The Grand Unified Theory andTechnological Applications

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Abstract- This paper presents the fundamentals of the grand unified theory or GUT and its technological applications. It focuses on quantum gravity, one of the two pillars of GUT and the extension of quantum physics to dark matter, one of the two fundamental states of matter, the other ordinary or visible matter. Dark matter consists of non-agitated superstrings, visible matter agitated superstrings. The superstring is the fundamental building block of matter. When a semi-agitated superstring is suitably agitated by electromagnetic wave, it converts to a primum, unit of visible matter. The basic prima arethe electron, charge −1; the +quark, charge 2/3; and the −quark, charge −1/3; they are basic because they comprise every atom.The paper also explains puzzling natural phenomena (appearances of matter) such as: wave-particle duality; matter-anti-matter interaction; superconductivity; nuclear and thermonuclear reaction; brittle and malleable materials,metal fatigue and human levitation.

- **Technologies that stem from GUT are called GUT technologies. There are six types:**
- **Type I.The Magnetic Electric Power Generator.**
- **Type II.The Magnetic Charger for Battery Cars, Trucks and Busses.**
- **Type III. The Magnetic Train (Maglev).**
- **Type IV.Genetic Alterator-Sterilizer.**
- **Type V. Baby Tornado Aborter and Terminator.**
- **Type VI. The Magnetic Engine for Space Vehicle.**

The paper is focused on Types I and II but offers improvement on the magnetic train, especially, its brake mechanism. GUT technologies have a common thread: they run on the clean, free, indestructible, therefore, inexhaustible dark matter that comprises95% of our universe which is abundant everywhere around us. The magnetic train and engine are discussed as technological applications of the grand unified theory.The rest of the GUT technologies are introduced to provide a sense of the breadth of GUT's applications.

Key Words.Anti-Matter, Big Bang, Black Hole, Cosmic Burst, Cosmological Vortex, Dark Matter, Fractal, Vortex Flux, Jet Outflow Magnet, Magnetic Train,Primum, Supernova, Superstring, Toroidal Flux.

I. INTRODUCTION

The paper consists of three parts: (1) exposition of the grand unified theory (GUT) [1] with more completeness and greater detail, (2) previously unpublished extensions of GUT in scientific journals and (3) technological applications of GUT in engineering. A physical theory such as GUT is an articulation of how nature works. That articulation is provided by mathematics, the language of science. Knowledge of how nature works is key for the design of technology. Therefore, the mark of a correct theory is its usefulness in the design of technology.

In the 1920s Albert Einstein proposed the grand unified theory to unify the four forces of nature– gravity, electromagnetism and the weak and strong forces – in the narrow sense, i.e., to find a single set of equationswith parameters that applies to these forces. The weak force accounts for radiation and the strong force for keeping the protons in the narrow confines of the nucleus despite the tremendous repulsion between them according to Coulomb's law [2].To account for the strong force, physicists postulated the gluon. It was the tradition then to postulate some particle to account for every force of nature. Thus, for gravity and electromagnetism which appear to have similar properties, the graviton was postulated. The traditional method for confirming them is quantitative modelling (formerly called mathematical modelling). This method is inadequate, the reason Einstein's project did not materialize during the next 80 years until the discovery of the superstring in 1997 [3]. The superstring is the fundamental building block of matter. It comprisesdark matter, one of the two fundamental states of matter, the other visible or ordinary matter comprised of agitated superstrings. Non-agitated superstring is dark,i.e., not observable because it is smaller than the wavelength of visible light. Dark matter has been thrown around since the 1980s but with much ambiguity. Now we have clarity: non-agitated superstrings comprise dark matter, agitated superstrings visible matter.

II. NEW METHODOLOGY

All attempts to solve the problem during those 80 years were based on Einstein's theory of relativity.But the theory is flawed on two counts: (1) the postulates of special relativity [4] is premised on the absence of matter beyond the

observable bodies in the cosmos which is contradicted by the discovery of the superstring and (2) the conclusion from the Lorentz's transformation [3] that the upper limit of speed of matter is the speed of light c = 3(1010) cm/sec which is also contradicted by the speed of electric current [5] and jet flow from the eye of a young galaxy and star [6]. Therefore, a new approach is needed which includes a new methodology, namely, qualitative mathematics and modeling, the main contribution of [7]. Qualitative mathematics is the complement of computation and measurement and the mathematical model of rational thought [8];it includes the following activity:

Making conclusions, visualizing, abstracting, thought experimenting, learning, creating abstract and physical concepts (the former created by thought, the latter has referent), intuition, imagination, trial and error to sift out what is valid, negating what is known to gain insights into the unknown, altering premises or axioms to draw out new conclusions, thinking backwards, finding basic premises for a mathematical space and devising techniques that yield results including the caveman's method.

Since qualitative mathematics draws in a wide range of information some of which may be false others ambiguous,there must be some standard sieve to make sure that neither arises in the pursuit of science. This requires rigorous reforms in and reconstruction of mathematics.This effort is carried out as critique-rectification of the real and complex number systemsin a series of papers [10-16] and completed in the extensions of the constructivist real number system [17] and the constructivist foundations of analysis [18].Flawless mathematics comes with building every field of mathematics asa mathematical space based on consistent basic premises or axioms where every concept is defined by and every conclusion follows from the axioms. The choice of the axioms is arbitrary depending on what the mathematical space is intended for. But once chosen, the mathematical space becomes deductive and all conclusion follow from them.

Einstein's project to unify the four forces of nature by a grand unified theory was commendable but doomed from the start.His main tool that physicists adopted, the theory of relativity, relies on computation, measurement and reasoning by analogy which is unreliable. An error in science can be catastrophic in its application to engineering as the disastrous final flight of the Columbia space shuttle shows [19]. The remedy: qualitative mathematics and modeling that explains natural phenomena (appearances of nature) and how nature works in terms of natural laws [20]. The natural laws are discovered only through qualitative mathematics.

III. THE GRAND UNIFIED THEORY

In his book, Celestial Mechanics, Simon Marquis de Laplace posed this problem at the turn of the 18th century:

Given n bodies in the Cosmos at time T, positions, $x, \ldots, x_n$, velocities $v_1, \ldots, v_1$, and masses $m_1, \ldots, m_n$, subject to their gravitational interaction, find their positions, velocities and paths or trajectories at later time t.

This is the modified and solvable form of the original formulation by Laplace. For 200 years physicists and mathematicians tried to solve it without success. Why? There is missing information: (1) the boundary conditions belong to the past and need to be reconstructed, (2) the n bodiesneed to be defined and (3) the laws of nature that govern their behavior need to be discovered so that their trajectories and positions can be computed and plotted. Moreover, the traditional method of science, namely, quantitative mathematics, is inadequate for it only describes the appearances of nature (natural phenomena) but does not tell us how nature works aside from the fact thatreasoning relies on analogy. We shall not solve this problem but refer the reader to [3] for the solution.Suffice it to say that the solution is the first milestone on the road towards solving a much bigger problem posed by David Hilbert in the early 20th Century, namely, problem 6 of his 23 problemsof mathematics [19]: Can physics be axiomatized? The answer is yes, the solution is the grand unified theory (GUT) [20] and the axioms are natural laws. The only way to avoid catastrophic man-made technological accidents is to build scienceas a physical theory such as GUT.A physical theory is a mathematical space where the axioms are laws of nature which are not arbitrary.Physical concepts that comprise physical theory, e.g., atom, star, have referents in the real world that can be studied objectively and collectively. In contrast, abstract concepts, e.g., time, do not have physical referents. Failure to distinguish them leads to strange interpretation of natural phenomena like black hole being a passage to another universe which is a bit mystical.

The reconstruction and retrieval of the boundary conditions of the n-body problem from the birth of our universe onwards started in [3], pursued in a series of papers [19,22-28] and completed in [1]. It required the discovery of natural laws using qualitative mathematics. However, the extensions and applications of GUT to the various fields of science and development of suitable mathematics for science continue.

Since the search for concepts is not deductive (in fact it allows trial and error), their validity must be confirmed by the axioms. The key step for the solution of the gravitational n-body problem was the discovery of the superstring through qualitative mathematics. However, the derivation of its nested generalized physical fractal structure through qualitative mathematics was completed in 2013 [29].

By the time Albert Einstein made the proposal for unification in the weak sense, i.e., finding a single set of equations describing the four forces, his field equations [30] and Maxwell's equations of electromagnetism [31] already did the job for gravity and electromagnetism but left the weak and strong forces out. Although physicists found what would turn out be the −quark in the 1950s that shed light on radiation and the positive quark in the 1990s, they did not know what their structures were as pieces of matter. It was only in 2008[1] when it was shown that they were non-agitated superstrings and the strong force did not exist as speculated. The protons were joined together in the nucleus by −quark which follows from Flux Compatibility.(We recount the discovery of the superstring later)

For historical purposes we look at Einstein's theory of relativity. Based on the negative results of the Michelson-Moreley's series of experiments 1885 − 1887 [32] that appeared to show that beyond the cosmological bodies, cosmic dust and sparse atoms and molecules the cosmos is empty, Einstein took the following postulates (axioms) of the special theory of relativity [4]:

1. The Principle of Relativity.The laws of physics are the same in all inertial frames of reference.

2. The Constancy of Speed of Light in Vacuum.The speed of light in vacuum has the same value c in all inertial frames of reference (e.g., a cosmological body like Earth).

To ensure that these postulates remain valid Einstein adopted the Lorentz's transformation [5]. If an observer in a frame of reference F records an event t, x, y, z, then an observer in another frame of reference F′ records the same event with coordinates

(1) $t' = \gamma(1 - vx/c2)$
$$x' = x - vt$$
$$y' = y$$
$$z' = z$$

where

(2) $\gamma = 1/\sqrt{1 - v^2/c^2}$

is the Lorentz factor. Note that γ limits the speed of a moving object to the speed of light c = 3(1010) cm/sec. This is contradicted by the linear speed of the vortex flux of the proton, 7(1022) cm/sec [6], which is equal to the speed of electric current, and the jet flow thrown by the eye of a young star or galaxy which is at least 75 times the speed of light [34,35]. This means that the theory of relativity is based on the false premises that the cosmos is empty and the upper limit of the speed of matter is the speed of light. Once a theory is flawed one cannot count on it for anything.

