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Opinion

# A Different Perspective on Cosmological and Quantum Phenomena That Involves the Temporal Multiverse and the Static Universe

**Rodney Bartlett**[1,*]

[1] Information Physics Institute, Stanthorpe, 4380, Australia

*Corresponding author: Rodney.bartlett22@yahoo.com

**Abstract** - In early January, an article titled "How a quantum innovation may quash the idea of the multiverse" appeared in New Scientist [1] It received a prompt response from German physicist Sabine Hossenfelder in the form of a video on You Tube [2]. The multiverse part got my attention. Suppose quantum gravity one day goes far beyond unifying quantum mechanics and general relativity. It might unite everything in space and time. Assuming the universe is everything that has existed or will exist, the multiverse could be temporal or all the things that happen at different zeptoseconds in this universe (a zeptosecond is the smallest unit of time ever measured and equals $10^{-21}$s or a trillionth of a billionth of a second). That quantum gravity from the far future could unify all the times in the multiverse with the one physical universe. This makes the multiverse observable constantly (and kind of scientific). Viewing a zeptosecond as the latest step towards discovering the quantum (smallest amount) of time, this Article proposes a connection between quantum mechanics and cosmology's holographic principle. This suggests the microscopic is united with the macroscopic when the holographic principle is combined with the precision of unrecognized quantum certainty. The micro-macro union means the holographic principle could not only be used to achieve physical quantum entanglement of particles or atoms but could also be used to unify the temporal multiverse with the physical universe. It even opens the door on quantum wave functions and particles being used to overcome otherwise inevitable phenomena like the Sun's future red-giant phase and the $2^{nd}$ law of thermodynamics' eventual entropic decay of the entire cosmos. Vopson writes, "In an expanding universe, the entropy will always increase because more possible micro-states are being created via the expansion of the space itself/universe"[3]. Therefore, avoiding the cosmic demise due to entropy requires the universe to be static. A possible mathematical structure of such a universe is outlined. The article finishes with Vector-Tensor-Scalar Geometry that offers support for the proposed building blocks of space-time via the Hodge Conjecture, presents a feasible alternative method for formation of astronomical bodies, and submits a new picture of the Higgs boson and field.

**Keywords** - Temporal multiverse; Static and mathematical universe; Quantum mechanics; Quantum gravity; Holographic principle; Cosmic entanglement; Microscopic-macroscopic union; Thermodynamic entropy; Imaginary time; Vector-tensor-scalar geometry.

The Mathematical Universe Hypothesis (MUH) is a speculation put forward by physicist and cosmologist Max Tegmark [4,5]. It speaks of "altogether different equations and mathematical structures". This Article could use such structures in the following way - one dimensional (1D) electrical pulses could form binary digits that could encode 2D Mobius

strips which would be the next level up in particles' structure. Cosmology's holographic principle suggests the $3^{rd}$ dimension results from information in the $2^{nd}$ dimension. The $2^{nd}$ D might be the Mobius strips comprising particles and the $3^{rd}$ D might be capable of being deleted by programming the binary digits (used in electronics) which act as Hidden Variables that aren't confined to one location but are compatible with quantum mechanics (not with known probabilistic quantum mechanics but with quantum certainty, for they give precise calculations). When subatomic particles appear in two places at once, the holographic principle can be combined with the precision of unrecognized quantum certainty. Then the particles would actually be in one place (quantum entangled) since the $3^{rd}$ D of space between their centers would be eliminated (since we live in space-time, the time taken to travel the distance between particles is also eliminated).

The $3^{rd}$ dimension we normally perceive could be thought of as composed of figure-8 Klein bottles i.e. it could be thought of as the union of pairs of Mobius strips [6] or as projection of the information inherent in particles' constituent strips. Since so-called "imaginary" numbers are essential in quantum mechanics, the $4^{th}$ dimension of time might be described by the Complex Plane's Wick Rotation which is often regarded as nothing more than mathematical convenience. Adapting a paper by Albert Einstein [7] - if electromagnetism's photon and gravitation's graviton are composed of trillions of Mobius strips, electromagnetic and gravitational interactions could produce the mass and quantum spin of every other particle, including the bosons of an atom's strong nuclear force, weak nuclear force, and even the Higgs boson (the possibility of excitation of the Higgs field resulting from photon-graviton interaction would mean the field is a union of electromagnetic and gravitational fields). Much more detail is available in the few paragraphs above, and few paragraphs below, Figure 3 - Vector Tensor Scalar Geometry.

