness implying space-time's infinity and, since space and time are always unified, its eternity. (In flat space-time, light beams travel in straight lines and can go infinite distance without ever meeting.)



Science seems to avoid infinity at all costs – equating it with zero will give scientists many more headaches. Maybe they could accept infinity if ∞=0 is viewed as the ultimate form of renormalization – a renormalization that doesn't reduce the infinite size of the universe but, thanks to $E=mc^2$, reduces the distances in space and between times to zero. E=mc^2 seems to tell us that all distances in space, and time, can be completely eliminated (permitting us to instantly reach anywhere in space-time). Einstein wrote a 1919 paper titled "Do gravitational fields play an essential role in the structure of elementary particles?" (it suggests electromagnetism is the other contributor to mass). Today's world

answers the paper's question with "no" but, out of curiosity, let's ask what happens if the answer is "yes". Since photons and gravitons exist everywhere in space-time, they can interact without motion from one spot to another ($E=mc^2$ only applies to motionless photons). Let's represent the masslessness of gravitons and photons by 0 and substitute that for m (mass) in $E=mc^2$. The masslessness of interacting photons and gravitons results in E=0*c^2 ie in bizarre physics like black holes, E can equal 0. Having reduced the equation to nothing but E, m=0 and c^2=0 which means m=c^2. The absence of E (energy) refers to there being no interaction of electromagnetic and gravitational energy, and therefore no mass. If mass cannot be produced, Einstein's paper implies mass-producing space-time/gravity must be zero. It obviously exists, so its zero-ness can mean we can relocate matter and information superluminally, or travel into the past and future, because distance can equal zero and can be eliminated from both space and time. An additional meaning of space-time/gravity equaling zero is that the constant value states the universe cannot be expanding or contracting (an entire eternally infinite universe can never expand or contract). Also, the universe can neither expand nor contract because photons and gravitons can be at rest in an electromagnetic or gravitational wave, never expanding or reducing their region of influence.

Section 4 - SUPERSYMMETRY AND WICK ROTATION

Following Albert Einstein's example of turning Max Planck's quanta (which, for years, Planck and all other scientists considered purely mathematical) into explanation of the physical photoelectric effect, the Wick rotation used to describe imaginary time may be transformed from mathematical "trickery" to physical meaning, and provide a modern way to unite space and time (and imaginary space-time's Dark Matter) into one space-time.

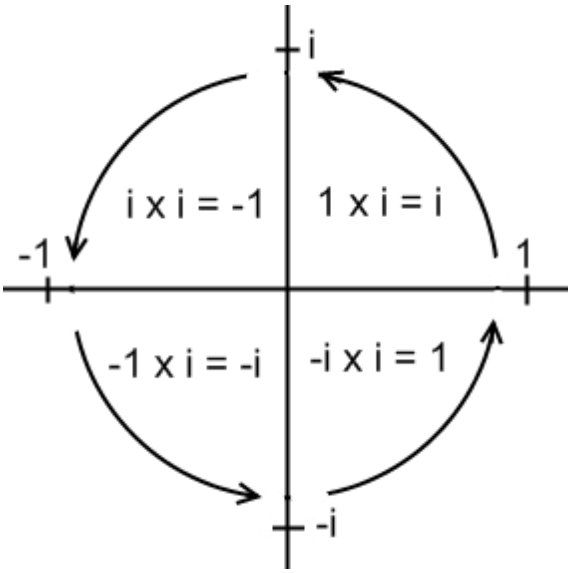


Figure 5 – WICK ROTATION: "The complex plane reveals i's special relationship with cycles via the circle of i, also known as Wick rotation. Whenever a point on the complex plane is multiplied by i, it moves a quarter rotation around the origin or center of the plane."(22)

Supersymmetry (SUSY) proposes a relationship between bosons and fermions. Some scientists believe supersymmetry is a failed theory. A new approach would be proposing that the Mobius strip is a fundamental constituent of not only fermions (particles of matter) but also of bosons (particles of energy) - and therefore unites all particles into one space. Mathematician and physicist Ron Kurtus states that

