

Sole Author: Solomon Budnik,
8/16 Harzfeld St, Tel Aviv 67530, Israel
Tel/Fax: (972-3) 7399645 Mobile: 054-7225389
Mobile from abroad: 972-54-7225389
Email: budnik1@013.net
s.b0246@gmail.com

THEORY OF TRANSITIONAL UNIVERSE

(NEW MODEL OF SPACE-TIME)

Article copyright © 2013 by Solomon Budnik. *All Rights Reserved*

MATTER AND TIME

Contents:

1. Abstract
2. Introduction
3. Matter and the Universe
4. New space-time model
5. Concept of Time
6. Conclusion

1. Abstract

This is a theory that makes macroscopic predictions based on the principle of duality as universal constant in space-time continuum, which is *finite in its infinity* due to integrated horizon and inherent reverse polarity.

It implies that there is an absolute frame of reference in our **uniform double cone space-time model** (as observed in cosmos) which shows that the state of our universe is a deterministic function of its previous state of a primordial universe where the rotating mass of first order extended in our universe to second order in the angular momentum.

Locality assumes that the current state of space-time is determined by the states of a fixed number of previous time steps. Discretized difference equations use at least the current and previous time steps if they are second order systems like the wave equation. **Physical quantities come in pairs** which are called *conjugate quantities*. According to quantum mechanics, under some conditions, **a pair of quantum systems may be described by a single wave function**, which encodes the probabilities of the outcomes of experiments that may be performed on the two systems, whether jointly or individually.

It means that space-time is not flat per Einstein-Minkowski and that there couldn't be a singular event of a Big Bang due to a single, primitive force ("primeval atom"), which allegedly caused a sudden "birth" of space-time without a preceding event -- past "conception" of our universe in a primordial universe. Accordingly, our 4D time-space model comprises a cross-like string structure with an integrated spiral timeframe that enables no analogy spacecrafts to traverse space unimpeded, as described in this article.

2. Introduction

"We have a complete inventory of the universe," Sean Carroll, a California Institute of technology cosmologist, has said, **"and it makes no sense."**

And it is obvious now that the previous cosmic model didn't actually integrate time, for it wasn't a space-time model per se, but a limited comprehension of the space-matter-energy correlation with wrongly perceived light-gravity-time interaction: there can't be gravitational bending of light and time delay in non-visible cosmic spectrum (which is 95% of our universe) and in the anti-gravity field of the galaxies. So the observed effects of quasi gravitational lensing of *Einstein ring* (in fact diffraction of light per position-momentum uncertainty principle) and the *Shapiro delay* should be rightfully attributed to the Faraday rotation and relative phase shift in the interstellar medium, the **Coanda effect** and shift, and the superposition, dispersion and deflection (echo) of the manmade radar beams radiated in the multi-radiated cosmos.

Moreover, light is an inhomogeneous wave (not uniform) and cannot be bent as such by the gravity. Light can indeed deviate from its rectilinear path due to "ray-optics" limit (geometrical optics) and due to nonlinear self-oscillation and *chaotic interference* of the particles in analogy with the free-electron-laser chaos; under such conditions the time delay can actually take place.

So the shape of the universe is a matter of debate in physical cosmology over the local and global geometry of the universe which considers both curvature and topology, though, strictly speaking, it goes beyond both.

The Big Bang theorists have overlooked the **Coriolis**, **Doppler** and **Chladni effects** in the universe, as revealed in this article to proper explain the rotation and expansion of our universe.

So we present here a new space-time model with a 4-dimensional **double cone structure** of our universe (successor of primordial universe), confirmed by natural phenomena (as elaborated below) which negates the Big Bang theory.

In re: the **Λ CDM** or **Lambda-CDM** model is a parameterization of the Big Bang cosmological model in which the universe contains a cosmological constant (usually denoted by the Greek capital letter lambda: Λ), which is supposed to be equivalent to the energy density in otherwise empty space. It was proposed by Albert Einstein as a modification of his original theory of general relativity to achieve a stationary universe. Einstein abandoned that concept since Hubble redshift indicated that the universe might not be stationary, contrary to Einstein's idea that the universe is unchanging.

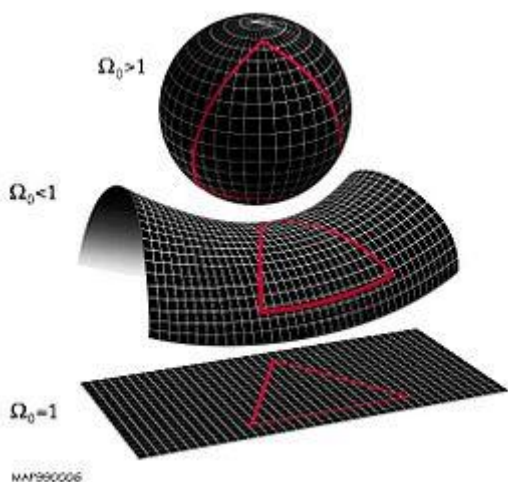


Fig.1

Shown in fig.1 is the common local geometry of the universe which is determined by whether the density parameter Ω is greater than, less than, or equal to 1. From top to bottom: a spherical universe with $\Omega > 1$, a hyperbolic universe with $\Omega < 1$, and a flat universe with $\Omega = 1$.

Scientists reached a consensus that there was more to the universe than meets the eye. In computer simulations of our galaxy, the Milky Way, theorists found that the center would not hold. Based on what we can see of it, our galaxy doesn't have enough mass to keep everything in place. As it rotates, it should disintegrate, shedding stars and gas in every direction.

So to advance our knowledge, a detailed study of the cosmic space has been made and elaborated in this article from a different perspective to supersede the Big Bang and Steady State concepts and modify the special theory of relativity based on new notions and discoveries in an attempt to unify Einstein's theory of relativity and the revolution of quantum mechanics.

Accordingly, we present here a new space-time model – a tandem of primordial and current universes coupled at their narrowest double cone points.

Said tandem universes represent the duality of nature, as is the space-time notion and the wave-particle duality of matter.

As the distance between galaxy clusters is increasing, it is inferred that everything was closer together in the past, since galaxies and clusters have an apparent velocity directly away from our vantage point.

There was previously little evidence regarding the absolute earliest instant of the expansion. That concerns also the Big Bang (BB) concept which cannot and does not provide sufficient explanation for such an initial condition; rather, it tries to describe the supposed evolution of the universe from that point on. The Big Bang idea and model is based on the observation that galaxies seem to move away from the earth, and that radiation comes from the point where the Big Bang supposedly occurred as the alleged creation of our universe.

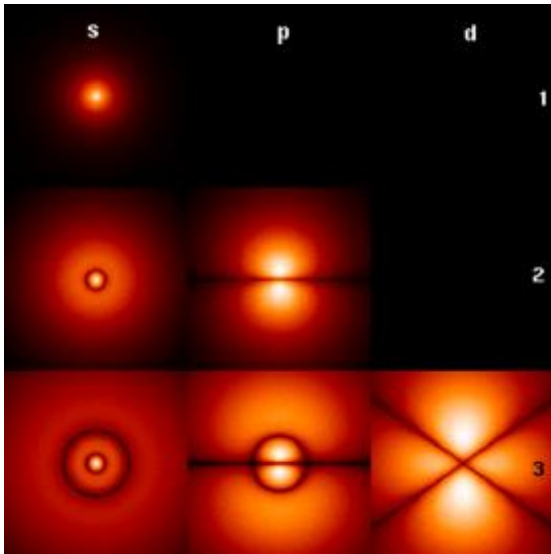
The BB theory doesn't explain how the pieces of matter that had never been in contact with each other have come to equilibrium at the very same temperature and then experienced an incredible burst of expansion called "inflation." For that inflation to have taken place, the universe at the time of the Big Bang must have been filled with an unstable form of energy whose nature is not yet known and which had allegedly led to the clumping and ignition of matter, with no explosion.

This is a wrong celestial theory, for there couldn't be a **dimensionless propagation constant** and equal mass distribution of matter forced to spread by the alleged quantum noise (?!).

The Big Bang is believed to have produced equal amounts of matter and antimatter. However, whenever matter and antimatter meet, they annihilate in a burst of gamma rays, so the BB theory suggests that both matter and antimatter annihilated long time ago, and the universe should consist today just of radiation.

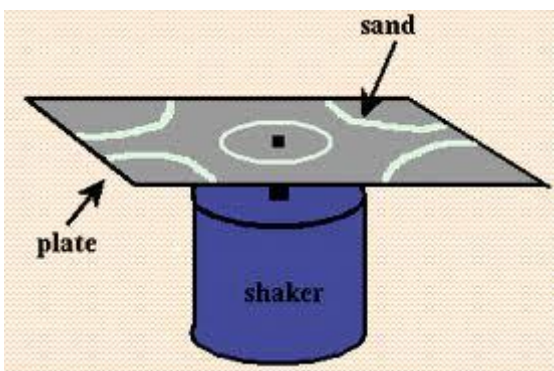
Said erroneous assumptions can be disproved, for there were no volume dimensions or directions in the void (empty cosmic space), since it had no boundaries, and if it had had, the shock wave of the BB would have bounced back, dispersed and destroyed the cosmic matter.

Accordingly, what the San Diego astronomers considered in 2005 to be the **vestiges of sound waves** that allegedly rumbled through the universe after the Big Bang, was in fact the echo of the BB, and this corresponds with my **new theory of acoustics** (see my book “The Absolute Tone”) where sound waves have actually not linear but spiral form of propagation, and that could be the only form of propagation in space. That space shockwave must have spread the matter and gave its spiral shape to the formation of galaxies, for a spiral is the best shape to conserve energy and resonate its elements. So we might less consider the annihilation and decay of elementary particles, but concentrate more on their **resonance** in space-time in a Chladni-like effect based on quantum mechanics of the dual *particle-like* and *wave-like* behavior and interactions of energy and matter, as in **Förster resonance energy transfer** (ill. 1).



