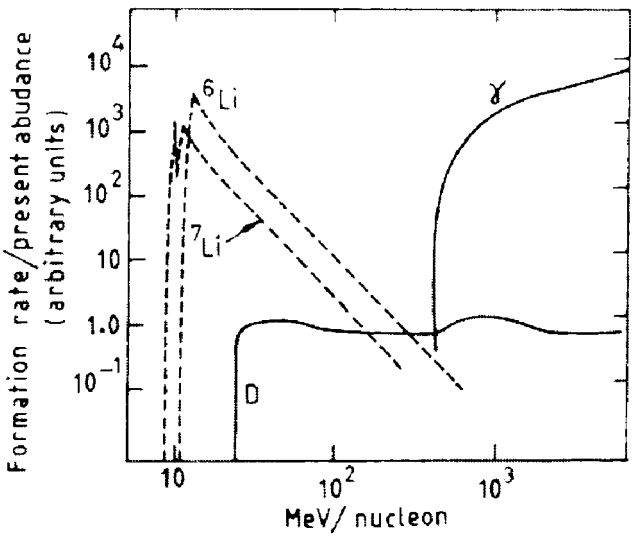
U K R A I N E ISSN 1726-4499

Spacetime & Substance

International Physical Journal



Volume 6, No. 2 (27), 2005

© 2005 Research and Technological Institute of
Transcription, Translation and Replication
JSC

U K R A I N E ISSN 1726-4499

Spacetime & Substance

International Physical Journal

Certificate of the series AB, No. 4858, issued by the State Committee for Information Policy, TV and Broadcasting of Ukraine (February 12, 2001).

The Journal is published by Research and Technological Institute of Transcription, Translation and Replication, JSC(Kharkiv, Ukraine).

It is a discussion journal on problems of theoretical and experimental physics in the field of research of space, time, substance and interactions. The Journal publishes:
— the theories combining space, time, gravitation and others interactions (including the Einstein's SR and GR);
— application of theories for description and/or explanations of properties of the Universe and microcosmos;
— mathematical models and philosophical bases, which touch the description of a physical reality;
— description of set-ups aimed at the realization of fundamental physical experiments and the forthcoming results;
— discussion of published materials, in particular, those questions, which still have not a correct explanation.

The volume of one issue is 48 pages. Format is A4. The periodicity is 5 issues per one year. The language is English. The equivalent versions: paper and electronic — ISSN 1813-9833 (*.TEX, *.PS, *.PDF).

Editorial Board:

N.A. Zhuck (Kharkiv, Ukraine) — *Editor-in-chief*
V.V. Krasnoholovets (Kyïv, Ukraine) — *Vice Editor*
B.N. Adamovich (Kyïv, Ukraine)
M.M.Abdildin (Almaty, Kazakhstan)
L.Ya. Arifov (Simferopol, Ukraine)
Yu.A. Bogdanov (Kharkiv, Ukraine)
B.V. Bolotov (Kyïv, Ukraine)
P. Carlos (Rio de Janeiro, Brazil)
M.J.F.T. Cabbolet (Eindhoven, Holland)
P. Flin (Krakow, Poland)
L.P. Fominsky (Cherkasy, Ukraine)
Yu.M. Galaev (Kharkiv, Ukraine)
J. Gil (Zielona Gora, Poland)
A.V Kinderevich (Kyïv, Ukraine)
N.D. Kolpakov (Kharkiv, Ukraine)
A. Loinger (Milan, Italy)
I.Yu. Miklyaev (Kharkiv, Ukraine)
V. Mioc (Bucharest, Romania)
Z.G. Murzakhanov (Kazan, Russia)
Lj. Nešić (Niš, Yugoslavia)
P.G. Niarxos (Athens, Greece)
V.I. Noskov (Moscow, Russia)
J. Quiroga (Pereira, Colombia)
V.L. Rvachev (Kharkiv, Ukraine)
A.A. Romanov (Kharkiv, Ukraine)
S.S. Sannikov-Proskurjakov (Kharkiv, Ukraine)
V. Skalský (Trnava, Slovakia)
V.I. Skubaev (Cherkasy, Ukraine)
R. Triay (Marseilles, France)
V.Ya. Vargashkin (Oryol, Russia)
Yu.S. Vladimirov (Moscow, Russia)

Executive Editor: V.V. Moroz; *Technical Editor*: A.M. Varaksin

Subscription information:

The price of one paper unit is $2.0 in Ukraine, $2.5 in NIS* states, $10.0 in all other countries (plus $1, $1.5 or $10 postage and handling accordingly). The electronic version price is 25% of the paper version price.

*) NIS (New Independent States without Ukraine) are Azerbaijan, Armenia, Byelorussia, Georgia, Kazakhstan, Kirghizia, Moldova, Russia, Tadjikistan, Turkmenistan, Uzbekistan.

Accounts:

In US Dollars

Correspondent: THE BANK OF NEW YORK
Eastern Europe Division
One WAll Street, New York, NY 10286
Account No. 890-0260-610
Beneficialry Bank: UKRSIBBANK of Ukraine
In favour of ZEMELNY BANK JSC
Account No. 1600-8-50174-01-00
SWIFT: KHAB UA 2K
Beneficiary: NTI TTR JSC
Account No. 26009011415

In UA Hryvnyas

Account No. 26009011415
in KHAB ZEMELNY BANK,
MFO 351652,
AO NTI TTR,
Cod 24473039,
Kharkov, Ukraine
(*for Ukraine subscribers, at the rate of the National Bank*)

The corresponding confermation as to the paying should be sent to the Editorial Office by E-mail.

Editorial Office: Zhuck N.A., RTI TTR, 3 Kolomenskaya St., Kharkov 61166, Ukraine
Tel.: +38 (057) 719-55-77, (044) 265-79-94. Tel./fax: +38 (057) 719-55-76, 759-12-67, 759-12-87
E-mail: zhuck@ttr.com.ua, spacetime@ukr.net, krasnoh@iop.kiev.ua. http://spacetime.narod.ru

© 2005 Research and Technological Institute of Transcription, Translation and Replication, JSC

Spacetime & Substance, Vol. 6 (2005), No. 2 (27), pp. 49–52
© 2005 Research and Technological Institute of Transcription, Translation and Replication, JSC

FAR-INFRARED LOW-TEMPERATURE SPECTRA OF CHEMICAL COMPOUNDS – GRAVITATIONAL EFFECTS

Jozef Šima[1] and Miroslav Súkeník[2]

Slovak Technical University, FCHPT, Radlinského 9, 812 37 Bratislava, Slovakia

Received April 1, 2005

Infrared and Raman spectra in the low-frequency region usually contain several bands assigned to lattice vibrations. Contrary to the transitions unambiguously attributable to various symmetric or asymmetric, stretching or deformation vibrations, the nature of the lattice vibrations has not been fully understood though it is tacidly accepted that they somehow depend on the mass of bonded atoms. Vaidya metric incorporating Expensive Nondecelerative Universe model (ENU) allows to localize and quantity density of gravitational energy created by a body with the mass m in the distance r. This its feature is exploited in the present explanation and predictability of peak positions in the far-infrared region. This contribution offers the background of ENU and examples of experimentally observed peaks in low-temperature spectra comparing with the ENU based calculated ones.

1. Introduction

In an interview [1], Rudolph A. Marcus, 1992 Nobel Laureate in Chemistry, when expressing his opinion on the mutual relationship between the theory and the experiment stated: "If you produce a theory that you just rationalize the experiment and can't make predictions, you can't really test it." One could hardly object to these words clearly defining the essence of theoretical scientific work. Bearing this aspect in mind, major part of our efford has been focused to rationalize known facts by independent ways, to predict some phenomena or characteristics, and to offer new experiments to verify theoretical predictions. Also the present contribution devoted to the issue of far-infrared low-temperature vibrational spectra should serve to reach such a goal.

Infrared and Raman vibrational spectra have been a powerful tool in elucidation of bonding properties within molecules and compounds. Based on the group theory and quantum mechanics, the analysis of possible vibrational motions allows to predict a number of peaks both in infrared and Raman spectra. The mass of atoms (polyatomic moieties) involved and the force of their bonding enable, in principle, to assign all peaks found in spectra to individual vibrational transitions. Several general conclusions related to the peak position and intensity have been formulated and those are, exemplified with numerous experimental data gathered in many monographs and reviews [see, e.g. 2, 3].

Along with peaks attributable to individual symmetric or asymmetric, stretching or deformation vibrations of atoms and polyatomic moieties, there are, mainly in the low-frequency region (50–400 cm^{-1}) further peaks observed which cannot be associated to the above mentioned vibrational modes. Such peaks are usually denoted as due to lattice (skeletal, phonon) vibrations. In general, their number, position and intensity are not predictable. It is, however, tacidly assumed that they are linked to the mass of vibrating portion of compound.

In this paper we manifest that the mass — a property being directly connected to the gravity — plays a crucial role in the mentioned low-frequency spectra. Provided that in the vibrating portion (part of its structure) of a solid compound all its atoms must be somehow bonded, also their individual mass may reflect in the spectra. Taking this assumption into account, it might be, in principle, possible to predict also peaks in low-frequency spectra. To eliminate all the possible perturbative temperature-induced factors, such atom mass-based spectra should be scanned at temperatures as low as possible.

2. ENU background

As a tool assisting to fulfil the task of offering a new approach to interpretation of experimental spectral data, the model of Expansive Nondecelerative Universe (ENU) has been chosen.

The cornerstones of ENU may be summarized as follows [4-7]:

1. Stemming from a postulate putting equal the mean and the critical energy density of the Universe, it follows that the Universe expands by a constant rate identical to the speed of light

[1]E-mail: sima@chtf.stuba.sk
[2]E-mail: sukenik.miroslav@stonline.sk

c throughout the whole expansive evolutionary phase, obeying thus relation (1)

$$a = c\,t_U = \frac{2\,G\,m_U}{c^2}, \tag{1}$$

where a is the Universe radius (gauge factor), t_U is the Universe age, m_U is the Universe mass (their present ENU-based values are following: $a \cong 1.299\,x\,10^{26}$ m, $m_U \cong 8.673x10^{52}$ kg, $t_U \cong 1.373\,x\,10^{10}$ yr);

2. The curvature index k and Einstein cosmologic constant Λ are of zero value;

3. Since a is increasing in time, m_U must increase as well, *i.e.* in the ENU, the creation of matter occurs. The total mass-energy of the Universe must, however, be exactly zero. It is achieved by a simultaneous gravitational field creation, the energy of which is negative. The fundamental mass-energy conservation law is thus observed;

4. Due to the matter creation, Schwarzschild metrics must be replaced in ENU by Vaidya metrics [8, 9] in which the line element is formulated as

$$\mathrm{d}s^2 = \left(\frac{\mathrm{d}\Psi}{c\,\mathrm{d}t}\right)^2 \frac{1}{f^2_{(m)}} \left(1 - \frac{2\,\Psi}{r}\right) c^2 \mathrm{d}t^2 - \\ - \left(1 - \frac{2\,\Psi}{r}\right)^{-1} \mathrm{d}r^2 \\ - r^2\left(\mathrm{d}\theta^2 + \sin^2\theta\,\mathrm{d}\varphi^2\right) \tag{2}$$

and the scalar curvature R (which is, contrary to a more frequently used Schwarzschild metric of non-zero value in Vaidya approach also outside the body allowing thus to localize the gravitational energy density) in the form

$$R = \frac{6\,G}{c^3\,r^2}.\frac{\mathrm{d}m}{\mathrm{d}t} = \frac{3\,r_g}{a\,r^2}, \tag{3}$$

where m is the mass of a body, G (6.67259×10^{-11} kg^{-1} m^3 s^{-2}) is the gravitational constant, r is the distance from the body, r_g is the gravitational radius of the body, $f_{(m)}$ is an arbitrary function, and Ψ is defined as

$$\Psi = \frac{G\,m}{c^2}. \tag{4}$$

5. Critical energy density (*i.e.* actual density within the ENU model) is related to the pressure p through the state equation relation

$$p = -\frac{\varepsilon}{3}. \tag{5}$$

A typical feature of the ENU model lies in its simplicity, in the fact that no "additional parameters" or strange "dark energy" are needed, and in the usage of only one state equation (5) in the Universe description. Calculated gauge factor a, cosmological time t_U, and energy density ε match well the generally accepted values.

3. Gravitational energy density localization

Owing to Vaidya metric application, the ENU model enables to localize gravitational energy and quantify its density. As a starting point in deriving the gravitational energy density, Einstein equation

$$R_{ik} - \frac{1}{2}g_{ik}R = \frac{8\pi G}{c^4}T_{ik} \tag{6}$$

is subjected to divergence giving the trace of energy-momentum tensor T in the form

$$-\frac{c^4}{8\pi G}R = T. \tag{7}$$

In case of weak fields

$$T = \varepsilon, \tag{8}$$

where ε is a field energy density.

Equation (7) can be applied in two metric. In the Schwarzschild metric, scalar curvature $R \neq 0$ only inside the body, and the energy density inside the body, ε_{in} is

$$T = \varepsilon_{in}. \tag{9}$$

In the Vaidya metric, $R \neq 0$ also outside the body, *i.e.* the energy density ε_g is of gravitational nature and

$$T = \varepsilon_g. \tag{10}$$

Taking the Vaidya scalar curvature (3) into account, the density of gravitational energy of a body with the mass m at the distance r is given by

$$\varepsilon_g = -\frac{3\,m\,c^2}{4\,\pi\,a\,r^2}. \tag{11}$$

Relation (11) may be applied to the whole Universe energy E_U emerging via integrating the gravitational energy density of a body over the whole Universe space ($a = r_U$)

$$E_U = \int \varepsilon_g \mathrm{d}V = -m_U\,c^2. \tag{12}$$

Since the trace of tensor T for the whole Universe is equal to zero

$$T = \varepsilon + 3p = 0 \tag{13}$$

then, applying equation (7) to the whole Universe, we obtain for the scalar curvature of the Universe $R_U = 0$. This relation is valid irrespective to the metric used since all the Universe mass is "inside" the Universe and, in turn, the total energy of the Universe is thus zero. As shown by (11), within the ENU limits it is possible to localize and determine gravitational energy density.

For a gravitational energy quantum E_g with the density ε_g it holds:

$$\varepsilon_g = \frac{3E_g}{4\pi\lambda^3}, \tag{14}$$

where the Compton's wave λ may be expressed as:

$$\lambda = \frac{h\,c}{2\,\pi\,E_g}. \tag{15}$$

Substituting λ in (15) for (14) and comparing the result with (11), the expression for an energy quantum associated with a body is obtained:

$$|\,E_g\,| = \int \mathrm{d}^3k\,\varepsilon_g = \left(\frac{m\,h^3\,c^5}{8\,\pi^3 a\,r^2}\right)^{1/4}, \tag{16}$$

where E_g is the quantum of gravitational energy created by a body with the mass m in the distance r. Relation (16) is in conformity with the limiting values: the maximum energy is represented by the Planck energy, the minimum energy equals the energy of a photon with the wavelength identical to the Universe dimension ($a = \lambda$).

4. Far IR low-temperature spectra

Equation (16) is of general validity both for macroworld and microworld. Its validity in the microworld may be checked by means of far-infrared (Raman) spectroscopy. For this purpose we substitute the mass m in (16) by a mass of an atomic nucleus. Expressing the mass m via the proton mass m_p and mass number A (the difference in the proton and neutron rest masses can be omitted)

$$m = m_p \cdot A \tag{17}$$

and the nucleus radius r as

$$r = r_o \cdot A^{1/3}, \tag{18}$$

where r_o is the Compton length of the π-mesone ($r_o = 1.4{\cdot}10^{-15}$ m), relation (16) can be rewritten in the form

$$|E_g| = \frac{h\,\omega}{2\,\pi} = \frac{\left(m_p\,h^3\,c^5\right)^{1/4}}{\left(8\,\pi^3\,a\,r_o^2\right)^{1/4}} A^{1/12}. \tag{19}$$

In some experimental techniques (*e.g.* in IR and Raman spectroscopies) the energy is usually expressed in wavenumbers $\tilde{\nu}$ (cm^{-1}) and for such cases (19) can be transformed to the form

$$\tilde{\nu} = \frac{1}{200\,\pi}.\frac{\left(2\,\pi\,m_p\,c\right)^{1/4}}{\left(h\,a\,r_o^2\right)^{1/4}}.A^{1/12}. \tag{20}$$

Introducing numerical values of the constant parameters into (20) we get

$$\tilde{\nu} = 105 A^{1/12}. \tag{21}$$

It follows from the above equation (21) that for atoms of naturally occurring elements with the mass number from $A = 1$ (hydrogen $_1$H atom) to 238 (uranium $_{238}$U) the energy due to their gravitation should span in 105 cm^{-1} – 165 cm^{-1}, *i.e.* in the domain of far-infrared (Raman) spectroscopies. It should be pointed out that contrary to the changes in vibrational and rotational energies, no theoretical background dealing with the gravitation and the mentioned spectrospopic methods has been elaborated so far. Our attempt to use these methods to detect gravitational field is based on the following postulates and assumptions (which are still waiting for theoretical elaboration):

1. The incident radiation will interact with the gravitational field created by atomic nuclei and consequences of such interaction will manifest in the spectra,
2. The interaction will be observable mainly at low temperatures when the presence of "hot bands" and peaks of lattice vibrations will be suppressed,
3. Due to the effects such as couplings with other motions, low transition probability and different bonding of atoms in investigated compounds, some peaks may be hidden, undetectable or shifted if compared to the calculated value.

Searching the literature devoted to far-infrared and Raman spectroscopy we found several papers presenting spectra scanned at various temperatures in the above mentioned region. In the spectra, the new peaks, which are not attributable to the vibrations predictable by the group theory and normal mode analysis, emerged at low temperatures. This phenomenon is documented by four examples.

The first one is the Raman spectrum of $Hg_2(NO_3)_2 \cdot 2D_2O$ measured at 295 K and 12 K [10]. It is obvious that new peaks positioned at 111 cm^{-1} and 163 cm^{-1} appeared at 12 K that is in excellent agreement with the calculated values for deuterium and mercury, respectively. A peak at 138 cm^{-1} can be assigned to the nitrogen and oxygen atoms. A small shift versus the calculated values (131 cm^{-1}, 132 cm^{-1}) might be a consequence of a coupling or a fact that the bond order N-O is higher than 1.

Temperature dependence of the Raman spectra of 1,4-cyclohexadiene [11] exhibits at 7 K the presence of

a new peak located at 105 cm^{-1} and a shoulder at 130 cm^{-1} that, in accordance with the values calculated using equation (21), can be due to hydrogen and carbon, respectively.

As a further example [12], the spectra of alkali metal salts of tetracyanoquinodimethanide can be introduced. It is obvious that decreasing the temperature from 298 K to 30 K gives rise to a formation of new spectral peaks, localized at 124 cm^{-1}, 137 cm^{-1} and 144 cm^{-1} for Li^+, Na^+ and K^+ salt, respectively. It is worth mentioning that the peak of sodium compound is absent in the spectra scanned at higher temperatures.

At the end, a structured peak centered at 156 cm^{-1} in the Raman spectra of three compounds containing the complex anion $[Au(CN)_2]^-$ can be mentioned. The peak was assigned [13] to a lattice vibration. The peak position does not, however, change with a countercation and is very near to the calculated position (162 cm^{-1}). Stemming from these facts it may be suggested that the gravitational effect might contribute to the peak. The issue of low-temperature far-infrared spectra can be concluded as follows:

1. The paper documents the potentials of spectroscopic methods to detect energy changes associated with gravitation, *i.e.* experimentally verify the theoretical background elaborated and published in our previous papers. To accept a more definite conclusion relating to this field, a thorough searching in the literature must be performed and the obtained data evaluated. It should be pointed out that the data should meet at least the following requirements: the spectra should be scanned in the region 100 – 200 cm^{-1} at various temperatures reaching down to 30 K and lower in order to identify new peaks in the region; the spectra should be interpreted in more detail in order to eliminate peaks attributable to normal modes. Papers with the spectra meeting the above requirements are, however, very rare.

2. The results obtained so far are of preliminary nature, however, they seem to be promising enough to stimulate further theoretical and experimental research in the field.

3. Based on the derived relation (21), peaks due to the presence of all the elements can be predicted, e.g., at 134 cm^{-1}, 141 cm^{-1}, 151 cm^{-1} and 157 cm^{-1} for single bonded fluorine, chlorine, bromine and iodine, respectively.

Acknowledgements

This work was supported by
the VEGA grant 1/2452/05.

References

[1] R.A. Marcus, *Spectrum* 16 (2003) 4

[2] E.A.V. Ebsworth, D.W.H. Rankin, S. Cradock, *Structural Methods in Inorganic Chemistry*, Blackwell Sci. Publ., Oxford, 1987

[3] K. Nakamoto, *Infrared and Raman Spectra of Inorganic and Coordination Compounds*, (4th edition), Wiley, New York, 1986

[4] V. Skalský, M. Súkeník, *Astroph. Space Sci.*, 178 (1991) 169

[5] V. Skalský, M. Súkeník, *Astroph. Space Sci.*, 181 (1991) 153

[6] M. Súkeník, J. Šima, *Spacetime & Substance, 4* (2003) 97

[7] J. Šima, M. Súkeník, *Neutron Stars - Rationalization and Prediction of Their Properties by the Model of Expansive Nondecelerative Universe, in Progress in Neutron Star Research*, Nova Science Publishers, New York, 2005 (in press)

[8] P.C. Vaidya, *Proc. Indian Acad. Sci.*, A33 (1951) 264

[9] K.S. Virbhadra, *Pramana – J. Phys.*, 38 (1992) 31

[10] A.K. Cheetham, Day, P.: 1991, *Solid State Chemistry, Techniques*, Clarendon Press, Oxford, 1991, p. 338

[11] H. Hagemann, H. Bill, D. Joly, P. Muller, N. Pautex, *Spectrochim. Acta, 41A*, (1985) 751

[12] M. Futamata, Y. Morioka, I. Nakagawa, *Spectrochim. Acta, 39A*, (1983) 515

[13] Z. Assefa, H.H. Petterson, *Inorg. Chem.*, 33, (1994) 6194

Spacetime & Substance, Vol. 6 (2005), No. 2 (27), pp. 53–60
© 2005 Research and Technological Institute of Transcription, Translation and Replication, JSC

A CASE FOR NUCLEOSYNTHESIS IN SLOWLY EVOLVING MODELS

Geetanjali Sethi, Pranav Kumar, Sanjay Pandey & Daksh Lohiya[1]†

Department of Physics & Astrophysics, University of Delhi, Delhi 110 007, India

†Inter University Centre for Astronomy and Astrophysics, Ganeskhind, Pune, India

Received March 6, 2005

We present a case for Cosmological Nucleosynthesis in an FRW universe in which the scale factor expands linearly with time: $a(t) \sim t$. It is demonstrated that adequate amount of ^4He requires a baryon density that saturates mass bounds from galactic clusters. There is a collataral metallicity production that is quite close to the lowest metallicity observed in metal poor Pop II stars and clouds. On the other hand, sites for incipient low metallicity (Pop II) star formation can support environments conducive to Deuterium production up to levels observed in the universe. A profile of a revised "Standard Cosmology" is outlined.

1. Introduction

Early universe (standard big-bang) nucleosynthesis [SBBN] is regarded as a major success for the Standard Big Bang [SBB] Model. As presented, SBBN results look rather good indeed. The observed light element abundances are taken to severely constrain cosmological and particle physics parameters. Deuterium, in particular, is regarded as an ideal "baryometer" for determining the baryon content of the universe [1]. This follows from the fact that deuterium is burned away whenever it is cycled through stars, and a belief, that there are no astrophysical sites (other than SBBN), capable of producing it in its observed abundance [2]. The purpose of this article is to admit caution in adhering to this belief and to explore nucleosynthesis in an environment radically different from the Standard.

What would be the point of such an exercise ?

Indeed, at the outset, drastic variations from SBBN may sound preposterous at this time. Confidence in SBBN stems primarily from D, ^7Li and ^4He measurements. D abundance is measured in the solar wind, in interstellar clouds and, more recently, in the intergalactic medium [3, 4]. The belief that no realistic astrophysical process other than the Big Bang can produce sufficient D lends support to its primordial origin. Further, ^7Li measurement [$^7Li/H \sim 10^{-10}$] in Pop II stars [5] and the consensus [6] over the primordial value for the ^4He ratio $Y_p \geq 23.4\%$ (by mass) suggest that light element abundances are consistent with SBBN over nine orders of magnitude. This is achieved by adjusting just one parameter, the baryon entropy ratio η. Alternative mechanisms for ^7Li production that are accompanied by a co-production of ^6Li with a later depletion of ^7Li have fallen out of favour. The debate on depletion of ^7Li has been put to rest by the observation of ^6Li in a Pop II star [7]. Any depletion of ^7Li would have to be accompanied by a complete destruction of the much more fragile ^6Li. Within the SBBN scenario therefore, one seeks to account for the abundances of ^4He, D, ^3He and ^7Li cosmologically, while Be, B and ^6Li are generated by spallation processes [8].

These results, however, do meet with occasional skepticism [see eg. [25] for problems with BBN]. Observation of ^6Li, for example, requires unreasonable suppression of astrophysical destruction of ^7Li. On the other hand, the production of ^6Li would be accompanied by a simultaneous production of ^7Li comparable to observed levels [9]. This raises doubts about using observed ^7Li levels as a benchmark to evaluate SBBN.

Further the best value of ^4He mass fraction, statistically averaged and extrapolated to zero heavy element abundances, hovers around $.216 \pm .006$ for Pop II objects [10]. Such low ^4He levels have also been reported in several metal poor HII galaxies [11]. For example for SBS 0335-052 the reported value is $Y_p = 0.21 \pm 0.01$ [12]. Such small values for ^4He would not lead to any concordant value for η consistent with bounds on ^7Li and D. Of course, one could still explore a multi-parameter non-minimal SBBN instead of the minimal model that just uses η for a single parameter fit. Non-vanishing neutrino chemical potentials have been proposed to be "natural" parameters for such a venture. These conclusions have been criticized in [6, 12] on grounds of reliance on statistical over-emphasis on a few metal-poor objects with a high enough ^4He abun-

[1]E-mail: getsethi@physics.du.ac.in, dlohiya@iucaa.ernet.in

dance to save minimal SBBN. On the other hand, there are objects reported with abysmally low ^4He levels. This is alarming for minimal SBBN. For example, levels of ^4He inferred for μ Cassiopeiae A [12] and from the emission lines of several quasars [13] are as low as 5% and 10 - 15% respectively. Such low levels would most definitely rule out SBBN. At present one excludes such objects from SBBN considerations on grounds of "our lack of understanding"of the environments local to these objects. As a matter of fact, one has to resort to specially contrived explanations to account for low Y_p values in quasars. Considering that a host of mechanisms for light element synthesis are discarded on grounds of requirement of special "unnatural" circumstances [2], it does not augur to have to resort to special explanations to contend with low ^4He emission spectra. This comment ought to be considered in the light of much emphasis that is laid on emission lines from nebulae with low metal content [6]. Quasars most certainly qualify for such candidates. Instead, one merely seems to concentrate on classes of Pop II objects and HII galaxies that would oblige SBBN. Until the dependence of light element abundance on sample and statistics is gotten rid of and / or fully understood, one must not close one's eyes to alternatives.

We end our overview of the status of SBBN with a few comments. Firstly the low metallicity that one sees in type II stars and interstellar clouds poses a problem in SBBN. There is no object in the universe that has low abundance [metallicity] of heavier elements as is produced in SBB. One relies on some kind of reprocessing, much later in the history of the universe, to get the low observed metallicity in, for example, old clusters and inter-stellar clouds. This could be in the form of a generation of very short-lived type III stars. Such a generation of stars may also be necessary to ionize the intergalactic medium. The extrapolation of ^4He abundance in type II objects and low metal (HII) galaxies, to its zero heavy metal abundance limit, presupposes that reprocessing and production of heavy elements in type III stars is not accompanied by a significant change in the ^4He levels. A violation of this assumption, i.e. a minute increase in ^4He during reprocessing (even as low as 1 - 2 %) would rule out the minimal SBBN. As a matter of fact, it is possible to account for the entire pre-galactic ^4He by such objects [14].

