Rising of the James Webb Space-Telescope
and its
Fundamental Blindness

The Software (Mathematica 13.0) which belongs to this book can be downloaded at the Download Page: ***https://quantumlight.science***

I thank my Powerful and Wonderful Wife
Lynn-Marie Sadok
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Introduction

Einstein understood “Quantum Mechanics” and “Quantum Field Theory” better than many modern physicist does, because he understood the Deeper Layers in Physics. The fundamental layer in physics, that probability is not the “Foundation of our Universe”. Albert Einstein was much more like Isaac Newton who saw and understood, 300 years ago, through his tiny little telescope the fundamental foundation of the universe better than most modern physicists do. When modern scientists observe the Universe through their powerful “Hubble Space Telescope” and the coming, thousand times more powerful, “James Webb Space Telescope” they can see far into the beginning of the Universe. But they will not see what Isaac Newton saw 300 years ago. They do not see the “Beauty” and the “Harmony” in the Universe. They do not see the Wonderful Equilibrium which holds the Universe together. They do not see the Love who created the Universe.

Looking through their powerful telescopes they are blind and cannot see that the $ 9.7 billion costs of the “James Webb Space Telescope” also could have been used to save millions of people from a starving death.

They do not see that the “James Webb Space Telescope” is already outdated. Because it has been designed for an “Euclidean Space”. A Space in which beams of light propagate according straight lines. And Intensities decrease according the inverse value of the square of the distance. They are not aware of the Gravitational Redshift and the Gravitational Blueshift. “General Relativity” is not enough anymore to understand our Unique Universe.

The “Hubble Constant” Value and specially the deviations in the “Hubble Constant” Value are one of the most fundamental parameters in our universe to understand the fine-structure of our 4-dimensional Space-Time continuum. Recent measurements with the “HST” of the “Hubble Constant” and the measured deviations[Ref. 17] reveal fundamental information of the fine-structure of our 4-dimensional Space-Time continuum. The New Theory about the interaction between “Gravity and Light” offers an easy way to calculate the extra Gravitational “Blueshifts” when a Beam of Light (from a far away

Galaxy) enters our “Milky Way Galaxy” and a second “Blueshift” when the Beam of Light enters the Gravitational Field around the Earth. And additional Gravitational Redshift has been created when a Beam of Light (from a far away Galaxy) leaves the Gravitational Field of the far away Galaxy. All these interactions between Gravity and Light disturbs the accuracy of the, by “HST” measured, “Hubble Constant” Value.

With increasing accuracies the need increases of a “New Theory in Physics” to explain the measured anomalies in the “Hubble Constant” value. Because “General Relativity” is not enough anymore to solve the nowadays problems in physics and specially in astronomy. With increasing accuracies the anomalies in the “Hubble Constant” value only become clearer. To develop a “New Theory in Physics” fundamental corrections have to be made in 2 of the 4 foundations in Physics. Corrections have to be made in Maxwell’s Electrodynamics and Bohr’s Quantum Mechanics.
A fundamental problem in the value of the “Hubble Constant” is that we measure with a very precisely instrument the “HST” which is looking a little bit with “crossed eyes”. Because the galaxies are not really there where “HST” measures it. The intensities are not really that value which the “HST” measures and therefore the distances are differently than the “HST measures and also the redshift is different than which the “HST measures. Because the “HST” has been designed for an Euclidean (linear) universe. And the universe is not Euclidean at all. Gravity is everywhere in the universe and for that reason the universe in not Euclidean. “GR” is not enough, it is not big enough to correct the values for the “HST”.

The impact of the gravitational field around our “Milky Way Galaxy” on the “HST” (Hubble Space Telescope) measurements are nothing compared to the real enormously, gigantic and intense gravitational fields in our Galaxy. With our vey accurate measurements we measure a non existing universe. The real “Non Euclidean” universe is very differently.

“The James Webb Space Telescope” (sometimes called JWST or Webb) is an orbiting infrared observatory that will complement and extend the discoveries of the Hubble Space Telescope, with longer wavelength coverage and greatly improved sensitivity. The longer wavelengths enable Webb to look much closer to the beginning of time and to hunt for the unobserved formation of the first galaxies, as well as to look inside dust clouds where stars and planetary systems are forming today”. The “JWST” will reveal the non Euclidean Universe. And will be a fundamental test for equation (113) as a result of a new kind of physics.

Isaac Newton, James Clerk Maxwell, Niels Bohr and Albert Einstein lived in fundamentally different time frames. Newton in the 16^{th} century, Maxwell in the 18^{th} century, Bohr in the 20^{th} century and Einstein was physically living in the 20^{th} century, but he was his time far ahead and with his concept of a “**curved space-time continuum**” more connected to the 21^{st} century.

Nowadays Physics requires a New Kind of Physics to understand the increasing complexity of the Universe and the observations of a new generation of telescopes like the JWST. Albert Einstein’s genius theory of “General Relativity” is not enough anymore to describe the complex interaction between “Gravity am Light”. Because the Gravity-Light interaction does not only cause a “Relativistic Location Shift” but also a “Relativistic Intensity Shift” and a “Relativistic Frequency Shift”.

In nowadays observations the velocity of Galaxies has been measured by the Doppler Shift. When the “Gravitational Frequency Shift” (according “Extended General Relativity”, equation 113, page 65)) not has been included in the frequency observations, a velocity of the far away Galaxies will be concluded, higher than the speed of light which is impossible. The theory of “Extended General Relativity” explains this effect and according “Extended General Relativity” the “Theory of the Expanding Universe” is very doubtfully. Because the more far away the galaxies are, the more the impact of the Gravitational Frequency Shift will disturb the frequency measurements and result in the wrong interpretations of the measured frequency shift and the related velocity.