(Ill. 1. Probability densities corresponding to the wave functions of an electron in a hydrogen atom possessing definite energy levels (increasing from the top of the image to the bottom: $n = 1, 2, 3, \dots$) and angular momenta (increasing across from left to right: s, p, d, \dots). Brighter areas correspond to higher probability density in a position measurement. A wave functions like these are directly comparable to Chladni's figures of acoustic modes of vibration in classical physics, and are indeed modes of oscillation as well, possessing a sharp energy and, thus, a definite frequency. The angular momentum and energy are quantized, and take only discrete values (as is also the case with resonant frequencies in acoustics, ill. 2, 3 below)

Compare the ill. 1 above images with the Chladni plate acoustic effects (ill. 2, 3):



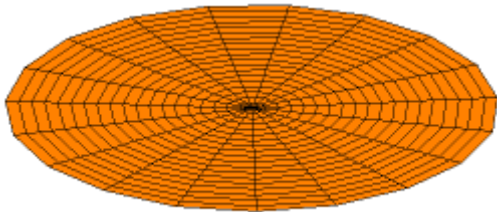
(Ill. 2,



3)

Having this in mind, we can construct a disc-like spacecraft with a Chladni plate effect, where the atomic reactor in the center of the rotating disc would generate charged particles resonating in a modulating unison of specific frequencies amplified by the applied magnetic field and accelerated in circular grooves of particles accelerator on the surface of the disc-craft, leaving behind a whirlpool of matter and propelling the craft in space like a Frisbee. (*Patent rights for this spacecraft's design and propulsion belong to the author, Solomon Budnik*)

In re: **Effects of tune modulation on particles trapped in 1D resonance islands**,
FERMILAB October 1993: experimental data obtained at Indiana University Cyclotron Facility for the 4th order resonance islands has confirmed this characteristic feature. The beam, driven by betatron tune modulation, was observed for the first time to travel from near the center of resonance islands toward the separatrix. The experimental data are characterized by the onset of large response at a critical modulation amplitude and frequency, which are compared with theoretical models).



☞(Ill 4. Chladni effect: vibration of a single normal mode of a circular disc with a pinned boundary condition along the entire outer edge)

3. MATTER and the UNIVERSE

Galaxies and clusters have an apparent velocity directly away from our vantage point, but directly toward the other vantage point at a distant planet, if inhabitant.

So the pertinent question here is: how the expansion of the observable universe began with the explosion of a single particle at a definite point in time if all the matter in the universe was packed together in an extremely dense state per Big Bang theory of Georges Lemaître, previously predicted by Alexander Friedman?

What was the force that propelled primordial matter to that tiny spec in the open space, and how that space could be without a previous universe, what magnetic field, gravitational force and pull could attract matter? That universal force had to be supercharged to attract large amounts of matter from all directions, and that would be impossible if primordial matter would have consisted just of a small quantity of weak subatomic particles of short range propagation. That baby matter couldn't be attracted by primordial nuclei due to the absence of sufficient pull, and it would also be impossible in the absence of primordial gravitational force prior to Creation.

The Big Bang idea discredits itself, for if all the matter was at one place without induced pressure and heat, it would had led to the disintegration of low energy particles in a *spontaneous broken symmetry* when a system possessing a certain symmetric property collapses into a vacuum state (lowest possible energy) that does not possess symmetric property. That would have been a *metabolic energy collapse* (in terms of biology), meaning that a high energy demand

to supposedly make a big bang, would had lead to the metabolic collapse of matter as a creating organism.

It means that our universe is not homogeneous, for it is comprised only of 4.9% of the ordinary matter, with the rest consisting of dark matter and dark energy.

So far, no one had properly explained the birth of the universe, how the matter was created in the void prior to the BB? But every natural birth requires two attracting forces of opposite charge. Same concerns the creation of primordial universe in its successive stages of Creation in space where. **LQG (loop quantum gravity)** predicts that not just matter, but also space itself, has an atomic structure.

So let's envision the dual protomatter in space, Adam and Eve – two icy-material **loops**, consisting of a few light nuclei along with free protons and electrons that produced non-zero magnetic field.

The entropy of primordial universe was very small, but its small temperature, as in **de Sitter empty phase**, allowed for fluctuations into a proto-inflationary configurations: A&E loops started to melt due to internal **magnetic fluctuations** and produced two uniformly suspended vertical threads of matter of opposite charge, repelled in anti-gravity (antimatter repels matter with the same magnitude as matter attracts matter) and encircled at their middle sections by the magnetic field. (Creation, stage 1, fig.2, **zero curvature**).

Adam & Eve (A&E)

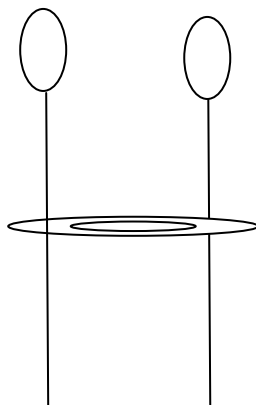
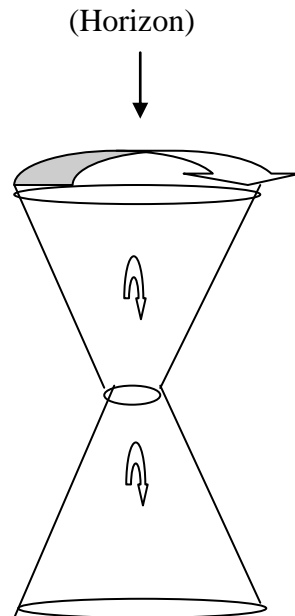


Figure 2

It is assumed that A&E had infinitesimal length (per microscopic nature of matter) and **Uniformly Distributed Density** with constant magnitude over differential length in vertical equilibrium. Compare our A&E model above with the recent experiment made by Dr. Igor Smolyaninov and his colleagues of the University of Maryland who used nanoparticles of cobalt and suspended them in kerosene. They then applied a magnetic field which, thanks to cobalt's ferromagnetic nature, arranged the particles into thin columns. In space-time terms the length of the columns is time and the two axes perpendicular to the length represent the three spatial dimensions in a real universe.

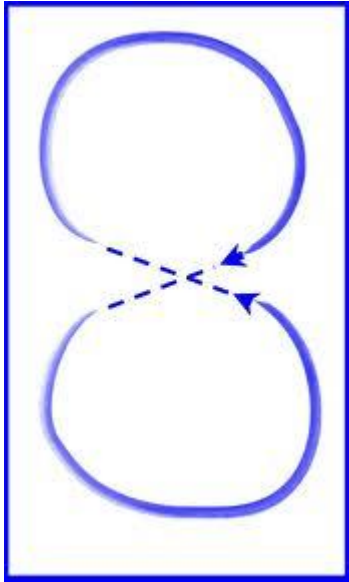
Those icy A&E were infinitely thin building blocks of matter, infinitesimally denoted ∞ in area calculations, as per John Wallis' calculus. Those primordial threads of matter must have had intrinsic magnetic properties with **spin ice monopoles** -- a north and south monopole. "Evidence for magnetic monopoles in spin ice shows predicted neutron scattering data" says Prof. Steve Bramwell of the London Centre for Nanotechnology, "in particular we have measured the monopole charge and observed monopole currents analogous to electricity. We have also used neutrons to measure the length of the so-called **Dirac strings** that run between North and South monopoles. The research shows how certain real materials, in this case spin ice, create within themselves things that resemble the basic particles by which the universe is composed. "The amazing thing about spin ice monopoles continues Prof. Bramwell, "is how perfect they are: they really do look just like those monopoles expected to exist somewhere in the universe. Why nature should reproduce a mini-universe within a material, we do not yet know".

The magnetic field around Adam and Eve' "waist" had then configured them to a double-V structure, which then **rotated** and accumulated mass and volume to become the double cone space-time structure (fig. 3 below).



(Fig. 3, Creation, stage 2, double cone space-time model with a curved horizon due to rotation and inflated gases, and showing the downward movement of matter due to Coriolis effect in both universes)

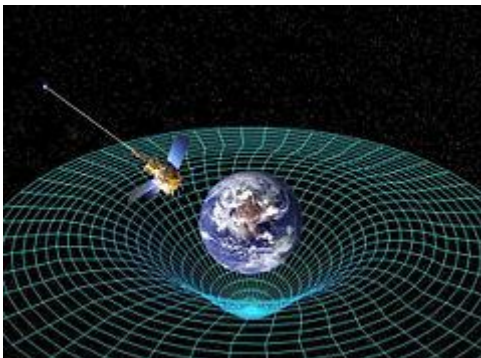
In fact, said double cone structure has a infinity projected 8-contour (fig. 3A), representing the corona of matter where energy circulates in a **Möbius band** (superconductive and polarized under magnetic field) in a partially visible and mostly invisible spectrum (dark energy in our universe), and where the inverse time-space travel is possible around double cone universes. (Charged particles that have been caught in the magnetic field of the earth can move on a Möbius band)



(Fig 3A)

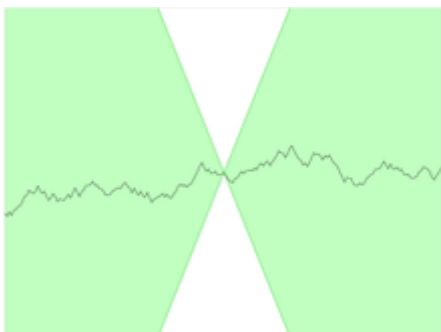
Re: in 1950, astronomer Bierman proposed that the centrifugal force generated in a **rotating plasma cloud** will separate out heavier protons from lighter electrons, thereby creating a separation of charge that leads to tiny electric and magnetic fields.

So, the rotational moment of our double cone universe created the first **horizon** (fig. 3 above) **and negative curvature of space** in the top cone (ill. 5 below).



(Ill. 5)

Thereby induced vortex attracted distant matter and forced it downward the top cone by Coriolis force in **Lipschitz continuity** (ill. 6 below) where the outside magnetic field is still in action, encircling/preserving that structure in its narrow middle coupling.

