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Classical Quantum Hidden Variable Gravitation

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ABSTRACT

Years ago, just by thinking about it, we discovered the rate of a unit clock in a gravitational field $\left(1-\frac{\alpha}{r}\right)^{\frac{1}{2}}$, and after that, that the energy that an energy wave sphere loses, because of the slower clock rate in a gravitational field, becomes its energy of motion. We calculated the radius of a proton energy wave sphere contained in an electron energy wave sphere as $r_p = 4\frac{\hbar}{m_p c}$. We extended the concept of energy wave spheres to imaginary energy wave spheres to explain the change in frequency of an energy wave sphere. The single expression, $\left(1-\frac{\alpha}{r}\right)^{\frac{1}{2}}$, of which we remarked this is what has to be this way, gives us the relationship between the wave velocities of the two types of energy wave spheres. The 1 in this expression for the rate of a unit energy wave sphere clock gives the clock rate squared of a unit energy wave sphere in the local system and $-\frac{\alpha}{r}$ gives the imaginary energy wave velocity function, $d\mathcal{X}_4$, squared of the particle with mass M at radius r, $d\mathcal{X}_4$ being the imaginary energy wave velocity function of the wave in an imaginary energy wave sphere with radius r and wave velocity $ic\left(\frac{\alpha}{r}\right)^{\frac{1}{2}}$. For an energy wave sphere with mass m and radius $r_m = \frac{\hbar}{mc}$ and imaginary energy wave sphere with mass m with radius $\alpha_m = \frac{\kappa m}{4\pi}$ inside that, the velocity, which is i times the absolute velocity of the energy wave sphere, of the wave in the imaginary energy wave sphere starts at 0 for infinite r, and for any $r > \alpha_M$, is equal to $cd\mathcal{X}_4(r) = ic\left(\frac{\alpha_M}{r}\right)^{\frac{1}{2}}$, and for $r = \alpha_M$, equals $d\mathcal{X}_4(\alpha_M) = i$, the imaginary energy wave velocity function $d\mathcal{X}_4(\alpha)$ of the wave of the imaginary energy wave sphere, at radius α of a mass M. It has the same velocity as the wave of the imaginary energy wave sphere, the kernel, at radius α of a mass M. The energy wave sphere is transformed into the imaginary energy wave sphere. For $r > \alpha_M$, we have $0 + d\mathcal{X}_4{}^2(r) = 0^2 - \frac{\alpha_M}{r} = -\frac{\alpha_M}{r}$, which shows the effect of the imaginary energy wave velocity function of a mass M on an imaginary energy wave sphere with mass m. The 0 on the left side of the last equation is clock rate of the imaginary energy wave sphere with mass m for infinite r and the square of this clock rate since its value is 0. The fraction $\frac{\alpha_M}{r}$ of the energy that the imaginary energy wave sphere with mass m loses in the sense that $d\mathcal{X}_4{}^2(r)$ is negative with increasing absolute value is the square $\left(\frac{v}{c}\right)^2$ of the ratio of its velocity $-v$ to c. For $r > \alpha_M$, the absolute velocity, its absolute value, of the energy wave sphere with mass m increases to the velocity $c\left(\frac{\alpha}{r}\right)^{\frac{1}{2}} = v$ as $r \searrow \alpha$; at $r = \alpha$, the

velocity of the wave in the energy wave sphere is 0 with no positive velocity to lose, thus making it the 0 energy wave sphere in that sense. This occurs just as, or nearly so, the velocity of the imaginary energy wave sphere, with wave velocity i and radius $\alpha_m = \frac{\kappa m}{4\pi}$, its wave velocity matching that of the imaginary energy wave sphere, the kernel, at radius α of a mass M, equals $-1 = -c$. The notion, as opposed to the idea of a black hole, of an imaginary energy wave sphere with radius $\alpha_M = \frac{\kappa M}{4\pi}$ and wave velocity $cd\mathcal{X}_4(r) = ic\left(\frac{\alpha_M}{r}\right)^{\frac{1}{2}}$, which for $r = \alpha_M$, equals $d\mathcal{X}_4(\alpha_M) = i$, gives the nature of the kernel with radius α of a mass M.

INTRODUCTION

If there is any threat to science, the danger of a false theory becoming true in the observances of the pseudoscientists, the only ones left, first comes to mind *here*. The local scientists and the ones far away, the great minds and the lesser minds, somehow turn logic around and twist it upside down until ridiculous conclusions get accepted with no real scrutiny. Giving analysis, as the only consciousness left, requires thought; still, with hardly any chance since the only theories around rely on deceptive trick arguments that get exposed if anyone looks at them, the first rule of thumb, the pillar of consciousness, is to never consider an argument, but to applaud it based on how absurdly it reaches, if that be possible. The bog is that bad. The silliness of discussing this with the only ones left, the pseudoscientists, should be enough to provoke laughter. No one else is capable of considering it. Of the only ones left, every conscious *being* has a field that is not the one under consideration. The existence of the Doppler effect of light waves, somehow an allowable result, and the concept that velocity is *wavelength times frequency* should be enough to establish that the measured velocity of light is not the same in systems with uniform velocity moving toward and away from the light *contradicting* Einstein's second principle.

In Einstein's *The Foundation of the General Theory of Relativity*, the rate of a unit clock in a quasi-static, spherically symmetric gravitational field at radius r is given by

$$\frac{1}{g_{44}{}^{\frac{1}{2}}} = \frac{1}{\left(1 - \frac{\alpha}{r}\right)^{\frac{1}{2}}}$$

which is greater than 1, the clock rate in the *local* system, and does not satisfy the equation, for the clock rate f,

$$\frac{\delta f}{f_0} = \frac{g\Delta h}{c^2}, \quad [i]$$

that is experimentally verified in "Optical Clocks and Relativity," Chou, C. W., D. B. Hume, T. Rosenband, D. J. Wineland, Science Vol 329 24 September 2010: 1630-1633.

The fine-structure constant α, also known as the Sommerfield constant, was introduced by Sommerfield in 1916. In Sommerfeld, A. (1921). *Atombau und Spektrallinien* (in German) pp. 241–242, Equation 8, Sommerfield considers α to be

$$\frac{\mathrm{v}_1}{c},$$

where $v_1$is velocity of the electron in the first circular orbit of the Bohr model of the hydrogen atom. On the other hand, in order to give a description of physical reality, we need α to be

$$\frac{m_e(a_0)}{m_e},$$

with $m_e(a_0)$ the mass, corresponding to the Bohr radius orbit, with radius

$$a_0 = \frac{\hbar}{\alpha m_e c},$$

of the hydrogen atom, that the electron energy wave sphere sheds and to show that this is true. Similarly, the proton energy wave sphere in the hydrogen atom sheds the mass

$$\frac{1}{4}m_p,$$

corresponding to the outer proton radius, the value of which is

$$r_p = 4\frac{\hbar}{m_p c} = 0.8411863173145236 \times 10^{-15}\, meters.$$

In "On the Einstein Podolsky Rosen Paradox," John Stewart Bell sets up and proceeds with the proof of Bell's Theorem as follows:

Let this more complete specification be affected by means of parameters λ. It is a matter of indifference in the following whether λ denotes a single variable or a set, or even a set of functions, and whether the variables are discrete or continuous. However, we write as if λ were a single continuous parameter. The result A of measuring a $\overrightarrow{\sigma_1} \cdot \vec{a}$ is then determined by $\vec{a}$ and λ, and the result B of measuring $\overrightarrow{\sigma_2} \cdot \vec{b}$ in the same instance is determined by $\vec{b}$ and λ, and

$$A(\vec{a}, \lambda) = \pm 1,\ B(\vec{b}, \lambda) = \pm 1. \quad (1)$$

The vital assumption [2] is that the result B for particle 2 does not depend on the setting $\vec{a}$ of the magnet for particle 1, nor A on $\vec{b}$.

If $\rho(\lambda)$ is the probability distribution of λ then the expectation value of the product of the two components $\overrightarrow{\sigma_1} \cdot \vec{a}$ and $\overrightarrow{\sigma_2} \cdot \vec{b}$ is

$$P(\vec{a},\vec{b}) = \int d\lambda\, \rho(\lambda)\, A(\vec{a},\lambda)\, B(\vec{b},\lambda) \quad (2)$$

This should equal the quantum mechanical expectation value, which for the singlet state is

$$\langle \overrightarrow{\sigma_1} \cdot \vec{a}\, \overrightarrow{\sigma_2} \cdot \vec{b} \rangle = -\vec{a} \cdot \vec{b}. \quad (3)$$

But it will be shown that this is not possible. Some might prefer a formulation in which the hidden variables fall into two sets, with A dependent on one and B on the other; this possibility is contained in the above, since λ stands for any number of variables and the dependences thereon of A and B are unrestricted. In a complete physical theory of the type envisaged by Einstein, the hidden variables would have dynamical significance and laws of motion; our λ can then be thought of as initial values of these variables at some suitable instant.

CONTRADICTION

The main result will now be proved. Because ρ is a normalized probability distribution,

$$\int d\lambda \rho(\lambda) = 1 \quad (12)$$

and because of the properties (1), P in (2) cannot be less than - 1. It can reach - 1 at $\vec{a} = \vec{b}$ only if

$$A(\vec{a},\lambda) = -B(\vec{a},\lambda) \quad (13)$$

except at a set of points A of zero probability. Assuming this, (2) can be rewritten

$$P(\vec{a},\vec{b}) = -\int d\lambda\, \rho(\lambda)\, A(\vec{a},\lambda)\, A(\vec{b},\lambda). \quad (14)$$

It follows that $\vec{c}$ is another unit vector

$$P(\vec{a},\vec{b}) - P(\vec{a},\vec{c}) = -\int d\lambda \rho(\lambda) \left[A(\vec{a},\lambda)A(\vec{b},\lambda) - A(\vec{a},\lambda)A(\vec{c},\lambda)\right]$$
$$= \int d\lambda\, \rho(\lambda)\, A(\vec{a},\lambda)\, A(\vec{b},\lambda)\left[A(\vec{b},\lambda)A(\vec{c},\lambda) - 1\right]$$

using (1), whence

$$\left|P(\vec{a},\vec{b}) - P(\vec{a},\vec{c})\right| \leq \int d\lambda\, \rho(\lambda)\left[1 - A(\vec{b},\lambda)A(\vec{c},\lambda)\right]$$

The second term on the right is $P(\vec{b},\vec{c})$, whence

$$1 + P(\vec{b},\vec{c}) \geq \left|P(\vec{a},\vec{b}) - P(\vec{a},\vec{c})\right| \quad (15)$$

For both equations (13) and (14), the assumption is made that $\vec{a} = \vec{b}$. The equality

$$P(\vec{a},\vec{b}) - P(\vec{a},\vec{c}) = -\int d\lambda\rho(\lambda)\left[A(\vec{a},\lambda)A(\vec{b},\lambda) - A(\vec{a},\lambda)A(\vec{c},\lambda)\right]$$

uses equation (14) twice so that the assumption is made that

$$\vec{a} = \vec{b} = \vec{c}.$$

Bell does not explain how he obtains the inequality

$$\left|P(\vec{a},\vec{b}) - P(\vec{a},\vec{c})\right| \leq \int d\lambda\, \rho(\lambda)\left[1 - A(\vec{b},\lambda)A(\vec{c},\lambda)\right]$$

from

$$P(\vec{a},\vec{b}) - P(\vec{a},\vec{c}) = \int d\lambda\, \rho(\lambda)\, A(\vec{a},\lambda)\, A(\vec{b},\lambda)\left[A(\vec{b},\lambda)A(\vec{c},\lambda) - 1\right].$$

Since

$$P(\vec{a},\vec{b}) = P(\vec{a},\vec{c}) = P(\vec{b},\vec{c}) = P(\vec{a},\vec{a}),$$

both sides of this last equation are just 0, so that we have

$$0 = 0.$$

While this does imply that

$$0 \leq 0,$$

this last equation does not imply

$$0 < 0.$$

Inequality (15), since greater than never applies, should be equality (15):

$$1 + P(\vec{b},\vec{c}) = P(\vec{a},\vec{b}) - P(\vec{a},\vec{c}) \quad (15)$$

or

$$P(\vec{a},\vec{b}) = P(\vec{a},\vec{c}) = P(\vec{b},\vec{c}) = P(\vec{a},\vec{a}) = -1,$$

which we knew all along.

