Cosmology – the cornerstone of physical reality

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Abstract

If any field can be overreaching into all aspects of physics it would be cosmology. A knowledge of the birth of the universe cannot help but be fundamental to physical reality, but the standard cosmological model is by no means written in stone. To make matters worse, the advent of quantum physics has engendered a movement away from conventional cosmology with concepts like the multiverse and the many-worlds interpretation that are as strange as the quantum world appears to be. In this essay I propose a cosmological model to underscore the role which cosmology may play as fundamental to an understanding of quantum entanglement, a physical reality perhaps impossible to reach by any other means.

Introduction

If we are to understand the workings of an observed phenomenon we often have to consider its origins and how it evolved from a past state. In biology, Charles Darwin's theory of evolution is fundamental to understanding why genetic mutation occurs. That theory is based on what happened in the distant past and is well substantiated, having the advantage that all the clues are here on Earth. Cosmology is not so fortunate as it pushes the past to an extreme and involves phenomena well beyond our reach. With the inception of quantum mechanics, the once fairly intuitive explanations of reality were cast in doubt and Nature was deemed – as Richard Feynman put it – "absurd from the point of view of common sense" [1]. Is Nature really absurd though?

I propose an alternative cosmological model that provides a foundation for the instantaneous action at a distance of quantum entanglement, the most perplexing aspect of quantum behavior. Since the model contains many elements that cannot be seen experimentally, it relies on several internal consistencies which connect with observed reality. For instance, the technical endnotes contain a derivation of the fine structure constant with an accuracy of one part in one million. The model is also shown to account for the observations which the standard cosmological model attributes to dark energy and dark matter.

The creation of a continuous space

In the standard cosmological model the universe has its beginning at a singularity where space is also born. In the model presented here space is created separately long before the big bang and remains eternally in place. The universe is cyclic; it is born small, has an expanding phase and then collapses to its death – a cycle that is repeated forever. It is the creation of the first cycle that is described here and it begins when nothing existed.

The underlying mechanism in the formation of a continuous space is simple geometry: a 0-D point forms a 1-D line by replicating itself at the speed of light, then the line is swept in a direction normal to it to create a 2-D surface, which in the same way generates a 3-D volume. To begin, a circular line is formed and then revolved around a fixed point resulting in a horn torus (a torus with a point as its hole). Its surface, which can be thought of as a collection of circles with infinitesimal separation, flows at the speed of light as seen in Figure 1. The size of the torus is within the atomic realm (10^{-15} m) and is developed in conjunction with a nucleus prototype. The prototype is shown in further detail in the endnotes and has an internal structure but for simplicity the reader can think of it as a point particle.
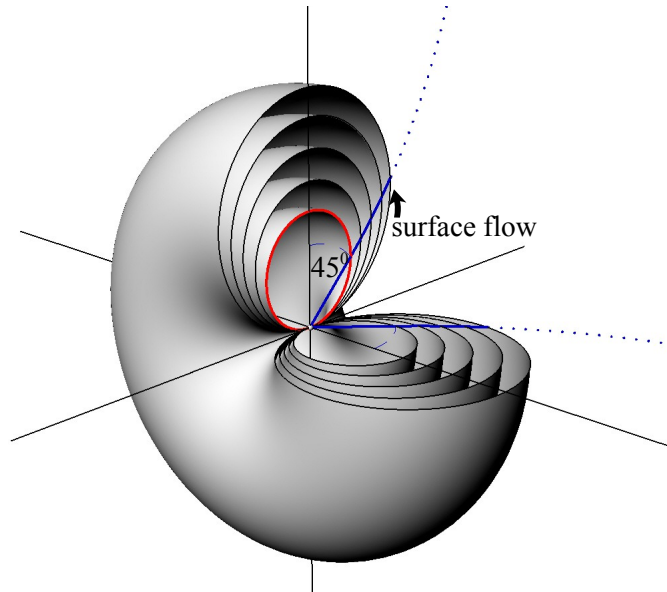

Figure 1: A cutaway of the horn torus formed from a single loop (in red). While the diagram shows separation between the tori as they are drawn out, they form a continuous space. The blue lines are particle trajectories.