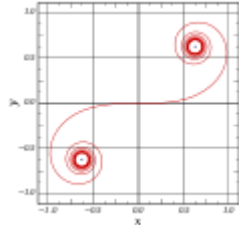


(Ill 6)



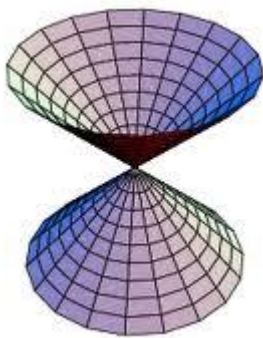
(For Lipschitz continuous function applied to a magnetic field there is a double cone (shown in white) whose vertex can be translated along the graph, i.e., the magnetic field always remains entirely outside the double cone. universal structure)

More to the notion of cosmic birth. Spiral form of each galaxy resembles an embryo with a quasi umbilical cord (**conic spiral**) spiraling toward the neighboring galaxy (ill. 7)



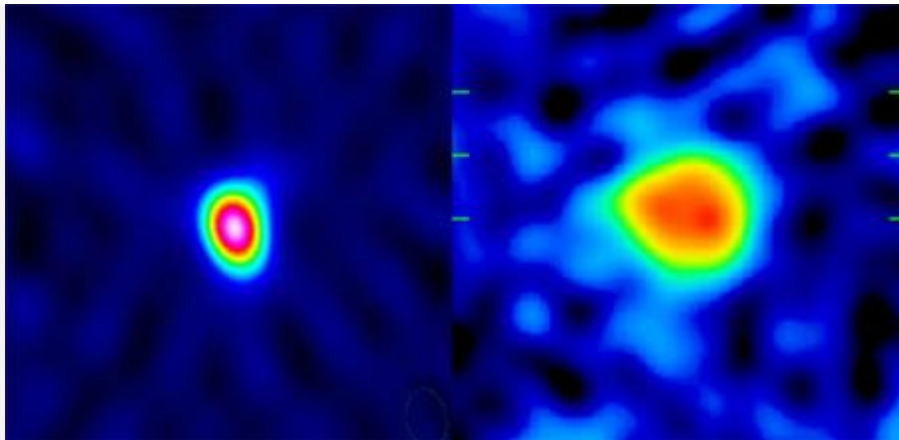
(Conic spiral, ill.7)

in a higher or lower part of the universe, per our double cone criss-cross like matrixes in two universes (ill. 8 below).



(ill. 8)

There, space occupied by a galaxy is limited by its dimensional frame or the grid system, as a certain energy barrier or boundary in space, separating the galaxies from each other (ill. 9).



Sn1987/Betelgeuse

(Ill. 9. A supernova and a star plugged into the cosmic grid)

From the medical biology we know that polymer gels coil and recoil under applied electric current, so a similar process must have taken place in the galaxies subject to the magnetic field which had made them coil initially (contract) to sustain energy and then recoil (expand) in space-time continuum. (Compare with the mechanical device of a coil spring, which is typically used to store energy due to resilience and subsequently release it to absorb shock, or to maintain a force between contacting surfaces)

Hence, the downward spiral movement of matter in the funnel-shaped top cone (negatively curved space) of primordial universe reminds the fall of sand in a common sand clock, with the difference that the sand just falls linearly under gravity, while cosmic structures have a rotational moment with a Coriolis Effect.

Space tunnel between the connected cone universes in our model acts as a **separatrix** - a boundary, separating negative and positive modes of the behavior of matter (behavioral cosmology). Strong electric fields exist inside the separatrix region where the electric potential drops, enabling the transition of matter from the negative charge in the top cone to the positive charge in the bottom cone of our double cone cosmic model.

We deal here with a new notion of *forward cosmic osmosis*, which is an osmotic process via a semi-permeable magnetic field membrane to force the separation of the antimatter from matter. The driving force for this separation is an osmotic pressure gradient, such that high density "draw" induces a net flow of particles through that membrane into our universe, thus effectively separating the antimatter from matter, with flux depending on the magnetofluid dynamics within the process itself set by the nonlinear evolution of these instabilities. It is argued that cosmic plasmas are "three-scale systems," comprising global dynamics, mesoscale turbulence and microscale plasma fluctuations. The astrophysical example of cool cores of galaxy clusters is considered and it is noted that the turbulence in clusters is in a marginal state with respect to plasma microinstabilities, and so it is the plasma microphysics that is likely to set the heating and conduction properties of the inter-universal medium in our double cone structure.

(See kinetics of channelized membrane ions in magnetic fields: cyclotron resonance model for channel ion transport in weak magnetic fields. It is consistent with another reported phenomenon, that of quantized multiple conductances in single patch-clamped channels).

Chaotic dynamics of the Bianchi IX universe in Gauss-Bonnet gravity including a higher curvature mode might be applicable here. The presence of a cosmological constant creates a critical point of a **saddle type** -- spiral matter centered in the phase space (coupling joint) in our double cone system. The orbiting gas starting from a neighborhood of that separatrix had evolved toward the critical point and eventually expanded in both cones, but first in inflation in the top cone due to rotational mode of spatial phenomena, showing directional effects. (Rate of inflation can be calculated by **Fibonacci ratio**)

4. New space-time model

The a.m. enables us to assume that the **negative primordial matter** coiled clockwise in the downward rotational Coriolis acceleration (ill. 10 below) in the top cone of our new space-time model,



(ill. 10)

then passed in continuous acceleration via frame-drag vortex and recoiled counterclockwise as the **positive matter** in the bottom cone of our universe in currently observed expansion in constant acceleration. Mass creates gravity, gravity creates pull, the pulling must slow the expansion, but the galaxies do expand and accelerate due to the **Coriolis Effect** in our double cone model and not due to the alleged dark energy or dynamic fluid that pushes galaxies apart, as previously wrongly presumed.

The observation that the light of the galaxies throughout our universe is redshifted is due to the **Doppler Effect**, which reveals that the galaxies that are farther away are more redshifted than closer ones. It seems that not only are all the galaxies in the universe moving away from us, the farther ones are moving away from us are the fastest due to the **Coriolis Effect**.

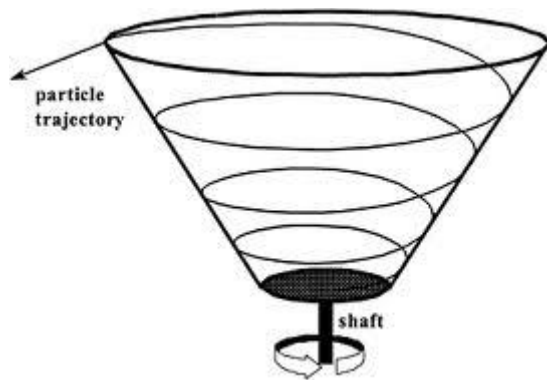
So in our space-time model the universe had changed its charge from antimatter in the top cone to matter in the bottom cone, with no annihilation but in transfusion of energy, showing anti-neutrino remnants and beta decay that some considered the result of the Big Bang. That answers one of the pertinent questions in antimatter physics: “why is our universe made almost entirely of matter?”

Because there was the **antimatter universe** prior to our universe, and that’s why no antimatter has been found in our universe, for the antimatter is not precisely the three-coordinate mirror image of matter; there is in fact a small flaw in the symmetry, repressing a *discrete symmetry* which flips a system from one state to another. This symmetry doesn’t have corresponding conservation laws, so per particle physics this explains the **transition** of antimatter in the top cone primordial universe to matter in the bottom cone current universe in our model.

“Our goal is to catch the moment when a system ceases to be quantum and becomes classical. This transition from one world to the other is called *decoherence*. It happens because the coherence of the system is somewhat disturbed by its macroscopic environment which forces it to take an unambiguous stand in the classical realm.” (Serge Haroche, 2012 Nobel Prize in Physics)

Nota bene: Coriolis Effect in our model was caused by rotating primordial universe, as it occurs on earth, and that force is responsible for the transition of primordial universe to its current stage as our universe. Our idea of the first universe of antimatter is confirmed by its clockwise rotation in the top cone in our model, since negatively charged particles move in a clockwise orbit. And the fact is that our universe and galaxies rotate counterclockwise.

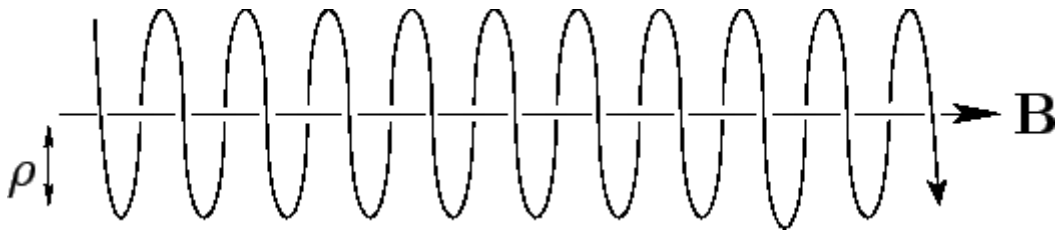
Our new space-time model represents the structural duality, polarity and rotation of the double cone system caused by its rotating cone structure, as it happens in rotating cone’ reactor on earth (fig. 4 below).



(Fig. 4)

Drift of a **spiral** wave of matter in the top cone of our space-time model is induced by the magnetic field directed downwards within that cone. (In re: a proton moving at 5.0×10^4 m/s horizontally enters a region where a magnetic field of 0.12 T is present, *directed vertically downward*)

And we know that charged particles in a magnetic field always accelerate *perpendicular* to the particles' instantaneous direction of motion. The combination of circular motion in the plane perpendicular to the magnetic field, and uniform motion along the direction of the field gives rise to *spiral* trajectory of a charged particle in magnetic field, where the field forms the axis of the spiral (fig. 5).



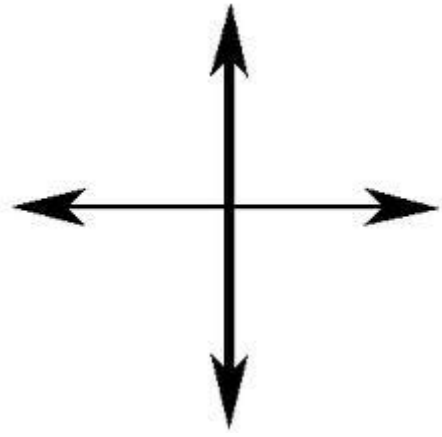
(Fig. 5)

Our claim that the universe rotates from its creation is confirmed by a team of scientists from the University of Michigan led by Michael Longo, while exploring the direction of rotation of 15 872 spiral galaxies, came to the conclusion that our universe may have been rotating about its axis as whirligig from its birth. In addition, the studies of the Americans actually disprove the hypothesis that the universe is isotropic and symmetric.