For the purpose of obtaining a contradiction, from equation (3) Bell obtains

$$\left|\vec{a}\cdot\vec{c}-\vec{a}\cdot\vec{b}\right|\leq 1-\vec{b}\cdot\vec{c}.$$

For $\vec{a}\cdot\vec{c}=0,\ \vec{a}\cdot\vec{b}=\vec{b}\cdot\vec{c}=1/\sqrt{2}$ we have, or Bell obtains,

$$\frac{1}{\sqrt{2}}\leq 1-\frac{1}{\sqrt{2}},$$

or

$$\sqrt{2}\leq 1,$$

supposedly violating Bell's inequality. Of course, since the conditions for which equation (15) holds are not met, there is no contradiction to equation (15). Any proof of equation (15) implies equation (15) *or* whatever inequality one picks as long as the assumptions, including

$$\vec{a}=\vec{b}=\vec{c},$$

hold. No strict inequality, without the equality attached, holds. Thus, Bell's Theorem serves as another example of a deceptive trick argument that gets exposed if anyone looks at it.

Yet, in "Bells Theorem," February 1999, by David M. Harrison, Department of Physics, University of Toronto, Harrison, at the beginning of the introduction, states,

> *"In 1975 Stapp called Bell's Theorem "the most profound discovery of science." Note that he says science, not physics. I agree with him."*

Bell's error in logic, as an attempt to deceive or not, lies in assuming that his inequality, which was never an inequality in the first place, still holds if

$$\vec{a}=\vec{b}=\vec{c}$$

is false. Particularly since Bell is held with such high *esteem* for this deceptive trick argument that gets exposed if anyone looks at it, we add Bell's Theorem to the list of theories, Einstein's relativity theories and theories of the nature of mass in particular, that we have taken apart via logic.

We choose not to repeat the entirety of our work here at this time for the purpose of presenting the great wealth of examples of similarly ridiculous results that cannot last. The time is right, if not ripe, for a discussion of a sort of classical quantum gravitation. In order to set this up, we quote in italics from Mystery's End: Analysis of Bell's Theorem as follows:

In Quantum Gravity, Energy Wave Spheres, and the Proton Radius, we considered electrons and protons in the hydrogen atom as energy wave spheres that shed mass corresponding to, in the case of the electron wave sphere, the Bohr radius electron orbit and, in the case of the proton wave sphere, the outer proton radius so that the corresponding radius of the shed mass is given by

$$r = \frac{\hbar}{mc}.$$

The reflection that this mass, in the case of Bohr radius electron wave sphere orbit, was the mass remaining changed to the shed mass after considering that

$$m = \alpha m_e,$$

with m_e the initial electron mass so that the mass of the remaining electron wave sphere is

$$(1 - \alpha)m_e$$

and the radius of the remaining electron wave sphere is

$$\frac{1}{(1 - \alpha)} r_e.$$

Similarly, the mass shed by the proton energy wave sphere is

$$m = \frac{1}{4} m_p,$$

with m_p the initial proton mass so that the mass of the remaining proton wave sphere is

$$\frac{3}{4} m_p,$$

with radius

$$\frac{4}{3} r_p.$$

Thus, the radius of the shed proton energy wave sphere in the hydrogen atom is

$$r_{shed} = 4 \frac{\hbar}{m_p c}.$$

For

$$m_p = 1.67272 \times 10^{-27} kg,$$

we have for the radius of the shed proton energy wave sphere inside of an electron energy wave sphere

$$\boldsymbol{r_{p_{e_{shed}}}} = \frac{\hbar}{\boldsymbol{m_{p_{e_{shed}}} c}} = \boldsymbol{4}\frac{\hbar}{\boldsymbol{m_p c}} = \boldsymbol{4}\frac{\boldsymbol{1}}{\boldsymbol{2\pi}}\frac{\boldsymbol{6.62607015}}{\boldsymbol{(1.67272)(2.99792458)}}\boldsymbol{10^{-15}}\,\boldsymbol{meters}$$

$$= \boldsymbol{0.8411863173145236 \times 10^{-15}}\,\boldsymbol{meters}.$$

The concept of energy remaining arose from the consideration of clock rates in a gravitational field and the realization that energy wave spheres are clocks such that the frequency of the energy wave is the clock rate if the wavelength is the circumference of the energy wave sphere.

In Quantum Gravity, Energy Wave Spheres, and the Proton Radius, pages 9-10, our copy, we wrote,
"We stated in the abstract to On the Nature of Being: Gravitation,
"The experimental result for the rate of a clock in a gravitational field is given in the paper, "Optical Clocks and Relativity" by C. W. Chou et al., Science 329, 1630 (2010). The clock rate $\boldsymbol{f}$ satisfies

$$\frac{\boldsymbol{\delta f}}{\boldsymbol{f_0}} = \frac{\boldsymbol{g\Delta h}}{\boldsymbol{c^2}}. \quad [\boldsymbol{i}]$$

By elementary functional analysis, Einstein's clock rate,

$$\boldsymbol{f} = (\boldsymbol{g_{44}})^{-\frac{1}{2}} = \left(\boldsymbol{1} - \frac{\boldsymbol{\alpha}}{\boldsymbol{r}}\right)^{-\frac{1}{2}}, \quad [\boldsymbol{ii}]$$

from The Foundation of the General Theory of Relativity is greater than **1**, the clock rate in flat space-time, and does not satisfy, as we show in Part 2, the equation that is experimentally verified. On the other hand, the multiplicative inverse of Einstein's clock rate,

$$\boldsymbol{f} = \left(\boldsymbol{1} - \frac{\boldsymbol{\alpha}}{\boldsymbol{r}}\right)^{\frac{1}{2}}, \quad [\boldsymbol{iii}]$$

gives a clock rate that is less than **1**, thus a slower rate than that in flat space-time, and satisfies the equation that is experimentally verified."

The clock rate in the Chou paper is not the clock rate from The Foundation of the General Theory of Relativity, but rather, the clock rate from Einstein's 1911 paper, On the Influence of Gravitation on the Propagation of Light. The true clock rate is not the one implied by the General Theory of Relativity; but, if General Relativity is true, then the clock rate arrived at by assuming General Relativity to be true must be true for General Relativity to imply it. More generally, no true statement implies one that is false. On the other hand, a false statement implies one that is true; moreover, assuming statements to be true, for example, the statement that the clock rate in a gravitational field is Einstein's clock rate, does not prove the premises or theory from which the statements follow; yet Einstein, referring to the facts given above, claims proof: "these facts must be taken as convincing proof of the correctness of the theory."

In the situation in which no theory of science can be proven, Einstein claims proof based on his fallacious logic. When no proof can be given, Einstein steps forward with a proof of his theory. No one is surprised and no one cares enough to challenge it; certainly, no one who is convinced is going to consider obvious evidence that contradicts the theory. This is a logical crime that cries out hysterically into the darkness of thought. No one, laziness and ignorance come to mind as applicable traits, knows the theory and no one cares, just that the theory is proven. The obvious contradictory evidence must be ignored. The experiments that find that q is true are repeatedly done, with increasing precision perhaps, as if they constitute proof of the theory."

In on the Nature of Being: Gravitation, pages 36-37, our copy, we showed that Einstein's clock rate from The Foundation of the General Theory of Relativity does not satisfy the equation that is experimentally verified in the Chou paper:

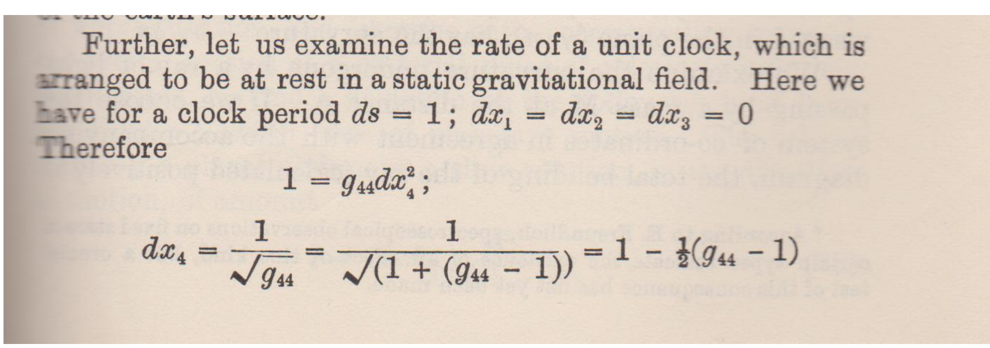
"More generally, for $\boldsymbol{ds = dt}$ and $\boldsymbol{x_4 = t'}$, we have

$$\boldsymbol{dt^2 = \left(1 - \frac{\alpha}{r}\right) dt'^2}, \quad [\mathbf{2.25}]$$

or

$$\boldsymbol{\frac{dt'}{dt} = \left(1 - \frac{\alpha}{r}\right)^{-\frac{1}{2}}}. \quad [\mathbf{2.26}]$$

Thus, according to Foundation, this last equation gives, to at least a first approximation, the instantaneous clock rate for a clock in a gravitational field. The derivative $\boldsymbol{\frac{dt'}{dt}}$ is just f, the clock frequency in the gravitational field. Simply by inspection, we already know that this clock rate is greater than 1, the clock rate in the "local" system; so, this gives the clock rate of a faster clock. Once again, for $\boldsymbol{dt = ds = 1}$ in the local system, Einstein obtains this:


Further, let us examine the rate of a unit clock, which is arranged to be at rest in a static gravitational field. Here we have for a clock period $ds = 1$; $dx_1 = dx_2 = dx_3 = 0$ Therefore

$$1 = g_{44} dx_4^2;$$

$$dx_4 = \frac{1}{\sqrt{g_{44}}} = \frac{1}{\sqrt{(1 + (g_{44} - 1))}} = 1 - \tfrac{1}{2}(g_{44} - 1)$$

Image 11: Scanned image from The Foundation of the General Theory of Relativity from The Principle of Relativity, Dover Publications, Inc., 1952, page 161.