The Fundamental Interaction between Gravity and Light

For many physicists, Albert Einstein's Theory of General Relativity is the top of Physics. A whole new concept, based on a flexible Space-Time Continuum. A wonderful New and Original insight in the Origins of Space and Time. But nowadays physics requires more than a fundamental theory about Space and Time.

The Universe is a Unique, Beautiful and Wonderful Interaction between Gravity and Light. Gravity in its most essential form as the Fundamental Power of Confinement and Light in its purest form of Freedom without Boundaries melting together in an amazing process of the creation of matter and anti-matter. A surprisingly effect is, that when scientists look through their Space Telescope, they see images which look very similar with the images, which scientists observe when they look deep into the essential forms of matter like the proton. An amazing world of beauty and harmony becomes visible like it has all been created by one almighty power of creation. One Creator of the Universe. And suddenly we feel like little children being loved by an amazing beauty.

The Mathematical foundation for "Extended General Relativity" is based on a 10-dimensional Space-Time Continuum. To make this "New Theory" accessible for the coming generation of physicists, the "First Years" students in Physics, this book has been written in projections of a 10-Dimensional Space-Time Continuum within a much easier to understand 4-Dimensional Space-Time Continuum. For that reason, this theory will not start with "Einstein's famous Field Equations", but the start will be at a very fundamental and basic concept in Physics. Isaac Newton's 3rd law as a fundament in Classical Mechanics. A fundament that will turn out to be much more powerful and much more insightful than many modern scientists has ever discovered.

To make the theory as much understandable as possible, the book starts with a short comprehension of the theory. Followed by 2 chapters with increasing background information.

1 The Fundamental corrections in "Maxwell's Theory of Electrodynamics" to build a framework for "Extended General Relativity"

To describe the interaction between "Gravity" and "Light", the Inertia (Mass) of Light has to be included within the Fundamental Electromagnetic Field Equations, which Describe Classical Electrodynamics. Maxwell's Equations do not include an Inertia Term for Light. For that reason a new "Fundamental Electromagnetic Equation" has to be developed to describe the Electromagnetic field (including Inertia and Electromagnetic Interaction) in a different and more complete way than Maxwell did (Einstein called Maxwell the greatest physicist of his century). To develop a new electromagnetic theory, it is necessary to go back to the time of Isaac Newton, who published in 1687 in the "Philosophiae Naturalis Principia Mathematica" a Universal Fundamental Principle in Physics. "**The Fundamental Principle of Harmony in the Whole Universe**" based on his religious and mathematical understanding of the "**Creator of the Universe**". Newton expressed this "**Harmony**" in the foundation of a "**Universal Equilibrium**" and he expressed the "**Universal Equilibrium**" in his **third Law** on which all Physics (till now) has been built.

1.1 Newton's approach to Electrodynamics and Electromagnetic Interaction based on Newtonian Physics.

Newton found the concept of "Universal Equilibrium" which he formulated in his famous third equation Action = - Reaction. In nowadays math the concept of "**Universal Equilibrium**" has been formulated as:

$$\sum_{i=0}^{i=n} \overline{\mathrm{F}_{\mathrm{i}}} = 0 \qquad (1)$$

Because the Inertia Force is a Reaction Force, the Inertia Force appears in the equation with a minus sign.

$$\sum_{i=0}^{i=n} \overline{F_i} \text{ - } m\,\overline{a} = 0 \qquad (2)$$

Equation (2) is a general presentation of Newton's famous second law of motion. In a fundamental way, Newton's second law of motion describes the required electromagnetic equation for the Gravitational-Electromagnetic Interaction in general terms, including Maxwell's theory of Electrodynamics published in 1865 in the article: "A Dynamic Theory of the Electromagnetic Field" and Einstein's theory of General Relativity published in 1911 the article: "On the Influence of Gravitation on the Propagation of Light".

Because Maxwell's 4 equations are not part of one whole uniform understanding of the universe like the fundamental equation of Newton's second law of motion represents, Maxwell's theory is missing the fundamental foundation.

Newton's second law of motion has been based on a profound understanding of the universe which is based on the fundamental principle of "**Harmony and Equilibrium**", expressed in equation (2).

To realize the new "Gravitational-Electromagnetic Equation", Newton's second law of motion will be the Universal Concept in Physics on which "**Quantum Light Theory**" will be built. The fundamental Electromagnetic force density equation has been based integral on Newton's second law of motion and has been divided into 5 separate terms (B-1 until B-5), each one describing a part of the electromagnetic and inertia force densities.

$$\sum_{i=0}^{i=5} B_i = 0 \qquad (3)$$

The first term B-1 represents the inertia of the mass density of light (Electromagnetic Radiation). The terms B-2 and B-3 represent the electric force densities within the Electromagnetic Radiation (Beam of Light) and the terms B-4 and B-5 represent the magnetic force densities within the Electromagnetic Radiation (Beam of Light).

Fundamental in the “Quantum Light Theory” is the outcome of (3) which always has to be zero according Newton’s fundamental principle of “Universal Equilibrium”.

To apply the concept of “Universal Equilibrium” within an electromagnetic field, the electric forces $F_{Electric}$, the magnetic forces $F_{Magnetic}$ and the inertia forces will be presented separately in equation (3):

$$\sum_{i=0,j=0}^{i=n,j=m} \left(\overline{F_{\text{Electric-i}}} + \overline{F_{Magnetic-j}} - m\,\overline{a} \right) = 0 \qquad (4)$$

1.2 The First Term in “Extended General Relativity” (Term B-1)

Albert Einstein’s “General Relativity” describes the interaction between “Gravity and Light”. It is impossible to build a framework for the interaction between “Gravity and Light” without describing the inertia (mass) of light. Because there can only be interaction between gravity and inertia (mass). Without inertia (mass) there will be no interaction with gravity. The mass of light is very different than the mass of objects we usually describe. The mass (inertia) of objects is always omni-directional. It does not matter in what for a position we put a mass on a scale. The weight (interaction) between gravity and the object will always be the same.