General relativity is an extension of special relativity with the introduction of a new concept gravity or curvature of spaceandaccelerated relative motion. The concept is ambiguous and the idea that mass creates curvature is false.It is the other way around: the eye of a cosmological vortex being a region of low pressure sucks matter around it that accumulatesand spinsaround the eye called its core. The Earth we stand on is the collected mass around the eye of its cosmological vortex that has cooled and solidified. It continues to spin at the rate of one rotation in 24 hours.The Earth's gravity continues to increase its mass. Its mass 65 million years ago was 67% of its present mass [35].

This ambiguity and erroneous interpretation of natural phenomena, e.g., gravity, combined with the false premise that the cosmos is empty accounts for the failure of the theory to unify the forces of nature if at all possible with the traditional method. An evidence of this failure is the continued search for the fundamental building block of matter (God's particle) at CERN [36]which is not informed by the fact the it was discovered in 1997. The situation is vividly described by Lee Smolin in his book, The Trouble With Physics [37]. In the author's view, the failure is due to two factors:

(a) Mainstream physics including Smolin's work has been framed and restrained by the theory of relativity, and

(b) The traditional method of quantitative modeling is incapable of solving this kind of problem which is the rationale for the introduction of qualitative mathematics and modeling for the grand unification of the natural sciences in our sense that we have called GUT, i.e., all other fields of natural science are extensions of GUT and built on natural laws. In other words, the natural laws are the unifying elements of science with the superstring as the common thread.

To-date, there are 15 natural laws of GUT [1,19], 11 biological laws [38], 3 laws of thought [7,39], 4 laws of thermodynamics [40],Newton's 3 laws of motion [41] and his law of universal gravitation [42]. In addition, there 24 known mathematical and physical principlesof the Energy Conservation Equivalence Law [1] and the Heisenberg uncertainty principle [43].To illustrate how Newton's third law (action-reaction) works, a rocket takes off and continues its motion, guided and stabilized by a programmed gyroscope, because the thrust of the engine is matched by an opposite force that pushes the rocket forward.

3.1 Physical Concepts

We first introduce partial definition of physical concepts until the discovery of appropriate natural laws that define them are found. Energy is motion of matter. Therefore, matter and energy are never separate and neither pure matter nor pure energy exists. Thus, there is no massless piece of matter and the photon has mass. Once the superstring is discovered, matter is known and everything else is. We know that the superstring is the, fundamental building block of matter that comprises dark matter but we know nothing yet about its structure and properties.Flux is motion of matter with direction at each point. Wave is suitably synchronized sequence of resolution of contending forces in the medium that results in suitably synchronized vibration of the medium. In the case of water wave the water molecules are the medium and the contending forces are gravity and pressure. Chaos is mixture of order none of which is identifiable. For example, chaos occurs at the onset of a hurricane. When warm huge solid el niño forms on the ocean surface (warm due to under-ocean volcanic eruptions) the lower atmosphere above it heats up causing low pressure or atmospheric depression. Heat raises kinetic energy and motion, pushes the molecules away from each other, lowers the density of air and reduces pressure. The atmospheric depression sucks the air molecules around it by the trillions and rush into it. At this phase in the evolution of this phenomenon it is impossible to identify the path of a single molecule among the trillions due to collision but every molecule is subject to natural laws (order). This is the first formal definition of chaos. Since chaos in this case is energy dissipating due to collision, Energy Conservation pushes this phase towards a global order, a coherent vortex in the atmosphere called hurricane which is turbulence. Electromagnetic wave, one of the two types of cosmic waves, is generated by the natural vibration of atomic nucleus and propagated across dark matter. The natural vibration of the atomic nucleus is due to the impact of electromagnetic waves coming from all directions in the cosmos. Thus, every piece of matter has natural vibration. In the solar system the radial vibration of a planet (radial oscillation) results in its elliptical orbit.Definition is important because a breakthrough in science starts with the introduction of relevant well-defined concepts. For example, the precise definition of energy above yields a number of new information.

IV. QUANTUM GRAVITY

Quantum gravity is the extensionof quantum physics to dark matter. It is one of the two pillars of GUT, the other macro gravity. The technologies that we discuss here are offspring of quantum gravity. As a science quantum gravity is focused on the primum (elementary particle), its structure and interaction.

We state the fundamental natural law, a modification and extension of the first law of thermodynamics to dark matter.

Energy Conservation Law. In any physical system and its interaction, the sum of kinetic (visible) and latent (dark) energy is constant, gain of energy is maximal and loss of energy is minimal.

This law is fundamental because all other natural laws and principles are expressions of or are consistent with it. We state this as a natural law.

Energy Conservation Equivalence. Energy conservation has many expressions or forms: order, symmetry, economy, least action, optimality, efficiency, stability, self-similarity (nested fractal), coherence, resonance,quantization, synchronization, smoothness, uniformity, motion-symmetry balance, non-redundancy, non-extravagance, evolution to infinitesimal configuration, helical and related configuration such as circular, spiral and sinusoidal and, in biology, genetic encoding of characteristics, reproduction, order in diversity and complexity of functions and configuration that provides optimal capability.

Each component of this law is called a mathematical or physical principle depending on its content.

Consider a piece of rock thrown into the water. It pulls molecules of water down with it. However, pressure pushes them upwards and above the water surface due to momentum (product of mass and speed). Gravity pulls them down below the surface due to momentum. Pressure pushes them up again, etc., causing oscillation about the water surface. Water viscosity induces advancing circular molecular oscillation (vibration) around the point of impact causing a sequence of concentric circular waves propagated away from the point of impact. Being circular, sinusoidal and symmetrical are universal (natural) configurations of matter according to the Energy Conservation Equivalence law. That is why the profile of a wave is sinusoidal, not triangular or trapezoidal. Water viscosity has a damping effect on the molecular vibration, dissipates the energy imparted by the impact of the falling rock and soon the waves vanish. Similarly, electromagnetic wave is suitably synchronized vibration of the medium – dark matter. This definition rules out wave in empty space. Basic cosmic or electromagnetic wave is generated by the natural vibration of atomic nucleus propagated across dark matter that fills up the cosmos. Nuclear vibration is due to the impact of electromagnetic waves coming from all directions its characteristics determined by the nuclear structure in accordance with this natural law:

Internal-External Factor Dichotomy Law. The interaction, dynamics and physical characteristics of a physical system are shaped by internal and external factors; in general, the internal is principal over the external and the latter works through the former.

This natural law explains why a magnet lasts forever unless it is dropped on a hard surface or pounded strongly and vigorously. Corrosion does not affect it being superficial; magnetic properties are determined by the internal join and alignment of the atoms of the ferromagnetic material.

Since the internal structure principally determines the properties and behavior of a physical system, we add this physical principle:

Principle of Interpenetration.In interacting physical systems each penetrates the internal structure of the other in the sense that it affects the properties and behavior of the other.

Heat is kinetic or visible energy due to vibration of atoms and molecules of a body. Its propagation through heat conduction is in accordance with the Resonance Law that says [19],

Resonance Law. Maximum resonance between waves, oscillation or vibration occurs when they have exactly the same characteristics with wavelength or frequency as the principal factor. The degree of resonance declines with the difference between wave characteristics and orders of magnitude of their wavelengths. However, at suitably high order of magnitude of wavelength the infinitesimal effect of resonance by orders of magnitude nearby rises to significance.

The next natural law is crucial for the study of turbulence.

Flux-Low-Pressure Complementarity Law. Low pressure sucks matter around it and the initial rush of matter towards a region of low pressure stabilizes into local or global coherent flux called turbulence; conversely, coherent flux induces low pressure around it.

This natural law was inspired by a simple high school experiment many years ago. The experiment goes as follows. Place two books on the table with edges parallel and five centimeters apart. Place a soft tissue over the parallel edges and blow underneath between the edges. Will the tissue fly off? No. The air molecules under the tissue will be swept away causing low pressure that sucks it into and rides in the wind flow.

One error of traditional physics that delayed the resolution of the ancient quest for the superstring is the failure to identify the key requirement for the fundamental building block of matter which is indestructibility. Otherwise, our universe would have vanished long ago which did not and has existed for 8 billion years (corrected valuein [1]).

It is a fact that matter appears steadily in the cosmos at the rate that varies from a few stars every million years to nearly a thousand stars every million years [44].There are regions in space where star formations is relatively rapid [45,46]. By Energy Conservation, it must have come from somewhere and that is what we have called dark matter consisting of non-agitated superstrings. The only force that resonates and interactswith the superstring is electromagnetic wave which has huge kinetic (visible) and latent (dark) energy being generated by the fractal atomic nucleus. Hit by suitable electromagnetic wave a non-agitated superstring is (a) thrown by its impact, bounces with others and comes to rest in dark matter when the imparted energy dissipates or (b) gets close to its path and sucked by it, by Flux-Low-Pressure Complementarity, and forms a loop the original superstring becoming its toroidal flux. By Energy Conservation and Energy Conservation Equivalence, its path shrinks and evolves to energy-conserving form: nested generalized physical fractal sequence of superstrings [29] traveling through its cycles at $7(10^{22})$ cm/sec [6], a constant of nature for toroidal and induced vortex fluxes. We identify the first term of the sequence with the superstring itself because it is the term involved in its interaction. (c) Hit by suitable electromagnetic wave the first term of the superstring expands and becomes semi-agitated, by Energy Conservation. In both cases (a) and (b) the superstring is a generalized nested physical fractal sequence of superstrings. Its latent energy is super huge due to its fractal structure (sum of infinite series of nonzero constant terms); it comes from the motion of its toroidal fluxes. The non-agitated superstring is mathematically modeled by the d-sequence of the dark number d* [16].

We summarize our findings as a natural law.

Existence of Fundamental Building Block of Matter and its Generalized Nested Fractal Structure. The fundamental building block of matter is the superstring, a non-agitated superstring traveling at $7(10^{22})$ cm/sec through its helical circular loop and nested fractal sequence of superstrings with itself as first term, each superstring except the first is contained in and similar to the preceding term in structure, behavior and properties, each superstring except the first is contained in and similar to the preceding term in structure, behavior and properties, each superstring except the first is contained in and similar to the preceding term in structure, behavior and properties, …

The structure described is called nested generalized physical fractal [29]. It has no last element. This structure makes the superstring indestructible and qualifies it as the fundamental building block of matter.