For average undergraduate students, every one of whom is better than Bender at mathematics, it is the last line:

$$\boldsymbol{dx_4 = \frac{1}{\sqrt{g_{44}}},\quad [2.27]}$$

with

$$\boldsymbol{g_{44} = 1 - \frac{\alpha}{r}.\quad [2.28]}$$

By the chain rule and since the unit of time is chosen so that $\boldsymbol{c = 1}$, we thus have

$$\boldsymbol{\frac{1}{f}\frac{df}{dr} = \frac{1}{\left(1-\frac{\alpha}{r}\right)^{-\frac{1}{2}}} - \frac{1}{2}\left(1-\frac{\alpha}{r}\right)^{-\frac{3}{2}}\frac{\alpha}{r^2} = -\frac{1}{\left(1-\frac{\alpha}{r}\right)}\left(\frac{\frac{1}{2}\alpha}{r^2}\right) = -\frac{g}{c^2}\frac{1}{\left(1-\frac{\alpha}{r}\right)}.\quad [2.29]}$$

This is obviously not, the problem being the – sign,

$$\boldsymbol{\frac{g}{c^2},\quad [2.30]}$$

the value of

$$\boldsymbol{\frac{1}{f}\frac{df}{dr}\quad [2.31]}$$

according to the Chou, Wineland paper."
For

$$\boldsymbol{f' = \left(1-\frac{\alpha}{r}\right)^{\frac{1}{2}},}$$

the multiplicative inverse of Einstein's clock rate, we have

$$\boldsymbol{\frac{1}{f'}\frac{df'}{dr} = f\frac{df^{-1}}{dr} = f\frac{-1}{f^2}\frac{df}{dr} = -\frac{1}{f}\frac{df}{dr} = \frac{g}{c^2}\frac{1}{\left(1-\frac{\alpha}{r}\right)},}$$

so that it satisfies the equation that is experimentally verified in the Chou, Wineland paper.
For Einstein's clock rate $\boldsymbol{f}$, the negative value of

$$\boldsymbol{\frac{1}{f}\frac{df}{dr},}$$

which arises from the negative value of

$$\frac{\boldsymbol{df}}{\boldsymbol{dr}},$$

implies that the clock rate $\boldsymbol{f}$ increases as $\boldsymbol{r}$ decreases, contradicting the slower clock rate in the gravitational field as $\boldsymbol{r}$ decreases.

Thus, the frequency of an energy wave sphere clock in a gravitational field decreases by a factor of

$$\left(\boldsymbol{1}-\frac{\boldsymbol{\alpha}}{\boldsymbol{r}}\right)^{\frac{1}{2}},$$

so that its energy at radius $\boldsymbol{r}$ becomes

$$\left(\boldsymbol{1}-\frac{\boldsymbol{\alpha}}{\boldsymbol{r}}\right)^{\frac{1}{2}}\boldsymbol{h\nu},$$

With

$$\boldsymbol{h\nu}=\boldsymbol{mc^2}$$

for $\boldsymbol{m}$ the mass of the energy wave sphere in the absence of gravitation. The energy that the energy wave sphere has at radius $\boldsymbol{r}$ is the remaining energy of the energy wave sphere; thus, we have the origin of the concept of energy remaining and, from it, the concept of energy lost. We had these ideas beforehand when we considered energy wave spheres in the hydrogen atom.

If the radius of an energy wave sphere decreases by the factor $\boldsymbol{\beta}(\boldsymbol{r})$ at the radius $\boldsymbol{r}$ in a gravitational field, then the frequency and, hence, velocity of the energy wave must decrease by both factors $\boldsymbol{\beta}(\boldsymbol{r})$ and $\left(\boldsymbol{1}-\frac{\boldsymbol{\alpha}}{\boldsymbol{r}}\right)^{\frac{1}{2}}$ in order that the wave sphere clock frequency decrease by the factor $\left(\boldsymbol{1}-\frac{\boldsymbol{\alpha}}{\boldsymbol{r}}\right)^{\frac{1}{2}}$ at radius $\boldsymbol{r}$. In on the Nature of Being: Gravitation, we assumed that the radius $\boldsymbol{r}$ does not decrease so that the frequency and, hence, velocity of the energy wave decreases by the factor $\left(\boldsymbol{1}-\frac{\boldsymbol{\alpha}}{\boldsymbol{r}}\right)^{\frac{1}{2}}$, resulting in the frequency of the energy wave clock decreasing by the same factor.

For any energy wave sphere we have

$$\left(\boldsymbol{1}-\frac{\boldsymbol{\alpha}}{\boldsymbol{r}}\right)^{\frac{1}{2}}\boldsymbol{h\nu}=\left(\boldsymbol{1}-\frac{\boldsymbol{\alpha}}{\boldsymbol{r}}\right)^{\frac{1}{2}}\boldsymbol{mc^2},$$

so that

$$\left(1-\frac{\alpha}{r}\right)^{\frac{1}{2}}\nu\frac{h}{c}=\left(1-\frac{\alpha}{r}\right)^{\frac{1}{2}}cm.$$

Thus

$$\frac{1}{\lambda}\frac{h}{c}=m,$$

which is the same value for m that it had in the absence of gravitation. Any change in m by the multiplicative factor k occurs if and only if the circumference λ changes by the multiplicative factor $\frac{1}{k}$. By the law of conservation of mass, as well as Newton's law of gravitation, neither changes. Moreover, we have

$$\frac{\left(1-\frac{\alpha}{r}\right)^{\frac{1}{2}}\nu}{\left(1-\frac{\alpha}{r}\right)^{\frac{1}{2}}c}=\frac{1}{\lambda},$$

so that the velocity of the energy wave in the energy wave sphere at the distance r is

$$\left(1-\frac{\alpha}{r}\right)^{\frac{1}{2}}c.$$

If we consider the velocity of the energy wave sphere along a radius to be

$$\frac{dx_1}{dx_4}=\frac{g_{44}{}^{\frac{1}{2}}dX_1}{dX_4}=-\left(1-\frac{\alpha}{r}\right)^{-\frac{1}{2}}c \quad (1),$$

then the absolute value of this velocity is the multiplicative inverse of the velocity of the energy wave in the energy wave sphere since $c=1$. Since the absolute value of this velocity is greater than c and increasing, equation (1) does not give the velocity of the energy wave sphere along a radius.

In On the Nature of Being: Gravitation, pages 69-70, our copy, we wrote,
"If the distance coordinate x_1, aligned along a radius in the gravitational field, does not vary so that $g_{11}=1$ and the clock rate is that above for

$$g_{44}=\left(1-\frac{\alpha}{r}\right)^{-1}, \quad [6.13]$$

then, if a material point moves in a geodetic line with these coordinates, we have, by the chain rule,

$$\frac{d^2x_1}{dx_4{}^2} = -\frac{1}{2}\frac{\alpha}{r^2}\left(1-\frac{\alpha}{r}\right)^{-\frac{3}{2}}\frac{dX_1}{dX_4}\frac{dx_1}{dx_4} = -\frac{1}{2}\frac{\alpha}{r^2}\left(1-\frac{\alpha}{r}\right)^{-2}\left(\frac{dX_1}{dX_4}\right)^2. \quad [6.14]$$

Thus, if a material point moves in a geodetic line with these coordinates, in order for the first order approximation to be $-\frac{\alpha}{2r^2}$, which is the value of the measured acceleration due to gravity, we must have

$$\left(\frac{dX_1}{dX_4}\right)^2 = 1, \quad [6.15]$$

or

$$\frac{dX_1}{dX_4} = -c. \quad [6.16]"$$

If we consider the energy wave sphere to have energy

$$\left(1-\frac{\alpha}{r}\right)^{-\frac{1}{2}} h\nu,$$

which is the energy that it should have with Einstein's clock rate,

$$\left(1-\frac{\alpha}{r}\right)^{-\frac{1}{2}},$$

then the velocity of the energy wave is greater than c and increasing as r decreases, thus placing Einstein's clock rate on the scrap pile of potential clock rates.

The notion that the energy wave spheres lose the energy that they no longer have, the energy that the remaining energy lost, is an essential feature of gravitational theory. We arrived at it by searching for the rule that explains and is explained by the motion of an energy wave sphere in a gravitational field. We found the rule by thinking about it. We want and encourage the possibility that some other explanation exists when the Newtonian energy of motion of an energy wave sphere is the first order term of the energy lost. Specifically, the energy lost,

$$h\nu - \left(1-\frac{\alpha}{r}\right)^{\frac{1}{2}} h\nu = \left(1-\left(1-\frac{\alpha}{r}\right)^{\frac{1}{2}}\right) h\nu = h\nu\left(\frac{1}{2}\frac{\alpha}{r} + \frac{1}{8}\left(\frac{\alpha}{r}\right)^2 + \frac{1}{16}\left(\frac{\alpha}{r}\right)^3 + \frac{5}{128}\left(\frac{\alpha}{r}\right)^4 + \cdots\right),$$

is such that that, after multiplication by $h\nu$, the first term of the last expression is the Newtonian value for the gravitational energy of motion of the energy wave sphere. The first term of this last series,

$$\frac{\mathbf{1}}{\mathbf{2}}\frac{\boldsymbol{\alpha}}{\boldsymbol{r}}\boldsymbol{h\nu},$$

is just the kinetic energy,

$$\frac{\mathbf{1}}{\mathbf{2}}\boldsymbol{mv^2},$$

that an energy wave sphere gains in moving from $\boldsymbol{r} = \infty$ to some finite $\boldsymbol{r}$. Since $\boldsymbol{v}$ is not constant, the energy wave sphere does not move in a geodetic line as Einstein would have it. Somehow, the collection of falsehoods that comprise Einstein's relativity theories is an ignorable fault in the game of science.

Somehow, where we ended this lengthy quotation, which set things up, was where we wanted to be in that sense that what we wanted to discuss was where we left off. The consideration here is just how a material point moves in a gravitational field with changing velocity as measured with the space-time coordinates there, apparently accelerating, blatantly perhaps so that there is no question that it is not moving in a geodetic line. The unit clock rate in the gravitational field at the radius r is simply the rate of the unit energy wave spheres,

$$\left(1 - \frac{\alpha}{r}\right)^{\frac{1}{2}},$$

at radius r. For the geodetic line in the local system with dX_1 aligned along a radius and dX_4 such that

$$\frac{dX_1}{dX_4} = -1,$$

the velocity of the material point in the gravitational field, according to Einstein's The Foundation of the General Theory of Relativity, with the x_i axis aligned with the X_i axis,

$$\frac{dx_1}{dx_4} = -\frac{{g_{44}}^{\frac{1}{2}}}{{g_{11}}^{\frac{1}{2}}} = -{g_{44}}^{\frac{1}{2}} = -\left(1 - \frac{\alpha}{r}\right)^{-\frac{1}{2}}, \quad (1)$$

where we have used the actual values for the g_{ii}. The velocity

$$\frac{dx_1}{dx_4} = -\left(\frac{\alpha}{r}\frac{h\nu}{m}\right)^{\frac{1}{2}} = -\left(\frac{\alpha}{r}c^2\right)^{\frac{1}{2}}$$

is not the velocity (1) just given so that the material point does not move in the geodetic line with the property that

$$\frac{dX_1}{dX_4} = -1$$

since the velocity (1) is not the velocity of the material point.

At the beginning of the lengthy quote, which ended on the previous page, from Mystery's End: Analysis of Bell's Theorem, we considered electrons and protons, in the hydrogen atom here, to be energy wave spheres:

In Quantum Gravity, Energy Wave Spheres, and the Proton Radius, we considered electrons and protons in the hydrogen atom as energy wave spheres that shed mass corresponding to, in the case of the electron wave sphere, the Bohr radius electron orbit and, in the case of the proton wave sphere, the outer proton radius so that the corresponding radius of the shed mass is given by

$$\boldsymbol{r} = \frac{\hbar}{\boldsymbol{mc}}.$$

The energy wave sphere, which exists, along with any other attributes the particle might have, *is the particle* corresponding to the energy wave sphere. The clock rate, or frequency, of the energy wave in the energy wave sphere *multiplied by Plank's constant h* is its energy $h\nu$.