Two matter particles are emitted at a low velocity from the center of the torus until they reach the surface and begin replicating it by drawing it outwards continuously to form space. The flow of the space affects them slightly, causing them to take curved trajectories and accelerating them. The creation of space is completed at the point shown in in Figure 2 and the particles continue to accelerate (for billions of years) until they meet, where they have reached the velocity of light. At this point though, they cease to be matter (which cannot reach that velocity) and join to become a photon with enough energy to create the universe. In this way they have been accelerated in a circular accelerator much like we use but on a universe-sized scale.
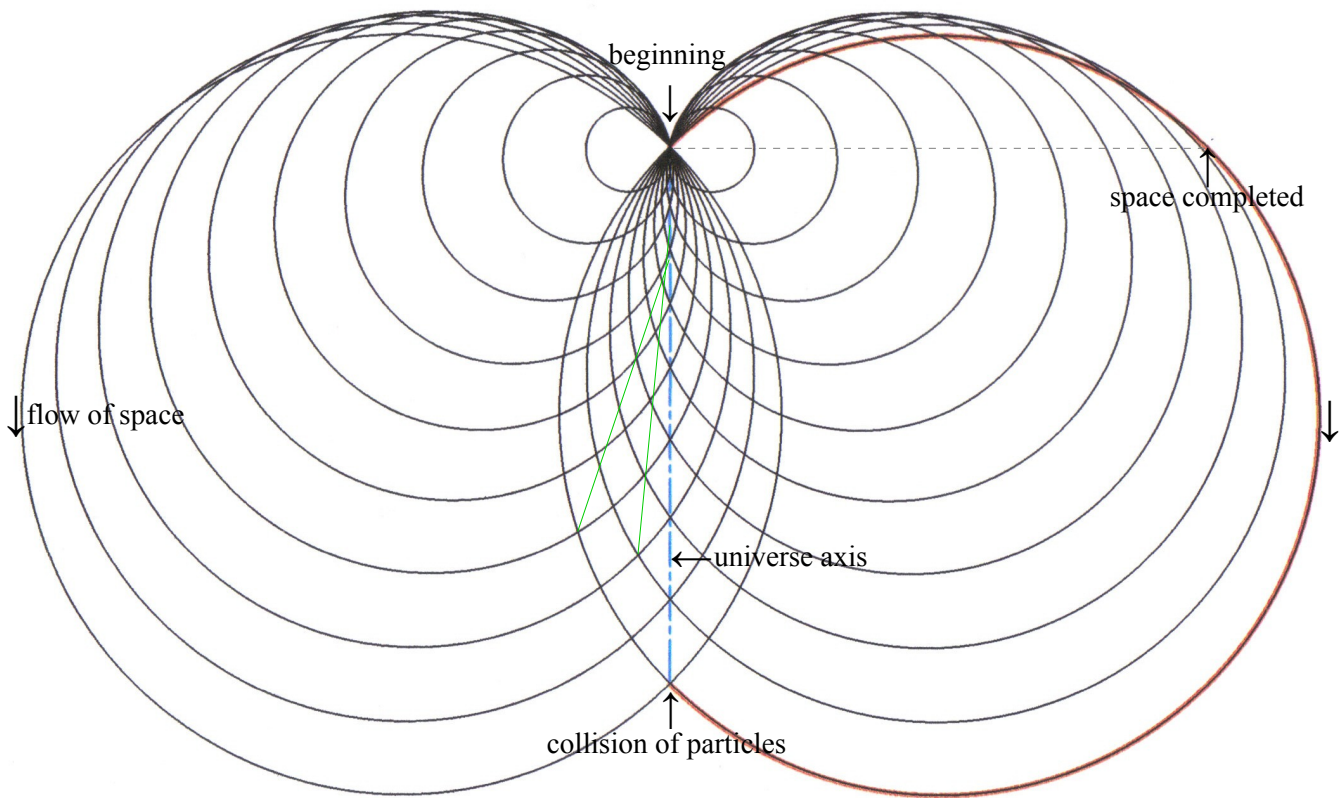
Figure 2: A cross-section of space showing one of the emitted particle's path in red. The other path is 90^0 to it, coming out of the page.

The shape of the completed space is a spindle torus. Johannes Kepler termed the exterior surface of a spindle torus an apple and the interior surface a lemon. The universe is bounded by the lemon and the space within it has a cross-flow where two force vectors placed anywhere have a net bisecting vector pointing towards the axis near the beginning (see the green lines in Figure 2 for examples). This causes anything within the lemon to experience a tidal effect, similar to two objects falling towards a center of gravity and accelerating towards each other. The collision causes the high-energy photon to enter space at an angle to the axis. It then replicates by dilution into a conical sea of photons which together comprise all the energy in the universe. When they form matter particles, a slight asymmetry in their positions with respect to the axis develops due to the tidal effect, allowing for gravitational clumping. By the era of recombination, the universe will have moved enough distance away from the location of the big bang to allow photons escaping in that direction to be turned around by the flow of space.

