Is everything we know about the shape and size of our universe, and how it works, wrong?

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The presently accepted model of a (3 dimensional) flat, and infinite universe is wrong. A number of recent papers in prestigious journal *Nature* and elsewhere have strongly suggested that our universe is indeed closed and finite. [Paper1] [Paper2] [Paper3]

Quantum Mechanics and General Relativity are our two greatest physics theories, which together explain everything we observe. However, the two pillars of Modern Physics appear to be incompatible and contradictory [Link1] [Link2] because we are using the wrong model of the universe. **Nature does not use two separate rulebooks, but uses two different viewpoints.** To see how the conflicting demands of Quantum Mechanics and General Relativity can be easily satisfied, we need the true model of our universe [link1] [Link2] [Link3] [Link4]. This article is based on this paper.

Ever since Hubble's law was discovered, scientists speculated that the analogy of an expanding balloon best described the shape of our universe. This view was rejected based on wrong assumptions. We are confident that we have measured the universe to be (3d) flat using two different methods. Unfortunately, neither method is capable of measuring the extrinsic curvature of a 3d hypersurface:

1) We cannot measure the curvature of a 3 dimensional (hyper) surface using summation of (plane) angles in a triangle. That method works for a 2 dimensional surface curving in the 3rd dimension. But for our case, we need the sum of solid angles (i.e. we need a tetrahedron, and not a triangle). Please see **Appendix A**. The 'sum of angles of the triangle' checkup which we had applied to CMB (Cosmic Microwave Background) spots is bound to show that our universe is (3d) flat.

2) We cannot measure the curvature of our universe using the critical mass-energy density method of General Relativity (**GR**). Both general and special relativity uses the same SpaceTime Metric (although **GR** uses complicated tensor calculus). It will soon become clear that both versions of relativity are just the inside viewpoint of a creature trapped inside 3 dimensions, and lacking access to move forwards and backwards at will along the fourth (time) dimension. Hence, **GR** can measure intrinsic curvature, but not the extrinsic curvature. That is exactly why **GR** cannot predict the global structure of our universe, nor can it accommodate 'external field effect' (which has now been confirmed to 11 Sigma accuracy in galaxies).

Therefore, we **cannot** be sure that the universe is 3d flat. But how can we be sure that it is curved? Here is another piece of clue which finally nails it: Our universe does have has a Centre (although the Centre does not lie anywhere in our 3d space). This can be easily proved:

The Centre of Mass equation is a powerful equation. $$c.m. = \frac{\sum_{i=1}^{n} m_i r_i}{\sum_{i=1}^{n} m_i}$$

In the vastness of our cosmos, we can consider each galaxy (or maybe a galaxy cluster) as a point mass. Even as the number of galaxies (n) tends to infinity ($n \rightarrow \infty$) we are still left with a single point center of mass. Simply invoking infinity isn't going to help us escape from the conclusion that there is indeed a Centre. And it has to lie **outside** the 3d hypersurface. Otherwise, we could have located the true center, and Hubble's law would not have the particular form $\mathbf{v = H_0 D}$. Also, the Big Bang **would not** have appeared to have happened everywhere. In fact the cosmos would be an irregular structure composed of an empty central region (the "crater of the explosion"), an intermediate region containing the galaxies and an external part containing only radiation. No structure in the three-dimensional space, born from an explosion occurring 13.8 billion years ago, could remotely resemble the universe we observe today.

It was a historical mistake (by Friedmann et al) to apply General Relativity (Einstein's field equations) to try to figure out the shape and size of our universe. We would have succeeded long ago if we had used Einstein's SpaceTime Metric instead! The SpaceTime equation $ds^2 = (\boldsymbol{i}c\ dt)^2 + dx^2 + dy^2 + dz^2 = (\boldsymbol{i}c\ dt)^2 + dr^2$ (which explains all of special relativity, including time dilation, length contraction, and relative simultaneity) is **not** a statement for 4d SpaceTime continuum. That is because unlike real numbers, imaginary number (i) **cannot** be used as an independent axis. Please see **Appendix B**. Einstein and Minkowski made that mistake, and assumed a block universe view in which the past, the present and the future simultaneously coexist! This view is in stark contrast to our everyday experience, as well as with an astonishing number of observations in the whole of science. In fact, an entire book has been written to highlight this mistake. [*The arrow of time: the quest to solve science's greatest mystery*].

The above equation represents a (**dynamic) 3d hypersheet**, **moving with a velocity c in the 4th dimension** in an embedding 4d hyperspace. For more information, see **Appendix C**. This perfectly describes a small section of an expanding (hyper) balloon, where **c** is the radial expansion velocity of our universe. Using this concept, and taking the age of our universe to be 13.8 billion years, **the calculated Hubble constant value (71.002 km/s/Mpc) matches very well with accepted values (69.8 km/s/Mpc and 74 km/s/Mpc determined by two separate methods).** Since the crucial SpaceTime equation and Hubble's law are both telling the same story, it should give us great confidence that we are on the right track.