The next step, following the concept that the energy wave sphere is the particle, is to consider the clock rate function everywhere to be the particle. Since this frequency determines the gravitational motion of a material point, the matter of how the particle, which is now a frequency function, achieves this is explainable by considering the particle to be the frequency function.

In On the Nature of Being: Gravitation, page 84, our copy, we wrote:
The mechanism for slowing these de Broglie wave clocks is not known, redundantly, the manner by which the de Broglie waves are slowed constituting another open question. This change in clock frequency is driven by the difference in clock rates along a radius passing through the atom; the outer clock rate slows, by decreasing the radius, in an endless attempt to equalize the wave frequency.

Similarly, in Quantum Gravity, Energy Wave Spheres, and the Proton Radius, page 54, our copy, we wrote:
In the gravitational case, the energy wave spheres are in an environment where the clock rate function of a mass is less on the side of the wave sphere that is closer to the mass so that the far side of the wave has to slow down to match up with the near side of the wave, which is endlessly pushed closer to the mass. In a sense, the energy wave sphere has to move, giving up energy that goes into the energy of motion of the wave sphere so that the wave frequency is the same in any direction.

In this situation, with

$$g_{44}dx_4{}^2 = \left(1 - \frac{\alpha}{r}\right)^{-1} dx_4{}^2 = dX_4{}^2, \quad (2)$$

where dx_4 upon multiplication by $h\nu$ is the energy remaining as we have given it, and no real hope of explaining how this happens, but given the opportunity and the idea, until now unconvincing, the *convincing* part emerges suddenly from the rather simple equation (2). From equation (2) we have

$$dx_4{}^2 = \left(1 - \frac{\alpha}{r}\right) = \left(dX_4{}^2 - \frac{\alpha}{r}\right)$$

$$dx_4{}^2 - dX_4{}^2 = -\frac{\alpha}{r},$$

this last expression being what we need to add to

$$dX_4{}^2$$

to obtain

$$dx_4{}^2.$$

For

$$d\mathcal{X}_4$$

the *imaginary energy wave velocity function* of the particle, we have

$$d\mathcal{X}_4{}^2 = dx_4{}^2 - dX_4{}^2 = -\frac{\alpha}{r}$$

or

$$d\mathcal{X}_4 = i\left(\frac{\alpha}{r}\right)^{\frac{1}{2}},$$

where we have taken

$$\left(\frac{\alpha}{r}\right)^{\frac{1}{2}}$$

to be *positive*.

In *The Principle of Relativity, The Foundation of the General Theory of Relativity*, pages 159, 160, Einstein obtains, quoting from *On the Nature of Being: Gravitation*, pages 87-89, our copy,

$$\boldsymbol{\alpha = \frac{\kappa M}{4\pi}} \quad \boldsymbol{[6.61]}$$

and

$$\boldsymbol{\kappa = \frac{8\pi K}{c^2} = 1.87 \times 10^{-27}}. \quad [\mathbf{6.62}]$$

The units here are

$$\boldsymbol{\frac{cm^3}{gm\,(sec')^2}} \quad [\mathbf{6.63}]$$

with, for the velocity of light expressed in $\boldsymbol{\frac{cm}{sec'}}$,

$$\boldsymbol{1\,sec = 3 \times 10^{10}(sec')}. \quad [\mathbf{6.64}]$$

Thus

$$\boldsymbol{\alpha = \frac{M}{4\pi} 1.87 \times 10^{-27} \frac{cm^3}{gm\,(sec')^2}}, \quad [\mathbf{6.65}]$$

where $\boldsymbol{M}$ is to be expressed in $\boldsymbol{gm}$'s, and, as a result,

$$\boldsymbol{\frac{1}{c^2}\alpha} \quad [\mathbf{6.66}]$$

is expressed in $\boldsymbol{cm}$'s.

The units

$$\frac{cm^3}{gm\,(sec')^2}$$

are for the gravitational constant K with the velocity of light c equal to

$$1\,\frac{cm}{sec'}.$$

Equation [6.65] contains the factor

$$\left(\frac{cm}{sec'}\right)^2 = 1$$

on the right side so that the α given has the same numerical value as the α of equation [6.61] but contains the factor c^2.

In a more recent calculation of κ, we obtain

$$\mathrm{K} = 6.6743\ \times\ 10^{\ -11} m^3\ kg^{-1}\ sec^{-2} = 6.6743\ \times\ 10^{\ -11} 10^6 cm^3 10^{-3}\ gm^{-1}\ sec^{-2}$$

$$\kappa = \frac{8\pi\mathrm{K}}{c^2}$$

$$\kappa = \frac{8(3.14159)(6.6743)10^{-8}}{(2.99792458)^2(10^{10})^2}$$

$$c^2 = (8.987551787368176)10^{20}$$

$$\kappa = (1.866396067265298)10^{-27} cmgm^{-1}.$$

For

$$\frac{\alpha}{r},$$

we have

$$\frac{\alpha}{r} = \frac{1}{r}\frac{\kappa M}{4\pi},$$

so that

$$d\mathcal{X}_4 = i\left(\frac{\alpha}{r}\right)^{\frac{1}{2}} = i\left(\frac{1}{r}\frac{\kappa M}{4\pi}\right)^{\frac{1}{2}} = i\left(\frac{1}{r}\frac{2\mathrm{K}M}{c^2}\right)^{\frac{1}{2}},$$

which is the imaginary energy wave velocity function of the particle with mass M.

For the proton, for example, we have for the radius of the proton *kernel* α_p

$$\alpha_p = \frac{\kappa m_p}{4\pi}$$

$$m_p = (1.67)10^{-24} gm$$

$$\alpha_p = \frac{(1.866396067265298)10^{-27} cmgm^{-1}}{12.5663706144}(1.67)10^{-24} g$$
$$= (0.2480335434927699)10^{-51} cm.$$

The *hidden variable*

$$d\mathcal{X}_4 = i\left(\frac{\alpha}{r}\right)^{\frac{1}{2}}$$

has

$$d\mathcal{X}_4{}^2 = -\frac{\alpha}{r}$$

for its square, which is negative, and occurs like this in equation (2).

For any energy wave sphere with mass m and radius

$$r = \frac{\hbar}{mc},$$

the ratio of the energy wave sphere radius to the radius of the mass m kernel is

$$\left(\frac{r}{\alpha}\right)_m = \frac{\frac{\hbar}{mc}}{\frac{\kappa m}{4\pi}} = 4\pi\frac{\hbar}{\kappa m^2 c} = 4\pi\frac{c^2}{8\pi\mathrm{K}}\frac{\hbar}{m^2 c} = \frac{1}{2}\frac{\hbar c}{\mathrm{K}m^2}.$$

For $r = \alpha$, the expression,

$$\left(1 - \frac{\alpha}{r}\right)^{\frac{1}{2}} h\nu,$$

is zero; for $r < \alpha$, the expression

$$\left(1 - \frac{\alpha}{r}\right),$$

the square of

$$\left(1 - \frac{\alpha}{r}\right)^{\frac{1}{2}},$$

is negative, like the imaginary energy wave velocity squared $d\mathcal{X}_4{}^2$ of the kernel at radius α of a mass M as if this were a requirement for entering the kernel.

The expression

$$\left(1 - \frac{\alpha}{r}\right),$$

which is the square

$$dx_4{}^2$$

of the clock rate of a unit clock along a radius, is, once again,

$$\left(dX_4{}^2 - \frac{\alpha}{r}\right)$$

so that

$$d\mathcal{X}_4{}^2 = dx_4{}^2 - dX_4{}^2 = -\frac{\alpha}{r}$$

gives the imaginary energy wave velocity function squared of the particle with mass M at radius r, $d\mathcal{X}_4 \frac{c}{2\pi r}$ being the frequency of the wave in an *imaginary* energy wave sphere with radius r and wave velocity

$$ic\left(\frac{\alpha}{r}\right)^{\frac{1}{2}},$$

taking, once again,

$$\left(\frac{\alpha}{r}\right)^{\frac{1}{2}}$$

to be *positive*.

For $r = \alpha$, the expression,

$$\left(1 - \frac{\alpha}{r}\right)^{\frac{1}{2}} h\nu,$$

is zero since

$$\left(1 - \frac{\alpha}{r}\right) = \left(dX_4{}^2 - \frac{\alpha}{r}\right) = 0.$$

The energy that the energy wave sphere loses,

$$h\nu - \left(1 - \frac{\alpha}{r}\right)^{\frac{1}{2}} h\nu = h\nu\left(1 - \left(1 - \frac{\alpha}{r}\right)^{\frac{1}{2}}\right),$$

is not

$$h\nu\left(\frac{\alpha}{r}\right)^{\frac{1}{2}} = -ih\nu d\mathcal{X}_4 = h\nu\frac{v}{c},$$

but for $r \geq \alpha$,

$$\left(\frac{\alpha}{r}\right)^{\frac{1}{2}} = \frac{v}{c} \quad (3)$$

gives, upon multiplication by i, the ratio of the velocity iv of the imaginary energy wave velocity function wave at radius r to c and, upon multiplication by -1 since the velocity is negative, the ratio of the velocity v of the energy wave sphere to c at radius r. To arrive at this last assertion, we note that the value of $\frac{\alpha}{r}$ in equation (3) is $\left(\frac{v}{c}\right)^2$ according to physical measurement.

For $r < \alpha$, the velocity v in equation (3), *if it holds*, satisfies

$$|v| > 1 = c,$$

giving an example of a velocity, the absolute velocity of which is greater than c. This example depends, once again, on the condition that equation (3) still holds, which is the case via the definition of $d\mathcal{X}_4$, but we are also concerned with physical reality.

The previously given Taylor series expansion about 1 of

$$\left(1 - \frac{\alpha}{r}\right)^{\frac{1}{2}},$$

the velocity, upon multiplication by c, of the wave in the energy wave sphere in the local system of coordinates, is

$$1 - \left(\frac{1}{2}\frac{\alpha}{r} + \frac{1}{8}\left(\frac{\alpha}{r}\right)^2 + \frac{1}{16}\left(\frac{\alpha}{r}\right)^3 + \frac{5}{128}\left(\frac{\alpha}{r}\right)^4 + \cdots\right), \quad (4)$$

so that

$$\begin{aligned}\left(1 - \left(1 - \frac{\alpha}{r}\right)^{\frac{1}{2}}\right) &= 1 - \left(1 - \left(\frac{1}{2}\frac{\alpha}{r} + \frac{1}{8}\left(\frac{\alpha}{r}\right)^2 + \frac{1}{16}\left(\frac{\alpha}{r}\right)^3 + \frac{5}{128}\left(\frac{\alpha}{r}\right)^4 + \cdots\right)\right) \\ &= \left(\frac{1}{2}\frac{\alpha}{r} + \frac{1}{8}\left(\frac{\alpha}{r}\right)^2 + \frac{1}{16}\left(\frac{\alpha}{r}\right)^3 + \frac{5}{128}\left(\frac{\alpha}{r}\right)^4 + \cdots\right),\end{aligned}$$

converges absolutely for

$$0 \le \frac{\alpha}{r} < 1$$

by the ratio test, which is an application of the comparison test. If

$$\frac{\alpha}{r} = 1,$$

then the series (4) converges to 0 if and only if

$$1 = \left(\frac{1}{2} + \frac{1}{8} + \frac{1}{16} + \frac{5}{128} + \cdots\right).$$

The sequence

$$\left\{\frac{1}{2}, \frac{1}{8}, \frac{1}{16}, \frac{5}{128}, \cdots\right\}$$

is decreasing and converges to 0 with nth term

$$a_n = \frac{(2n-3)(2n-5)(2n-7)\dots 1 \times 1}{2^n n!}. \quad (5)$$

Thus

$$\frac{a_{n+1}}{a_n} = \frac{2n+2-3}{2(n+1)} = 1 - \frac{3}{2(n+1)},$$

so that

$$\lim_{n\to\infty} \inf \left|\frac{a_{n+1}}{a_n}\right| \leq 1 \leq \lim_{n\to\infty} \sup \left|\frac{a_{n+1}}{a_n}\right|$$

and the ratio test is inconclusive; however, since

$$\lim_{n\to\infty} \sup \sqrt[n]{|a_n|} < 1,$$

the series

$$\sum_{n=1}^{\infty} a_n$$

with a_n as in equation (5) converges absolutely by the root test.