Finally, of late [15], the need for a careful scrutiny and a possible revision of the status of SBBN has also been suggested from the reported high abundance of D in several Ly_α systems. It may be difficult to accommodate such high abundances within the minimal SBBN. Though the status of these observations is still a matter of debate, and (assuming their confirmation) attempts to reconcile the cosmological abundance of deuterium and the number of neutrino generations within the framework of SBB are still on, a reconsideration of alternate routes to deuterium in a slow expanding universe as described in this article could well be worth the effort. This is specially in consideration of the stranglehold that Deuterium has on SBB in constraining the baryon density upper limit to not more than some 3 to 4 % . This constraint has been used in SBB to make out a strong case for non - baryonic dark matter to make up the mass estimates at galactic and cluster scales. Relying on Deuterium that is so local environment sensitive, to predict the nature of CDM runs the risk of "building a colossus on a few feet of clay"[16].

This article reports our study of nucleosynthesis in a universe in which the scale factor evolves linearly with time independent of the equation of state of matter. A strictly linear evolution of the cosmological scale factor is surprisingly an excellent fit to a host of cosmological observations. Any model that can support such a coasting presents itself as a falsifiable model as far as classical cosmological tests are concerned as it exhibits distinguishable and verifiable features.

Large scale homogeneity and isotropy observed in the universe is incorporated in the Friedman-Robertson-Walker (FRW) metric:

$$ds^2 = dt^2 - a(t)^2[\frac{dr^2}{1-Kr^2} + r^2(d\theta^2 + sin^2\theta d\phi^2)]. \quad (1)$$

Here $K = \pm 1, 0$ is the curvature constant. In the following section, we summarize the concordance of observations in a $K = -1$ FRW cosmology in which the scale factor evolves linearly with time: $a(t) \propto t$, right from the creation event itself. The motivation for such an endeavor has been discussed at length in a series of earlier articles [31, 23]. For the purpose of this article, we shall take as a conjecture that a strictly homogeneous background FRW model coasts linearly with time. This can be achieved in a large class of non-minimally coupled theories of gravity. However, perturbations around the homogeneous background are asumed to satisfy the perturbed Einstein equations. Section 3 describes concordant nucleosynthesis in such a model.

2. Concordance of a linear coasting cosmology:

Classical Cosmology tests

- **n(z), a(z):** Data on Galaxy number counts as a function of red-shift along with data angular diameter distance as a function of red-shift do not rule out a linearly coasting cosmology [28]. However, as these tests are marred by evolutionary effects (and mergers), they have fallen into disfavour as reliable tests of a viable model.

- **Hubble Diagram:** With the discovery of Supernovae type Ia [SNe Ia] as reliable standard can-

dles, the status of the Hubble test has been elevated to that of a precision measurement. The Hubble plot relates the magnitude of a standard candle to its redshift in an expanding FRW universe. In [31] we demonstrated how linear coasting is as accommodating for high red-shift objects as the standard non–minimal model with a small cosmological constant. The concordance of linear coasting with SNe1a data finds a passing mention in the analysis of Perlmutter [26] who noted that the Hubble plot for $\Omega_\Lambda = \Omega_M = 0$ (for which the scale factor would have a linear evolution in standard cosmology) is "practically identical to the **bestfit** plot for an unconstrained cosmology". The concordance of this Hubble plot continues even for the more recent data on SNe1a with redshifts $z \geq 1$. The plot almost coincides with the Hubble plot for $\Omega_\Lambda \approx 0.72$, $\Omega_M = 0.28$.

- **Age of the Universe** The age estimate of an $(a(t) \propto t)$ universe, deduced from a measurement of the Hubble parameter, is given by $t_o = (H_o)^{-1}$. The low red-shift SNe1a give the best value of 65 km sec^{-1} Mpc^{-1} for the Hubble parameter. The age of the universe turns out to be 15×10^9 years. Such an age estimate is comfortably concordant with age estimates of old clusters.

- **Lensing Statistics:** Consistency and concordance of linear coasting with gravitational lensing statistics was reported in [32].

- **Density Perturbations**

In [27] we explored a conjecture that the background universe coasts linearly with perturbations around this background being described by

$$-8\pi G \delta T^M_{\mu\nu} = \delta G_{\mu\nu}. \tag{2}$$

It turns out that small perturbations can evolve to a non-linear regime and therefore be expected to lead to structures at large scales. This can be seen by expressing the metric as $g_{\mu\nu} =^{(o)} g_{\mu\nu} + \delta g_{\mu\nu}$, the $\delta g_{\mu\nu}$ being the perturbations. Scalar perturbations can be decomposed in terms of eigenmodes of the laplacian on the constant $\bar{\eta}$ surface (here $d\bar{\eta} = a^{-1}dt$) with eigenvalues $-k^2$ In terms of matter gauge invariant variable D_g (see eg. [29, 30]) and a density parameter

$$C \equiv 4\pi G \rho^o_b a^2_0 = \frac{3}{2}\frac{8\pi G}{3H^2_o}\rho^o_b = \frac{3}{2}\Omega_b$$

the density perturbation equation simply reduces to [27]:

$$[(k^2+3)\frac{e^{\bar{\eta}}}{C} + 3]\ddot{D}_g +$$

$$+[(k^2+3)\frac{e^{\bar{\eta}}}{C} + 2]\dot{D}_g - D_g k^2 = 0. \tag{3}$$

$k = 1$ corresponds to the Hubble scale which is the same as the curvature scale in this model. At a redshift ≈ 1000, a sphere of Hubble radius subtends an angle roughly .25 degrees. Using constraints from microwave background anisotropy at these angles gives $D_g \approx 10^{-5}$ at these scales at the last scattering surface. It is easy to see that modes $k \leq 1$ do not grow. At smaller angular scales ($k >> 1$), the observed anisotropy is expected to fall to much lower values [34]. Photon diffusion dampens anisotropies at angular scales smaller than about one minute. However, for such large values of k, D_g has rapidly growing solutions. The perturbation equation becomes

$$\ddot{D}_g + \dot{D}_g - Ce^{-\bar{\eta}} D_g = 0. \tag{4}$$

This has exact solutions in terms of modified first and second type bessel functions I_1, K_1:

$$D_g = C_1 (Ce^{-\bar{\eta}})^{\frac{1}{2}} I_1((4Ce^{-\bar{\eta}})^{\frac{1}{2}}) +$$

$$+C_2 (Ce^{-\bar{\eta}})^{\frac{1}{2}} K_1((4Ce^{-\bar{\eta}})^{\frac{1}{2}}). \tag{5}$$

For large arguments, these functions have their asymptotic forms:

$$I_1 \longrightarrow \frac{(Ce^{-\bar{\eta}})^{-\frac{1}{4}}}{2\sqrt{\pi}} exp[2(Ce^{-\bar{\eta}})^{\frac{1}{2}}];$$

$$K_1 \longrightarrow \frac{(Ce^{-\bar{\eta}})^{-\frac{1}{4}}}{2\sqrt{\pi}} exp[-2(Ce^{-\bar{\eta}})^{\frac{1}{2}}]. \tag{6}$$

Even if diffusion damping were to reduce the baryon density contrast to values as low as some 10^{-15}, a straight forward numerical integration of eqn(4) demonstrates that for $k \geq 3000$ the density contrast becomes non linear around redshift of the order 50.

In contrast to the above, in the radiation dominated epoch, the adiabatic approximation perturbation equations imply [27]:

$$[(k^2+3)\frac{3}{4k^2} + \frac{3\tilde{C}}{2k^2 e^{2\bar{\eta}}}]\ddot{D}_g +$$

$$+\frac{3\tilde{C}}{k^2 e^{2\bar{\eta}}}\dot{D}_g + [\frac{k^2+3}{8} - \frac{\tilde{C}}{2e^{2\bar{\eta}}}]D_g = 0. \tag{7}$$

For $\bar{\eta}$ large and negative, small k pertubation equation reduces to

$$3\ddot{D}_g + 6\dot{D}_g - k^2 D_g = 0. \tag{8}$$

Eqns(7–8) imply that perturbations bounded for large negative η damp out for small k while large k modes are oscillatory.

We conclude that fluctuations do not grow in the radiation dominated era, small k (large scale) fluctuations do not grow in the matter dominated era as well. However, even tiny residual baryonic fluctuations $O(10^{-15})$ at the last scattering surface for large values of $k \geq 3000$ in the matter dominated era, grow to the non linear regime. Such a growth would be a necessary condition for structure formation and is not satisfied in the standard model. In the standard model, cold dark matter is absolutely essential for structure formation.

- **The recombination epoch**

Salient features of the plasma era in a linear coasting cosmology have been described in [36, 33, 34]. Here we reproduce some of the peculiarities of the recombination epoch. These are deduced by making a simplifying assumption of thermodynamic equilibrium just before recombination.

The probability that a photon was last scattered in the interval $(z, z + dz)$ can be expressed in terms of optical depth,and turns out to be:

$$P(z) = e^{-\tau_\gamma} \frac{d\tau_\gamma}{dz} \approx$$

$$\approx 7.85 \times 10^{-3} (\frac{z}{1000})^{13.25} \times$$

$$\times exp[-0.55 (\frac{z}{1000})^{14.25}]. \qquad (9)$$

This $P(z)$ is sharply peaked and well fitted by a gaussian of mean redshift $z \approx 1037$ and standard deviation in redshift $\Delta z \approx 67.88$. Thus in a linearly coasting cosmology, the last scattering surface locates at redshift $z^* = 1037$ with thickness $\Delta z \approx 68$. Corresponding values in standard cosmology are $z = 1065$ and $\Delta z \approx 80$.

An important scale that determines the nature of CMBR anisotropy is the Hubble scale which is the same as the curvature scale for linear coasting. The angle subtended today, by a sphere of Hubble radius at $z^* = 1037$, turns out to be $\theta_H \approx 15.5$ minutes. The Hubble length determines the scale over which physical processes can occur coherently. Thus one expects all acoustic signals to be contained within an angle $\theta_H \approx 15.5$ minutes.

We expect the nature of CMB anisotropy to follow from the above results. The details are still under study and shall be reported separately.

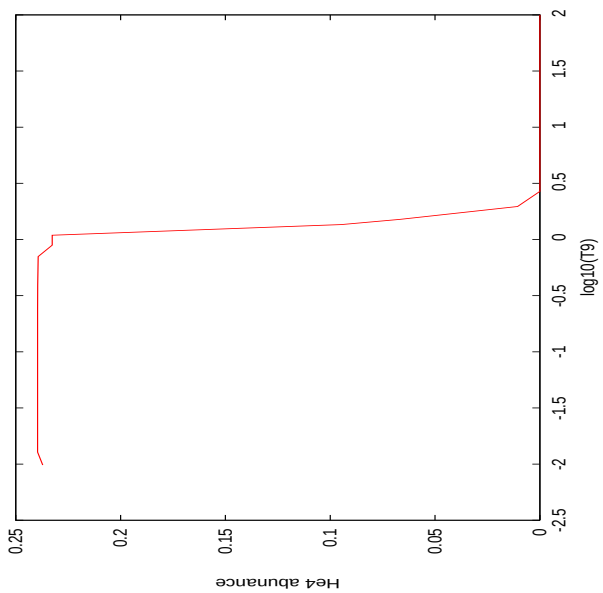


Figure 1: The figure shows abundance of He4 as a function of temperature for $\eta \approx 7.8 \times 10^{-9}$. The final abundance of He4 is approximately 23 %. It reaches this value around $T \approx T_9$ and stays same thereafter.

- **Summary**

In spite of a significantly different evolution, a linear coasting cosmology can not be ruled out by all the tests we have subjected it to so far. Linear coasting being extremely falsifiable, it is encouraging to observe its concordance !! In standard cosmology, falsifiability has taken a backstage - one just constrains the values of cosmological parameters subjecting the data to Bayesian statistics. Ideally, one would have been very content with a cosmology based on physics tested in the laboratory. Clearly, standard cosmology does not pass such a test. One needs a mixture of hot and cold dark matter, together with (now) some form of *dark energy* to act as a cosmological constant, to find any concordance with observations. In other words, one uses observations to parametrize theory in Standard Cosmology. In contrast, a universe that is born and evolves as a curvature dominated model has a tremendous concordance, it does not need any form of dark matter and there are sufficient grounds to explore models that support such a coasting.

3. The Nucleosynthesis Constraint:

What makes linear coasting particularly appealing is a straightforward adaptation of standard nucleosynthesis codes to demonstrate that primordial nucleosynthesis

is not an impediment for a linear coasting cosmology [22, 23]. A linear evolution of the scale factor radically effects nucleosynthesis in the early universe. With the present age of the universe some 15×10^9 years and the $effective$ CMB temperature 2.73 K, the universe turns out to be some 45 years old at 10^9 K. With the universe expanding at such low rates, weak interactions remain in equillibrium for temperature as low as $\approx 10^8$ K. The neutron to proton ratio is determined by the n-p mass difference and is approximately $n/p \sim exp[-15/T_9]$. This falls to abysmally low values at temperatures below 10^9 K. Significant nucleosynthesis leading to helium formation commences only near temperatures below $\sim 5 \times 10^9$ K. The low n/p ratio is not an impediment to adequate helium production. This is because once nucleosynthesis commences, inverse beta decay replenishes neutrons by converting protons into neutrons and pumping them into the nucleosynthesis network. For baryon entropy ratio $\eta \approx 7.8 \times 10^{-9}$, the standard nucleosynthesis network can be modified for linear coasting and gives $\approx 23.9\%$ Helium. The temperatures are high enough to cause helium to burn. Even in SBBN the temperatures are high enough for helium to burn. However, the universe expands very rapidly in SBBN. In comparison, the linear evolution gives enough time for successive burning of helium, carbon and oxygen. The metallicity yield is some 10^8 times the metallicity produced in the early universe in the SBBN. The metallicity is expected to get distributed amongst nucleii with maximum binding energies per nucleon. These are nuclei with atomic masses between 50 and 60. This metallicity is close to that seen in lowest metallicity objects. Fig. 1–4 describe nuclesynthesis as a function of the Baryon entropy ratio. The metallicity concommitantly produced with $\approx 23.9\%$ Helium is roughly 10^{-5} solar.

The only problem that one has to contend with is the significantly low residual deuterium in such an evolution. The desired amount would have to be produced by the spallation processes much later in the history of the universe as described below.

Interestingly, the baryon entropy ratio required for the right amount of helium corresponds to $\Omega_b \equiv \rho_b/\rho_c = 8\pi G\rho_b/3H_o^2 \approx 0.69$. This closes dynamic mass estimates of large galaxies and clusters [see eg [35]]. In standard cosmology this closure is sought by taking recourse to non-baryonic cold dark matter. There is hardly any budget for non - baryonic CDM in linear coasting cosmology.

Deuterium Production:

To get the observed abundances of light elements besides ^4He, we recall spallation mechanisms that were explored in the pre - 1976 days [2]. Deuterium can indeed be produced by the following spallation reactions:

$$p +^4 He \longrightarrow D +^3 He; \quad 2p \longrightarrow D + \pi^+;$$

$$2p \longrightarrow 2p + \pi^o, \ \pi^o \longrightarrow 2\gamma, \ \gamma +^4 He \longrightarrow 2D.$$

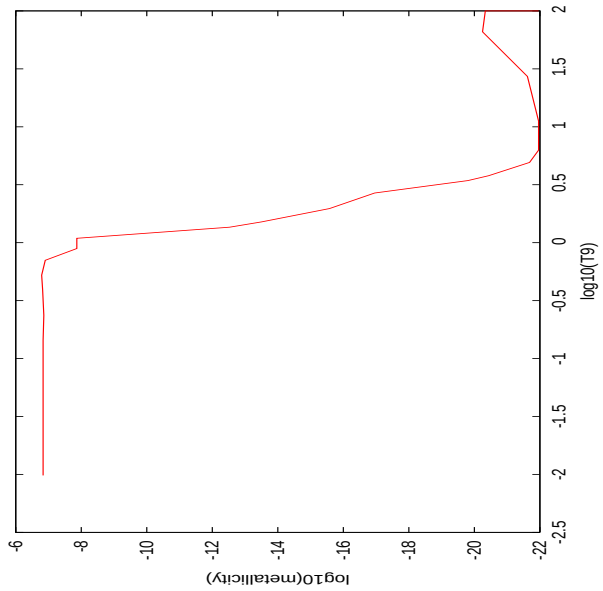


Figure 2: The figure shows metalicity as a function of temperature for $\eta \approx 7.8 \times 10^{-9}$. The metallicity for a linaer coasting model is nearly equal to 10^{-5} times solar metallicity.

There is no problem in producing Deuterium all the way to observed levels. The trouble is that under most conditions there is a concomitant over - production of Li nuclei and γ rays at unacceptable levels. Any later destruction of lithium in turn completely destroys D. As described in [2], Fig. 5 exhibits relative production of ^7Li and D by spallation. It is apparent that the production of these nuclei to observed levels and without a collateral gamma ray flux is possible only if the incident (cosmic ray or any other) beam is energized to an almost mono energetic value of around 400 MeV. A model that requires nearly mono energetic particles would be rightly considered *ad hoc* and would be hard to physically justify.

However, lithium production occurs by spallation of protons over heavy nuclei as well as spallation of helium over helium:

$$p, \alpha \ + \ C, N, O \longrightarrow Li \ + \ X;$$

$$p, \alpha \ + \ Mg, Si, Fe \longrightarrow Li \ + \ X;$$

$$2\alpha \longrightarrow^7 Li \ + \ p; \ \ \alpha \ + \ D \longrightarrow p \ + \ ^6Li;$$

$$^7Be + \gamma \longrightarrow p +^6 Li; \ \ ^9Be + p \longrightarrow \alpha +^6 Li.$$

The absence or deficiency of heavy nuclei in a target cloud and deficiency of alpha particles in the incident beam would clearly suppress lithium production. Such conditions could well have existed in the environments of incipient Pop II stars.

Essential aspects of evolution of a collapsing cloud to form a low mass Pop II star is believed to be fairly well understood [17, 18]. The formation and early

evolution of such stars can be discussed in terms of gravitational and hydrodynamical processes. A protostar would emerge from the collapse of a molecular cloud core and would be surrounded by high angular momentum material forming a circumstellar accretion disk with bipolar outflows. Such a star contracts slowly while the magnetic fields play a very important role in regulating collapse of the accretion disk and transferring the disk orbital angular motion to collimated outflows. A substantial fraction of the accreting matter is ejected out to contribute to the inter - stellar medium.

Empirical studies of star forming regions over the last twenty years have now provided direct and ample evidence for MeV particles produced within protostellar and T Tauri systems [19, 20]. The source of such accelerated particle beaming is understood to be violent magnetohydrodynamic (MHD) reconnection events. These are analogous to solar magnetic flaring but elevated by factors of 10^1 to 10^6 above levels seen on the contemporary sun besides being up to some 100 times more frequent. Accounting for characteristics in the meteoritic record of solar nebula from integrated effects of particle irradiation of the incipient sun's flaring has assumed the status of an industry. Protons are the primary component of particles beaming out from the sun in gradual flares while ^4He are suppressed by factors of ten in rapid flares to factors of a hundred in gradual flares[19, 20]. Models of young sun visualizes it as a much larger protostar with a cooler surface temperature and with a very highly elevated level of magnetic activity in comparison to the contemporary sun. It is reasonable to suppose that magnetic reconnection events would lead to abundant release of MeV nuclei and strong shocks that propagate into the circumstellar matter. Considerable evidence for such processes in the early solar nebula has been found in the meteoric record. It would be fair to say that the hydrodynamical paradigms for understanding the earliest stages of stellar evolution is still not complete. However, it seems reasonable to conjecture that several features of collapse of a central core and its subsequent growth from acreting material would hold for low metallicity Pop II stars. Strong magnetic fields may well provide for a link between a central star, its circumstellar envelope and the acreting disk. Acceleration of jets of charged particles from the surface of such stars could well have suppressed levels of ^4He. Such a suppression could be naturally expected if the particles are picked up from an environment cool enough to suppress ionized ^4He in comparison to ionized hydrogen. Ionized helium to hydrogen number ratio in a cool sunspot temperature of $\approx 3000\ K$ can be calculated by the Saha's ionization formula and the ionization energies of helium and hydrogen. This turns out to be $\approx\ exp(-40)$ and increases rapidly with temperature. Any electrodynamic process that accelerates charged particles from such a cool environment would yield a beam deficient in alpha

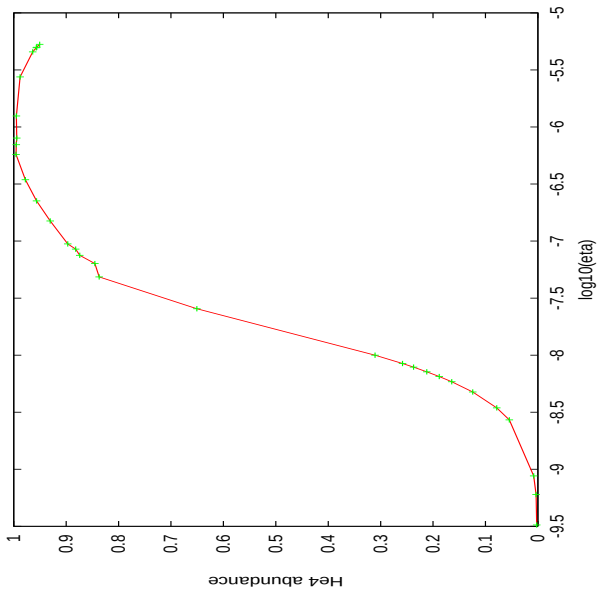


Figure 3: The figure shows He4 abundance as a function of η.

particles. With ^4He content in an accelerated particle beam suppressed in the incident beam and with the incipient cloud forming a Pop II star having low metallicity in the target, the "no - go" concern of (Epstein et.al. [2]) is effectively circumvented. The "no-go" used $Y_\alpha/Y_p \approx .07$ in both the energetic particle flux as well as the ambient medium besides the canonical solar heavy element mass fraction. Incipient Pop II environments may typically have heavy element fraction suppressed by more than five orders of magnitude while, as described above, magnetic field acceleration could accelerate beams of particles deficient in ^4He.

One can thus have a broad energy band - all the way from a few MeV up to some 500 MeV per nucleon as described in the Fig. 5, in which acceptable levels of deuterium could be "naturally" produced. The higher energy end of the band may also not be an impediment. There are several astrophysical processes associated with gamma ray bursts that could produce D at high beam energies with the surplus gamma ray flux a natural by product.

Circumventing the "no-go" concern of Epstein et al would be of interest for any cosmology having an early universe expansion rate significantly lower than corresponding rates for the same temperatures in early universe SBB.

4. Conclusions:

Our understanding of star formation has considerably evolved since 1976. SBBN constraints need to be reconsidered in view of empirical evidence from young

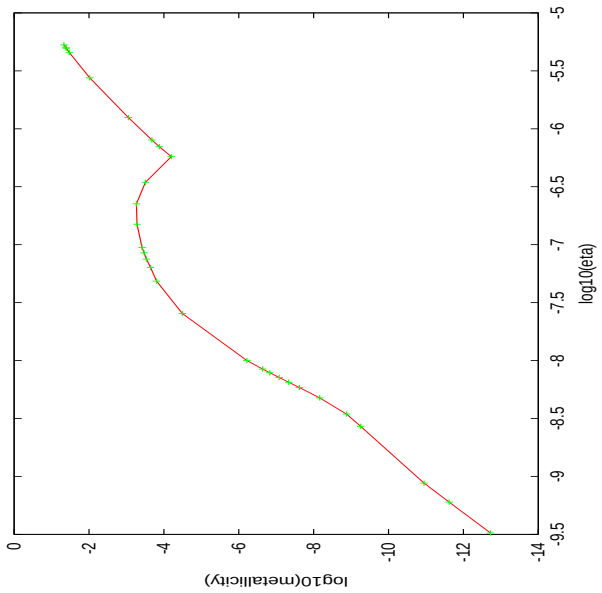


Figure 4: The figure shows metallicity as a function of η.

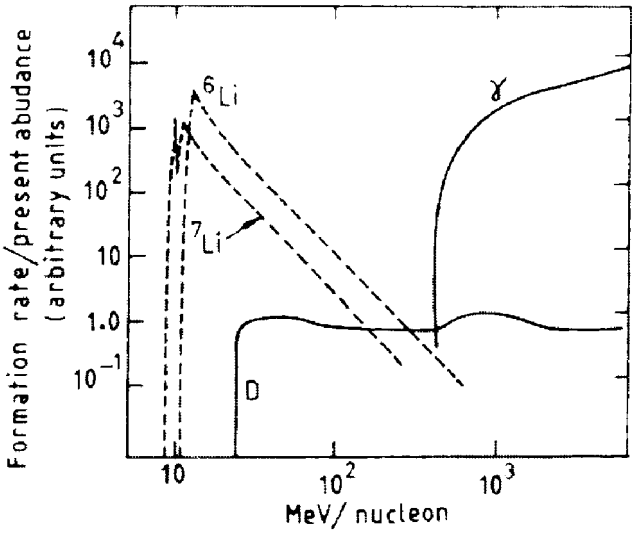


Figure 5: The rates at which abundances approach their present values as a function of the energy per nucleon of the incident particle.

star forming regions. These models clearly imply that spallation mechanism can lead to viable and natural production of Deuterium and Lithium in the incipient environment of Pop II stars. One can conceive of cosmological models in which early universe nucleosynthesis produces the desired primordial levels of ^4He but virtually no D. Such a situation can arise in SBBN itself with a high baryon entropy ratio η. In such a universe, in principle, Deuterium and Lithium can be synthesized up to acceptable levels in the environment of incipient Pop II stars.

In SBB, hardly any metallicity is produced in the very early universe. Metal enrichment is supposed to be facilitated by a generation of Pop III stars. Pop III star formation from a pristine material is not well understood till date in spite of a lot of effort that has been expanded to that effect recently [21]. It is believed that with metallicity below a critical transition metallicity ($Z_{cr} \approx 10^{-4} Z_{\odot}$), masses of Pop III stars would be biased towards very high masses. Metal content higher than Z_{cr} facilitates cooling and a formation of lower mass Pop II stars. In SBB, the route to Deuterium by spallation discussed in this article would have to follow a low metal contamination by a generation of Pop III stars.

Deuterium production by spallation discussed in this article would be good news for a host of slowly evolving cosmological models [22, 23]. An FRW model with a linearly evolving scale factor enjoys concordance with constraints on age of the universe and with the Hubble data on SNe1A. Such a linear coasting is consistent with the right amount of helium observed in the universe and metallicity yields close to the lowest observed metallicities. The only problem that one has to contend with is the significantly low yields of deuterium in such a cosmology. In such a model, the first generation of stars would be the low mass Pop II stars and the above analysis would facilitate the desired deuterium yields.

In SBB, large-scale production and recycling of metals through exploding early generation Pop III stars leads to verifiable observational constraints. Such stars would be visible as 27–29 magnitude stars appearing any time in every square arc-minute of the sky. Serious doubts have been expressed on the existence and detection of such signals [24]. The linear coasting cosmology would do away with the requirement of such Pop III stars altogether.

[2]

Acknowledgements

Daksh Lohiya and Sanjay Pandey acknowledge IUCAA for support under the IUCAA Associate Program. Geetanjali and Pranav ackowledge C.S.I.R for financial support.

References

[1] K. A. Olive, G. Steigman, T.P. Walker; astro-ph/990532

[2] R. I. Epstein, J. M. Lattimer & D. N. Schramm, Nature 263, 198 (1976)

[3] J. Geiss, H. Reeves; Astron. Astrophys. 18 6 (1971); D. Black, Nature 234 148 (1971); J. Rogerson, D. York; *ApJ* 186 L95, (1973)

[4] See eg. C. J. Hogan; astro-ph/9702044 and references therein.