A superstring is non-agitated if its cycle length (CL) is less than $10{-}16$ meters, semi-agitated if $10{-}16 < CL < 10{-}14$ meters and agitated if $CL > 10{-}14$ meters. Dark matter consists of non-agitated superstrings (Figure 1).
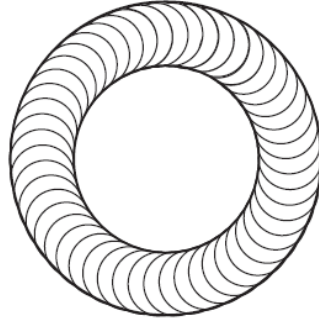
Figure 1: The circular, helical toroidal superstring (which looks like a lady's spring bracelet); its dark toroidal flux,a superstring, travels along its cycles at 7(1022) cm/sec. (Figure from [47])§

When suitable electromagnetic wave hits a semi-agitated superstring a pair of mutually exclusive events occurs: (d) the first term of its fractal superstring bulges to retain the toroidal flux speed despite the energy imparted by the electromagnetic wave, by Energy Conservation, turning it into an agitated superstring called primum(Figure 2), a unit of visible matter, its toroidal flux non-agitated, or (e) the first term breaks, its toroidal flux remaining non-agitated and dark. The primum has dark superstring component that attaches it to dark matter via resonance. The basic prima are the electron, +quark and –quark; they are basic because they comprise every atom of our universe.

The next natural law articulates our findings.
Dark-to-Visible-Matter Conversion. When suitable electromagnetic wave hits a semi-agitated superstring one of these occurs: (i) the outer superstring breaks, its toroidal flux remaining non-agitated superstring; (ii) a segment bulges into a primum, an agitated superstring and a unit of visible matter.
When a suitable electromagnetic wave hits a superstring one term of the sequence breaks, by Resonance, leaving the rest intact and nested fractal sequence of superstrings, i.e., a superstring. Thus, this structure insures its indestructibility. It is neither created nor destroyed; it only goes through an endless cycle. It follows that the Universe of dark matter has no beginning and no end (timeless). By Flux-Low-Pressure Complementarity, it has no boundary, i.e., unbounded and infinite, and our universe is a finite local bubble in it among other universes.
The next natural law is central to primal interaction. We first state its broad form.
Flux Compatibility*. Two fluxes of the same direction attract but two fluxes of opposite directions repel each other.
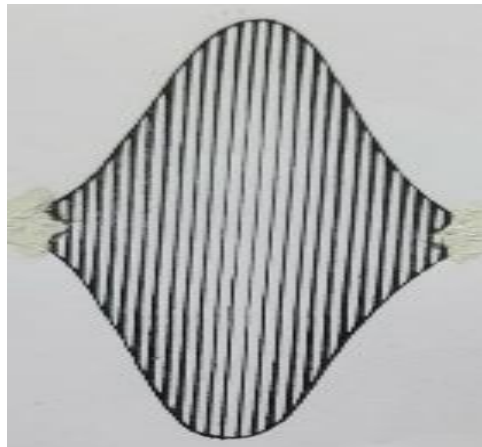

Figure 2: A simple primum, bulged segment of a semi-agitated superstring. Its toroidal flux pulls and spins the non-agitated a vortex flux of superstrings around it, by Resonance, into its magnetic flux (dark, not shown). Its polarity conforms to the right-hand-rule of electromagnetism: when the index finger points in the direction of its toroidal flux, the thumb points to the north pole. The region wound by the helix is the eye of the vortex flux, a region of low pressure. That is why every charged primum sucks non-agitated superstrings into it and accumulate as massive concentration of non-agitated superstrings called mini black hole. The dark (non-agitated) segment of the primum joins and pulls the north and south poles, by Energy Conservation (Figure from [47])§.

We state a special form of the Flux Compatibility* law that applies directly to vortex fluxes of superstrings.

Flux Compatibility.Two prima of opposite toroidal flux spins attract at their equators but repel at their poles; otherwise, they repel at their equators but attract at their poles. Two prima of same toroidal flux spin connect equatorially only through a primum of opposite toroidal flux spin between them called connector.

A physical system is observable through the medium of light if its size is comparable with the wavelength of the latter; this follows from the Resonance Law [19]. Thus, a semi- or non-agitated superstring is not observable since its cycle length is less than the finest wavelength of visible light in order of magnitude which is about $10-14$ meters. What really is a primum? When the toroidal flux along its cycles is hit by cosmic waves coming from all directions it is thrown into erratic motion due to collision with other superstrings turning it into a spike with the centroid traveling through the cycles at $7(1022)$ cm/sec. It pulls the superstrings around the primum into its induced vortex flux (simply referred to as vortex flux), by Flux-Low-Pressure Complementarity, with its axis coinciding with the axis of the primum inside the cylindrical eye making it a magnet, its polarity in accordance with the righthand rule of electromagnetism (Figure 2). The vortex flux is counterclockwise for a positive primum, by convention, negative otherwise. By Newton's action-reaction law a free positive primum has the opposite spin. This is the spin of an elementary particle of quantum physics which is a measure of angular momentum. For example, the electron has spin $+1/2$ [48].The plane passing through the apex of its profile and normal to its axis is its equatorial plane its intersection with the primum the equator.

The energy of the vortex flux of a primum is measured as charge its unit the electron's charge: -1 $(1.6(10-19)$ coulombs). Charge is a property of the vortex flux of the primum that follows from Flux-Low-Pressure Complementarity. The graviton that physicists are looking for does not exist. The electron, +quark and −quark have charges -1, $2/3$, $-1/3$, respectively [49]. Seismic waves generated by the micro component of turbulence at its interfaces and at the spinning cores of a cosmological vortex [25,50] convert dark to visible matter in and around it, e.g., cosmic dust.(We note that seismic waves are responsible for cracking or pulverization of brittle materials and softening of metals during an earthquake so that the amount of destruction is quite disproportionate to its jolting action).

The primum's vortex flux and natural vibration endow dark matter huge latent energy partially convertible to kinetic energy. The latent energy density of dark matter is 1026 joules/cubic ft. according to de Broglie [35], 8(108) volts/cm says Seike Jr [35] and the equivalent of 18 kg/cu meter according to Gerlovin [49] using relativistic conversion.

The proton consists of two +quarks joined by −quark equatorially, by Flux Compatibility (Figure 3). By Energy Conservation, its axis are coplanar; the proton's charge: $2/3 − 1/3 + 1/3 = +1$. Thus, the proton has net coherent counterclockwise vortex flux around it. Since a simple primum is charged, the neutral neutrino must be a coupled pair of simple prima of numerically equal but opposite charges, say, +q and −q, so that its charge is +q + −q = 0, neutral.

Figure 3.The proton (left)is a cluster of two +quarks joined by a −quark at their vortex flux's rims by Flux Compatibility. The neutron (right) consists of a proton, electron and neutrino (represented by a horizontal figure 8). Thus, the two +quarks of the proton are joined separately by the electron and −quark (by Flux Compatibility). The coherent flux at the center of the neutron (same direction of spin at interfaces) creates suction, by Flux-Low Pressure Complementarity, that pulls the neutrino in. (Figure from [47])§

By Flux Compatibility the electron can attach itself to a positive quark of the proton but Energy Conservation and the optimality principle of the Energy Conservation Equivalence require that it attaches to both +quarks beside the negative quark as the most stable position but pushes the −quark a bit by Flux Compatibility so that their centers viewed from the north pole form the vertices of a quadrilateral. In its interior are the coherent vortex fluxes of the +quarks, −quark and electron that make it a region of low pressure or depression. By Flux-Low-Pressure Complementarity its interior sucks a neutral primum around it since charged primum is repelled by the −quark.

Therefore, only suitably light neutral primum fits in and that is the neutrino. Thus, we have just reconstructed the neutron consisting of a proton, electron and neutrino. Its charge: $+2/3 - 1/3 + 2/3 - 1 + 0 = 0$, i.e., neutral, and there is no net coherent vortex flux around it. The vortex flux of a charged coupled primum is also discular for the same reason that the simple primum's vortex flux is due to greater centrifugal force along the equatorial plane.

V. THE ATOM, MOLECULE, HEAVY ISOTOPE

The protons are the first to form the nucleus of the atom (Figure 4). When there is only one proton it forms a linear array of its component quarks inside the eye of its vortex flux and has charge + 1. Therefore, it is stable when there is one orbital electron around it. The light isotope of hydrogen has this configuration. If there are more their vortex fluxes add up to form the vortex flux around it. The protons are joined pairwise by –quarks. In large a nucleus the protons form layers of concentric rings around the bulge cylindrical eye, its profile similar to that of a primum (Figure 2). The number of layers is subject to qthe quantization principle and energy conservation. In a heavy isotope the neutrons around the protons concentrating and close to the equatorial plane symmetrically due to centrifugal force. Clearly, the nucleus is fractal; therefore, the electromagnetic waves generated by its natural vibration is also fractal and endowed with huge energy. As positive coupled primum (its induced vortex flux spins clockwise), the nucleus is a magnet of positive polarity with the vortex flux around it providing the magnetic field. Viewed from the northpole the vortex flux of a free atom spins counterclockwise (right hand rule of electromagnetism). The electrons being negatively charged are attracted to the vortex flux away from the eye but being light, they are swept into orbit by the vortex. By centrifugal force, the most energetic orbital electrons are those closest to the equatorial plane; they form the outermost subshells [20]. The least energetic cluster near the poles and form the lowest orbital shells. A stable atom has orbital electrons equal to the number of protons in the nucleus. Otherwise, it is a positive or negative ion and reacts with other prima. Moreover, the eye sucks non-agitated super- strings that accumulate steadily in the nucleus as mini black hole [20], the principal source of nuclear energy in nuclear fission. In fact, every charged primum, simple or coupled, sucks and accumulates non-agitated superstrings that form a mini black hole in the eye. This was confirmed for the proton at CERN [36] by the great burst of energy attributed to the Higgs boson released when two protons collided at great speed. The neutron is the only primum sucked by the nuclear eye to form heavy isotope because it is neutral [20].Charged prima are repelled by the +quark or the –quark. The usual molecular formation has one valence electron and a –quark from each of the two atoms at their outer subshells that serve as double connector [20] so that the molecule has two electron connectors.
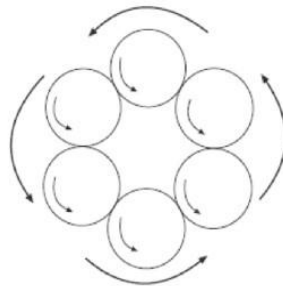

Fig. 4: Light nucleus viewed from the north-pole. The neutron is not indicated as it has no vortex flux being neutral. (Figure from [47])§

Since adjacent protons in Figure 4 have opposite flux spins, they are repulsive. According to Coulomb's law [2], the force of attraction or repulsion between two charged prima is given by,

(3) $F = \mu q_{m1} q_{m2}/4\pi r_2$,

where
F is force (SI unit: newton);
q_{m1} and q_{m2} are the magnitudes of the interacting charge primaas magnets (SI unit: ampere-meter;
μ is the permeability of the intervening medium (SI unit: newton per ampere squared);
r is the separation (SI unit: meter).
As $r \rightarrow 0$, $F \rightarrow \infty$. This is the strong force that puzzled physicists: how come the nucleus is intact and stable despite the repulsive force between them. The reason: the +quarks, one from each of the adjacent protons, are joined together by a –quark [47]. Therefore, the gluon is really the –quark. This was confirmed by an experiment in Fermi Lab in 2004 and publicized widely. In Figure 4 the adjacent protons are joined by a –quark (not shown).