The universe expands during the first half of its path through the lemon due to its initial momentum outwards, opposing the much weaker tidal effect until the latter half, where it begins to collapse. When the contents of the universe have returned, two more particles are emitted to generate another cycle. The idea that the universe is flowing has been proposed after astrophysicists observed that it appears to do so in a particular direction, calling it "dark flow"[2].

Dark energy and dark matter

Just as the two emitted "seed" particles are accelerated, the universe in its entirety is also accelerated from its inception by the flow of space but its expansion would not account for observed high redshifts

of z > 1. However, it may be that cosmic redshift is misinterpreted as movement away from the observer. The universe is traveling faster through space now than when it began, so that mass has increased over time. The photons we see from an earlier universe have been emitted by weaker matter and this has been suggested by physicist Chris Wetterich to be an alternative to cosmic redshift arising from the stretching of space. He writes, "Imagine that masses of electrons and protons were smaller at the time of emission of radiation from a galaxy than they are today. Then the frequencies of characteristic atomic lines are also smaller than the ones observed on earth. This effect could replace the redshift due to expanding distances"[3].

As for the effects attributed to dark matter, there is also an alternative explanation: the tidal effect. It compresses everything within the universe as it moves through the lemon's space. It is unnoticeable near a galaxy's central region where gravitation dominates, but in the outer reaches gravitation becomes so weak that the tidal effect manifests itself. That the rotation remains constant far beyond the galaxy supports the omnipresence of this effect only noticeable on a galactic scale. The dark matter hypothesis requires not only matter spread throughout a galaxy, but it must extend well beyond in a "halo" to account for the continuing constant rotation velocity. Note that the tidal effect only compresses two sides of a galaxy but as most are either rotating themselves or within a system that has rotation, the compression will be more uniformly spread out. Depending on this, some galaxies are more affected than others.

Quantum entanglement

Now that we have proposed a viable universe we come to quantum entanglement and how such a universe can account for this phenomenon. The answer lies in the axis of the universe. The distance between the particle that began the universe and the big bang photon is the longest separation of particles possible within the lemon of space. They are connected momentarily by the axis of the universe, a straight one-dimensional line which is a unique entity in space in that the force of the flow (responsible for the tidal effect) along that line points directly towards the beginning particle. The two particles it emits travel 180^0 around the apple of the torus so that when they reach the axis they are mirror images of the beginning particle. When two particles become entangled they form the same type of line between them as they move away from each other. The points on that line, superposed on those in space, have their net flow vectors pointing from one particle to the other and thus differentiate themselves from the points in space, where each point's net vector is unique and directed towards the axis. When observed the particles exhibit opposite attributes because they are on the ends of the line as mirror images. There is no communication – it is just the axis of the universe on a smaller scale.

Some astrophysicists have made observations leading to the possibility that the universe has an axis [4] and have dubbed it the "Axis of Evil" since it destroys the accepted theory of an isotropic universe. I call the line between entangled particles a "Mini-Me Axis of Evil" because it will always be a much shorter version of the Axis of Evil.[1]

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[1] The name is derived from the popular Austin Powers comedy movies with the characters Dr. Evil (played by Mike Myers) and his 2'8" clone Mini-Me (Verne Troyer). In a spooky coincidence, Mike Myers and I attended the same high school in Toronto.

References

[1] R. P. Feynman, QED: The Strange Theory of Light And Matter, Princeton University Press, Princeton, N.J., 1985, p.10.

[2] A. Kashlinsky, F. Atrio-Barandela, D. Kocevski, and H. Ebeling, "A measurement of large-scale peculiar velocities of clusters of galaxies: results and cosmological implications," arXiv:0809.3734v1 [astro-ph].

[3] C. Wetterich, "A Universe without expansion," arXiv:1303.6878 [astro-ph.CO].

[4] K. Land and J. Magueijo, The axis of evil, arXiv:astro-ph/0502237v2.