[5] J. Spite, F. Spite, Astron. & Astrophys. 115 357, (1982)

[6] J. Yang, M. Turner, G. Steigman, D. N. Schramm & K. Olive, *ApJ* 281 493 (1984)

[7] V. Smith, R. Nissen & D. Lambert; *ApJ* 408 262, (1993)

[8] K. Olive & D. N. Schramm; Nature 360 434, (1992); G. Steigman, B. Fields, K. Olive, D. N. Schramm & T. Walker; *ApJ* 415 L35, (1993)

[9] M. J. Rees; private communication (1999)

[10] N. Rana; Phys. Rev. Lett. 48 209, (1982); F. W. Stecker; Phys. Rev. Lett. 44 1237, (1980); Phys. Rev. Lett. 46 517, (1981)

[11] B. E. J. Pagel; Physica Scripta; *T36* 7, (1991)

[12] E. Terlevich, R. Terlevich, E. Skillman, J. Stepanian & V. Lipovetskii in "Elements and the Cosmos", Cambridge University Press (1992) eds. Mike G. Edmunds & R. Terlevich

[13] M. Peimbert & H. Spinrad; *ApJ* 159 809, (1970); D. E. Osterbrock & R. A. Parker; *ApJ* 143 268, (1966); J. N. Bahcall & B. Kozlovsky; *ApJ* 155 1077, (1969)

[14] R. V. Wagoner; *ApJ Supp* 18 247, (1969); *ApJ* 179 343, (1973)

[15] M. Lemoine et al. astro-ph/9903043; G. Steigman, Astro-ph/9601126 (1996)

[16] G. Borner, Early Universe, Springer - Verlag (1993)

[17] E. D. Feigelson & T. Montmerle; *Ann. Rev. Astron. Astrophys* 37, 363, 1999.

[18] L. Hartmann, Accretion Process in Star Formation, Camb. Univ. Press. (1998)

[19] O. V. Terekhov et.al.; *Astrn. Lett.* 19(2), (1993)

[20] J. Torsti et.al.; *Solar Physics* 214, 1773, (2003)

[21] E. Scannapieco, R. Schnieder & A. Ferrara; astro-ph/0301628

[22] M. Kaplinghat, G. Steigman, I. Tkachev, & T. P. Walker; *Phys. Rev.* *D59*, 043514, 1999

[23] A Batra, D Lohiya S Mahajan & A. Mukherjee; *Int. J. Mod. Phys.* *D6*, 757, 2000.

[24] J. M. Escude & M. J. Rees; astro-ph/9701093.

[25] J. R. Primack; astro-ph/0408359.

[26] S. Perlmutter et. al.; astro-ph/9812133.

[27] S. Gehlaut, Pranav, Geetanjali & D. Lohiya; astro-ph/0306448

[28] E. W. Kolb; *ApJ.* 344,543 (1989).

[29] V. F. Mukhanov, H. A. Feldman & R. H. Brandernberger, *Phy. Rev.* 215, Nos.5 & 6, 203 (1992).

[30] R. Durrer; astro-ph/0109522.

[31] M. Sethi, A. Batra & D. Lohiya; *Phy. Rev.* *D60*, 3678 (1987).

[32] A. Dev, M. Safanova, D. Jain & D. Lohiya; *Phy. Lett* *B548*, 12 (2002).

[33] Savita Gehlaut, A. Mukherjee, S. Mahajan & D. Lohiya, *Spacetime. and Substance* 4, 14 (2002).

[34] Savita *Ph. D. Thesis*, (*UniversityofDelhi*, 2003).

[35] R. B. Tully & E.J.Shaya, *Proceedings : Evolution of Large Scale Structure- Garching*, August 1998.

[36] S. K. Pandey & D. Lohiya; astro-ph/0406678.

Spacetime & Substance, Vol. 6 (2005), No. 2 (27), pp. 61–63
© 2005 Research and Technological Institute of Transcription, Translation and Replication, JSC

ON SERINI'S RELATIVISTIC THEOREM

Angelo Loinger[1]

Dipartimento di Fisica, Università di Milano, Via Celoria, 16 - 20133 Milano, Italy

Received April 15, 2005

I expound here in a more detailed way a proof of an important Serini's theorem, which I have already sketched in a previous Note. Two related questions are briefly discussed.

1. Introduction

In the Note "On the beams of wavy metric tensors" [1] I sketched a simple and concise proof of an important Serini's theorem (1918). Serini's original demonstration was subsequently generalized by Einstein and Pauli (1943) and by Lichnerowicz (1946) (see [2]). Independently, a different proof was given by Fock [2bis].

I wish now to expound again, in a more detailed way, my proof of the above theorem, and to solve an apparent contradiction with the main result of the paper "Regular solutions of Schwarzschild problem" [3]. The Appendices contain some remarks concerning the so-called gravitational waves.

2. The theorem

Serini's theorem affirms the non-existence of *regular* (i.e. without singularities) time independent solutions of Einstein field equations for the perfectly empty space, $R_{jk} = 0$, $(j,k = 0,1,2,3)$, that become pseudo-Euclidean at spatial infinity. The unique time independent solution of $R_{jk} = 0$ is the trivial solution $g_{jk} = \text{const}$. Thus, in the time independent case, $R_{jk} = 0$ imply $R_{jklm} = 0$, the vanishing of Riemann curvature tensor of the spacetime manifold.

3. Proof of the theorem

a) As it was remarked by Hilbert [4], we can always choose a Gaussian normal (or synchronous [5]) system of coordinates for the solution of *any* relativistic problem. In their treatise [5] Landau and Lifchitz explain in a detailed way the interesting properties of this reference system. I shall follow their treatment, but with some slight differences of notations.

A Gaussian normal (or synchronous) reference frame can be defined by the conditions:

$$g_{00} = 1, \qquad g_{0\alpha} = 0, \quad (\alpha = 1,2,3); \tag{1}$$

accordingly:

$$\mathrm{d}s^2 = (\mathrm{d}x^0)^2 + g_{\alpha\beta}(\mathbf{x}, x^0)\mathrm{d}x^\alpha \mathrm{d}x^\beta; \tag{2}$$

putting $g_{\alpha\beta} \equiv -h_{\alpha\beta}$, we have:

$$\mathrm{d}s^2 = (\mathrm{d}x^0)^2 - h_{\alpha\beta}(\mathbf{x}, x^0)\mathrm{d}x^\alpha \mathrm{d}x^\beta. \tag{2'}$$

It is easy to see that the time lines *coincide* with the spacetime geodesics. Henceforth, all the operations of index displacement and covariant derivative concern *only* the three-dimensional space with the metric tensor $h_{\alpha\beta}$. If

$$\kappa_{\alpha\beta} := \frac{\partial h_{\alpha\beta}}{\partial x^0}, \tag{3}$$

the components of the Ricci-Einstein tensor R_{lm}, $(l,m = 0,1,2,3)$, are:

$$R_{00} = -\frac{1}{2}\frac{\partial \kappa^\alpha_\alpha}{\partial x^0} - \frac{1}{4}\kappa^\beta_\alpha \kappa^\alpha_\beta, \tag{4}$$

$$R_{0\alpha} = \frac{1}{2}\left(\kappa^\beta_{\alpha;\beta} - \kappa^\beta_{\beta;\alpha}\right), \tag{4'}$$

$$R_{\alpha\beta} = \frac{1}{2}\frac{\partial \kappa_{\alpha\beta}}{\partial x^0} + \frac{1}{4}\left(\kappa_{\alpha\beta}\kappa^\gamma_\gamma - 2\kappa^\gamma_\alpha \kappa_{\beta\gamma}\right) + \mathrm{P}_{\alpha\beta}, \tag{4''}$$

where $\mathrm{P}_{\alpha\beta}$ is the three-dimensional analogue of R_{lm}.

The Riemann curvature tensor R_{lmrs} is given by:

$$R_{\alpha\beta\gamma\delta} = \mathrm{P}_{\alpha\beta\gamma\delta} + \frac{1}{4}\left(\kappa_{\alpha\gamma}\kappa_{\beta\delta} - \kappa_{\alpha\beta}\kappa_{\gamma\delta}\right), \tag{5}$$

[1] E-mail: angelo.loinger@mi.infn.it

$$R_{0\alpha\beta\gamma} = \frac{1}{2}\left(\kappa_{\alpha\beta;\gamma} - \kappa_{\alpha\gamma;\beta}\right), \tag{5'}$$

$$R_{0\alpha0\beta} = -\frac{1}{2}\frac{\partial\kappa_{\alpha\beta}}{\partial x^0} + \frac{1}{4}\kappa_{\alpha\gamma}\kappa^r_\beta, \tag{5''}$$

where $\mathrm{P}_{\alpha\beta\gamma\delta}$ is the three-dimensional analogue of R_{lmrs}.

b) For a *time-independent* metric tensor $h_{\alpha\beta}(\mathbf{x})$, we have:

$$R_{00} = R_{0\alpha} = 0, \tag{6}$$

$$R_{\alpha\beta} = \mathrm{P}_{\alpha\beta}; \tag{6'}$$

$$R_{\alpha\beta\gamma\delta} = \mathrm{P}_{\alpha\beta\gamma\delta}, \tag{7}$$

$$R_{0\alpha\beta\gamma} = R_{0\alpha0\beta} = 0; \tag{7'}$$

now, it is (see e.g. Fock [2bis], App. G):

$$\mathrm{P}_{\alpha\beta\gamma\delta} = \left(\mathrm{P}^{\rho\sigma} - \frac{1}{2}h^{\rho\sigma}\mathrm{P}\right)E_{\rho\alpha\beta}E_{\sigma\gamma\delta}, \tag{8}$$

where

$$E_{\alpha\beta\gamma} := h^{1/2}e_{\alpha\beta\gamma}, \tag{8'}$$

if $h \equiv \det\|h_{\alpha\beta}\|$, and $e_{\alpha\beta\gamma}$ is a system of antisymmetric quantities with $e_{123} = 1$.

c) For a perfectly empty space, we have:

$$R_{lm} = 0, \tag{9}$$

and therefore, as an immediate consequence of eqs. (6), (6′), (7), (7′), (8), (8′):

$$R_{lmrs} = 0, \qquad q.e.d.; \tag{10}$$

the unique *time-independent* solution of $R_{lm} = 0$ is $g_{lm} = \text{const}$. This result is obviously quite intuitive, because the curvature of spacetime is created by matter, and if the matter is absent ... –

(Remark that the above proof does not require the hypothesis that g_{jk} is pseudo-Euclidean at spatial infinity.)

4. An apparent contradiction

At the first sight, it seems that Serini's theorem denies, in particular, the existence of those *regular* solutions of Schwarzschild problem – i.e., of the problem to determine the gravitational field of a point mass at rest – which have been exhibited in paper [3]. However, the contradiction is only apparent: indeed, *all* forms of solution of Schwarzschild problem are in reality relative to a matter tensor T_{jk} different from zero, and precisely: to a matter tensor involving a Dirac delta-distribution [6], or to the matter tensor of the limiting case of a concentrated mass, according to Fock's procedure [7], which was also followed in [3].

APPENDIX A

In sect.**3**. of paper [1] I have given an *intuitive* demonstration of the *physical* unreality of the gravitational waves (GW's). I have considered there a spatially limited train $\mathcal{L}$ of running (hypothetical) GW's – the source of which is at spatial infinity –, satisfying exactly the equations $R_{jk} = 0$. (It was implicitly assumed that the g_{jk}'s of $\mathcal{L}$ do *not* possess any singularity of any kind whatever.) Then, the proof rested on a characteristic property of *general* relativity (GR), that distinguishes it from Maxwell theory: the absence of any limitation to the velocities of the reference frames. Thus, we can ideally consider an observer Ω, who moves together with our train $\mathcal{L}$. For Ω the metric tensor of $\mathcal{L}$ is *time independent*; consequently, Serini's theorem tells us that its Riemann curvature tensor is zero: the GW's of $\mathcal{L}$ are mere coordinate undulations.

Of course, this demonstration of the *physical* nonexistence of GW's is a little bold. But there exist absolutely trenchant proofs, as e.g. the proofs of the nonexistence, in the ***exact*** formulation of GR, of "mechanisms" capable of generating GW's, *in primis* the ***fact*** that the purely gravitational motions of bodies are *geodesic* [8]. Quite generally, even the *non*-purely gravitational motions cannot generate GW's, see [9].

A last remark. One could ***object*** that – as a matter of fact – there are wavy solutions of Einstein equations $R_{jk} = 0$, the curvature tensor of which is different from zero. ***Answer***: *i*) *all* solutions of $R_{jk} = 0$ do not possess an energy-momentum endowed with a *true* tensor character: accordingly, they are unphysical objects; *ii*) any undulatory character can be obliterated by a sequence of suitable coordinate transformations; *iii*) the *mathematical* existence of wavy solutions of $R_{jk} = 0$, having a curvature tensor $R_{jklm} \neq 0$, can be easily understood: let W be a solution of this kind; it owes its computative existence to a given gravity source S (explicitly or implicitly postulated) at a very large distance from an ideal observer [10]. Of course, W retains "memory" of the spacetime curvature produced by S –

for a detailed and analytical corroboration of this statement, see e.g. the treatment given by Fock in Ch. VII of his book [2bis]; on the other hand, no motion of a gravity source, no cataclysmic disruption of it can give origin to GW's, as it has been proved.

APPENDIX B

The analogy between Maxwell e.m. theory and Einstein general relativity is a misleading analogy. This is, in particular, clarified also by the intuitive proof of the non-existence of physical GW's, which I have recalled in App.A. In his splendid *Autobiographisches* [11], at page 53, Einstein emphasized the following paradox of classical time conception, which was discovered by him when he was only 16 years old: "Wenn ich einem Lichtstrahl nacheile mit der Geschwindigkeit c (Lichtgeschwindigkeit im Vacuum), so sollte ich einen solchen Lichtstrall als ruhendes, räumlich oszillatorisches elektromagnetisches Feld wahrnehmen. So etwas scheint es aber nicht zu geben, weder auf Grund der Erfahrung noch gemäß den Maxwell'schen Gleichungen." In the English translation by P.A. Schilpp: "If I pursue a beam of light with the velocity c (velocity of light in a vacuum), I should observe such a beam of light as a spatially oscillatory electromagnetic field at rest. However, there seems to be no such thing, whether on the basis of experience or according to Maxwell's equations." Now, in *general* relativity the paradoxical character of the above consideration *disappears* if in particular the beam of light is substituted by a beam of (hypothetical) GW's: indeed, in GR there is no limitation to the velocity of the reference frames.

References

[1] A. Loinger, *On Black Holes and Gravitational Waves* (La Goliardica Pavese, Pavia) 2002, p.82; also on *arXiv:physics/0102011* (February 6th, 2001) – [misclassified; proper class.: gr-qc].

[2] W. Pauli, *Teoria della Relatività* (Boringhieri, Torino) 1958, p.274 of sect. **62**; C. Møller, *The Theory of Relativity* (Clarendon Press, Oxford) 1972, p.441; and the literature quoted there.

[2bis] V. Fock, *The Theory of Space, Time and Gravitation* (Pergamon Press, Oxford, *etc.*) 1964, p.209 of sect.**56**.

[3] A. Loinger, *On Black Holes and Gravitational Waves* (La Goliardica Pavese, Pavia) 2002, p.26; also on *arXiv:physics/0104064* (April 20th, 2001) – [misclassified; proper class.: gr-qc].

[4] D. Hilbert, *Mathem. Annalen*, **92** (1924) 1.

[5] L. Landau et E. Lifchitz, *Théorie du Champ* (Édition Mir, Moscou) 1966, sects. **99** and **110**.

[6] Cf. L. Infeld, *Acta Phys. Polonica*, **13** (1954) 187. – The Newtonian analogue: we can affirm either that M/r is a solution, *singular at* $r = 0$, of $\nabla^2\varphi(\mathbf{r}) = 0$, or that M/r is solution of $\nabla^2\varphi(\mathbf{r}) = -4\pi M\delta(\mathbf{r})$, with Dirac's $\delta(\mathbf{r}) \equiv \delta(x)\delta(y)\delta(z)$. In GR the delta-distributions must be handled with some caution, see L. Infeld and J. Plebanski, *Motion and Relativity* (Pergamon Press, Oxford, *etc.*), 1960.

[7] V. Fock, [2bis], sect.**57**.

[8] A. Loinger, *Nuovo Cimento* B, **115** (2000) 679; also in *On Black Holes and Gravitational Waves* (La Goliardica Pavese, Pavia) 2002, p.76; also in *arXiv:astro-ph/0003230* (March 16th, 2000).

[9] See: A. Loinger, *arXiv:physics/0502089 v1* (February 16th, 2005) – [misclassified; proper class.: gr-qc] – to be published in *Spacetime & Substance*; and the literature quoted there *sub* [3], [5], [6], [10], [11], [14].

[10] The controversial limiting case of the *plane* GW's, which has given origin to several learned papers – see e.g. H. Bondi, F.A.E. Pirani, and I. Robinson, *Proc. Roy. Soc.*, **A 251** (1959) 519 –, does not represent an exception, from the conceptual standpoint.

[11] See *Albert Einstein: Philosopher-Scientist*, ed. by P.A. Schilpp (Tudor Publ. Company, New York) 1949.

Spacetime & Substance, Vol. 6 (2005), No. 2 (27), pp. 64–96
© 2005 Research and Technological Institute of Transcription, Translation and Replication, JSC

QUANTUM MATRIX REALITY, REAL AND J REACTIVE

Frank Boring Fitzgerald[1]

Planck Length-time Quantum Physics Theorist Rural Route One, Box 66, Joliet, Montana, 59041-9705 USA

Received April 1, 2005

Allegedly, all of the Universe can be described in terms of a bifurcated physical reality, real and J reactive, together they exist in 4 levels or in combinations thereof. This paper brings together various concepts of reality which togetherness is based upon a Level 1 commonality with its Planck length-time dipoles of a precise frequency, with a precise 1/2 cycle quantum of virtual resonant energies, potential and kinetic phased 90°. Virtual black holes at dipole end-nodes form out of dimensional fluctuations which take place in a broad spectrum at and near the dipole frequency. Formation of virtual black holes are said to create a system of confinement of the dipoles and checks and balances result. Dipoles of the Universe are said to be found in a matrix of intersecting standing waves. Longitudinal and transverse amplitude modulation are found joined representing every "thing" in Levels 2, 3, and 4. Quantum mechanics and Relativity are joined. Relativity is bifurcated. Gravity field and electric field are joined. Inertia and J reactive gravity are joined. Mass and charge are joined. Relativity is described in terms of translocation of modulation sideband components which form a joining with quantum mechanics. Because Level 1 dipoles are quantized so is every "thing" at Levels 2, 3, and 4. And, all changes in Levels 2, 3, and 4 occurs in steps. All changes are related to the dipole 1/2 cycle quantum.

SUMMARY

1. Our quantum matrix reality is bifurcated into a **real reality** and a J **reactive reality**.

2. Relativity is bifurcated into a mass based Relativity and a charge based Relativity, both quantized.

3. Concepts **1** and **2** are derived from viewing quantum Planck length-time dipoles. Central to the formulation of my paper are portions of concepts from Einstein's Reality Field, his Equivalence Principle, his theories of Relativity, Schwarz and Green's Superstrings, Minkowski's 4D spacetime, de Broglie's wave nature of the electron, Bohr's quantum mechanics, Fourier's wave analysis, and Planck's quantum physics. In addition, complex numbers, mathematical complex phase planes, and, J reactance from Electronics and Electrical Engineering. Some idea of these concepts could result in a better understanding of nature beginning with the very small.

4. I speculate, our universe began with a "big bang" the size of a bipolar virtual black hole singularity, about 10^{-35} m. Our big bang was only one of an infinite number of cycles of big bangs. The red shift is composed of universal expansion red shift, gravity red shift, and a universal residual-gravity red shift and are all quantized.

5. A mind's eye proper view of any "thing" of any size begins with quantization of Planck length-time resonant dipoles at the very small. With quantization of time, length, direction, virtual bipolar black holes, and translocation of primary AM components, all existing in a quantized universal matrix.

6. There are 4 levels to quantum matrix reality. Level 1 is fixed quantized resonant dipoles of a precise frequency, in standing waves, held in precise confinement by a universal natural system of checks and balances. Level 1 I call a quantum matrix reality field. It is the real reality 1st part of our bifurcated quantum matrix reality and is similar to an Einstein Reality Field.

7. Virtual energy of dimensional fluctuations is cause for formation of Level 1 dipoles at Planck length-time.

8. Dipole total virtual energy is step quantized, via 12 unique primary modulations, seen to be different aspects of a common process forming Level 2 [fields], and Level 3 [mass and charge], with a J reactive reality as the 4th Level. This Level 4 consists of bipolar virtual black holes at dipole end-nodes, the 2nd part of bifurcated reality and essence of the most small, a singularity bipolar virtual black hole, as storage for the next "big bang" cycle.

9. J reactive reality is caused by primary AM. A virtual black hole occurs at each of the dipole end-nodes formed during peak part of each half cycle of dipole resonance. A plus black hole at one dipole end-node simultaneously with a minus-black hole at the opposite end-node which both end-node black hole polarities reverse during a peak part of the opposite 1/2 cycle.

10. If we could get our reality resolution smaller than a dipole, we then are mind's eye viewing the J

[1]E-mail: fitzgerald@sofast.net and fitzgerald@imt.net

reactive reality of bipolar virtual black holes, as the seeing thru event horizon point windows to the bipolar singularity, the absolute dimensional most small, a storage device for the ultimate end of our universe then on to a big bang beginning of the next their cycle.

11. Primary AM, value added, at the frequency of the Level 1 dipole, are cause for formation of the other 3 Levels.

12. Primary AM is bifurcated into 2 families, longitudinal mass family of 5 and transverse charge family of 5.

13. When primary AM components are in translocation moving from dipole to dipole across end-nodes, this explains a bifurcation of Relativity [longitudinal AM versus transversal AM].

INTRODUCTION

I believe it is paramount; we view the very small of reality in quantum matrix terms to begin to understand reality's enormous complexity. Just the size of the powers of 10 involved staggers the imagination.

Some of the staggering numbers involved are:

1. resonant virtual dipoles have a Planck length of about 10^{-35} m;

2. a Planck time at about 10^{-43} sec;

3. simultaneous compression-expansion resonant peaks at about + and – 10^{43} kg forming and unforming virtual bipolar black holes at dipole end-nodes during those peaks, alternating with the resonance each 1/2 cycle;

4. dipoles exist joined end to end in near infinite ratio standing waves which waves intersect in 10^{43} directions at each and every dipole end-node to form the universal quantum matrix reality;

5. specific types of step quantized primary AM, of the dipole's precise resonant frequency, about 10^{42} Hz, uniquely account for each and all "things";

6. intensity of dipole modulations exist step quantized in 10^{42} steps.

In 1949, I contemplated the very small, getting nowhere absent cyclic phenomena of resonant dipoles. I returned to mind's eye study the very small beginning again to write notes on September 27, 1987 after reading Schwarz and Green **"Superstrings"**.

Superstrings? Fantastic. It looked to me like Schwarz and Green had the undeniable beginnings of spacetime answers to have eluded scientists since the dawn of human curiosity.

Einstein's "Reality Field" was said by him, in 1952, to be ***the*** "thing" of the spacetime void. Quantum Planck length-time dipoles naturally resonating longitudinally at a precise frequency in intersecting standing waves forming a universal matrix I thought might better explain the "thing" of the spacetime void, which under conditions of dipole AM might point, as Einstein would have wanted, to theories of unified fields and unified charge - mass. Then, on to a unification of everything, if, I could only poke my mind's eye view into the very small, determine what that some "thing" is, then try to relate at-rest gravity and at-rest electric field not directly to each other but both to that some "thing".

So I have studied and expanded basics of the very small since learning of Superstrings but from considerably different points of view complexly related to resonant dipoles and modulations thereof.

Most deep thinking persons should be able to grasp concepts of my paper. However, those concepts may not now be easily understood in terms of a single equation because of an in-depth complexity that single equation requires to define nature in all of its aspects.

For example: Do we want to define a gravity field or an electric field? Minkowski's 4D equation (1), at CHAPTER 1, is a proper equation to start with, but, it is not, in and of itself, an automatic solution to any "thing". To reach an any "thing" requires refining (1) with a diverse set of complex coefficients to match the chosen goal which then is applicable to a study of quantum matrix reality, that is, to include in the equation "**many degrees of freedom**", each "degree" representative of the goal sought. By combining the many mathematical terms as coefficients, one ought to eventually reach that single all-encompassing equation having its roots in Minkowski's 4D equation (1).

Examples of complexities: When I got to defining a dipole, I determined its resonance was **longitudinal** compression-expansion. When I got to defining an at-rest gravity field, I determined its dipole AM was **longitudinal** value added. When I got to defining an at-rest electric field, I determined its dipole AM was **transverse** value added. Longitudinal resonance of the dipole itself being the least common denominator and a starting point for viewing and defining a universal commonality mechanics.

Dipoles, in their various modes of operation, are herein said to be described simplistically via **4 levels to quantum matrix reality**. As I studied reality at Level 1, I found it was *the* "thing" of spacetime void a close analogy to an Einstein Reality Field he described as constituting spacetime, only my reality field is a "matrix" of quantized dipoles making it a "quantum matrix reality field". I choose the word "matrix" for lack of a better word to describe my mind's eye view. The word matrix can be used to generally describe reality either in macrocosm or microcosm terms.

I seek a mathematician collaborator. Must know Fourier series, and most important, mathematical complex phase planes, 4D complex numbers to include J reactance, applying them as coefficients to Fourier series modifying Minkowski's 4D equation. Must know something of physics and a willingness to learn essence of this paper for collaboration. This paper gets unimaginably

complex and badly needs a mathematician's touch. We would jointly share equal recognition and credit in all things derived from a collaboration but otherwise earn the satisfaction of successfully producing an adequate paper.

1. QUANTUM MATRIX REAL REALITY FIELD

I propose my QUANTUM MATRIX REAL REALITY FIELD is similar to Einstein's Reality Field when his Reality Field and Relativity models include Planck length-time dipole cyclic phenomena as presented herein.

Each of the 2 resonant dipole fixed virtual energy units is referenced to the other as exchanging back and forth their respective virtual energies [potential¡—¿kinetic] in a quantum forming the essential and precise reality Level 1 frequency carrier, $f_{carrier}$, which is capable of being step modulated with combinations of 12 types of primary AM associated with Levels 2, 3, and 4. A dipole quantum, E_{dipole}, is in regards to 1/2 cycle of dipole resonant virtual energy by convention.

At Level 1, simple periodic length-time standing wave resonance of dipoles occurs between end-nodes of each dipole in a reflecting back and forth where, upon a reflection, the length virtual energy reverses course to go back to the other end-node without increasing average dimension. This is called even-parity. Time reflecting back and forth in sinusoidal synchronization with length does not result in a cyclic time reversal upon reflection due to equation (1) having a [-] sign for time dt^2 factor and thus reflection is associated with odd-parity, meaning time of each 1/2 cycle adds sequentially. These dipole events lead to establishing a quantum for length and a quantum for time of each dipole 1/2 cycle and establishing the basic frequency of resonance, $f_{carrier}$, as fixed for all 4 levels.

Here is what Einstein wrote in 1952 about his Reality Field. I pickup his words at his writing of Minkowski's 4D equation (1). He then produced equation (2). From there he progressed to spacetime as composed of some sort of a non-symmetric gravity field he called a Reality Field, so as to take into account application of his Relativity to inertial bodies in translocation thru Minkowski's 4D coordinates. Notice the [-] sign for factor 4, time. This [-] sign is extremely important in my paper for it establishes a number of things explored herein.

QUOTE:

(1) $ds^2 = dx^2 + dy^2 + dz^2 - dt^2$,

Minkowski's 4D equation.

"An objective metrical significance is attached to the quantity of equation (1). This is readily shown with the aid of Lorentz transformations. Mathematically, this fact corresponds to the condition ds^2 is invariant with respect to Lorentz transformations."