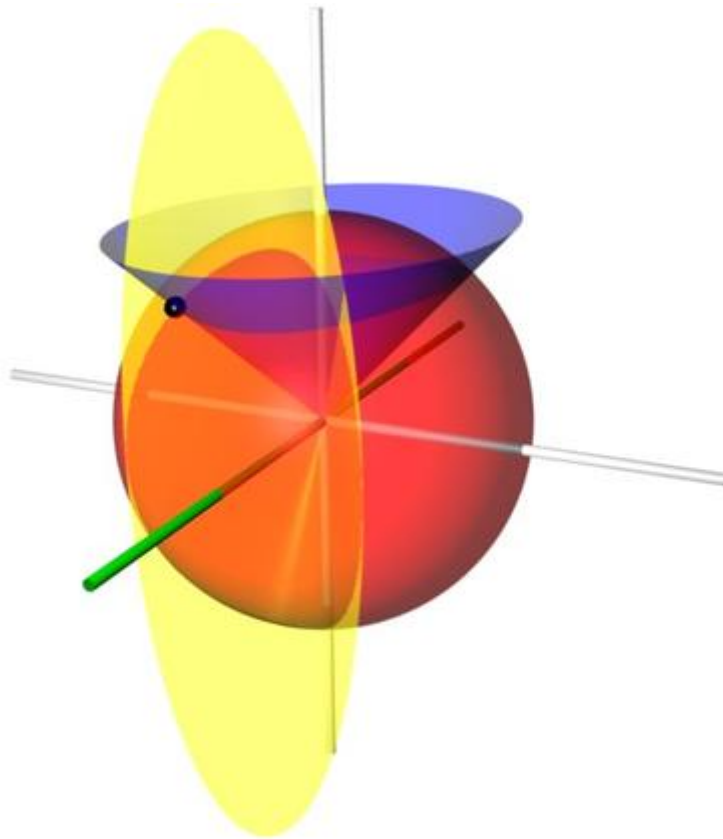
That research was conducted as a part of Sloan Digital Sky Survey (SDSS). At first, scientists tried to find evidence that the universe has the **properties of mirror symmetry**. In this case, they reasoned, the number of galaxies that rotate clockwise and those that are "twisted" in the opposite direction, would be the same.

However, it turned out that towards the north pole of the Milky Way counterclockwise rotation among spiral galaxies is dominant, that is, they are oriented in the right direction. This trend is visible even at a distance of more than 600 million light years.

This substantiates our space-time model of the expanding current universe, which rotates counterclockwise in the bottom cone of its cosmic frame. Accumulated knowledge enables to envision a universal structure where strings of matter constitute a quasi cross (fig. 6) within Cartesian conical coordinates (fig. 7 below).



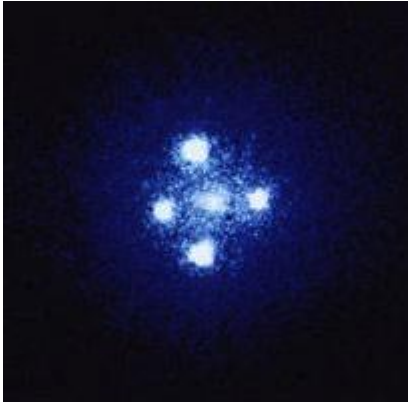
(Fig. 6, *string theory* might be applicable)



(Fig. 7. Coordinate surfaces of the conical coordinates)

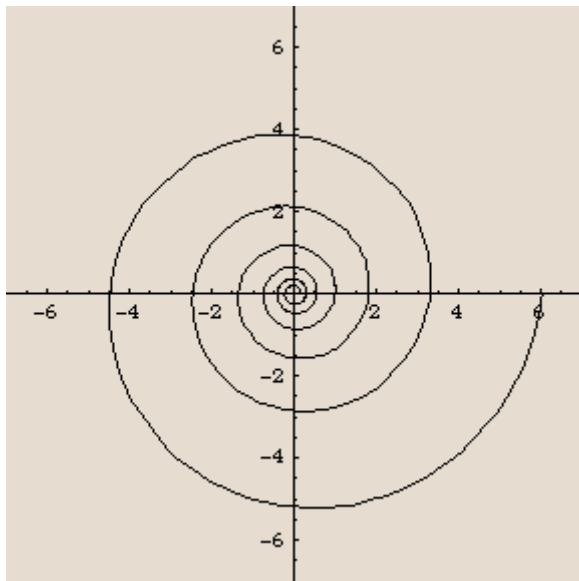
In reality, both lines don't cross, for strings of matter do not intersect, and this structure is composed of four aligned "L"-shaped parallel angular structures at 90 degree angle, constituting a combined cosmic system with integrated energy channels. This structure gives matter its angular momentum along **quantization axis**, with polarization vector of orthogonal projections of subatomic particles (see ill. 16 below).

Our cross structure of cosmic strings (fig. 6 above) has its actual confirmation in *Einstein cross* (Twin Quasar Q0957+561, ill. 11) which doesn't show a gravitational lens effect but pictures a cross of vertical and horizontal strings of matter with condensed plasma at the cross-point and at the ends of the strings, like the St. Elmo's light effect on earth.



(Ill 11. Using the Hubble Space Telescope, a friend of Halton Arp documented that quasar D (right side of photo) is physically connected to the nucleus of the galaxy. Later, a high redshift connection was discovered between quasars A (bottom) and B (top) which passes in front of the connection between the nucleus and quasar D)

To further substantiate our new theory, we show that our criss-cross string structure has an integrated space-time dimension at its cross-point in the form of **logarithmic spiral** (ill. 12 below) whose center represents the disc-core of the time-energy spiral, and that explains the flatness of its rotation curve, as in barred spiral galaxies (ill. 13 below)



(III 12,

13)

There (ill. 10 above), the sideways directed gravitational pull at the **nodes*** of the horizontal string of matter under supertension contracts space-time toward the center of that spiral (*a curve on a plane that winds around a fixed center point at a continuously increasing or decreasing distance from the point*), while the sideways directed gravitational pull at the nodes of the vertical string expands space-time backward per **inverse-square law** in proportional quantity and intensity, forcing the **spiral time-energy field** to coil and recoil as a pulsating perpetual structure (compare with a pulsar), securing thereby the eternal space-time continuum. (Certain types of pulsars rival atomic clocks in their accuracy in keeping time).

(*For example, in a vibrating guitar string, the ends of the string where the wave has minimal amplitude are **nodes**. By changing the position of the end node through frets, the guitarist changes the effective length of the vibrating string).

The elapsed time in the moving spiral frame will appear shortened or lengthen in the direction of motion, i.e., contracted or expanded in a linear transformation, including the rotation of space.

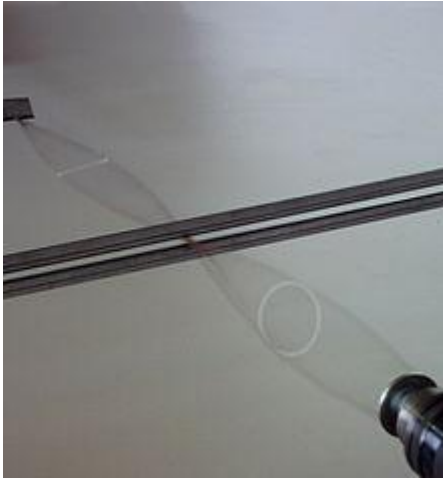
A.m. strings of matter might be vast **standing waves** in which the distribution of field strength is formed by the superposition of two waves of the same frequency propagating in opposite directions. The effect is a series of nodes (zero displacement) and anti-nodes (maximum displacement) at fixed points along the energy transmission.

In re: Ken D. Olum, J. J. Blanco-Pillado

(Submitted 19 Oct 1999)

“Abstract: We have simulated large-amplitude standing waves on an Abelian-Higgs cosmic string in classical lattice field theory. The radiation rate falls exponentially with wavelength, as one would expect from the field profile around a gauge string.”

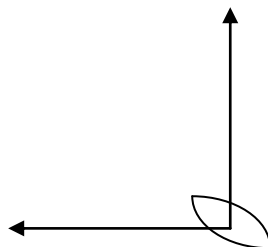
So the discussed here double cone universal model was initially composed of the perpendicular strings of matter that acted *in coherence* as standing (stationary) waves with ideal property that enabled stationary (**primordial spatial constant**) interference of said two waves added together to create a wave of greater amplitude in *constructive interference*. That cosmic tsunami had excited primordial gases trapped and condensed by the strings of matter and created thereby the **packets or blocs of matter** to constitute the first, upper cone universe in our double cone model, as in ill. 14:



Ill. 14. Polarization on rubber thread. (Circularly→linearly polarized standing wave.)

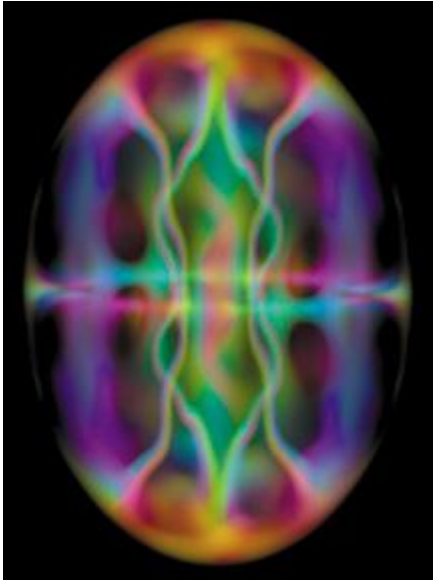
One might ask how the gravitational pull was created in the strings of matter pointing in opposite directions, with no external force or point of attraction. The answer is that we deal here with the **warps of matter** as the set of lengthwise streams of particles held in opposing tension in said strings and **twisting** around those strings of matter, as a certain metal encapsulates a violin string in a spiral. Our warp concept is supported by a practical experiment conducted by Professor Sergey Lebedev's team in the Department of Physics at Imperial College London that sent a high-powered pulse of energy into an aluminum disk. In less than a few billions of a second, the aluminum began to evaporate, creating a cloud of plasma very similar to the plasma cloud surrounding a young star. Where the energy flowed into the center of the disk, the aluminum eroded completely, creating a hole through which a magnetic field from beneath the disk could penetrate. The field initially pushes aside the plasma, forming a bubble within it. As the field penetrates further and the bubble grows, however, the magnetic fields begin to **warp and twist, creating a knot in the jet**.