An immediate consequence of making the above correction (4d spacetime continuum **versus** dynamic 3d hypersheet) is that one dimension got freed up (which we were reserving unnecessarily). That is because if we ignore the motion of the hypersheet, then, what Einstein had assumed as a 4d structure, turns out to be a 3d one inside a 4d embedding hyperspace. **Kaluza's miracle** of obtaining Maxwell's equation in addition to Einstein's field equations seemed to demand a heavy price: a 5th dimension was required as an embedding space [Link1]. Actually, 4 dimensions are sufficient, and we get electromagnetic phenomena as a bonus! In fact, the implications of freeing up a dimension is much more profound, and solves the requirement of a fifth dimension popping up everywhere in physics [Link1] [Link2] [Link3],but stringent limit on the number of dimensions set at four from experiments & observations simply won't allow that.

Therefore, relativity is all about being trapped inside the wall of the expanding (hyper) balloon, but free to move along the wall of the (hyper) balloon. But, what is this 3d hypersurface made of?

It is made of (scalar) fields, and particles, which are mere resonances/excitations in that field. **That is just the core statement of stunningly accurate Quantum Field Theory (QFT) which forms the foundation of Standard Model of Particle Physics.** Thus, we get a glimpse of the unity between relativity and Quantum Mechanics. Since every star and planets and even ourselves are ultimately made up of particles (which are mere excitations/resonances in the 3d fields), therefore, every bit of matter is eternally trapped in this 3d hypersheet, and is getting dragged with it as the (hyper) balloon universe expands.

Copernicus broke with 1300 years of tradition, and revolutionized science by moving from earth-centric to sun-centric view. But, moving the viewpoint to the true center of our expanding universe explains the origin and true nature of time itself!

Clearly there are two viewpoints: the Center of Universe viewpoint (God's view/nature's view) and our viewpoint (i.e. viewpoint of an unfortunate creature trapped inside the wall of the hyper-balloon). From our viewpoint, the radius of the universe is an impossible direction, which does not even exist for us (thus forcing us to use imaginary number) and hence it is a temporal dimension. But from the center of universe viewpoint, the radius is a real dimension, and hence is spatial dimension. Thus time and space dimension exchange roles. The radial expansion of the universe appears as passage of time from our viewpoint.

From the center of universe viewpoint, simultaneity is absolute (as demanded by Sagnac effect [Link1]), and there is indeed absolute universal time (as demanded by quantum mechanics [Link1] [Link2]). That is because the absolute universal time passed since the Big Bang is just a function of the radius of the universe. From our viewpoint (located at an awkward position in the universe), locality is absolute, and velocity **c** is the upper limit, and remains constant for every observer. Those were Einstein's firm belief, which were later shattered by Quantum Entanglement experiments (which led to the award of this year's Nobel Prize). This viewpoint turns (our) space and time into inseparable twins, and makes (our) time a relative concept. This partially solves the **time problem** [Link1] which had so stubbornly resisted the reconciliation of Quantum Mechanics and General Relativity. The remaining part of the problem is the flexibility of time in presence of massive objects (gravitational time dilation).

The two viewpoints differ drastically. As explained in my paper, temporal (time) dimension is that dimension along which any movement can be ignored. For example, we can easily ignore the tremendous velocity with which we are travelling along the radius of the universe. In a similar manner, nature/universe ignores movement along the wall of the balloon whether we travel to the moon or to the sun or to the Andromeda galaxy. That is because the moon, the sun, and Andromeda galaxy are all equidistant from the true center of the universe. This fact, combined with the fact that the (entire) closed universe is an absolutely isolated system (True Island) and has to conserve total momentum etc. gives rise to non-locality and instant communication over vast distances in quantum-entangled particles.

Relativity and Quantum Mechanics are like two sides of the same coin. Relativity is inside the light cone phenomena (since nothing can travel faster than light), while Quantum Mechanics is outside the light cone phenomena (allowing instant communications in 'quantum entanglement' experiments). Both are dictated just by the scale (i.e. whether we use classical/human scale or sub-atomic scale) for a very good reason (explained in detail in my paper).

Why transition from Relativity to Quantum Mechanics happens with decreasing size scale? That's because, this is what is happens to spatial and temporal dimensions at different scales:

3+1 (Classical regime) <=> 2+2 (Compton regime) <=> 1+3 (Planck regime).