"If now, in the sense of the general principle of Relativity, this space (1) is subjected to an arbitrary continuous transformation of the coordinates, then the objectively significant quantity $ds^{(2)}$ is expressed in the new system of coordinates by the relation:

(2) $ds^2 = g_{ik} dx_i dx_k \ldots$,

which has to be summed up over the indices i and k for all combinations 11, 12, . . . up to 44. The terms g_{ik} now are not constants, but functions of the coordinates, which are determined by the arbitrarily chosen transformation. Nevertheless, the terms g_{ik} are not arbitrary functions of the new coordinates, but just functions of such a kind of form (2) which can be transformed back again into the form (1) by a continuous transformation of the 4 coordinates. In order this may be possible, the functions g_{ik} must satisfy certain general covariant equations of condition, which were derived by [Bernhard] **Riemann [1826-66] more than half a century before the formulation of the general theory of Relativity ("Riemann condition")** [Curvature of spacetime]**. According to the principle of equivalence, (2) describes in general covariant form a gravitational field of a special kind, when the functions g_{ik} satisfy the Riemann condition."**

"It follows, the law for the pure gravitational field of a general kind must be satisfied when the Riemann condition is satisfied; but it must be weaker or less restricting than the Riemann condition. In this way the field law of pure gravitation is practically completely determined, a result which will not be justified in greater detail here."

"We are now in a position to see how far the transition to the general theory of Relativity modifies the concept of space. In accordance with classical mechanics and according to the special theory of Relativity, space (spacetime) has an existence independent of matter or field. In order to describe at all that which fills up space and is dependent on the coordinates, spacetime or the inertial system with its metrical properties must be thought of at once as existing, for otherwise the description of "that which fills up space" would have no meaning."

"If we consider that which fills space (e.g. the field) to be removed, there still remains the metric space in accordance with (1), which would also determine the inertial behaviour of a test body introduced into it."

"On basis of the general theory of Relativity, on the other hand, space as opposed to "that which fills space", which is dependent on the

coordinates, has no separate existence. Thus a pure gravitational field might have been described in terms of the g_{ik} (as functions of the coordinates), by solution of the gravitational equations. If we imagine the gravitational field, i.e. the functions g_{ik}, to be removed, there does not remain a space of the type (1), but absolutely nothing, and also no "topological space". For the functions g_{ik} describe not only the field, but at the same time also the topological and metrical structural properties of the manifold. A space of the type (1), judged from the standpoint of the general theory of Relativity, is not a space without field, but a special case of the g_{ik} field, for which [for the coordinate system used, which in itself has no objective significance] the functions g_{ik} have values not dependent on the coordinates."

"There is no such thing as an empty space, i.e. a space without field. Spacetime does not claim existence on its own, but only as a structural quality of the field."

"Thus [Rene] **Descartes [1596-1650] was not so far from the truth when he believed he must exclude the existence of an empty space. The notion indeed appears absurd, as long as physical reality is seen exclusively in ponderable bodies. It requires the idea of the field as the representative of reality, in combination with the general principle of Relativity, to show the true kernel of Descartes' idea; there exists no space empty of field."**

Generalized Theory of Gravitation

"The theory of the pure gravitational field on the basis of the general theory of Relativity is therefore readily obtainable, because we may be confident 'field-free' Minkowski space with its metric in conformity with (1) must satisfy the general laws of field. From this special case the law of gravitation follows by a generalization which is practically free from arbitrariness. Further development of the theory is not so unequivocally determined by the general principle of Relativity; it has been attempted in various directions during the last few decades." [Without success.]

"It is common to all these attempts, to conceive of reality as a field, and moreover, one which is a generalization of the gravitational field, and in which the field is a generalization of the law for the pure gravitational field."

"The generalization can be characterized in the following way. In accordance with its derivation from 'Minkowski space', the pure gravitational field of the functions g_{ik} has the property of symmetry given by, $g_{ik} = g_{ki}$ ($g_{12} = g_{21}$, etc.). The generalized field is of the same kind, but without this property of symmetry. The derivation of the [Reality] Field is completely analogous to that of the case of pure gravitation less symmetry."

"After long probing I believe I have now [June 9, 1952] **found the most natural form for this generalization, but I have not yet been able to find out whether this generalization law can stand up against the fact of experience."**

"The question of the particular field law is secondary in the preceding general considerations. At the present time [1952], **the main question is whether a field theory of the kind here contemplated can lead to the [unification] goal at all. By this is meant, a theory which describes exhaustively physical reality, including 4D space, by a field. The present day** [1952] **generation of physicists is inclined to answer that question in the negative."**

"In conformity with the present form of the quantum theory, the present-day [1952] **generation of physicists believes the state of a system cannot be specified directly,** [Heisenberg's Uncertainty Principle-Indeterminacy Principle] **but only in an indirect way by a statement of the statistics of the results of measurement**[s] **attainable on the system. The conviction prevails, experimentally assured duality of nature** [corpuscular-wave and Bohr's Principle of Complementarity] **can be realized only by such a weakening of the concept of reality. I think such a far-reaching theoretical renunciation is not for the present** [1952] **justified by our actual knowledge, and one should not desist from pursuing to the end the path of the relativistic field theory."**

UNQUOTE:

Ins. and ed. add. Quote from ***RELATIVITY The Special And The General Theory*** Albert Einstein, Crown Publishers, Inc., ***Bonanza Books***, Appendix 5, p154-157 (1961). Also, ***Encyclopdia Britannica***, Great Books Vol. 56, p242-3 (1990).

Apparently, Einstein did not consider in his thoughts about reality, the other part of a bifurcated Relativity, charge and the electric field, choosing only to consider his Reality Field only in terms of some sort of non-symmetric gravity. Later on in this paper, I shall address very striking different aspects of reality, mass versus charge and gravity field versus electric field viewing them while they are in relative motion in terms of J reactance value added as a function of velocity to show why and how a bifurcation of Relativity occurs.

To derive a quantum matrix reality field, which I consider is a quantized view of an Einstein Reality Field, I propose the use of complex coefficients, based on dipole cyclic phenomena to magnify Minkowski's

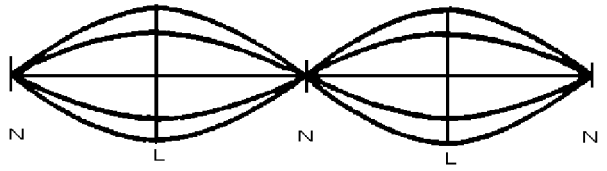


Figure 1:

equation (1) at each of the 4D factors.

Complex magnification makes the ultimate equation of the Quantum Matrix Reality Field non-linear just as Einstein said it would be. This then establishes an equation (2) foundational basis for tying all "things" together showing a common mechanics, the resonance of Level 1 dipoles in standing waves of a universal matrix.

Such amplification to represent all modes of dipole virtual energy would include the following 11 mathematical treatments:

1. Relativity during translocation;
2. dipole cyclic phenomena;
3. J reactance;
4. longitudinal and transverse AM;
5. parity;
6. Fourier series;
7. mathematical complex phase planes;
8. quantization;
9. bipolar virtual black holes at dipole end-nodes;
10. clipping at event horizons of the bipolar virtual black holes resulting in sidebands;
11. J reactive value added during translocation.

With the above mathematical treatments of equation (1) in proper place satisfying dipole cyclic phenomena conditions now make the Lorentz transformations to an equation like (2) and that result now points to a "Unified Gravity Field - Electric Field Theory" and a "Unified Mass - Charge Theory" at the macrocosmic matrix level. The transformation from equation (1) to (2) then competently describes a physical result via a properly pre-chosen set of equation (1) complex coefficients. Equation (1) modified with proper coefficients is the commonality mathematics among all "things". Equation (1) itself, [absent any coefficients], is not the commonality and does not in and of itself lead to any Unified Theories which Einstein so competently proved in his dying days.

That part of Einstein's statement which pointed me to my quantum matrix reality field as similar to his Reality Field, was:

"There is no such thing as an empty space, i.e., a space without field. Spacetime does not claim existence on its own, but only as a structural quality of the field."

To paraphrase in my terms: there is no such "thing" as spacetime without the quantum matrix reality field of standing wave dipoles at Level 1.

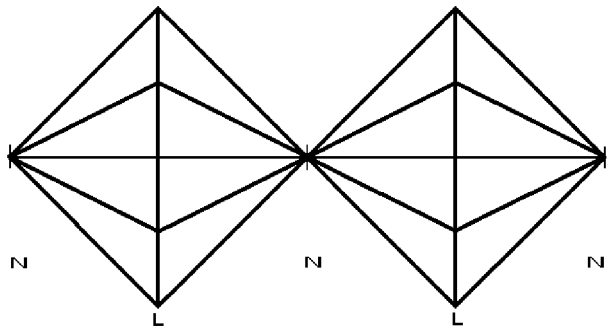


Figure 2:

Graphically, standing waves look very different viewed at **macrocosm** levels and at **microcosm**. The difference can be represented by examining fig. 1 and fig. 2.

"Fig. 1" is a graph of a line segment of 2 infinite ratio standing waves of vertical **sinusoidal** energy versus **linear** time at the **macrocosm**: [Example would be quantity of electron flow at points along a full wave antenna consisting of 2 stacked dipoles.]

"Fig. 2" is a graph of a line segment of 2 infinite ratio standing waves of vertical **sinusoidal** virtual dipole energy versus **sinusoidal** time covariant at Level 1 of the **microcosm**.

Bear in mind, the waves of fig. 2 are but 2 Level 1 dipole waves out of an infinite number on but only one line segment of standing waves intersecting at 10^{43} directions at each and every dipole end-node which form the universal matrix.

I accept the premise of dimensional fluctuations in the microcosm and incorporate the resonant very small in building my concepts of this paper.

At the microcosm, larger than the dipole, all dimensions are in fluctuation including time. Precisely at the size of the dipole, time **can not** be linear, must be sinusoidal and length and time are covariant, which non-linearity can be seen with an expansion of equation (1) in terms of dipole cyclic phenomena.

Fig. 2 at Level 1 can be viewed as correct because the equation for velocity of light at each and every Δ ?length-time along any given dipole, regardless of how large or small the Δ, must always produce $|c|$.

If at Level 1, time were not sinusoidally covariant with length in a dipole but were linear, C measured at various points of a dipole would go from zero to infinity with an average of $|C|$. Scientists would agree, C can not be zero nor infinite at any time, no matter how short the time or when measured.

Thus, dipole length and time are both presumed to be covariantly sinusoidal at the **microcosm** in Level 1 dipole resonance.

The $|c|$ mathematical proof of fig. 2 is shown by dividing Planck's length by Planck's time. Dipole resonance, free of harmonics and modulation sidebands, as it is at Level 1, is therefore length-time covariant sinusoidal if there is to be no variation in c at any point along the dipole.

Assuming at Level 1, each dipole's length-time are covariantly sinusoidal and there is a natural system of checks and balances, it follows all dipoles of all standing waves in the universal matrix have a precise fixed frequency of resonance and no coupling action existing amongst all dipoles in Level 1.

My paper proposes to modify Einstein's Reality Field so as to include in his model a matrix of **microcosm** resonant quantized dipoles, in the following way:

1. Compare Level 1 dipoles and Einstein's Reality Field where he indicates the pure gravity field has symmetry but his Reality Field is without this symmetry.

2. I propose the symmetry aspects of pure gravity field, Einstein mentions, are Level 2 macrocosmic based wherein all matrix microcosmic events are averaged appearing continuous because we lack the necessary resolution to see the microcosmic resonant events. When we look only at the larger picture of gravity we cannot see the minute events happening at Planck length-time because it is impossible, at this time, to see or measure, 10^{35} dipoles per meter.

3. I propose the non-symmetry aspects of reality, Einstein mentions, are Level 1 microcosmic based wherein all microcosmic events are considered, in my paper, as components of a universal matrix. When we look at each dipole by itself, we see non-symmetry happenings forming and unforming at the ends of the dipole and reversing each and every 1/2 cycle of dipole oscillations; that is, reversing dipole virtual black holes of plus at one dipole end and minus at the other end. So, viewing microcosmic dipole reality in real time is not the same as reality viewed macrocosmically as an average.

4. Also, I propose the non-symmetry aspects of reality, Einstein mentions, are related to the relationship at the microcosm between a physical length dimension and the dimension of time. We can mind's eye view a physical length dimension as composed of a chain of dipoles all resonating in standing waves making zero average change. But time, while in resonance covariant with physical length dimension, has no such zero average change. Time progresses forward explainable on the basis of odd-parity reflections at dipole end-nodes.

We shall see this comparison is adaptable to my presentation to establish some confirmation of effects associated with one type of AM upon dipoles, at-rest gravity field, longitudinal primary AM, and another type as at-rest electric field, transverse primary AM.

Einstein's mathematical and intuitive analysis, dealing with equation (1), appeared to suggest to him, confirming earlier thinking by others, there is no such "thing" as no "thing"; no "empty field-free" spacetime void. A paradox thus he imagined, to the 1st approximation. Applying logic and his Theories of Relativity to the paradox, he seemingly resolved the dilemma moving on to develop his Reality Field [altho absent dipole phenomena, which I say, prevented him from realizing a unified field theory].

He was looking for some kind of a field which could form a basis for a description of the void of empty spacetime in terms of reality and concluded reality was a non-symmetrical form of gravity, not detectable by experience, which could form his some "thing". He felt his Theories of Relativity did not need an ther [which Maxwell relied on]. Over the years, Einstein's theories did not prove or disprove the presence of an ther of the kind contemplated in the late 1800s. That is, not until his Reality Field strongly leaned in the direction of an ther, altho of course, he would never have called his model of reality, *the* ther. Neither do I with quantum matrix reality field.

Classically, without fields, charge, or mass, supposedly the spacetime void is empty, free, no "thing". Yet, spacetime has to be some kind of field, Einstein said, which is some "thing", because, he envisioned, there still remains the metric space defined in equation (1) which also would determine inertial behavior of an inertial translocating test body introduced into that metric space. So his Relativity math said.

While he got highly technical, with his math and all, he nonetheless appeared to have solved the paradox of spatial some "thing" versus spatial no "thing" thru expanding his Relativistic math to satisfy him. He was then with his newly developed Reality Field on the verge of his sought after unified field theory when he died in 1955. On his death bed he again tried to formulate his unified field theory but failed. If only there had been time for him to have considered effects at the microcosm in terms similar to de Broglie wave mechanics in light of Pauli's exclusionary principle. With these 2 theories in mind, he could have wondered about some kind of an electron orbital synchronizing mechanism in the atom which involves standing waves of precise numbers thereby to see perhaps its foundational basis was very very much smaller than even he had imagined.

No one on the planet at that time was able enough to continue with his line of thinking, not so much lacking academic talent as lacking a unique Einsteinian visualization of relationships among "things". His works seemed to have been carried on by those who developed the concept of Strings in the 70s and 80s, then onto Superstrings conceived by Schwarz and Green, and followed thereupon by others.

Neither equation (1) nor (2), per se, contain dipole cyclic phenomena, as written. As I see it now, quite possibly that is why Einstein failed to derive a unified field theory. Dipole phenom-

ena involves quantum mechanics which points to unification theories.

Levels of quantum matrix reality

Level 1 of quantum matrix reality is herein said to be the void of empty free spacetime described as Einstein's Reality Field revisited via quantized Planck length-time resonant dipole virtual energies of a precise frequency. Dipoles are always found lined up everywhere in standing waves intersecting in 10^{43} directions at each and every dipole end-node.

Level 2 is described as conventional observable fields composed herein of certain unique types of step quantized "primary amplitude modulation" [primary AM] virtual energy imposed upon Level 1 dipole resonant virtual energy seen as the carrier frequency. Sidebands are produced during the dipole cycle at the horizons of end-nodal virtual bipolar black holes. Looking thru such modulation upon such carrier, it can be said there is an appearance, at the very small, of a commonality, a dipole quantum mechanics which ties together all fields in a proposed Unified Field Theory magnifying Einstein's Reality Field to include the matrix of the very small of reality.

Level 3 is described as mass and charge in similar fashion as fields as regards having a common mechanics. Mass and charge appear in a proposed Unified Mass-Charge Theory via certain types of step quantized primary AM in a setting of mathematical complex phase planes much more complicated than the simple math of fields.

Level 4, constitutes a J reactive reality, described as **"hard"** Schwarz and Green virtual bipolar black holes at dipole end-nodes and are found always associated with Levels 2 and 3. A plus virtual black hole forms step quantized at one dipole end-node simultaneously with an equal intensity minus virtual black hole at the opposite end-node of the same dipole with both polarities reversing each 1/2 cycle of dipole resonance. [Designation of a plus and a minus is to establish a convention.]

Examples of studies of the very small of Level 1 are seeking answers to questions Einstein raised. Are fields supported in a void? If so, how? In the void, are they supported by themselves? Their essence in the void has to be supported by some "thing" other than themselves, said Einstein, much as some scientists are again saying a century after the ther concept was rejected. I say each type of field is, in and of itself, a unique primary amplitude modulation (AM) on Planck length-time dipoles of a precise frequency resonant virtual potential and kinetic energies, which dipole virtual energies are a "fall-out" of dimensional fluctuations natural to nearness of that smallness.

Dimensional fluctuations are themselves a product of the universal matrix. Which came first?

In a setting of the "thing" essence of Einstein's (1952) Reality Field, the very small of reality is herein described as a quantized resonant dipole stabilized in frequency, amplitude, bandwidth, from out of dimensional virtual fluctuations via a system of virtual energy checks and balances. This natural checks and balances system results from expansion - compression of dimensional fluctuations at their peaks which form virtual bipolar Schwarz and Green black holes at dipole end-nodes and which black holes absorb great magnitudes of expansion - compression energies all beyond that needed to generate the virtual black hole horizons. This produces a dampening resulting in a most precise frequency of dipole resonance thruout Level 1. The dimensional fluctuations at lower frequencies are herein considered secondary random amplitude modulation.

Dimensional smallness

"Viewing" smallness from 10^{-15} m towards the very small at about 10^{-35} m, length is said to be in virtual fluctuation which gets stronger with the smallness, that is, virtual entropy increases as size gets smaller. Until the size of a virtual dipole is reached, at which point due to the universal checks and balances system of the virtual bipolar black holes, thereupon entropy decreases abruptly to near zero if not actually zero. If not a perfect zero, there is a universal step 1 quantized minute non-symmetrical gravity in the otherwise void of space which possibility I study later. These dimensional fluctuations could also be thought of as constituting some sort of dark hidden energy which dark energy some scientists are viewing today as effecting the universe in as yet uncertain ways.

At the resonant very small of reality, Planck length-time virtual dipoles, I contend random dimensional fluctuations of both length and time naturally covariantly synchronize to form all of Level 1. That is, a universal matrix at the macrocosm is associated with dipole quanta at Planck length-time. This is our empty free space real reality fabric, the quantized Einstein Reality Field, as seen from the resonant very small.

In the past, said fluctuations could not be analyzed in real time, so indeterminacy principles were formulated. Heisenberg, for example. Einstein objected to indeterminacy principles, as did many others; and, so do I. Today, we have enough theoretical background, mathematical insights, and results of experiments to formulate concepts of real time analyses of the very small in terms of resonance, thereby we are able to derive dipole quanta.

Dimensional fluctuations in the range larger than the dipole are all secondary random AM having an extremely wide amplitude, phase, frequencies, and bandwidth of sidebands. At about 10^{-35} m, upper sidebands of dimensional fluctuations are "swallowed" into the event horizons of dipole virtual black holes. The

event horizons form non-linear elements for generating AM sideband components mentioned later on in connection with translocation.

After some years of studying black body infra-red radiation, in 1901, Max Planck (1858-1947) put forth his concept of quanta, fundamental energy increments of EM radiation as a function of frequency, which later thru analyses and application became useful in quantum mechanics, now very basic to physics.

de Broglie (1892-1987) expanded upon Planck and conceived of electron waves in 1923-4, improving the mechanics of Planck's quantum physics. de Broglie put forth the concept energies of electrons in atoms are in orbital standing waves of precise quantum numbers depending on the orbit and showed some sort of locking or synchronization mechanics was involved. He was able to show when an electron changed orbit it changed a precise quantum number of standing waves which change in energy to match the quantum of light involved.

If the concept of Planck's radiation quanta be correct, which most all of us now accept, it appears logical to suggest a beginning and an end to each of his hv quantum from a mathematical point of view. This suggests quanta of discrete packets of energy appear stabilized when taken as an average over time but which, when viewed individually, would occur at different points in a bell curve of mathematical fluctuation of some sort. Otherwise, light quanta would not exist and its radiation would only exist in the form of a continuation. Laser light consists of phase locked quanta, thus it appears as a continuation, during pulses or otherwise.

Planck formulated a number of concepts:

Planck's constant (h) about $6.6260755 \cdot 10^{-34}$ Joule-sec;

Planck's density $(d) = \left[|c|^5 \operatorname{div} hG^2\right]^{1/2}$ about $1.84 \cdot 10^{108} kgm^{-3}$; $|c|$ = velocity of light in Level 1, h = Planck's constant, G = gravitational constant about $6.67259 \cdot 10^{-11} m^3 sec^{-2} kg^{-1}$ with $|c|$ about $2.997924562 \cdot 10^8 msec^{-1}$;

Planck's mass $(m) = [h\,|c| \operatorname{div} G]^{1/2}$ about $5.456 \cdot 10^{-8}$ kg, or about 10^{28} eV;

Planck's quantum (hv).

I apply some of Planck's equations directly to dipoles:

(3) Planck's length $(L) = \left[Gh\operatorname{div} |c|^3\right]^{1/2}$ about $4.0508332 \cdot 10^{-35}$ m;

(4) Planck's time $(t) = \left[Gh\operatorname{div} |c|^5\right]^{1/2}$ about $1.8257753 \cdot 10^{-43}$ sec.

Ancillary to L and t, is a precise dipole resonant frequency which could be called:

(5) Planck's carrier frequency,

$f_{carrier} = |c| \operatorname{div} 2L = |c| \operatorname{div} 2 \left[Gh\operatorname{div} |c|^3\right]^{1/2}$ about $3.7003802 \cdot 10^{42}$ Hz. Wavelength is measured from trough to trough of dipoles on a standing wave, not in-between virtual bipolar black hole event horizons.

In Level 1 terms, Planck's quantum for dipole frequency is:

(6) Quantum

$E_{gen} = hv = hf = h\,|c| \operatorname{div} 2 \left[Gh\operatorname{div} |c|^3\right]^{1/2}\Big\}$ about $2.4518999 \cdot 10^9$ Joule.

My paper claims a distinction between a generalized dipole frequency-derived quantum E_{gen} and a special case individual dipole based quantum:

(7) $E_{sp} = E_{dipole}$. When we speak of dipole quantum, we must address the subject as viewing virtual energies, potential and kinetic in 1/2 cycle length of dipole resonance.

E_{gen} is a summation of individual dipole quantum, E_{sp}.

Equation (6) deals only with Planck's generalized quantum E_{gen}. To arrive at the special case of a quantum of a single dipole:

Take (6) $E_{gen} = hf$ about $2.4518999 \cdot 10^9$ Joule, convert Joule into meter-kilogram, then, convert:

(7) $E_{sp} = E_{dipole}$ about $2.5498849 \cdot 10^{42}$ kg over 1 dipole 1/2 cycle length.

Since (7) quantum of a single dipole represents total energy over a length of 1 dipole, this fact translates $[E_{sp} = E_{dipole}]$ into a total RMS E for the single dipole consisting of 2 equal RMS energies, potential and kinetic phased 90° apart.

To split total RMS E into RMS potential energy [stress energy for a dipole's 2 ends], divide by $[2]^{1/2}$, then to get peak $E_{potential}$ energy, multiply by $[2]^{1/2}$. Remember potential and kinetic energies are phased 90°.

The result of translation is in terms of total ${}_{dipole}E_{potential}$ peak stress, making:

(8) Dipole total $E_{potential}$ energy peak¡—¿Dipole [2 ends] peak stress about $2.5498849 \cdot 10^{42}$ kg.

To get 1 end stress of a given dipole, divide (8) by 2 making 1 end peak stress from within a single dipole = 1/2 (8) equals:

(9) about $1.27494245 \cdot 10^{42}$ kg for the single dipole single end-node.

But, it takes adjacent dipoles end to end 180° out of phase in the system of checks and balances of Level 1 to form the standing wave equilibrium. Looking thru 1 end of a standing wave dipole to the adjacent beginning we then multiple (9) by 2 to give (8) again.

Equations (8) and (9) are somewhat in agreement with Schwarz and Green tension at about 10^{42} kg. While (8) and (9) were derived from Planck's quantum non-Relativity concepts, Schwarz and Green derived their said result using Relativity. These, are partially where I get supposed confirmation of my concept of dipoles joining quantum mechanics and Relativity.

Hereinafter, I shall use (9) in any precise calculations, otherwise shortened to about 10^{42} kg.

We shall need these quantum concepts of individual dipole fixed dual energy units and the checks and balances system to explain propagation of step quantized EM radiation field and why it takes 7 wavelengths of radiation to settle into an approximate 0° phase relationship between the electric field and magnetic field which start out from the source phased 90° apart. I get into this in EM Radiation later.

These above explanations of quantum, relative to the dipole, begins a proposed explanation why all things exist in a bifurcation of reality step quantized, and when translocation is involved, are in a state of bifurcated Relativity, one form or the other attributed to which of the 2 families of primary AM is involved in the translocation. It can truly be said, no "thing" in the microcosm is "at-rest" and because it is not, we have some "thing" in our macrocosmic reality, even in the void of space.

Einstein called reality a "Reality Field". In my view, every aspect of his Reality Field is quantized because, in my view, there can be shown a relationship between his Reality Field and my cyclic phenomena of dipoles themselves quantized.

Quantization at the very small involves resonances, standing waves, interference patterns, primary and secondary AM, translocation, and parity. My quantum matrix reality of Level 1 dipoles is a modification of an Einstein Reality Field.

1. Our real reality [the 1st part of a bifurcation of reality], Level 1, is that portion of quantized dipoles remaining outside of dipole virtual bipolar black holes at dipole end-nodes; and,

2. The J reactive reality [the 2nd part of bifurcation of reality], Level 4, is that portion of quantized dipoles inside of dipole end-node virtual bipolar black holes associated with AM. No AM, no Level 4.

Not only is length-time quantized but so is direction, 10^{43} step directions from each and every virtual black hole at each dipole end-node. Space quantization for example leading to electron magnetic quantum number.

Any change of primary AM at the Levels 2, 3, producing changes in Level 4, occurs in precise increments, from zero step quantum to maximum quantum step entering a stellar black hole horizon.

Granted, the incremental energy values are extremely tiny, yet, if fractional incremental energy steps of that tiny were somehow attempting to take place, the checks and balances system would suppress them just as if any given dipole itself attempted [via dimensional fluctuations] to become out of synchronization with the rest it would be brought back into sync with all other dipoles thru action of end-nodal virtual black hole stabilization and synchronization.

This synchronization mechanics is analogous to standing de Broglie electron waves in the atom which can only exist synchronized in specific orbits due to a unique set of checks and balances precisely configuring the electron wave orbit. It has to do with de Broglie standing waves which if out of sync [for example an encounter with a passing electron or impinging photon causing a change in orbital energy], for a specific orbit, will reconfigure to a precisely correct number of waves for that orbit making or taking a precise photon in the process. That science, such as the eximer tunable uv laser, is the basis for many things such as uranium isotopic separation, genetic engineering, and laser spectroscopy.

To do a direct extrapolation, from the visual macrocosm to the very small of the microcosm without inclusion of resonant dipoles, in the end results in fatal errors. A few such fatal errors, if direct extrapolation is carried out without dipoles, are: ambiguities, zeros, infinities, failure to identify cause of and justification for time dimensional progression forward, time dilation, and with many conflicts "hidden" or "curled" dimensions. The closest means to qualitatively verifying much of my paper's dipole concepts appears to be mathematics.

2. QUANTUM STEP MODULATION

Primary amplitude modulation [AM] herein refers to a quantum step increase or decrease in total Planck length-time dipole virtual resonant energy existing in our reality and in a J reactive reality at dipole end-nodes.

Each of the 10^{42} AM steps are synchronized with the dipole resonance, unable to change steps in any fraction of the dipole cycle due to the checks and balances system. Since the dipole is quantized so are all AM steps.

What we view as "things" compounding a QUANTUM MATRIX REAL REALITY FIELD are manifestations of AM. Various AM explain Levels 2, 3, and 4 of QUANTUM MATRIX REALITY in terms of what is real and what is J reactive.