"An analogy of gravitational and electromagnetic fields is seen by comparing the Einstein Field Equations from the General Theory of Relativity with Maxwell's Field Equations for electrical and magnetic fields." (23)

In relation to Quantum Spin, Wolfgang Pauli in 1924 was the first to propose a doubling of electron states due to a two-valued non-classical "hidden rotation".(24) Extending the ideas of "doubling", "two-valued" and "hidden rotation" to the Mobius strip being a basic, fundamental unit of reality**;** it can be seen that Pauli's proposal has an analogy to this article. The doubled Mobius strips produced by the two-valued binary-digit system creates the hidden rotation of the figure-8 Klein bottle (two strips joining to make a 4-D Klein bottle

and extending the photon's link to the Mobius strip into the dynamic graviton's link to the Mobius doublet called the figure-8 Klein bottle).

This proposed link between the Mobius strip and the Mobius doublet (figure-8 Klein bottle) would also be a link between the photon and graviton, suggesting unification of electromagnetism with gravitation.

Recalling how photons can be at rest in an electromagnetic wave, it's possible for electrons to be at rest in a superconductor. This means the explanation of superconductivity developed by John Bardeen, Leon Cooper, and John Schrieffer in 1957 (for which they shared the 1972 Nobel Prize) need not depend on the Cooper pair or BCS pair - a pair of electrons (or other fermions) bound together at low temperatures in a certain manner first described in 1956 by American physicist Leon Cooper. (25) John Bardeen commented - "The idea of paired electrons, though not fully accurate, captures the sense of it." (26) His comment about the idea of paired electrons not being fully accurate can mean that superconductivity is, at least partly, a wave motion not involving the motion of particles.

The inner and outer surfaces of a Mobius form a continuous strip in space – unification of space with time requires a temporal continuity. This is carried out by Wick rotation's continuous cycling between what are called real and imaginary time – a property programmed into the Mobius strip. Therefore, the Mobius strip combined with Wick rotation and imaginary time (represented as the vertical direction on mathematics' Complex Number Plane) provides a modern way to unite space and time into one space-time. **Since time and space are forever united, imaginary time must be joined with an imaginary space and imaginary space-time would be the realm of Dark Matter.** (The continuously curved Mobius surface + continuous Wick rotation = curvature of space-time.) Like ocean waves diverted towards the mass of an island, the primary focus of mass-contributing gravitational waves must be a galaxy's centre because they help form a supermassive black hole there.

Subsection 4.1 –

"BITS AND TOPOLOGY" PLUS "SUPERSYMMETRY AND WICK ROTATION"

SUMMARIZED FROM ANOTHER PERSPECTIVE

PART 1 (PARTICLES OF MATTER, SPECIAL RELATIVITY, ADVANCED WAVES) –

Particles of matter have spin one-half which means they must be turned through two complete revolutions to look the same. Also, you must go around a Mobius strip twice to reach your starting point. Therefore, matter particles are linked to the Mobius. They require Wick rotation to give them the property of movement in time and graviton-photon interaction to give them mass. Speaking of time - Special Relativity says that when you move through space-time, especially when your speed relative to other objects is close to the speed of light (c), time goes slower for you. But what if the speed of light, when regarded as the speed of photons, is not 186,000 miles per second? This article says photons fill all space-time and are static, with the excitation of photons by virtual particles being the phenomenon that travels at 186,000 miles per second. This subtle distinction still agrees with Einstein's claim that the speed of light in a vacuum is a constant**:** c=0 is consistent with E(energy)=0 at the end of **Section 3 – BITS AND TOPOLOGY**. It also means even the slightest movement by anything exceeds c and results in time travel, which is why everything in the universe is moving forward at one second per second (reversing the direction of the Wick rotation built into everything by warping space-time should send us backwards in time at one second per second).