All of the information in the universe is contained in two-dimensional packages trillions of times smaller than an atom [8] (in this case, the 2D package is the Mobius Strip).

"When we solve ($19^{th}$-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 [9]." 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 [10]. It's therefore likely that gravitational waves also possess retarded and advanced portions. John G. Cramer wrote in his 2022 Internet article "Advanced Waves Detected" - "In summary, it appears that advanced waves do exist and have been detected. Much more work must be done to ensure that this effect is real and can be extended, but the physics implications are gigantic [11]." Advanced waves travel back in time and when combined with the retarded waves which go forwards in time, their entanglement would result in an "eternal present" necessary for time travel. Touring the centuries is possibly attainable by the future or past destination being reached by a computer using tensor calculus to change the present coordinates in Wick Rotation to ones in the future or past. To use a simple example confined to two dimensions: -1, +i becomes +1, -i. (See Figure 2) Advanced waves might have consequences for radioactive dating, too. When a dinosaur dies, the advanced gravitational and electromagnetic waves composing its particles would continue traveling back in time. By the time its bones or fossilized remains, or the surrounding rocks, were subjected to modern science's dating methods; those advanced waves might have gone so far back in time that the dating method says the dinosaur died 100 million years ago or more. Radio-dating is thus a form of (advanced) gravitational-wave detection, just as LIGO - the Laser Interferometer Gravitational-wave Observatory - picks up (retarded) gravitational waves. If Einstein and this article are correct about graviton-photon interaction

being responsible for the generation of mass, the retarded and advanced waves associated with both gravitation and electromagnetism would produce mass (though they violate the everyday concept of purely linear time, advanced waves have apparently been detected). Therefore, 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.

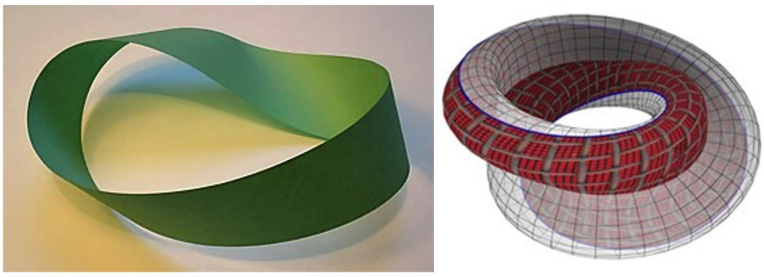

**Figure 1:** Mobius Band (left) and figure-8 Klein Bottle (right). The bottle may be called a Mobius Doublet since it's formed from the union of two bands. (Mobius figure from wikimedia.org/ and Klein fig. from http://plus.maths.org/content/os/issue26/features/mathart/index)

The connection discussed here between quantum mechanics and cosmology's holographic principle suggests the microscopic is linked to the macroscopic. Besides quantum entanglement, macro-entanglement seems to exist and it eradicates distance between galaxies or periods of time when the holographic principle is combined with the precision of unrecognized quantum certainty. (The above paragraphs and figures are from [13]).

What does it mean for the universe if all fermions and bosons - all particles of matter and energy - incorporate Mobius strips, Klein bottles, electrical pulses (Electric Dipole Moments), and base 2 maths aka bits or bi(nary) (digi)ts? It seems to mean the topological universe is, remarkably, just an extension of the pulses and bits used in electronics (with time being just a useful abstraction - an electronic subroutine employing imaginary numbers and motion from 1 to i to -1 to -i and back to 1).

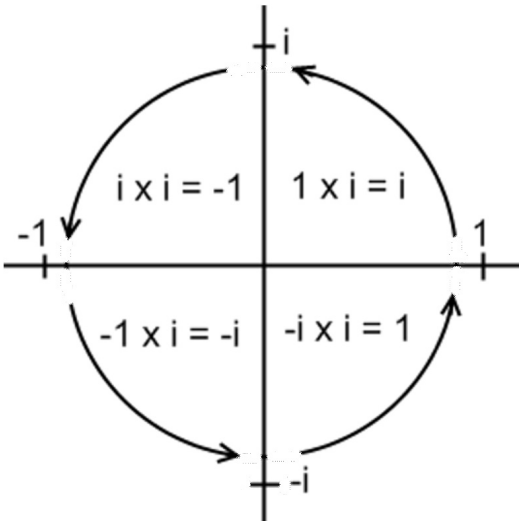


**Figure 2:** WICK ROTATION: "The complex plane reveals i's special relationship with cycles via the circle of i, also known as Wick rotation. Whenever a point on the complex plane is multiplied by i, it moves a quarter rotation around the origin or cen-ter of the plane." (source - reference [12])