This is very similar to the complete exchange of roles of time and space dimensions at the event horizon of a black hole (which arises due to completely different mechanism). In fact, tiniest elementary particles can be modeled like a black hole [Link1]. Tiniest objects start using imaginary numbers for our x, y and z axis, as it feels trapped in extremely tiny volume. The trap need not even be a physical trap. It can be an intangible trap. The intangible trap can be just the meaning of 'remaining extremely small at all times', which creates an invisible and intangible trap. While the particle remains eternally trapped in a tiniest volume, the trap itself is free to move (always enclosing the particle). The above mechanism is responsible for the existence of a minimum Planck length in nature (which solves several problems like explaining Ultra High energy cosmic ray and the TeV-photon paradoxes [Link1], and some cases of duality [Link1]). The present estimate for Planck length is about 1.616255×10^{-35} m. What is remarkable is that this is roughly the same order [Link1] [Link2] as the thickness of our 3d hypersurface (which we call 3d space). This really makes one wonder if the Planck length itself is set by the thickness of our 3d hypersurface (i.e. the thickness which nature considers as infinitesimally small and start using imaginary numbers), and hence is getting smaller and smaller as our universe expands (i.e. gets thinner). That would give a physical meaning (and certainly an arrow) to the passage of time.

Special Relativity is based on constancy of speed of light for any observer. By basing his theory on this postulate, Einstein unknowingly selected a scale: the classical/human scale and above (i.e. astronomical scale), which uses 3 spatial coordinates and one time coordinate. Additionally, it makes Special Relativity a 'Principle Theory' rather than a 'Constructive Theory'. It does not even answer the basic questions: "Why is the velocity of light (c) constant? Why can't anything travel faster than the speed of light?" Please see **Appendix D**. However, for Planck scale objects, there is only one spatial dimension and three temporal dimensions (i.e. nature's viewpoint prevails). That's exactly why physicists like Dirac and Feynman were so amazed at how finely tuned Quaternions (which uses 1 real number and 3 imaginary numbers and hence best represents 1+3 spacetime structure) are in describing the physics of the very small.

This recent paper [Paper1] has shown that every exotic Quantum effect like superposition, entanglement, probabilistic behavior, multiple paths etc. can be explained just by allowing superluminal possibility. Quantum Mechanics appears so weird to us because we straightaway reject nature's point of view, in which superluminal communication is not only possible, but the only possibility (**c** becomes the lower limit). Our mistake was to assume that nature will continue to use our 3+1 spacetime even at the

smallest scale. 3+1 spacetime structure is necessarily about 'inside the light cone', while 1+3 structure is about 'outside the light cone' i.e. necessarily superluminal which is the description of tachyons and quarks [Paper1] [Paper2]

Relativistic Quantum Mechanics is the meeting boundary of Special Relativity and Quantum Mechanics and hence uses the intermediate between (3+1) and (1+3), and has a spacetime dimension of 2+2 as proved by G.N. Ord [Link1].

The 'inside the light cone' phenomena and the 'outside the light cone' phenomena together span the entire region within the space and time axes. Only in unison they complete the entire picture. We failed to realize that the same spacetime is getting split into 'space like' and 'time like' regions based on scale. And the reason behind this is **not** the magical (**?**) speed of light. That would have turned both relativity and quantum mechanics into mere branches of electromagnetism. The reason lies at a much more deeper and fundamental level: it turns out that the **c** is the radial expansion velocity of our universe.

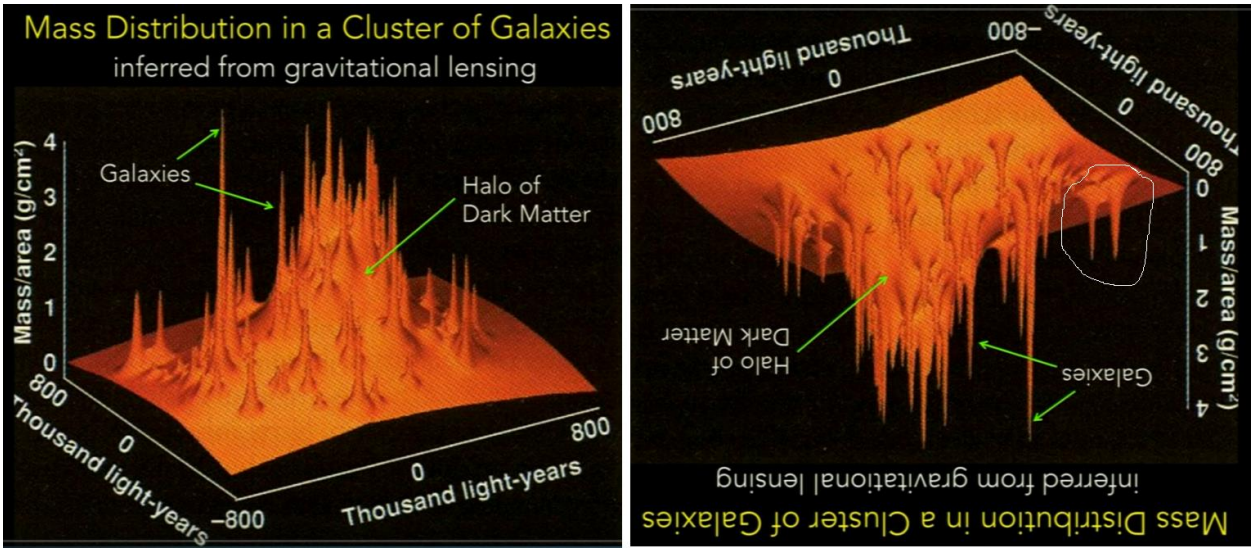
DARK ENERGY: My model states unambiguously that our universe is expanding at a constant rate rather than accelerating (as currently believed). Recent studies using much bigger dataset actually favor universe's constant rate of expansion over accelerated expansion, as shown in journal *Nature* [Link1]. Why the illusion of accelerated expansion arises has also been explained. This solves the problem of dark energy: **we don't need dark energy**, since we don't have to account for acceleration. [However, it must be mentioned that experiments and observations does still allow a very tiny variation in the speed of light (VSL) ever since the Big Bang (which actually boils down to radial expansion velocity of our universe), which might answer the difference in the observed Hubble constant values].