That is not the fact for light. A spherical beam of light has no mass. The mass (inertia) will occur when the electromagnetic energy density in the light changes. At the edges of “Light” and “No Light”, the interaction between gravity and light will take place. For a LASER beam the interaction between gravity and light will take place at the edges of the LASER beam. For that reason a LASER beam will be deflected by a gravitational field when it pass a large mass. But when a LASER beam propagates towards (or away from) a Back Hole, the speed of light will not change because there is no interaction.

The result of interaction is a “Force”. When a beam of light propagates towards the Earth and will be (partly absorbed and partly reflected), the

Electromagnetic Energy Flux changes in direction (partly becomes zero, and has been absorbed) and Newton's effect of "F = m a" becomes noticeable in a radiation pressure e.g. on the Earth of a few ton.

Reducing Equation (2) to one single Force $\overline{F}$, equation (2) will be written in the well-known presentation:

$$\overline{F} = m\,\overline{a} \tag{5}$$

The right and the left term of Newton's law of motion in equation (5) has to be divided by the Volume "V" to find an equation for the force density $\overline{f}$ related to the mass density "ρ".

$$\begin{aligned} \overline{F} &= m\,\overline{a} \\ \left(\frac{\overline{F}}{V}\right) &= \left(\frac{m}{V}\right)\overline{a} \\ \overline{f} &= \rho\,\overline{a} \end{aligned} \tag{6}$$

The Inertia Force $\overline{F_{Inertia}}$ for Electromagnetic Radiation will be derived from Newton's second law of motion, using the relationship between the momentum vector $\overline{p}$ for radiation expressed by the Poynting vector $\overline{S}$:

$$\overline{F_{INERTIA}} = -\,m\,\overline{a} = -\,m\frac{\Delta\,\overline{v}}{\Delta\,t} = -\,\frac{\Delta\left(m\overline{v}\right)}{\Delta\,t} = -\,\frac{\Delta\,\overline{p}}{\Delta\,t} = -\left(\frac{V}{c^2}\right)\frac{\Delta\overline{S}}{\Delta t} \tag{7}$$

Dividing the right and the left term in equation (7) by the volume V results in the inertia force density $\overline{f_{Inertia}}$:

$$\overline{F_{INERTIA}} = -m\,\bar{a} = -m\frac{\Delta\bar{v}}{\Delta t} = -\frac{\Delta\left(m\bar{v}\right)}{\Delta t} = -\frac{\Delta\bar{p}}{\Delta t} = -\left(\frac{V}{c^2}\right)\frac{\Delta\bar{S}}{\Delta t}$$

$$\frac{\overline{F_{INERTIA}}}{V} = -\frac{m}{V}\bar{a} = -\frac{m}{V}\frac{\Delta\bar{v}}{\Delta t} = -\frac{1}{V}\frac{\Delta\bar{p}}{\Delta t} = -\left(\frac{1}{c^2}\right)\frac{\Delta\bar{S}}{\Delta t} \qquad (8)$$

$$\overline{f_{INERTIA}} = -\rho\,\bar{a} = -\left(\frac{1}{c^2}\right)\frac{\Delta\bar{S}}{\Delta t}\ \left[N/m^3\right]$$

The Poynting vector $\bar{S}$ represents the total energy transport of the electromagnetic radiation per unit surface per unit time [J / m^2 s]. Which can be written as the cross product of the Electric Field intensity $\bar{E}$ and the magnetic Field intensity $\bar{H}$.

$$\overline{f_{INERTIA}} = -\rho a = -\left(\frac{1}{c^2}\right)\frac{\Delta S}{\Delta t} = -\left(\frac{1}{c^2}\right)\frac{\Delta\left(\bar{E}\times\bar{H}\right)}{\Delta t}\left[N/m^3\right]$$

$$\overline{f_{INERTIA}} = -\left(\frac{1}{c^2}\right)\frac{\partial\left(\bar{E}\times\bar{H}\right)}{\partial t}\ \left[N/m^3\right] \qquad (9)$$

1.3 Coulomb's Law (Colomb Force) for Electromagnetic GEONs (Term B-2 and B-4)

An example of the Coulomb Force is the Electric Force $F_{Coulomb}$ acting on an electric charge Q placed in an electric field E. The equation for the Coulomb Force equals:

$$\overline{F_{Coulomb}} = \bar{E}\,Q\quad [N] \qquad (10)$$

Dividing the right and the left term in equation (10) by the volume V results in the Electric force density $\overline{f_{Coulomb}}$:

$$\bar{F}_{COULOMB} = \bar{E}\,Q\quad [N]$$

$$\frac{\bar{F}_{COULOMB}}{V} = \bar{E}\,\frac{Q}{V}\ \left[N/m^3\right] \qquad (11)$$

$$\bar{f}_{COULOMB} = \bar{E}\,\rho_E\ \left[N/m^3\right]$$

Substituting Gauss's law in differential form in (11) results in Coulombs Law for Electromagnetic Radiation for the Electric force density $\overline{f_{\text{Coulomb}}}$:

$$\begin{aligned} \overline{f}_{\text{COULOMB}} &= \overline{E}\ \rho_E \\ \overline{f}_{\text{COULOMB}} &= \overline{E}\ \rho_E = \overline{E}\ \left(\nabla \cdot \overline{D}\right) \\ \overline{f}_{\text{COULOMB}} &= \overline{E}\ \left(\nabla \cdot D\right) = \varepsilon\ \overline{E}\ \left(\nabla \cdot \overline{E}\right)\ \left[N/\ m^3\right] \end{aligned} \qquad (12)$$

In Electromagnetic Field Configurations, there is in general no preference for the electric force densities or the magnetic force densities. In general the equations for the electric field densities are universally exchangeable with the magnetic field densities.