"Monitors typically offer refresh rates of 60, 75, 120, 144, 240, and even 360 Hz. The standard refresh rate on your monitor for everyday use is 60 Hz, which updates the image 60 times per second. However, gaming monitors often support higher refresh rates, like 144 Hz or more, which can make the experience smoother and more responsive. These monitors may also feature faster response times, reducing input delay and motion blur during rapid-action games [14]."

Since electronic monitors refresh or reload, any extension of that electronics (even a universal one) should also refresh. If all of the information in the universe is contained in two-dimensional packages trillions of times smaller than an atom, it's conceivable that cosmic refreshment occurs trillions of trillions times faster than monitors. Such rapidity is essential to making the refreshment undetectable today, when events can be viewed at the zeptosecond scale ($10^{-21}$ s). A trillion multiplied by a trillion times quicker would be between $60 \times 10^{-24}$ and $360 \times 10^{-24}$ reloads a second. Such reloading would have serious consequences for the lifetime of a proton. For nearly 50 years there has been a strong belief that the proton is absolutely stable. The current experimental upper bound on its decay rate corresponds to a mean life-time of more than $10^{30}$ years. Some theories predict a proton lifetime short enough for the decays to be detectable by experiments [15]. The proton may only exist for, say, $210 \times 10^{-24}$ of a second (210 is the average of 60 and 360) before it's refreshed. There are implications for the quark, too. The quark model was independently proposed by Murray Gell-Mann and George Zweig in 1964. Owing to a phenomenon called Color Confinement, quarks can never exist in isolation – they're found combined within protons, neutrons, and mesons. Stephen Hawking and Leonard Mlodi-now state:

"The question of whether it makes sense to say quarks really exist if you can never isolate one was a controversial issue in the years after the quark model was first proposed." "It is certainly possible that some alien beings would make the same experimental observations that we do, but describe them without quarks [16]."

If those extraterrestrial beings adopted the ideas proposed in this Article, they might describe their experimental observations with binary digits, topology, the Complex Plane's combination of real and imaginary numbers, and photon-graviton interaction.

In about 5 billion years the Sun is supposed to expand into a red giant and engulf Mercury and Venus and possibly Earth (the expansion would probably make Earth uninhabitable in less than 1 billion years).

"The aging and gradual brightening of the Sun will challenge Earth's habitability in the next few billion years. If life exists elsewhere in the Universe, the aging of its host star similarly poses an existential threat. One solution, which we dub a Lazarus star, is for an advanced civilization to remove (or star-lift) mass from their host star at a rate that offsets the increase in luminosity, keeping the flux on the habitable planet(s) constant and extending the lifetime of their star. For more massive stars, star-lifting increases main-sequence lifetimes by 1–100 Gyr (Giga-years), though they still enter the red-giant phase. For example, a Sun-like star has a main-sequence life-time that can be increased by up to 3 Gyr"[17].

It's entirely possible that there may not even be a red giant phase for the Sun. This relies on entropy being looked at from another angle - with the apparent randomness in quantum and cosmic processes obeying Chaos theory, in which there's a hidden order behind apparent randomness. Expansion to a Red Giant could then be described with the Information Theory vital to the Internet, mathematics, deep space, etc. In information theory, entropy is defined as a logarithmic measure of the rate of transfer of information. This definition introduces a hidden exactness, removing superficial probability. It suggests it's possible for information to be transmitted to objects, processes, or systems and restore them to a previous state - like refreshing (reloading) a computer screen. Potentially, the Sun could be prevented from becoming a red giant and returned to a previous state in a billion years (or far less) - and repeatedly every billion years - so Earth could remain habitable permanently. (Paragraph from [18]).

