

Physics of Mathematics: Mathematical Structure Hypothesis (MSH)

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Introduction : I try to expand the horizon of archaic mathematics leading to the Unified Theory of mathematics and physics. I explore the implications of my newly propounded Mathematical Structure Hypothesis (MSH), which explains naturally the Unreasonable Effectiveness of Mathematics in Physics/Natural Sciences. It will concentrate on what governs the physics behind mathematical structures of equations itself which is considered to be just existing in Level IV multiverse of Max Tegmark. It will unify External reality with Copenhagen as a matter of Eternal Vibration. It explains the relevant topics like randomness, complexity, Gödel's Incompleteness, Consciousness, Paradoxes among others based on MSH. That paves way to evolution of mathematics as how to fundamentally remove inconsistencies by allowing time and reference dimension to make maths dynamic in contrast to perception that mathematics exists in timeless space unlike physics even if causation is experienced.

Abstract: MSH Unifies Maths & Physics.

**Why does mathematics seem so "unreasonably" effective in fundamental physics?
(Or does it?)**

Mathematical Structure Hypothesis (MSH):

It states that mathematical structures have no independent existence without

Physics is mathematical not because we know so much about the physical world, but because we know so little; it is only its mathematical properties that we can discover. – Bernard Russell.

How can it be that mathematics, being after all a product of human thought which is independent of experience, is so admirably appropriate to the objects of reality? [...] In my opinion the answer to this question is, briefly, this: As far as the laws of mathematics refer to reality, they are not certain; and as far as they are certain, they do not refer to reality - Albert Einstein.

Mathematical Structures & Physical Reality : Creations of Vibration

Galileo Galilei stated that the Universe is a grand book written in the language of mathematics, but who decides the symphonic structure of that language? Responding to Wigner's 1967 essay [3]

The reason why mathematics has been effective in physics is a natural consequence of MSH It's not actually mathematics describing physics rather physics of invariance behind mathematical structures describing the invariance of physical world. Its Vibration explaining Vibration.

Everything in this universe is Prana Vibrating –Swami Vivekananda.[4]

Despite the right and wrong results of mathematical applications in physics, it's physical characteristics which govern math.structures. Physical world is mathematical superficially.That's why before applying mathematics to physical problems or physics to mathematical problems, we need to check their compatibility based on their intrinsic physical characteristics, else leads to mutual friction. Why one of the toughest riddles of mathematics Riemann Zeta function [5] has connection with the quantum world. This is natural consequence of MSH .When we dive visually into the graphs of the function, there are certain physicalities present e.g. Collinearity of trivial and non-trivial zeros. Along the non-trivial zeros, the macro patterns in the negative side is projected onto critical region of $0 < R(z) < 1$. There are certain laws of invariance, which govern its mathematical structure including complex domain here. It's the physics of defining operators $(+)^n \wedge (-)^1 = (+)^{1/n}$. The same sort of physicality of prime numbers has been present in [6] the physical quantum world of atoms .

As mathematical structures are creations of Quantum Vibration, that's why it is deeply linked with the description of physical world. Physical world motion can prove the truthfulness of Pythagoras theorem! The classical external world mathematical structures we visualize is like a TV screen of Consciousness .It's the wave phenomenon which

develops the sense of dimensionalism, motion and other characteristics fictitiously. ,which are merely effects of wave phenomenon. But, at the quantum level, the superficial classical mathematical effects are invalid. *That's the reason why it raises the deeper question in context of Riemann geometry that at quantum level the hypotheses of geometry don't conform because geometrical structures are created out of wave phenomenon externally*[7] Here is the limitation on what certain mathematical structures can describe about the physical world.

As Hawking & asks why this equation? MSH answers- Nature favors the most stable mathematical structure according to the given physical scenario.

Human & Universe as the same Entity: Effect of Consciousness.

