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# The Rotational Dynamics in Haramein-Rauscher Metrics and the Monopolic Current

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This commentary shall be in the form of a particular address of this excerpted Haramein-Rauscher paper in extending the theoretical foundation for that model so indicated. Firstly, electromagnetic coupling of the Black Hole (equivalent) to the gravitational field is shown to directly derive from a mass-independent metric background, which introduces the property of inertia as a 'natural monopolic' superconductive currentflow. And secondly, this 'monopolic electricity' is then described as a consequence of particular Planck-String couplings preceeding the birth of the thermodynamic and classically relativistic cosmogenesis in its unified selfstate of unbroken supersymmetry. It shall be shown, that any mass M is quantised in a Monopole mass $m_M=m_P\sqrt{Alpha}$ in its Schwarzschild radius and where the characterising monopolic Schwarzschild radius represents the minimum metric displacement scale as the Oscillation of the Planck-Length in the form $2L_P\sqrt{Alpha}$ $\sim L_P/5.85\sim 3.4x10^{-36}$ meters.

**Reference: { Full paper: http://theresonanceproject.org/pdf/plasma_paper.pdf}**
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COLLECTIVE COHERENT OSCILLATION PLASMA MODES IN SURROUNDING MEDIA OF BLACK HOLES AND VACUUM STRUCTURE - QUANTUM PROCESSES WITH CONSIDERATIONS OF SPACETIME TORQUE AND CORIOLIS FORCES

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Abstract.
The main forces driving black holes, neutron stars, pulsars, quasars, and supernovae dynamics have certain commonality to the mechanisms of less tumultuous systems such as galaxies, stellar and planetary dynamics. They involve gravity, electromagnetic, and single and collective particle processes. We examine the collective coherent structures of plasma and their interactions with the vacuum. In this paper we present a balance equation and, in particular, the balance between extremely collapsing gravitational systems and their surrounding energetic plasma media. Of particular interest is the dynamics of the plasma media, the structure of the vacuum, and the coupling of electromagnetic and gravitational forces with the inclusion of torque and Coriolis phenomena as described by the Haramein-Rauscher solution to Einstein's field equations. The exotic nature of complex black holes involves not only the black hole itself but the surrounding plasma media. The main forces involved are intense gravitational collapsing forces, powerful electromagnetic fields, charge, and spin

angular momentum. We find soliton or magneto-acoustic plasma solutions to the relativistic Vlasov equations solved in the vicinity of black hole ergospheres. Collective phonon or plasmon states of plasma fields are given. We utilize the Hamiltonian formalism to describe the collective states of matter and the dynamic processes within plasma allowing us to deduce a possible polarized vacuum structure and a unified physics.

**I. INTRODUCTION**

In this paper we present a generalized model of the balance between the gravitational and electromagnetic fields near or at the ergosphere of a black hole. A. Einstein, [1] J. A. Wheeler [2] and many other researchers have attempted to reduce both gravitation and electromagnetism concepts to the principles of geometry. As is well known, the geometrization of gravity has met with great success, while the latter endeavor for electromagnetism has met with many difficulties. In the case of a black hole, the charge of the heavier ions, by charge separation will be closer to the ergosphere than the negative ions or electrons. Electric field polarization will occur by its emission from the rotating body or system. Magnetism will arise in the vacuum induced by polarization by the rotation of a gravitational body such as a pulsar or black hole.

This model and the general interaction between electromagnetism and gravity is basic and involves the details of many-body physics and the structure of the vacuum. The vacuum is a potential source of electrons, positrons as well as other particles when activated by a polarizing energy source [3]. Our new and unique approach of developing the relativistic Vlasov equation, formulated and solved in the vicinity of black holes does, indeed, describe the electromagnetic phenomena of a dense plasma under a strong gravitational field. In the extreme gravitational conditions in a black hole, photons are trapped by being strongly bent by the gravitational field described by the curvature of space. Interaction between the media outside and the inside of a black hole can occur due to vacuum state polarization i.e. the properties of the vacuum, angular momentum of the black hole (Kerr metric) and charged (Kerr-Newman metric) as well as magnetic field coupling through plasma vacuum state polarization.

## (1) B proportional $\{e/c^3\}\mathbf{g}\mathbf{x}\boldsymbol{\omega}$

where $e$ is the charge on the electron, $c$ is the velocity of light, $g$ is the local gravitational acceleration, and ω is the angular velocity of rotation of the body or black hole. The (cross product) term (**gxω**) is analogous to a gravitational gyroscopic term. If $v_{esc}$ is the escape velocity of an electron on the event horizon of a black hole then $v_{esc} \sim c$.

The highly bent space of a black hole generates a higher magnetic and charge field often observed near a pulsar. In a black hole, gravity is so strong that space is so sharply curved that the gas of the interstellar media is compressed and becomes dense, and like any hot gas, emits radiation in the form of radio waves, visible light, and x -rays. This electromagnetic field effect across the event horizon acting through the effects of vacuum state polarization correlates external and internal effects and hence may resolve the information paradox so that information going into a black hole is conserved with charge, angular momentum and information is transformed by the black hole. Black holes act as an electric generator power source of quasars which emit the light of an entire galaxy.

Of course, the black hole stores energy from the gravitational field and, as R. Penrose suggested, also stores a great deal of energy in its rotation. As further collapse occurs, more energy is generated to power the quasar [3]. The plasma dynamics in the external region generates electric field gradients and hence current flow and induces intense magnetic fields across the ergosphere. The event horizon is stretched and acts as a conducting sphere with a resistivity, for example, having an impedance of 377 Ohm. Magnetic lines of force pass across the sphere, exciting its surface with eddy currents producing drag on the sphere. The lines of force do not cross the horizon but wrap around it and, for a rotating system, they eventually pinch off as loops. Astrophysical effects on the black holes occur through the effects of their excited states of the dense plasma on the vacuum.

For 377 Ohm , an electric field of 377 volts would be needed to drive one ampere of current across a square surface area on the event horizon. This value is chosen, for the sake of this picture, analogous to the Earth's fields. It is of interest to note that the magnetohydrodynamics and Coriolis forces of the plasma's collective behaviors in this picture are similar to the process of sunspot formation and coronal ejection on our sun. Thereafter, close examination of black holes ergospheres structures may reveal regions of high magnetic flux and *x* -ray emissions resembling the sunspot activity found on our local star.

Of course, the motion of the magnetic field by the dynamic processes near a black hole generates an electric field which can give us a quantitative method to describe the energy transfer mechanisms. In the case of a rapidly rotating magnetized black hole, the electric field generated near the event horizon can produce enormous voltage differences between the poles of the spinning body and its equatorial region. As much as $10^{20}$ volts may be generated through field lines stretched at the event horizon, resulting in the system acting as an enormous battery. The magnetic field lines carry current which are driven by the voltage difference to distant parts of a quasar, which are linked by the magnetic field lines and the vacuum state polarization in its environment, producing a gigantic direct current circuit.