For $r < \alpha$, just as in the case for $r > \alpha$,

$$d\mathcal{X}_4 = i\left(\frac{\alpha}{r}\right)^{\frac{1}{2}} = i\frac{v}{c},$$

so that equation (3) gives, upon multiplication by i, the ratio of the velocity iv of the imaginary wave velocity function wave or imaginary energy wave sphere wave at radius r to c and, upon multiplication by -1 since the velocity is negative, the ratio of the velocity v of the energy wave sphere to c at radius r. Thus, both velocities have absolute values that become arbitrarily large with respect to clocks in the local system of coordinates.

Seeing what one has not yet seen may be enough to startle or surprise, but glimpsing physical reality is, after all, what we are here for. The notion that Einstein was able to see the way things are just by thinking about them was dispelled by the actual quote, which was that Einstein discovered, merely by thinking about it, that the universe was *not* as it seemed, as we give here from pages 4-5 of The Material Point Universe Revisited, our copy, unpublished,

Once again, in the December, 31, 1999 issue of Time magazine, in which Einstein was named person of the century, Frederic Golden states, "He was the embodiment of pure intellect, the bumbling professor with the German accent, a comic cliché in a thousand films. Instantly recognizable, like Charlie Chaplin's Little Tramp, Albert Einstein's shaggy-haired visage was as familiar to ordinary people as to the matrons who fluttered about him in salons from Berlin to Hollywood. Yet he was unfathomably profound--the genius among geniuses who discovered, merely by thinking about it, that the universe was not as it seemed." In the same issue, Walter Isaacson, in "Who Mattered and Why," states, "… one person stands out as both the greatest mind and paramount icon of our age: the kindly, absentminded professor whose wild halo of hair, piercing eyes, engaging humanity and extraordinary brilliance made his face a symbol and his name a synonym for genius: Albert Einstein." In pointing out Einstein's logical error above, a small dagger has been placed in Einstein's image as "the genius among geniuses;" in what follows immediately in a brief consideration of special relativity, this image gets run over by a steamroller.

The velocity of the energy wave sphere starts at 0 for infinite r and increases in absolute value to $1 = c$ at $r = \alpha$. For $r < \alpha$, we have, as before,

$$d\mathcal{X}_4 = i\left(\frac{\alpha}{r}\right)^{\frac{1}{2}} = i\frac{v}{c}.$$

Thus, inside the kernel, as r decreases, $d\mathcal{X}_4$ is imaginary and increasing in absolute value and the velocity of the energy wave sphere is increasing in absolute value and *real*.

Since

$$d\mathcal{X}_4{}^2 = dx_4{}^2 - dX_4{}^2 = -\frac{\alpha}{r},$$

we have

$$dx_4{}^2 - 1 = -\frac{\alpha}{r}$$

$$dx_4{}^2 = 1 - \frac{\alpha}{r}$$

$$d{x_4}^2 = 1 + d{\mathcal{X}_4}^2.$$

The energy wave sphere, the one with radius

$$r = \frac{\hbar}{mc},$$

which varies inversely with the mass m, differs from the kernel, with radius

$$\alpha = \frac{\kappa M}{4\pi},$$

which varies directly with the mass M. For an energy wave sphere with mass M, the mass of the kernel, the radius r is less than α if

$$\frac{\hbar}{Mc} < \frac{\kappa M}{4\pi}$$

or

$$M^2 > \frac{4\pi\hbar}{\kappa c}. \quad (6)$$

The problem is that if

$$r = \frac{\hbar}{Mc}$$

for the energy wave sphere with mass M, then if the velocity of the energy wave in the energy wave sphere is constant, the frequency dx_4 of energy wave increases, if r decreases, by the factor

$$\frac{1}{2\pi r},$$

which is equal to

$$\frac{Mc}{h}.$$

In this case, the clock rate dx_4, which we should have set up to be imaginary, of the energy wave sphere does not increase because the absolute value of the velocity of the energy wave is increasing, but, rather, because the radius of the energy wave sphere is decreasing with constant velocity of the energy wave.

The energy wave sphere that we considered had a constant radius in the gravitational field and, hence, an energy wave with constant wavelength. Thus, the frequency decreased by the factor $\left(1-\frac{\alpha}{r}\right)^{\frac{1}{2}}$ with decreasing r if and only if the velocity of the wave decreased by the factor.

$$\left(1-\frac{\alpha}{r}\right)^{\frac{1}{2}}.$$

For $r < \alpha$, if equation (3) holds, then there is a problem with the wave velocity of an incoming energy wave sphere, the ratio of the velocity of which to c is according to equation (3) after multiplication by -1, matching that of an energy wave sphere centered at radius 0 with radius less than α, mass M, and clock rate given by equation (3) with radius

$$r = \frac{\hbar}{Mc}.$$

Essentially, we need the incoming energy wave sphere to have some place to go if nothing else to prevent it from obtaining a velocity with absolute value greater than c, not to mention, except now, a velocity with absolute value that becomes arbitrarily large. The imaginary energy wave velocity function $d\mathcal{X}_4(\alpha)$ at radius α of a mass M already gives us a radius

$$\alpha = \frac{\kappa M}{4\pi}$$

and the value of the imaginary energy wave velocity function for that radius, the value being i, the ratio of the velocity v of the wave to $c = 1$.

For an energy wave sphere with mass m and radius

$$r_m = \frac{\hbar}{mc}$$

and imaginary energy wave sphere with mass m with radius

$$\alpha_m = \frac{\kappa m}{4\pi}$$

inside that, the velocity, which is i times the absolute velocity of the energy wave sphere, of the wave in the imaginary energy wave sphere starts at 0 for infinite r, and for any $r > \alpha_M$, is equal to

$$d\mathcal{X}_4(r) = ic\left(\frac{\alpha_M}{r}\right)^{\frac{1}{2}},$$

and for $r = \alpha_M$, equals

$$d\mathcal{X}_4(\alpha_M) = ic,$$

the imaginary energy wave velocity $d\mathcal{X}_4(\alpha)$ of the wave of the imaginary energy wave sphere, at radius α of a mass M. It has the same velocity as the wave of the imaginary energy wave sphere, the kernel, at radius α of a mass M. The energy wave sphere is transformed into the imaginary energy wave sphere. For $r > \alpha_M$, we have

$$0 + d\mathcal{X}_4{}^2(r) = 0^2 - \frac{\alpha_M}{r} = -\frac{\alpha_M}{r},$$

which shows the effect of the imaginary energy wave velocity function of a mass M on an imaginary energy wave sphere with mass m. The 0 on the left side of the last equation is clock rate of the imaginary energy wave sphere with mass m for infinite r and the square of this clock rate since its value is 0. The fraction

$$\frac{\alpha_M}{r}$$

of the energy that the imaginary energy wave sphere with mass m loses in the sense that $d\mathcal{X}_4{}^2(r)$ *is negative with increasing absolute value* is the square $\left(\frac{v}{c}\right)^2$ of the ratio of its velocity $-v$ to c.

For $r > \alpha_M$, the absolute velocity, its absolute value, of the energy wave sphere with mass m increases to the velocity $c\left(\frac{\alpha}{r}\right)^{\frac{1}{2}} = v$ as $r \searrow \alpha$; at $r = \alpha$, the velocity of the wave in the energy wave sphere is 0 with no positive velocity to lose, thus making it the 0 energy wave sphere in that sense. This occurs just as, or nearly so, the velocity of the imaginary energy wave sphere, with wave velocity i and radius

$$\alpha_m = \frac{\kappa m}{4\pi},$$

its wave velocity matching that of the imaginary energy wave sphere, the kernel, at radius α of a mass M, equals $-1 = -c$.

We could invoke a principle or rule, e.g., that no absolute value of a wave velocity can exceed the velocity of light, to tell us what happens in the world hidden here. With gravitation, where only the effects of the imaginary wave sphere hidden variable can be seen, we have already inferred, for one, that the imaginary energy wave spheres exist, from those effects. If imaginary energy wave spheres with *absolute value of the wave velocity greater than* $c = 1$ exist inside the kernel at radius α of a mass M, then we need a plausible effect that we can observe, something more than an inequality that never holds anyway.

Bell's inequality does not hold if the equality $\vec{a} = \vec{b} = \vec{c}$ of the unit vectors *does not hold*, but there is no contradiction to the inequality holding if the condition of equality of the unit vectors is met. The deception fooled everyone until now. Bell gets credit for nothing, his name and bronze head removed from the wall.

Einstein, when he solves the equation of the geodetic line, assumed to hold in every direction in the construction of the Einstein tensor, for approximate space-time coordinates in the case of a quasi-static, spherically symmetric gravitation field about a point mass, obtains a clock rate dx_4

$$\left(1-\frac{\alpha}{r}\right)^{-\frac{1}{2}}$$

in the gravitational field at radius r that is the multiplicative inverse of the actual clock rate. In *The Material Point Universe*, unpublished, page 46, we considered the assumption that the equation of the geodetic line holds in every direction:

The tensor $\boldsymbol{G_{\mu\nu}}$ is formed (constructed) as described in the previous section and, completely, in Appendix B. This process includes the formation (Appendix A') of tensors, via differentiation, of existing covariant tensors. Einstein assumes “the curve along which we have differentiated to be a geodetic” and directly substitutes, for $\boldsymbol{d^2x_\nu/ds^2}$, its value according to the equations of the geodetic line (22). It suffices, in order to make this assumption, that the equation of the geodetic line holds in every direction; on the other hand, if such an extension exists, the equation of the geodetic line must hold in every direction since, otherwise, the required assumption cannot be made. It follows that, given whatever other conditions, which, together with the assumption that the equation of the geodetic line holds in every direction, are necessary and sufficient for the existence of the tensor $\boldsymbol{G_{\mu\nu}}$, the existence of $\boldsymbol{G_{\mu\nu}}$ is equivalent to the condition that the equation of the geodetic line holds in every direction. These “other” conditions are presumably obtainable by a proper examination of the construction process.

If the equation of the geodetic line does not hold in every direction, then the requirements for the construction of the Einstein tensor are not followed.

As we show in *On the Nature of Being: Gravitation*, pages 60-62, our copy, “the *culprit*, assuming that the material point moves in a geodetic line in the first place, here is that Einstein does not choose the space-time coordinates so that

$$\frac{d^2x_1}{{dx_4}^2} = -\frac{m}{r^2}, \quad [5.5]$$

but, rather, so that

$$\frac{d^2x_1}{ds^2} = -\frac{m}{r^2}." \quad [5.6]$$

Using Einstein’s value for g_{11}, we wrote, Einstein, of course, assumes that material points have geodetic lines as paths since that behavior of their motion "readily suggests itself." Einstein, claiming proof on the basis of verification of certain implications of the theory, considers not a single point of what we have written in these first fifty pages. Metaphorically, the fat lady is ready to sing and the removal of the furniture is at hand.