Technical Endnotes

## The Fine Structure Constant (α)
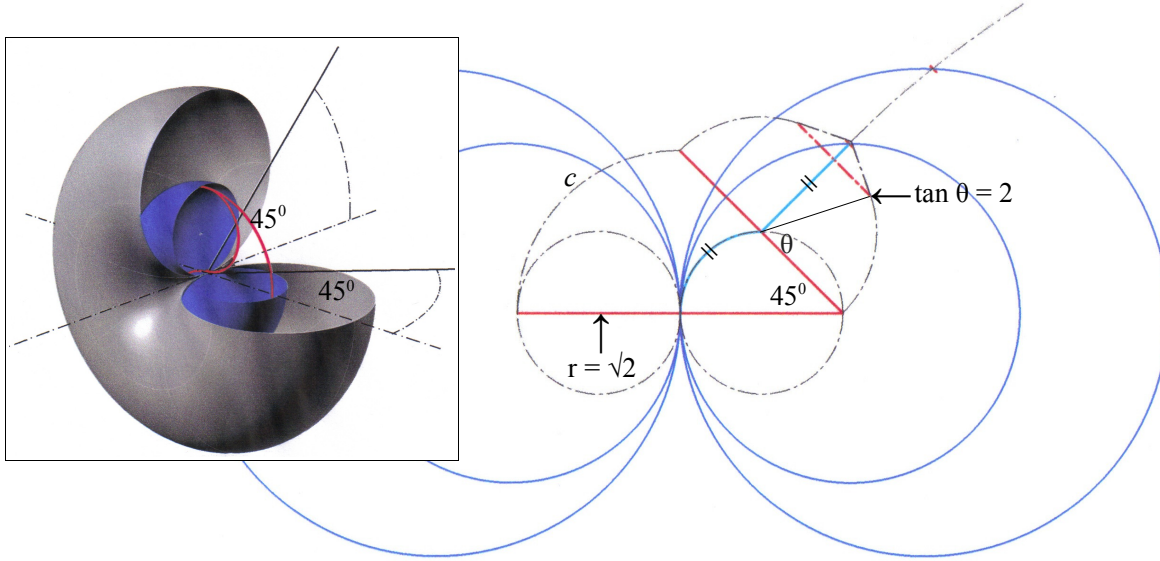
This shows how space is created along with a prototype particle. The first particle formed (a string having the the yin yang shape shown below which spins at c, the velocity of light) creates two hinged copies that stop at 45^0 (only one is shown). They then emit copies which follow a circular pattern of reduction at the same velocity as the centers of the first copies ($1/2$ c), stopping when they have traveled the same distance ($\pi\sqrt{2}/4$). They also begin drawing out space from the torus. At $\tan\theta = 2$, they must follow a linear pattern of reduction so that c is not exceeded. They then emit third copies with the remaining distance to the apex being $\csc\theta - \pi\sqrt{2}/4 = .007313 = 1.0022\alpha$. As their internal structure prevents them from reducing to points they each emit a particle. The third copy recoils into the second and the second into the first, which remains there along with the beginning particle until the universe ends, whereupon it launches two more particles. They are electron-like but the magnetic moment anomaly and g-factor are not at play here as there are no photon-electron interactions. Since α is divided by π in formulating the g-factor, this operation should be reversed here. Multiplying α by 1.0023, the amount that the integer -2 is multiplied by to obtain the g-factor, gives .007314, an accuracy of 1 part in one million. (Enlarge to see the second copy.)

Special Relativity
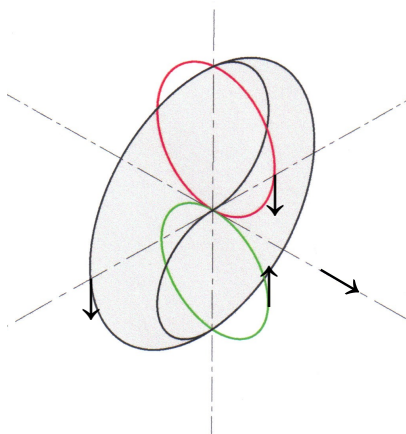
The diagram shows a particle simplified for ease of visualization. The points on the strings are superposed in space, which only interacts with the center point to provide energy for its internal spin. The black string spins at c at the perimeter while the green loop has a flow which spins the black string at c perpendicular to its plane of rotation while fixed to its perimeter. Together they define the particle's mass at rest. It is apparent that if this assembly moved it would violate relativity because of the black string's spin at c in the direction of motion, so the the red loop opposes the green loop's spin, increasing in strength as the particle accelerates and slowing both spins (green and black) by the Lorentz factor. This adds to the overall mass of the particle which in turn makes it more difficult to slow, leading to an exponential increase in mass. The rotation of the black string is equivalent to a clock with a countable number of rotations as increments of time and in some cases (e.g. muon), a set number before decay occurs. A photon consists of two of these structures in a transverse configuration but it has no time mechanism since it rotates perpendicular to its direction of motion, free to travel at c (see next page).