For the magnetic field densities, equation (12) can be written as:

$$\begin{aligned} \overline{f}_{\text{Coulomb - Electric}} &= \overline{E}\left(\nabla.\ \overline{D}\right) = \varepsilon\ \overline{E}\ \left(\nabla.\ \overline{E}\right)\ \left[N/\ m^3\right]\ \text{(Term B-2)} \\ \overline{f}_{\text{Coulomb - Magnetic}} &= \overline{H}\left(\nabla.\ \overline{B}\right) = \mu\ \overline{H}\ \left(\nabla.\ \overline{H}\right)\ \left[N/\ m^3\right]\ \text{(Term B-4)} \end{aligned} \qquad (13)$$

1.4 Lorentz's Law (Lorentz Force) for Electromagnetic GEONs (Term B-3 and B-5)

An example of the Lorentz Force is the Magnetic Force F_{Lorentz} acting on an electric charge Q moving with a velocity v within a magnetic field with magnetic field intensity B (magnetic induction).

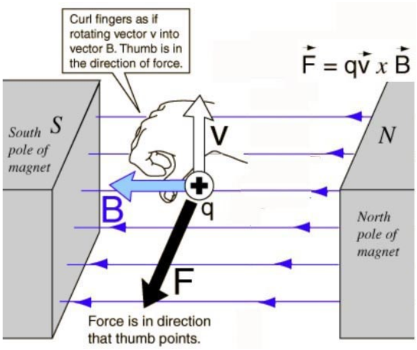

Fig. 1. The Lorentz Force equals the cross product of the Magnetic Induction B and the velocity v of the charge q moving within the magnetic field times the value of the electric charge

The equation for the Lorentz Force equals:

$$\overline{F}_{LORENTZ} = Q\,\overline{v} \times \overline{B} \quad [N] \tag{14}$$

Dividing the right and the left term in equation (14) by the volume V results in the Lorentz force density $\overline{f_{Lorentz}}$

$$\begin{aligned} \overline{F}_{LORENTZ} &= Q\,\overline{v} \times \overline{B} \quad [N] \\ \frac{\overline{F}_{LORENTZ}}{V} &= -\,\overline{B} \times \frac{Q\,\overline{v}}{V} \quad \left[N/\,m^3\right] \\ \overline{f}_{LORENTZ} &= -\,\overline{B} \times \frac{Q\,\overline{v}}{V} = -\,\overline{B} \times \overline{j} = -\,\mu\,\overline{H} \times \overline{j} \quad \left[N/\,m^3\right] \end{aligned} \tag{15}$$

In which q is the electric charge, v the velocity of the electric charge, B the magnetic induction and j the electric current density. Substituting Ampère's law in differential form in (15) results in Lorentz's Law for Electromagnetic Radiation for the Electric force density $\overline{f_{Lorentz}}$:

$$\begin{aligned} \overline{f}_{LORENTZ} &= -\,\mu\,\overline{H} \times \left(\overline{j}\right) \\ \overline{f}_{LORENTZ} &= -\,\mu\,\overline{H} \times \left(\overline{j}\right) = -\,\mu\,\overline{H} \times \left(\nabla \times \overline{H}\right) \quad \left[N/\,m^3\right] \end{aligned} \tag{16}$$

In Electromagnetic Field Configurations, there is in general no preference for the electric force densities or the magnetic force densities. In general the equations for the electric field densities are universally exchangeable with the magnetic field densities. For the electric field densities, equation (16) can be written as:

$$\begin{aligned} \bar{f}_{\text{Coulomb - Electric}} &= -\,\varepsilon\, \bar{E} \times \left(\nabla \times \bar{E}\right)\left[\mathrm{N/\,m^3}\right] \text{ (Term B-3)} \\ \bar{f}_{\text{Coulomb - Magnetic}} &= -\,\mu\, \bar{\mathrm{H}} \times \left(\nabla \times \bar{\mathrm{H}}\right)\left[\mathrm{N/\,m^3}\right] \text{(Term B-5)} \end{aligned} \tag{17}$$

1.5 The Universal Equation for the Electromagnetic field (Term B-1 + Term B-2 + Term B-3 + Term B-4 + Term B-5)

Newton's second law of motion applied within any arbitrary electromagnetic field configuration results in the fundamental equation (23) for any arbitrary electromagnetic field configuration (a beam of light):

$$\text{NEWTON: } F_{TOTAAL} = m\,a \text{ represents: } f_{TOTAAL} = \rho\,a$$

$$\begin{aligned}
-\rho\,a &+ f_{TOTAAL} = 0 \\
-\rho\,a &+ f_{ELEKTRISCH} + f_{MAGNETISCH} = 0 \\
-\rho\,a &+ F_{COULOMB} + F_{LORENTZ} + F_{COULOMB} + F_{LORENTZ} = 0 \\
-\frac{1}{c^2}\frac{\partial(\overline{E}\times\overline{H})}{\partial t} &+ \varepsilon_0\,\overline{E}(\nabla.\overline{E}) - \varepsilon_0\,\overline{E}\times(\nabla\times\overline{E}) + \mu_0\,\overline{H}(\nabla.\overline{H}) - \mu_0\,\overline{H}\times(\nabla\times\overline{H}) = 0
\end{aligned} \tag{18}$$

B-1 B-2 B-3 B-4 B-5

Term B-4 is the magnetic equivalent of the (electric) Coulomb's law B-2 and Term B-3 is the electric equivalent of the (magnetic) Lorentz's law B-5.