Every boson and fermion in the universe may exist for an infinitesimal instant (between $60 \times 10^{-24}$ and $360 \times 10^{-24}$ of a second) before being regenerated back to its original state. Such refreshing would drastically limit the influence of the $2^{nd}$ law of thermodynamics. Particles would no longer decay constantly from entropy. Would the large objects composed of particles also be liberated from constant descent into disorder? Think of the microscopic-macroscopic union where the Hidden Variables of binary digits extend the familiar predictability of macroscopic objects to the quantum world, resulting in quantum certainty and

the principle of determinacy. Assuming the micro-macro link is valid, the universe would be capable of existing forever. As noted in the Abstract, physicist Melvin Vopson writes, "In an expanding universe, the entropy will always increase because more possible micro-states are being created via the expansion of the space itself/universe". Therefore, avoiding a cosmological end from entropy requires the universe to be static.

When a particle appears to be in more than one place at once, the holographic principle can be combined with quantum certainty. Then the particle obeys common sense and, like a macroscopic object, would actually be in one place (quantum entangled).

It appears to be infinite and eternal, neither expanding nor contracting. Referring to the right side of Figure 1, note that the Klein bottle's two different colors (representing positive and negative curvature) fit together to produce the outline of a doughnut. A doughnut (or strictly, a torus) is technically flat. If continuously deformed like a mass of clay, it has the same topological properties as a flat surface (like a piece of paper). When many figure-8 Klein bottles are grouped together, a procedure analogous to computer art's Sky Replacement will cause binary digits to fill in any gaps or holes in the same way that computers can make a sky that's blue from horizon to horizon. In other words, the digits "smooth out" the Klein bottles to produce General Relativity's regular space (often likened to a rubber sheet). But the Klein doesn't become multiply connected like the doughnut. Only the doughnut's outline (with its hole filled in) is adopted and the bottle retains the property of simple connectedness. (Informally, if an object in space consists of one piece [the outline of one filled-in doughnut] - and has no holes passing all the way through it, it is called simply-connected.) According to the paper "Cosmic Topology", a flat universe that is also simply connected implies an infinite universe that extends endlessly in all directions [19].

The switching of bits - bi(nary) (digi)ts - between "one" and "zero" is comparable to the "quantum fluctuations" associated with Big Bang theory. The following speculation proposes a method whereby a universe that's infinite and eternal - neither expanding nor contracting - could share another correspondence with the Big Bang viz a definite time of creation.

Creating something which has always existed seems to be a paradox – whose definition is "a seemingly absurd or contradictory statement or proposition which when investigated may prove to be well founded or true". On the subject of paradox, $20^{th}$-century physicist Niels Bohr said, "How wonderful that we have met with a paradox. Now we have some hope of making progress". He also said, "Your theory is crazy, but it's not crazy enough to be true". Hopefully, the crazy ideas in this article are "crazy enough to be true". So, how might it be done? A model of the cosmos might be built that uses the infinite number pi and imaginary time, and resides in Virtual Reality (artificial, computer-generated simulation). The entanglement (both quantum and macroscopic) in the simulated universe is unable to remain separate from the entanglement existing in our perceived reality because computers using so-called "imaginary time" (which is defined by numbers with the property $i^2 = -1$) remove all boundaries between the two universes. This enables them to become one Augmented Reality (known now as technology that layers computer-generated enhancements onto an existing reality but seen here as the related layering of virtual reality onto other points in time and space). The poorly named imaginary time of physics and mathematics unites with pi, an "infinite decimal" whose digits after the decimal point go on forever (both are necessary to generate a non-Big-Bang cosmos i.e. an infinite universe which, because space and time can never be separated, is eternal). The augmented reality which is layered on "other" points in space-time actually isn't transmitted to other points - because of the quantum entanglement of every particle (massive or massless) of everything in spacetime, only one ever exists. Thus, trans-missions to any (apparently other) places or times wouldn't be restricted to the speed of light but are instantaneous. (Paragraph from [20])

Professor Stephen Hawking tells us: "In real time, the universe has a beginning and an end at singularities that form a boundary to space-time and at which the laws of science break down. But in imaginary time, there are no singularities or boundaries." "A scientific

theory is just a mathematical model we make to describe our observations: it exists only in our minds. So it is meaningless to ask: Which is real, 'real' or 'imaginary' time? It is simply a matter of which is the more useful description." [21].