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1/2–Spin Particle
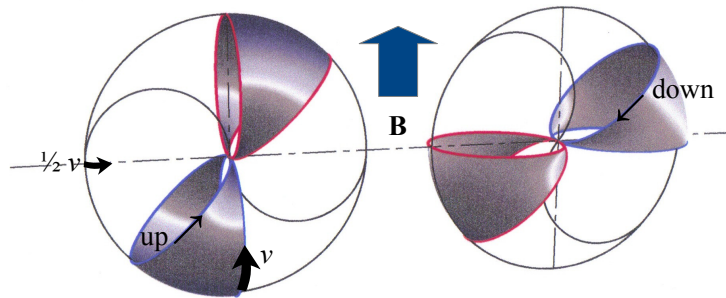
The up and down spins of a ½-spin electron. The shading in this and the following diagrams are for clarity. The blue loops, along with the black string comprise the rest mass while the red loops add relativistic mass by opposing the spin. Normally the loops are fixed to the spinning perimeter so the up and down spins are simultaneous, but in a magnetic field they disengage to align parallel or perpendicular to the field while the black string continues spinning. The symbol v denotes the velocity of the spin which is less than c, depending on the amount of relativistic slowing.
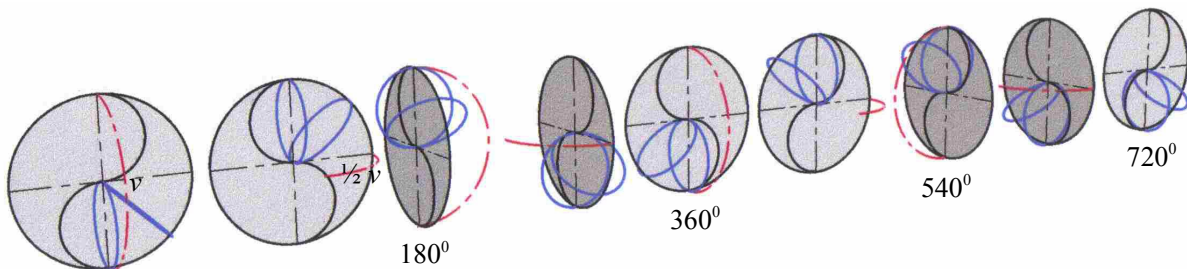

A schematic of the 720^0 rotation required to bring a ½-spin particle back to its original state. The slowing loops are not shown and the red dashed lines show the rotations. The first two in the series occur simultaneously to form the first 180^0 rotation.
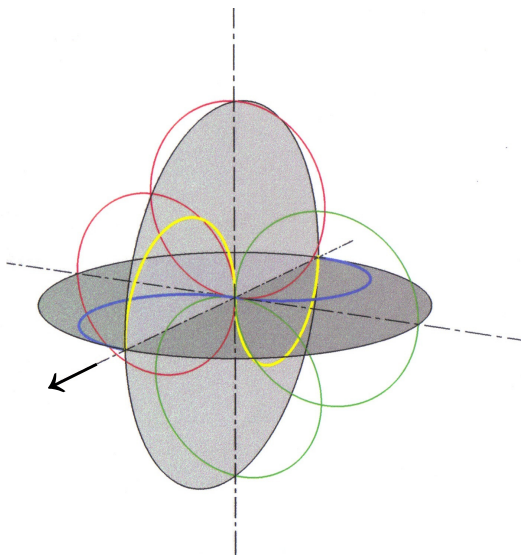
Photon

The blue and yellow strings comprise the energy of a photon. The green loops rotate the photon while the red ones lock it into a polarity. The loops also control the amplitude.
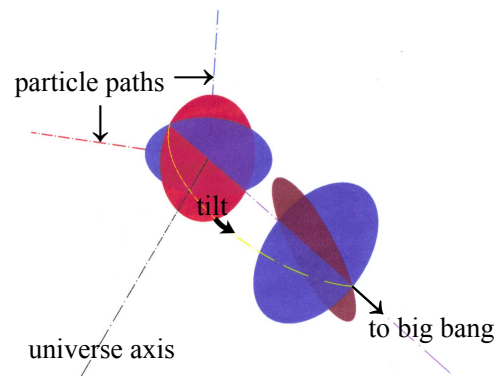
The two particles that meet prior to the big bang have all spins slowed to a stop. They combine to form a photon which tilts as it continues away from the axis at c while the loop spin resumes perpendicular to the direction of motion so that c is not violated.