The radial expansion velocity **c** of the universe introduces the concept of rest-mass momentum (p=m.c) which greatly simplifies and unifies physics [Link1], although that paper had not mentioned why rest-mass momentum arises in the first place. However, it is an integral part of my theory. In fact, this theory also explains the true origin of rest-mass energy (**$E=mc^2$**), since the energy (E) and momentum (p) are always related as **E=p.c** (as shown in above-mentioned paper).

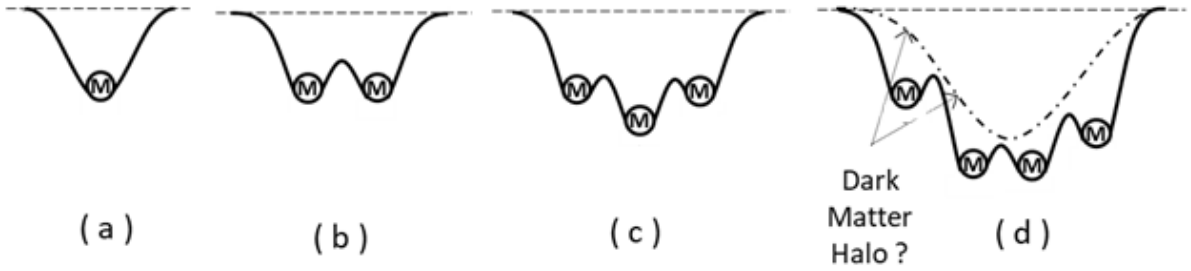
General Relativity makes things a bit tricky since it involves curvature/warping of spacetime, but it does not become incompatible with Quantum Mechanics. The only difference between the warped spacetime of General Relativity, and the flat spacetime of Special Relativity is very similar to the difference between a stretched rubber membrane, **with and without** a metal ball placed on it. This stretching also produces the same time dilation (as predicted by Einstein), but now it is due to the cos(θ) and sin(θ) components of the temporal mation, which appears as temporal and spatial motions, depending on the slope (value of θ) of the rubber membrane at that point.

So, in a nutshell, the wall of our (hyper) balloon universe is made of fields and particles, just as the Quantum Field Theory (QFT) insists, while massive objects like stars and planets (embedded like thin coins inside this wall itself) produces stretching of this wall along the 4^{th} dimension (which is seen by trapped flatlanders like us as warping of 4d SpaceTime fabric itself) and gives rise to gravity as General Relativity (GR) insist. General Relativity and Quantum Mechanics are the two pillars of modern Science. Reconciling the two leads us to 'Theory of Everything'.

DARK MATTER: General Relativity remains our best theory of gravity. However the greatest cosmological challenges today like dark matter, black hole singularity (leading to 'information loss' paradox) etc. are mere relics of our misunderstanding of General Relativity. Gravity is not a warping in 4d spacetime, but a stretching of the 3d hypersheet (by massive objects) in the 4th dimension. Every normal baryonic matter has a natural tendency to move towards the future (away from the center of the universe). The 3d hypersheet (of field and particles) behaves just like a stretched rubber membrane, and all massive objects nearby stretch this membrane in a single direction, thus enormously amplifying their collective stretching. This magically solves all dark matter related issues. Just 2 images are added here to stimulate the reader's imagination:



[**Image source** Galaxy Clusters: Well of darkness; August E. Evrard, **NATURE**, VOL 394, 9 JULY 1998]



The colored image on the RHS is the inverted image of the colored image on LHS. Just compare the inverted image with figure (d) to see how Dark Matter Halo arises. The huge depression bends light rays enormously (through gravitational lensing) and gives false impression of enormous amounts of Dark Matter. **N.B.** Figures (a), (b), (c), (d) are cross sections of rubber membranes (RM) with balls placed on it. [Note: Massive objects are shown as balls for easy visualization, but are actually embedded like coins inside the RM].