The universal equation for the electromagnetic field (free electromagnetic waves and confined electromagnetic fields) has been presented in (24) and expresses the perfect equilibrium between the inertia forces (B-1), the electric forces (B-2 and B-3) and the magnetic forces (B-4 and B-5) in any arbitrary electromagnetic field configuration.

$$-\frac{1}{c^2}\frac{\partial(\overline{E}\times\overline{H})}{\partial t} + \varepsilon_0\,\overline{E}(\nabla.\overline{E}) - \varepsilon_0\,\overline{E}\times(\nabla\times\overline{E}) + \mu_0\,\overline{H}(\nabla.\overline{H}) - \mu_0\,\overline{H}\times(\nabla\times\overline{H}) = 0 \tag{19}$$

B-1 B-2 B-3 B-4 B-5

1.6 The Universal Integration of Maxwell's Theory of Electrodynamics:

The universal equation (19) for any arbitrary electromagnetic field configuration can be written in the form:

$$- \frac{1}{c^2}\frac{\partial(\overline{E}\times\overline{H})}{\partial t} + \varepsilon_0\,\overline{E}(\nabla.\overline{E}) - \varepsilon_0\overline{E}\times(\nabla\times\overline{E}) + \mu_0\overline{H}(\nabla.\overline{H}) - \mu_0\overline{H}\times(\nabla\times\overline{H}) = 0$$

$$-\varepsilon_0\mu_0\left(\overline{E}\times\frac{\partial(\overline{H})}{\partial t} + \overline{H}\times\frac{\partial(\overline{E})}{\partial t}\right) + \varepsilon_0\overline{E}(\nabla.\overline{E}) - \varepsilon_0\overline{E}\times(\nabla\times\overline{E}) + \mu_0\overline{H}(\nabla.\overline{H}) - \mu_0\overline{H}\times(\nabla\times\overline{H}) = 0 \qquad (20)$$

$$-\left(\varepsilon_0\overline{E}\times\frac{\partial(\overline{B})}{\partial t} + \mu_0\overline{H}\times\frac{\partial(\overline{D})}{\partial t}\right) + \overline{E}(\nabla.\overline{D}) - \varepsilon_0\overline{E}\times(\nabla\times\overline{E}) + \overline{H}(\nabla.\overline{B}) - \mu_0\overline{H}\times(\nabla\times\overline{H}) = 0$$

M-3 M-4 M-1 M-3 M-2 M-4

The Maxwell Equations are presented in (21):

$$\nabla.\overline{D} = \rho \quad \text{(M-1)} \qquad \nabla\times\overline{E} = -\frac{\partial B}{\partial t} \quad \text{(M-3)} \qquad (21)$$

$$\nabla.\overline{B} = 0 \quad \text{(M-2)} \qquad \nabla\times\overline{H} = \frac{\partial D}{\partial t} \quad \text{(M-4)}$$

In vacuum in the absence of any charge density, it follows from (26) that all the solutions for the Maxwell's Equations are also solutions for the separate parts of the Universal Equation (25) for the Electromagnetic field.

Universal Equation for the Electromagnetic Field.

$$-\left(\varepsilon_0\overline{E}\times\frac{\partial(\overline{B})}{\partial t} + \mu_0\overline{H}\times\frac{\partial(\overline{D})}{\partial t}\right) + \overline{E}(\nabla.\overline{D}) - \varepsilon_0\overline{E}\times(\nabla\times\overline{E}) + \overline{H}(\nabla.\overline{B}) - \mu_0\overline{H}\times(\nabla\times\overline{H}) = 0$$

M-3 M-4 M-1 M-3 M-2 M-4

4 Maxwell's Equations (22)

$$\nabla.\overline{D} = \rho \quad \text{(M-1)} \qquad \nabla\times\overline{E} = -\frac{\partial B}{\partial t} \quad \text{(M-3)}$$

$$\nabla.\overline{B} = 0 \quad \text{(M-2)} \qquad \nabla\times\overline{H} = \frac{\partial D}{\partial t} \quad \text{(M-4)}$$

Comparing the 4 Maxwell Equations (26) with the Universal Equation (24) we conclude that the 4 Maxwell equations show only the 4 parts of the Universal Dynamic Equilibrium in 4 separate terms and the 4 Maxwell equations are missing the fundamental term for inertia. For that reason it is impossible to calculate the interaction between light and gravity with the 4 Maxwell equations. To find the interaction terms between light and gravity the inertia term (B-1 in 24) is necessary.

2 The Fundamental Corrections in Bohr's Theory of "Quantum Physics"

The physical concept of quantum mechanical probability waves has been created during the famous 1927 5th Solvay Conference. During that period there were several circumstances which came just together and made it possible to create a unique idea of "**Material Waves**" (Solutions of Schödinger's wave equation) being complex (partly real and partly imaginary) and describing the probability of the appearance of a physical object (elementary particle) generally indicated as "**Quantum Mechanical Probability Waves**".

2.1 Newton's approach to the Fundamental Concept of Probability based on Newtonian Physics.

Newton's second law can be interpreted as the law of "Conservation of Energy". For an Electromagnetic Field the law of conservation of Energy has been expressed as:

$$\nabla . \bar{S} + \frac{\partial w}{\partial t} = 0 \qquad (23)$$

From the equation for the "Conservation of Electromagnetic Energy" the Relativistic Quantum Mechanical "Dirac" equation will be derived which can be considered to be the relativistic version of the Quantum Mechanical Schrodinger wave equation.

2.2 The fundamental concept of Probability

The idea of complex (probability) waves is directly related to the concept of confined (standing) waves. Characteristic for any standing wave is the fact that the velocity and the pressure (electric field and magnetic field) are always shifted over 90 degrees. The same principle does exist for the standing (confined) electromagnetic waves,

For that reason every confined (standing) Electromagnetic wave can be described by a complex sum vector $\bar{\phi}$ of the Electric Field Vector $\bar{E}$ and the Magnetic Field Vector $\bar{B}$ ($\bar{E}$ has 90 degrees phase shift compared to $\bar{B}$).