Speeding up Wick rotation by exposure to faster and faster travel through space (and increasingly greater levels of energy) would, since space travel is actually space-time travel, propel an astronaut/cosmonaut through more time than his or her comrades back on Earth. At 99.9% of light speed, 3.7 years pass in a spaceship while 21.6 years go by on Earth. At 99.999999% of light speed, 9 years pass in the ship while Earth experiences 6,847 years. (27) This agrees with Special Relativity's statement about events not being simultaneous for different observers. If the ship leaves in 2009, the calendar of its occupants will say their return occurs in 2018. The calendars of those who stayed on Earth will say it's 8856. This time dilation cannot exceed the speed of light because excitations of gravitons - what are known as gravitational waves - also travel at the speed of light. According to the visualizing of gravitational fields forming space-time being themselves formed by a multitude of weak and presently undetectable gravitational waves plus General Relativity's statement that gravitation IS space-time, these waves ARE space-time (as well as matter and mass according to this article). Nothing made of space-time can go faster than gravitational waves (space-time).

What about the theory in Cosmic Inflation that space-time itself can expand faster than light (faster than gravitational waves)? This can be addressed by “advanced” waves and Isaac Newton’s idea of gravity acting instantly across the universe. Consider the Wheeler-Feynman absorber theory(28) and Transactional Interpretation of Quantum mechanics.(29) These speak of "retarded" electromagnetic waves going forward in time and "advanced" waves going backwards in time. Einstein's gravitational equations contain enough information about electromagnetism to allow electromagnetism equations to be restated in terms of these gravitational fields,(30) giving gravity retarded and advanced components too.

"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. 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." (31)

Advanced waves are usually discarded because they are thought to violate the causality principle: advanced waves could be detected before their emission. On one level, I can appreciate that reasoning. But ultimately, I think it's an error that should be replaced by Isaac Newton's idea of gravity and the modern idea of quantum mechanics' 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. Instantaneous effect over large distances is known as quantum mechanics' entanglement and has been repeatedly verified experimentally. Similarly, gravitational waves generated during inflation from a Big Bang could “quantum tunnel” back through time and could have already created an infinite, eternal universe by the time they were generated (eternal as well as infinite because time is united with space). That last sentence is extremely appealing! It’s enough to make any sincerely curious person wonder if there really is truth to Inflation and the Big Bang. But the only way to get from the tiny Big Bang singularity to the infinite universe is - regardless of how space and time are manipulated, regardless of what is visible and what remains undetected - via expansion. And there never was, nor will be, cosmic expansion.

Suppose Einstein's paper "Do gravitational fields play an essential role in the structure of elementary particles?" hinted at science still in our future. If a dinosaur died mere thousands of years ago, the advanced waves composing its particles would continue travelling back in time. By the time its bones or fossilized remains, or the rocks surrounding it, were subjected to modern science's dating methods; those advanced waves might have gone so far back in time that the dating method incorrectly says the dinosaur died many millions of years ago. Radioactive dating is thus a form of (advanced) gravitational-wave detection, just as LIGO – the Laser Interferometer Gravitational-wave Observatory (32) - picks up (retarded) gravitational waves.^ Technology based on the way noise-cancelling headphones work might provide a more accurate reading. Generating a waveform that's the exact opposite of the advanced waves emitted should, at least partially, neutralize the advanced waves. This would restrict measurement of ages to the retarded waves which go forward in time and are associated with the amount of radioactive decay occurring. Advanced waves also cause living creatures to age faster than they would without those waves - by extending the creatures' reach into the past (this is the equivalent of having been alive for more years). Neutralizing the advanced waves should dramatically increase the health and lifespan of dinosaurs, humans and all other species if it doesn't adversely affect anatomy and physiology ie if the retarded waves alone are sufficient for normal structure and function.

^ More precisely, advanced and retarded waves would be different phases in the cycling of the same wave. Visualizing the Complex Plane, a gravitational wave cycles or oscillates between its advanced (towards the left and the past) or retarded (towards the right and the future) states as a result of Wick rotation. It also spends time in the vertical direction – contributing to the formation of (a) “dark matter” in so-called imaginary spacetime, and (b) “subspace” below the Complex Plane’s centre or origin. To again be precise, a wave would actually be a succession of excitations.