To discuss further the strings of matter constituting the primordial structure of space-time, we come to the notion of **repellent gravity**, as observed in galaxies. Due to anti-gravity in the strings of matter in our model, matter shifts toward the density points at the end of each string. Said strings are “**plugged**” at their low density vertex (fig. 8 below), representing is a **plasma conductor in a vacuum loop**, which can withstand large gravitational pull. Dynamics of plasmas are often the sources of electromagnetic fields. ((Loop quantum gravity might be applicable).

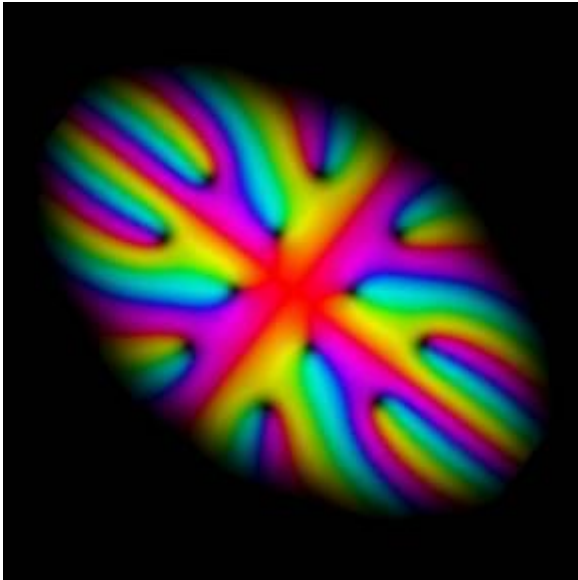


(Fig. 8)

This corresponds with the **superfluid vacuum theory** (SVT), sometimes known as the BEC vacuum theory -- an approach in theoretical physics and quantum mechanics, where fundamental physical vacuum (non-removable background) is viewed as superfluid or as a Bose-Einstein condensate (BEC, ill. 15, 16 below).

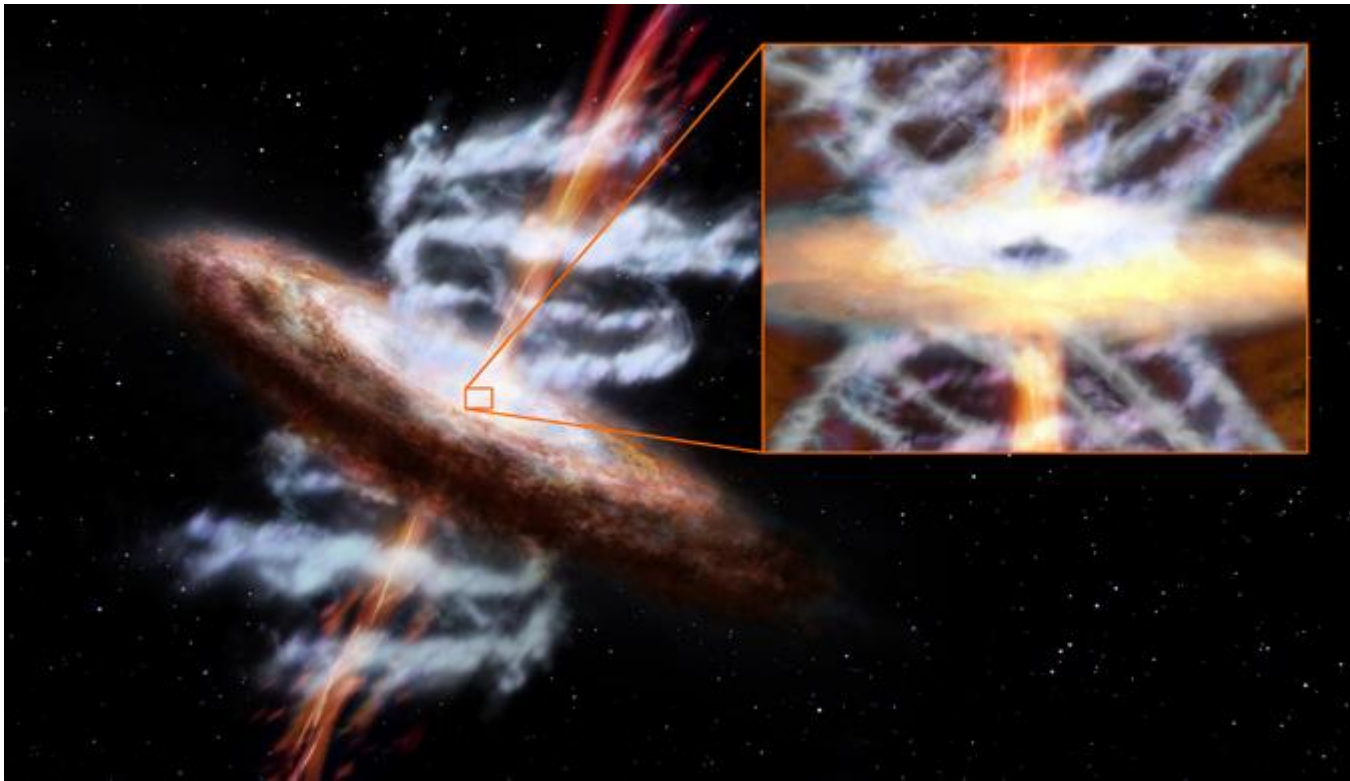


(Ill. 15. Emergence of vortex structure in a rotating Bose-Einstein condensate. From NIST Technology at a Glance, Fall 1999).



(Ill. 16. Twelve-vortex array in a rotating Bose-Einstein condensate) -- **resembles an electric plug.**

So our a.m. 4D space-time model consists of the cross-like strings of matter and a horizontal rotating space-time spiral at their cross-point, inducing its Coriolis Effect upon matter, as perceived in NASA' findings in the black holes (ill. 17 below), thus confirming our assumption of the processes that took place in primordial universe and in our universe still in formation via expansion.

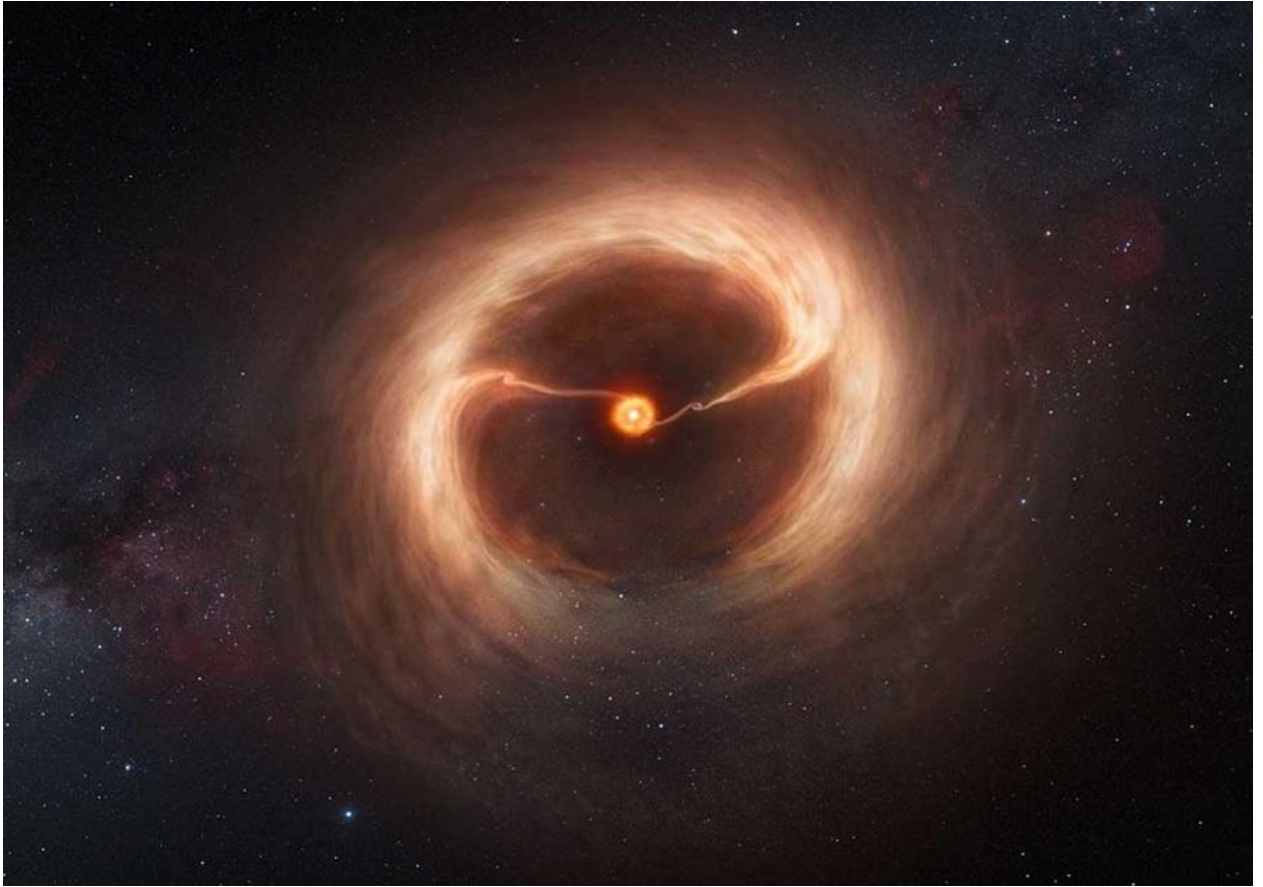


(Ill. 17. The supermassive black holes in active galaxies can produce narrow **particle jets** (orange) and wider streams of gas (blue-gray) known as ultra-fast outflows, which are powerful enough to regulate both star formation in the wider galaxy and the growth of the black hole. Inset: A close-up of the black hole and its **accretion disk**. (Artist concept credit: ESA/AOES Medialab)

“A curious correlation between the mass of a galaxy's central black hole and the velocity of stars in a vast, roughly spherical structure known as its **bulge** has puzzled astronomers for years. An international team led by Francesco Tombesi at NASA's Goddard Space Flight Center in Greenbelt, Md., now has identified a new type of black-hole-driven outflow that appears to be both powerful enough and common enough to explain this link. (<http://www.nasa.gov/topics/universe/features/fast-tflow.html>)”

That a.m. outflows have a double cone shape which might represent the circular polarization of gravitational waves as the reflection of the double cone universal structure, as in our model.