Positive charges flow up the field lines from the equatorial regions of the surface and are balanced by the current from the polar field lines to the equatorial lines. The complex properties of the energized plasma feeds the jets of ionized gases that have been observed emerging from the nuclei of quasars, supernovae and galaxies, stretching out many light years into space. The plasma can act as if it is frozen around magnetic field lines, where the electrons undergo gyroscopic spin. As the lines of magnetic force thread through the ergosphere, energy is deposited in the intervening plasma, accelerating it outward against the strong magnetic field. This process is balanced by the pull of gravity in the vacuum of the black hole's event horizon. Hence a balance is maintained at certain phases of collapse stability, where energy balance occurs.

The processes of plasma magneto-electrodynamics with a large magnetic field in the strong gravitational field of a black hole act as a generator/magnetic motor. The generated Coriolis forces in the plasma media occur due to the rotational acceleration as well as the gravitational field of the black hole. As we demonstrated in detail, the angular momentum properties result from the torque term in Einstein's stress-energy tensor [4]. The resulting acceleration produces electromagnetic biases in the electron-positron states in the vacuum producing the polarization of the vacuum which we demonstrate here and in reference [5]. This requires that we include the magnetic field in the Vlasov equation [6]. It is the strong magnetic field case that gives us the dynamo generator dynamics displayed by galactic and supernovae black holes. Shockwave and bow wave phenomena can occur because of violent plasma eruptions in a strong magnetic field and bow wave phenomena can occur when the black hole is associated with a second astrophysical body in which the two exchange magnetic lines of flux and plasma fields [7].

We and others have described elsewhere the manner in which the strong force and the gravitational forces can become balanced through the formalism of the relationship of quantum chromodynamics (QCD) and quantum electrodynamics (QED). The strong and electroweak forces are related through the quark model. This model utilizes the existence of mini Planck unit black holes [8]. Thus we can describe the form of the dynamics of the plasma energy tensor by treating its effect through the Coriolis forces. These accelerative driving forces activate the plasma dynamics and, hence the effect of the vacuum is manifest through the effect of the torque term in the stress-energy tensor. This is the manner in which the stress-energy tensor is modified which we detailed in references [3,4].
Hence the torque term in the stress-energy tensor actually yields the more detailed and accurate Einstein-Vlasov model because plasma can be utilized in this approach [9,10].

Media Surrounding Black Holes
These turbulent perturbations often diffuse and propagate transverse to the magnetic lines of force. Many higher order terms and a number of coupling constants are not directly amenable to an analytic approach and require computer simulations. Under such variable gravitational and electromagnetic conditions, patterns can emerge under cyclical interactions but also large dynamical unpredictable instabilities will occur. Our wave equations must accommodate these two cases. Some of the more detailed analytic approaches can be found in reference [5]. We describe examples of black hole plasma systems for stellar, and supernovae phenomena. In this paper, we express in detail the balance equations between the gravitational collapsing system and the surrounding plasma. Balance systems act in a thermo-plasma-gravitationally coupled systems that obey unique structures in space, some of which we present in this volume.

We can treat the electromagnetic field in terms of spherical harmonics as an approximation. We have solved Einstein's field-curvature equation with a centrifugal term that arises out of the torque term in the stress-energy tensor term, and source term and demonstrate a possible balance equation at the event horizon [3,4]. The high magnetic field of neutron stars of about $10^{14}$ Gauss, and possibly the black holes also act to direct and repel the plasma against accretion at the event horizon surface. We find soliton or magneto-acoustic plasma states as solutions to the relativistic Vlasov plasma equations solved in the vicinity of a black hole ergosphere.

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**Commentary by Hans Schatten:**

The following derivations lead to an extended proof for the Haramein-Rauscher equation (1) from the above and through those formulations indicate the relevance of the Haramein-Rauscher cosmology coupled to a simplified string formalism as boundary- and initial conditions in a de Sitter cosmology encompassing the classical Minkowski-Friedmann spacetimes holographically and fractally in the Schwarzschild metrics and as advocated by Haramein-Rauscher.

The magnetic field intensity B is classically described in the Biot-Savart Law:
$B=\mu_o qv/4\pi r^2=\mu_o i/4\pi r=\mu_o q\omega/4\pi r=\mu_o Nef/2r$
for a charge count q=Ne; angular velocity $\omega=v/r=2\pi f$; current i=dq/dt and the current element i.dl=dq.(dl/dt)=vdq.

The Maxwell constant then can be written as an (approximating) finestructure:
$\mu_o\varepsilon_o=1/c^2=(120\pi/c)(1/120\pi c)$ to crystallise the 'free space impedance' $Z_o=\sqrt{(\mu_o/\varepsilon_o)}=120\pi\sim377$ Ohm (Ω). This vacuum resistance $Z_o$ so defines a 'Unified Action Law' in a coupling of the electric permittivity component ($\varepsilon_o$) of inertial mass and the magnetic permeability componen ($\mu_o$) of gravitational mass in the Equivalence Principle of General Relativity.

A unified selfstate of the preinertial (string- or brane) cosmology so is obtained from the finestructures for the electric- and gravitational interactions coupling a so defined electropolic mass to magnetopolic mass respectively. The Planck-Mass is given from Unity $1=2\pi Gm_P^2/hc$ and the Planck-Charge derives from $Alpha=2\pi ke^2/hc$ and where $k=1/4\pi\varepsilon_o$ in the electromagnetic finestructure describing the probability interaction between matter and light (as about 1/137).

The important aspect of alpha relates to the inertia coupling of Planck-Charge to Planck-Mass as all inertial masses are associated with Coulombic charges as inertial electropoles; whilst the stringed form of the Planck-Mass remains massless as gravitational mass. It is the acceleration of electropoles coupled to inertial mass, which produces electromagnetic radiation (EMR); whilst the analogy of accelerating magnetopoles coupled to gravitational mass and emitting electromagnetic monopolic radiation (EMMR) remains hitherto undefined in the standard models of both cosmology and particle physics.

But the coupling between electropoles and magnetopoles occurs as dimensional intersection, say between a flat Minkowskian spacetime in 4D and a curved de Sitter spacetime in 5D (and which becomes topologically extended in 6-dimensional Calabi-Yau tori and 7-dimensional Joyce manifolds in M-Theory).
The formal coupling results in the 'bounce' of the Planck-Length in the pre-Big Bang scenario, and which manifests in the de Broglie inflaton-instanton.
The Planck-Length $L_P=\sqrt{(hG/2\pi c^3)}$ 'oscillates' in its Planck-Energy $m_P=h/\lambda_P c=h/2\pi cL_P$ to give $\sqrt{Alpha}).L_P=e/c^2$ in the coupling of 'Stoney units' suppressing Planck's constant 'h' to the 'Planck units' suppressing charge quantum 'e'.

Subsequently, the Planck-Length is 'displaced' in a factor of about $11.7=1/\sqrt{Alpha}=\sqrt{(h/60\pi)}/e$ and using the Maxwellian finestructures and the unity condition kG=1 for a dimensionless string coupling

$G_o=4\pi\varepsilon_o$, describing the 'Action Law' for the Vacuum Impedance as Action=Charge$^2$, say via dimensional analysis:

$Z_o=\sqrt{([Js^2/C^2m]/[C^2/Jm])}=[Js]/[C^2]=[Action/Charge^2]$ in Ohms [$\Omega=V/I=Js/C^2$] and proportional to [$h/e^2$] as the 'higher dimensional source' for the manifesting superconductivity of the lower dimensions in the Quantum Hall Effect ($\sim e^2/h$), the conductance quantum ($2e^2/h$) and the Josephson frequencies ($\sim 2e/h$) in Ohms [$\Omega$].