PART 2 -

(IMMATERIAL WORLD OF HIGHER DIMENSIONS, PHOTONS AND GRAVITONS)

This part deals with mathematics similar to the matrix, a rectangular array of numbers or symbols placed in rows and columns. Matrices have a long history possibly going back 3,000 years to their use in solving simultaneous equations in China. In the mid-nineteenth century, British mathematician Arthur Cayley discovered how to add, subtract, multiply and divide them.

For example, the underlined entry 2340 in the product is calculated as (2 × 1000) + (3 × 100) + (4 × 10) = 2340:

$$\begin{bmatrix} \underline{2} & \underline{3} & \underline{4} \\ 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} 0 & \underline{1000} \\ 1 & \underline{100} \\ 0 & \underline{10} \end{bmatrix} = \begin{bmatrix} 3 & \underline{2340} \\ 0 & 1000 \end{bmatrix}.$$

Figure 6 – Matrix multiplication

From <https://en.wikipedia.org/wiki/Matrix_(mathematics)> This Wikipedia reference is not used to support a scientific claim, but merely as an example of what basic matrix multiplication looks like.

Matrix mechanics is a version of quantum mechanics discovered by Werner Heisenberg in 1925, and matrix multiplication says X multiplied by Y does not always equal Y times X. The book "Quantum" states, Max Born wrote to Albert Einstein that "Heisenberg's latest paper, soon to be published, appears rather mystifying, but is certainly true and profound." He was referring to "the strange multiplication rule" Heisenberg used in developing matrix mechanics. Born eventually realised that Heisenberg had stumbled on matrix multiplication - to which the originator of matrix mechanics replied, "I do not even know what a matrix is." (33)

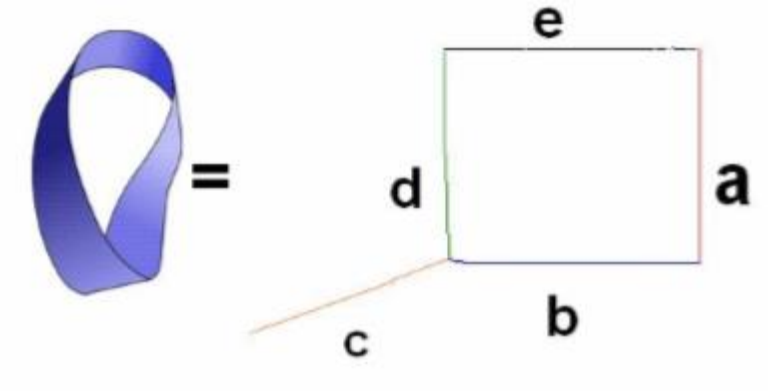


Figure 7 – MOBIUS MATRIX (Mobius equals a,b,c,d,e array)

Width a is perpendicular to the length (b or e) which is perpendicular to height c. How can a line be drawn perpendicular to c without retracing b's path? By positioning it at d, which is then parallel to (or, it could be said, at 180 degrees to) a. d is already at 90 degrees to length b and height c. **d has to be at right angles to length, width and height simultaneously if it's going to include the Complex Plane's vertical imaginary axis in space-time (see next paragraph: the imaginary realm is at a right angle to the 4 known dimensions of space-time, which all reside on the horizontal real plane).** In other words, d has to also be perpendicular to (not parallel to) a. This is accomplished by a twist, like on the right side of the Mobius strip pictured above, existing in a. The twist needs to be more exaggerated than the illustrated one, with the upper right of the Mobius descending parallel to side "a" then turning perpendicular to it at approximately the level of the = sign. Thus, 90+90 (the degrees between b & c added to the degrees between c & d) can equal 180, making a & d parallel. But 90+90 can also equal 90, making a & d perpendicular. (Saying 90+90=90 sounds ridiculous but it has similarities to the Matrix [of mathematics, not the action-science fiction movie] in which X multiplied by Y does not always equal Y times X. The first 90 plus the second 90 does not always equal the second 90 plus the first 90 because 90+90 can equal either 180 or 90.