There are herein said to be a longitudinal primary AM mass family of 5 unique mathematical types; and, a transverse primary AM charge family of 5 unique mathematical types. 2 additional primary AM mathematical types account for such things as chirality and field direction vectors.

Longitudinal primary AM - the mass family

THE MASS FAMILY OF MODULATIONS CONSISTS OF:

1. At-rest gravity field;
2. translocating gravity field;
3. at-rest mass;
4. translocating mass;
5. acceleration.

Figure 3:

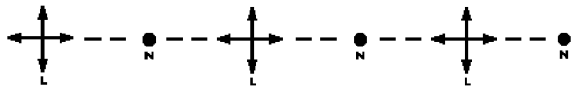


Figure 4:

The mass family is value added longitudinally to each N-L-N of longitudinal dipoles in a standing wave as per fig. 3.

Example of longitudinal AM on longitudinal Planck length-time dipoles is at-rest gravity field formed at Level 2.

Transverse primary AM - the charge family

THE CHARGE FAMILY OF MODULATIONS CONSISTS OF:

1. At-rest electric field;
2. translocating electric field;
3. magnetic field;
4. at-rest charge;
5. translocating charge.

The charge family is value added transversely to each L of longitudinal dipoles in a standing wave as per fig. 4.

Example of transverse AM on longitudinal Planck length-time dipoles is at-rest electric field formed at Level 2. Transverse primary AM does not longitudinally modulate the dipole until amplitude has reached a threshold at 100% AM. An extreme amount of virtual transverse energy.

Angle primary AM

Angle modulation is value added to other modulations. Example is fig. 5: Gravitational field horizontal displacement of "L" relative to "N" is a function of intensity of angle AM. The leaning of the dipole is in the direction of gravity lines of field force.

Directional data [Space quantization]. Space quantization takes place within the virtual bipolar black holes in J reactive reality.

Torsional primary AM

Torsional AM is associated with chirality. Chirality is a technical term for system or object said to possess definite left or right handedness, curvature of lines of field force, translocation in curves, and spin, are results.

Example is fig. 6 where the dipoles have rotated under torsional value added to other modulations.

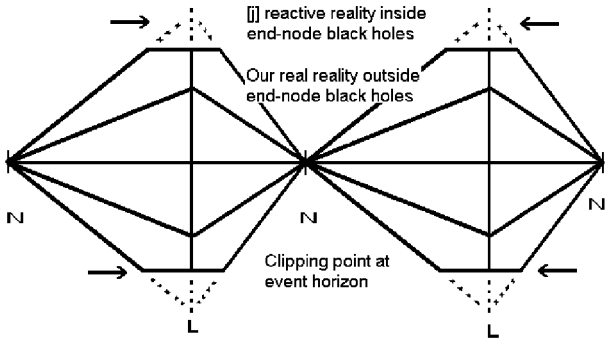


Figure 5:

Figure 6:

Minkowski's 4D equation

(1) $ds^2 = dx^2 + dy^2 + dz^2 - dt^2$.

Equation (1) establishes beginnings for unification of fields, mass, and charge as a macrocosmic matrix of Planck length-time resonant dipoles in standing waves. The equation when properly modified, ties together length and time by their fitting in with a precise frequency dipole resonance, primary AM, J reactance, and other mathematical treatments, such as mathematical complex phase planes, contained in appropriate mathematical coefficients of each factor.

How so J reactance? In the Minkowski 4D macrocosmic spacetime void equation (1), a most significant [-] sign for time, the 4th factor, becomes extremely important in my paper. It ties together, time dilation, time uniform progression forward via a natural odd-parity.

The originating Minkowski 4D equation contained in the time factor, a [+] multiplying an imaginary coefficient, $[i]$, where $[i] = (-1)^{1/2}$ which when put into the squared and summed differential version, (1), the $[i]$ became a [-] sign. [+] times [-] = [-].

50 years ago while studying Electronic and Electrical Engineering, in reviewing evolution of equation (1), I came to wrongly think maybe, one could directly substitute J reactance for imaginary $[i]$ of the time factor in the originating equation. Unfortunately, I had no success. I did not then visualize a connection with dipole cyclic phenomena at the very small which thereby could have allowed J reactance to modify all 4 factors and perhaps then on to a complex field theory.

Via considering dipole cyclic phenomena inserted into equation (1) the [-] time factor now has odd-parity involvement. This is to say, dipole time has a [-] sign, so there is an odd-parity of the time factor resulting in time dimensional progression forward each 1/2 cycle

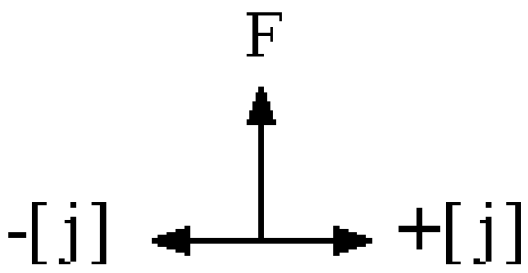


Figure 7:

reversal of dipole oscillations rather than average-wise standing still.

I make use of the J operator, from Electronic and Electrical Engineering, to indicate a factor contains an expression of reactance via appropriate coefficients. J reactance can be viewed either macrocosmic or microcosmic. J reactance at the macrocosmic denotes value added to original without the need for consideration of dipole cyclic effects whereas at the microcosmic, J reactance denotes value added to original with the need to consider dipole cyclic phenomena. J ops are not imaginary. They can be visualized at the microcosm of dipole cyclic effects as a 90° phase vector to another phase vector. Phase in this case is in relationship to cyclic phenomena of the dipoles.

For example: in fig. 7, + or J reactance is associated with 90° phase lead or lag from that of F.

A word on visualization of resonant dipoles in the presence of modulation in terms of **real reality** and J **reactive reality**. Our "real" reality macrocosmic dimensions of time and space are as a measure of a "matrix" of dipole virtual energies summed along each dipole between event horizons of end-nodal virtual bipolar black holes. Ancillary thereto, the void in-between laterally adjacent dipoles is without form, reality field, or virtual energy and plays no part in these studies. It is the real reality part of dipoles themselves which make up that real reality matrix. By visualizing this real reality matrix, one can ***also*** visualize virtual bipolar black holes inside their event horizons as constituting J reactive reality which could be thought of as a 2nd "matrix", a J reactive "matrix" which if seen from inside, that "matrix" would appear to occupy an all in one virtual bipolar resonant black hole singularity. One sees what is to be seen from where the seeing takes place; inside or outside virtual black holes or stellar black holes.

Dipole time forward progression can be visualized as a function of odd-parity, intensity of gravity, intensity of other fields beyond a certain threshold, and Relativity, all of which depend on whether viewed at macrocosm or microcosm. Even tho time in a dipole is in resonance, as is length, there is a significant difference attributed to this matter of parity as to how to graphically display and to view time dilation as a function of gravity and Relativity.

For purposes of 2D graphing time dilation, J reactive time value added to original, in the presence of at-rest gravity we pass thru [as say a trip to the stars], we resort to an even-parity display looking similar to gravity in translocation but where axis Z is rotated at minus *phi*. For purposes of a description of dipole cyclic time dilation, we resort to time's microcosm odd-parity. The difference between these seeming contradictions is because J reactive time value added to original time requires we not include cyclic phenomena in our 2D graph which is drawn as tho at the macrocosm level, and for that display we rely on even-parity. Whereas, if we include cyclic effects of time, we now are in a dipole cyclic description mode at the microcosm level requiring odd-parity. See rotation of Minkowski's axes at CHAPTER 9, below.

Time accuracy, on a practical level, is a function of our ability to make measurements of time in the macrocosmic matrix which depends on our ability to produce resolution which is rather poor at the present.

From our macrocosmic view because of a lack of resolution, time measurements are an average of unseen Planck length-time dipoles. See Heisenberg indeterminacy principle and apply it to time. Presently, we can not resolve measurements of time into 10^{42} increments per second which would be needed to actually analyze time of Planck length-time dipoles. However, we can mind's eye visualize events taking place at that incremental shortness of time.

In the Planck length-time dipole, the 2-dimensional length-time is both in resonance existing together in the dipole. While length oscillation reflections from dipole end-nodes and their virtual bipolar black hole horizons are even-parity, time oscillation reflections are odd-parity. This odd-parity aspect of time is derived mathematically from Minkowski's equation (1) at [-] dt^2, when the equation is modified to include dipole cyclic phenomena. Dipole time resonance odd-parity is not to be confused with the odd-parity of the transverse charge family of AM, no more so than dipole length resonance even-parity is to be confused with the even-parity of the longitudinal mass family of AM.

Longitudinal odd-parity of dipole oscillating time gives rise to the phenomena of forward progression of time each 1/2 cycle of the dipole as if in a continuous sequential summation whereas even-parity of dipole length gives rise to repeating the same dipole length over and over again, hence no summation.

Mere speculation: **Length odd-parity may have existed at our big bang and could describe the explosive nature of our big bang for a brief period.**

For a Level 1 dipole to become a full cycle virtual bipolar black hole within the event horizon of a stellar

black hole, the maximum step primary AM quantum would equal individual Level 1 dipole quantum of zero step primary AM. The stellar black hole event horizon stress is then a sum of quantum for Level 1 dipole (8) plus the last step primary AM quantum also (8).

Stellar black hole event horizon stress then becomes:
$\mathbf{(10)} = 2\,(8) = 2_{dipole}E_{potential}$ energy peak<>2Dipole end peak stress about $2(2.5498849 \cdot 10^{42}$ kg) for about $5.0997698 \cdot 10^{42}$ kg.

This is in somewhat agreement with some estimates for stress at the event horizon of a stellar black hole.

As a function of step primary AM upon the dipole length-time oscillations, for example gravity, just as length is "clipped", time is also "clipped", meaning time stands still as viewed in our real reality for a portion of dipole cycle, forming a step quanta time dilation function; and also, when the electric field [or magnetic field] is beyond its certain threshold for interaction [an extreme intensity].

It could be proposed, time, while thought of as a real 4th dimension, is not like the 3 real physical dimensions. Supposedly, real time is not volumetric, having only 1 real dimension.

While length-time resonates in the dipole, each 1/2 cycle length does not add to each previous 1/2 cycle length because upon reflection at a dipole end-node the length oscillation goes back to the previous end-node [via even-parity reflection]. In Level 1, altho time co-varies sinusoidally with the resonant length dimension, each 1/2 cycle time adds to each previous 1/2 cycle time [via odd-parity reflection].

While to us in our macrocosmic reality, time progresses forward as if un-varying, time at the Planck length-time size is part of the dipole resonance, where time has a quantum relationship to that of dipole quantum and to primary AM quantum.

In other than Level 1, light speed is measured at less than $|c|$. And, we assume length decreases and time increases in the presence of a gravity field, but why? Via modifying Minkowski's 4D equation (1), we see if we were to shorten the real portion of a dipole [(minus)(plus) = **minus**], we would lengthen time [(minus)(minus) = **plus**].

In the classical Cartesian system of coordinates, the 3 real physical dimensions are related to each other by 90° in a volume of macrocosmic space. Supposedly, none of our real physical dimensions are reactively related to each other at microcosmic length-time so therefore their math representation does not of themselves contain the J operator, even tho they are related by 90°. That is because in the 3-dimensions, the 90° are physical not dipole cyclic phased. J reactance is cyclic based. In translocation, dipole AM components cyclic phased are J related. Apparently, no such sort of volumetric reality exists for time. Time, while a real reality dimension outside virtual bipolar black holes, allegedly can be step modulated becoming cyclic partly associated with J reactive reality inside dipole black holes just as length can. But keep in mind the [-] sign for time in equation (1).

So far, I have found no $\pm\,[j_{y\ or\ z}]$ phase operators associated with time, which if they do exist would pose some very interesting effects. Volumetric reactive time would result, suggestive of J reactive parallel universes, but then look inside a stellar black hole! What do we find? Perhaps the makings of a beginning and an end to many parallel universes as parts of many cycles of "their" existence.

In 1913, Niels Bohr (1885-1962) proposed a quantum theory of the hydrogen atom. This began an era of quantum mechanics which has extended to today. Bohr won the Nobel Prize in 1922 for his efforts.

At that time, quantum mechanics envisioned the atom as a small solar system with a core like the sun surrounded by electrons in orbit like planets. Bohr's math seemed to fit.

Because of de Broglie and his electron\wave equivalent, together with the Pauli exclusionary principle, we now envision the electrons in orbit as rings of standing wave energy instead of hard orbiting planetary particles.

We also now envision the nucleus of the atom as composed of "particles" within nucleons each as bundles of energy each composed of quark\wave bundles mutually in orbit around a common center of gravity of said nuclear particle. Again, de Broglie waves, Pauli's exclusionary principle, and resonance, prevail as suggested by very high energy accelerator experiment interpretations. From this system can be emanated a variety of particles and photons which depend upon a variety of happenstances in the atom.

When Planck's quantum theory matured into quantum mechanics and attempts were made unsuccessfully to quantize Relativity, Einstein rebelled. His rebellion was not against quantum mechanics, per se, but against efforts of the Bohr clan to discredit his Relativity. Some Bohr clan scientists said Relativity, and gravity defined within Relativity's curvature of space, were unquantizeable. I most strongly disagree. I think his rebellion can now be viewed as justified. Relativity and quanta are simply 2 divergent views of nature's dipole commonality mechanics.

A great debate has lasted nearly a century over which concept is correct; Relativity versus quantum mechanics. They are both correct, emanating from nature's common mechanics, Level 1 dipoles. So say I.

Those who followed Relativity, and those who followed quantum mechanics, constantly argued in the 1920's as to who was right. The scientific community falsely [my expression] assigned Bohr winner, largely due to his winning the Nobel Prize, restricting Relativity mostly to observations of the macrocosm, because gravity, said by the Bohr clan, was impossible to quantize. The argument actually lasted so very long due

mainly to so very many critics of the scientific community's failure to join the 2 concepts into one. An attempt was made with gravitons but none have been observed, and, Superstrings is a promising attempt.

Einstein indicated, one day we would have the ability to fit things together. That ability began to take shape in the 60's - 80's with "symmetry", "supersymmetry", "strings", then Schwarz and Green "Superstrings", each concept as a starting point to a then newer vogue, a much clearer and better understanding of nature at any size as viewed from the very small.

Superstrings may not be a complete answer to every "thing" but Schwarz and Green damn sure have done wonders to redirect thinking. Without their works, for example, I probably would have gotten no where with this paper as with others and their attempts at a theory of everything.

My idea of a slower larger macrocosm not revealing a swallowing of Planck length-time into virtual bipolar black holes at dipole end-nodes as a function of added unique primary AM, I got from studying the arguments of Einstein [with his Relativity and his Reality Field] and Bohr [with his quantum mechanics] in a setting of studies of Schwarz and Green Superstrings theory of the very small, Planck's quantum, Minkowski's spatial axes "rotation", and de Broglie's wave mechanics.

According to Einstein, Relativity could not form a basis for quantum mechanics. According to Bohr, quantum mechanics could not form a basis for Einstein's curvature of length-time, to his Relativity, to his application of what is known as the FitzGerald-Lorentz [length] contraction of a translocating length along its x axis, longitudinally [not transverse], and to the Lorentz [translocation] mass equation. How does one quantized a Relativistic equation, it was asked? It was said in self-answer, Relativity is continuous not discrete.

The Relativistic macrocosmic Lorentz mass generalized equation used by Einstein in his Relativity is:

(11) $M = M_0 \text{div} \left[1 - (v\text{div}\ |c|)^2\right]^{1/2}$

Bohr of course had his set in his ways concept of quantum mechanics with which he was said to be able to explain most of everything, that is, until he was confronted by Relativistic equations and by Einstein and Relativity. Bohr could not quantize Relativity and it bothered him immensely, privately that is. In public, Bohr simply criticized Einstein for being wrong because, Bohr said, Relativity and gravity could not be quantized.

Einstein's Relativity is now assumed correct thruout the scientific community for gravity but is still isolated from quantum mechanics which are said by many to only apply to the other 3 forces of nature.

However, Einstein's precise form of envisioned gravity field may not be so precise and in fact may be quantizeable after all just as Bohr wanted. Yes I say, gravity is quantized because it involves AM of the resonant quantum dipoles, upon which its simplistic longitudinal primary AM [gravity] takes place as we shall see in At-Rest Gravity, CHAPTER 4. Relativity is merely an extension of that concept applicable to translocation of primary AM components, including those of gravity.

Thus, the 4 forces of nature can be quantized and can be related to each other, and to mass, charge, and energy thru the observations of quantum resonances of Planck length-time dipoles. This paper brings Einstein's macrocosmic Relativity down to the microcosmic arena of dipoles and its modulation and quantization.

3. FIELDS

As between Level 2 modulations of gravity and electric fields, the commonality is Level 1.

Criteria to be met in analyzing at-rest field activity of dipoles in standing waves are:

1. $f_{carrier}$, of all dipoles is precise at any level of any primary AM outside a stellar black hole;

2. All longitudinal standing waves of dipoles maintain their troughs the same Planck length distance apart regardless of level of any primary AM outside a stellar black hole;

3. Soft virtual bipolar black holes of Level 1 turn hard with a step function 1 amount of any combination of reactive or non-reactive primary AM. The 2 hard virtual bipolar black hole event horizons of a given dipole grow in step lengths toward that dipole center as a step function of longitudinal primary AM intensity.

4. Our real length, L, left outside the hard virtual bipolar black holes decreases as a linear step function of non-reactive longitudinal primary AM and is herein said to be associated with our macrocosmic matrix interpretation as being gravity;

5. Intensity of compression\expansion stress of about 10^{42} kg occurs at event horizons of dipole virtual bipolar black holes. Compression occurs at one dipole virtual black hole horizon having a plus sign and expansion at the other with a minus sign. With the next 1/2 cycle, the signs reverse.

6. Resonant dipole bipolar potential virtual energies at opposite event horizons is totally transferred into bipolar virtual kinetic energies at the dipole mid-center where potential is zero and plus and minus kinetic cross over to the opposite 1/2 length-time thereupon the potential energies build in opposite polarity as kinetic reduces. We will see this picture is not true for odd-parity of the electric field because of transverse motion effects.

7. Our real time, t, increases as a step function of non-reactive primary AM outside hard virtual bipolar black holes;

8. "V_c", decreases as a step function of primary AM outside a stellar black hole;

9. Gravity primary AM is associated with "clip-

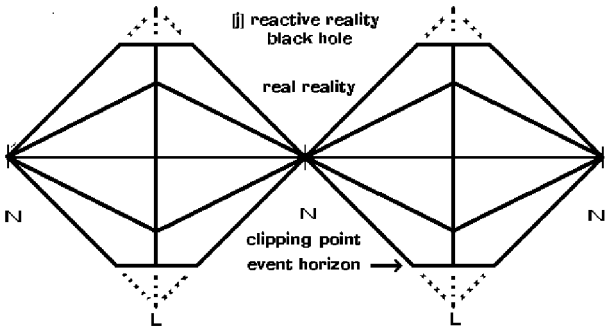


Figure 8:

ping" and a J reactive swallowing into virtual bipolar black holes some of our reality length-time, making length shorter, time longer, and velocity of light, less.

2 standing waves being clipped associated with gravity primary AM

10. Virtual energy reflections and clipping action on dipole sine-waves are associated with non-linear zones of virtual black hole event horizons which clipping is associated with a wide spectrum of primary AM sideband components. It is these primary AM sideband components associated with clipping which appear to travel during translocation of field virtual energy.

11. There is a difference between dipole end-nodal reflections of longitudinal versus transverse. This is the beginning explanation of what is called **parity**. There is a 180° phase difference in the 2 types of parities making longitudinal an **even-parity** with transverse an **odd-parity**. These differences form the very foundations between the various fields and enter in the mathematics of both at-rest primary AM and translocating primary AM components. These are studied later. Suffice to say, parity plays a vital role in composition of fields, charge, and mass.

Dimensional Fluctuations

At near that resonant very small length-time, dimensional fluctuations are simply recognized as extremely wide bandwidth random secondary AM upon the fixed resonant dipole frequency $f_{carrier}$ which secondary AM bandwidth is proportional to strength of dimensional fluctuations. As we approach the smallness of Planck length-time, the very short term spectrum of secondary AM bandwidth looks more and more like wider and wider white noise of lower and lower amplitude for any upper sideband component getting close to the Planck length-time. This concept adds to a pattern for studying composition of charge and mass at the Planck length-time.

Here is my generalized explanation of why at the resonant very small we view only standing waves of resonant dipoles instead of dimensional fluctuations of intense proportions:

1. Schwarz and Green have proposed, as have others, a natural property of extreme smallness is dimensional fluctuations. Michael Green, ***Scientific American***, Sep 1986, p. 53;

2. At or near about 10^{-35} m [Planck length-time], they postulated, dimensional fluctuations at stress peaks are intense enough to form virtual black holes, using the theory of Relativity to demonstrate the process. Michael Green, supra;

It is my assumption, and background for my paper, Schwarz and Green are correct in their postulations of dimensional fluctuations at **1.**, and virtual black holes at **2.** Additionally, I propose, at precisely Planck length-time, Schwarz and Green said dimensional fluctuations and their said ["soft"] virtual bipolar black holes mutually form the basis for a Level 1 universal matrix, a "mechanics", which virtual bipolar black holes act to reflect, to contain, and confine virtual energies of dimensional fluctuations synchronized into length-time dipoles of simple sinusoidal periodic length-time motion at an exact frequency in standing waves.

The containment and confinement mutually equate to the checks and balances system. One aspect does not exist without all others with the causes and effects in mutuality, beginning our study of nature's commonality mechanics. Which came first? They all come together as natural events.

Now I shall examine in detail the oscillations of a Planck length-time dipole in a setting of the macrocosmic matrix to see what is happening. When I studied the fluctuation effect of measurements of length of the order of Planck length-time, why did I stop there, why not go a higher order of resolution to an even shorter length? The answer is fluctuation and entropy effects grow ever so pronounced as we get smaller and smaller from a size of proton about 10^{-15} m down to the range of the very small, of Planck length-time, at about 10^{-35} m at which precise Planck length we observe soft point virtual bipolar black holes forming with each peak of compression\expansion stress of the fluctuations just at a precise value of the order of about 10^{42} kg.

This forms the beginnings of the checks and balances system which has the negative feedback effect of stabilizing fluctuations and reducing entropy to near zero at that smallness into oscillations of periodic longitudinal length-time motion; instantaneously reducing the fluctuations and entropy bandwidth from gigantic to near zero at the reflection impact points of the soft point virtual bipolar black holes; dipole resonant circuit Q crosses over from near zero to near infinite. This is what is seen as Level 1. The fluctuations at much larger than Planck length-time are unaffected by stabilization of the checks and balances system except to suggest the larger fluctuations modulate $f_{carrier}$ of dipoles as secondary AM where sidebands at spectrally very low frequencies are harmonically phase locked to $f_{carrier}$.

Because the upper sideband virtual energies are sup-

pressed into forming $f_{carrier}$, assisted by virtual energies of phased lock lower sideband, in the first place, we wind up with full carrier having only a lower single sideband. Any residual upper sideband virtual energies are swallowed into the end-nodal soft virtual bipolar black holes and ought to form at least a step 1 residual gravity field thruout the continuum as a component part of the red shift.

Either the macrocosm is infinite or it folds back upon itself; in either case, the checks and balances system is in place; the why of establishment I leave to others to ponder. The 1st part of virtual bifurcation of reality consists of a Level 1 of these unmodulated, that is, un-primary AM, dipoles; a sort of quanta fog of virtual energy resonances existing everywhere in length-time.

In Level 1, I assign periodic motion within any given dipole resonance as the special case of motion. I assign primary AM of dipole resonant motion at Level 4 as associated with a quantized bifurcation of reality. I assign translocation in the general case to motion of primary AM sideband components from dipole to dipole in order to derive a concept of quantized bifurcation of Relativity, longitudinal v transverse primary AM.

Upon this precise virtual quantum dipole resonant frequency, $f_{carrier}$, are found 2 families of step quantized primary AM families of 5 each, longitudinal [mass family] and transverse [charge family], plus one of step angle AM [field direction], plus one of step torsional AM [chirality]. The 2 families account for a bifurcation of Relativity. Sidebands, also quantized, result from combinations of these 12 unique primary AM and the clipping action of the discontinuity at virtual bipolar black hole horizons. Complex harmonic motion is associated with Level 2 fields; complex on top of complex harmonic motion is associated with Level 3 mass and charge.

Associated with Levels 2 and 3, a Level 4 is the insides of virtual bipolar black holes [at the dipole end-nodes] forming the 2nd part of the bifurcation of reality, J reactive reality. Primary AM sidebands are associated with clipping dipole resonance while passing into J reactive reality of the virtual bipolar black holes and passing back out into our real reality, which in-out action takes place at non-linear event horizon points at each dipole end, the virtual bipolar black holes with their own reality inside. See fig. 5, above.

It is the potential virtual energy, which if primary AM exceeds a step function 1 quantity, forms the hard virtual bipolar black holes. Virtual kinetic energy left upon entering the virtual bipolar black hole plus primary AM components therein results in a number of effects we study later.

Dimensional fluctuations have an enormous wide bandwidth whereas each Level 1 dipole has a spectrum of virtual energy of near zero bandwidth, if not truly zero. If not truly zero then a step function 1 residual gravity is to be seen as a component part of the red shift explained later. At a size much larger than a dipole, such wide bandwidth ought to be associated with random AM of the narrow bandwidth dipole natural oscillations. This idea comes from equations and a graph of frequency versus amplitude in AM emissions where the carrier is totally unaffected in the AM process [if less than 100% AM] with sidebands representing primary AM components of the total energy associated with "clipping".

Added unique clipped primary AM upon the dipole carrier frequency, $f_{carrier}$, is associated with sidebands representative of a field, charge, mass, with translocation of primary AM components associated with a bifurcated Relativity.

We ought to be able to mathematically confirm dipole parameters in the presence of clipped AM on the basis of how they matrix parameters of much larger event-objects such as fields interacting with fundamental particles. For example, a single electron in a magnetic field having a magnetic quantum number [space quantization of angle primary AM].

Dipole step quantization occurs because primary AM, representing fields, mass, charge, energy, is related to 1/2 cycle of the frequency carrier, $f_{carrier}$. To change level of primary AM requires it occur in discrete steps because of the checks and balances system suppressing any out of sync AM just as it does with the virtual energies of dimensional fluctuations at $f_{carrier}$. Translocation of primary AM components are step quantized as well due to the checks and balances system suppressing any out of sync AM component. Fourier series math is useful in analyzing these clipping, translocation, and checks and balances events.

It is my expression, all virtual energy increases of dipoles, due to presence of primary AM, at the very small of our reality, are not continuous in changes of intensity but only occur in discrete steps related to dipole 1/2 cycle motion. All 12 primary AM systems of quantum are composed of such step intensity levels. The physical seeing is impossible at this time because we do not have the instrumentality to actually see about 10^{35} dipoles per meter, and, of course we can not see the AM directly. However, I suggest we might be able to measure effects of "space quantization" [magnetic quantum number] as a function of dimensional fluctuation lower sidebands phase locked to $f_{carrier}$. [A view to resonant de Broglie quark resonant waves, for example and their orbital standing waves which give or take quantum energy in the presence of excitation via the strong force.] Adjacent levels of quantum could then be determined one from another because the far distant down frequency sidebands could be extrapolated. This should take place at absolute 0° K to take temperature quanta out of the experiment. Optical tweezers, laser entrapment, ought to be useful as tools to measure lower sidebands.

In my paper, J coefficient is viewed 2 ways:

1. From a macrocosmic view;

2. From a microcosmic view.

From the macrocosmic view, J coefficient is an expression of "value added to original" as a result of increased translocation velocity. Accumulating value added as a function of increased velocity, it decreases to zero at zero velocity, a storage of value added.

$\pm J$ reactance is associated with 90° phase lead or lag from that of the $f_{carrier}$.

From a microcosmic view, J applies to reactance, a storage of virtual energy. It is 90° phase lead or lag related to the dipole resonance frequency, $f_{carrier}$, of the dipole, and, to the virtual bipolar black holes, and is an expression of "step quantum value added to dipole original resonance quantum" as a result of increased translocation.