This derivation so indicates an electromagnetic cosmology based on string parameters as preceding the introduction of inertial mass (in the quantum Big Bang) and defines an intrinsic curvature within the higher dimensional (de Sitter) universe based on gravitational mass equivalents and their superconductive monopolic current flows.

A massless, but monopolically electromagnetic de Sitter universe would exhibit intrinsic curvature in gravitational mass equivalence in its property of closure under an encompassing static Schwarzschild metric and a Gravitational String-Constant $G_o=1/k=1/30c$ (as given in the Maxwellian finestructures in the string space).

In other words, the Big Bang manifested inertial parameters and the matter content for a subsequent cosmoevolution in the transformation of gravitational 'curvature energy', here called *gravita as precursor for inertia* into inertial mass seedlings; both however describable in Black Hole physics and the Schwarzschild metrics.

The Gravitational Finestructure so derives in replacing the Planck-Mass $m_P$ by a protonucleonic mass: $m_c=\sqrt{(hc/2\pi G_o)}.f(alpha)= f(Alpha).m_P$ and where $f(Alpha)=Alpha^9$.
The Gravitational finestructure, here named Omega, is further described in a fivefolded supersymmetry of the string hierarchies, the latter as indicated in the Haramein-Rausch paper following below in excerpt.

This pentagonal supersymmetry can be expressed in a number of ways, say in a one-to-one mapping of the Alpha finestructure constant as invariant X from the Euler Identity:
$X+Y=XY= -1=i^2=\exp(i\pi)$.
One can write a Unification Polynomial: $(1-X)(X)(1+X)(2+X)=1$ or $X^4+2X^3-X^2-2X+1=0$
to find the coupling ratios: $f(S)¦f(E)¦f(W)¦f(G)=\#¦\#^3¦\#^{18}¦\#^{54}$ from the proportionality
$\#¦\#^3¦\{[(\#^3)^2]\}^3¦(\{[(\#^3)^2]\}^3)^3$=Cuberoot(Alpha):Alpha:Cuberoot(Omega):Omega.

The Unification polynomial then sets the ratios in the inversion properties under modular duality:
(1)[Strong short]¦(X)[Electromagnetic long]¦($X^2$)[Weak short]¦($X^3$)[Gravitational long]
as $1¦X¦X^2¦X^3 = (1-X)¦(X)¦(1+X)¦(2+X)$.
Unity 1 maps as (1-X) transforming as f(S) in the equality $(1-X)=X^2$; X maps as invariant of f(E) in the equality (X)=(X); $X^2$ maps as (1+X) transforming as f(W) in the equality (1+X)=1/X; and $X^3$ maps as (2+X) transforming as f(G) in the equality $(2+X)=1/X^2=1/(1-X)$.

The mathematical pentagonal supersymmetry from the above then indicates the physicalised T-duality of M-theory in the principle of mirror-symmetry and which manifests in the reflection properties of the

heterotic string classes HO(32) and HE(64), described further in the following.
Defining f(S)=#=1/f(G) and f(E)=$\#^2$.f(S) then describes a symmetry breaking between the 'strong S' f(S) interaction and the 'electromagnetic E' f(E) interaction under the unification couplings.
This couples under modular duality to f(S).f(G)=1=$\#^{55}$ in a factor $\#^{-53}$=f(S)/f(G)={f(S)}$^2$ of the 'broken' symmetry between the longrange- and the shortrange interactions.

SEWG=1=Strong-Electromagnetic-Weak-Gravitational as the unified supersymmetric identity then decouples in the manifestation of string-classes in the de Broglie 'matter wave' epoch termed inflation and preceding the Big Bang, the latter manifesting at Weyl-Time as a string-transformed Planck-Time as the heterotic HE(64) class.

As SEWG indicates the Planck-String (class I, which is both openended and closed), the first transformation becomes the suppression of the nuclear interactions sEwG and describing the selfdual monopole (stringclass IIB, which is loop-closed in Dirichlet brane attachement across dimensions say Kaluza-Klein $R^5$ to Minkowski $R^4$ or Membrane-Space $R^{11}$ to String Space $R^{10}$).
The monopole class so 'unifies' E with G via the gravitational finestructure assuming not a Weylian fermionic nucleon, but the bosonic monopole from the $kG_o=1$ initial-boundary condition $Gm_M^2=ke^2$ for $m_M=ke=30[ec]=m_P\sqrt{Alpha}$.

The Planck-Monopole coupling so becomes $m_P/m_M=m_P/30[ec]=1/\sqrt{Alpha}$
with f(S)=f(E)/$\#^2$ modulating f(G)=$\#^2$/f(E)=1/# ↔ f(G){f(S)/f(G)}=# in the symmetry breaking f(S)/f(G)=1/$\#^{53}$ between short (nuclear asymptotic) and long (inverse square).

The shortrange coupling becomes f(S)/f(W)=#/$\#^{18}$=1/$\#^{17}$=Cuberoot(Alpha)/$Alpha^6$
and the longrange coupling is Alpha/Omega=1/$Alpha^{17}$=$\#^3$/$\#^{54}$=1/$\#^{51}$=1/($\#^{17}$)$^3$.

The strong nuclear interaction coupling parameter so becomes about 0.2 as the cuberoot of alpha and as measured in the standard model of particle physics.

The monopole quasimass [ec] describes a monopolic sourcecurrent ef, manifesting for a displacement λ=c/f. This is of course the GUT unification energy of the Dirac Monopole at precisely [$c^3$] eV or $2.7x10^{16}$ GeV and the upper limit for the Cosmic Ray spectra as the physical manifestation for the string classes: {I, IIB, HO(32), IIA and HE(64) in order of modular duality transmutation}.

The transformation of the Monopole string into the XL-Boson string decouples Gravity from sEwG in sEw.G in the heterotic superstring class HO(32). As this heterotic class is modular dual to the other heterotic class HE(64), it is here, that the protonucleon mass is defined in the modular duality of the heterosis in: $Omega=Alpha^{18}=2\pi G_o m_c^2/hc=(m_c/m_P)^2$.

The HO(32) string bifurcates into a quarkian X-part and a leptonic L-part, so rendering the bosonic scalar spin as fermionic halfspin in the continuation of the 'breaking' of the supersymmetry of the Planckian unification. Its heterosis with the Weyl-string then decouples the strong interaction at Weyl-Time for a Weyl-Mass $m_W$, meaning at the timeinstanton of the end of inflation or the Big Bang in sEw.G becoming s.Ew.G.

The X-Boson then transforms into a fermionic protonucleon triquark-component (of energy ~ $10^{-27}$ kg or 560 MeV) and the L-Boson transforms into the protomuon (of energy about 111 MeV).

The last 'electroweak' decoupling then occurs at the Fermi-Expectation Energy about 1/365 seconds after the Big Bang at a temperature of about $3.4x10^{15}$ K and at a 'Higgs Boson' energy of about 298 GeV.
A Bosonic decoupling preceeded the electroweak decoupling about 2 nanoseconds into the cosmogenesis at the Weyl-temperature of so $T_{Weyl}=T_{max}=E_{Weyl}/k=1.4x10^{20}$ K as the maximum Black Hole temperature maximised in the Hawking MT modulus and the Hawking-Gibbons formulation: $M_{critical}T_{min}=½M_{Planck}T_{Planck}=(hc/2\pi G_o)(c^2/2k)=hc^3/4\pi kG_o$ for $T_{min}=1.4x10^{-29}$ K and Boltzmann constant k.