Primal interaction is governed by Flux Compatibility and Flux-Low-Pressure Complementarity. Since the masses of the neutron, proton and electron are known [51] and the composition of the neutron is known, the mass of the neutrino is computed as follows:

(1)   neutron: 1.674(10−27) kg; proton: 1.672(10−27)kg; electron: 9.611(10−31)kg.

Converting to atomic mass unit (amu) their masses are:

(2)   neutron: 1.0087 amu; proton: 1.0073 amu; electron: 5.486(10−8) amu.

The mass of the neutrino is: η = 8.5(10−8) amu or 1.55 times the electron's mass (that of the electron is 1/1840th that of the proton's). Ironically, the mass of the neutrino is still a subject of hot pursuit [52,53].

A primum in flight rides on electromagnetic wave, its envelope. In cylindrical coordinates the primum has the equation x = t, y(t) = β(sinnπt)(cosmkπt)), θ =nπt, t ∈ [−1⁄k,1⁄k], n, m, k, integers, n >> k, m even [54]. Its cycle energy is the Planck's constant h = 6.64×10–34joules. Scooped up and carried by cosmic wave, its cycles flatten to the rapid oscillation, z = 0, x = t, y(t) = β(sinnπt)(cosmkπt) due to dark viscosity due to dark viscosity. Thus, a primum in flight is a fine sinusoidal arc. It becomes the photon, z = 0, y(t) = β(sinnπt)(cosmkπt), when it breaks off from its loop; the energy of one full cycle of the primum or one full arc of photon (its projection on the plane) is h and its toroidal flux speed along the arc is 7(1022) cm/sec. Figure 5 shows a primum or photon lodged between two parallel electromagnetic waves with the two half arcs as its envelope.

The photon is a primum separated from its loop. Since the photon has energy, it has mass converted from the mass of the primum it comes from; its speed equals the speed of its electromagnetic wave carrier which is 3(1010) cm/sec after adjusting for the effect of dark viscosity. Since the photon is not a loop it collapses when it leaves the carrier wave envelope its toroidal flux remaining dark. This is the reason it has no rest mass. This happens when the photon is blocked by opaque substance;its toroidal flux breaks away from its carrier (which goes through) and remains dark and non-agitated. In large quantity the combined kinetic energy heats up the opaque medium. In translucent medium some of the photons go through. When the photon is knocked off by another cosmic wave or reflected by a mirror it switches to another electromagnetic wave carrier in the direction of transit.

VI. QUANTUM PHENOMENA

We present some of the previously unexplained natural phenomena in traditional physics.

Wave-particle duality

The wave-particle duality of quantum physics applies to any primum or photon that is embedded between adjacent parallel electromagnetic waves their ends half-phase apart, e.g., electron or photon (Figure5). That the electron is a particle is well established. That it is a wave is supposedly confirmed by shooting a beam of electrons through slits in a thin plate where they become waves emanating from the slits on the other side of the plate [43], an electron in the beam supposedly becoming a wave.
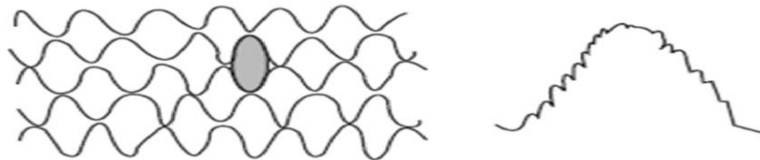

Fig. 5. A primum or photon lodged between two arcs of parallel electromagnetic waves, left. An arc of electromagnetic wave,right, is fractal because it is generated by the natural vibration of the fractal nucleus. The fractal structure of electromagnetic wave endows it with huge energy that it converts superstrings to prima. (Figure from [47])

The notion that a particle is both wave and particle is a contradiction. A particle is an autonomous physical system independent of the medium while a wave is suitably synchronized vibration of the medium with a sinusoidal profile expanding radially from its source (analogous to the "motion" of neon lights due to synchronized sequence of switching); each vibrating element remaining in place. That medium is dark matter which is unknown in traditional physics including quantum physics. Therefore, this contradiction cannot be resolved there. With dark matter as medium we are able to resolve this contradiction. The wave characteristic is provided by the carrier electromagnetic wave and the particle characteristic by the primum it carries.

Recall that the electron, a primum, is bulged segment of semi-agitated (hence, visible) superstring, where the helical cycles are infinitely close and its toroidal flux, a non-agitated superstring, travels through the cycles uniformly at speed of 7(1022) cm/sec. However, when in flight and it is embedded between the full arcs of a pair of parallel electromagnetic waves, its carrier and envelope at half phase apart.The helical cycles become flattened rapid oscillation due to dark viscosity with the arcs infinitesimally close together and the toroidal flux retaining the speed

of 7(1022) cm/sec, by energy conservation, and becominga thin solid figure of sinusoidal shape (embedded in a pair of electromagnetic waves that gives it particle characteristics; the embedding pair of waves is its envelope and retains its wave characteristics.

The same wave-particle characteristic is attributed to the photon, a primum in flight that has broken off its loop [54]. Dark viscosity similarly flattens it into rapid oscillation embedded between two arcs of parallel electromagnetic waves half a phase apart. Its toroidal flux travels through the arcs of the rapid oscillation at the same speed of 7(1022) cm/sec, its forward flux speed equals the speed of the carrier basic electromagnetic wave which is the speed of light c = 1010 cm/sec. Therefore, it is stable only when its forward flux speed is equal to the speed of its carrier electromagnetic wave; otherwise, its flux leaves the carrier and the photon, i.e., the first term of its fractal sequence, vanishes, its toroidal flux remaining at rest in dark matter. This accounts for the photon having no rest mass.

The solidity of suitably close toroidal fluxes is analogous to the solidity of an ordinary object, say, a piece of iron. All that we have in the latter are toroidal and vortex fluxes of superstrings. In fact, the atomic nuclei consisting of toroidal fluxes are so far apart that at the dark scale a piece of iron is practically a vacuum.

Among gases the most energy conserving arrangement is diatomic, i.e., coupled pair of atoms of the same gas. Ions are unstable since they interact with other atoms. Chemical replenishment including that of oil follows the Stochastic Complexity and Stability Laws.

Matter-anti-matter interaction

Two simple prima are anti-matter to each other if they are mirror images of each other with respect to a plane between them normal to their common equatorial plane. For example, the electron and positron are anti-matter of each other. Their toroidal flux spins are symmetric and have opposite spins. Therefore, they attract each other. When they get close, the momentum of their attraction forces their cycles to overlap and their fluxes to repel (since their overlapping cycles have opposite toroidal flux spins) leading to explosion, by Flux Compatibility, that throws them as photons into opposite directions parallel to their respective axis. The logic of GUT says that every simple primum has anti-matter. However, primal polarity and the Earth's gravitational flux separate matter from its anti-matter. Free negative anti-matter, e.g., the electron and –quark, remain on the ground while free positive anti-matter remain in the atmosphere the lighter ones near the rim of the gravitational flux.

A simple primum has anti-matter. Does a coupled primum have anti-matter? Yes, when it has suitable symmetry. For example, since the two +quark and the –quark of the proton are linearly arranged, a coupled primum consisting of two –quarks joined by a +quark is its anti-matter. Then they are attractive and when close, the momentum of their approach forces their cycles to overlap and mutually throw each other in opposite directions as two photons. Such occurrence is minimized by the Earth's gravitational flux which separates them. Neutral prima, of course, have no anti-matter but their charged components have. However, a simple primum even if coupled with other prima may be annihilated by its anti-matter. This applies to charged components of the neutron. In fact, individual simple primal component of a coupled primum have anti-matter that can mutually destroy each other.

Superconductivity

Electric current is induced vortex flux of superstrings of an atom (magnetic flux) diverted through a conductor). At room temperature visible (measurable) electric current is provided by electrons riding on the flux of superstrings. Resistance is due to their collision with the atoms of the conductor. When the temperature of the conductor is reduced to 110○K, the ionization energy of the conductor is raised to a point where no electronis freed from its orbit. Since the flux of superstrings continues to flow through the conductor there is electric current without resistance. This is called superconductivity [55].

The Higgs boson

The recent experiment at CERN released powerful burst of energy upon head-on collision of two protons at great speed, each close to the speed of light, and this was attributed to the Higgs boson within the proton [36]. To be precise, what the experiment revealed was the destruction of that so-called Higgs boson. Therefore, being destructible, the Higgs boson cannot be the fundamental building block of matter. The Higgs boson is actually at least one of the 6 mini black holes in the eyes of the two colliding protonsin the experiment.The experiment confirms the existence of a mini black hole in a simple primum. When suitably agitated it releases a huge burst of kinetic energy, e.g., photons. The experiment is also an independent verification of the mini black hole as source of tremendous energy released by nuclear explosion.

The work around CERN raises several questions. (1) How does the Higgs boson fit in and define the structure of the proton and other elementary particles and the atom? (2) Since the Higgs boson is supposed to endow mass to an elementary particle, it must have mass and its conversion to kinetic energy conforms to Energy Conservation. It is known that in the Cosmos, the cosmological bodies, e.g., stars, galaxies and planets, add up to less than 5% of the mass of our universe. (3) Where is the remaining over 95%? (4) What is it and how does the Higgs boson fit there?

The experiments at CERN do not answer these questions but GUT does. The failure to answer these questions account for the failure of the standard model to advance physics.

An advocate of the standard model made this comment [56]:

"Experimenters will have to verify that the new particle (Higgs boson) is at a spin-0 Higgs boson. Next, they must test how the Higgs boson interacts with other particles to high precision. At this writing its couplings do not quite match predictions, which could be just a statistical fluctuation or a sign of some deeper effect."

With dark matter as medium we can resolve this contradiction.

Unstable prima

There are close to 200 unstable prima (elementary particles) produced mainly in the laboratory. Except for the stable basic prima, they all vanish in split second. Why? The only relevant natural principles that provide the answer are the non-redundancy and non-extravagance principles that say, in effect, nature does not need them because they have no function that is not covered by existing prima. They are man-made prima produced by the agitation of the superstrings in the laboratory or by cosmic waves.