Einstein was unhappy with "[i] imaginary numbers" saying at one time, "I do not believe in imaginary numbers". But so-called imaginary numbers by another expression are real from the stand-point of effect. Hence in my paper, "imaginary numbers" are not imaginary but represent reactance. To distinguish reactance from an [i] imaginary number, I use "J operators" from Electronics and Electrical Engineering instead of [i] from math.

The below section deals with other than Level 1, which are Levels 2, 3, and 4, associated with combinations of 12 types of primary AM. These higher virtual energy level dipoles no longer look like Level 1 dipoles. Dipoles at these other levels consist of a viewable real reality 1st part of bifurcated reality, which is a decreased reality length simultaneously with an increased reality time, and non-viewable J reactive reality [virtual bipolar black holes at dipole end-nodes], Level 4, the 2nd part of bifurcated reality. A J reactive length-time is associated with primary AM forming end-node virtual bipolar black holes consisting of a plus virtual black hole at one end and a minus simultaneously at the other end which alternate each 1/2 cycle.

Above, we saw Level 1 of our reality contains none of the 12 primary AM. All existential fields are herein said to exist at Level 2 of our reality. Mass and charge are said to exist at Level 3. Level 4 are virtual bipolar black holes said to form in quantized steps under primary AM conditions. The inside of a virtual bipolar black hole is said to exist in a 2nd part of reality, not our real reality but a J reactive reality, a subspace. This expression will be repeated many times with each time aiming to further clarify.

Position of dipole end-node virtual bipolar black hole event horizons are associated with primary AM moving the impact event horizon point of Schwarz and Green virtual black hole stress value away from the two Level 1 dipole reflective end-node points towards the centre of the dipole forming 2 virtual bipolar line black holes, one at each end, decreasing our real reality length and increasing our real reality time, as we see it. What dipole length-time virtual energies are clipped and left stranded at each of the end-nodes are to be found J reactively inside the event horizon of the J reactive virtual line black holes, one at each end and constitute the 2nd part of reality, the subspace.

Length, time, and velocity of light, are modified by primary AM. In equation (3), above, $f_{carrier}$ becomes the frequency carrier upon which step primary AM takes place. Steps are in relationship to the dipole 1/2 cycle.

From the theory of AM, comes the concept, at less than 100% AM, the carrier wave is unaffected by AM, and sidebands are associated with a function of AM. Thus, the quantum of the originating Level 1 dipole is unaffected by primary AM. However, in the case of at-rest fields, the sidebands occur at the same frequency as the carrier adding a step quantum to the unaffected Level 1 quantum. In this case, primary AM becomes a DC increase in carrier frequency energy. The picture changes dramatically as a result of translocation where sidebands seem to originate from an AC modulating virtual energy. The creation of translocation sidebands as AM components is associated with clipping action of the virtual bipolar black hole event horizons and is J reactance based.

Upon the Level 1 dipole fixed frequency, $f_{carrier}$, there are alleged to be found 2 types of primary AM families of 5 each; longitudinal [mass family]; and, transverse [charge family]; plus one of angle AM; and one of torsional AM associated with torsional sinusoidal dipole resonance [space quantization and particle spin]. These 12 unique primary AM of the dipoles are associated with complex harmonic motion resulting in: Level 2 fields; complex on top of complex harmonic motion forming Level 3 charges and mass. These result in a 1st part of a bifurcation of our reality. Level 4 are all insides of dipole virtual black holes seen as a virtual bipolar black hole singularity, I refer to as subspace, and results in the 2nd part of a bifurcation of our reality.

Each 1/2 cycle of a dipole has a dimensional length sum "quantum" defined herein as the sum of Level 1 fixed quantum [zero step primary AM quantum in Level 1], plus any higher step primary AM quantum, associated with Levels 2, and 3, with step quantum angle AM forming direction [space quantization], plus step quantum torsional motion forming a step quantum of spin. Also, time is step quantized. Hard virtual bipolar black holes form at dipole end-nodes as a result of any value of step primary AM, quantized from step zero AM energy [soft] increasing [hard] in increments related to a dipole 1/2 cycle quantum until the maximum quantum last step is reached crossing into the inside of an event horizon of a stellar black hole. With the presence of primary AM, time is step quantum dilated which means time does not move forward as quickly as in Level 1. Time step dilation evolves from equation (12), above, when the equation includes primary AM,

and, other cyclic phenomena as presented in my paper.

Combinations of the below 12 primary AM families, to include angle AM and torsional AM, produce a bifurcation of reality and a bifurcation of Relativity, at the very small. Bifurcation of Relativity is based upon longitudinal primary AM [even-parity] versus transverse [odd-parity] primary AM where parity and J reactance play vital roles in determining which Relativity is in place and why. To arrive at 4D, visualize a wad of infinite length intersecting length-time sticks. Intersections form at each and every soft or hard black hole where there are step quanta of angle and torsional AM forming space quantized direction. All of this in total is seen as the macrocosmic matrix.

4. AT-REST GRAVITY FIELD

The gravity field is part of Level 2 of our quantum matrix reality. It occurs when Planck length-time dipoles are longitudinally amplitude modulated.

In Level 1, dipoles are stacked in standing waves, the potential energy of a dipole reflects back off of its impact with its adjacent dipole without loss of any kind. This reflection is associated with the checks and balances system. That reflection for longitudinal AM is classified, herein, as **even-parity**. At Levels 2 and 3, for longitudinal AM, the event horizons of virtual bipolar black holes are associated with a precise dipole potential energy intensity regardless of added longitudinal AM. The result is a diminished dipole oscillation length to appear in our real reality with the rest of the length "swallowed" into virtual bipolar black holes, as J reactive reality. Some may say this swallowing constitutes a "dark" matter or "dark" energy. However, the overall effect for us is a reduction in dimensional length, a stress, causing the gravity effect. [Similar to Einstein's curvature of space and Minkowski's axes rotation.] Angle AM gives to us a direction towards the source of gravity. We will need this information to study J reactive gravity associated with acceleration.

"At-rest" is a popular expression for something at the macrocosmic level not in motion. It is alleged, an "at-rest" gravity field is associated with longitudinal step primary AM upon Level 1 Planck length-time dipole longitudinal oscillations. Changing of overall dipole quantum to a sum of fixed Level 1 dipole quantum plus Level 2 step primary AM quantum is associated with cyclic forming and unforming of hard point or line virtual bipolar black holes at dipole end-nodes. Stressful reduction in dimensional length is associated with gravity lines of force in the matrix in the longitudinal direction towards the originating sink by means of angle AM; the 11th type of primary AM. Angle plus torsional AM gives radius of field curvature.

Experience tells us we can not tell the difference between acceleration J reactive gravity and gravity associated with mass; Einstein's Principle of Equivalence, which is studied later.

I frequently use the term "black hole", a common usage expression generally attributed to USA Physicist, John Archibald Wheeler, but, the concept had earlier origins.

In the late 1700's, John Michell (1724-1793), an English Astronomer and Geologist suggested light might be affected by gravity.

In a 1798 treatise, French Mathematician Pierre-Simon de Laplace (1749-1827) reasoned if enough mass were added to a star, gravity force of the star eventually would become so great its escape velocity would equal velocity of light. Under such gravity, light would not be able to leave the surface of the star, and it would blink out to become an invisible dark star; a stellar black hole.

In 1916, German Astrophysicist, Karl Schwarzschild (1873-1916), used Einstein's theory of Relativity to calculate if any star were compressed to a size smaller than a certain critical radius, called Schwarzschild radius, the density and gravity force would become so great the star would become a dark star. A spherical surface about a dark star at the Schwarzschild radius is called the event horizon, a surface at which escape velocity just equals velocity of light [this assumes no rotation near the speed of light at the equator]. Schwarzschild stated, the critical radius of a dark star is proportional to its mass. For mass of our Sun, this radius is about 3 km. To find Schwarzschild radius of any other object, divide mass of that object by mass of our Sun and then multiply by 3 km, assuming a linear relationship.

I add the word "stellar" to black hole meaning a dark blinked out star, and "virtual bipolar black hole for Planck length-time dipole complex harmonic motion exceeding dipole compression\ expansion stress of about 10^{42} kg.

I think, Einstein was trying to tell us how we might proceed along the way to an ultimate understanding of reality. And, I think he pointed to gravity, Relativity and his Reality Law as beginnings to that understanding, hence I was inspired to create these studies.

Think of a dark star, a stellar black hole

Our sun's mass $[M] = 1.989 \cdot 10^{30}$ kg. A stellar black hole can be $10^{10}\,[M] = 10^{40}$ kg.

Visualize a dark star with far more gravity than our own sun, a stellar black hole. Intentionally, I have used the word gravity instead of mass so as to avoid a possibility a stellar black hole may only have gravity and no mass. In effect, an extraordinary Principle of Equivalence.

There is a very strange uniqueness about a stellar black hole, it is accompanied by a tremendous strong gravity field which is observed far into space.

If a stellar black hole has such intense gravity as to swallow its own starlight, why does it not swallow its own gravity field?

In the scientific community, apparently none of the stellar black hole concepts developed so far consider that logical question. I rely on the stellar black hole not swallowing its own gravity in order to extend my Planck length-time commonality mechanics concept beyond Level 1 dipoles.

A gravity field is the easiest and simplest of fields to describe in terms of its representation by a unique primary AM of dipoles.

Inside, on, and outside a stellar black hole

Just inside a stellar black hole, as well as deep inside, all dipoles look like totally hard line black holes each of maximum quantum.

That expression can be said 4 other ways:

1. Planck length-time dipoles seen as totally hard line virtual bipolar black holes could only exist inside a stellar black hole. The gravity represented by those virtual bipolar black holes would be so enormous it could not exist anywhere in our continuum except inside a stellar black hole;

2. All Planck length-time dipole oscillations can then only take place on the inside of totally hard line virtual bipolar black holes;

3. Length-time is zero when all of the Planck length-time dipole oscillations have disappeared into totally hard line virtual bipolar black holes;

4. Planck length-time dipoles in a stellar black hole can only represent gravity and no other fields, charge, possibly not even mass.

At the stellar black hole event horizon, I allege the horizon is 1 Planck length-time dipole dual energy unit thick, and forms the boundary between dipoles looking like totally hard line virtual bipolar black holes comprising length-time zero and those dipoles which are not totally hard comprising length-time not zero, making for non-symmetry. However, the dipoles forming the horizon are unique existing elsewhere only at the surface of a mass particle.

That expression can be said another way:

1. Each and every Planck length-time dipole forming the horizon has a center dividing point, dividing the dipole into 2 parts, one towards the center of the stellar black hole and the other 180° away.

Outside the horizon, a Planck length-time dipole looks like less than a totally hard line virtual bipolar black hole. That expression can be said 2 other ways:

1. A Planck length-time dipole seen as less than a totally hard line black hole would have some of its oscillation on the outside of its line virtual bipolar black holes, with most of the other of its oscillations on the inside and this occurs just outside of a stellar black hole.

2. Planck length-time gravity extends outward towards normal the farther one moves away from a stellar black hole which intensity of gravity is governed by the inverse square law.

More on the virtual black hole

Point or line virtual bipolar black holes allegedly represent at-rest gravity, for a period of dipole cycle time when Planck length-time non-reactive longitudinal oscillations are in the peak compression\expansion parts of that cycle where stress exceeds about 10^{42} kg, at a fundamental frequency of about 10^{43} Hz. That portion outside the point or line black holes is what we see in our reality as stressful reduction of the length-time and is really that which represents gravity; the more stressful reduction, the more gravity.

Inside a stellar black hole we saw all dipoles as totally line virtual bipolar black holes suggesting a maximum gravity. [If curling is not a possibility.]

So, if I set up a mind's eye imaginary experiment to view the smallness of smaller than Level 1 dipoles, I would be seeing only dipoles with hard point or line virtual bipolar black holes, exceeding about 10^{42} kg stress J reactively, and, if total, existence could only be inside a stellar black hole.

Thus, the smallest size of our reality as we know it for which we can imagine in Level 1 is in the range of Planck length-time. Any smaller and we do not have Level 1 but rather an at-rest gravity field of Level 2 and a subspace of Level 4.

This does not discount the possibility of an underlying support system inside the point or line virtual bipolar black hole, which insides we might call subspace, as if looking thru windows to but one bipolar singularity. I examine that possibility more so in Level 4.

Gravity field directional data

Direction of a gravity field's lines of force are towards its J reactive sink be it a mass or an acceleration and this is allegedly associated with angle AM coinciding with longitudinal stressful reduction of our reality as part of each dipole. Also between the accelerating observer and the J reactive sink. It appears as an offset-bias, a leaning of the dipole. We shall see directional data is more complex for the other fields.

The red shift and the big bang

Most scientists "believe" the red shift is totally a Doppler effect, a result of galaxies flying apart from each other [the expanding universe] which concept leads one into the arena of speculation as to origin of that flying apart being caused by a "**big bang**" about 13.8 billion years ago.

I contend, if all of the continuum were now somehow

to become devoid of both radiation and mass, another so-called big bang would eventually result from release of dipole end-node bipolar black hole stored **virtual energies** of dimensional fluctuations and the fluctuations' upper sidebands. Regardless of what transpires in our continuum, the big bang is inevitable altho if without mass and radiation, only dimensional fluctuations, it might take an enormous period of time, perhaps as long as 10^{39} years.

In empty free length-time, dimensional fluctuations are said to be a natural property of dimensional smallness and become significant at about the smallness of Planck length-time which energy is enough to form "virtual" black holes. ***Schwarz and Green.***

For purposes of argument set forth here, the reader can be thinking about this, I consider dimensional fluctuations were, are, and will be, forever present. Long before our so-called big bang. Suppose in the last-cycle-continuum there was an eventual reduction of star-mass where a sufficient amount of mass eventually had turned into radiant energy. It is alleged, the red shift is responsible for causing radiant energy travelling great distances to lower it's quanta not simply from the Doppler effect of an expanding continuum. I say the red shift is caused, in part, by residual gravity generated by upper sidebands of dimensional fluctuations having been drawn and swallowed into the universal matrix of black holes at end-nodes of Planck length-time dipoles, everywhen everywhere. The corollary to the hypothetical residual gravity in empty free space, is residual time dilation. Both residuals would be basic to all of the continuum regardless of location biasing measurements of the expansion red shift.

That swallowing of dimensional fluctuations, and radiation travelling thru the residuals, I say, takes place at adjacent ends of each paired adjacent dipole black holes. While the swallowing is going on, generating residuals, precisely where did the original energy of random modulation come from? Dimensional fluctuations. And when swallowed where did the energy go? Into the end-node black holes.

Is there a J reactive reality continuum inside stellar or virtual black holes? Yes – the next big band cycle reality continuum yet to be. How much energy can virtual black holes swallow into their singularity bi-polar black hole before they can be considered "full" of stored energy and can absorb no more? **Bang!** Into the beginning of the next real continuum. Are they storage mechanisms in our reality? Yes, J reactive storage. Accumulating now to give back later? Yes. Important questions to be asked in this study with some unconventional possible answers. One aspect of black holes I study in Subspace is the possibility, all black holes everywhere in our continuum occupy the same internal resonant "place-time", a singularity bi-polar black hole. An internal J reactive reality continuum growing all unto itself. Viewing black holes from inside reveals what they all look like; one resonant bipolar "place-time". That scene suggests there could be a limit to the intake of energy from our side of the event horizons feeding the singularity. Inside, they would call incoming energy "virtual energy" [primary and secondary modulation peaks from the outside], coming into the singularity black hole. Inside, it would be similar to our continuum except their boundary is a single surface of an event horizon we see from our side as thru the many point or line virtual black holes and the many stellar black holes. To them inside, all our black holes regardless of placement in our continuum are at one and the same "place-time"; subspace to us, but, looking out from inside, they see thru the horizon of a giant black hole into where length-time is zero. Their continuum full of stored energy when turned inside out becomes our big bang to start the cycle over again when the stored energy finds no more storage "place-time". It is full. One more iota and ker-**bang**.

For us on our side, we look into any black hole to see length-time is zero. To us, this is very strange. So would looking out from inside. The point I am trying to make is the scene of a viewing thru an event horizon is a function of from which side we look; a bifurcation of visualization, **and**, a **bifurcation of reality**.

If the above concepts are valid, then [in our view] the swallowing of stellar radiation quanta, part of the red shift, is made into dipole black holes everywhere pouring J reactive energy into but one singularity bipolar black hole which will eventually give back what it has stored over the life of that internal continuum cycle.

Regardless of which system of frame of references are used, the one inescapable principle in the summation of all frames of references is ultimately a complete **conservation of energy**. It may take a great deal of length-time and involve different forms, but energy eventually is conserved. For example: Energy into mass and back into energy; our energy into black holes and eventually back into our energy. Stored energy, in what ever form, is not always time dependent to make a return. It can be time dependent as in decay of mass to energy. The half-life decay phenomenon can be explained in terms of Planck resonant dipoles and a set of trigger methodologies analogist to laser and the de Broglie effect.

Dimensional fluctuations at near Planck length-time have enormous bandwidth proportional to smallness down to Planck length-time at which point things change radically [virtual bipolar black holes forming]. One upper sideband frequency component of that bandwidth at precisely the frequency of Planck length-time naturally causes the resonant dipole with its end nodes of bipolar black holes, standing waves, checks and balances system. Any energy of higher frequency components of the bandwidth are found inside the dipole end-node black holes having been J reactively swal-

lowed into the black hole's zero length and zero time.

These above concepts lead into speculation and questioning the accepted concepts of a big bang as a total requirement for the red shift, and, a once and for all big bang. There could be other explanations, such as Planck length-time dipoles, their black holes and for a redshift\black holes\big bang which ought to be studied.

Allegedly, without the dipoles, formed from dimensional fluctuations, there would be nothing from the infinitesimal to the infinite in both time and space.

From these concepts comes a speculation, in empty free length-time, the bandwidth components above the frequency of Planck length-time dipole because of their being inside the dipole black hole causes a reduction of length-time outside the black hole in our reality. The effect is one of a creation of residuals of gravity and time dilation. Were that the case it would prevail thruout the continuum and account for at least part of the total "red shift". Mathematical analysis should be studied for residuals as part of the red shift sources.

Speculating, the big bang could have come from a previous continuum having gone thru a cycle of a beginning and an end at which end a black hole bi-polar singularity was all there was left in that continuum and became our cycle's beginning. That singularity black hole would be giving back in our cycle what it had accumulated in the previous cycle. To us now reviewing the big bang, it most likely came from a black hole bipolar singularity the size of a Planck length-time dipole, 10^{-35} m.

5. AT-REST ELECTRIC FIELD

The electric field is part of Level 2 of our quantum matrix reality. It occurs when Planck length-time dipoles are transversely amplitude modulated.

It is interesting to observe, when a dipole is solely transversely step amplitude modulated, longitudinally generated virtual bipolar black holes do not form at dipole end-nodes until the intensity of transverse AM exceeds a threshold value [100% AM] which must exceed the enormous value of the Level 1 dipole end node potential energy of about 10^{43} kg. Because dipoles are stacked in standing waves, their end nodes for transverse primary AM are a reflection point as if the end nodes were anchor points at which there is a reversing of transverse oscillation polarity in the reversing transverse wave.

That reflection for transverse primary AM is referred to herein as having odd-parity. The transverse reflection off the dipole's end node occurs regardless of added transverse primary AM up to the threshold. Transversally, at less than the threshold, the result for us is a "curving" of length-time. The overall result for us is a transversal reduction in dimensional length, causing the effect of an electric field, a stress differing from that of gravity which is longitudinal. Angle AM gives to us a direction along the direction of lines of electric force. We will need this information in regards to studying the electric charge at Level 3.

Michael Faraday (1791-1867), an English Chemist and Physicist, is credited with having suggested the existence of electric fields.

The study of the electric field at Level 2 appears to present a set of investigations of mechanics similar to those for gravity also at Level 2 both of which are allegedly based upon the fundamental foundational Level 1.

With the weakest, step 1 level, of at-rest electric field, Level 1 is no longer free and empty. Each dipole of Level 1 standing waves now has at each end a non-reactive transverse hard point virtual bipolar black hole forming and unforming at $f_{carrier}$. Transverse non-reactive at-rest electric field entity is imposed upon the dipole oscillations as one form of primary AM. The dipole allegedly carries [much as an RF carrier in AM carries sidebands] the transverse primary AM of the electric field, sort of side-saddle piggy-back [whereas the longitudinal primary AM of gravity is carried sort of conventional-saddle piggy-back].

The certain threshold for interaction by an electric field is allegedly associated with over-AM, where the transverse primary AM, upon the dipole Level 1 oscillations, exceeds ability of the dipole to maintain its own amplitude and phase relationship to all other dipoles. It can be seen the transverse primary AM would have to be gigantic in order to exceed the dipole $f_{carrier}$, which if it did occur would create gravity by producing an additional added value in the form of longitudinally hard virtual bipolar black holes.

The effect of non-reactive transverse hard virtual bipolar black holes presented by the at-rest electric field is to nearly copy the effect of at-rest gravity which gravity effect allegedly is where non-reactive longitudinal hard virtual bipolar black holes swallow into J reactive reality some of our real reality producing a longitudinal stressful reduction of our real length-time. With the electric field, the effect is a non-reactive transverse stressful reduction of our real length-time.

In a way, the electric field and gravity are similar but the electric field does not cause an effect upon gravity on the dipoles until the electric field intensity reaches a certain threshold for interaction to occur, such as on the surface of a mass particle with charge. Experience dictates, a gravity field of any intensity affects any intensity of the electric field [less than the electric intensity for over-modulation] to some finite degree regardless of how small the gravity may be [step 1 AM].

Discussion of the electric field in translocation cannot be completed without discussing the translation results of that translocation, changing the sign of J op-

erator via odd-parity of the electric field, which then is associated with the magnetic field, but we discuss this later more appropriately in Translocating Electric Field\Magnetic Field.

Look at the surface of a charged mass particle. A charged mass particle has spin so its centrifugally translocating electric field is associated with a magnetic field. So, one test would be to try our guess to see if at the surface of a charged mass particle, where the electric field is the most intense, it is possible to generate a gravity field. We shall study this in Electric Charge.

We can conclude from use of math, electric field non-reactive transverse stress as primary AM upon dipoles leaves the carrier oscillation stresses effectively the same regardless of:

1. intensity of an electric field, up to the certain threshold for interaction, below 100% AM; or,

2. its translocation from dipole to dipole.

Thus, we see an electric field intensity is not directly affected by longitudinal translocation relative to any observer. [Value added to original electric field as a result of translocation is the magnetic field.]

It must be noted, however, in the presence of increased gravity there would be less of a dipole's oscillation cycle outside the line virtual bipolar black holes on the standing waves associated with simultaneously less primary AM in the transverse family. The amount of reduction is proportional to gravity and is associated with stress on the dipole. No gravity is generated, nor required, by addition of low enough intensity transverse primary AM representing an electric field.

It is suggested, if matrix reality proves correct upon adequate testing, the theories of Relativity, Reality Field, and quantum mechanics ought to be modified to take these dipole oscillation descriptive factors and effects into account and thus be more of an explanation of nature. That is, classical laws would be more complete.

I have said a gravity field affects EM radiation. Here I say a very strong electric field affects EM radiation at its source in the atom at many orders of magnitude under its affecting gravity. That is allegedly due to the electric field and EM radiation field are both transverse primary AM while gravity is longitudinal.

In 1919, Johannes Stark, (1874-1957), German Physicist, won the Nobel Prize for physics for his experiments on a positively charged hydrogen particle stream in electrical discharge tubes. In 1905, Stark had detected a Doppler shift in light emitted by these streams. In 1913, with a strong (about 10^7 volts per m) electric field (the Stark electric effect), he split into a number of symmetrically spaced components, some of which were linearly polarized with photon electric vector parallel to the electric field lines of force, remainder of photons being polarized perpendicular to the direction of the field except when viewed along the field.

Thus, he discovered an electric counterpart to the Zeeman magnetic effect we will study later.

Stark and Zeeman effects, as regards Planck length-time, amount to multiple sidebands of emitted photons, a result of primary AM by the electric or magnetic fields upon the de Broglie electron standing wave which changes to a lower energy level, that is, the standing waves rearrange themselves to the new lower orbit and are modulated by the field at that time. In those cases, the photon itself is the frequency carrier with Stark electric or Zeeman magnetic forces as a medium of AM producing sidebands. The sum total [photon quantum plus sideband quanta] is related to a matrix of the many dipole oscillations compounded by AM upon them all. We shall study Zeeman magnetic and Stark-electric effects again in Unification.

Electric field directional data

Step angle AM of the at-rest electric field non-reactive transverse primary AM represents electric field directional data and is quantized in 10^{43} steps. It amounts to a field direction bifurcated into: towards the sink of negative charge, and, away from the source of positive charge, by classical convention. These angles can be kept track of via resolution of the mathematics involved.

When the electric field is in translocation, this directional data translates to an angle AM of the magnetic field amplitude J reactive transverse primary AM, via parity changing the sign of the J operator of the AM components in translocation. It is from these events we can determine a specific sign of the angle AM for the electric field and for the magnetic field.

Predictable progressive differences in dipoles towards a sink or away from a source are themselves reducible to a mathematical expression for directional data of an electric field and magnetic field and are expressive of overall resolution as angle AM.

6. SOME DIFFERENCES BETWEEN GRAVITY AND ELECTRIC FIELDS

While field directional data of electric and gravity fields are similar [angle AM], **parity**, is not.

Odd-parity, which changes the sign of the J operator, for electric-magnetic fields in translocation because they belong to the charge family of transverse primary AM.

Even-parity, which does not change the sign of the J operator, for gravity and mass in translocation because they belong to the mass family of longitudinal primary AM.

Allegedly, any field's directional data can be represented as an offset-bias, a leaning, an angle AM coincid-

ing with the primary AM, at Level 2 be it non-reactive or J reactive of either longitudinal or transverse family. This is represented in the math via resolution, or keeping track of all factors.

All longitudinal field primary AM have a monopolar directional data vector always towards the sink whereas all transverse field primary AM have a directional data vector, which is bipolar, and its polarity depends on whether the vector originates as a field source or field sink.

Angle AM represents the directional data vector in all field cases, that is, at all of Level 2.

From step zero level of gravity to more gravity, each soft point virtual bipolar black hole turns into a hard line virtual bipolar black hole effectively reducing our observed length via length J reactive stress of the virtual bipolar black holes, and increasing time dilation between each adjacent dipole virtual bipolar black hole on standing waves, swallowing more, reductively stressing length-time more. The more gravity, the longer each dipole virtual bipolar black hole appears to us altho inside the virtual bipolar black hole there is zero internal length-time, thus a bifurcation of reality.

Bifurcation of reality apparently holds true for all fields, charge, and mass, but each have allegedly unique mechanics of stress associated with application of their primary AM upon Level 1 dipole oscillations. With the slightest [step 1] of electric field to be represented at Level 2, each soft virtual bipolar black hole of Level 1 turns non-reactively transverse quantumly hard; forming and un-forming with each 1/2 wave of dipole oscillation due to addition of transverse stress similar to longitudinal gravity stress.

We know from experience, we can not yet generate gravity [except by acceleration], nor, anti-gravity, as of this moment altho light pressure, like charges and poles [and if real, perhaps hypercharge], could be considered pseudo antigravity. Therefore, our test of gravity is one involving the above.

Mutual attraction between 2 unlike electric charges is proportional to the product of their 2 strengths and inversely proportional to the square of their distance apart. This equation is similar to that for gravity, and magnetism, and is Level 2 based where checks and balance system attempts to distribute the value added load of primary AM. Thus, Level 2 follows the inverse square law.

Are these attractions some form of gravity different from gravity as we know it? And what about like electric charges and like poles repelling? Are these repulsions some form of pseudo anti-gravity? Yes, but they are a very different kind of gravity as we know it. We can not create on Earth an electric or magnetic field which changes the force of mass-gravity or acceleration-gravity or we would be able to fly away from the earth and defy centrifugal force by simply using electric or magnetic fields. No, this does not happen, not at levels of intensity we can generate. The 4 fields, electric, magnetic, gravity, and J gravity, are not the same at-rest. In translocation, that is another story we will get into later. EM radiation field for example.