The XL-Boson mass is given in the quark-component: $m_X=\#^3m_W/[ec]=Alpha.m_W/m_P=\#^3\{m_W/m_P\}\sim1.9x10^{15}$ GeV; and the lepton-component: $m_L=Omega.[ec]/\#^2=\#^{52}[ec/m_W]$ ~ 111 MeV.

The Haramein-Rauscher model is then fully realised in the reformulation of the rotational dynamics associated with the monopolic naturally superconductive currentflow and the fractalisation of the static Schwarzschild solution.
All inertial objects are massless as 'Strominger branes' or extremal boundary Black Hole equivalents and as such obey the static and basic Schwarzschild metric as *gravita* template for *inertia*. Once inertialised, the Newmann-Kerr solutions described by Haramein and Rauscher become applicable.

This also crystallises the Sarkar Black Hole boundary as the 100Mpc limit ($R_{Sarkar}=(M_o/M_{critical}.R_{Hubble})=0.028.R_{Hubble}\sim$237 Million lightyears) for the cosmological principle, describing large scale homogeneity and isotropy, in the supercluster scale as the direct 'descendants' of Daughter Black Holes from the Universal Mother Black Hole describing the Hubble Horizon as the de Sitter envelope for the Friedmann cosmology (see linked website references on de Sitter cosmology) for the oscillatory universe bounded in the Hubble nodes as a standing waveform.

The Biot-Savart Law: $B=\mu_o qv/4\pi r^2=\mu_o i/4\pi r=\mu_o Nef/2r=\mu_o Ne\omega/4\pi r$ for angular velocity $\omega=v/r$ transforms into $B=constant(e/c^3)\mathbf{gx\omega}$
in using $a_{centripetal}=v^2/r=r\omega^2$ for $g=GM/r^2=(2GM/c^2)(c^2/2r^2)=(R_Sc^2/2R^2)$ for a Schwarzschild solution $R_S=2GM/c^2$.
$B=constant(e\omega/rc)(v/c)^2=\mu_o Ne\omega/4\pi r$ yields $constant=\mu_o Nc/4\pi=(120\pi N/4\pi)=30N$ with $e=m_M/30c$ for $30N(e\omega/c^3)(GM/R^2)=30N(m_M/30c)\omega(2GM/c^2)/(2cR^2)=NmM(\omega/2c^2R)(R_S/R)=\{M\}\omega/2c^2R$.

Subsequently, $B=Mw/2c^2R=Nm_M(R_S/R)\{\omega/2c^2R\}$ to give a manifesting mass M finestructured in $M=Nm_M(R_S/R)$ for N=2n in the superconductive 'Cooper-Pairings' for a charge count q=Ne=2ne.

But any mass M has a Schwarzschild radius $R_S$ for $N=(M/m_M)\{R/R_S\}=(M/m_M)\{Rc^2/2GM\}=\{Rc^2/2Gm_M\}=\{R/R_M\}$ for a monopolic Schwarzschild radius $R_M=2Gm_M/c^2=2G(30ec)/$

$c^2=60ec/30c^3=2e/c^2=2L_P\sqrt{Alpha}=2OL_P$.

Any mass M is quantised in the Monopole mass $m_M=m_P\sqrt{Alpha}$ in its Schwarzschild (Haramein-Rauscher) metric and where the characterising monopolic Schwarzschild radius represents the minimum metric displacement scale as the Oscillation of the Planck-Length in the form $2L_P\sqrt{Alpha}\sim L_P/5.85$.

This relates directly to the manifestation of the magnetopole in the lower dimensions, say in Minkowski spacetime in the coupling of inertia to Coulombic charges, that is the electropole and resulting in the creation of the mass-associated electromagnetic fields bounded in the c-invariance. From the Planck-Length Oscillation or '$L_P$-bounce': $OL_P=L_P\sqrt{Alpha}=e/c^2$ in the higher (collapsed or enfolded) string dimensions, the electropole $e=OL_P.c^2$ maps the magnetopole $e^*=2R_e.c^2$ as 'inverse source energy' $E_{Weyl}=hf_{Weyl}$ and as function of the classical electron radius $R_e=ke^2/m_ec^2=R_{Compton}.Alpha=R_{Bohr1}.Alpha^2=Alpha^3/4\pi R_{Rydberg}=10^{10}\{2\pi R_W/360\}=\{e^*/2e\}.OL_P$.

The resulting reflection-mirror space of the M-Membrane space (in 11D) so manifests the 'higher D' magnetocharge 'e*' AS INERTIAL MASS in the monopolic current [ec], that is the electropolic Coulomb charge 'e'.
This M-space becomes then mathematically formulated in the gauge symmetry of the algebraic Lie group $E_8$ and which generates the inertial parameters of the classical Big Bang in the Weylian limits and as the final Planck-String transformation.

The stringparametric Biot-Savart law then relates the angular momentum of any inertial object of mass M with angular velocity ω in selfinducing a magnetic flux intensity given by $B=M\omega/2Rc^2$ and where the magnetic flux relates inversely to a displacement R from the center of rotation and as a leading term approximation for applicable perturbation series.

The following excerpt from the referenced Haramein-Rauscher paper relates the inherent pentagonal supersymmetry in the cosmogenesis to the definition of the Euler identity in its finestructure X+Y=XY=-1, and a resulting quadratic with roots the Golden Mean and the Golden Ratio of the ancient omniscience of harmonics, inclusive of the five Platonic solids mapping the five superstring classes. Foundations and applications of superstring theory are also indicated in the below and serve as reference for the above.

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The relationship between the Lindquist and Wheeler Schwarzschild sphere and the vertices of the Battaner and Florido regular geometric structure of superclusters can be compared. For *N* vertices, each vertex can be equidistant from its nearest neighbor only when *N*= 5, 8, 16, 24, 120, or 600 [94]. The case where *N=8* yields the simplest arrangement. In this lattice, *N*=5, 16, and 600 correspond to a tetrahedron, N= 8 to a cube, N=24 to an octahedron, and *N*= 120 to a dodecahedron. Correspondence is made in terms of the ratio of the distance from a face to a corner of a cell of some volume of a regular polyhedron to a sphere.
One of us (Rauscher) [25] treated the whole Universe as expanding under a Schwarzschild condition. We found that consistence between Einstein's field equations with big bang cosmologies can be obtained but requires the introduction of an additional term in the stress-energy tensor. We can associate this term with the torque term in