This is illusion that human and the universe are two independent entities both being described by different set of physical laws. Human is also made up of vibration. In fact human's separate existence is nothing but lack of our consciousness that makes it external to physical reality of universe. **"A human being is part of the whole called by us universe, a part limited in time and space. We experience ourselves, our thoughts and feelings as something separate from the rest. A kind of optical delusion of consciousness. This delusion is a kind of prison for us, restricting us to our personal desires and to affection for a few persons nearest to us. Our task must be to free ourselves from the prison by widening our circle of compassion to embrace all living creatures and the whole of nature in its beauty... The true value of a human being is determined primarily by the measure and the sense in which they have obtained liberation from the self. ... We shall require a substantially new manner of thinking if humanity is to survive. (Albert Einstein, 1954)." How Riemann's foundation of geometry connects human mind to Universe.**[7] ERH, MUH don't acknowledge this. Bernard Russell's above quote is quite supportive. e. g. when drop of rain falls under gravitation, the mathematical structure it takes is formed by taking all the physical forces acting on it depending on stability. **It was not possible to formulate the laws of quantum theory without reference to consciousness-Wigner. Consciousness is the screen on which pictures come and go. The screen is real, pictures are mere shadows on it.**[1] TV screen where the external 3D Space-1D Time world which appears is nothing but a wave phenomenon in no dimension. So, mathematics is an external phenomenon. Here the physics governing classical geometry is not conducive because that was analogous to virtual TV world but it can't say how the quantum waves-particles producing TV world function. MUH theory states that the physical world is just mathematical structures. Every aspect of physical world is NOT mathematics. Computable relational operators don't look deeply into the mechanism of the world, why something occurs rather establishes the quantity relation between superficial observables as the Ultimate Laws of Nature. This questions the authenticity of physical laws. Even abstract relational operators are the effects of vibrations. Russell points out in the above mentioned quote. *ERH, MUH claims as if human height, breadth, weight can describe everything e.g. his soft-nature, social behavior.* Looking at human eyes, the distance between the eyeballs always remain constant like a hyperbola in Euclidean metric. Da Vinc's geometry, Golden ratio in human body. After all these there is no question of physical reality being independent of humans.

How deeply does mathematics inform physics? How deeply does physics inform mathematics?

Convergence of Copenhagenians with External Reality

MSH explains Wigner's mystery. The world has different faces but physics is not interested in how things happen internally rather only tries to formulate the laws through external appearances e.g. quantitative parameters e.g. distance, speed in classical mechanics. This is what Wigner & Russell pointed out. Mathematics is the abstract relation between entities but the structure of relation is derived from physical world experiences itself. For example, let me take an example of structure of the number say 285. There are different places like 5 at Unit's place, 8 at Tenth place, 2 at Hundredth place. This is how the atomic energy levels are structured at quantum level. Now if it is multiplied by say another 5. A certain algorithm is followed in that order. Why this particular order? Because the physical world is based on that order of invariance Even if you change the rule and define $1+1=1$ in different algebra but the new order of algorithm will also have certain physicality drawn from the real world. That's the reason why the pure number theory has so much of order, invariance reflected in it. Why the prime numbers distribution traces a hyperbolic curve or Hardy Littlewood's circle method comes to circularity phenomenon of numbers. If one looks at the Riemann Zeta function, one can decipher so many physical characteristic similarities. It definitely reflects the Vibrational behavior in the quantum world of atoms. That's the reason I devised a method based on the invariance of certain physicality of trivial and non-trivial zeros that Riemann hypothesis is true. The development of complex number is not independent of physical world existence. The physicality behind the complex numbers is based on the physical world only. The reason is that why we have defined $- * - = +$ why not $+ * + = -$ also?

Complex number depicts those things which are not observable but exist Why complex numbers are so unreasonably effectiveness in quantum physics? This is because we have ourselves customized its physical structures from the structure of quantum world. See Hamming [18]. If someone claims that complex numbers reside in Level V multiverse!

Complex numbers structure is not strange if the algorithm of addition, multiplication, operators itself is drawn from the quantum world energy level structures. MUH simply talks about the existence of operators without explaining the hidden mystery behind them. which it avoids.

Physical objects arrange themselves in specific mathematical structures to attain the most stability. Integers, prime numbers perception need some physical objects to create them. Its quantum Vibration which creates this integer, prime, composite perceptions of physical objects. That's the reason they number theory exhibits similarity as quantum atomic behaviors.

MSH theory asserts Dirac's views that all the pure mathematical structures should be applied in discovering the physical world In context of Geometrization [8] and Poincare conjecture, It can be traced that Entropy, which was considered a physical phenomenon is also present in mathematical world. Why? MSH answers this. MUH theory also asserts that symmetries in mathematical world are in fact physical symmetries. That's why mathematical structures are so effective in physics and reciprocally physical laws have been able to crack toughest number theory problems e.g. string theory.