The list of achievements in my paper is simply too long to be detailed here in this article. [e.g. The 'Principle of Least Action (**PLA**)' comes closest to the 'theory of Everything' in physics, and from which, all known laws of physics can be derived. **PLA** can be generalized (for relativistic velocities) to 'Principle of Maximum Proper Time', which is just the Minkowskian version of the shockingly simple Euclidean statement: **"The least distance between two points in (hyper) space is a straight line"**. A similar conclusion is reached in this paper [Link1] which claims that the roles played by kinetic and potential energies in **PLA** are **secondary**, and **PLA** seems to be just a footnote for the statement that 'least distance between two points is a straight line'].

My paper also explains why dualities like wave (field)-particle duality, or Lagrangian-Hamiltonian duality arises. Lagrangian is the Minkowskian version, while Hamiltonian is the Euclidean version. Duality is a bedrock concept of modern physics.

The crucial conservation laws of Physics arise from symmetries of nature (as per Noether's theorem). We can directly see from this simple (hyper)balloon structure of our universe, why those symmetries (e.g. homogeneity and isotropy) arises in the first place. The surface of a balloon looks same everywhere (homogeneous), and from any point on its surface, all directions (drawn along the surface) will look basically the same (isotropic).

My paper explains the source of Gauge Symmetries, which lies at the heart of the three fundamental forces of nature (i.e. electromagnetic, weak force and strong nuclear force). Maldacena had shown [Paper1] that electromagnetic forces simply requires a circle at each point in spacetime, weak forces require a sphere, while nuclear forces require a hypersphere. All these phenomena emerges from 3+1 (one imaginary dimension), 2+2 (two imaginary dimensions) and 1+3 (three imaginary dimensions) respectively, because the Euler's formula establishes a relation between imaginary numbers and circles (which can be actually seen by a divine being having access to the higher dimension). Quaternions (1+3) obey SU (3) symmetry, and Quantum Chromodynamics (QCD) which gives rise to the 3 colors od quarks, is essentially quantum quaternion dynamics [Paper1]

Many physicists have claimed that the second law of thermodynamics (which states that any spontaneously occurring process, will always lead to an increase in the entropy of the universe) is the most fundamental law [Link1] [Link2] . They fail to realize that this law itself arises from the expansion of the universe. That is because, entropy and probability are directly related, and the expansion of the universe causes increase in volume of our 3d space, and hence allowed possibilities. In fact, it is the expansion of our universe which gives time its arrow, and hence is the most fundamental thing.

When a balloon expands, its surface area increases. However the volume (amount) of rubber remains constant. Similarly, as our universe expands, the volume of 3d space increases, while the hypervolume of the (hyper) balloon remains the same. This explains why entropy increases; while the crucial unitarity condition of Quantum Mechanics (QM) is still maintained (thus giving us a false impression that time is completely reversible at the fundamental level). This solves another deep conflict between QM and thermodynamics (classical physics) [Link1].

Acknowledgement: The figures were drawn for me by my colleague Shri Sanjay Prajapati (Lattice Design Lab., RRCAT].

APPENDIX A:

We cannot measure the curvature of the universe using the sum of angles of a triangle.

Please note that the triangle method of adding up the sum of angles and checking whether it is 180° or not, will work fine for a 2d surface curving in the 3rd dimension (example: surface of a ball). However, we are talking of 3d hyper-surface curving in the fourth dimension. What we need is a tetrahedron, and we have to check the sum of solid angles, rather than the angles on the faces of the tetrahedron.

Please let me elaborate: let's go down one-dimension and take the curved surface of the earth as an example. Let a person starts from point A on the North Pole, move southwards till point B on the equator. Then he moves an equal distance along the equator to reach point C. Now he turns 90°, and faces the North direction. He continues his journey and reaches point A. Now each of the angles, at A, B and C are 90°. Therefore the total angles in the triangle add up to 270°.

Now he repeats his journey from point A (North Pole) and again reaches point B on the equator. But now he travels **just a few steps** and turn 90° again. He continues his journey to reach point A. Now the angles formed at points B and C are 90° each, while the angle formed at A is almost 0°. The sum of the angles now almost adds up to 180°.