The vector functions $\bar{\phi}$ and the complex conjugated vector function $\bar{\phi}^*$ will be written as:

$$\bar{\phi} = \frac{1}{\sqrt{2\,\mu}}\left(\bar{\mathrm{B}} + \mathrm{i}\,\frac{\bar{\mathrm{E}}}{c}\right) \tag{24}$$

$\bar{\mathrm{B}}$ equals the magnetic induction, $\bar{\mathrm{E}}$ the electric field intensity ($\bar{\mathrm{E}}$ has + 90 degrees phase shift compared to $\bar{\mathrm{B}}$) and c the speed of light.

The complex conjugated vector function equals:

$$\overline{\phi^*} = \frac{1}{\sqrt{2\,\mu}}\left(\bar{\mathrm{B}} - \mathrm{i}\,\frac{\bar{\mathrm{E}}}{c}\right) \tag{25}$$

The dot product equals the electromagnetic energy density w:

$$\bar{\phi}\,.\,\overline{\phi^*} = \frac{1}{2\,\mu}\left(\bar{\mathrm{B}} + \mathrm{i}\,\frac{\bar{\mathrm{E}}}{c}\right).\left(\bar{\mathrm{B}} - \mathrm{i}\,\frac{\bar{\mathrm{E}}}{c}\right) = \frac{1}{2}\,\mu\,\mathrm{H}^2 + \frac{1}{2}\,\varepsilon\,\mathrm{E}^2 = \mathrm{w} \tag{26}$$

Using Einstein's equation W = m c^2 ,the dot product equals the electromagnetic mass density w

$$\bar{\phi}\,.\,\overline{\phi^*}\frac{1}{\mathrm{c}^2} = \frac{\varepsilon}{2}\left(\bar{\mathrm{B}} + \mathrm{i}\,\frac{\bar{\mathrm{E}}}{c}\right).\left(\bar{\mathrm{B}} - \mathrm{i}\,\frac{\bar{\mathrm{E}}}{c}\right) = \frac{1}{2}\varepsilon\,\mu^2\mathrm{H}^2 + \frac{1}{2}\varepsilon^2\mathrm{E}^2 = \rho\ [\mathrm{kg/m^3}] \tag{27}$$

The cross product is proportional to the Poynting vector (Ref. 3, page 202, equation 15).

$$\bar{\phi} \times \overline{\phi^*} = \frac{1}{2\,\mu}\left(\bar{\mathrm{B}} + \mathrm{i}\,\frac{\bar{\mathrm{E}}}{c}\right) \times \left(\bar{\mathrm{B}} - \mathrm{i}\,\frac{\bar{\mathrm{E}}}{c}\right) = \mathrm{i}\sqrt{\varepsilon\,\mu}\;\bar{\mathrm{E}} \times \bar{\mathrm{H}} = \mathrm{i}\sqrt{\varepsilon\,\mu}\;\bar{\mathrm{S}} \tag{28}$$

Newton's second law of motion has been described in 3 spatial dimensions, resulting in the fundamental equation for the electromagnetic field.

3-Dimensional Space Domain

$$\begin{pmatrix} x_3 \\ x_2 \\ x_1 \end{pmatrix} \begin{array}{l} \quad\quad \overset{\text{B-1}}{-\frac{1}{c^2}\frac{\partial(\bar{E}\times\bar{H})}{\partial t}} + \overset{\text{B-2}}{\varepsilon_0\,\bar{E}\,(\nabla\,.\,\bar{E})} - \overset{\text{B-3}}{\varepsilon_0\,\bar{E}\times(\nabla\times\bar{E})} + \\ + \underset{\text{}}{\overset{\text{B-4}}{\mu_0\,\bar{H}\,(\nabla\,.\,\bar{H})}} - \overset{\text{B-5}}{\mu_0\,\bar{H}\times(\nabla\times\bar{H})} + \overset{\text{B-6}}{\frac{1}{2}\left(\varepsilon^2\mu\left(\bar{E}\bullet\bar{E}\right)+\varepsilon\,\mu^2\left(\bar{H}\bullet\bar{H}\right)\right)\bar{g}} = \bar{0} \end{array} \quad (29)$$

The formal mathematical way to describe the force density results from the 4-dimensional divergence of the 4-dimensional energy momentum tensor, resulting in a 4-dimensional Force vector. Dividing the 4-dimensional Force vector by the Volume results in the 4-dimensional force density vector.

The 4-dimensional Electromagnetic Vector Potential has been defined by:

$$\bar{\varphi}^4 = \begin{pmatrix} \varphi_4 \\ \varphi_3 \\ \varphi_2 \\ \varphi_1 \end{pmatrix} \xrightarrow{\text{CartesianCoordinateSystem}} \begin{pmatrix} \varphi_t \\ \varphi_z \\ \varphi_y \\ \varphi_x \end{pmatrix} \quad (30)$$

In which the term φ_a represents the 4-dimensional electromagnetic vector potential in the “a” direction while the indice “a” varies from 1 to 4. In a cartesian coordinate system the indices are chosen varying from the x,y,z and t direction. In which the indice “t” represents the time direction which has been considered to be the 4th dimension. The 4-dimensional Electromagnetic “Maxwell Tensor” has been defined by:

$$F_{ab} = \partial_b\,\varphi_a - \partial_a\,\varphi_b \quad (31)$$

Where the indices “a” and “b” vary from 1 to 4.