“Why complex not real-valued phenomenon to represent quantum phenomenon as Eugene Merzbacher has described in his book on Quantum Mechanics (Equations 2.3 to 2.6) where he takes the most general form of harmonic plane wave [21] Then the condition that “An arbitrary displacement of variable x or t should not alter the physical character of these waves, which describe, respectively, a particle moving uniformly in the positive and negative x directions, nor should the phase constants of these waves have any physical significance. Hence it must be required that the parameter in the equation of wave must be “ i ” and the wave equation turns out to be complex-valued. So, here is the foundation of mathematics of quantum mechanics and complex functions. This is not miracle rather how reveals the physics of mathematics of complex function which has been molded for the physical scenario]. This is the key to complex analytical continuation of Riemann Zeta function, which is often ignored in conventional mathematics.”

Paradox of Vision & Externalism as the Copenhagen phenomenon.

The sense of the external world on human mind is through image formed on retina visually. Externally, it is just few micrometers in size but internally we find the size of the world so large in size, why? Mind doesn't sense the real size rather it sense only image size. What is the real size? This externalism is not primary and its consciousness state which lets human feel externalism. Externalism is the cause of Vibration rather than absolute externalism. Thus, Copenhagen can explain external reality. MUH, which seeks consensus view of unifying external and internal can be explained by MSH.

At higher level of consciousness, effect of one small human entity can affect the functioning of Universe. At higher consciousness stage where sense of conflict between human and external world vanishes and it can be realized that Human is a Universal phenomenon and is Universe itself.. Edington [3] rightly said that sufficiently human intelligence can understand the universe against Wigner! That's where Copenhagen and ERH contradiction will converge. Horizon in the sky, from any point makes you appear at the Centre. It's translational invariant in space-time. Hence, this classical external horizon is fundamentally Quantum phenomenon to be represented by Complex function as discussed earlier. Spiritualists obey mathematics strictly by discarding bondations. See Peter Collins.

[Ref.11]

Complexity, Randomness & Consciousness. Complexity/Randomness is due to human ignorance because of lack of deciphering patterns. The highly conscious spiritual scientist Swami Vivekananda, [4]. asked Tesla to formulate mathematical laws to show that matter and energy ultimately converge to Cosmic Mind. Leibniz said: Randomness is complexity.[12] MUH correctly implies that there is no true randomness present in Nature/mathematical/physical world. The occurrence of prime numbers is NOT random, though it appears. Copenhagen's randomness is also ignorance! Einstein: God doesn't play dice is correct! For universe, universe is not probabilistic but for lower level conscious people it appears. Its true and that requires higher consciousness. Probability is deterministic! As MUH explores complexity in bird's (outside) or frog (inside) view, let me say that in any view complexity is ignorance. This is what Vedanta philosophy explores. MSH theory implies complexity in line with MUH. Chaitin talks about Algorithmic Complexity in terms of computing algorithm. John Neumann said-Random numbers generated by computer algorithms is ignorance for there are no true random numbers. **Hermann Weyl correctly asserts that[12] what is complex to one person at one particular time may not appear to be complex to another person a few years later – defined in this way, complexity is in the eye of the beholder. MSH agrees.** MUH/any theory claiming that computer programming is the ultimate tool to decide complexity is false. The Universe is not just computable operators to decide complexity. MSH agrees with Vedanta:

'Creation is eternal'. Vivekananda explains: There was no time when there was no creation'. It also refutes the necessity of initial condition of the universe. Algorithmic complexity is not Universal but for machines. There is no complexity at higher level of consciousness. The measure of complexity is the level of ignorance [4]!!

Infinity, Physical Constants, Units, Pluralism, Countability, Uncountability from the perspective of Universal Vibration .

Physical constants: why have we defined base size so that we need fraction and an absolute reference frame? Hamming on fractions [18], Why not take the level Planck's constant as the base or different reference frames so that the concept of fraction itself is banished rather an absolute frame. Nature is independent of these classification of numbers! The occurrence of irrationality, reals, fractions occur because we have defined the structure of numbers in that manner. This raises question why Godel Incompleteness or Inconsistency should be limited to only Natural/whole numbers? It's a physical phenomenon. The claim that MSH makes here is that only that portion of universe itself exists for that human which is being created.. **So, the Question of Infinity no longer exists. Infinity is the byproduct of the FALSE idea of Absolute Universe existing for all simultaneously.** This banishes the concept of Uncountability and Skolem paradox conflict in model theory .Here is the role of time &reference dimension in mathematics. Question should be how many Integers are there for a mathematician A at a time $T= t$ or in a reference frame rather than absolute question .**And it must be Countable and finite for every value of T and for some reference frame.** Imagine by comparing it with finite TV screen effect. Internal world appearing infinite is fiction. In context of Zeno's paradox, the phenomenon of plurality, motion is illusion. There is no plurality of phenomenon at the highest level of consciousness, which Schrodinger [9] [10] rightly put-Consciousness is singular. This has effect on Zeno's paradox. Zeno's view resides at this crude pure higher conscious level. Standard approach claiming to resolve Zeno's paradox should look into it. Hilbert's approach connection with Zeno's paradox and wave-particle duality [17]. This ultimately derives from MSH which CUH doesn't. So, any science which ignores human mind will be directionless in discovering the Ultimate reality because human mind=universe.[7]