Even at the strongest of electric field intensities we can now generate on Earth, an electric field is not associated with AM compression\expansion of the dipole longitudinal standing waves sufficient to change a portion of the transverse hard virtual bipolar black hole into a transverse hard plus longitudinally hard point or line virtual bipolar black hole. We can not at present generate an electric field sufficient to become associated with measurable gravity.

Gravity familiar to us as we know it appears to be only associated with a dipole longitudinally hard point or line virtual bipolar black holes. Apparently, acceleration, deceleration, and centrifugal force results in the same thing, but, as J reactive gravity we can not tell from non-reactive gravity. We do not know of an anti-gravity, not yet, altho same sign electric and magnetic fields repel in a pseudo-anti-gravity.

We know a motionless electric field in space does not attract a motionless magnetic pole and vice-versa. [The Hall effect is a different story, with atomic influences at work.] There is a decided interaction between an electric field and a magnetic field under certain conditions. Relative translocation and angles of relative translocation are key factors determining interaction.

Oscillations of a dipole apparently are able to represent at the same time, and same dipole, fields not in translocation and at intensities less than the various certain thresholds for interaction.

Gravity field near a stellar black hole has a decidedly different effect upon various parts of a given mass as we shall see later. Similarly so for an electric field acting on a charged sphere and a magnetic field acting on a pole.

Like charges repel, unlike charges attract. [Same for magnetic poles.] Mutual coexistence, occurs when lines of force of 2 electric [or magnetic] fields of same direction sign are parallel. If they have same sign and are head-on at the start these lines of force in mutually exclusive existence wind up in mutual coexistence each rotated to some angle to become parallel and in doing the rotations are associated with a mutual repulsion force to be generated as if the length-time were stressfully stretched [or perhaps folded back upon itself as a curving]. Basis for this has to do with representation of either electric and magnetic fields, being transverse primary AM of dipoles. Repulsion effect is as if transverse primary AM were to exceed 100% then to become associated with stressful reduction in compression\expansion at virtual bipolar black holes J reactively lengthening the dipole which J reactance is now in-line from one pole to the other. At LaGrange surface, angle AM changes polarity thus repulsion.

The effect is analyzed in the following way:

1. The electric [or magnetic] field is represented on each dipole as transverse primary AM having angle AM representing the field directional data.

2. 180° head-on lines of force of same sign means the transverse primary AM on each dipole is attempting to nullify each other.

3. 180° head-on lines of force of same sign means the directional data on each dipole is attempting to nullify each other.

4. Nullification would lead to no lines of force creating a paradox of both lines and no lines at the same time and on the same dipoles. Dipole oscillation virtual energies must be conserved because of the checks and balances system, so J reactance plays its part.

5. Attempting to nullify leads to production of a J reactive dipole expansive length-time stress which appears rotated physically at 90° from the transverse, as longitudinal 180° out of phase primary AM to that of the longitudinal Level 1 dipoles.

6. 1. thru 5. have 2 results:

a. each dipole appears J reactive stretched [reduced longitudinal stress with an associated J reactance appearing inside the point or line black holes creating a pseudo-anti-gravity as between the electric [or magnetic] fields;

b. attempts to nullify are associated with angular displacement of the transverse primary AM to angles for each dipole such as eventually thru successive dipoles the angle approaches 90° from the original at which point the lines of force from opposing fields can mutually coexist but under stress of J reactance to return to their original states of head-on.

7. With head-on lines of force having opposite signs, the transverse primary AM representing each electric [or magnetic] field attempts to re-enforce each other in mutual coexistence as does the field directional data because the opposite angle AM signs are attached to fields coming from opposite directions.

8. Attempting to re-enforce, leads to production of a J reactance which appears at 90° from the originating transverse primary AM, as longitudinal 0° in phase primary AM with that of the longitudinal Level 1 dipoles associated with a pseudo-gravity. These 2 phenomena, attempts at nullification and re-enforcement, are micro-Relativity at work and help explain Stark electric effect, polarization of emitted light from atoms in presence of an electric field whose intensity is beyond a certain threshold for interaction, about 10^7 volts per m. Stark electric effect and Zeeman magnetic effect are analogous.

9. J reactance at the macrocosm can be further analyzed from the microcosmic level of dipoles.

Every mass generates gravity. With more than one mass, the gravity field direction on either side of La-Grange equal gravity surface [1 dipole thick] is always back towards a mass sink. So, there is a finite difference between directional field data for the various fields.

Going back to gravity field intensity, mass-gravity not J reactive gravity associated with acceleration. From experience with accelerators, intensity of increasing gravity of an increasing mass is a function of its velocity [translocation in the longitudinal direction]. In at-rest gravity, mass-gravity allegedly related to primary AM of the oscillating longitudinal compression\expansion of a dipole into each line virtual bipolar black hole as we shall see further when we study mass. Mass-gravity comes about thru this velocity relationship, whereas acceleration J reactive gravity ceases to exist at zero or any constant velocity and only appearing during acceleration [parity, and part of the Principle of Equivalence, and, is Relativity at work].

An at-rest electric field's non-reactive primary AM, allegedly existing only if they were transverse, use dipole longitudinal oscillation as the frequency carrier, $f_{carrier}$. However, an at-rest electric field, can produce an increase in ability of the dipole longitudinal oscillations to represent gravity at extremely high electric field intensities beyond a certain threshold for interaction, that, is a significant event. For example: That event can be reached on surface of a charged mass particle, particularly in connection with spin of the particle turning out to be finite and discrete; a sort of spin quanta related to torsional AM, if, we keep track of resolution.

A dipole must be able to represent all fields simultaneously while they are at low enough intensities [below the certain thresholds for interaction]. Otherwise, at such low enough intensities as found on this planet, we would easily have seen interaction happen long before now. Perhaps we have seen it just outside the event horizon of stellar black holes, on surface of particles, and to some extent on surface of the sun. Even the most powerful laser does not appear to create, increase or decrease a gravity field, or it is an extremely small interaction, but it appears there is a different story, on the surface of a mass particle with an electric charge which particle has spin, angular momentum, a magnetic moment, and a spatial quantization.

According to Relativity, it is true, and, allegedly according to my dipole concepts, any gravity should effect any intensity of an electric, magnetic, or EM radiation field. Gravity, of our sun as well as other stars and stellar black holes, is strong enough to affect EM radiation field, and most likely such star gravity affects electric and magnetic fields as well. At very strong intensities, an electric or magnetic field affects an EM radiation field as it is being generated in an atom; Stark electric and Zeeman magnetic effects which act to modulate the de Broglie electron waves. I allege this is so because of an effect attributed to hv quantum of light now containing value added quantized sidebands. Since light can be modulated producing sidebands, it stands to reason hv quantum under modulation conditions also contains quantized sidebands and is not merely a single

spectrum line. Simplistic singularity representation of any given hv quantum is not enough. Thus, the math of hv quantum must be modified to include the concept of quantized sidebands under modulation conditions of Stark or Zeeman.

If we free fall approach a stellar black hole and then hold static position with an established given electric field we are carrying with us, we should see a vast increase of gravity from the stellar black hole and a vast decrease in intensity of that electric field which intensity is a function of orientation with respect to the gravity lines of force emanating from the stellar black hole. We shall study this later. This presents us, in a static position, with a tool to measure direction in space towards a gravity sink. So, where does the component of reduction of the electric field go in presence of a vast gravity field? My explanation is, while existing together on the same dipoles, greater gravity field is associated with transverse oscillations of an electric field representation, to be J reactively dragged into each virtual bipolar black hole along with that portion of the dipole exceeding about 10^{42} kg stress which is the gravity AM. Dipoles give back the electric field taken into the virtual bipolar black holes when gravity field intensity decreases, as by moving a distance away from a stellar black hole to repeat the experiment.

So there is a J reactive storage mechanism capability built into each virtual bipolar black hole as regards the electric field being swallowed by those virtual bipolar black holes in the presence of a gravity field. That amounts to a J reactance just as in the case of increased mass and gravity as J reactive value added via Relativity. Thus it can be said the decrease of an electric field, J reactively in the presence of a gravity field, amounts to effects produced by Relativity, in this case, micro-Relativity and involves conservation of virtual energies J reactively. Resolution in the mathematics keeps track of all this.

In the case of a component of reduction of an electric field in presence of increasing gravity, that situation is similar to reduction of our length-time due to increasing gravity associated with dipole oscillations taking place more of our time inside the line virtual bipolar black hole; that is to say, gravity is associated with a reduction in length and an increase in dilation-in-time, with a J reactive reduction in an electric field strength both as a result of dipole oscillations spending more of our time in the virtual bipolar black hole.

In the case of an at-rest electric field existing without gravity, that electric field itself is associated with a transverse stressful reduction in our length-time. We will study more of these later.

7. J REACTIVE AM

A word on J reactance. It is a concept I borrow from Electronic and Electrical Engineering. It applies to any phenomena involving storage of energy only to give it back later. It can take several forms during the storage phase. Usually, J reactance applies to the cyclic phenomena during storage of cyclic energy at $\pm 90°$ phase shifted from another cyclic energy. However, it can be associated with value added to original during translocation.

Since 1987, I have thought J reactance can be applied to all equations involving translocation. But from 1949-1987, I had no idea precise frequency dipole cyclic phenomena or virtual bipolar black holes could be involved at the very small as I do now.

As I developed the Planck length-time gravity field representation, I discovered a J reactive AM was not needed, it was zero, to complete the thought about at-rest gravity. However, I found a J reactance concept was required to formalize a bifurcation of reality into our real reality and the reality found inside dipole end-nodes under conditions of AM I call J reactive reality. Later I found a J reactive AM was also not needed to complete the thought about at-rest electric field. As applied to a gravity field in Relative constant translocation, allegedly, a J reactive longitudinal AM is needed. J reactive gravity, it turned out, is also associated with acceleration. Real gravity in translocation, and, J reactive acceleration-gravity, looked and felt precisely like more gravity in our slower real macrocosmic world, which it is proposed, is because of LEVEL 2 longitudinal character of at-rest gravity AM being imposed in line with LEVEL 1 longitudinal dipole oscillations.

This is to say, altho non-covariant in length and time of the dipole, translocating gravity, while containing J reactive AM components, is still longitudinal and to us looks like more gravity along the longitudinal direction of translocation. Therefore, we need to include math of Fourier series, modified by mathematics of complex phase planes, and Relativity, keeping track of everything via resolution in order to complete the thought about a gravity field in translocation generating more gravity, and, for acceleration to generate J reactive gravity. We shall address translocating gravity more later.

In studies beyond at-rest gravity, it is proposed, I make use of J reactive AM to show how and why translocating original gravity generates more gravity in the direction of translocation.

Not all possible J reactive AM are required to represent a given field. Quantum matrix reality is not an ther concept, said in the 1800s to be a medium of space thru which light can travel.

It is proposed, a characteristic of dipole oscillations is there is no active LEVEL 1 inverse square law. This

is because all quanta of LEVEL 1 standing wave dipoles thruout the universe are identical and their average position relative to all others does not vary in a checks and balances system and is without transmission of its fundamental LEVEL 1 resonant virtual energies; only J reactive AM components of LEVELS 2 and 3 can translocate. Only LEVEL 2 complies with the inverse square law.

Gravity of LEVEL 2 and mass of LEVEL 3 increase longitudinally [which has to do with even-parity, and, Relativity] in the direction of translocation [not transversely]. An EM radiation field of LEVEL 2 translocates as AM components upon LEVEL 1 quanta at the maximum speed, $|c|$, Thru LEVELS 2 and 3, light speed depends upon the medium, being slower thru gravity and very much slower for a dense LEVEL 3 medium, such as condensed mass at 0° K.

Translocating electric or magnetic fields of the LEVEL 2 do not generate more of themselves only the other [which has to do with transverse J reactance, odd-parity which reverses sign of the J operator, and, Relativity]. There are other effects we shall study as part of reactance and Relativity.

8. ACCELERATION J REACTIVE GRAVITY FIELD

Any entity which appears to us in our reality to increase as a function of increasing velocity and to likewise decrease as a function of decreasing velocity I consider is an observation of J reactive added value to original.

I consider gravity associated with acceleration [and gravity in translocation we study later] as J reactive added value because when the acceleration ceases there is then no added value. This J reactive form of gravity, because it is 90° cyclic phased from each dipole longitudinal resonant oscillation along the path of standing waves of a line segment, is generated in Relativity as J reactive longitudinal primary AM with angle AM serving to represent directional data. I am not talking about acceleration caused by gravity; that amounts to free fall as when an object is falling towards or orbiting a sink of gravity such as a planet. This J reactive gravity is quantized. Dipole to dipole changes form a beginning and an end to each and every gravity quantum with the summation as quanta all subject to Fourier analysis. At our level of macrocosmic reality we can not see each dipole forming a quantum but see only the averaged quanta.

For our observation to be valid, all this takes place absent any artifacts of any kind. To grasp the concept of a J reactive gravity field associated with acceleration, we start by magically collecting data from viewing a portion of a Planck length-time line segment's dipoles sitting in standing waves. We view perpendicular to the line segment and its soft point virtual bipolar black holes at each and every dipole end-node, with a magical video camera, magical computer, and a magical display screen, all of these with infinite resolution, infinite number of frames per second, and zero time lost in getting, handling, and displaying the data as a graphical image.

This magical setup produces for us a magical image on this magical computer screen with which we, as the observer, can see the computer generated image of the dipoles sitting in their standing waves on the line segment while we are at rest, constantly translocating, or constantly accelerating. As with our earlier study of LEVEL 1, we and our apparatus do not generate any fields, neither real nor [j] reactive.

Earlier, we said while Planck's length-time is not a crystal lattice structure, dipoles do not translocate [because of checks and balances everywhere thruout the continuum] only effects [primary AM components] can translocate from dipole to dipole. In the case of Relativity at work, effects come and go [thus all such translocating primary AM as effects are [j] reactive]. In the case of translocating longitudinal primary AM the translocating effects are different to different observers. Translocating transverse primary AM is independent of observer. We saw these effects more clearly in a comparison of the at-rest gravity field with the at-rest electric field. Later, we shall see the comparison of effects of their motions. But for now remember there are 2 families of primary AM, longitudinal and transverse.

While at-rest, we feed camera data into this magical computer. The computer stores all data, makes data comparisons and displays on the screen an at-rest base-line graph while we are at-rest. We see on the screen the amplitude of tensions along the standing wave from zero at mid-center between dipole ends to about 10^{42} kg tension opposing from opposite directions at the "soft" black hole boundaries of the dipole end-nodes. We see the length between each "soft" point black hole; and, the "soft" black holes themselves to see each dipole end-node is precisely a "soft" point precisely equal to every other "soft" point. While at-rest, the screen shows us a graph of intensity of tensions versus length between several "soft" point black holes on a line segment. Because time is dipole sinusoidal, the picture on the screen looks like an oscilloscope view of an inverted full-wave rectified AC triangle wave with the abrupt change in intensity representing the "soft" point virtual black hole at each dipole's end-node.

Having established an at-rest base-line graph for further measurement comparison, next, we, as observers, move at a constant velocity with our magical equipment parallel to these standing waves to again bring up on the screen to view any differences our constant motion makes compared to the base-line. If we adjust the computer program's handling of the constant movement data we could compensate for our constant velocity to display a stationary graph which is not translocating on

the screen. We can adjust the display to superimpose the constant translocation graph over the at-rest graph of the base-line, that is, the displayed graphic shows us 2 images which do not move across the display screen.

While we are in constant translocation, but considerably less than the speed of light, say a few km per second, we note on this stationary 2nd graph no apparent difference compared to the at-rest base-line graph. We are looking perpendicular to the line segment so we do not see a Doppler shift in frequency of carrier of the dipole oscillations as we translocate. Because we are looking transverse, the FitzGerald-Lorentz contraction does not appear. [Contraction would take place looking longitudinally in the direction of translocation.]

Next we constantly accelerate. We adjust the computer program's handling of this constant acceleration data to again display for us this 3rd stationary graph of intensity of dipole tensions on the standing waves versus time along the standing waves. Now the graph appears decided difference from our at-rest and constant velocity yet stationary produced 3 graphic images on the screen.

This time, the 3rd graph [program adjusted to display this data as stationary] shows each succeeding standing wave dipole, compared to the base-line graph, seems to have a consistent shorter real length between once "soft" point black holes now turned [j] reactively longitudinally "hard" and in turn to have turned into line black holes with tension on each standing wave increased more at the end towards the opposite direction from acceleration, representative of an offset-bias suggestive of giving directional data to the [j] reactive gravity field thus generated.

That directional data displayed is the difference between the graph of acceleration and at-rest\constant velocity graphs, 1 and 2, and the computer has determined for us the equation representing differences in the graphs and it is allegedly a J reactive longitudinal primary AM along with longitudinal angle AM imposed thereupon; that is, the display gives us a J reactive gravity field representation with a leaning of the oscillation curves towards the direction from which we came looking to us like gravity we can not tell from mass-generated non-J reactive-gravity. I say it is a J reactive gravity because it will return to zero when acceleration ceases.

The effect [not FitzGerald-Lorentz contraction] is as if the spatial length were shorter [[j] reactive gravity] and the spatial time were longer [[j] reactive time dilation]. That shortness of length and that longness of time is [j] reactive and is proportional to the amount of fixed acceleration we experience. The shortness appears to us as the very same kind of shortness we found when we studied gravity except the primary AM [associated with acceleration] has a 90° phase relationship to dipole resonant oscillations. At different accelerations we, as the translocating observers, will see on our screen different lengths of line virtual bipolar black hole lengths are a direct function of acceleration.

Those differences in observation results are Relativity at work, that is, micro-Relativity, a translocation from one dipole to the next as longitudinal [j] reactive effects only this time they are associated with our own increasing velocity. Therefore, acceleration [j] reactive gravity is a direct function of acceleration with angle AM producing directional field data towards the direction from which we came. There are additional descriptions of this effect. For example: The length of virtual bipolar line black holes are of different lengths on the same dipole at its end-nodes.

Gravity we said was a stressful reduction in a spatial length accompanied by a stressful increase in time. It appears acceleration [j] reactive-gravity and mass non-[j] reactive-gravity are viewed by us as identical appearing stresses of the length-time [because they are all longitudinal in character] and are equivalent; that is, both follow the Principal of Equivalence enunciated by Einstein.

While in constant velocity or at-rest, we notice no difference in displayed graphs of intensity at any point along each dipole.

Free fall is gravity caused acceleration, while in free fall towards or orbiting a sink of gravity, we notice no difference in displayed graphs of intensity to that of the at-rest base-line. Even tho they were "hard" while we were at-rest in a gravity field, virtual bipolar black holes appear to us in free fall to lose their "hardness" and we see them again as "soft"; that is, free fall in a gravity field and zero gravity both exhibit the same dipole characteristics and both are caused by "soft" point black holes [absent any "hard" point or line black hole], zero gravity having only "soft", while in free fall the "hard" have returned to "soft", complying with the Principle of Equivalence.

It may seem strange, but in free fall towards a stellar black hole horizon, we should notice no gravity, that is, if we were a singularity point. If we were a spherical object of size in such free fall, on the other hand, we would definitely feel dissimilar gravitational effects, those parts of the sphere in converging gravitational trajectories [emanating from the stellar black hole] causing a generating of gravity acting to bring mass together at a right angle to direction of stellar black hole's gravity, plus a greater gravity from the stellar black hole acting upon closer mass than mass less close causing a generating of anti-gravity, that is, less gravity acting on the end of a diameter of the sphere away from the direction of stellar black hole gravity. These 2 dissimilar gravitational effects can be explained by examining how dipoles operate. Time dilation in atomic orbits is as a result not of the source gravity holding the orbit but gravity associated with orbitally passing thru converging gravitational trajectories. These unusual effects are [j] reactance at work.

While we are accelerating in LEVEL 1, on our screen we notice tension on the end-nodes of the each dipole in the standing wave have increased [j] reactively uneven beyond about 10^{42} kg tension and have caused the "soft" point black holes to turn [j] reactively "hard" and into bipolar virtual line black holes. Also, each dipole of the standing waves has become distorted, looking like it was leaning away from the direction of acceleration towards where we came from. This leaning provides us with specific direction data of the gravity field associated with acceleration. It is an offset-bias; an angle AM coinciding with the longitudinal stressful reduction in a spatial length and with its accompanying time dilation in the length-time of the dipole.

These acceleration effects are also Relativity at work. There are other effects of Relativity at work, the redshift and time dilation within the LEVEL 2 acceleration [j] reactive-gravity field.

9. TRANSLOCATION OF FIELDS MINKOWSKI'S ROTATION OF AXES

I proceed by establishing some limits thus narrowing investigation. Experience says, relative to a stationary observer, a constantly translocating charge and its electric field do not increase with translocation while a constantly translocating mass and its gravity increase with translocation in the direction of translocation.

Experience has been put to print. Here are 2 modern physics statements quoted from ***Encyclopdia Britannica*** , Volume 26, p534 (1990). Ins. add.

1. "...sources of the electric field, electric charges of particles, have values independent of state of motion [translocation] of the instruments by which these charges are measured."

Said another way, an electric charge, and its electric field intensity, appear to remain the same value regardless of translocation Relative to different observers. Almost as if the translocating charge and its field were related to the Relativistic concept of $|c|$ being independent of observers, giving us a clue as to what type of primary AM to look for in regards charge and electric field. But Relativity in this case does not seem to directly apply to the sources [and sinks]. Why? Certain J reactance effects, magnetic field production as value added, appears to be a possible answer. Electric field and charge I have proposed are forms of transverse primary AM upon the LEVEL 1 longitudinal dipole oscillations. The next statement differs radically from the first.

2. "...source of a gravitational field, mass of a particle, and the mass of that particle, increases with an increase of speed [trans-locating] of the particle relative to the frame of reference in which it is determined and hence will have different values in different frames of reference."

Said another way, a gravity field of a mass and the mass itself both appear to increase with translocation in the direction of translocation [but not transverse to direction of motion] and said increases differ with translocation Relative to different observers, giving us a clue as to what type of primary AM to look for in regards mass-gravity. Gravity and mass I have proposed are forms of longitudinal primary AM upon LEVEL 1 longitudinal dipole oscillations.

Relativity in the case of mass-gravity does apply directly only to longitudinal observations. Why? J Reactance with its value added and longitudinal view versus transverse view effects appears to be possible answers because it does matter which observer reports what.

It is alleged, J reactance in **2.**, appears with translocation of mass and gravity longitudinally but does not apply the same way as J reactance associated with translocation of electric charge and its electric field in 1.

Why does Relativity appear longitudinally to directly apply to a translocating mass and its gravity and not longitudinally to translocating electric charge and its electric field in an identical way? If the essence of this question is correctly presented, then the concept of Relativity must be modified to include a better definition, which I do herein without changing classical Relativity as a whole.

I say there is one family of primary AM [transverse] associated with electric charge and its electric field and another [longitudinal] associated with mass and its gravity and these account for bifurcated Relativity effects [charge versus mass in the longitudinal direction].

Analyzing the data from experience:

1. Relativity appears to indirectly apply to translocating electric charge and its electric field. Indirectly meaning, translocation of charge and electric field are associated with a magnetic field, the mathematics of which include odd-parity and change of sign of the J operator. The magnetic field is then value added to original as a function of velocity differences between observer and the translocating electric field.

2. Relativity appears to directly apply to translocating mass and its gravity. Directly meaning, translocation of mass and gravity are associated with more of the same, value added to original, the mathematics of which include J reactance.

Real mass in translocation and its real gravity in translocation allegedly results in an added value J reactive mass and added value J reactive gravity [viewed as occurring in the longitudinal direction of translocation but not transverse which remains unchanged] which looks and feels like more mass and gravity we can not tell from real mass and real gravity [part of the Principle of Equivalence]. In the transverse view of

mass and gravity, the originals do not have observable added value J reactive changes with longitudinal velocity. These are allegedly because these translocation are J reactive longitudinal primary AM upon the dipoles and are thus not to be seen transverse. In Minkowski terms, his rotation of axes cannot be seen from a right angle because we are then looking, in the above case, along the J reactive vector seeing the vector end only as a zero dot. In the longitudinal direction I say the math of translocation of mass and gravity are similar to the complex numbers equation for impedance from Electronic and Electrical engineering:

(14) $Z_{(AC\ impedance)} = A_{(real\ resistance)} + \\ +JB_{(reactance)}$.

For us to understand and observe (14) in terms of value added to original, A stands for original and B stands for reactive value added to original.

To put (14) in context of Minkowski's equation (1), (1) must be modified to include cyclic phenomena. To do this correctly and completely, mathematical complex phase planes are needed, and, the assistance of a mathematician. And something else, a J reactive entity is not able to exist without its entity to which it is J reactive. This is to say, one can not have value added to original without the original.

For an at-rest electric field representation, I have proposed a transverse primary AM of dipole resonance, that is, a non-reactive [0° phase] as transverse primary AM, at physical 90° to the dipole longitudinal oscillations, and covariant in-phase at 0°, with the dipole oscillations [until reaching a certain threshold for interaction (100% modulation–an extreme value), and\or, in the presence of gravity]. Transverse reactive $\pm[j_{y,z}]$ primary AM would represent electric field in translocation, magnetic field, electric charge, and charge in translocation. $\pm[j_{x,y,z}]$ are operators indicating reactance designations are in mathematical complex phase planes and are not related to physical 90° activities, that is, they are not $\pm$ transverse physically 90° to $\pm$ transverse, only in a phase relationship. Odd-parity of transverse AM on the other hand changes the sign of the J operator making the translocating electric field appear as value added in the form of a magnetic field instead of an increased electric field.

Thus, we have a set of 5 transverse primary AM classifying a family of effects associated with electric charge and electric field, at-rest and in translocation along with the magnetic field, at-rest and in translocation, while the set of 5 longitudinal primary AM classify a family of effects associated with mass and gravity, at-rest and in translocation along with acceleration J reactive gravity. Angle AM, for all primary AM on LEVEL 2 representing fields, is herein defined as field directional data. Torsional AM, the 12th primary AM, deals with chirality and spin, etc.

After studying Einstein's Relativity in 1905, and considering Lorentz 1904 transforms, Minkowski offered his opinion, motion [translocation of mass and gravity, for example] was associated with a rotation of axes in 3D. See ***Encyclopdia Britannica***, Volume 28, p. 655-2b (1990).

As I see it, his opinionated rotation was composed of 2 parts: 1st, the original static value A; 2nd, a value added JB, which value is a function of translocation, where the resulting hypotenuse, in macrocosmic terms not microcosmic, Z, became:

(14a) $Z = A + JB$,

rotated to an angle *phi* because of value added $J\,(B)$ factor as a function of velocity.

J in (14a) does not represent reactance associated with cyclic phenomena at the microcosm, but only of generalized events of translocation at the macrocosmic level of reality. By modifying coefficients of Minkowski's equation (1) in light of translocation cyclic phenomena at Planck length-time, of Fourier series, and mathematical complex phase planes, etc., we can make the connection between his axes macrocosmic rotation Z he speaks of, and a microcosmic bifurcation of reality into real reality plus J reactive reality and a bifurcation of Relativity into charge family and mass family based, leading us then thru Lorentz transforms, like (2) to a unified field theory. All these factors progressing thru Lorentz transforms can be kept track of via mathematical resolution, a modification of equation (1) to (2).

The Minkowski rotation of axes, *phi*, are where supposedly I get partial confirmation of my cyclic phenomena concept of J reactance applicable to translocation effects requiring the use of mathematical complex phase planes; complex numbers, real vector A plus reactance vector JB; similar to the equation for AC impedance, equation (14).

When math complexity coefficients modify equation (1), to include all of the field translocation AM sidebands and at least the 7th harmonic of $f_{carrier}$ as a 1st approximation, we can proceed thru Lorentz transforms to view mathematically the full macrocosmic matrix represented as a resulting modification of Einstein's equation (2), which interpretation then becomes a unified field theory.

However, the J reactance complex can be seen as a bifurcation of Relativity, either based upon longitudinal mass family, or based upon transverse charge family. Or, both, as for example an electric field translocating not synchronized with a translocating gravity field.