So, we came here to the pertinent question: how the primordial universe was created? We think that matter was attracted from the left and the right to the core of the protouniverse as in ill. 18,



(III. 18)

(This artist's impression shows the disk of gas and cosmic dust around the young star HD 142527. Astronomers using the Atacama Large Millimeter/submillimeter Array (ALMA) telescope have seen vast streams of gas flowing across the gap in the disk. These are the first direct observations of these streams, which are expected to be created by giant planets guzzling gas as they grow, and which are a key stage in the birth of giant planets. *Credit: ALMA (ESO/NAOJ/NRAO)/M. Kornmesser (ESO)*)

thn interacted and was forced in jet streams upward and downward from the nuclei, surrounded by the magnetic field as a cosmic placenta (ill. 19 below)



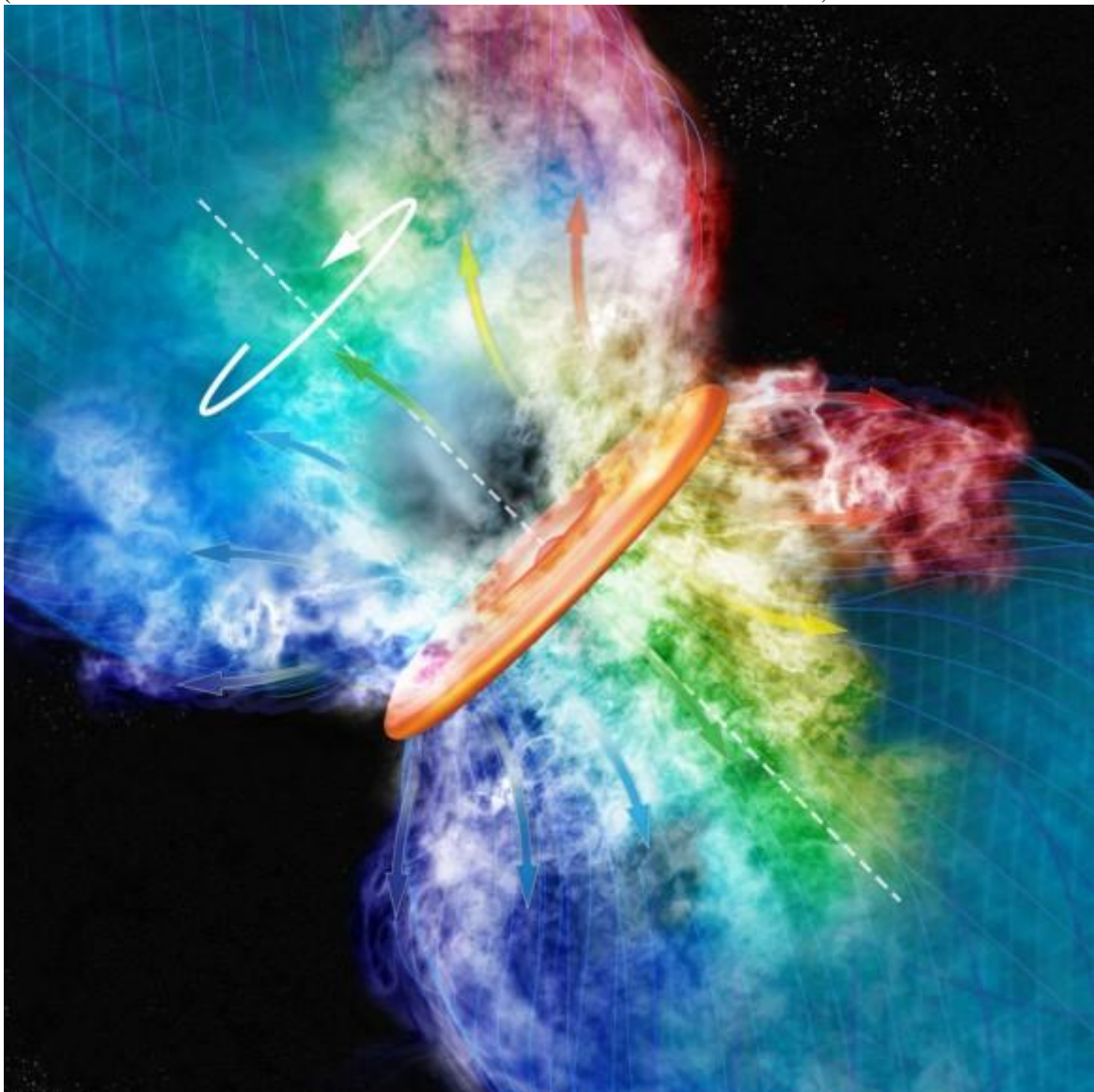
(III. 19)

This could be the effect of the external magnetic field, acting as a containing sheath that is generated by the high-pressure gas, at the same time preventing it from falling apart. These

containment fields have also been observed in similar jet streams spanning more than a million light years from the center of an elliptical galaxy.

In re: An astronomer wrote recently in the journal Physical Review Letters about a new mechanism for the magnetization of the early universe. Before stars formed, luminous matter consisted only of fully ionized gas of protons, electrons, helium nuclei and lithium nuclei. Schlickeiser found that magnetic fields fluctuate depending on their position in the plasma, regardless of time. Electromagnetic waves such as light waves fluctuate over time. The magnetic field in the plasma of the early universe was very weak, but covered almost 100 percent of the plasma volume.

Compare the core image of our protouniverse model (ill. 18 above) with ill 20, below, artist's conception of the "boiling disk" surrounding the massive young stellar object known as Orion (source I. Credit: Bill Saxton, NRAO/AUI/NSF)



(Ill. 20. A two-year look at "proplyds," or protoplanetary disks in the constellation Orion has provided astronomers with a new high-resolution time-lapse movie that reveals the process of how massive star form. The birth of the largest stars has been mysterious, in part, because

massive stars are rare and tend to spend their youth enshrouded by dust and gas hiding them from view. “We know how these stars die, but not how they are born,” said Lincoln Greenhill, a principal investigator for team using radio images) (<http://www.universetoday.com/45151/new-movie-reveals-birth-of-super-suns/>)

Hence, the primordial energy structure might have looked in our view like a system of quasi valves (ill. 21 below) – energy channels to pump (regulate, direct and control) the flow of pre-stellar gases.

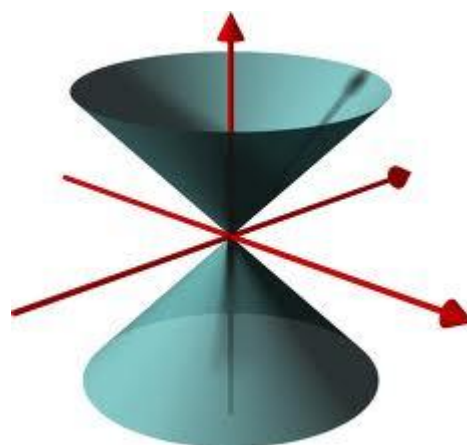


(Ill. 21)

Note that time in our new 4D space-time model is not a simple dimension, as in the light cone model in special theory relativity and Minkowski space-time, which is based on the assumption of a light source and observer on a hyper-surface of the present that doesn't exist in time in our opinion (see explanation below in sec. 5. Concept of TIME).

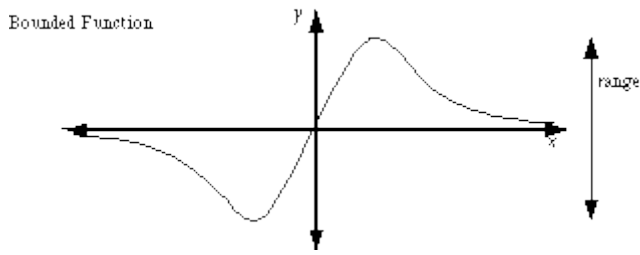
We claim that time is a wave -- a result of certain disturbance or event caused by applied force, and propagates for the distance and duration equal to accumulated energy.

So, our new **uniform space model** is represented by a double cone (ill. 22 below), where space-matter is three dimensionally framed by that double cone



(ill. 22)

in quasi *bounded function* (math., where range must have both an upper bound and a lower bound (fig. 9),



(Fig. 9)

and spreads with the help of the oscillating **spiral time-energy wave** within those given parameters, with no infinity.

Our model corresponds with the **uniform field theory** and the **Grand Unified Theory** only with regard to the space-time intersections as **coupling constants**, along which our spiral time-wave “slides” outward and backward on the horizontal and vertical strings of matter in our model and covers simultaneously the past and the future.

When visualized in a similar process, the three-dimensional vortexes and tendexes of a $(l,m)=(2,2)$ mode, and also a $(2,1)$ mode, spiral outward and backward, becoming outgoing gravitational waves. (See ref. 1 in appendix)

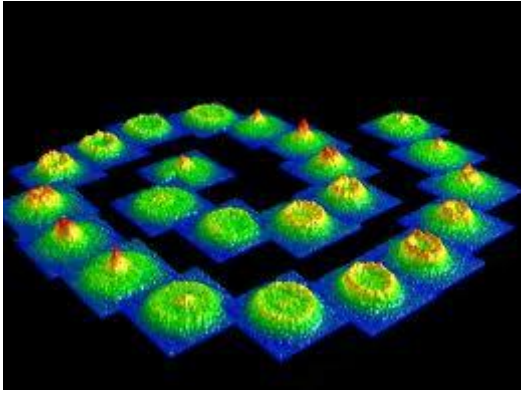
So this is a plausible explanation of the creation of space-time not provided by Einstein and other scientists, for the primordial spiral space-time matter must have been a twin spiral. The upper one formed the primordial frame and horizon of the top cone universe by creating a volume and 3D space (ill. 23 below).