This Article's author suggests imaginary time is more useful for describing the universe since, as Prof Hawking writes a few pages later, "Imaginary time is indistinguishable from directions in space" - and this aligns with Hermann Minkowski's / Relativity's concept where time and space aren't separate but are intermingled in a single entity called space-time. Though for space-time to be complete, time described by imaginary numbers probably needs to be combined with real numbers to form Wick Rotation's complex numbers. According to reference [6], the TeX Commands for deriving the surface of the figure-8 Klein bottle involved in this article's structure of particles and the static universe are:

$$F(u,v) = \begin{pmatrix} \sin v(4 + 2\cos u \cos tv - \sin 2u \sin tv) \\ \cos v(4 + 2\cos u \cos tv - \sin 2u \sin tv) \\ 2\cos u \sin tv + \sin 2u \cos tv \end{pmatrix} \quad (1)$$

Therefore, the precise nature of time's partner "space" is also likely to be described by a system related to TeX Commands. The TeX provides an equation basis for the topology of the Hodge Conjecture (the Hodge Conjecture proposes a deep link be-tween topology and geometry). Space-time would not, ideally, be illustrated by Feynman diagrams utilizing virtual particles - the concept of virtual particles arises in the perturbation theory (merely an approximation scheme) of quantum field theory. As Einstein suggested in "Do gravitational fields play an essential role in the structure of elementary particles?", fermions may be composed of space itself in the form of its photons and gravitons. Building on Einstein, a more exact account (using a system of vectors, tensors, and scalars which offers a mathematical basis for the geometry of the Hodge Conjecture) is offered in the following paragraphs.

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 proto-planetary disks in which they formed, leaving astronomers to re-evaluate planet-formation theories [22].

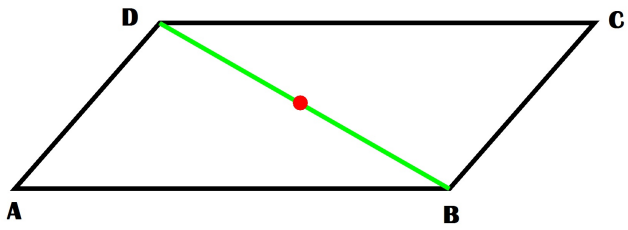


**Figure 3:** Vector-Tensor-Scalar Geometry: Parallelogram With Diagonal and Central Higgs Boson (Horizontal Direction = Graviton Vector; Vertical = Photon Vector). The deep link between geometry and topology (the Hodge Conjecture) may be about vector-tensor-scalar geometry plus the topological Mobius band and figure-8 Klein bottle (with addition of Wick rotation and the binary digits).

The graviton vector and photon vector can be pictured as adjacent sides of a parallelogram. Tensor calculus converts the coordinates of the sides into those of a diagonal representing the interaction of the sides' vectors. The sides' coordinates can also be changed into a point on the diagonal. A position on a line that only has magnitude is called a scalar variable and this scalar is associated with particles of spin zero [23]. Since the Higgs boson is scalar, the point on the diagonal represents the Higgs boson which is obviously related to the graviton. The Higgs field is therefore intimately related to the gravitational (and its associated electromagnetic) field. The Higgs field may be regarded as a unification of the gravitational and electromagnetic fields. The pressure generated by photon-graviton interaction may be identified as mass, just as electromagnetic forces between your hand and the object you're touching are interpreted as the object's solidity. Photon-graviton interaction can, using William Rowan Hamilton's 1843 definition of quaternions as the quotient of two

vectors [24] produce 1/2 which is the quantum spin of all particles of matter. Photon spin is 1, graviton spin is 2, and their interaction can also produce 2/1 which is the quantum spin of the graviton. An assembly of countless gravitons might form the intense gravity of a stellar, intermediate-mass, or supermassive black hole. Examples of quantum spin:

1) Photon divided by graviton = spin 1/2 of all matter particles.
2) Graviton divided by photon = spin 2/1 which may be responsible for the intense gravity of black holes.
3) Using time reversal in case of graviton: 1 + 2 - 2 = spin of nuclear-force bosons. It also equals photon spin - establishing a link between gravitation's spin 2, electromagnetism, and the nuclear forces.
4) Speaking of the Higgs which resides on the diagonal in Figure 3 and has spin 0: zero can be arrived at through (1 - 2) + 1 which uses the experimental data of a pho-ton existing in two places simultaneously (it uses the graviton's spin 2 being taken away from the photon's spin 1, and the spin motion of 1 being in more than one place at the same time). (Paragraph from [25])

There are two possibilities for photon-graviton interaction (perhaps both occur):