This bifurcation of Relativity can be shown by visualizing 2 macrocosmic level field intensity 2 dimensional translocation vector graphs. For purposes of these graphs we discount *phi* angle, time dt^2, and dipole cyclic phenomena. We are not visualizing the actual happening. We simply want to see $Z_{gravity\ or\ electric}$ in a contrasting result, a bifurcation of Relativity:

Gravity field. Looking along the make believe z-axis, an x-y 2D graph of translocating gravity field shows us a real horizontal originating at-rest gravity

field value vector ($A_{gravity}$) with a reactive value added $+[j_y]\,B_{gravity}$ vector graphically appearing in the vertical plane, y, as a function of translocation. Increase in value added vector appears to us to increase $|Z_{gravity}|$ as a function of translocation.

Electric field. Looking along the z-axis, an x-z 2D graph of translocating electric field shows us a real horizontal originating at-rest electric field value vector ($A_{electric}$), but with a reactive value added $[j_z]\,B_{electric}$ vector graphically appearing in the horizontal plane we see only as a dot not changing as a function of translocation. Therefore, $|Z_{electric}|$ always equals ($A_{electric}$). If we could look at this graph along the make believe y axis we would see a magnetic field $-[j_z]\,B_{electric}$ as the value added. This reversal of sign of the J operator in $[j_z]\,B_{electric}$ from (+) to (-) is because of the transverse character of the electric field, and, its odd-parity.

It has been said above, gravity is longitudinal thus its translocation J vector value added is at a right angle to originating value lying in the x-y 2D plane. Electric field is transverse thus its translocation J vector value added is also at a right angle but lying in the z-y 2D plane. For gravity, above, the J coefficient was intentionally chosen as $[j_y]$, and for electric field $[j_z]$, and these were chosen as so as to draw attention to results of our viewing the graphs along the z-axis, to a difference between gravity and electric fields as a function of translocation. Thus, the equation

(15) $|Z_{gravity\ or\ electric}| =$
$|A + [j_{y\ gravity\ or\ z\ electric}]\,B|$,

graphically represents factual sightings by a stationary observer actually looking in the longitudinal direction of field translocation giving some idea why Relativity is bifurcated.

To clarify, the drawn graphs of $|Z_{gravity\ or\ electric}|$ at (15) and the factual sighting are not at the same view angle. Graphs are useful to illustrate a concept; it is not a visual fact of precise orientation. The true sighting of translocation is what is fact while the graphs can be put into any angle for viewing, such as on a table or hung on a wall. The drawing of the graphs to be placed say on a table, was done in 2D while our view of the graphs was at the z-axis. This was done for contrast to show graphically a difference between gravity and the electric fields while in translocation.

With the graphs in mind, we then can see factual translocation of these 2 fields have different results of value added. Gravity increases $+[j_{gravity}]$ reactively while the electric field has no apparent electric field $+[j_{electric}]$ reactance. However, we find upon looking at the electric field at a right angle from that of z-axis [along the y-axis], we see the magnetic field we could not see while looking along the z-axis. So translocation of electric field while it does not produce a $+[j_{electric}]$ reactively added value to originating electric field, it does produce the added value $-[j_{electric}]$ magnetic field instead.

This is done via the odd-parity aspects of the mere fact of translocation of the originating electric field which changes the sign of the $+J$ to $-J$ which is the magnetic field. The secrets of nature are most complicated, intriguing, and fascinating.

Minkowski's equation (1) can be most helpful in showing what happens at Planck length-time in presence of primary AM upon dipoles; a length, x, y, z, with time, dt^2. In at-rest gravity, I pointed out intensity of primary AM unique to at-rest gravity is associated with virtual bipolar black holes having moved their event horizons closer to the dipole center from each end-node as a function of intensity of gravity thus shortening our real reality we observe. A reduced real reality is as tho component parts of equation (1) were reduced. Minus times plus gives minus, for x, y, z, the decreased length of our reality portion of a dipole, and minus times minus gives plus, for dt^2, the increased time of our reality portion. In terms of the microcosm, our real reality length reduces and time increases, hence which of x, y, z, we take as in length-time at the microcosm is irrelevant when eventually viewing the matrix at the macrocosm. J reactive reality in the virtual bipolar black holes is that reduced part of original real reality, for at-rest conditions. For translocation, the picture gets complex.

At the microcosmic level, static LEVEL 1 dipole length and time are both sinusoidal oscillations. In the presence of AM, that portion of the original real reality LEVEL 1 length-time value disappearing into the virtual bipolar black holes becomes J reactive reality.

Because of the character of dipole length oscillations and its even-parity, J reactive reality length of at-rest gravity detracts from the originating LEVEL 1 real reality length. Because of the character of dipole time oscillations and its odd-parity, J reactive reality time in a gravity field, while it detracts from the originating Level 1 real reality time, changes sign of the J effectively adding value of time to the originating LEVEL 1 time value.

10. CLASSICAL RELATIVISTIC EQUATIONS ASSOCIATED WITH TRANSLOCATION

I allege the following 6 macrocosmic classical generalized Relativistic equations are approximations because they contain no J reactance factors nor dipole cyclic phenomena, as I allege they should.

(10) $m = m_0 \mathrm{div}\left[1-b^2\right]^{1/2}$. Mass increases as a function of translocation velocity.

(16) $g_{field} = g\,(_0)_{field}\,\mathrm{div}\left[1-b^2\right]^{1/2}$. Gravity field increases as a function of translocation velocity.

(17) $q_e = q_e\,(_0)$. Charge remains constant at any translocation velocity.

(18) $e_{field} = e\,(_0)_{field}$. Electric field remains constant at any translocation velocity.

(19) $L = L_0 \left[1 - b^2\right]^{1/2}$. Length decreases as a function of translocation velocity.

(20) $t = t_0 \text{div} \left[1 - b^2\right]^{1/2}$. Time increases as a function of translocation velocity.

(21) $b = v \text{div} \, |c|$,

$(_0)$ designates at-rest original value. v = velocity of translocation. $|c|$ = velocity of light in empty free space.

The classical math of viewing translocation was derived by FitzGerald, Lorentz, Poincare, and Einstein, and while FitzGerald, in 1892, derived the [longitudinal] length contraction equation (19) based on translocation in the x axis direction, he did not complete the thought leading him eventually to relativity as did the others.

Equations (22-25) below are based on x, y, and z coordinates in longitudinal x translocation absent consideration of reactance resulting from that x, y, z translocation nor of the possibility of dipole cyclic phenomena. In a 1904 paper Lorentz said:

(22) $x' = k\,(x - vt) \text{ div } \left[1 - b^2\right] 1/2$,

(23) $y' = ky$,

(24) $z' = kz$,

(25) $t' = k\left[t - \left(vx \text{div } |c|^2\right)\right] \text{ div } \left[1 - b^2\right]^{1/2}$,

(26) $b = v \text{div } |c|$,

k can be assumed to be 1.

Relativistic translocation equations containing J reactance

However, if one considers the microcosm 4D matrix of Planck length-time dipoles, each k is not equal to 1 unless $v = 0$. To be precise, each J operator coefficient below must be expanded to include cyclic phenomena and which family of AM is being studied.

v of (26) is step quantized as a function of passage across multiple Planck length-time dipoles. The Doppler effect enters the quantization on the bases of sidebands associated with passage of virtual energy components of AM in non-symmetrical "clipping" at the event horizon of each succeeding dipole's virtual bipolar black holes. A 1/2 cycle cause quantization of AM components thru takes place in passing thru each dipole from one dipole to the next.

Listing each k of (22-25) to include a reactive component absent cyclic phenomena, we have:

(27) $= (22)\, k = kx = [j_x]\,(x' - x) + 1$,

(28) $= (23)\, k = ky = [j_y]\,(y' - y) + 1$,

(29) $= (24)\, k = kz = [j_z]\,(z' - z) + 1$,

(30) $= (25)\, k = kt = [j_t]\,(t' - t) + 1$.

The coefficients of the 4 J operators in (27-30) are themselves axially based. If also made appropriately cyclically based they become a function of step quantized velocity, v. Translocation would then be step quantized with no translocation partial quantum possible in-between dipole quanta steps because of the checks and balances system. k in each of the above equations would thus be quantized.

Also, each J operator component of x, y, z, and t, form as a real quantity summation in the direction of x translocation leaving a reactance relative to a decrease in length and a dilation of time as a function of velocity. In terms of longitudinal AM, during translocation the real quantity summation, in the direction of x formed from the J reactive components of x, y, z, and t, is zero resulting only in a J reactive effect adding to that of the at-rest entity being represented. This is important for it teaches us the reason for dilation of time; an increased mass and gravity as a function of velocity associated with longitudinal AM. Whereas no increase of charge or electric field with velocity associated with longitudinal AM occurs but there is the appearance of a magnetic field instead. This is to say, reasons for the 2 different mechanics come from which of 2 AM family we are observing in translocation. Thus, a bifurcation of Relativity.

We shall need all of this involvement of translocation of the 2 families of AM to understand LEVEL 2 fields in translocation and LEVEL 3 at-rest or in translation.

It can be seen from his macrocosmic equations, as Lorentz wrote them, there is no observable change in y or z axes as a function of velocity. This forms the 1st part of a bifurcation of quantized Relativity which 1st part involves the mass family of AM described below, with the charge family forming the 2nd part.

A bifurcation of quantized Relativity results thru which type of step AM complexities upon the dipoles [beyond certain thresholds for interaction] we are dealing with when components of that AM are in translocation, and, upon status of observer.

We shall study this further in mass where we shall include J reactance due to dipole resonance and longitudinal AM, but suffice here to say, the increase in mass or gravity shows up only in the longitudinal direction of x translocation not the transversal of y, z.

About Relativity

Einstein pointed out in his Theories of Relativity, gravity complies with a Riemann condition, a curvature of space caused by a presence of mass. I have a different methodology to a similar result. Stressed Planck length-time, caused by AM J reactive into and out of virtual bipolar black holes at dipole end-nodes, the 2nd part of a bifurcation of reality, is without regard to mass which has its own unique AM. Gravity can exist without mass – acceleration generated J reactive gravity. My concept of a stress of length-time as a function of gravity ought not conflict with an Einstein Reality Field.

In studying Planck length-time, I modify Einstein's

5th Appendix, as regards his concept of "empty space losing its meaning". [See June 9th, 1952, note to 15th ed. of ***Relativity: The Special And The General Theory*** (1961), supra, at pages vi, and 135, et seq.] If we were to examine space at LEVEL 1, we would see space is not empty but consists of Planck length-time dipoles in a universal matrix.

In my paper, Relativity is shown to be bifurcated and associated with J reactance. I expand upon Relativity as a function of translocation of AM components.

Relativity is a word generally credited to Albert Einstein in connection with his Special and General Theories of Relativity. He won the Nobel Prize in 1921, not for his Relativity but for his law of the Photoelectric Effect. ***That*** was a mistake, a "black eye upon scientific thought", as I call it, which ought to be corrected even now; for his then Relativity efforts have become a vital part of foundations of all which is now known, and, yet to be knowable.

Relativity, in other context, began before Einstein in the late 19th century with George Francis FitzGerald (1851-1901), when he postulated an oscillating electric current should produce EM radiation altho he did not demonstrate his hypothesis. However, his concept was later confirmed in 1885 by Heinrich Hertz (1857-1894) who had studied Maxwell's equations in 1883.

At about the same time as FitzGerald's EM postulation, James Clerk Maxwell (1831-1879) formulated his 4 equations (1873) to describe interrelationships between electric and magnetic fields. Maxwell's equations are now most useful in connection with EM radiation field theory, altho they rely upon an ther as a medium.

Apparently, FitzGerald was first to formulate a Relativistic equation (19) in1892 explaining failure of Michelson-Morley 1881-7 experiments intended to measure motion of the earth relative to a stationary ther.

In 1895, Hendrik A. Lorentz (1853-1928) devised essentially the same equation, which then became known as the FitzGerald-Lorentz [length] contraction. Because Lorentz went on to develop other Relativistic equations [used in Einstein's Relativity], the name of Lorentz most often comes before FitzGerald as regards naming responsibility for the length contraction equation (19).

Classical Relativistic equations modified by J reactance

Einstein was unhappy with "imaginary numbers" saying at one time, "I do not believe in imaginary numbers". But imaginary numbers [i] by another expression are real from the stand-point of overall effect. Hence in my paper, "reactive numbers" are not imaginary but represent J reactance. To distinguish J reactance from an imaginary [i] number, I use J operators, altho they both equal $(-1)^{1/2}$.

From (10, 16, 19, 20) above, the accumulating "value added to at-rest original", as a function of velocity over that of at-rest, decreases back to zero while returning back to zero velocity. Hence it appears there is the potential for J reactance involvement which could be said to express a storage mechanics.

For macrocosmic interpretation of a storage mechanics of J reactance to be complete, value added must be correctly obtained from a microcosmic viewpoint of resonant Planck length-time virtual dipoles and their virtual bipolar black holes which dipoles are then seen as a matrix.

At the macrocosm level, the term J reactance is a generalized expression unless modified by cyclic coefficients of a Fourier series to become the specific expression.

So said, from the macrocosmic generalized viewpoint, the below 4 J reactance equations express "value added to at-rest original" which value added is associated with increased translocation velocity v, and could be interpreted as complying with classical Relativity. These equations are void of dipole cyclic phenomena and thus void of parity.

(31) $m = m_0 + Jm_0 \cdot$
$\cdot \left\{ \left(1\text{div} \left[1 - (v\text{div}\ |c|)^2 \right]^{1/2} \right) - 1 \right\}$. Mass increases J reactively as a function of translocation velocity.

(32) $L = L_0 - JL_0 \left\{ \left[1 - (v\text{div}\ |c|)^2 \right]^{1/2} - 1 \right\}$. Length decreases J reactively as a function of translocation velocity.

(33) $t = t_0 + Jt_0 \cdot$
$\cdot \left\{ \left(1\text{div} \left[1 - (v\text{div}\ |c|)^2 \right]^{1/2} \right) - 1 \right\}$. Notice the $+J$. Time here increases J reactively as a function of translocation velocity **away** from observer.

(34) $t = t_0 - [j]\, t_0 \cdot$
$\cdot \left\{ \left(1\text{div} \left[1 - (v\text{div}\ |c|)^2 \right]^{1/2} \right) - 1 \right\}$. Notice the $-J$. Time here decreases J reactively as a function of translocation velocity **towards** observer.

Then there is the equation for a dilation of time while in an at-rest gravity field as seen by a stationary observer

(35) $T = T_0 + T_g$.

Peter-Paul Relativistic time differential paradox

If we add dipole cyclic coefficients of a Fourier series to the above equations (31-34), J reactance would truly play a part in the so-called Peter-Paul Relativistic time differential paradox resulting in accuracy of equations (31), (32), (33), and (34) [(35) is not translocation J reactive based, meaning moving out of a non-reactive gravity field does not give back accumulated dilation time which would be the case if it were J reactive

acceleration-gravity]. Peter is said to stay on Earth while Paul rockets off into space and upon returning, Paul, classically it is said, has not aged as much as Peter, because it is said Paul's space clock has not run as fast as Peter's Earth clock due to Relativity.

The said classical Relativity created time differential paradox can be addressed in terms of $\pm J$ reactive time, as in (33 and 34) modified by cyclic phenomena if accuracy is to be maintained, but they are 1st approximation time dilation equations. Paul's going and coming time line now can be said to be composed of 3 components, real time and reactive $+J$ and $-J$ time. The $-J$ indicates going out slowing Paul's clock and the $+J$ indicates coming back quickening his clock, so going out and coming back results in precise cancellation of the J reactive components of going and coming. In that case, both clocks brought together would show the same elapsed time if other factors were not vectored in such as Paul traveling thru non-reactive gravity fields which change the results via combining (33 and 34) with (35) making

(36) $T = T_0 \pm jT_0 \cdot$
$$\cdot \left\{ \left(1\mathrm{div} \left[1 - (v\mathrm{div}\, c)^2 \right]^{1/2} \right) - 1 \right\} +$$
$$+ {}_{go}T_g + {}_{come}T_g \,.$$

While Paul travels going and coming thru the same non-reactive gravity fields, time dilation for him occurs both ways because going non-reactive gravity time added, ${}_{go}T_g$, is not returned with a minus sign upon coming back [due to gravity's even-parity]. Also, it has no J reactive component, so the plus sign of ${}_{go}T_g$ remains unchanged coming back and is additive making

(37) ${}_{go-come}T_g = {}_{go}T_g + {}_{come}T_g \,.$

This says nothing about the fact Peter is in Earth's gravity field causing dilation of his time. If Paul's time dilation in space-non-reactive gravity fields equals Peter's Earth non-reactive gravity field time dilation then the 2 clocks record time the same amount. But if Paul goes thru no non-reactive gravity fields it would mean Paul's clock has not recorded as much time as Peter's clock in Earth's gravity.

Of course none of the above equations are complete and are not valid in and of themselves until dipole resonance, non-reactive AM, directional data (angle AM), and J reactive amplitude AM, are vectored in.

CERN time experiment

"An experiment performed in 1966 in an accelerator at CERN near Geneva, Switzerland...the travelers [Pauls] were unstable elementary particles called mu mesons confined by means of magnetic fields to move in circular paths with velocities 99.6% of light speed. The returning muons were found to be younger; that is, to have decayed more slowly, than muons at rest in the laboratory [by a factor of 12]. Thus, both experiments and a correct application of theory, verify there is no clock paradox." Ed. Ins. *The Grolier Multimedia Encyclopedia* (CD-ROM 1999).

An example of what can transcend from a study of quantum matrix reality, consider my allegation there may be a problem with interpreting that data, and, theory was perhaps misapplied. While the mu mesons at-rest have aged at a normal rate, the translocating muons upon returning are said to have aged more slowly. That said slowing of aging [time dilation] could partially be as a result of the mu mesons translocating thru the mediums of magnetic and electric fields [plus a tiny modification due to translocation thru the earth's gravity] beyond the certain thresholds for interaction. Time dilation in that experiment ought not be confined to translocation solely within the bounds of the theory of velocity Relativity. The experiment included passage thru those fields, I say, which of themselves contributed to said time dilation. Additionally, passage thru the fields could have resulted in a modification of the moving mu mesons' internal structures [such as changes in quark orbits as a function of intensity of passage thru the fields and their interaction with and between the quarks] causing a finite nuclear decay rate change. I feel the experiment was uninterpretable in terms of said time dilation due solely to velocity, said doings of the theory of Relativity.

About length and time in resonance of dipoles

From the equations above, variations in dipole time progression can be visualized as a function of even-parity, odd-parity, intensity of gravity, and translocation, depending on views at macrocosm and microcosm. Even tho time in a dipole is in oscillation, there is a significant difference attributed to this matter of parity as to how to graphically display and to factually view time dilation.

For purposes of 2D graphing time dilation, J reactive time value added to original, in the presence of at-rest gravity, we resort to an even-parity display looking similar to gravity in translocation but Z is rotated at minus *phi*. For purposes of a description of factual time dilation we resort to time's microcosm odd-parity. The difference between these seeming contradictions is because J reactive time value added to original time requires we not include cyclic phenomena in our 2D graph which is drawn as tho at the macrocosm level, and for that display we rely on even-parity. Whereas, if we include dipole cyclic effects of time, we now are in a description mode at the microcosm level requiring odd-parity.

Previously, I addressed the matter of time odd-parity. In the Planck length-time dipole, the 2D length-time are both in resonance existing together in the dipole. While length oscillation reflections, from dipole end-nodes and virtual bipolar black hole horizons, are

even-parity, time oscillation reflections are odd-parity. This odd-parity aspect of time is derived mathematically from Minkowski's equation (1) at dt^2 modified to include cyclic effects. Dipole time resonance odd-parity is not to be confused with the odd-parity of the transverse charge family of AM, no more so than dipole length resonance even-parity is to be confused with the even-parity of the longitudinal mass family of AM.

Longitudinal odd-parity of dipole oscillating time gives rise to the phenomena of forward progression of time each 1/2 cycle of the dipole as a summation whereas even-parity of dipole length gives rise to repeating the same dipole length over and over again, hence no summation. Speculating. At the big bang, length may have been odd-parity just as time was then.

Notes

My paper began in 1987 without my knowing of other works in the field going on at those times. From then to now, 2004, much has been done on a similar set of subject matters as are in my paper but by various names. Some of those works began in earnest when NASA let a contract, NASW 5050, to Lockeed Martin and subsequently to others, searching for technologies to power interstellar space missions to other star systems, and as fallout, to power vehicles and generate stationary power. Below is a partial list of Internet accessible published papers centered around that and subsequent NASA and Air Force contracts. When and if these power source technologies become available, the need for fossil fuels for our energy will be a thing of the past.

California Institute for Physics and Astrophysics [CIPA] has physics papers and hyperlinks to other sites with more papers. View in html at:
http://www.calphysics.org

References

[1] Cornell University Library has physics papers. View abstracts in html or full papers in Adobe PDF format. Go to: **http://www.arxiv.org**.

[2] At Cornell, look for: **physics/9802031** v1 16 Feb 1998 ***INERTIA AS REACTION OF THE VACUUM TO ACCELERATED MOTION***.

[3] **physics/9802030** v1 17 Feb 1998 ***CONTRIBUTION TO INERTIAL MASS BY REACTION OF THE VACUUM TO ACCELERATED MOTION***.

[4] **hep-th/9901011** v1 4 Jan 1999 ***THE CASIMIR EFFECT: PHYSICAL MANIFESTATIONS OF ZERO-POINT ENERGY***.

[5] **quant-ph/9907076** v1 23 Jul 1999 ***EXPERIMENTAL VERIFICATIONS OF THE CASIMIR ATTRACTIVE FORCE BETWEEN SOLID BODIES***.

[6] **gr-qc/9905084** v5 21 Sep 1999 ***A 'WARP DRIVE' WITH MORE REASONABLE TOTAL ENERGY REQUIREMENTS***.

[7] **physics/9909043** v1 21 Sep 1999 ***TOWARD AN INTERSTELLAR MISSION: ZEROING IN ON THE ZERO-POINT-FIELD INERTIA RESONANCE***.

[8] **gr-qc/0002069** v1 19 Feb 2000 ***THE CASE FOR INERTIA AS A VACUUM EFFECT: A REPLY TO WOODWARD AND MAHOOD***.

[9] **gr-qc/9906084** v3 12 May 2000 ***ON THE RELATION BETWEEN A ZERO-POINT-FIELD INDUCED INERTIAL EFFECT AND THE EINSTEIN-DE BROGLIE FORMULA***.

[10] **hep-th/0005038** v2 8 Jun 2000 ***THE PARADOX OF VIRTUAL DIPOLES IN THE EINSTEIN ACTION***.

[11] **gr-qc/0005009** v3 7 Sep 2000 ***LARGE "DIPOLAR" VACUUM FLUCTUATIONS IN QUANTUM GRAVITY***.

[12] **gr-qc/0009036** v1 12 Sep 2000 ***INERTIAL MASS AND THE QUANTUM VACUUM FIELDS***.

[13] **gr-qc/0011030** v1 9 Nov 2000 ***THE DIPOLAR ZERO-MODES OF EINSTEIN ACTION: AN INFORMAL SUMMARY WITH SOME NEW ISSUES***.

[14] **gr-qc/0108026** v1 9 Aug 2001 ***GRAVITY AND THE QUANTUM VACUUM INERTIA HYPOTHESES I. FORMALIZED GROUNDWORK FOR EXTENSION TO GRAVITY***.

[15] **gr-qc/0209016** v1 5 Sep 2002 ***UPDATE ON AN ELECTROMAGNETIC BASIS FOR INERTIA, GRAVITATION, THE PRINCIPLE OF EQUIVALENCE, SPIN AND PARTICLE MASS RATIOS***.

[16] **physics/0205086** v3 9 May 2003 ***CONNECTIVITY AND THE ORIGIN OF INERTIA***.

[17] **ZP, ZPE, ZPF**.

[18] **NASA Contracts: NASW-5050, NASA/CP–1999-208694, NAS8-98109, Air Force Rocket Propulsion Laboratory Contract F04611-83-C-0013, US Patent# 5,188,090, US Patent# 5,590,031.**

Spacetime & Substance
International Physical Journal

INFORMATION FOR AUTHORS

The Editorial Council accepts the manuscripts for the publication only in an electronic variant in the format for LATEX 2.09. They should be completely prepared for the publication. The manuscripts are accepted by e-mail or on diskettes (3.5"). The manuscripts can be adopted in other view only for familiarization.

The original manuscripts should be preferably no longer then 6 pages. They should contain no more than 4 figures. Length of the manuscript can be up to 10 pages only in exclusive cases (at arguing problems of primary importance). If the length of the manuscript exceeds 10 pages, it should be divided by the author into two or more papers, each of which should contain all pieces of a separate paper (title, authors, abstracts, text, references etc.). The Editorial Council accepts for the publication the brief reports too.

The payment for the publication of the manuscripts is not done. Each author gets the electronic version of that Journal edition, in which his paper was published free of charge.

An E-mail message acknowledging the receipt of the manuscript will be sent to the corresponding author within two working days after the manuscript receipt. If a message is not received please contact *krasnoh@iop.kiev.ua* to inquire about the manuscripts.

The Style File and Instructions for its use can be found at http://spacetime.narod.ru (sample.zip, 19 kb).

An abstract (within 20 lines) must be submitted. This one should be concise and complete regardless of the paper content. Include purpose, methodology, results, and conclusions. References should not be cited in the abstract. The abstract should be suitable for separate publication in an abstract journal and be adequate for indexing.

If the argument of an exponential is complicated or long, "exp" rather than "e" should be used. Awkward fractional composition can be avoided by the proper introduction of negative degrees. Solidus fractions (l/r) should be used, and enough enclosures should be included to avoid ambiguity in the text. According to the accepted convention, parentheses, brackets, and braces are in the order { [( )] }. Displayed equations should be numbered consecutively throughout the paper; the number (in parentheses) should be to the right of the equation.

Figures (black-and-while) should be of minimal size providing clear understanding. Breadth of the figure should not exceed 84 mm or 174 mm (in exclusive cases). Figures should be made out as separate files in the format of *.pcx (300 dpi/inch), *.ps or *.eps (minimum of kb).

Each figure must be cited in numerical order in the text and must have figure legend.

Tables should be typed as authors expect them to look in print. Every table must have a title, and all columns must have headings. Column headings must be arranged so that their relation to the data is clear. Footnotes should be indicated by reference marks [1], [2] etc. or by lowercase letters typed as superiors. Each table must be cited in the text.

The Editorial Council accepts also response on papers, published in the Journal. They should be no more than 1 journal page in length and should not contain figures but only to refer to the already published materials. But they can contain the formulas. The recalls are publishing in section "Discussion."

The list of references may be formed either by first citation in the text, or alphabetically.

Only works cited in the text should be included in the reference list. Personal communications and unpublished data or reports are not included in the reference list; they should be shown parenthetically in the text: (F.S. Jones, unpublished data, 1990).

The title of paper is permissible not to indicate. It is permissible to give only the initial page number of a paper. The format of the reference list is as indicated below.

References

[1] F.W. Stecker, K.J. Frost, *Nature*, **245**, 270 (1973).

[2] V.A. Brumberg, "Relativistic Celestial Mechanics", Nauka, Moskow, 1972 (in Russian).

[3] S.W. Hawking, in: "General Relativity. An Einstein Centenary Sutvey", eds. S.W. Hawking and W. Israel, *Cambr. Univ. Press*, Cambridge, England, 1979.

Read the Journal before sending a manuscript!

Spacetime & Substance Volume 6, No. 2 (27), 2005

CONTENTS

Jozef Šima and Miroslav Súkeník. FAR-INFRARED LOW-TEMPERATURE SPECTRA OF CHEMICAL COMPOUNDS – GRAVITATIONAL EFFECTS **49**

Geetanjali Sethi, Pranav Kumar, Sanjay Pandey & Daksh Lohiya. A CASE FOR NUCLEOSYNTHESIS IN SLOWLY EVOLVING MODELS **53**

Angelo Loinger. ON SERINI'S RELATIVISTIC THEOREM **61**

Frank Boring Fitzgerald. QUANTUM MATRIX REALITY, REAL AND J REACTIVE **64**