Mathematics has three types of numbers - real, imaginary and complex. Real numbers are exemplified by 0, the positive numbers used in counting and negative numbers. On a two dimensional "Complex Plane", 'Real Numbers' are on the horizontal plane and 'Imaginary Numbers such as $i=\sqrt{-1}$ are on the vertical plane. 'Complex Numbers' can be easily identified as a combination of 'Real Numbers' and 'Imaginary Numbers'.(34) Retarded gravitational and electromagnetic waves that go forwards in the horizontal plane of space-time can be termed real. Advanced waves that go backwards in space-time may

be considered complex. The imaginary numbers of the vertical direction could describe waves in an "imaginary" space-time.

On the subject of dimensions of space-time**:** 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'. (35)

Could Prof. Bars' second dimension of space be imaginary (in the sense of $i = \sqrt{-1}$) space which is united with imaginary time the same way ordinary space and time are joined? And in the unification of a quantum gravity universe, the real and imaginary would be connected (quantum gravity is the anticipated unification of quantum mechanics with Einstein's theory of gravity – General Relativity).

We see that the Mobius is necessary to the immaterial portions of the world – not only undetected large-scale dimensions but also particles of energy (the photon of electromagnetism would be an assembly of trillions of strips). Now cast your mind back to **Section 3 – BITS AND TOPOLOGY**. When introducing this section, the subject of quantum spin was first mentioned. Appropriately, it will be mentioned again now regarding the structure of gravitation's graviton (by copying a paragraph from **Section 4 – SUPERSYMMETRY AND WICK ROTATION**).

"In relation to Quantum Spin, Wolfgang Pauli in 1924 was the first to propose a doubling of electron states due to a two-valued non-classical "hidden rotation". Extending the ideas of "doubling", "two-valued" and "hidden rotation" to the Mobius strip being a basic, fundamental unit of reality**;** it can be seen that Pauli's proposal has an analogy to this article. The doubled Mobius strips produced by the two-valued binary-digit system creates the hidden rotation of the figure-8 Klein bottle (two strips joining to make a 4-D Klein bottle and extending the photon's link to the Mobius strip into the dynamic graviton's link to the trillions of Mobius doublets it's composed of). This not only unites the Mobius strip with the figure-8 Klein bottle but also the photon with the graviton ie electromagnetism with gravitation. It also confirms Erik Verlinde's idea that gravity is an emergent property (emerging from mathematics).

PART 3 –

TWO CONSEQUENCES OF ELECTROMAGNETISM-GRAVITATION UNIFICATION AND MATHEMATICS FOR SPACE-TIME TRAVEL

ELECTRICAL ENGINEERING AND SPACE-TIME WARPS

A 2009 electrical-engineering experiment at America's Yale University, together with the ideas of Albert Einstein, tells us how we could travel to other stars and galaxies. Electrical engineer Hong Tang and his team at Yale demonstrated that, on silicon-chip and transistor scales, light can attract and repel itself like electric charges or magnets. (36) This is the “optical 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. Apart from the content of this article, I’ll mention 2 references to the similarities between gravitation and electromagnetism:

(1) "Electromagnetic and Gravitational Waves: the Third Dimension" (37) states, "The motion of a set of test particles under the influence of a plane gravitational wave differs considerably from the electromagnetic case. Yet, there are similarities: not only do both have two independent polarization states, but when one includes the longitudinal motion, the surface associated with the motion of a charged particle responding to an elliptically polarized wave is similar to the constant phase surfaces of a set of particles driven by a plane gravitational wave; in both cases the latter surfaces derive their longitudinal motion from trigonometric double angle functions."

(2) According to "Similarity Between Gravitation and Electrostatic Forces" (under the heading "Gravitomagnetism"), "An analogy of gravitational and electromagnetic fields is seen by comparing the Einstein Field Equations from the General Theory of Relativity with Maxwell's Field Equations for electrical and magnetic fields."