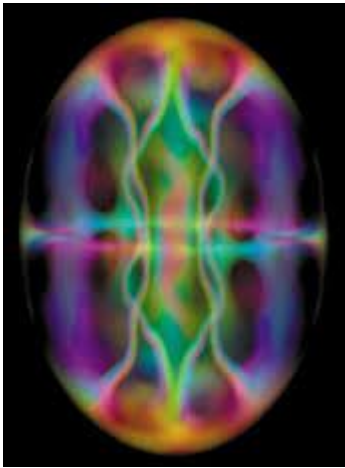
(Ill. 23)

Same happened with the lower spiral, which formed the bottom cone – our universe. The expanding frame of both cones was formed by same space-time spiral whose oscillating amplitude had first broadened up the top cone’ frame till its horizon, and then broadened down the bottom cone’ frame till its horizon.

Note that we deal here not with the curvature of space-time per Einstein, but with harmonic motion of matter along the vertical “string” of space-time, i.e., reversing its upward motion back to the core-spiral in the center of the double cone. That was due to the upper cone’ ballooning motion of hot primordial gases in a multidimensional **Brownian motion** within a bounded cone domain. Those inflated gases then cooled in **Bose-Einstein** like condensation and spiraled (ill. 24) downward the disc-core located between the double cones in our space-time model, in its perfect visualization in the Bose-Einstein condensate image (ill. 25 below).



(III. 24)



(III. 25)

(Homogeneous matter in that double cone core is wrongly perceived nowadays as the too homogeneous early universe).

The a.m. spiral downflow of gases in our model was predicted by the theoretical model of a binary system where gas will spiral in and fall to the surface of the compact object creating a flow of matter in the shape of a disk. This model explains many features of X-ray pulsars.

Such oscillating space-time continuum explains the universal oscillation of particles, appearing in *resonant oscillation* at any part of the universe without traversing space. Such particles reverberate in unison with other particles and appear where they receive a consonant signal, subject to modulation and infinite number of frequencies in space, providing them with infinite number of propagations for time-space entry, exit and reentry. Similarly, a vertical string of matter can act in our space-time cone as a pendulum, oscillating about the core spiral and reaching its outer ends or horizon at ever new point..

This new knowledge of time-space oscillation (TSO, see ref. in appendix) enables us to construct a special spacecraft encapsulated by a stream of on-board produced charged particles, whereby when the mass of the outside energy capsule is equal or larger than that of the spacecraft, the latter won't travel commonly in space but will traverse it within the time capsule, which would penetrate the space unimpeded, carrying the spacecraft trough the time-matter continuum via the network of galaxies.

This space-time ship of no analogy can be at one end of the universe and then appear at the other end. It can be assembled on the moon by separate parts brought there by a spacecraft of our special design.

So, a new point of view of our universe elaborated above provides for panoramic view of the universe and enables to define and perceive *panoramic radiation*, observed so far in small segments as background radiation. For as light has many colors and wavelengths, so universal radiation must have many different frequencies and wavelengths of so far invisible spectrum.

5. CONCEPT OF TIME

In 1964, when Yakir Aharonov, Peter Bergman, and Joel Lebowitz started to think seriously about the issue of the arrow of time in quantum mechanics, whether time only flows from the past to the future or also from the future to the past, they couldn't have possibly imagined that their esoteric quest would one day lead to one of the most powerful amplification methods in physics.

It means there are flaws in the previous space-time model per theory of relativity. In general relativity, gravity is described using noneuclidean geometry, so that gravitational effects are represented by the curvature of space-time, while special relativity is restricted to the flat space-time.

In our opinion, space-time cannot be flat if it rotates, is inflated and contains time as a dimension, since time is a wave equally propagated and not subject to gravity for it has no mass, but inherent physical properties: actual space-time is infinite within its finite frame, as shown in our space-time model.

University of Queensland's scientists Jay Olson and Timothy Ralph claim that the quantum entanglement is a fundamental part of the universe, and it works both in space and time, so changing the state of particle today instantly changes the same particle in the future, even while the particle will not exist between those two points.

In 1977, Bailey et al, accelerated a muon (a negatively charged subatomic particle about 200 times heavier than an electron) close to the speed of light, using the CERN Muon storage ring. **The accelerated muon's lifetime increased almost thirty times that of a muon at rest.** This time dilation effect suggests that the muon is able to travel to the future, since it continues to exist at a future time.

So we come here to the notion of the **velocity of time** which should be measured not by the speed of light and distance, but by the amount of comparable mass, accumulated energy and thereby acquired time acceleration of moving objects based on their universal and singular time-spans and chosen orbits applicable to humans, stars and galaxies in equation $T=mv^2$, where T stands for time, m -- mass and v – speed of time squared. (Note that Einstein's use of "C" in $E=mc^2$ relates more to the fact that it is the speed where time and space are in some ways the same, than the fact that it was the speed of "light").

So per $E=mc^2$ the **accumulation of time** can take place in a black hole acting as a time-energy battery that accumulates energy and elapsed time of the exploding stars. There, time can be amplified by the applied magnetic field and "borrowed" by a spacecraft to retrace the time of the past stars by employing time as energy.

So the universe is made up of the time, space and matter in *coherent correlation* of their physical properties. So what was first? Time, space or matter? If there was no time-space density prior to creation of matter, there is no point of calculating the age of primordial universe. If the time preceded matter, it means that we live in our past. If the time was "born" along with matter, it must have "grown" with the matter as its integral part, representing its time-span and energy, since chemical and physical elements and living beings all have their space, time and energy limits.

Per our spiral universal model time is a wave. It is horizontally created and spread when a physical object is born in a splash of time-energy wave (as a short "burst" or "envelope" of localized wave action in physics), and operates according to its wavelength which represents the time-span given by the nature to each object.

In future, advanced genetics could decipher that wavelength to predict the lifespan of a human being.

We come here to a new notion of past and time without present. For example, a baby is conceived before its future birth in nine months, which is a small space-time event that progresses in given space-time continuum for that particular being, whose future is actually the movement back in time to the state of non-being, as a photon dies at birth.

As a physical object (including humans) grows in height, width and weight, it gathers mass and density during the initial segment of its time which becomes the immediate past, with a remained segment of time still in the future. Such continuum has no place for present, for time doesn't stand still for a second, which immediately becomes a past time unit in the continuous flow of time. So, there couldn't be a permanent present observer as in the special theory of relativity.

We have determined here that time has just two interrelated segments – past and future, where past shortens the future for a relevant segment of time. That notion enables us to envision the past-future pass in time, where time is quasi energy.

It means that a living being or celestial body uses energy to grow, move and travel on earth and in space, leaving in its wake spent energy and time, which becomes thereby time-energy with kinetic properties to move the object in space and time. That past trace can be retraced in time travel back to the past, if we consider the following time model: zero is the point where any object is born or created. Spent years are minus zero, while future years are zero plus. When one year is past-lived (-1) it simultaneously becomes +1, i.e., the object becomes a year older in a simultaneous loss and gain of time. So, if we draw a line to the left of zero representing one year left in the past, same length section would progress to the right of zero, representing one year in the future, i.e., one year that went to the past is the recoil of the time-energy of the same year spent to gain a year in the future. So, the past can be traced back in time-travel along that pass, to be then retraced forward to the future for the same period of time.

In a nutshell, one year in the past propels one year into the future, and it's not the same year, since past is not future and they cannot be superimposed.

It means that time is not a simple dimension amongst other dimensions as in special theory of relativity, but is a space coordinate and coordinating space event, as it helps coordinate events on earth.

Since time has no mass, its elements can be traced back in time, as can be light.

For example, light of an extinguished star can still be seen on earth due to large amount of time to reach us. A special **atomic mirror** might reflect and reverse that beam of light and reach the star in its still existing past, thus space-time can be traversed by quasi riding on light beams in cosmos in a **time reversal of the light particles**.

In that respect, **pulse-gravity technology** and time-space craft can be developed. The latter would be operated by its own magnetic field, pulsating to and fro around that craft, attracting itself to celestial bodies in its forward destination, at the same repelling itself from celestial bodies and clusters behind it. Time in such a craft might stand still, for it pulsates to and fro in equally spent segments of future and past, achieving thereby **time parity**. We can observe similar phenomena in quasi normal pulsations of Schwarzschild and Kerr black holes.

It implies that the UFOs might use the pulse time-energy technology, if they do exist. In general, a special spacecraft emitting a supercharged field can be encapsulated by a stream of trapped particles, evenly distributed over its entire structure in magnetic parity mode. That mode can be classified by radial quantum number n , spheroidal harmonic orders (l,m) , and parity, which can be electric $[(-1)^l]$ or magnetic $[(-1)^{l+1}]$.

That can be compared on earth with the distribution of electricity over a human body, i.e., due to skin's strong resistance, high-voltage charge of a lightning spreads over entire body. That phenomenon is known as **external charge**.

Our spacecraft concept supersedes the *Alcubierre drive*, a speculative idea proposed by Miguel Alcubierre, by which a spacecraft could achieve faster-than-light travel if negative mass existed.

Rather than trying to exceed the speed of light within its local frame of reference, our spacecraft would traverse time by contracting space in front of it and expanding space behind it, resulting in effective beyond the light speed space travel.

Having in mind our cosmic model, space-time travel is possible there not in a common linear way but via volutes of the space-time spiral, whereby a spacecraft would be catapulted in space similar to a stone thrown by a David' sling.

6. Conclusion

To summarize, $E=mc^2$ is insufficient to describe complex universal processes in dual universes, as in our double-cone model, since celestial bodies don't consume energy to traverse space, and the speed of light is irrelevant to them, for in most cases they are the source of light and are the

light and energy, as our sun is. The only relevant constant in space is time, which, coupled with energy constitutes our universe, for even common clocks require mechanical, electric or atomic energy to function.

Accordingly, here is a new equation to better explain the correlation between space, time and energy (matter and acquired mass), i.e., $S=te^2$, where S is space, t – time and e – energy squared, as the **building block** of space-time where time is multiplied by amount of energy needed to occupy a particular space. It means that space is equal to its time and energy components, like jets of matter that don't break into pieces — they are formed in pieces.

