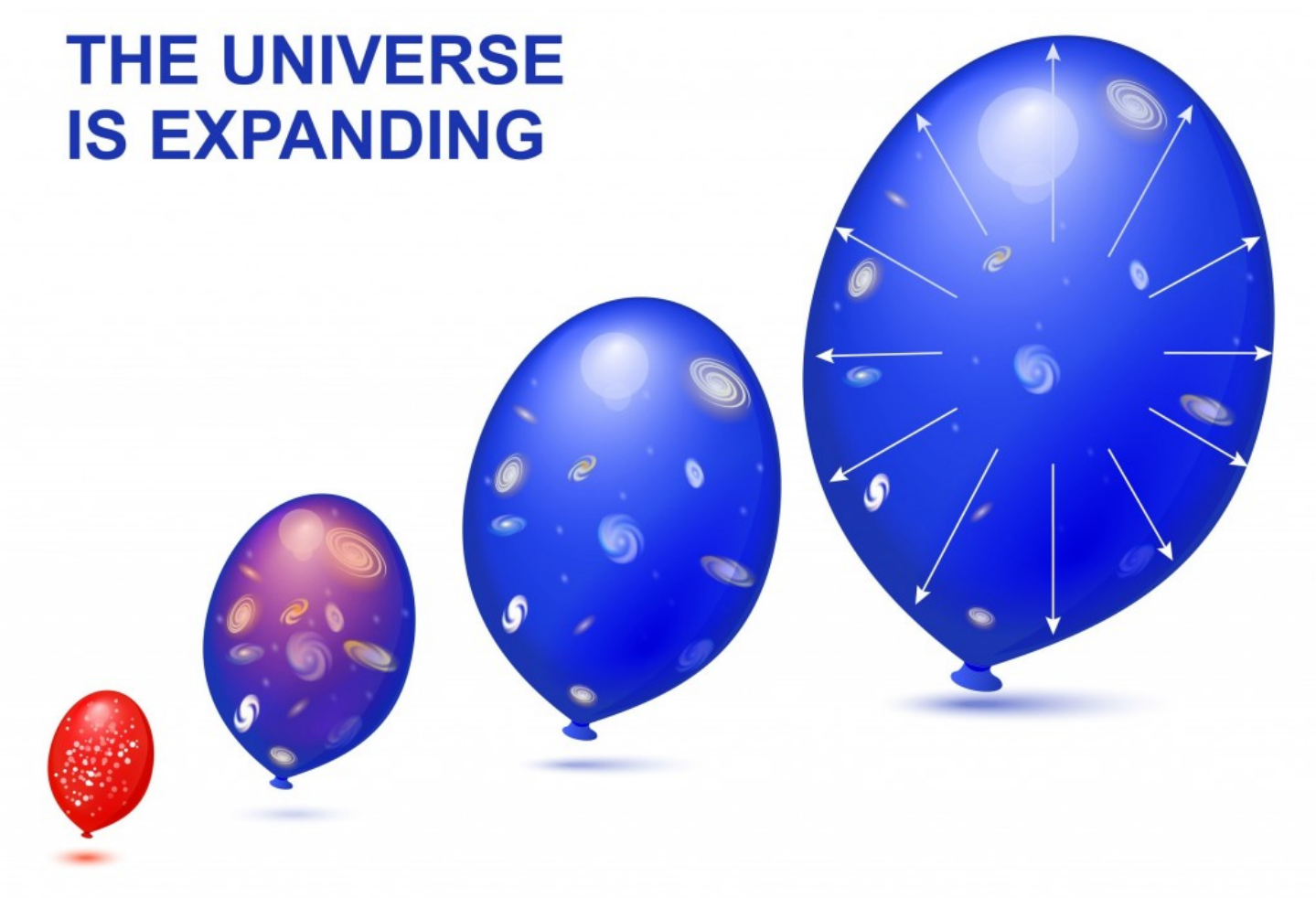
Rescuing Physics and Cosmology by revising the concept of SpaceTime

The two greatest theories of Physics are incompatible and mutually conflicting because of wrong model of the universe.



Indore, Madhya Pradesh Feb 6, 2023 (Issuewire.com**)** - Einstein and Minkowski combined the three dimensions of space and one dimension of time into a single four-dimensional manifold called SpaceTime. This leads to a block universe view in which there is no distinction between the past, the present and the future, and all three of them 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*]. This view has been challenged in a landmark paper published online by Mr. Subhajit Waugh. A brief summary of the research geared towards non-specialist audiences, can be found here. The original preprint paper is titled *Quantum Mechanics and General Relativity are fully compatible, and have a common origin: the expanding (hyper) balloon universe.* [Link1] [Link2]

What is SpaceTime?

SpaceTime is not a 4 dimensional continuum; mathematics is telling something else!

The Minkowski SpaceTime Equation (MSTE) (which explains all of special relativity, including time dilation, length contraction, and relative simultaneity) is **not** a statement for 4D SpaceTime continuum. That mistake occurred due to our incomplete knowledge about the true nature of imaginary numbers. An imaginary sign lies hidden within the MSTE, which distinguishes spatial dimensions from time dimension and turns the metric **(+,+,+,-)** instead of **(+,+,+,+)**. Einstein's mistake was to treat time and space exactly equally (which certainly is not the case). Unlike real numbers, imaginary number **(i)** cannot be used as an independent axis (this is explained in detail in the paper whose link is provided below). An independent axis means an additional dimension. Imaginary number is required only for inaccessible dimension, and does not create an additional dimension. Imaginary number is required only by a trapped creature.