If the positive $\boldsymbol{X_1}$ axis is aligned along a radius, $\boldsymbol{X_1}$ increasing with increasing $\boldsymbol{r}$, and the $\boldsymbol{x_1}$ and $\boldsymbol{x_4}$ axes in the gravitational field are aligned with the corresponding axes in flat space-time, we have, for the velocity $\frac{dx_1}{dx_4}$ of the material point in the gravitational field,

$$\frac{dx_1}{dx_4} = \sqrt{\frac{g_{44}}{-g_{11}}}\frac{dX_1}{dX_4} = \left(1 - \frac{\alpha}{r}\right)\frac{dX_1}{dX_4}. \quad [5.1]$$

We note that there is no square-root in the expression on the right. By elementary functional analysis, the expression $\left(1 - \frac{\alpha}{r}\right)$, which is the ratio of the velocity of the material point in the gravitational field to the velocity of the material point in flat space-time, decreases as $\boldsymbol{r}$ decreases. This contradicts the acceleration, an increase in the absolute value of the velocity, of the material point in the gravitational field as $\boldsymbol{r}$ decreases.

Thus, we have proved that if a material point moves in a geodetic line, it does not do it with Einstein's space-time coordinates, which we have previously shown to be incorrect. According to Einstein's theory, the expression $\frac{dx_1}{dx_4}$ must correspond to the measured velocity of the material point in the gravitational field.

If we consider the acceleration, $\frac{d^2x_1}{{dx_4}^2}$, which must equal the measured acceleration in the gravitational field, we have, once again, by the chain rule,

$$\frac{d^2x_1}{{dx_4}^2} = \frac{\alpha}{r^2}\frac{dX_1}{dX_4}\frac{dx_1}{dx_4} = \frac{\alpha}{r^2}\left(1 - \frac{\alpha}{r}\right)\left(\frac{dX_1}{dX_4}\right)^2. \quad [5.2]$$

This last expression is positive, which is the wrong sign, and in order for the first order approximation to be $\frac{\alpha}{2r^2}$, which is the absolute value of the measured acceleration due to gravity, we must have

$$\left(\frac{dX_1}{dX_4}\right)^2 = \frac{1}{2}, \quad [5.3]$$

or

$$\frac{dX_1}{dX_4} = -\frac{c}{\sqrt{2}} \quad [5.4]$$

since the unit of time is chosen so that the velocity of light is equal to one.

Just giving the rule, as Einstein attempted to do by asserting that a material point moves in a geodetic line and that the coordinate acceleration, given by the equation of the geodetic line, is equal to $-\frac{m}{r^2}$, determining the motion of a material point in a gravitational field does not necessarily constitute giving the nature of reality for the gravitational force. The theory gives a coordinate acceleration of $-\frac{m}{r^2}$, which is the coordinate acceleration of a material point in a gravitational field, but Einstein's space-time coordinates, as determined by the Schwarzschild solution, give an approximate coordinate acceleration of $+\frac{m}{r^2}$ if and only if the material point moves with a constant velocity $-\frac{c}{\sqrt{2}}$ in flat space–time along the geodetic line. If the falsity of this last circumstance were obvious or not, we need to show that this condition just does not happen. The culprit, assuming that the material point moves in a geodetic line in the first place, here is that Einstein does not choose the space-time coordinates so that

$$\frac{d^2x_1}{dx_4{}^2} = -\frac{m}{r^2}, \quad [5.5]$$

but, rather, so that

$$\frac{d^2x_1}{ds^2} = -\frac{m}{r^2}. \quad [5.6]$$

If the irony of this state of affairs is not apparent, we note that the measurement of the acceleration of a material point in the gravitational field gives the value

$$\frac{d^2x_1}{dx_4{}^2} = -\frac{m}{r^2}. \quad [5.7]$$

By assuming, as readily suggested by itself, that a material point moves in a geodetic line and taking the space-time coordinates to be such that

$$\frac{d^2x_1}{ds^2} = -\frac{m}{r^2}, \quad [5.8]$$

Einstein guarantees that his space-time coordinates correspond to a faster clock and a larger unit of distance and that the measured velocity and acceleration of a material point in a gravitational field are what we just gave. According to the general theory of relativity, the measured acceleration of a material point in a gravitational field is given by

$$\frac{d^2x_1}{dx_4{}^2} = \frac{\alpha}{r^2}\frac{dX_1}{dX_4}\frac{dx_1}{dx_4} = \frac{\alpha}{r^2}\left(1-\frac{\alpha}{r}\right)\left(\frac{dX_1}{dX_4}\right)^2. \quad [5.9]$$

This does not give Newton's law of gravitation as an approximation.

Thus, trivially, the Schwarzschild solution, once again, described by Wald as “the general solution, first discovered by Schwarzschild, of the vacuum Einstein equation corresponding to static, spherically symmetric spacetimes” and the “solution of Einstein’s equation corresponding to the exterior gravitational field of a static, spherically symmetric body” and considered by Einstein as the solution of the equation of the geodetic line such that

$$\frac{d^2x_1}{ds^2} = -\frac{m}{r^2}, \quad [5.10]$$

has no chance of being that which Wald, or anyone else, claims. Trivially, by inspection, we showed in Part 1 that the given time coordinate corresponds to a faster clock and not a slower clock as claimed by Einstein and everyone else.

Einstein’s place on the wall, considering that his theories fall apart should anyone look at them, takes a tumble and the head of Einstein mounted up there turns to bronze momentarily before melting in wax, somehow ignored by the onlookers in their smug attire that they wear so that everyone will know that they too have a place on this great wall of dishonesty.

Everyone on that wall is complicit in the crime against human knowledge called *posing as scientists*. We avoid naming the great minds because that is a problem in itself. Einstein made it because he got more propaganda than anyone and Bell, because his theorem is called by Stapp “the most profound discovery of *science*" when Bell’s counterexample does not satisfy the conditions in the proof of the inequality and we were able to figure this out. The whereabouts of the great minds when the great false theories of science were just out or their significance has always been a mystery.

Years ago, just by thinking about it, we discovered the rate of a unit clock in a gravitational field

$$\left(1-\frac{\alpha}{r}\right)^{\frac{1}{2}},$$

and after that, that the energy that an energy wave sphere loses, because of the slower clock rate in a gravitational field, becomes its energy of motion. We calculated the radius of a proton energy wave sphere contained in an electron energy wave sphere as

$$r_p = 4\frac{\hbar}{m_p c}.$$

We extended the concept of energy wave spheres to imaginary energy wave spheres to explain the change in frequency of an energy wave sphere. The single expression,

$$\left(1-\frac{\alpha}{r}\right)^{\frac{1}{2}},$$

of which we remarked *this is what has to be this way*, gives us the relationship between the wave velocities the two types of energy wave spheres. The 1 in this expression *for the rate of a unit energy wave sphere clock* gives the clock rate squared of a unit energy wave sphere in the local system and $-\frac{\alpha}{r}$ gives the imaginary energy wave velocity function, $d\mathcal{X}_4$, squared of the particle with mass M at radius r, $d\mathcal{X}_4$ being the imaginary energy wave velocity function of the wave in an *imaginary* energy wave sphere with radius r and wave velocity

$$ic\left(\frac{\alpha}{r}\right)^{\frac{1}{2}}.$$

For an energy wave sphere with mass m and radius

$$r_m = \frac{\hbar}{mc}$$

and imaginary energy wave sphere with mass m with radius

$$\alpha_m = \frac{\kappa m}{4\pi}$$

inside that, the velocity, which is i times the absolute velocity of the energy wave sphere, of the wave in the imaginary energy wave sphere starts at 0 for infinite r, and for any $r > \alpha_M$, is equal to

$$cd\mathcal{X}_4(r) = ic\left(\frac{\alpha_M}{r}\right)^{\frac{1}{2}},$$

and for $r = \alpha_M$, equals

$$d\mathcal{X}_4(\alpha_M) = i,$$

the imaginary energy wave velocity function $d\mathcal{X}_4(\alpha)$ of the wave of the imaginary energy wave sphere, at radius α_M of a mass M. It has the same velocity as the wave of the imaginary energy wave sphere, the kernel, at radius α of a mass M. The energy wave sphere is transformed into the imaginary energy wave sphere. For $r > \alpha_M$, we have

$$0 + d{\mathcal{X}_4}^2(r) = 0^2 - \frac{\alpha_M}{r} = -\frac{\alpha_M}{r},$$

which shows the effect of the imaginary energy wave velocity function of a mass M on an imaginary energy wave sphere with mass m. The 0 on the left side of the last equation is clock rate of the imaginary energy wave sphere with mass m for infinite r and the square of this clock rate since its value is 0. The fraction

$$\frac{\alpha_M}{r}$$

of the energy that the imaginary energy wave sphere with mass m loses in the sense that $d\mathcal{X}_4{}^2(r)$ *is negative with increasing absolute value* is the square $\left(\frac{v}{c}\right)^2$ of the ratio of its velocity $-v$ to c.

For $r > \alpha_M$, the absolute velocity, its absolute value, of the energy wave sphere with mass m increases to the velocity $c\left(\frac{\alpha}{r}\right)^{\frac{1}{2}} = v$ as $r \searrow \alpha$; at $r = \alpha$, the velocity of the wave in the energy wave sphere is 0 with no positive velocity to lose, thus making it the 0 energy wave sphere in that sense. This occurs just as, or nearly so, the velocity of the imaginary energy wave sphere, with wave velocity i and radius

$$\alpha_m = \frac{\kappa m}{4\pi},$$

its wave velocity matching that of the imaginary energy wave sphere, the kernel, at radius α of a mass M, equals $-1 = -c$.

The notion, as opposed to the idea of a black hole, of an imaginary energy wave sphere with radius

$$\alpha_M = \frac{\kappa M}{4\pi}$$

and wave velocity

$$cd\mathcal{X}_4(r) = ic\left(\frac{\alpha_M}{r}\right)^{\frac{1}{2}},$$

which for $r = \alpha_M$, equals

$$d\mathcal{X}_4(\alpha_M) = i,$$

gives the nature of the kernel with radius α of a mass M.

In The Foundation of the General Theory of Relativity, The Principle of Relativity, § 21. Newton's Theory as a First Approximation and § 22. Behaviour of Rods and Clocks in the Static Gravitational Field. Bending of Light-rays. Motion of the Perihelion of a Planetary Orbit, pages 158-160, Einstein obtains, for a field-producing point mass at the origin of co-ordinates, to the first approximation, the radially symmetrical solution for the $g_{\mu\nu}$ as follows:

If in addition we suppose the gravitational field to be a quasi-static field, by confining ourselves to the case where the motion of matter generating the gravitational field is but slow (in comparison with the velocity of propagation of light), we may neglect on the right-hand side differentiations with respect to time in comparison with those with respect to the space co-ordinates, so that we have

$$\frac{d^2 x_\tau}{dt^2} = -\frac{1}{2}\frac{\partial g_{44}}{\partial x_\tau} \quad (\tau = 1, 2, 3) \dots (67)$$

This is the equation of motion of the material point according to Newton's theory, in which $\frac{1}{2} g_{44}$ plays the part of the gravitational potential. What is remarkable in this result is that the component g_{44} of the fundamental tensor alone defines, to a first approximation, the motion of the material point.