You exist externally in my quantum Universe rather than you and I both exist in absolute Universe. This is also referred to paradox of self-consciousness. The notion arises because it is thought that an absolute platonic universe exists and humans, birds are different subsets of it. I can't experience your universe! Here is the concept of many universes.

What are the tensions between physics and mathematics?

Banach Tarski paradox [Please refer 13]: This paradox reveals how far the mathematical structures, which MUH claims to be Universe is capable to capture the physical realities. The group can't represent physical sphere correctly. It only outlines its external co-ordinates. Just applying a^{-1} changes only the relative co-ordinates. It doesn't describe the physical aspects of sphere, which remains the same if the sphere is rotated. Secondly, here mathematical operators ignore relativity aspects of operators, which physics rests on. $a^{-1}F_1 \cup F_2$. This "Union" is invalid because both exist in different frames and they can NOT be summed up unless they are in the same frame. Here mathematical operator system is trying to imitate physics, which they are not. The physicality inside the operators doesn't allow for this.

Russell's paradox- A is the subset of B & B is the subset of A in different reference and time frames.

A set is the member of itself, if it is not the member of itself. MUH tries to escape Russell's paradox stating that the set of all mathematical structures in level IV is not its member because it's infinite but Infinity doesn't exist in MSH The Universe(A) has human mind/atom(B) within it and Mind/atom(B) within it(A). This is a two way geometrical manifold to be explored This peculiar geometry leads classical set theory to Russell's paradox. **It dissolves the classical definition of the world SET, which rests on the principle that its entire constituents "simultaneously" exist, which physics relativity theory doesn't believe in.** In quantum perspective, the concept of set is fundamentally invalid. The principles of ZFC are invalid in quantum world. The paradox leads axiomatic mathematics to a new evolution phase where external world lies inside the human mind and vice versa in two different reference frames. It's possible because of vibration. A large particle can't remain inside small but a wave can!! The peculiar geometry of consciousness is beyond Russell's paradox where normal constructive geometry doesn't work.

Skolem paradox: From one perspective, there's nothing especially *surprising* about the fact that a particular model fails to accurately capture every feature of the reality of which it is a model.[Ref.14] A mathematical model of a physical theory, for instance, may contain and sets of real numbers, even though the theory itself concerns, say, subatomic particles and regions of space-timeright about the solar system while getting other things quite wrong Skolem's Paradox *looks paradoxical* in the first place. The reason why it doesn't produce contradiction is we always look by being inside the mathematical system rather than looking at it from outside. Like a physical system, one can't ascertain its contradictions by being inside it. Skolem paradox comments on mathematical set theory by being outside the mathematical system rather than being inside. That's the reason why we don't find contradiction inside the system because we always look at mathematics by being inside.[22]

This is because mathematical structures creation of Vibrations(MSH) has certain physicality which may not match all the physicality of the physical world. That makes it behave so in explaining certain aspects while failing in other aspects. Skolem's argue that set theory can't serve as a "foundation for mathematics" and that axiomatizing set theory leads to a "relativity of set theoretic notions" (Skolem 1922). Is mathematics relative? By Field Medalist Enrico Bombieri [20]. ***Set theory rests on simultaneity but relativistic physics considers simultaneity absurd. That's why it is possible that concept of set is fundamentally objectionable***

MSH & Godel Incompleteness, Computability, Time Dimension of mathematics, Contradictions, Paradoxes and their Physical Implications.

The traditional paradoxes are the consequences of this fundamental view about the mathematical structures that it exist in timeless space despite involving causation. Time & reference frame have roles in mathematical structures because it has no independent existence from physical reality.