The other stable prima are anti-matter of the basic prima. The anti-matter of the electron is the positron. The other stable primum is the neutrino. At this time, it is not known what its two components are although we know that have equal but opposite charges.

Primal Polarity

We look at the primum as it pops out of dark matter. Since the dark superstring has infinitesimal induced vortex flux, it has no polarity and does not interact with anything except cosmic waves and it is oriented randomly. When a dark superstring is agitated by suitable cosmic wave and pops out of dark matter as free positive primum and its equatorial plane is oblique to the direction of the gravitational flux it rotates suitably due to the coriolis effect [25], its north pole pointing North and equatorial plane parallel to the Earth's equatorial plane (vortex flux spins from West to East) making its vortex flux a counterclockwise eddy in the gravitational flux, its optimal energy-conserving alignment. Free neutral prima are oriented randomly but free positive ions are counterclockwise eddies in the Earth's gravitational flux; they are pushed upwards, by Flux Compatibility. However, the protons being heavy remain in the lower atmosphere. The free electrons as clockwise eddies in the Earth's gravitational flux whose equatorial plane is parallel to the Earth's equatorial plane are pushed downwards, by Flux Compatibility. Thus, there is abundance of free electrons on the ground. Other free negative prima including the –quarks should be abundant on the ground also but we do not know where they are and no study has been done on them. It is possible that they also ride in the flux of electrons in a live conductor. When the voltage between the positive ions in the lower atmosphere and the electrons on the ground reaches critical level they rush towards each other, collide and explode as lightning. Lightning, being interface of turbulences [25] generates seismic waves that convert dark matter to earthlights in the mesosphere called sprites, elves, blue jets and gamma rays [57].

The Gluon and Graviton

In 2004, there was much excitement among physicists when a third quark was discovered in the nucleus outside the proton. They thought it was the gluon they were looking for that is supposedly responsible for counteracting the strong force and holds the protons together in the narrow confines of the nucleus. By the non-redundancy and non-extravagance principles the gluon is the –quark. Thus, the strong force does not exist. The –quarks bind the protons together. We now know what is in the atom and there is no graviton there. It neither exists nor is itsexistence a theoretical necessity. In the cosmos? It is not there either. Gravity is due to the suction of the eye of a cosmological vortex being a region of low pressure.

Nuclear and Thermonuclear Energy

We note that the mass of an atom is concentrated in the nucleus since the mass of the proton alone is 1840 times that of the electron. It is known that when a radioactive material splits into lighter elements the sum of the masses of the resulting component elements is less than that of the original element. This is edified by Einstein's famous equation $E = mc^2$. This is based on the assumption that some pieces of matter of mass m is destroyed in the splitting of the atom. However, we know that matter is indestructible. Therefore, the correct equation should be $E = (\Delta m)c^2$. This equation is verified in every nuclear reactor today. There is very little destruction of the radioactive material. That is why the problem of nuclear waste disposal remains a problem. The half-life of Uranium 235 is 1,800 years. The question that remains is: Where does nuclear energy come from? The answer according to [20] is: the agitation of the mini black holes in the prima of the nucleus. We know that every charged primum sucks non-agitated superstrings that accumulates into a mini black hole in the eye. Thus, a proton has three mini black holes since it

consists of two +quarks and a –quark. The one that burst at CERN was one of the six mini black holes of the two protons that collided.

The energy in thermonuclear explosion is wrongly attributed to nuclear fusion. In the first place, there is no natural law that supports it. In fact merging of two nuclei would require inserting at least an additional proton in the nucleus and the resistance is incomprehensively huge, according to Coulomb's law.

Brittle and malleable materials

Brittle material, e.g., ceramics, has no free electrons; therefore, it is a good electrical insulator and does not vibrate and transfer heat. That is why it is heat insulator. Malleable material like metal has free electrons; therefore, it is good electrical conductor. When bent valence electrons are expelled but when released free electrons replace them, the material restored to its original form and the essence of elasticity. Therefore, malleable material vibrates as synchronized sequence of distortion and "restortion". When heated at a point malleable material vibrates there since heat is vibration of molecules and, through resonance, vibration spreads outward along concentric circles (if its elasticity is homogenous) and heat is similarly conducted outwards. Therefore, malleable material is good heat conductor.

When metal vibrate beyond a critical point and the rate of expulsion of valence electrons is greater than the rate of replacement it may soften or even melt. Valence electrons may also be expelled by the impact of seismic waves. The softening of metal attachments of building foundations and concrete reinforcement due to high intensity seismic waves during earthquake knocks out buildings and cracks or pulverizes concrete [24]. It is not due to the usual gentle rocking action during earthquake that causes destruction but the impact of seismic waves. There is technological challenge here: making suitable alloy resistant to the softening impact of seismic waves and composite resistant to cracking and pulverization by them. It offers the possibility for constructing earthquake-proof structures. This needs research and development on compositesand alloys resistant to cracking and softening or melting.

Metal fatigue

An American Airlines plane's pylon broke and the engine fell off just after take-off from O'Hare International Airport in Chicago in the 70s causing the plane to crash and kill all 392 passengers aboard. Bridges suddenly collapse and metallic casing of a train's wheel breaks off, gets stuck dangling under the train and caught at rail junction causing terrible derailment accident (this happened in Germany fivedecades ago). These phenomena are still not understood but they are the result of sustained repetitive motion or vibration.

Metal is not perfectly elastic; when subjected to repetitive distortion like vibration, the net loss of valence elections accumulates over time, reaches a critical point and the metal snaps. This explains the cause of the above accidents involving repetitive motion. This is illustrated by a metallic paper clip that snaps when bent back and forth. Infinitesimal but progressive deterioration of vibrating metal is not detectable. Therefore, test of material should be made at appropriate conditions for its use to determine when metal fatigue sets in to avoid accident.

Greater elasticity of carbon relative to other gases due to stronger bonding raises its normal vibration frequency and absorption of excess heat in the atmosphere coming from the Sun and contributes significantly to the Greenhouse effect [58].

Brownian motion and pressure

Brownian motion is due to the impact of electromagnetic waves on the atoms and molecules of gas and liquid that throws them in all directions which, combined with their collisions, send them into erratic motion. When confined their motion creates pressure on the container, by momentum conservation. In the case of liquid pressure is proportional to the distance from the surface due to gravity. Since the atoms and molecules of light gas are widely dispersed the effect of gravity on pressure is minimal and when confined pressure is even on the container. However, for dense materials like liquids pressure from gravity is considerably higher that a hollow cylindrical metallic pipe submerged in water at suitable depth is flattened due to the pressure gradient between the inner and outer surfaces.

VII. ELECTROMAGNETISM

Every minute of our life depends on electricity and magnetism and every engineer knows their relationship: magnet produces electricity and electricity produces magnet. Today, we lift technology into a new domain and resolve the burning issue of the moment: climate change.

Electric Current

When a live conductor (malleable material like metal) cuts across the magnetic lines of force vortex flux of superstrings flow through it at speed of 7(1022) cm/sec. In a malleable material there are free electrons because it has low ionization energy. This means that orbital electrons are knocked off their orbits by electromagnetic waves. They ride on the flux of superstrings. When they collide with atoms of a resistor, e.g., the filament of an electric bulb, they produce heat or light. When the temperature of the conductor is reduced to 110° K or less, the ionization energy rises so that free electrons vanish, i.e., there is electric current (flux of superstrings) without resistance because there are no electrons to collide with the atoms of the resistor. This phenomenon is called superconductivity. This debunks the idea that electric current is due to some charged carrier.

Making a magnet

To make a bar magnet, one wraps a coil around it connected to a direct current and another coil over it first coil connected to alternating current. When power is turned on for both then the second coil shakes the atoms, the first aligns them polarly to form strings and bundles and the iron bar becomes a magnet. A strong magnet can be made by raising the voltage and duration of the process.

Recall that the atom is a magnet with a vortex flux of superstrings powered by the protons in the nucleus. Its polarity is in accordance with the right-hand rule of electromagnetism. Denote by N and S the north and south poles. Using the right-hand rule of electromagnetism the spin of its vortex flux is counterclockwise looking at it from the north pole N. In a ferromagnetic material, e.g., iron, the atoms can be aligned and joined N-to-S or S-to-N to form a string. Then the string can be joined equatorially with other strings through their component atoms by −quarks to form a bundle, the maximum number of strings depending on the material, by quantization.
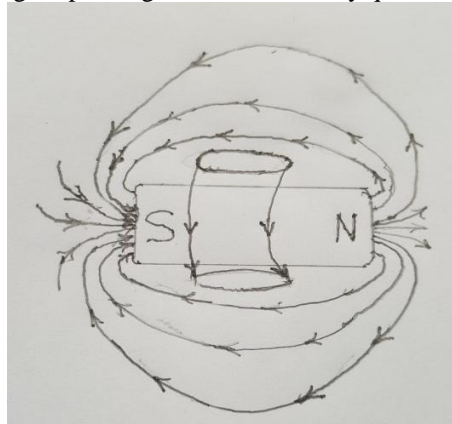

Figure 6. A bar magnet, its magnetic lines of force, shown by arrows from N to S, and the cylindrical eyes of its magnetic flux.There are two cylindrical eyes. The main one is the straight cylindrical eye where the bar magnet is. The other is the circular cylindrical eye whose axis is normal to the former's axis.

In an ordinary magnet each bundle determines a line of force whose induced vortex fluxes are subject to the righthand rule. Both N and S poles of a bar magnet have little N and S poles corresponding to the poles of the bundles. They show when iron filings are dropped sparingly on a piece of paper placed over the magnet. The coherent vortex flux of the bundles creates a magnetic field. In a magnet bundles form beyond the N-pole (by Flux Compatibility) that go around and join their respective south poles. The bundles form the lines of force around it. When a live conductor (closed circuit) cuts across the toroidal fluxes of the bundles the toroidal fluxes are diverted to it. That is how electricity is generated by a magnet. In an ordinary electric power plant the rotating coil around the armature generates AC which is suitable for long distance transmission with little loss of power because flux of superstrings do not travel far; they just oscillate in place.
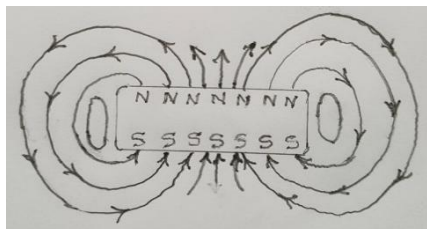
Figure 7. In the above fat bar magnet, atoms of the same vortex flux spin join S → N to form a string. Strings are joined by –quarks to form a bundle. The number of strings in a bundle depends on the ferromagnetic material. Each bundle extends beyond the N-pole and joins the S-pole of the bundleindicated by the arrows. The magnetic lines of force indicated by the arrows map the locations of the bundles. The two ovals at the ends of the fat bar magnet are are the cross-sections of the cylindrical eye. For an oval magnet, just smooth out the corners of a fat bar magnet.