Appendix

Ref. 1

Cosmic strings, loops, and linear growth of matter perturbations

Wu, J.-H.-P., Avelino, P. P., Shellard, E. P. S., & Allen, B. (2002). Cosmic strings, loops, and linear growth of matter perturbations. *International Journal of Modern Physics D*, 11(1), 61-102. doi:10.1142/S0218271802001299.

Abstract: We describe a detailed study of string-seeded structure formation using high resolution numerical simulations in open universes and those with a **non-zero cosmological constant**. We provide a semi-analytical model which can reproduce these simulation results including the effect from **small loops chopped off by the string network**. A detailed study of cosmic string network properties regarding structure formation is also given, including the correlation time, the topological analysis of the source spectrum, the correlation between long strings and loops, and the evolution of long-string and loop energy densities. For models with $\Gamma=\Omega h=0.1-0.2$ and a cold dark matter background, we show that the linear density fluctuation power spectrum induced by cosmic strings has both an amplitude at $8 h^{-1}$ Mpc, σ_8 , and an overall shape which are consistent within uncertainties with those currently inferred from galaxy surveys. The cosmic string scenario with hot dark matter requires a strongly scale-dependent bias in order to agree with observations.

2. TIME-SPACE-OSCILLATION

The Hidden Mechanism Behind Physics

Olof Sundén

France, 01220 Divonne, 113 Rue d'Arbère

Abstract. Time-Space-Oscillation, TSO, is a comprehensive theory^{1;2)} TSO considers the physical world as constituted of ($\approx 10^{80}$) harmonic T-S-oscillators, approximately corresponding to the mass/energy of a neutron. TSO describes the physical phenomena by stoichimetric, simple equations and in terms of constitutive quantum parameters, i.e. the harmonic oscillatory amplitudes of force F_0 and of time-space (A_T , and $A_0=cA_T$). Together with the constants π , c and \hbar , these parameters give quantitative accounts for both cosmic and quantum phenomena including the enigmatic formation of matter, mass and charge.

Derivation of the TSO-concept

The derivation of TSO is based on the fact that Einstein's formula $E=mc^2$ is not relativistic but identical to the old formula for oscillatory motion $E=m(A_o\omega)^2/2$, when the velocity amplitude $(A_o\omega)=c\sqrt{2}$. This unveiling enables a combination with Planck's $E= \hbar\omega$ and the work formula $E=F_oA_o/2$, which yields correct relations between the parameters, but not their exact harmonic values. Thus the very clue to TSO is to determine its harmonic mass m_o or force F_o , which requires an intuitive extrapolation. It is evaluated by aid of the neutron mass to $F_n=0,10136.10^7\text{N}$ and extrapolated to a π -function $F_o= 10^7/\pi^2=0,10132.10^7\text{N}$. This strong oscillatory force corresponds to the harmonic mass m_o of exactly one proton with a hidden positron plus one from the TSO-unit dissociated electron. When dissociated from the harmonic TSO, the electron becomes a weak oscillatory force $F_e=1,000067.10^{-9}\text{c}$.

A new insight in Physics

The new perspectives on physics appear in TSO as stoichiometric relations between the parameters thus obtained. The important parameters and their relations are. They reveal new connections and turn physics and QM into one causal science. But first of all, TSO necessitates the existence of two parallel worlds, our world of 3-D space and another of 3-D time, which is almost hidden to our senses.

One perspective presents Planck's \hbar [M^2] as an equilibrium constant according to the equations $\hbar=F_oA_oA_T/2\sqrt{2}$ and $\hbar=m_o c^2 m_o c\sqrt{2}/F_o$, which even elucidate the very characteristics of the uncertainty principle. The latter equation describes the state of any "stationary" particle (if F_o and m_o are mutually adjusted). But if the energy and momentum of the particle is increased by an additional velocity, the equilibrium collapses and a secondary action pulse of space appears $\hbar=nA_o^2[\text{M}^2]$ i.e. the de Broglie wave. Hereby Planck's \hbar fits into classical and causal physics without need of any theory of relativity. But as subatomic entities are oscillators with individual phase constants, outside our control, our measurements will give values of only wave-statistical character. Physics is not probabilistic. It is causal but dependent on the oscillatory character of all fundamental quantum units.

An unexpected result is that the space and time amplitudes A_o and A_T are related to Planck's length L_P and time T_P according to $A_o^2=10^{41}L_P^2 F_o/c$. It reveals that gravitation is the weak coupling between a space oscillator (A_o^2) of this side and a time oscillator (A_T^2) of the other side with $G=2\sqrt{2}.10^{-41}.c^5/F_o^2=6,6718765.10^{-11}$. The A_o^2/L_P^2 ratio reveals the size or reach of Universe $10^{41}\lambda= 1,32.10^{26}$ [M] and that each of its 10^{80} TSO-units contributes an odd expansive force $+F_o/\sqrt{2}$ on this side and an odd constricting force $-F_o/\sqrt{2}$ on the other side, which balances it

The A_o/L_P ratio even elucidates the formation of mass and charge, and it enables an exact account of the elementary charge and the electron and proton masses. A study of how TSO-units accrete to composite oscillators, to deuteron, α -particles and heavy nuclides, reveals a consistent Mendeleiev system for nuclides. It is constituted of up to 6 shells with the nucleons arranged in reiterated geometrical patterns. The study also shows that the strong nuclear force of present physics does not exist. The nucleons of a nuclide are simply kept together by the impact of the oscillatory force F_o . The elements designated as magic are just those, which have the maximal impact per utmost shell area.

An aspect of TSO is its limitation to two dimensions, meter [M] and second [S]. This may first appear as a drawback, but enables a "dimensional mathematics" of great value. By this mathematics the outcome of interactions between different physical phenomena and parameters can be pictured similar to reactions between substances in chemistry. Further it enables us to

consider physical interactions from two sides, from the “physical” side with its intensity parameters of fields and forces and from the “stoichiometric” side with its constitutive parameters of space, time and mass. One example is that Planck’s \hbar [M^2] and the enigmatic Poynting vector S [S^{-2}] describes the same interaction of energy flow, one from this side of 3-D space and the other from the other side of 3-D time.

Future expectations

What can we expect of TSO in the future, beside an improved comprehension of physics in only two dimensions and a faster development of it? I here limit myself to hint at effects on chemistry and biology. In chemistry we can expect development of coherent molecules with atoms (not only electrons) oscillating coherently, similarly to photons in laser light. Hereby a bridge is erected between physics and animate matter including mind. Animate proteins appear as molecules, constituted of coherently oscillating atoms, which thereby can overcome thermodynamic restrictions and function as receivers and transmitters.

Reference:

1. O. Sundén. 1994, 96 “Time Space Oscillation” Proceedings of the St. Petersburg conferences “Space, Time and Gravitation”
2. O. Sundén. 1998 ”The Hidden Time-Space-Mechanism” Apeiron Canada, vol 5 no 1-2, **TSO-Units - Relations, Values and Dimensions**

TSO refers to the fundamental harmonic Time-Space-Oscillator that creates the physical world. This table contains the TSO-units, their values, their stoichimetric relations and their fundamental dimensions {which are only meter [M] and second [S]}. TSO relies basically only on the three natural constants c , \hbar and π plus the strong oscillatory force $F_o=10^7/\pi^2$ (with impedance amplitude $I_{mo}=F_o/c$) and the space amplitude A_o (with time amplitude $A_T=A_o/c$). All other units are related to them and to each other as indicated in this table. The fundamental harmonic mass appears in TSO as $m_o=I_{mo}A_T/2= 1,674557 \cdot 10^{-27}$ kg [S], a mass that does not correspond to a single particle but to one proton including a hidden positron plus one dissociated electron. As we here count with amplitudes the factor $1/\sqrt{2}$ frequently appears, which here corresponds to the half period averaged value of the amplitude units. At the end of the table also the dissociated electron units are given together with the gravitational constant G as it appears in TSO and \hbar as it is related to the harmonic mass m_o and to the inharmonic mass of the electron m_e .

3.Department of Physics and Astronomy, Oberlin College, Oberlin, Ohio 44074, USA

Received 15 August 2012; published 12 November 2012

In recent papers, we and colleagues have introduced a way to visualize the full vacuum Riemann curvature tensor using frame-drag vortex lines and their vorticities, and tidal tendex lines and their tendicities. We have also introduced the concepts of horizon vortexes and tendexes and **three-dimensional vortexes** and tendexes (regions on or outside the horizon where vorticities or tendicities are large). In this paper, using these concepts, we discover a number of previously unknown features of quasinormal modes of Schwarzschild and Kerr black holes. These modes can be classified by a radial quantum number n , spheroidal harmonic orders (l,m) , and parity, which can be electric $[(-1)^l]$ or magnetic $[(-1)^{l+1}]$. Among our discoveries are these: (i) There is a near duality between modes of the same (n,l,m) : a duality in which the tendex and vortex structures of electric-parity modes are interchanged with the vortex and tendex structures

(respectively) of magnetic-parity modes. (ii) This near duality is perfect for the modes' complex eigenfrequencies (which are well known to be identical) and perfect on the horizon; it is slightly broken in the equatorial plane of a nonspinning hole, and the breaking becomes greater out of the equatorial plane, and greater as the hole is spun up; but even out of the plane for fast-spinning holes, the duality is surprisingly good. Electric-parity modes can be regarded as generated by three-dimensional tendexes that stick radially out of the horizon. **As these "longitudinal," near-zone tendexes rotate or oscillate, they generate longitudinal-transverse near-zone vortexes and tendexes and outgoing and ingoing gravitational waves.** The ingoing waves act back on the longitudinal tendexes, driving them to slide off the horizon, which results in decay of the mode's strength. (iv) By duality, magnetic-parity modes are driven in this same manner by longitudinal, near-zone vortexes that stick out of the horizon. (v) **When visualized, the three-dimensional vortexes and tendexes of a $(l,m)=(2,2)$ mode, and also a $(2,1)$ mode, spiral outward and backward, becoming outgoing gravitational waves.**