Einstein's field equations in the Haramein-Rauscher model [3]. One of us (Haramein), has put forward the need to include spin and torque to modify the simplistic Schwarzschild metrical zones of Lindquist and Wheeler although their model is very useful in our considerations even if it is clearly a limited case.
The motivation of the Lindquist and Wheeler model is that the cell method in gravitational theory contains a new dynamic feature which expresses the equation of motion of a mass at the center of a cell as a dynamic condition on the boundary of the cell. The boundary condition defines a constraint on the space which comprises simple geometric forms. The whole of the dynamics of this model are expressed in terms of the expansion and subsequent contraction of the Schwarzschild solution to Einstein's field equation. Their analogy is to that of a crystal lattice and by defining cells in terms of a Schwarzschild solutions in a curved space, in a simple Friedman metric of uniform curvature which corresponds to a polyhedron in Euclidian space. They derive a boundary condition on the Schwarzschild potentials which do not go to zero at a finite radius and hence avoids the discontinuity of matching the normal derivative of the gravitational potentials which would occur in the Schwarzschild solution alone. In the lattice Universe, mass is concentrated into *N* centers (or vertices) which could correspond to the galactic cluster centers in the Battener and Florido analysis [87,88]. In each cell, a Schwarzschild black hole is located at the center of its own cell. In their figure 3, six cone shapes define their boundary conditions in a lattice Universe and correspond to the vertices of an octahedron. Therefore, a parallel can be made between the work of Lindquist and Wheeler, Battener and Florido and our model which predicts a polarized structured vacuum. Hence, Lindquist and Wheeler's approach using the Schwarzschild cell solution without spin or charge gives a good first-order approximation. We use the Kerr-Newman with spin and charge and incorporate the torque and Coriolis forces in the Haramein-Rauscher solution to quantize the vacuum into cells.

We consider the topological structures of the current string theory and our approach to the unified theory of the four forces and structured vacuum [3].
Although superstring theories have their critics, due to the fact that those theories contain a number of "free" parameters, there has been great interest in these theories by the physics community. Superstring theory has been related to the standard model. Some string theories contain gravity and others do not. One of the major features of superstring theory is to treat particles as tiny loops rather than as point particles so as to avoid the problem of singularities. The string theory approach has some topological similarities to that of Lindquist and Wheeler's work, which is an effort to avoid singularities. In the string theory, particles are treated as vibrations of a membrane (Brane *M as a* surface), which is swept out by the vibrating string occurring in eight dimensional space. These eight dimensions comprise eight of the ten dimensional standard model in which two of the dimensions are the string surface itself. This vibrational space carries the symmetry of the Lie group $E_8$ [95].
Superstring theory represents both bosonic and fermionic particle states. The usual string theories occupy a 26-dimensional spacetime, representing bosonic particle states. A quantum state of identical bosonic particles is symmetric under the exchange of any two particles. A quantum state of identical fermionic particles is antisymmetric under the exchange of any two particles to include the photon and gravitation. Then we have 64=8x8 dimensional states in some superstring theories. The closed string theory is called a type II string theory, which has the doubly fermionic states included, for a total of 128=8x8x2 fermionic states [96].
In addition to the type II, there are two heterotic superstring theories which involve closed strings. Out of the 26-L bosonic coordinates of the bosonic factor, only ten are matched to R-bosonic coordinates of the superstring factor, hence this theory effectively exists in ten-dimensional spacetime. Heterotic strings come in two versions, that is $E_8 x E_8$ and the $SO_{32}$. The Ramond vacuum is included and $E_8$ is the highest dimensional exceptional group. The $E_8 x E_8$ superstring theory is derived from the compilation of *M*-theory. One of the most promising superstring theories that unifies the four forces is the $E_8 x E_8$ reflection space. This is possible only because reflection embedding provides for an embedding of $A_4$ in $E_8$ [97]. In our paper reference [3] we present the symmetry group relationship between $A_4$ and the 24 element octahedral group. This procedure operates along the lines of the relationship between the $SO_{32}$ heterotic string theory which also utilizes the $E_8 x E_8$ formalism. However, we believe our approach to gravitation and strong interactions, which considers the inclusion of torque and Coriolis effects will result in a simplification and a more fundamental formalism with fewer free parameters.

In general, the Lie algebra $A_n$ associated with a reflection space $C_n$ has a compact Lie group $SU_{n+1}$.
S.P. Sirag attempts to develop a unified field theory in terms of $U_1 x SU_2 x SU_3 x SU_4$, where he identifies the $SU_4$ group with the tensor gravitational field [98]. Note that gravity is missing from the $SU_5$ theory.
The *SO(32)*, or $SO_{32}$, is the group generated by 32-by-32 matrices that are orthogonal. For the strong force,

gluons are described by a four dimensional $SU_3$ Yang-Mills theory. The full set of standard model gauge bosons is described by the Yang-Mills theory with the gauge group $SU_3 x SU_2 x U_1$. Alternatively, for the $U_5 = SU_2 x SU_3$ Yang-Mills theory, the gauge group that emerges as $U_3 x U_2 = SU_2 x SU_3 x U_1 x U_1$ where $U_1 x U_1$ is the topology of the torus. Note that the $A_4$ group of the tetrahedron is the label for a complex Lie algebra whose compact Lie group is $SU_5$ which comprised the first unification, GUT theory. The standard force bosons are derived from the group $SU_3 x SU_2 x U_1$ in the group algebra.

In the heterotic $E_8 x E_8$ superstring theory, six of the nine spatial dimensions are curled up into a small sixdimensional compact space, which is termed the Calabi-Yau space. All Calabi Yau spaces have both discrete and continuous parameters which determine the details of the four-dimensional theory that arises upon compactification.

For all Calabi-Yau spaces, the minimal amount of supersymmetry survives the compactification and the resulting four-dimensional theory is supersymmetric. The compactification also allows one to break the original gauge symmetry $E_8 x E_8$ down to $E_6 x E_8$. The group $E_6$ contains $U_1 x SU_2 x SU_3$ as a subgroup to that standard model gauge group. An alternative to the 6-dimensional space compactification of the heterotic string is an alternative 6-dimensional space where one can simply use a six-torus $T^6$ group space. The $T^6$ space, however, has singularities that arise at the fixed points of certain identifications, but orbitals constructed from tori are much easier to analyze than the general Calabi-Yau spaces.

For the following Lie group $S = U_2 x T^6$ where $U_2$ is a four dimensional spacetime called the conformally compactified Minkowski space and $T^6 = U_1 x U_1 x U_1 x U_1 x U_1 x U_1$ , or a 3-torus. We regard $SU_2$ as a spherical three space, $S^3$, as the usual space of cosmology. For a 7-torus$T^7$ which incorporates $U_1$ from the $U_2$ space also includes time. The $T^7$ tori space corresponds to the 7-reflection space $E^7$ because $T^7 = R^7/L$ where $R^7$ is the real part of the $E^7$ which also contains the complex reflection space $C^7$ , and $L$ is the root of $E^7$.

This means that all parts of the lattice are identified as a single point: the identity element of $T^7$ and every other point of $T^4$ is a copy of $L$ . The $T^4$ group can be identified with two double tori. We have identified the double torus structure as fundamental to a metric of spacetime which appropriately accounts for the source of spin/angular momentum. Many striking examples of this dynamic structure are observed at the cosmological scale such as galactic halos, black hole ergosphere and supernovae.

The $S^4$ group is associated with the 24 element octahedral group C{Obar} which can be written in terms of C{Obar}$= U_2 x U_2$(bar)x$U_4$ or $T^8$ group [3]. Both C{O} and C{Obar} relate to the $T^4$ double torus group of four copies of $U_1$ where $T_n$ is the direct product of $n$ copies of $U_1$ , which comprises the $n$-torus, which is always an Abelian group. The $T^n$ group refers to the structure of spacetime. We have related this spacetime structure to the torque term in Einstein's field equations [3]. Hence, the torus topology can be considered fundamental to the structure of spacetime and also the tenets in the superstring theory.