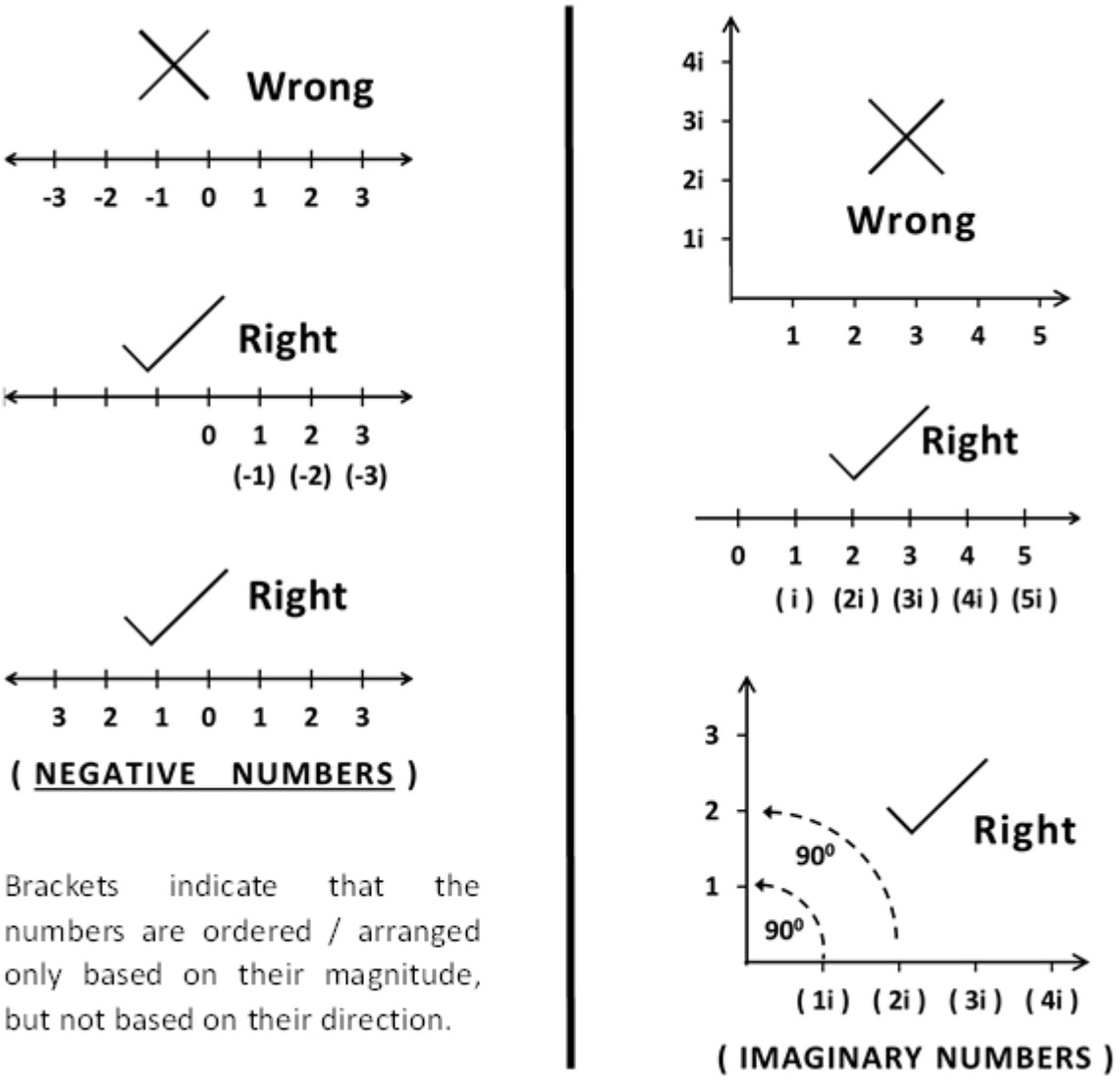
Therefore as the triangle shrinks into a line (i.e. point C comes closer and closer to point B, and ultimately merges), it loses its detecting power. We need a 2d object (like triangle) and not a 1d object (line) to measure the curvature of 2d surface. The same phenomenon happens in one higher dimension. A triangle is nothing but a tetrahedron whose apex/peak point has merged with the base. Hence a triangle is useless for measuring curvature of the universe.

APPENDIX B

Imaginary numbers are ubiquitous in Quantum Mechanics and SpaceTime Physics. Imaginary number **(i)** enters through the temporal dimension, and makes the spacetime metric **(-, +, +, +)** instead of **(+,+,+,+)**. Let us shake the very mathematical foundation of SpaceTime physics. **Unlike real numbers, imaginary numbers cannot be taken as an independent axis.** While we had correctly identified that **i** (square root of -1) represent 90 degree rotation, we failed to realize that if we explicitly use a perpendicular axis (additional dimension), then imaginary sign **(i)** must go away. The imaginary sign **(i)** can stay only as long as we don't use an additional axis. This is very similar to the argument: Suppose I have taken one thousand dollars from the bank and spent it somewhere. Then I will **either** say "I am in a debt of 1000 dollars", **or** else I should say "I own -1000 dollars". But I **must not** say "I am in a debt of -1000 dollars". The negative sign is automatically telling the direction (since debt is in the opposite direction of owning). Therefore, if negative numbers are used (i.e. along with the minus sign), then we should use the positive x-axis (i.e. in the same direction of positive numbers). If we don't use the minus sign, then we should use

the negative x-axis (in the opposite direction of positive x-axis from the chosen origin). But **we should never use both together**. Similar argument applies for imaginary **i** .