We now turn to the field equations (53). Here we have to take into consideration that the energy-tensor of "matter" is almost exclusively defined by the density of matter in the narrower sense, i.e. by the second term of the right-hand side of (58) [or, respectively, (58a) or (58b)]. If we form the approximation in question, all the components vanish with the one exception of $T_{44} = \rho = T$. On the left-hand side of (53) the second term is a small quantity of second order; the first yields, to the approximation in question,

$$\frac{\partial}{\partial x_1}[\mu\nu, 1] + \frac{\partial}{\partial x_2}[\mu\nu, 2] + \frac{\partial}{\partial x_3}[\mu\nu, 3] - \frac{\partial}{\partial x_4}[\mu\nu, 4].$$

For $\mu = \nu = 4$, this gives, with the omission of terms differentiated with respect to time,

$$-\frac{1}{2}\left(\frac{\partial^2 g_{44}}{\partial {x_1}^2} + \frac{\partial^2 g_{44}}{\partial {x_2}^2} + \frac{\partial^2 g_{44}}{\partial {x_3}^2}\right) = -\frac{1}{2}\nabla^2 g_{44}.$$

The last of equations (53) thus yields

$$\nabla^2 g_{44} = \kappa\rho \dots (68).$$

The equations (67) and (68) together are equivalent to Newton's law of gravitation.

By (67) and (68) the expression for the gravitational potential becomes

$$-\frac{\kappa}{8\pi}\int \frac{\rho d\tau}{r} \dots (68a)$$

while Newton's theory, with the unit of time we have chosen, gives

$$-\frac{K}{c^2}\int \frac{\rho d\tau}{r}$$

in which K denotes the constant 6.7×10^{-8}, usually called the constant of gravitation. By comparison we obtain

$$\kappa = \frac{8\pi K}{c^2} = 1.87 \times 10^{-27} \dots (69)$$

To arrive at Newton's theory as a first approximation we had to calculate only one component, $\boldsymbol{g_{44}}$, of the ten $\boldsymbol{g_{\mu\nu}}$ of the gravitational field, since this quantity alone enters into the first approximation, (67), of the equation for the motion of the material point in the gravitational field. From this, however, it is already apparent that other components of the $\boldsymbol{g_{\mu\nu}}$ must differ from the values given in (4) by small quantities of the first order. This is required by the condition $\boldsymbol{g = -1}$.

For a field-producing point mass at the origin of co-ordinates we obtain, to the first approximation, the radially symmetrical solution

$$\left.\begin{array}{c} \boldsymbol{g_{\rho\sigma} = -\delta_{\rho\sigma} - \alpha \frac{x_\rho x_\sigma}{r^3} (\rho, \sigma = 1, 2, 3)} \\ \boldsymbol{g_{\rho 4} = g_{4\rho} = 0 \qquad (\rho = 1, 2, 3)} \\ \boldsymbol{g_{44} = 1 - \frac{\alpha}{r}} \end{array}\right\} \dots (\boldsymbol{70})$$

where $\boldsymbol{\delta_{\rho\sigma}}$ is $\boldsymbol{1}$ or $\boldsymbol{0}$, respectively accordingly as $\boldsymbol{\rho = \sigma}$ $\boldsymbol{\rho \neq \sigma}$, and $\boldsymbol{r}$ is the quantity $+\sqrt{\boldsymbol{x_1}^2 + \boldsymbol{x_2}^2 + \boldsymbol{x_3}^2}$. On account of (68a)

$$\boldsymbol{\alpha = \frac{\kappa M}{4\pi}}, \dots (\boldsymbol{70a})$$

if $\boldsymbol{M}$ denotes the field-producing mass. It is easy to verify that the field equations (outside the mass) are satisfied to the first order of small quantities.

Einstein, in the footnote on page 118 of the same source, chooses the unit of time "so that the velocity of light *in vacuo* as measured in the "local" system of coordinates is to be equal to unity." The constant of gravitation K is given by

$$\mathrm{K} = 6.6743 \times 10^{-11} m^3\, kg^{-1}\, sec^{-2} = 6.6743 \times 10^{-11} 10^6 cm^3 10^{-3}\, gm^{-1}\, sec^{-2}. \quad (7)$$

For

$$1\, sec = (2.99792458) \times 10^{10} (sec'),$$

we may express K with the unit of time sec' by replacing sec in equation (7) by this last expression to obtain

$$\mathrm{K} = \frac{6.6743 \times 10^{-8}}{\left((2.99792458) \times 10^{10} (sec')\right)^2} \frac{cm^3}{gm}$$
$$= \frac{6.6743 \times 10^{-8}}{(8.987551787368176) 10^{20}} \frac{cm^3}{gmsec'^2}$$

$$= 0.7426160269118666 \times 10^{-28} \frac{cm^3}{gmsec'^2}.$$

Multiplying this last expression by 8π, we obtain

$$8\pi\mathrm{K} = (25.1327412288) \times 0.7426160269118666 \times 10^{-28} \frac{cm^3}{gmsec'^2}$$
$$= 1.866397643673552 \times 10^{-27} \frac{cm}{gm}\left(\frac{cm}{sec'}\right)^2$$
$$= \kappa\left(\frac{cm}{sec'}\right)^2.$$

Thus 8πK has the same *value* as κ except for the factor

$$\left(\frac{cm}{sec'}\right)^2 = c^2,$$

and this value was obtained without division by c^2. For any M, we have

$$2\mathrm{KM} = \frac{8\pi KM}{4\pi} = 1.485232053823733 \times 10^{-28} \frac{cm}{gm}\left(\frac{cm}{sec'}\right)^2 M = \alpha_M(cm)\left(\frac{cm}{sec'}\right)^2. \quad (8)$$

This last equation yields the two different $\alpha_M{}'s$, one with unit (cm) and the other with units $(cm)\left(\frac{cm}{sec'}\right)^2$, both having the same value α_M. The first is a mass constant since α_M is proportional to the mass M; whereas, the second is an energy constant since the energy is equal to the mass times the velocity of light squared and α_M is proportional to that. For α_M the mass constant obtained by dividing 2KM by $\left(\frac{cm}{sec'}\right)^2$, we have

$$M = \frac{\alpha_M}{2K}(cm)\left(\frac{cm}{sec'}\right)^2.$$

For α_M the energy constant obtained by substitution of $(2.99792458) \times 10^{10}(sec')$ for 1 sec in the expression for the gravitational constant K, we have

$$M = \frac{\alpha_M}{2K}(cm)\left(\frac{cm}{sec'}\right)^2.$$

In the first case, replacing $\alpha_M(cm)$ by $\frac{2KM}{\left(\frac{cm}{sec'}\right)^2}$, we obtain

$$M = \frac{2\mathrm{K}M}{2\mathrm{K}} = M.$$

In the second case, replacing $\alpha_M(cm)\left(\frac{cm}{sec'}\right)^2$ by 2KM, we get the same result.

In the expression

$$\frac{1}{c^2}\frac{\alpha}{r},$$

without any units given, α is the constant obtained by substitution of $(2.99792458) \times 10^{10}(sec')$ for 1 sec in the expression for the gravitational constant K so that

$$\frac{\alpha}{r},$$

where α is the constant obtained by dividing 2KM by $\left(\frac{cm}{sec\prime}\right)^2$, has the same value.

In *Quantum Gravity, Energy Wave Spheres and the Proton Radius*, our copy, pages 66, 67, considering the bending of light perpendicular to a radius in a gravitational field, we wrote, With the space-time coordinates and the value for $\frac{dx_1}{dx_2}$ that we have given, we obtain, for a light ray, corresponding to a light ray perpendicular to a radius in flat space-time, in a gravitational field, for γ the value

$$\boldsymbol{\gamma = \frac{dx_2}{dx_4}\sqrt{1+\left(\frac{dx_1}{dx_2}\right)^2}}$$

$$\boldsymbol{= \frac{dx_2}{dx_4}\sqrt{1+\frac{1-\left(1-\frac{1}{c^2}\frac{\alpha}{r}\right)}{\left(1-\frac{1}{c^2}\frac{\alpha}{r}\right)}}}$$

$$\boldsymbol{= \frac{dx_2}{dx_4}\sqrt{\frac{1}{\left(1-\frac{1}{c^2}\frac{\alpha}{r}\right)}}}$$

$$\boldsymbol{= 1. \quad [6.136]}"$$

The choice of space-time coordinates just above has

$$\boldsymbol{\frac{dx_2}{dx_4} = \left(1-\frac{1}{c^2}\frac{\alpha}{r}\right)^{\frac{1}{2}}},$$

corresponding to the velocity of light equal to $\boldsymbol{\frac{dX_2}{dX_4} = 1}$ in the absence of gravitation. The right triangle having velocities for sides, with the hypotenuse having velocity of light equal to 1 and length equal to the wavelength of the non-gravitational light-ray so that the frequency of the light ray along the hypotenuse has the same frequency, which we may as well consider to be 1, as the non-gravitational light ray, has for the side perpendicular to a radius

$$\boldsymbol{\frac{dx_2}{dx_4} = \left(1 - \frac{1}{c^2}\frac{\alpha}{r}\right)^{\frac{1}{2}}}.$$

Thus, the side along the radius has for length, which is a velocity,

$$\boldsymbol{\frac{dx_1}{dx_4} = \left(\frac{1}{c^2}\frac{\alpha}{r}\right)^{\frac{1}{2}}}.$$

Using the convention for the expression

$$\frac{1}{c^2}\frac{\alpha}{r},$$

given without units, having the same value as

$$\frac{\alpha}{r},$$

we have, for the component of the velocity of light perpendicular to the radius,

$$\frac{dx_2}{dx_4} = c\left(1 - \frac{\alpha}{r}\right)^{\frac{1}{2}}$$

and, for the absolute value of the component of the velocity of the light ray along the radius,

$$\frac{dx_1}{dx_4} = c\left(\frac{\alpha}{r}\right)^{\frac{1}{2}}.$$

Since the fraction

$$\frac{\alpha_M}{r}$$

of the energy that the imaginary energy wave sphere with mass m *loses in the sense that* $d\mathcal{X}_4{}^2(r)$ *is negative with increasing absolute value* is the square $\left(\frac{v}{c}\right)^2$ of the ratio of its velocity $-v$ to c and the component of the velocity of the light ray along the radius has the value

$$\frac{dx_1}{dx_4} = -c\left(\frac{\alpha}{r}\right)^{\frac{1}{2}},$$

we see an imaginary energy wave sphere, the motion of which in a gravitational field we have described, inside the *photon*.