Hull utilized string theory in a "T-fold-background" with local $n$-torus fabrication and $T$-duality transition functions in O{n,n;Z} in an enlarged space with $T^{2n}$ fabrication geometry [99]. For a geometric background, the local choice of $T^n$ fit together to give a spacetime which is a $T^n$ fiber bundle. Thus this string theory approach involves diffeomorphisms and gauge transformations as well as duality transformations. The $T$-duality is associated with mirror symmetry [100]. In some cases, the compactifications with duality are equivalent to asymmetric orbits. The full transition functions for the torus bundles, which are considered in Hull's approach, are in GL{n,**Z**}x$U_1^n$, where $U_1$ acts as a translation on a circle fiber. String theory compactification of dimensions on the $T^n$ has O{n,n;Z} symmetry. In the geometric GL{n,**Z**} subgroup that acts through $T^n$ diffeomorphisms, can be lifted to a higher dimensional theory which is compactified on a $T^n$ fiber bundled over a circle.

A $T$-duality on any circle gives a twisted reduction on a $T^2$ fiber bundled over a circle in GL{2,**Z**} which is representative of a dual torus. These mirror, or duality symmetries are related to space with Calabi-Yau fibrations in space with torus fibrations [99]. The topology of $T$-folds, and their doubled formulations, is then seen as a geometric background in which there is a global polarization. The polarization can be characterized in terms of a product on the $T^{2n}$ fibers. Local product structures satisfy integrability thus eliminating the problems of singularities. A product structure defines a splitting into eigenspaces of $R$ with eigenvalues ±1 and for a torus $T^{2n}$. This extends to a splitting as the periodic torus coordinates into two $T^n$ eigenspaces, if the product structure is integral, or *R is an element of* GL(2n,**Z** ) , so that it acts on the coordinates while preserving the periodicities. A product structure and pseudo-Hermitian O{n,n} invariant metric are together preserved by the subgroup GL(n.**R**) subset O{n,n} and for the transformations acting on the torus and is preserved by GL(2n,**Z**) subset

O(n,n;Z) [3,5,20,47]. The fundamental structures activated in the vacuum by polarized coherent resonant states of matter also act as part of the process that creates these vacuum properties.
To paraphrase John A. Wheeler, "Spacetime is not just a passive arena for doing physics, it is the physics" [2]. The torquing of spacetime is an active part of the structure of the stress-energy tensor and hence is a fundamental force coupling to produce the observable universe of matter and energy.

## CONCLUDING REMARKS

We have a vast new set of tools to comprehend the processes of astrophysical and cosmological phenomena, atomic and collective matter states. For example some of the collective state phenomena we have considered are accelerator "fireballs," Bose-Einstein condensates, Fermi electron states, MHD and BCS descriptions, all of which obey soliton dynamic solutions. Theoretical and experimental findings and relativistic formulations, quantum theory, electromagnetic interactions can well be described in terms of topological structures and group theory. The fundamental base of our approach is to consider that the topological structure of a torquing spacetime, and its Coriolis gyroscopic dynamics, has critical aspects of unification theory.
We pursue this point further in references [39,101,102] when we consider atomic, nuclear, and quantum physics in a nonlinear space. When a torque and Coriolis term is considered for the formation of spin/angular momentum we find that the dual torus topology occupies a fundamental role in both astrophysics and quantum particle physics. The Haramein-Rauscher approach takes spin and rotation properties as fundamental to the structure of the spacetime manifold. We have identified the properties of the structure of the vacuum itself from fundamental coherent polarized states of matter in the facility of astrophysical black hole event horizons. That is to say, we have demonstrated that the properties of matter in superclusters, galaxies, supernovae and their vicinities, for example, could exist in resonant states, only if the vacuum is structured. These considerations may also be utilized to explain the effects that are currently attributed to dark matter and dark energy.
In the words of Nobel laureate C. N. Yang, of the Yang-Mills equation "Einstein's general relativity theory, though profoundly beautiful, is likely to be amended... that the amendment may not disturb the usual test is easy to imagine, since the usual tests do not relate to spin... somehow (the amendment) entangles spin and rotation" [103].

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## REFERENCES

[1] A.Einstein, *Relativity, the Special and General Theory* (Crown Publishers, Inc., New York 1961)
[2] J.A. Wheeler, *Geometrodynamics* (Academic Press, New York and London 1962) and private communication with E.A. Rauscher, 1974-1982, on expanding on Einstein's theory.
[3] N. Haramein and E.A. Rauscher, "The Origin of Spin: A Consideration of Torque and Coriolis Forces in Einstein's Field Equations and Grand Unification Theory," in *Beyond the Standard Model: Searching for Unity in Physics, R.L. Amoroso. B. Lehnert & J-P Vigier (eds.) Oakland: The Noetic Press. (see this volume pp. 153-168)* Physics, R.L. Amoroso. B. Lehnert & J-P Vigier (eds.) Oakland: The Noetic Press. (see this volume pp. 153-168)
[4] N. Haramein and E.A. Rauscher, "The Quest for the Higgs Boson and its Planck Black Hole Production at the CERN Large Hadron Collider," Bull. Am. Phys. Soc. **S8002** (2003).
[5] E.A. Rauscher, "Electron Interactions and Quantum Plasma Physics," J. Plasma Physics **2**, 517 (1968) and additional research (1992 and 2000).
[6] E.A. Rauscher, "Dynamic Plasma Excitation Modes of Propagation in the Ionosphere," US, PA Press, **13**, 295 (Wisconsin, 2004).
[7] Ya. B. Zeldovich and Yu. P. Rayzer, *Physics of Shock Waves and High Temperature Hydrodynamic Phenomena* (Academic Press, New York 1967).
[8] N. Haramein and E.A. Rauscher, "Strong and Gravitational Forces in Black Hole Physics," in progress.
[9] T. Feder, "Astronomers Envision Linking Data Archives," Physics Today **55**, 20 (2002).
[10] S. Ichimaru, *Basic Principles of Plasma Physics: A Statistical Approach* (W.A. Benjamin, Inc. Advanced Book Program, Massachusetts, London, Sydney, Tokyo, 1973).
[11] A.A. Vlasov, "Theory of Vibrations Properties of Electron Gas and its Application," JETF **8**, 291 (1938) and Moscow (1945).
[12] L.D. Landau, JETF **16**, 574 (1946).
[13] H. Andreasson, "The Einstein-A.A. Vlasov System / Kinetic Theory," Living Rev. Relativity **5**, 7 (2002), http://www.livingreviews.org/lrr-2002-7, ISSN1433-8351.
[14] D.E. McCumber, Rev Mod. Phys. **38**, 491 (1966).
[15] D. Bohm and D. Pines, "A Collective Description of Electron Interactions. I. Magnetic Interactions," Phys. Rev. **82**, 625 (1951) and private communication between D. Bohm and E.A. Rauscher (1977-1982).
[16] S. Ichac, Am. Phys. **20**, 78 (1962).
[17] D. Ter Haar, *Introduction to the Physics of Many Body Systems* (Interscience Publications on Physics and Astronomy, No. 5, New York 1958).
[18] J. Bardeen and D. Pines, "Electron-Phonon Interaction in Metals," Phys. Rev. **99**, 1140 (1955).
[19] R.W. Lindquist and J.A. Wheeler, "Dynamics of a Lattice by the Schwarzschild-Cell Method," Rev. of Mod. Phys. **29**, 432 (1957).
[20] N. Haramein and E.A. Rauscher, "The Dynamic Crystal Lattice Group Theoretical Vacuum Structure in the Unified Field," in progress.
21] J. Bardeen, L.N. Cooper, and J.R. Schrieffer, "Theory of Superconductivity," Phys. Rev. **108**, 1175 (1957).
[22] L. Cooper, "Bound Electron Pairs in a Degenerate Fermi Gas," Phys. Rev. **104**, 1189 (1956).
[23] J. Bardeen, Handbook of Phys. **15**, 274 (1956).
[24] J.R. Schrieffer, *The Many Body Problem* (Wiley & Sons, New York 1959).