Achievement of electromagnetic-gravitational union means the quantum components (gravitons) of gravity/spacetime between spaceships and stars could mimic the Optical

Effect and be attracted together, thereby partially eliminating distance (this is similar to traversing a wormhole, or shortcut, between two folds in space-time).

BROUWER FIXED-POINT THEOREM

After hundreds of years of further progress, scientists may not only be detecting gravitational waves from collisions between black holes or neutron stars, but may also be detecting weaker waves on terrestrial and atomic scales. They may also be manipulating them, rather like the way electromagnetic waves are exploited today. General Relativity says gravity doesn't exist in space-time but IS space-time. Manipulating gravity is therefore manipulation of space-time and will lead to presently unbelievable revolutions in space travel and so-called time travel (including travel millions of years into the uninhabited past).

Early last century, the Dutch mathematician and philosopher Luitzen Egbertus Jan Brouwer (1881-1966) had one of the most useful theorems in mathematics named after him - the amazing topological result known as the Brouwer Fixed Point Theorem. 'In dimension three, Brouwer's theorem says that if you take a cup of coffee, and slosh it around, then after the sloshing there must be some point in the coffee which is in the exact spot that it was before you did the sloshing (though it might have moved around in between). Moreover, if you tried to slosh that point out of its original position, you can't help but slosh another point back into its original position. More formally the theorem says that a continuous function from an N-ball into an N-ball must have a fixed point. Continuity of the function is essential (... if you slosh discontinuously, then there may not be [a] fixed point).' (38)

Translating this into a possible method of future spacetime travel - take the universe and 'slosh it around' (this refers to gravitational waves of varying strengths constantly moving in different directions in space as well as time). Assume the point which is in the exact spot after the sloshing as it was before the sloshing is a point an orbiting spaceship might occupy near Mars - this orbital point might be encoded using the binary digits (1's and 0's) of electronics. Since the point might have moved around thanks to the Brouwer Fixed Point Theorem, it could be encoded to pick up a spaceship orbiting Earth and quickly

transport it to Mars orbit (greatly reducing astronaut/cosmonaut exposure to radiation, bone and muscle wasting, etc.) Sloshing (continuously manipulating gravitational waves) so that part of the Andromeda galaxy is in the exact spot after the sloshing as it was before the sloshing would, even assuming travel at 186,282 miles a second was possible, reduce travel time to a star in that galaxy by millions of years. The journeys - to Andromeda or Mars or any other spot in space, or through the time which can't be separated from space - wouldn't depend on slow rocket power but on fast electronics and gravitational waves that can travel backwards in time, acting instantly across the universe and being entangled with any selected point in space or time (see “advanced waves” in PART 1 of this section).

PART 4 -

Creation Of The Infinite, Eternal Cosmos Using Electronic BITS, Pi And Imaginary Time (With Evolution, Virtual Reality, Augmented Reality)

Most scientists don't believe there can be a rational explanation for an infinite, eternal universe. They much prefer ideas like the Big Bang, the multiverse and random quantum fluctuations causing everything to pop into existence from nothing. Our concept of time as something that only goes from past to future makes the thought of creating an infinite, eternal cosmos unacceptable – a paradox which is seemingly absurd. But as 20th-century Danish physicist Niels Bohr said, “How wonderful that we have met with a paradox. Now we have some hope of making progress.” If he's correct, then the ideas in Parts 1, 2 and 3 of this subsection about the universe may, when investigated, turn out to well-founded or true.

Imaginary time - which is as real to physicists and mathematicians as our familiar real time - obtained its name because it was originally a purely mathematical representation of time which appears in some approaches to the special relativity and quantum mechanics theories developed in the early decades of last century. We can picture imaginary time in the following way. One can think of ordinary, real, time as a horizontal line. On the left, there's the past - and on the right, the future. But there's another kind of time in the vertical direction. This is called imaginary time (it's described with imaginary numbers such as i which equals $\sqrt{-1}$). Professor Paul Davies writes,

'The name has stuck, even though today we accept imaginary numbers are just as real as real numbers.' (39)