Every vortex has an eye including the magnetic flux which is a vortex flux of non-agitated superstrings. The bar magnet shown in Fig. 7 has two eyes. One is a circular cylindrical eye that wraps around the middle of the magnet. The arrows do not indicate magnetic lines of force but the coherent direction of the vortex fluxes of the atoms of the bundles in the magnet. The other eye is also cylindrical but elongated and contains all the bundles within the magnet. The polar joins of the strings in the bundles become weaker as they move away from the bar magnet, by Coulomb's law. Therefore, they break at their farthest points. The remaining segments of the broken bundles are indicated by arrows at the poles.
The north pole of a magnet has little north poles of the bundles. It is illustrated by the fat bar magnet in Figure 7. The little ovals at the left and right are the cross sections of the circular cylindrical eye around the fat bar magnet.

VIII. MACRO GRAVITY

Macro is the science of cosmological vortices including our universe, a super galaxy.We focus on the cosmology of our universe – its birth, evolution, destiny –and physical systems at macro scale, e.g., stars and galaxies. Our universe is a local "bubble" in the boundless, timeless Universe of dark matter. This is a new perspective where previously it was thought our universe was the Universe, a source of error in the estimate of its age [1], especially, with the discovery of stars in the Milky Way older than the Big Bang [59].

Ordinary Universe
By Energy Conservation the superstrings shrink steadily and by the law of uneven development depressions form each containing depressions, etc., ad infinitum, forming nested fractal sequence of depressions [29] with the original depression the common first term. By Flux-Low-Pressure Complementarity each depression becomes the common first term of nested fractal sequences of cosmological vortices of superstrings around it. It becomes the major cosmological vortex whose eye sucks and pulls the surrounding fractal sequences of cosmological vortices along rotating spirals falling towards and winding around and merging with the spinning collected mass around the eye called the core, a cosmological body. Its equatorial plane passes through the center of the eye normal to its axis. The spinning discular halo of vortex flux of visible matter containing all cosmological bodies (minor cosmological vortices) and their cores (minor cosmological bodies) under its influence including the spirals of falling cosmological vortices and cosmic dust is discular just as its gravitational flux that wraps it is. The gravitational flux determines the internal dynamics of this cosmological vortex including gravity which is suction by the eye. The same dynamics, processes and structure are replicated in each of the minor vortices, e.g., star and planet in the case of a galaxy.
Initially, a cosmological vortex is dark but its tremendous spin (kinetic energy) agitates and converts the superstrings around the eye to visible matter, first as simple prima and then as light elements. The bulk of the conversion is due to its micro component of turbulence in the inner core that generates seismic waves and convert dark to visible matter in the core and around it [25,50]. In a galaxy the increasing power of spin combined with dark viscosity results in: (a) stretching of suction by the eye and reach of the rotating spiral paths of falling minor vortices and their cores (seen in young galaxies called spiral nebulae [60] at the ascent phase of their development) and (b) increasing centrifugal force on the revolving cosmological bodies along the spirals. The balance between the suction by the eye (gravity) and centrifugal force on the rotating cosmological bodies is attained first on the periphery of the vortex flux along the equatorial plane that puts the bodies there into orbit around the eye. The locus of this point approaches the eye along the spiral so that all visible bodies near the core are engulfed by gravity first. Mercury was the last planet to escape the Sun's gravity.

Evolution of Cosmological Vortex
The expansion and increasing power of a major vortex continues until it gets pulled by an even more powerful cosmological vortex of opposite vortex spin, if any, and becomes the latter's minor vortex. Vortex fluxes of the same spin along a common equatorial plane repel each other but when their equatorial planes are oblique to each

other they can collide. Such an event between two galaxies was observed in 1995 [61]. Interaction between cosmological vortices leads to formation of maximal major vortices, by the quantization principle. When a maximal cosmological vortex has a galaxy as minor cosmological vortex we call it an ordinary universe.

Examples of Ordinary Universe

The Milky Way was an ordinary universe since it has 10 galaxies as minor cosmological vortices [62] before it was pulled into orbit by our universe which is a special universe. So does Andromeda which has 22 galaxies as minor cosmological vortices [62] but it probably formed in our universe because it is quite young as shown by its bright and robust spirals of falling stars [62,63]. The discovery of stars in the Milky Way older than the Big Bang shows that it is older than our universe [59,62]. This explains its faint uneven spirals of falling matter revealing that much of its visible matter has been sucked by gravity. Moreover, we can see the Cosmic Burst (Second Biggest Bang [64]) from our vantage point proving the Milky Way was far from the Big Bang when it occurred 8 billion years ago and was not part of our young universe. The Milky Way has 400 billion stars [62,65]. Its visible discular halo along its galactic equatorial plane is 100 million light years across, its crater 10 million light years thick [65]. Sagittarius, relic of a former galaxy and now a cloud of stars has been "cannibalized" by Milky Way that has gobbled up some of its stars [65]. Andromeda's visible discular halo is 200 million light years across; has mass equivalent to 3500 billion Suns [62,63]; has a double core at the center indicating it almost formed a binary galaxy; has the discular halo of a galaxy due to centrifugal force, thick at the center where visible matter collects due to suction by the eye but thin at the rim along the equatorial plane due to stretching by centrifugal force. Two of Andromeda's 22 minor galaxies are at opposite sides of and near its visible discular halo and appear headed for gravitational gobbling [62]. This dynamics of the evolution of a cosmological vortex applies to our universe as a super galaxy.

Cosmological Vortex Interaction

In any cosmological vortex the lucky few minor vortices at the balance between suction by the eye and centrifugal force take their orbits around the eye along rotating spirals. In the solar system they are the planets and planetoids that orbit the Sun. The Sun is a minor cosmological vortex of the Milky Way and what we see is its visible core. Consider any cosmological vortex. Since it rotates at great speed, greatest at the equator and 0 at the poles, centrifugal force throws visible matter outward at the equator. Then it becomes a thin disc of visible matter consisting of minor vortices and their cores and clouds of cosmic dust riding on the gravitational flux which is thick and concentrated around the eye. The discular cosmological vortex is seen in the image of a galaxy. Vortex flux spin determines interaction between cosmological vortices mediated by their gravitational fluxes in view of Flux Compatibility: two vortices of opposite spins are attractive at their rims along their equatorial planes; they are repulsive otherwise. If they have the same spin and their masses have the same order of magnitude, they evolve into binary cosmological vortices each revolving around the other and mutually riding on each other's spiral flux; centrifugal force prevents them from crushing into each other. If they have the same spin, regardless of their relative masses, they have mutual repulsion unless one is a giant compared to the other in which case the more massive one gobbles up the other by gravity. However, if one is large compared to the other and has opposite spin, the latter rides as minor vortex or an eddy on the gravitational flux towards and merges smoothly with the core of the former unless the centrifugal force on the smaller vortex balances the main gravitational flux pressure in which case it takes elliptical orbit around the main core. Otherwise, if centrifugal force exceeds gravitational pull on a body, it gets catapulted off the vortex's influence along the equatorial plane. This is what happened to the galaxy clusters traversing our universe [67]. Elliptical orbit, being due to radial oscillation is the most probable orbital configuration since perfect balance that yields circular orbit is unstable, by Uneven Development. A minor vortex along the main spiral streamline that spins opposite that of the main vortex either forms elliptical orbit around it as eddy or gets sucked into and is crushed by the core and joins it. As an eddy a vortex has relative autonomy. Two contiguous vortices of comparable masses with the same spin do not crash into each other due to mutual repulsion of opposite fluxes, another case of quantum-macro gravity duality.

The Destiny of a Cosmological Vortex

The steady suction by the eye thins out both dark and visible matter and weakens the impact of both gravity and spin, again, starting from the rim of the equatorial disc where gravity is weakest and moving on towards the core until the core vortex is completely isolated from the minor vortices and the latter, in turn, become an independent cosmological vortex like the cloud of stars of Sagittarius. Over a long period of time the core spin considerably weakens and much of the prima have weakened also and lost their bonding and separated. Most of their kinetic (dark) energy has dissipated (turned dark) and, in the case of a galaxy has become a dwarf star; not literally dwarf or small but shrank and weakened considerably. There are many dwarf stars in the cosmos, some as massive as 200

million times the mass of our Sun. The superstrings that comprise them continue to shrink and, over a long period of time, become non-agitated and dark. At this time, this region of the sky appears empty – absence of visible matter. There are many such regions in the sky referred to as black holes. Indeed, at the center of each of such a region is a black hole, massive concentration of non-agitated superstrings that comprised the once massive and powerful galaxy. It is now its graveyard.

Let us look closely at the ageing of a cosmological body. The sucked minor cosmological vortices do not get into the eye directly but spin and accumulate around the it. If its mass is less than 2/3 the mass of the Sun it cools off and solidify over a long period of time. Let us look at the Earth as an example since much is known about it. Details about the Earth's interior are provided by [68] and there is no controversy regarding that portion of the Earth around the inner core. It is believed that the inner core consists of solid iron. Its solidity is based on analysis of seismic waves passing through it. That it consists of iron is doubtful. The inner core is sandwiched between the cold eye and the hot outer core. The inner layer of the inner core is being de-agitated by the calm cold eye of the Earth's vortex that weakens the primal bonding of the elements that are able penetrate the inner core into separate prima. They are eventually de-agitated into non-agitated superstrings and join the black hole in the eye. At the outer layer of the inner core complex elements like iron are ripped apart by the high temperature and kinetic energy (mainly vibration) into at most composite prima like neutrons and protons whose bonding are weakened by the lower temperature around the eye. They are eventually decomposed into simple basic prima at the boundary of the eye and ultimately de-agitated at the boundary of the eye and join the build up of the black hole in the eye.