[25] E.A. Rauscher, "On the Evolution of a Schwarzschild Universe," *Lawrence Berkeley National Laboratory Report (LBL-4353 1975), and Cosmology and Quantum Theory, edited by R.L. Amoroso, Oakland: The Noetic* Report (LBL-4353 1975), The Noetic Press (2007).
[26] E.A. Rauscher, "The Fundamentals of Fusion," University of California Engineer, **20** (1960).
[27] A.C. Scott, F.Y.F. Chu, and D.W. McLaughin, Proc. IEEE **61**, 1443 (1973).
[28] A.C. Scott, "The Birth of a Paradigm," in *Nonlinear Electromagnetics,* edited by P.L.E. Uslenghi, 35 (Academic Press, New York 1980).
[29] H. Washimi and T. Taniuti, "Propagation of Ion-Acoustic Solitary Waves of Small Amplitude," Phys. Rev. Lett. **17**, 996 (2001).
[30] L.C. Lee and J.R. Kan, "Nonlinear Ion-acoustic Waves and Solitons in a Magnetized Plasma," Phys. of Fluids **24, 430 (1981).**
[31] P.K. Shakla and M.Y. Yu, "Exact Solitary Ion-acoustic Waves in a Magnetoplasma," J. Math Phys, **19**, 2506 (1978).
[32] R.L. Sagdeev and A.A. Galeev, *Non-Linear Plasma Theory* (Benjamin, New York 1969).
[33] B. Sutherland, Beautiful Models: 70 Years of Exactly Solved Quantum Many-Body Problems (World Scientific, River Edge, New Jersey 2004).
[34] S. S. Schweber, Introduction to Relativistic Quantum Field Theory (Harper & Row, New York 1961).
[35] S.W. Hawking, "Particle Creation by Black Holes," Comm. Math. Phys. **43**, 199 (1975).
[36] J.D. Hartle and S.W. Hawking, "Path Integral Derivation of Black-Hole Radiance," Phys. Rev. D **13**, 2188 (1976).
[37] S.W. Hawking and G.F.R. Ellis, *Large Scale Structure of Space Time* (Cambridge University Press, London 1974).
[38] E.A. Rauscher, *Electromagnetic Phenomena in Complex Geometries and Nonlinear, Non-Hertzian Waves* (Tesla Book Co., California, 1983), to be republished by The Noetic Press, California (2007).
[39] E.A. Rauscher, "Conceptual Charges in New Reality Models from Discoveries in Physics: Complexification of the Schrödinger Wave Equation," ICF Press, New York, Korea 1407 (1981).
[40] T.H. Boyer, "Quantum Zero-Point Energy and Long Range Forces," Annals of Phys. **56**, 474 (1970).
[41] H.B.G. Casimir, "On the Attraction Between Two Perfectly Conducting Plates," Proc. Kon. Ned. Akad. Wetenschap. **5,** 793 (1948).
[42] E.A. Rauscher, "Electromagnetic Phenomena in Complex Minkowski Spaces," Bull. Am. Phys. Soc. **28**, 351(1983).
[43] F. Wilczek, "Scaling Mount Planck," Phys. Today, **55**, 10 (2002).
[44] N. Haramein and E.A. Rauscher, "A Consideration of Torsion and Coriolis Effects in Einstein's Field Equations," Bull. Am. Phys. Soc. **S10.016** (2003).
[45] N. Haramein, "A Scaling Law for Organized Matter in the Universe," Bull. Am. Phys. Soc. **AB006**, (2001).
[46] E.P. Wigner and F. Seitz, "On the Constitution of Metallic Sodium," Phys. Rev. **43**, 804 (1933) on the theory of solids and private communication between E.P. Wigner and E.A. Rauscher (1981-1986).
[47] N. Haramein and E.A. Rauscher, "Lattice Structure and the Kerr-Newman Cell Method," (in progress).
[48] R.Z. Sagdeev and A.A. Galeev, *Nonlinear Plasma Theory* (Benjamin, New York 1969).
[49] E.A. Rauscher, "Closed Cosmological Solutions to Einstein's Field Equations," Lett. Nuovo Cimento, **3**, 661 (1972).
[50] E.A. Rauscher, "A Unifying Theory of Fundamental Processes," *Lawrence Berkeley National Laboratory Report (UCRL-20808 June 1971) and Bull. Am. Phys. Soc. **13**, 1643 (1968).*
[51] C.L. Grabbe, "Generation of Broadband Electrostatic Waves in Earth's Magnetotail," Phys. Rev. Lett. **84**, 3614 (2000).
[52] R.C. Davidson, *Methods in Nonlinear Plasma Theory* (Academic Press, New York 1972).
[53] M. Polanyi, "A New Thermodynamic Consequence of the Quantum Hypothesis," Verhandl. Deut. Physik. Ges.**15, 156 (1913).**
[54] W. Nernst, Nachr. d. Kgl. Ges. d. Wissensch. Gittingen, Math. Phys. KL. (1906) and republished, *The New Heat Theorem: Its foundations in theory and experiment (Dover Pub. Inc., 1969).*
[55] P. Uttley, "Active Galactic Nuclei as Scaled-Up Galactic Black Holes," Nature **444**, 730 (2006).
[56] C. Ramon and E.A. Rauscher, "Superluminal Transformations in Complex Minkowski Spaces," Found. of Phys. **10**, 661 (1980).
[57] E.A. Rauscher, "Solitary Waves, Coherent Non-dispersive Waves in Complex Minkowski Spaces," Bull. Am.Phys. Soc. **27**, 35 (1982).
[58] E.A. Rauscher, "The Minkowski Metric for a Multidimensional Geometry," Lett. Nuovo Cimento **7**, 361(1973).
[59] R. Penrose, "Gravitational Collapse and Space-Time Singularities," Phys. Rev. Lett. **14**, 57 (1965).
[60] K.S. Thorne and C.M. Will, "Theoretical Framework for Testing Relativistic Gravity," Astrophys. J., **163**, 595 (1971).
[61] B.S. DeWitt, "Dynamical Theory in Curved Spaces. I. A Review of the Classical and Quantum Action Principles," Rev. Mod. Phys. **29**, 377 (1957) and private communication with E.A. Rauscher (1967).
[62] J.B. Kogut and M.A. Stephanor, "*The Phases of Quantum Chromo-dynamics: From Confinement to Extreme Environments," (Cambridge University Press, New York 2004).*
[63] H. Nastase, "The RHIC fireball as a Dual Black Hole," http://xxx.lanl.gov, arXiv Archive, hep-th/0501068, v.2 (Brown University, Brown HET 1439 February 16, 2005).
[64] K.Tuchin, "On Black Hole Horizon Fluctuations," Nucl. Phys. B **553**, 333 (1999).
[65] D. Kharzeev, Y.V. Kovchegov, and K. Tuchin, "Nuclear Modification Factor in D+Au Collisions: Onset of Suppression in the Color Glass Condensate," Phys. Lett. B **599**, 23 (2004).
[66] D. Kharzeev and K. Tuchin, "From Color Glass Condensate to Quark Gluon Plasma through the Event Horizon," Nucl. Phys. A **753** 316 (2005).
[67] G. Chapline, *Foundations of Quantum Mechanics*, edited by T.D. Black, M.M. Nieto, H.S. Scully, and M. Sinclair, 255 (World Scientific, Singapore 1992).
[68] D. Kharzeev, E. Levin, K. Tuchin, "QCD in Curved Space-Time: A Conformal Bag Model," Phys. Rev. D **70**, 4005 (2005).
[69] R.B. Laughlin, "Emergent Relativity," Int. J. Mod. Phys., A **18**, 831 (2003).
[70] K. Fossheim, A. Sudboe, *Superconductivity: Physics and Applications* (Wiley, New York 2004).
[71] G. Chapline, "Quantum Phase Transitions and the Failure of Classical General Relativity," Int. J. Mod. Phys. A **18, 3587 (2003).**
[72] E.A. Rauscher, "Application of Soliton Physics to Plasma - MHD and Superconductivity - BCS: Theoretical Implications for Primary Energy," *Requested report Primary Energy Technologies of Los Angeles* (PSRL-3107 Tecnic Research Laboratory, November, 1982).
[73] D.L. Dexter and R.S. Knox, *Excitations* (Wiley, New York 1965).
[74] V. D. Hunt, *Superconductivity Sourcebook* (John Wiley and Sons, New York, Toronto, Singapore 1989).
[75] E.A. Rauscher, "Quantized plasmas," Bull. Amer. Phys. Soc. **15**, 1639, (1970).
[76] E.F. Gross, Nuovo Cimento Suppl. 3, 672 (1956).
[77] Ji, H. S., et al., "Hydrodynamic Turbulence Cannot Transport Angular Momentum Effectively in Astrophysical Disks," Nature **444**, 343-346 (November 16, 2006).
[78] Spence, E. J. et al., "Observation of a Turbulence-Induced Large Scale Magnetic Field," arXiv:physics/0511029 V2 (December 5, 2005).
[79] Alboussiere, T., et al., "MHD Turbulence in a Rotating Spherical Couette Flow of Sodium with an Imposed Dipolar Magnetic Field," GTP Workshop on Modeling MHD Turbulence: Applications to Planetary and Stellar Dynamos, at: NCAR (Boulder, CO. 27-30 June, 2006).[80] H. Stocker, "Collective Flow Signals the Quark-gluon Plasma," Nuclear Physics A **750**, 121 (2005).
[81] Z. Foder and S.D. Katz, JHEP 0203-014 (2002) and JHEP 0404-050 (2004).
[82] G.A. Thomas, "An Electron Hole liquid," Sci. Amer. **28** (June 1976).
[83] Dressler, D. Lynden-Bell, D. Burstein, R.L. Davis, S.M. Faber, R. Terlevich, and G. Wagner, Ap. J., **313**, 42 (1987).
[84] T. Lauer, et al. "The Masses of Nuclear Black Holes in Luminous Elliptical Galaxies and Implications for the Space Density of the Most Massive Black Holes," arXiv Archive, astro-ph/0606739, v.1 (June 29, 2006).
[85] K.I. Strecker, et al., "Formation and Propagation of Matter-wave Soliton Trains," Nature **417**, 150 (2002).
[86] L. Khaykovich, et al., "Formation of a Matter-Wave Bright Soliton," Science **296**, 1290 (2002).
[87] E. Battaner, "The Fractal Octahedron Network of Large Scale Structure," arXiv Archive, astro-ph/9801276 (January 28, 1998).
[88] E. Battaner and E. Florido, "Egg-Carton Universe," arXiv Archive, astro-ph/9802009 (February 2, 1998).
[89] N. Haramein, presentation at the Unified Theories conference (Budapest, Hungary 2006) in R.L. Amoroso, I. Dienes, & Cs. Varga (eds.) Unified Theories, Oakland: The Noetic Press, www.theresonanceproject.org/research/scientific.htm.
[90] JPL, "Cassini Images Bizarre Hexagon on Saturn," www.jpl.nasa.gov/news/news.cfm?release=2007-034 (Jet Propulsion Laboratory, 2007).
[91] Eric Weisstein (Wenzel Jamnitzer in 1568), Kepler (*Harmonice Mundi* in 1619), http://mathworld.wolfram.com/StellaOctangula.html (Wolfram MathWorld 2007).
[92] R.B. Tully, R. Scaramella, G. Vettalani, and G. Zamorani, Ap. J. **388**, 9 (1992).