In the unification of a **quantum gravity** universe (where **quantum** mechanics is unified with General Relativity, Einstein's theory of **gravity**), the real and imaginary would be connected. Like the surface of the Earth, imaginary time has no boundaries (you can go around the world without falling over any edge) but, also like Earth, it is finite unless pi or another infinite number is incorporated into each and every part - numbers could be encoded into parts using the BITS (BInary digiTS, 1's and 0's) of electronics. Dr. Andrea Alberti of the Institute of Applied Physics of the University of Bonn says, 'Quantum mechanics allows superposition states of large, macroscopic objects. But these states are very fragile, even following (a) football with our eyes is enough to destroy the superposition and (make) it follow a definite trajectory.' (40)

So although we only see one Earth; it's within the realm of possibility that it, and everything else, is not finite but is infinite and superposed and actually existing in more than one place - even everywhere in spacetime. This is one more reason to prefer the ideas of pi and imaginary time to the "advanced inflation" idea in PART 1. The only way to get from the tiny Big Bang singularity to the infinite universe is - regardless of how space and time are manipulated, regardless of what is visible and what remains undetected - via expansion. And there never was, nor will be, cosmic expansion. So discovering more about pi and imaginary time is a wise pursuit. The condition of everything being infinite, superposed and existing everywhere/everywhen in space-time completely removes the need for any kind of expansion. It sounds very strange because every object and event anywhere in space or time would be entangled with and capable of affecting any other object/event. However, it might add some common sense to quantum mechanics which has been repeatedly verified by experiment but makes no sense at all if we cling to the notion of finite, separate objects and events.

The existence of Earth and everything else in every spot and time is consistent with a never-ending number of Cosmic DVD's extending infinitely in every possible direction, and any object's position not being restricted to any one DVD. This condition would not be accessible to present-day humanity since consciousness is comparable to illumination by the player's laser, and people today have limited concepts of space-time compared to people living centuries from now. The above need not violate Pauli's exclusion principle which says that two similar particles of matter cannot have both the same position and

the same velocity. If electrons on different Cosmic DVDs occupy the same position, they must have different velocities. This strange state could give rise to the false idea of a multiverse - other universes with different laws of physics existing alongside ours.

A model of the cosmos might be built that uses pi and imaginary time, and resides in Virtual Reality (an artificial, computer-generated simulation or recreation of a real life environment or situation). Entanglement in the simulation is unable to remain separate from the quantum-mechanical and macroscopic entanglement existing in our perceived reality because imaginary time removes all boundaries between the two universes. They naturally merge, influencing each other and becoming one Augmented Reality (a technology that layers computer-generated enhancements atop an existing reality in order to make it more meaningful through the ability to interact with it). The poorly-named imaginary time of physics and mathematics unites with pi (both are necessary to generate an infinite universe - alone, unbounded imaginary time is finite).

As suggested by Elon Musk (founder of a number of high-profile companies, such as Tesla and Space X) -

"*If you assume any rate of improvement at all, then the games will become indistinguishable from reality, even if that rate of advancement drops by a thousand from what it is now. Then you just say, okay, let's imagine it's 10,000 years in the future, which is nothing on the evolutionary^ scale.*

So given that we're clearly on a trajectory to have games that are indistinguishable from reality, and those games could be played on any set-top box or on a PC or whatever, and there would probably be billions of such computers or set-top boxes, it would seem to follow that the odds that we're in base (non-simulated) reality is one in billions." (41)

^ Evolution doesn't 100% compute with this article. Evolution would always exist in the forms of adaptation and of modification to anatomy/physiology, but it would not explain origins. Consider the future revolution of time travel combined with the unimaginable biotechnology and genetic engineering of centuries to come. Isn't it conceivable that plants, animals and even humans are the product of entirely natural intelligent design by humanity of the distant future? Making production a two-way process is the fact that

humans of the distant future rely on the reproductive instincts of past and present men and women for their existence.

Professor Stephen Hawking says that boundaries and singularities exist in real time but don't exist in imaginary time. (42) There really are boundaries in real time and it must hypothetically be possible to step outside the universe if only real time exists. But when so-called imaginary time also exists, it is not possible to step outside the universe because the boundaries simply aren't there and the universe has no end or start (neither in space nor in time). Only one universe can then exist, and there is no multiverse.