The 4-dimensional Electromagnetic “Energy Momentum Tensor” has been defined by:

$$T^{ab} = \frac{1}{\mu_0}\left[F_{ac} F^{cb} + \frac{1}{4}\delta_{ab} F_{cd} F^{cd} \right] \tag{32}$$

The 4-dimensional divergence of the 4-dimensional Energy Momentum Tensor equals the 4-dimensional Force Density 4-vector f^a :

$$f^a = \partial_b \, \mathrm{T}^{ab} \tag{33}$$

Substituting the electromagnetic values for the electric field intensity "E" and the magnetic field intensity "H" in (71) results in the 4-dimensional representation of Newton's second law of motion:

Energy-Time Domain

B-7

$$(f_4) \qquad \nabla \cdot (\bar{\mathrm{E}} \times \bar{\mathrm{H}}) + \frac{1}{2}\frac{\partial\left(\varepsilon_0 \left(\bar{\mathrm{E}} \cdot \bar{\mathrm{E}}\right) + \mu_0 \left(\bar{\mathrm{H}} \cdot \bar{\mathrm{H}}\right)\right)}{\partial t} = 0$$

3-Dimensional Space Domain (34)

B-1 B-2 B-3

$$\begin{pmatrix} f_3 \\ f_2 \\ f_1 \end{pmatrix} \quad - \frac{1}{c^2}\frac{\partial\, (\bar{\mathrm{E}} \times \bar{\mathrm{H}})}{\partial t} + \varepsilon_0\, \bar{\mathrm{E}}\, (\nabla \cdot \bar{\mathrm{E}}) - \varepsilon_0\, \bar{\mathrm{E}} \times (\nabla \times \bar{\mathrm{E}}) +$$

B-4 B-5

$$+ \mu_0\, \bar{\mathrm{H}}\, (\nabla \cdot \bar{\mathrm{H}}) - \mu_0\, \bar{\mathrm{H}} \times (\nabla \times \bar{\mathrm{H}}) = \bar{0}$$

In which f_1 , f_2 , f_3, represent the force densities in the 3 spatial dimensions and f_4 represent the force density (energy flow) in the time dimension (4th dimension). Equation (42) can be written as:

The 4th term in equation (42) can be written in the terms of the Poynting vector "S" and the energy density "w" representing the electromagnetic law for the conservation of energy (Newton's second law of motion).

Energy-Time Domain

Inner Energy

B-7

$$\left(f_4\right) \qquad \nabla . \bar{S} + \frac{\partial w}{\partial t} = 0 \qquad (35.1)$$

(35)

3-Dimensional Space Domain

B-1 B-2 B-3

$$\begin{pmatrix} f_3 \\ f_2 \\ f_1 \end{pmatrix} \qquad - \frac{1}{c^2} \frac{\partial\, (\overline{E} \times \overline{H})}{\partial t} + \varepsilon_0\, \overline{E}\, (\nabla . \overline{E}) - \varepsilon_0\, \overline{E} \times (\nabla \times \overline{E}) +$$

B-4 B-5

$$+ \mu_0\, \overline{H}\, (\nabla . \overline{H}) - \mu_0\, \overline{H} \times (\nabla \times \overline{H}) = \bar{0} \qquad (35.2)$$

2.3 The 4-Dimensional Relativistic Quantum Mechanical Dirac Equation

Substituting (27) and (28) in Equation (35.1) results in The 4-Dimensional Equilibrium Equation (36):

$$(x_4) \quad - \frac{i}{\sqrt{\varepsilon_0\, \mu_0}} \nabla \cdot (\bar{\phi} \times \bar{\phi}) \quad = \; - \frac{\partial \bar{\phi} \cdot \bar{\phi}^*}{\partial t} \qquad (36.1)$$

$$\begin{pmatrix} x_3 \\ x_2 \\ x_1 \end{pmatrix} \quad - \frac{1}{c^2} \frac{\partial\, (\bar{E} \times \bar{H})}{\partial t} + \varepsilon_0\, \bar{E}\, (\nabla \cdot \bar{E}) - \varepsilon_0\, \bar{E} \times (\nabla \times \bar{E}) + \mu_0\, \bar{H}\, (\nabla \cdot \bar{H}) - \mu_0\, \bar{H} \times (\nabla \times \bar{H}) = \bar{0} \qquad (36.2)$$

(36)

To transform the electromagnetic vector wave function $\bar{\phi}$ into a scalar (spinor or one-dimensional matrix representation), the Pauli spin matrices σ and the following matrices (Ref. 3 page 213, equation 99) are introduced:

$$\bar{\alpha} = \begin{bmatrix} 0 & \sigma \\ \sigma & 0 \end{bmatrix} \quad \text{and} \quad \bar{\beta} = \begin{bmatrix} \delta_{ab} & 0 \\ 0 & -\delta_{ab} \end{bmatrix} \qquad (37)$$

Then equation (44) can be written as the 4-Dimensional Hyperspace Equilibrium Dirac Equation:

$$(x_4) \quad \left(\frac{i\, m\, c}{h} \bar{\beta} + \bar{\alpha} \cdot \nabla \right) \psi \quad = - \frac{1}{c} \frac{\partial \psi}{\partial t} \qquad (38.1)$$

$$\begin{pmatrix} x_3 \\ x_2 \\ x_1 \end{pmatrix} \quad - \frac{1}{c^2} \frac{\partial\, (\bar{E} \times \bar{H})}{\partial t} + \varepsilon_0\, \bar{E}\, (\nabla \cdot \bar{E}) - \varepsilon_0\, \bar{E} \times (\nabla \times \bar{E}) + \mu_0\, \bar{H}\, (\nabla \cdot \bar{H}) - \mu_0\, \bar{H} \times (\nabla \times \bar{H}) = \bar{0} \qquad (38.2)$$

(38)

The fourth term (x_4) equals the relativistic Dirac equation (38.1) which equals equation (102) page 213 in Ref.3.

Equation (38.1) represents the relativistic quantum mechanical Dirac Equation where ψ represents the quantum mechanical probability wave function. The mathematical evidence for the equivalent for (38.1) has been published in 1995 in the article: "A Continuous Model of Matter based on AEONs". Equation (1) page 201 to Equation (102) page 213. (Doi: 10.31219/osf.io/ra7ng)

The Electromagnetic Law for the conservation of Energy (35.1) and the Relativistic Dirac Equation (38.1) are **identical** but written in a different form.