[93] H.P. Robertson, "Relativistic Cosmology," Rev. Mod. Phys. **5**, 62 (1933).
[94] H.M.S. Coxeter, *Regular Polytopes* (Methun and Co., Ltd., London 1948).
[95] M.B. Green and D.J. Gross, eds., *Workshop on Unified String Theories: 29 July-16 August 1985*, Institute for Theoretical Physics, University of California, Santa Barbara (World Scientific, Singapore 1986).
[96] B. Zwiebach, *String Theory* (Cambridge University Press, UK 2004).
[97] M.J. Duff, "Recent Results in Extra Dimensions," in *The Physics in Higher Dimensions*, edited by T. Piran and S. Weinberg (World Scientific, Singapore 1986) and Nucl. Phys. **B235**, 610 (1990).
[98] S. P. Sirag, "The Cosmology of Consciousness: A Group Theory Approach," Presentation, University of California, Berkeley, Dwinelle Hall, (Preprint and private communication September 28, 1987).
[99] G.M. Hall, "A Geometry for Non-Geometric String Backgrounds," arXiv Archive, hep-th/0406102, v.3 (July 14, 2005).
[100] Strominger, S.T. Yau, and E. Zaslow, Nucl. Phys. B **479**, 243 (1996) and "Mirror Symmetry is T-Duality," arXiv Archive, hep-th/9606040 (June 14, 1996).
[101] N. Haramein and E.A. Rauscher, "Nonlinear Quantum Theory Under the Influence of Torque and Coriolis Forces," (in progress).
[102] N. Haramein and E.A. Rauscher, "The Balance Equation in a Haramein-Rauscher Metrical Space," (in progress).
[103] Stanford University, NASA, "The Gravity Probe B Story," http://einstein.stanford.edu/content/story_of_gpb/gpb_story.pdf (Stanford, CA 2007).
[104] www.theresonanceproject.org