Section 5 -

FUTURE SCIENCE'S DOWN-TO-EARTH APPLICATIONS:

ETERNAL LIFE, WORLD PEACE AND PHYSICS' UNIFICATION

These ideas are based on science's search for a theory uniting everything on Earth, in space and in time. For a brief history of unification from scientist Hermann Weyl's unification scheme and Albert Einstein's Unified Field Theory to modern physics' string theory and Theory of Everything, see reference 43. Though we see things as separate, we'll ultimately understand that the universe is just one thing – like the objects in a computer image seem to be a lot of separate objects but are really just one thing (strings of binary digits – see **BITS AND TOPOLOGY**). Defying our bodily senses (which are limited and subject to illusions), every person is united by these strings of binary digits. We can, if we wish, express this as – you and I are the same person in many ways. When people realize that hurting others in any manner is the same as hurting yourself, the Golden Rule (treat others as you would like to be treated yourself) will spring to life and world peace will be inevitable.

Returning to eternal life - certainly, the bodies we have now won't last forever and will die sooner or later. My belief that we go on has nothing at all to do with the idea of the soul or spirit. I believe science's search for unification will be successful and as long as the universe continues, you and I will go on in some form because we're part of it. When his engineer friend Michele Angelo Besso died, Albert Einstein wrote a letter of condolence to the Besso family, including his now famous quote: 'Now he has departed from this strange world a little ahead of me. That means nothing. People like us, who

believe in physics, know that the distinction between past, present and future is only a stubbornly persistent illusion.' This suggests the following interpretation of his statement - if someone is alive in what we call the present, they must continue to be alive at any point in the future, all points of which have no actual separation from the present (though that future life would not be in the form we know). So there would be life after death. If all times in the past are united with the present, there must also be life before conception (in a different form, possibly the same as that existing after death).

Section 6 - COSMIC ENZYME AND SUBSTRATE

The binary digits of 1 and 0 (coupling a) "bind to" and "hold in the proper position" the Mobius strip plus the figure-8 Klein bottle (trillions of these respectively form the electromagnetic wave's photon and gravitational wave's graviton ie coupling b). The binding is done by uniting two Mobius strips to form each figure-8 Klein bottle. (a) also changes the shape of the figure-8 Klein bottle. Informally - if an object in space consists of one piece and does not have any "holes" that pass all the way through it, it is called simply connected. A doughnut (and the figure-8 Klein bottle it resembles) is "holey" and not simply connected (they're multiply connected). Referring to the infinite universe (see text associated with Figure 4) - a flat universe that is also simply connected implies an infinite universe [44]. So it seems the infinite universe cannot be composed of subunits called figure-8 Klein bottles (flat universes that are finite in extent include the torus and Klein bottle). But the changing of the Klein bottle's shape by gravitation and electromagnetism (these are composed of binary digits, also called virtual particles and hidden variables) mimics the process of gaps in, or irregularities between, figure-8 Klein bottles being "filled in" by binary digits in the same way that computer drawings can extrapolate a small patch of blue sky to make a sky that's blue from horizon to horizon. This ensures the positive and negative shapes in different figure-8 Klein bottles are precisely united, and makes space-time relatively smooth and continuous as Einstein thought. Plus - it gets rid of holes, making figure-8 Klein subunits feasible.

Though (b)'s waves are re-radiated, mass can remain constant because new waves are perpetually absorbed and re-emitted, renewing and refreshing the mass. Since the elements in (b) are both mathematical shapes, (a) must also be mathematical to interact with it. It uses the base-2 maths of binary digits to produce

m = (a) (b) (equation 5)

Or, if you prefer a slightly longer version,

$m = (D_{1+0})\ (S_M, K_8)$ (equation 6)

$mass = (Digits_{\ binary})\ (Strip_{\ Mobius,}\ Klein\ bottle_{\ figure\text{-}8})$

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