[**Please scroll down** for the image]



It is shown in my paper that a better understanding of imaginary numbers lets us realize that our 'clock time' is imaginary. Imaginary **doesn't mean** something cooked up in our imagination. It is simply mocking at our face at our inability to access the 4^{th} dimension, which is very much real. **Clocks don't lie** (only humans are capable of telling lies). **But it doesn't tell the complete truth either.** It tells us the measurement (of actual movement), but not the direction. That direction is in fact an impossible direction for us. That direction does not even exist in our 3d space. Just try pointing your finger towards the past or towards the future. That direction is in fact perpendicular to every possible direction we can point our finger at. And that is exactly why we need an imaginary numbers. Failure to realize this fact has led to several physicists questioning the "reality of time".

It also explains the true meaning of Wick rotated, Euclidean time (wrongly called 'imaginary time') which is so ubiquitous in physics. Actually, clock time is associated with imaginary number, while absolute universal time is associated with real number. It becomes crystal clear why Physicists like Dirac & Feynman were so puzzled that 'imaginary time seems more real than real time'!

APPENDIX C

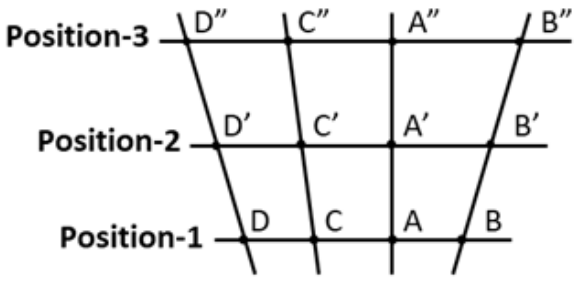
The equation $ds^2 = (\boldsymbol{i}c\ dt)^{\,2} + dx^2 + dy^2 + dz^2 = (\boldsymbol{i}c\ dt)^{\,2} + dr^2$ represents a dynamic **3d hypersheet** (composed of fields & particles. Therefore I'll refer to it as **Field-Particle Hypersheet**, or **3d FPHS**) **moving with a velocity c in the 4th dimension** in an embedding 4d hyperspace. This is very easy to see. Let us take any observer, located anywhere in 3d space (3d FPHS), and moving with any possible velocity. Relative to itself, the observer does not move through space (dr=0). Hence, the above equation becomes (putting dr=0):

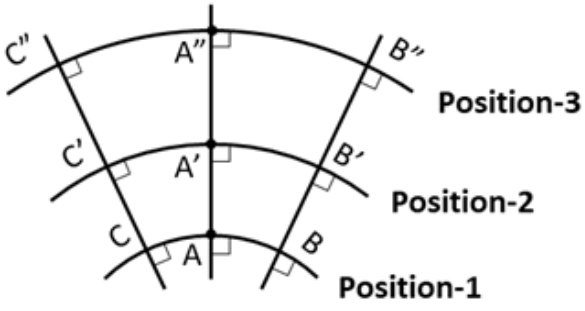
$ds^2 = (ic\ dt)^{\,2}$ Therefore, **ds/dt = i.c**

Therefore, every frame of reference reaches the same conclusion. The presence of **i** clearly shows that everyone is moving with a velocity **c** in a perpendicular direction to all three x,y and z axis (which is an impossible direction for every observer trapped in this 3d FPHS. Why impossible direction? Well, just try to point your finger towards the future or towards the past. That direction is perpendicular to every direction we can point our finger at). The lack of understanding about **i**=sqrt(-1) had led scientists to conclude that the velocity is imaginary (and hence discouraged from digging deeper). They simply concluded that our spacetime is very peculiar (hyperbolic), without questioning why this peculiarity arises after all.

But every frame of reference can reach the same conclusion only if the **entire** 3d FPHS is moving in the same direction. That's why I emphasized 3d FPHS (instead of 3d space). A 3d space moving through 4d hyperspace doesn't make any sense! But a 3d FPHS moving (at velocity c) through 4d hyperspace does make sense.

We have another piece of the jigsaw puzzle: The 3d FPHS is also getting stretched (Hubble's law) as it moves in the 4th dimension. From above discussion, and this clue, two models of our universe are easily possible (scroll to see diagram below). Which model is more appropriate?





As clearly shown in my paper, all galaxies in the entire universe can satisfy both conditions 1 & 2 simultaneously only in the second model. In the first model (the currently accepted 3d flat, grid model), the 1st and 2nd conditions are unrelated, and we are puzzled why Hubble constant would take the particular value it actually possess. It is still unclear to me if the presently accepted grid model [Video1] even cares what the crucial (Minkowski-Einstein) SpaceTime equation actually means. It ignores the dimension aspect of time (as pointed out by both Minkowski and Einstein) and treats time as just evolving parameter. [The above video asked the question: "if our universe is expanding, what is it expanding into?" Then the video claimed that the "hyper balloon" model cannot answer that, while the "grid model" can answer it. ACTUALLY, THE SITUATION IS JUST THE REVERSE!

Here is the explanation offered in the video: General Relativity assumes that the metric tensor is changing (an analogy is a three-dimensional grid, where the spacing between each grid is increasing). But this is illogical! Distance between each point is increasing without the overall space (containing all those points) actually expanding into anything!!