The law of conservation of Electromagnetic Energy can be written in an electromagnetic form (39.1) or in an identical way in a quantum mechanical form (39.2):

Energy-Time Domain

Inner Energy

B-7

$$(f_4) \qquad \nabla \cdot (\bar{\phi} \times \bar{\phi}) = - \frac{i}{c} \frac{\partial \bar{\phi} \cdot \bar{\phi}^*}{\partial t} \qquad (39.1)$$

(39)

$$(x_4) \qquad \left(\frac{i\,m\,c}{h} \bar{\beta} + \bar{\alpha} \cdot \nabla \right) \psi = - \frac{1}{c} \frac{\partial \psi}{\partial t} \qquad (39.2)$$

The weakness in the Quantum Mechanical Relativistic Dirac Equation (39.2) is that the Dirac Equation is a 1-dimensional equation which will never be able to describe the 4-dimensional real physical world. While 39.1 represents a ElectromagneticVector Equation.

From the equations (27) and (28) follows the 4-Dimensional Vector-Dirac equation (40). This equation is a 4-dimensional vector equation and is coherent with the 4-dimensional physical reality.

$$(x_4) \qquad \nabla \cdot (\bar{\phi} \times \bar{\phi}) = - \frac{i}{c} \frac{\partial \bar{\phi} \cdot \bar{\phi}^*}{\partial t}$$

(40)

$$\begin{pmatrix} x_3 \\ x_2 \\ x_1 \end{pmatrix} \quad \frac{i}{c} \frac{\partial\, (\bar{\phi} \times \bar{\phi}^*)}{\partial t} - \left(\bar{\phi} \times (\nabla \times \bar{\phi}^*) + \bar{\phi}^* \times (\nabla \times \bar{\phi}) \right) + \left(\bar{\phi}\ (\nabla \cdot \bar{\phi}^*) + \bar{\phi}^*\ (\nabla \cdot \bar{\phi}) \right) = 0$$

In which the Quantum Mechanical Complex Probability Vector Function $\overline{\phi}$ and the complex conjugated vector function $\overline{\phi *}$ equals:

$$\begin{aligned} \overline{\phi} &= \overline{B} + \frac{i}{c}\overline{E} = \mu\,\overline{H} + \frac{i}{c}\overline{E} \\ \overline{\phi *} &= \overline{B} - \frac{i}{c}\overline{E} = \mu\,\overline{H} - \frac{i}{c}\overline{E} \end{aligned} \qquad (41)$$

The 4-Dimensional Dirac equation represents the "Newtonian Perfect Equilibrium" in the 4-Dimensional Space-Time Continuum en has been represented by 4 separate equations. The first one represents the well-known relativistic quantum mechanical Dirac Equation in the Time-Energy domain x_4. The 3 quantum mechanical equations in the space-momentum domain represents the "Newtonian Perfect Equilibrium" for the force densities in the domains (x_1 ,x_2 ,x_3)

$$(x_4) \qquad \nabla \,.\, (\overline{\phi} \times \overline{\phi}) = -\frac{i}{c}\frac{\partial\, \overline{\phi}\,.\,\overline{\phi *}}{\partial t}$$

$$\begin{pmatrix} x_3 \\ x_2 \\ x_1 \end{pmatrix} \quad \underbrace{\frac{i}{c}\frac{\partial\,(\overline{\phi} \times \overline{\phi *})}{\partial t}}_{\text{Newton}} - \underbrace{\left(\overline{\phi} \times (\nabla \times \overline{\phi *}) + \overline{\phi *} \times (\nabla \times \overline{\phi})\right)}_{\text{Lorentz}} + \underbrace{\left(\overline{\phi}\;(\nabla \,.\, \overline{\phi *}) + \overline{\phi *}\;(\nabla \,.\, \overline{\phi})\right)}_{\text{Coulomb}} = 0 \qquad (42)$$

Newtonian Perfect Equilibrium

$$\frac{1}{c^2}\,\overline{\phi}\,.\,\overline{\phi *} = \rho \text{ [kg/m}^3\text{]}$$

These results lead to the conclusion that the results of the experiments, published in 2021 "Operational Resource Theory of Imaginarity " in "Physical Review Letters" present strong evidence for the existence at sub-atomic level of the **electromagnetic GEONs** and the correctness of Wheeler's theory (Equation (50) and (51).

To define the Fundamental Equation for the Interaction between Gravity and Light, an extra term (B-6) has been introduced in equation (29). The term B-6 represents the force density of the gravitational field acting on the electromagnetic mass density.

$$F_{GRAVITY} = m\,\bar{g} \quad [N]$$

Dividing both terms by the Volume V:

$$\frac{F_{GRAVITY}}{V} = \frac{m}{V}\,\bar{g} \quad [N/\,m^3] \tag{43}$$

Results in the force density:

$$f_{GRAVITY} = \rho\,\bar{g} \quad [N/\,m^3]$$

The specific mass “ρ” of a beam of light follows from Einstein’s equation:

$$W = m\,c^2$$

Divinding both terms by the Volume V results in:

$$\frac{W}{V} = \frac{m}{V}\,c^2 \tag{44}$$

which represents the energy density "w" and the specific mass "ρ" of the electromagnetic radiation:

$$w = \rho\,c^2$$

which results for an expression of the specific mass ρ:

$$\rho = \frac{1}{c^2}\,w = \varepsilon\,\mu\,w$$

The energy density “w” follows from the electric and the magnetic field intensities:

$$w = \frac{1}{2}\,\varepsilon\,E^2 + \frac{1}{2}\,\mu\,H^2$$

$$w = \frac{1}{2}\left(\varepsilon\,E^2 + \mu\,H^2\right) = \frac{1}{2}\left(\varepsilon\left(\bar{E}\,.\,\bar{E}\right) + \mu\left(\bar{H}\,.\,\bar{H}\right)\right) \tag{45}$$