Every cosmological vortex goes through this process and has a black hole in the eye [69,70].

it, accumulate around the eye and cool off into a solid at the outer layer at the ouFor example, the Earth we stand on is the solid core of a minor cosmological vortex of the Sun. Since the eye of a cosmological vortex is a region of calm, it de-agitates the core layer by layer. The non-agitated superstrings join the massive concentration of non-agitated superstrings in the eye – a black hole. That is why every cosmological vortex, e.g., the Earth, has a black hole at the center. We can see here that contrary to popular belief, a black hole does not suck matter around it. It is the eye of a cosmological vortex that nurtures and builds it that does. To summarize this section, the destiny of a cosmological vortex is a black hole.

Our Universe

Our universe traces its origin to the Big Bang, a rare colossal event, an explosion of a super massive black hole 8 billion years ago [71], destiny of the core of a previous special universe [20,63]. The Big Bang was caused by a sequence of hits on that black hole by electromagnetic waves that triggered chain reaction and eventual explosion. It created a super depression that started the formation of a super galaxy which has now evolved to our universe [28]. The Big Bang created shock waves (highly energetic nested fractal cosmic waves) and a wave front as a Cosmic Sphere that pushed outward into accelerated expansion while at the same time being pushed by dark matter exterior to it due to suction by thesuper depression. Thus, the trapped superstrings were compressed between the inner and outer boundaries (layers) of the Cosmic Sphere by the two opposite forces. The most energetic shock waves pierced through the Cosmic Sphere and converted dark to visible matter in its immediate vicinity. The less energetic ones bounced between the outer and inner boundaries agitating the trapped superstrings but only up to semi- agitated superstrings due to compression. Continued expansion combined with outward pressure from the compressed semi-agitated superstrings weakened it until it burst at t = 1.5 billion years from the start of the second big bang (Cosmic Burst) [64] much more powerful than the Big Bang due to the great infusion of energy during 1.5 billion years of semi-agitation of the trapped superstrings. We put the birth of our universe at this point because the released semi-agitated superstrings converted to prima in the neighborhood of the once Cosmic Sphere and formed bright radioactive clusters called quasars consisting mainly of simple, therefore, charged prima, the initial visible matter of our early universe. They peaked at t = 2.5 billion years [70]. As the temperature cooled coupled prima and light elements formed and got entangled into the galaxies around it which, in turn, were drawn to it by gravity and became minor vortices. Thus, the Big Bang did not create new galaxies other than our early universe that evolved into our universe. As our universe increased its spin it imparted greater centrifugal force on the galaxies but suction by the eye balanced it and induced them to form elliptical orbits around it, by Uneven Development. As its power rose further, centrifugal force surpassed gravitational suction and catapulted galaxies outward. This explains its present accelerated radial expansion [73,74] which has nothing to do with the big bang anymore since the Cosmic Burst eliminated any trace of events before it including the Big Bang. As our early universe continued to expand due to increasing centrifugal force on the galaxies that have been drawn into it its gravitational pull on the galaxies around it broadened. Our universe is not the only special universe; the galaxy clusters traversing our universe must have been catapulted by a much more powerful special universe. Moreover, the collision of a galaxy with one of the two galaxies coming from a different direction [61] reveals the existence of some special universe more powerful

than ours. Galaxies in our universe travel along outward radial trajectories and cannot collide among themselves. One of the stunning discoveries of the last century that still haunts many physicists today is the staggering rate of radial expansion of our universe at accelerated rate [73,74].

Based on extensive direct measurement of the separation of galaxies from Earth Edwin Hubble formulated his law that expresses the rate of separation of a galaxy from us at distance s from Earth:

(4) $ds/dt = \rho s$,

where $\rho = 1.7 \times 10^{-2}$ /km distance of the receding galaxy from Earth. For convenience, we measure distance S along a great circle in the spherical dark halo of our universe. Then,

(5) $dS/dt = \rho S$.

Since this discovery the estimate of the age of our universe increased from the original 8 billion to the present 14.7 billion and there is talk of raising it to 20 billion. Each time an older star is discovered the estimate is adjusted to accommodate it. This star-chasing game is based on the wrong premise that only our universe exists. In fact, there are others and the evidence is quite strong. One is the presence of galaxy clusters traversing our universe and another is the collision of galaxies coming from different directions Galaxies in our universe travel along outward radial trajectories and cannot collide among themselves. Still another is the discovery of stars in the Milky Way older than the Big Bang. Therefore, we stick to the original estimate of 8 billion to solve (4) and find the radius r as a function of t.

Since $dS/dt = 2\pi dr/dt$ and (2) is independent of the distance between us and the other galaxy it holds when $S = r$. Then,

(6) $2\pi dr/dt = \rho r$ or $dr/r = (\rho/2\pi)dt$.

Solving for r, reckoning time from the Big Bang and taking one light year and one billion years as units and 10 billion light years as the diameter of our universe [75] we have,

(7) $r(t) = 1010e(\rho/2\pi)(t - 8)$ light years,

$r'(t) = (\rho/2\pi)1010e\rho/2\pi (t-8)$ light years/billion year,

$r''(t) = (\rho/2\pi)21010e\rho/2\pi (t-8)$ light years /(billion year)2.

Using standard units we have, at $t = 8$,

(8) $r(8) = 3.2(1022)$ km,

$r'(8) = 840$ km/sec,

$r''(8) = 1.7(10^{-2})$ km/sec2.

These figures where confirmed recently by Saul Perlmutter, Brian Schmidt and Adam Riess who shared the Nobel Prize for physics in 2011. This accelerated expansion was earlier reported in the scientific literature.

Since $r'' > 0$, our universe is on the young phase of its cycle. The value, $\rho = 1.7(10-2)$ km/sec2 was obtained by Edwin Hubble himself after extensive measurements of distances from Earth to galaxies. Now comes the online encyclopedia Encarta with a radically different value of $\rho = 2.3(10-18)$ or $r' = 1.1$ km/sec2. This implies a steady state universe expanding at the rate of 10–39 km/sec, slower than the fastest turtle on land. If this were true we would have been roasted by intense heat due to the steady formation of stars and galaxies in the cosmos. On the contrary, the average temperature remains at 3° K. This is chasing a wish in pursuit of science because relativists were alarmed by the rapid expansion of our universe which does not suit relativity. No evidence whatsoever has been offered except empirical data obtain 3 million years ago (by whom?).

Although GUT was completed in 2008, its extensions continue to be published to this day. In fact, a book, The Grand Unified Theory, is in the works to be published by Cambridge Scholars Publishing scheduled for release next year. These extensions comprise Phase II of the development of GUT, namely, the unification of the natural sciences. This paper launches Phase III: technological applications of GUT.

Magnetic levitation
Since a magnet has a vortex flux of superstrings, its eye is region of low pressure that it sucks and"floats" on the Earth's gravitational flux. This property of a magnet has important industrial applications in the design of electromagnetic engines that we shall discuss below. It also sheds light on human levitation since the human body is made up of prima and atoms which are tiny magnets

Human levitation
In rare cases, an individual may have sufficiently strong magnetic flux, a genetic endowment that can make him levitate. Since a healthy human body is stable as a physical system it has globally coherent net vortex fluxes of its prima around the body, by Energy Conservation and Energy Conservation Equivalence. Therefore, like a magnet the human body is engulfed by its coherent vortex flux of superstrings, its eye a region of low pressure embedded in

Earth's magnetic or gravitational flux that pulls the body upward. When the human vortex flux is particularly intense, the body levitates and, with proper balancing (squatting position), does not wobble. It can be an advantage in selected athletic games such as high jump or pole vault but a disadvantage for a runner since he loses grip on the ground. Giving the mind a blank moment regularly can invigorate it and improve control not only of thought but also body functions. In fact, in some very old ancient cultures like India, there is a legacy of training over an extended period of time to achieve some body control by thought including the coherence of the vortex flux (detected by sensitive camera as human aura) to be able to levitate. (The author talked with a man levitating in Circular Que, Sydney; using sign language, he said it took him 4 years to train to levitate)

IX. TECHNOLOGICAL APPLICATIONS

We introduce the subject with a discussion of one of the most advanced technologies of our time the magnetic train (magnetic levitation) or maglev.The author is not privy to its construction. Therefore, what we have here is a recommendation for the safest,most comfortable,quiet and efficient maglev train without operational and maintenance costbased on GUT.

The Maglev

The ultimate in technology is one that uses the clean, free, inexhaustible and indestructible dark matter which comprises 95% of the cosmos and is abundant everywhere around us. In the case of technology for treatment of diseases the ultimate one has no side effect. The pace-setter in the former is the maglev (Fig. 8) which runs solely on the basis of Flux Compatibility. Parallel oval bar magnets normal to and on the track line the full stretch of the track. The north pole of each magnet points to the left side of the track. Under the platform of each car are two oval bar magnets at the ends with the same polarity as the ones on the track. Since the track and platform magnets have the same polarity they are repulsive, i.e., the fluxes of the platform magnets and those of the track magnets push against each other, by Flux Compatibility. In effect, the train floats on the magnetic fluxes of the track magnets so that there is no friction when the train is pulled by its engine.
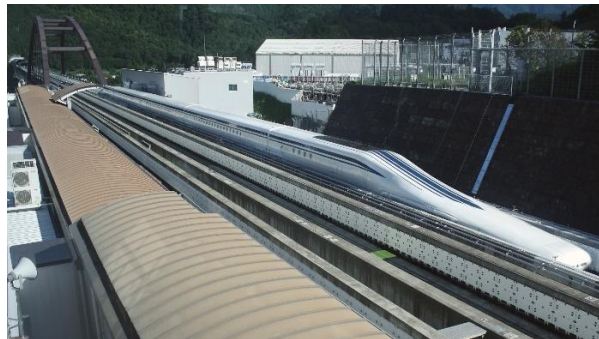

Figure 8. A 5-car long-nosed maglev. The magnetic engine is in the lead car. The long-nosed lead car minimizes aerodynamic resistance.

The maglev's engine is an oval bar magnet with the same polarity as the track magnets its planar axis horizontal when the train is at rest (Figure 9)
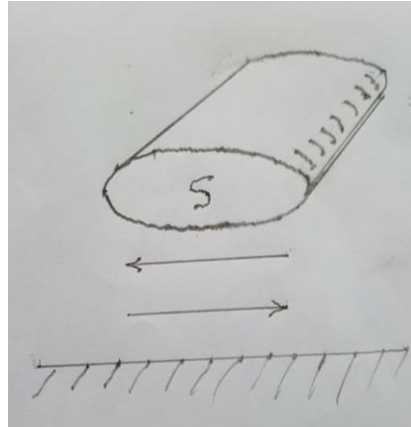
Figure 9.The magnetic engine is an oval magnet its planar axis parallel to the ground when the train is at rest. The first arrow points in the direction of the magnetic flux of the engine and the second below it points in the direction of the magnetic flux of the magnets on the track (not shown). Since the two fluxes are opposite theirmagnetic fluxes are oppositely directed and repulsive.