(a) The mass-energy relation ($E = mc^2$ or $m = E/c^2$) means electromagnetic energy has relativistic mass and can exert a gravitational effect. USA theoretical physicist Ronald Mallett is doing experimental work on space-time warping (which is gravitational warping, since General Relativity defines gravity as the warps and curves in space-time) for the purpose of developing scientific time travel. He describes his work - called the Space-time Twisting by Light (STL) project:

"In Einstein's General Theory of Relativity, both matter and energy can create a gravitational field. This means that the energy of a light beam can produce a gravitational field. My current research considers both the weak and strong gravitational fields produced by a single continuously circulating unidirectional beam of light. In the weak gravitational field of an unidirectional ring laser, it is predicted that a spinning neutral particle, when placed in the ring, is dragged around by the resulting gravitational field. [26]"

This article views the term "curved space-time" as equivalent to "photons and gravitons traveling on curved trajectories and interacting in a way that produces mass".

The gravitational effect of electromagnetism means the Mobius strips composing the latter's photons can fit together, in the fashion of reference [6], to form graviton's Klein bottles. To apply this to gravity refracting light - General relativity says a light ray sent from a star and passing by the Sun is deflected 1.75 arc-seconds from its original path by the Sun's gravity. Also, Isaac Newton knew of gravitation's effect on light more than 300 years ago. Like the "lock and key" mechanism in biological organisms of molecules engaging with cells' receptors, gravity may deflect light because the latter's photons are a key fitting into the former's graviton-locks. This makes sense if trillions of Mobius strips make up a photon, and trillions of figure-8 Klein bottles make a graviton. Photons and gravitons fit together because Mobius strips and figure-8 Klein bottles fit together.

(b) If all particles (including gravitons) have an Electric Dipole Moment (EDM) - if they possess both positive and negative electric charges - the graviton would have equal quantities of the charges which cancel to produce neutrality. In rare cases, particles like electrons can have a fraction of their usual electrical charge – this is known as the fractional quantum Hall effect [27]. It appears possible that, in the case of an electron possessing an EDM, there could be some cancellation of positive and negative charges which would result in its overall

negativity being reduced and becoming fractional.

But returning to the graviton - just as electrolysis splits water molecules into their constituent hydrogen and oxygen atoms, the Electric Dipole effect fractionates the graviton. That is, the particle loses some Mobius strips from its figure-8 Klein bottles and these missing strips can be replaced with Mobius components of the electromagnetic photons. The result is that a beam of light would necessarily change trajectory and position when inserting some of its Mobius strips into the gravitational wave. The degree of refraction may depend on how many Mobius components were deleted from the gravitational wave, i.e. on the strength of the gravitation.

The above gives a possible account of gravity affecting light. How might light influence gravity? Some of the ocean waves passing an island are refracted - when they enter shallow water, they're refracted by friction with the mass of the seabed. They change direction and head towards the island, breaking onto its beaches. Similarly, gravitational waves are refracted as they journey through space by light and other electromagnetism inserting Mobius strips into the waves. Changes to a gravitational wave's path would be on truly quantum scales over relatively short astronomical distances. Suppose the wave undergoes 1.75 arc-seconds of refraction per light-year. There are 1,296,000 arc-seconds in the circle of the Sun, so refracting a gravitational wave to its center requires the wave to originate 1296000/1.75 light-years away (~740,000 light-years or a third of the distance to the Andromeda galaxy). When waves from this or another galaxy focus on the Sun's center, they can team up with $10^{36}$ times more powerful electromagnetism to produce the solar mass via vector-tensor-scalar geometry. In the case of a black hole, the waves are headed toward the singularity (center) of the black hole, where they help form the hole (and increase its mass).

Obviously, the paragraph above about light influencing gravity is very different from the accepted view of the Sun and stars forming from condensation of clouds of gas and dust. Most importantly, this article is easily reconciled with the accepted proto-planetary disc. If gravitational and electromagnetic waves focus on a proto-planetary disc surrounding a newborn star, the quantum spin of the particles of matter in the disc (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 black holes. Also, it's supported by the Hodge Conjecture's deeply linked topology and geometry (this article's Mobius and Klein figures plus its vector-tensor-scalar parallelogram). Science is familiar with the reality of wave-particle duality: this article simply transfers emphasis from particles in the proto-planetary disc to waves of gravitation and electromagnetism.

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