MSTE is confirmed to be true in countless experiments, but is actually a mathematical statement for a (**dynamic) 3D hypersheet**, **moving with a velocity c in the 4th dimension** in an embedding 4D hyperspace. Thus MSTE perfectly describes a small section of an expanding (hyper) balloon universe, where **c** is the radial increment velocity of our universe. Using this balloon model, 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 to claim that our universe is an expanding (hyper) balloon. Since our universe is expanding at a constant rate rather than accelerating (as currently believed), **we do not need dark energy**, since we do not have to account for acceleration.

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, but stringent limit on the number of dimensions set at four from experiments and observations simply won't allow that.

MSTE shows that relativity is all about being trapped inside the wall of the expanding (hyper) balloon, but being free to move along the wall. The question is "What is this 3D hypersurface wall of the balloon universe 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. The radius of the universe is an impossible direction for us (which does not even exist for trapped creatures like us). The radial increase of the universe appears as passage of time for us.

The balloon shape of the universe creates two different frames of reference/viewpoints. The universe is perceived differently from each viewpoint, due to space and time exchanging roles. But it is precisely this, which allows the reconciliation between Quantum Mechanics and General Relativity, which are the

two pillars of modern Physics. From the center of (balloon) universe viewpoint, simultaneity is absolute (as demanded by Sagnac effect) and there is absolute universal time (as demanded by Quantum Mechanics). This is because, the absolute universal time elapsed since the Big Bang is simply a function of the radius of the universe. From our viewpoint (located on the surface of the balloon), our concept of SpaceTime is relative, locality is absolute, and the velocity of light is the upper limit (and remains constant for every observer irrespective of their velocity). Those were Einstein's unshakeable beliefs, which were shattered by Quantum Entanglement experiments (which led to last year's Nobel Prize in Physics). Since both relative and absolute times are possible, it solves the **Time Problem**, which had stubbornly resisted the reconciliation of QM and GR. Which viewpoint shall prevail is determined by size scale (explained in detail in the research paper).

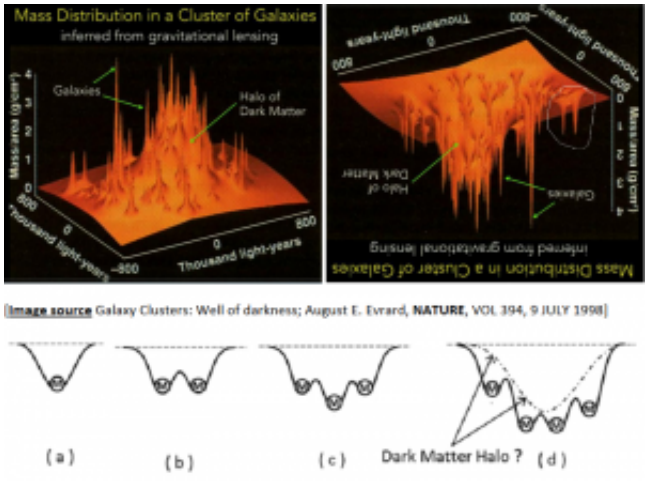
GRAVITY AND DARK MATTER: The rubber membrane/sheet model is used to teach General Relativity in schools and colleges. Rather than taking it as an analogy, we should take it rather literally. The wall of the balloon universe behave just like a rubber membrane. The difference is that it is a 3D hypersheet rather than a 2D sheet. Massive objects like stars and planets are embedded like thin coins inside this wall itself (when viewed from the 4th dimension), and produces stretching of this wall along the 4th dimension. This stretching is seen by trapped creatures like us as warping of 4D SpaceTime fabric itself, and gives rise to gravity as General Relativity (GR) insist. This stretching also produces the same gravitational time dilation (as predicted by Einstein). But now it is due to the reduction of the net temporal motion (i.e. motion along the radius of the universe) due to the inclusion of sin(θ) or cos(θ) depending on definition of θ, whose value depends on the slope of the 3D membrane at that point.

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. Since the 3D hypersheet is a single continuous sheet, and since all massive objects nearby stretch this sheet in a single direction, therefore the collective stretching gets enormously amplified. The resultant huge stretching bends light rays enormously (through gravitational lensing) and gives false impression of enormous amounts of Dark Matter halo. This magically solves all dark matter related issues. Black hole singularity is just the insider viewpoint of a trapped creature. Right at the center of the naked singularity, time passes at the same rate as in deep space, far away from any gravitational sources.

IMAGE: 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. **Note:** Figures (a), (b), (c), (d) are cross sections of rubber membranes (RM) with balls placed on it. Massive objects are shown as balls for easy visualization, but are actually embedded like coins inside the RM.

About Mr. Subhajit Waugh

Mr. Subhajit Waugh is presently working as a Scientific Officer. He obtained his Master's degree in Physics from the National Institute of Technology, Rourkela, in 2003, where he was the topper of his batch. In 1996, he was awarded the prestigious NCERT National Talent Scholarship. He appeals his viewers to watch and share his favorite (non-scientific) video.



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

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