My "hyper balloon" model satisfactorily answers the above question. Our balloon universe (the term universe is used only for the 3d balloon surface) is expanding into an embedding four dimensional hyperspace, which might actually extend infinitely in all 4 directions. i.e. hyperspace (emptiness) is possibly infinite, while matter and fields (which creates the wall of the hyper balloon) is finite in extent and forms a closed 3d hypersurface.]

But how can everything we observe (including huge boulders, mighty mountains and even our rock solid planet) be just an extremely thin surface? Well, if there is anything which quantum mechanics has taught us, it is this: The solidity (rigidity) of rocks and the reality of everything we observe, is a mere illusion. In fact, high energy particle physics have to ditch the very idea of a particle in favor of field. A planet or a star looks like a spherical ball to us. But to a divine being having access to the 4th dimension, it looks like a very thin circular coin embedded within a thin membrane. Even the mightiest mountains are extremely flexible when viewed from the fourth dimension.

While we are already well aware that our entire 3d space (which we also call 'vacuum') is filled with fields, which is brimming with energy (in which particles can pop in and out of existence), we never figured out that it is this 3d FPHS which has made our geometry 3 dimensional! That is a big trick by nature, since the geometry of universe/nature is 4 dimensional (i.e. 4d hyperspace). Space (actually, hyperspace) is nothing but 4d geometry (true vacuum) which embeds this 3d FPHS. Just imagine a 2d creature moving on the surface on a rubber sheet (RS). If the RS is absolutely transparent/invisible, and offers no resistance to its movement (unless it changes is velocity), the creature will assume that the RS is space/geometry of the universe itself. It will treat the RS so synonymously with space that it will treat the distance between two visible dots on the RS as the spatial distance. Even if it is somehow aware of the existence of the (almost imperceptible) RS, it will ignore its presence, and will hardly ever acknowledge that it is a trapped creature. I can say this with confidence that this indeed is the case!

The simple fact that Einstein had mistaken this 3d hypersheet as fabric of space-time itself becomes very clear when we investigate the 1995 proposal by the American theoretical physicist Ted Jacobson that

Einstein's gravity equations can be derived from thermodynamics. This suggests that Gravity is just an average of the behavior of unknown "atoms" of Spacetime (well, not space-time, but field-particle hypersheet).

The embedding 4d hyperspace is absolute and Euclidean (as it should be) and possibly extends infinitely in all 4 directions. The emptiness/nothingness maybe infinite, while our universe (which is a hyperballon composed of fields and particles) is finite and closed. Newton's view of absolute space is back. Newton will surely be proud! Indeed we need an absolute space for explaining inertia as well as acceleration. This solves the conflict between Newton and Einstein. We need to look outside the window of a moving car to confirm if it is moving or at rest (Einstein's view) but we can say with our eyes closed when the driver has pressed his foot on the gas/accelerator, and hence has to be accelerating with respect to an absolute space (Newton's view).

APPENDIX D

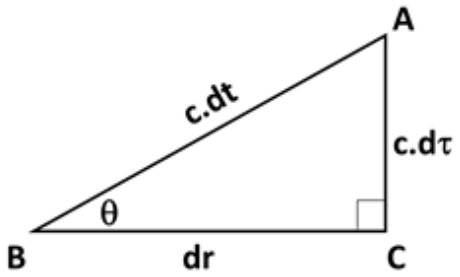
Why is the velocity of light (c) constant? Why can't anything travel faster than the speed of light?

The real reason is: it is a peculiarity of Minkowskian (hyperbolic) structure!

$$Velocity = \frac{dr}{dt} = \frac{dr}{AB/c} \ (since\ AB = c.dt)$$

$$= c.\frac{dr}{AB} = c.\ \frac{BC}{AB}$$

$$= c.\ \frac{Base}{Hypotenuse} = c.\cos\theta$$



$$\left[As\ dr \to \infty\ (i.e.\ body\ moving\ infinitely\ fast),\ \theta \to 0 \right.$$
$$\left. \Rightarrow \cos\theta \to 1 \quad and \quad Velocity = c \right]$$

So here is the actual reason, while nothing can travel faster than the speed of light (which is actually, the velocity of expansion of our universe)

By using the definition of velocity as: constant X (Base/Hypotenuse) we have made sure that we choke (put an upper ceiling to) any possible velocity at c. As the base (distance covered by the particle) gets larger, the hypotenuse gets larger as well (time dilation), since by Pythagoras theorem, the base of the triangle contributes to the hypotenuse.

In other words, due to this peculiar geometry, for a sufficiently fast moving frame of reference, we start counting the spatial distance as temporal distance. We inevitably mixes space and time.

There is no speed limit in the universe (photons can travel at infinite speed). If we had asked the photon how fast it travels, it would have replied “I can travel to the farthest galaxies, without ever observing time passing”. In fact, if we use the formula for proper velocity, we can quite easily verify that.

An appeal to all readers:

Please view and share this video. https://www.youtube.com/watch?v=YgUchABJ0EQ