When the engine's axis is tilted downward the horizontal component of its repulsive force pulls the maglev forward. Since maglev floats on magnetic flux which has no friction, its potential maximum speed without load is 1.4(1023) cm/sec [6]. China has the fastest maglev train that runs at 431 kph. Japan has tested one at 581 kph. This relatively low speed relative to what is possible suggests that the maglev has room for improvement.

Ordinary bearings to minimize friction between the train and the track (Figure 10) are impractical as they wear out quickly due to the great speed of the train. Instead, fat magnets (Figure 7) line the inner surface of each latch. Fat bar magnets of the same poles as the ones in the latches line the outer surfaces of each track edge so that their respective are opposite each other (N ↔N or S ↔ S) and repulsive. The magnets in the track line its full stretch at distance equal to 1/3 the length of each car between consecutive magnets. At any time there are two pairs of magnets holding the train. The force of repulsion between two magnets of the same polarity is quite huge, according to Coulomb's law [2].

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Figure 10. The maglev showing the track as guide and holder at the same time. Repulsive magnets (same polarity) around the inner surfaces of the two latchesof each car and outer surfaces of the edges of the track hold, guide and keep the maglev on the track without friction.

Clearly, the maglev is powered by dark matter – the magnetic fluxes. Thus, the maglev is the ultimate in technology. But there is a drawback: the cost of construction is prohibitive: $50 billion for the 150-km track of South Korea. That is why only three countries operate a maglev at this time: China, Japan and South Korea. This where our new technology comes in.

Magnetic Insulation
From equation (3) it is impossible to put magnets of the same poles side by side. Therefore, we need some kind of magnet insulator between them to break the magnetic fluxes that repel or attract them.The author has seen a fabric (looked like an ordinary dark soft piece of cloth) that blocks off mobile phone signals by scattering the

electromagnetic waves that carry them. This is the same effect that extensive steel work in the neighborhood does to radio and TV signals. A magnet insulator consistsof thin narrow strips of ferromagnetic material scattered randomly (with respect to direction) but sparingly and evenly on a flat surface heater. The material is pressed by a similar flat surface heater. The surfaces are heated just enough to weld the strips together into a thin sheet. For brake mechanism for the maglev a thin but strong and rigid sheet of ferromagnetic sheet of magnet insulator is needed. We call it magnet brake pad.

Brake Mechanism for Maglev

At one km from the train station, cut the length of each track magnet by 6.25″ at each end (see Figure 10). Insert an array of elliptical magnets 6″ thick, of opposite polarity as the track magnets, on both ends of the track magnets from one km away from the station to the far end of the platform. Extend the modification and contraptions to the rear by as far as the length of the train. We call them track brake pads. Insert magnetic insulator between the track magnets and the track brake pads. On the train, in front of the magnetic engine and at each end of the coach, place a pair of elliptical magnets aligned with the ends of the magnetic engine. We call these pair of magnets train brake pads. When the train is running, the train brake pads' lateral axes are horizontal. At 1 km from the station the magnetic engine's lateral axis is pulled up to horizontal position. The train will continue to run at the same speed due to inertia. When the pair of train brake pads hits the one-km mark from the station, the brake pads' back sides are tilted downward gradually to pull back the train to a stop at the train station.

For optimal safety, the passengers and crew are insulated from the magnets by magnetic fabric insulators.

Electric Power Generator Run by Dark Matter

Mount a system of parallel vertical conductors on the roof of any train along the full length of the train (Figure 11). They should be close together as much as possible but safely apart from each otherto accommodate huge number of conductors covering the entire roof. They may be grouped into blocks or groups to generate desired voltage.
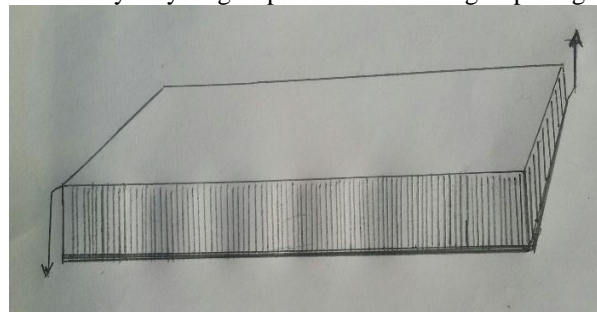

Figure 11. Parallel conductors are mounted on the roof of a train; they cut magnetic lines of force (magnetic flux) provided by an array of C-magnets (Figure 12) as the train moves along the track and generate electricity.

Install an array of C-magnets over the conductors (Figure 12) through the entire stretch of the track so that the conductors in Figure 12cut across their magnetic lines of force as the train passes through to generate huge electric power for the power grid.
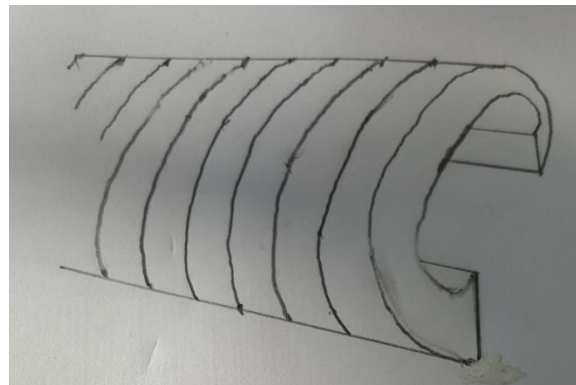

Figure 12. An array of C-magnets is mounted above the railroad track along its full stretch at a height so that as the train passes through the parallel conductors on the train's roof (Figure 11)cut across the magnetic lines of force

provided by the C-magnets and generate DC current. It is converted to AC by a reverse rectifier and connected to the power grid or power source.

If we install such power generators on all track systems, maglev or conventional, country and city rails, huge electric power can be generated for local use and still accumulate surplus that can be exported worldwide through power cables. For the maglev, recovery of cost can be achieved much faster. Then we can do away with power plants run by the dirty fossil, nuclear and geothermal fuel. This way we can liberate planet Earth from the impending environmental disasterit now faces.Moreover, left alone, nature heals itself and reverses the negative legacy of fossil-, nuclear- and geothermal-powered technologies. Furthermore, this is the way for the Third World to liberate themselves from underdevelopment.

Magnetic Charger for Battery Cars
We now have two types of magnetic engines: the type that powers the maglev and the type that generates huge electricity. We introduce a third type to power motor vehicles.
Mount parallel conductors on the roof of a car. At a bypass along a road or freeway, put an array of C-magnets with the same polarity above it so that when that car passes through the conductors cut their magnetic lines of force. The direct current generated is stored in a set of parallel lithium batteries to power the car for,say, the next 200kilometers depending on how long the array is at the charger.As in conventional transport a charger may be installed every 30 km to serve the motorists. Chargers for trucks and busses may be installed separately. In the city chargers can be installed on street sides at suitable distances from each other.

Alternatively, an electromagnet connected to the power grid may be used as charger whichever is less expensive.
A magnet lasts forever unless it is dropped on a hard surface or pounded strongly and vigorously. This does not happen to the magnetic power generator and magnetic charger. However, when repulsive magnets are put side by side there is some degradation of magnetic properties because of the principle of interpenetration. In this case, there should be magneticinsulator between them.
Super magnets can power cargo ships and ocean liners.The author has seen a small prototype of six 2-inch diameter disc super magnets placed side by side that yield 720 watts of electricity. Several of these prototypes can be assembled parallel to each other to construct a power generator huge capacity. The author has also a sketch of a potential magnetic engine for space vehicle (e.g., UFO) using self-generating magnets andthe Searle effect. A gyroscope can stabilize and guide the vehicle.
Equation (3) says that it is impossible to put an array of magnets of the same polarity. That is possible by putting magnetic fabric insulatorsbetween them.

X. THE SIGNIFICANCE OF GUT
The grand unified theory proposed by Albert Einstein in the 1920s was aimed at finding a set of equations that describes the forces of nature. The only tools available then were measurement and computation. They are the components of the traditional method of quantitative modeling that describes the appearances of nature (natural phenomena) mathematically. We have seen some of its shortcoming: (1) failure to solve long standing problems of science such as the gravitational n-body problem and (2) failure to discover the fundamental building block of matter.What scientists confirmed in CERN (27-mile circular underground proton accelerator that cuts across the boundary between Switzerland and Italy) was the destruction of what they call the Higgs boson which oddly confirmed that the Higgs boson was not the fundamental particle. Why? Because the fundamental building block of matter must be indestructible; otherwise, our universe would have vanished long ago. It did not and has existed eight billion years [1]. As we have seen, the fundamental building block of matter is the superstring discovered in 1997 [3].
True to its name the grand unified theory we have developed here unifies the natural sciences (not just the forces of nature) in the strong sense by building each of them on natural laws and as extensions of GUT. To-date these are the fields of natural science which have been touched by this unification process: biology [38,77], genetics [78,79], quantum physics [19,20,24,27,51] astrophysics [3,22,26,28,47,50,70,72], geology and oceanography [25,80], neuroscience [9,39,81], atmospheric and climatic sciences [25,58], cosmology [47,71,72] and medicine [78-81].The technologies we have presented here are contributions to engineering.
Traditional science fosters mechanicalism in thought, approach to research and evaluation of scientific contribution being dependent on computation and measurement which can be done by the computer.Since reasoning allows analogy, new concepts can be added without any connections to old ones. Therefore, reviewers can mechanically require a certain ratio between the new and the old concepts.

The new science articulated by GUT,while it retains computation and measurement, uses qualitative mathematics as its principal tool.This not mechanical because it is the mathematical model or representation of rational thought and cannot be done by the computer. It requires more discipline. For example, to avoid any flaw in science it requires its mathematics to be constructivist. As such, every concept, abstract or physical, must be defined by natural laws.Inevitably, every new concept brings in old concepts in a scientific paper. Mathematicians have a term for it: completeness, required by the new science. Thus, all papers, in the extensions of GUT starts with an overview of GUT. Moreover, the core values of the new science are critical thinking and creativity. Critical thinking filters out any flaw in a science and creativity builds or develops new on old concepts. That is why the ratio of new to old concepts is meaningless in the new science. Consequently, many traditional processes in science, particularly, in research and review process need suitable adjustment in this the era for science and mathematics.

§Figures 1 – 4 were drawn by Noel E. Escultura, Professor of Fine Arts, University of Santo Tomas, Manila.

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