The truth is that for both mathematics and physics(not only mathematics)'Time,space,&causation are like the glass through which Absolute is seen.In the Absolute there is neither time,space,nor causation.-Swami Vivekananda.SBut we allow time in physics and take mathematics in timeless space.

If say A is black at time $t=1$ and white at $t=2$. If I remove dimension of time and ask what is the color of A? Answer will be inconsistent because it will say both black & white. How can it be possible? Mathematics demands dynamism to banish conflicts. The most important of all: Godel, Turing, Church . CUH hypothesis claiming that rest of the mathematical structures are meaningless/illusion [2].It doesn't acknowledge the physics behind complex functions. CUH/CFUH states only Godel-complete mathematical structures exist. That means incompleteness, inconsistency both exist simultaneously .But Inconsistency is inevitable for completeness of Universe. If we combine Skolem paradox with Godel a new results come out: **Inconsistency in one world or reference frame can be made consistent in**

Godel Incompleteness implies that there will definitely remain a question, at least related to self-consistency where the physical world intervention would be required to solve them. .That's why physics has been useful to crack the riddles in pure mathematics because both originate from vibration.

The phenomenon of pluralism itself is illusion as Zeno's paradox states and $0=1$ (which can be mathematically proved in complete system) is not absurd but this inconsistency indicates deeper truth of countability and singularity. As Bohr had once shown the complementarity and contradictory view of wave-particle duality. [16] Quantum world is incomplete because of Bell's locality-at-distance. MSH explains these conflicts. As Hawking says [15] that M-Theory or TOE will never be found. **TOE of M-theory exists but axiomatic maths need to be evolved in the dimension of time/reference frames.** Godel Incompleteness indicates towards unification of mathematics and physics with MSH.

If axiomatic system doesn't ascertain its own self-consistency, then how can it deal with concepts like Consciousness.[22] MUH stating that the co-existence of consistency and completeness is quite objectionable

against Nature. There is required evolution of mathematics beyond Russell's paradox while allowing inconsistency to prevail (which can be removed dynamically by allowing the time/reference dimension to mathematics. The geometry of self-consciousness is linked to Russell's paradox geometry. This also leads towards resolution of Bell's state theorem of locality-at-distance. Then only it can be Unified Theory.

If one accepts David Hilbert's dictum that "mathematical existence is merely freedom from contradiction"

There is no truth without contradiction. Wave-particle duality, which can be called inconsistency is the characteristic of Nature. Nature has inconsistency, contradictions but that's how it functions.

“MSH implies that we need to advance mathematics beyond paradoxes accepting contradictions, inconsistency, incompleteness in timeless dimension statically and mathematics should be given time/reference dimension to sort out these dynamically.”

MSH Vs MUH, ERH, CUH

The Interconnectedness exists because of vibration and separation of distance is delusion and beyond causation. As Hawking states that physical theories are Platonists, but fundamentally self-referencing.[15] MUH =Platonism, The MUH and the Level IV multiverse idea don't certainly imply that all imaginable universes exist. We humans can imagine many things that are mathematically undefined and hence do not correspond to mathematical structures. But they are creations of Vibration only, though without mathematical existence. So, MUH claims that mathematical existence and physical existence are equivalent completely is objectionable. In case of Halting problem, it reflects the fundamental problem with the physicality phenomenon of Computability, which is not able to capture certain aspects of problem leading to undefined halting time. CUH assumption that External Reality is Godel-complete Computable functions [2] doesn't properly understand the physicality of axiomatic limitation and computability. But the Universe is beyond that. This is quite objectionable because Computability is a small part of Universe that blocks the relativistic and time dimension in axiomatic mathematics.

All historically successful theories of physics violate the CUH, [2]. This violation comes from continuum form of real or complex numbers. Complex numbers are essentially required in physical theories as I mentioned before. CUH as complete description is objectionable. Quantum gravity research suggests that even classical space-time breaks down on very small scales. This is because of Vibrational origin. We therefore cannot be sure that quantities that we still treat as continuous (like the metric, field strengths and quantum amplitudes) are not mere approximations of something discrete.

Black Swan Theory by Taleb which rests on pure randomness could also be the theory due to human ignorance according to MSH /MUH. Didier Sornette's opposing Dragon King should be relevant. I heartily welcome the discussion in detail on this further.

(Paradox of grammar)!

Conclusion: It prepares the background for researchers to explore the mechanism behind mathematical structures based on Vibration and their creation based on physical reality beyond level IV Multiverse.

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