For such a light ray, for $tan\ \theta$, we have

$$tan\,\theta = \frac{\frac{dx_1}{dx_4}}{\frac{dx_2}{dx_4}} = \frac{\left(\frac{\alpha}{r}\right)^{\frac{1}{2}}}{\left(1-\frac{\alpha}{r}\right)^{\frac{1}{2}}}.$$

For an energy wave sphere of mass m at radius r in the quasi-static, radially symmetric gravitational field about a point mass M, the fraction of energy that the energy wave in the energy wave sphere has left

$$\left(1-\frac{\alpha}{r}\right)^{\frac{1}{2}},$$

which is also the ratio of the velocity of the energy wave to c, has the previously given Taylor series expansion about 1 of

$$\left(1-\frac{\alpha}{r}\right)^{\frac{1}{2}},$$

so that the velocity, upon multiplication by c, of the wave in the energy wave sphere in the local system of coordinates, is

$$1-\left(\frac{1}{2}\frac{\alpha}{r}+\frac{1}{8}\left(\frac{\alpha}{r}\right)^2+\frac{1}{16}\left(\frac{\alpha}{r}\right)^3+\frac{5}{128}\left(\frac{\alpha}{r}\right)^4+\cdots\right). \quad (4)$$

The first term $\frac{1}{2}\frac{\alpha}{r}$ in the series, which upon multiplication by $h\nu$ is the energy lost,

$$\left(1-\left(1-\frac{\alpha}{r}\right)^{\frac{1}{2}}\right) = 1-\left(1-\left(\frac{1}{2}\frac{\alpha}{r}+\frac{1}{8}\left(\frac{\alpha}{r}\right)^2+\frac{1}{16}\left(\frac{\alpha}{r}\right)^3+\frac{5}{128}\left(\frac{\alpha}{r}\right)^4+\cdots\right)\right)$$

$$=\left(\frac{1}{2}\frac{\alpha}{r}+\frac{1}{8}\left(\frac{\alpha}{r}\right)^2+\frac{1}{16}\left(\frac{\alpha}{r}\right)^3+\frac{5}{128}\left(\frac{\alpha}{r}\right)^4+\cdots\right), \quad (9)$$

is equal to

$$\frac{1}{2}\left(\frac{v}{c}\right)^2,$$

where v is the velocity

$$c\left(\frac{\alpha}{r}\right)^{\frac{1}{2}}.$$

For the constant of gravitation K, with

$$\frac{\mathrm{KM}}{c^2} = \frac{1}{2}\alpha_M,$$

we have

$$\frac{1}{c^2}\frac{KM}{r} = \frac{1}{2}\frac{\alpha_M}{r},$$

and

$$\frac{KM}{r} = \frac{1}{2}\frac{\alpha_M}{r}c^2 = \frac{KM}{r} = \frac{1}{2}v^2,$$

which upon multiplication by m is the kinetic energy

$$\frac{1}{2}mv^2.$$

Once again, if

$$\frac{\alpha}{r} = 1,$$

then the series (4) converges to 0 if and only if

$$1 = \left(\frac{1}{2} + \frac{1}{8} + \frac{1}{16} + \frac{5}{128} + \cdots\right).$$

As $r \searrow \alpha, \frac{\alpha}{r} \nearrow 1$, so that the kinetic energy of the energy wave sphere is arbitrarily close to one half of the energy lost, which cannot be greater than $h\nu$, or the energy lost is arbitrarily close to twice the kinetic energy.

For the mass M the mass of the Earth,

$$M = (5.9722)10^{24}\,kg = (5.9722)10^{27}gm,$$

for $2\mathrm{K}M$, with the unit of time being such that the velocity of light $c = (2.99792458) \times 10^{10}\,\frac{cm}{sec}$, we have

$$\begin{aligned} 2\mathrm{K}M &= 2(6.6743\ \times\ 10^{\ -11}10^6 cm^3 10^{-3}\ gm^{-1}\ sec^{-2})(5.9722)10^{27}gm \\ &= 7.972050892 \times 10^{20} cm^3 sec^{-2}, \end{aligned}$$

or

$$\mathrm{K}M = 3.986025446 \times 10^{20} cm^3 sec^{-2}.$$

For the radius $r = (6.378)10^8 cm$ of the Earth, we have

$$r^2 = \left((6.378)10^8 cm\right)^2 = 4.0678884 \times 10^{17} cm^2$$

and

$$\frac{\mathrm{K}M}{r^2} = \frac{3.986025446}{4.0678884} \times 10^3 cmsec^{-2}$$

$$= 0.9798758112439859 \times 10^3 cmsec^{-2},$$

which is the familiar *acceleration*, calculated using only the first term of the energy lost, due to gravity at the Earth' surface since

$$\frac{d}{dr}\frac{KM}{r} = -\frac{KM}{r^2}.$$

The second term of the series (9), which is the energy lost after multiplication by $h\nu$, still with the unit of time being such that the velocity of light $c = (2.99792458) \times 10^{10} \frac{cm}{sec}$, is

$$\frac{1}{8}\left(\frac{\alpha}{r}\right)^2 = \frac{1}{8}\left(\frac{2KM}{r}\right)^2 = \frac{1}{2}\mathrm{K}M\frac{\mathrm{K}M}{r^2}$$

$$= 1.95290495876921 \times 10^{23} cm^4 sec^{-4},$$

which, if expected to be small, as in negligible or unnoticeable, seems quite large. With these units,

$$\frac{2KM}{r} > 1.$$

If we use equation (8),

$$2\mathrm{KM} = \frac{8\pi KM}{4\pi} = 1.485232053823733 \times 10^{-28}\frac{cm}{gm}\left(\frac{cm}{sec'}\right)^2 M = \alpha_M(cm)\left(\frac{cm}{sec'}\right)^2, \quad (8)$$

with

$$1.485232053823733 \times 10^{-28}\frac{cm}{gm}M = \alpha_M(cm),$$

so that $\frac{2\mathrm{K}M}{c^2} = \alpha_M$ with unit of time such that the velocity of light is 1, for the mass M the mass of the Earth with

$$M = (5.9722)10^{24}\,kg = (5.9722)10^{27}\,gm,$$

we have

$$\alpha_M(cm) = 0.8870102871846098(cm).$$

For the radius $r = (6.378)10^8 cm$ of the Earth,

$$\frac{\alpha_M(cm)}{r} = \frac{0.8870102871846098(cm)}{(6.378)10^8 cm} = 1.390734222616196 \times 10^{-9}.$$

For this value of $\frac{\alpha}{r}$, its powers in the series (9) become arbitrarily small. For $\frac{\alpha}{r} = 1$, however, the terms in the series (9) are not negligible. At the radius of the Earth, the second term

$$\frac{1}{8}\left(\frac{\alpha}{r}\right)^2 = 2.417677097444844 \times 10^{-19}$$

and the succeeding terms are arguably small enough that

$$\frac{1}{2}\frac{\alpha}{r}\mathrm{h}\nu$$

is a good approximation to the energy lost. More generally, for $\frac{\alpha}{r}$ sufficiently small,

$$\frac{1}{2}\frac{\alpha}{r}\mathrm{h}\nu$$

is close to the energy lost.

For a quasi-energy conserving gravitation in which an energy wave sphere with mass m has lost the energy

$$mc^2$$

when the energy wave sphere reaches the radius α_M, the first term in the series (9) accounts for half of that. The sum of the remaining terms gives the other half. The velocity of the energy wave sphere at this point is

$$-c\left(\frac{\alpha_M}{\alpha_M}\right)^{\frac{1}{2}} = -c,$$

and the velocity of the wave in the energy wave sphere is 0. Nearly simultaneously with this, the velocity of the wave in the imaginary energy wave sphere, also with velocity $-c$, inside the energy wave sphere is ic, the same as the velocity of the imaginary energy wave of the kernel of the mass M with radius α_M.

What happens to an energy wave sphere, with wave velocity 0 and velocity $-c$, inside the kernel depends on factors only the unknown effects of which can be seen. If imaginary energy wave spheres are not present inside the imaginary energy wave sphere, the kernel of a mass M at radius α_M, then the velocity of the energy wave sphere remains $-c$. The existence of an energy wave sphere, the *real* kernel, with mass M and radius

$$r_M = \frac{\hbar}{Mc},$$

assuming this equation still holds, would give the energy wave sphere and any light ray a place *past the imaginary kernel*, where the imaginary energy wave sphere inside the energy wave sphere or light ray was left, to go.

For the mass of the Sun

$$M_S = 1.989 \times 10^{33} gm,$$

we have

$$\alpha_{M_S} = \frac{\kappa M_S}{4\pi}$$

$$= \frac{(1.866396067265298)10^{-27} cmgm^{-1}}{12.5663706144}(1.989) \times 10^{33} gm$$

$$= 2.95412405992287 \times 10^5 cm,$$

which is $2.95412405992287 km$. For the mass $M = 10^{10} M_S = 1.989 \times 10^{43} gm$,
we have

$$\alpha_M = 10^{10} \frac{\kappa M_S}{4\pi} = 2.95412405992287 \times 10^{15} cm$$

$$= 1.83451104121204 \times 10^{10} miles.$$

The time for light to travel this last distance is

$$\frac{2.95412405992287 \times 10^{15} cm}{2.99792458 \times 10^{10} \frac{cm}{sec}} = 0.9853897191512636 \times 10^5 sec.$$

The radius of the real kernel for this mass M is

$$r_M = \frac{\hbar}{Mc}$$

$$= \frac{6.62607015 \times 10^{-27} \frac{gmcm^2}{sec}}{(6.283185307)(1.989 \times 10^{43} gm)\left(2.99792458 \times 10^{10} \frac{cm}{sec}\right)}$$

$$= 1.768563570561413 \times 10^{-81} cm.$$

The density of the real kernel, if it exists, with mass M and radius

$$r_M = \frac{\hbar}{Mc},$$

is

$$\frac{M}{\frac{4}{3}\pi\left(\frac{\hbar}{Mc}\right)^3} = \frac{3}{4}\frac{M^4c^3}{\pi\hbar^3}\frac{gm^4\left(\frac{cm}{sec}\right)^3}{\left(\frac{gmcm^2}{sec}\right)^3} = \frac{3}{4}\frac{M^4c^3}{\pi\hbar^3}\frac{gm}{cm^3}.$$

For any energy wave sphere with mass m and radius

$$r = \frac{\hbar}{mc},$$

we have

$$(2\pi r)mc = h,$$

where $2\pi r = \lambda$. Similarly,

$$h\nu\frac{1}{\nu} = h.$$

The failure of an energy wave sphere or light ray to escape the imaginary kernel may be due to the existence of a place, such as the real kernel, to go. For an energy wave sphere with wave velocity 0 or a light ray with no imaginary energy wave sphere inside, gravitation may not work on it anyway.

For the sake of argument, we assume, as a starting point, that inside the imaginary kernel of a mass M, imaginary wave spheres with wave velocity

$$ic\left(\frac{\alpha_M}{r}\right)^{\frac{1}{2}}$$

exist for each r. If a real kernel for the mass M exists for some radius $r \leq \alpha_M$, then we can deal with that. We can cope with energy wave spheres, imaginary or real, making it past the imaginary kernel for the mass M.

The situation at $r = 0$, where the imaginary wave velocity is undefined, is no more bizarre than the existence of a real kernel with radius

$$r_M = \frac{\hbar}{Mc}$$

and gives us yet another place for the energy wave spheres to go.

We may as well regard *the imaginary energy wave sphere inside an energy wave sphere* as the *source* of the gravitational force that holds the wave of the energy wave sphere together. If the imaginary energy wave sphere inside an energy wave sphere does not get past the imaginary kernel of a mass M, then there is nothing to hold the wave, the velocity of which is 0 at α_M, of the energy wave sphere together. There is, however, seemingly nothing to prevent an imaginary energy wave sphere from starting up inside an energy wave sphere inside the imaginary kernel of a mass M, but once the imaginary energy wave sphere is gone, there is nothing to hold the energy wave sphere together.

An energy wave sphere with mass m *that makes it past the radius* α_M has

$$c\left(1 - \frac{\alpha_M}{r}\right)^{\frac{1}{2}},$$

which is imaginary, for wave velocity, making it impossible to match the real wave velocity of the real kernel for a mass M. The only conceivable place to match the wave velocity of the real kernel of a mass M, where the wave velocity of the kernel is c and the velocity of the energy wave sphere, not its wave velocity, is $-c$, is at the radius α_M. The other remaining place for the energy wave sphere to go is to a discontinuity at radius 0, where its velocity and wave velocity are no longer defined.

A light ray with constant velocity $-c$ moving toward the imaginary kernel of a mass M along a radius has a real energy wave sphere with wave velocity 0 always. In the face of imaginary energy wave spheres with wave velocity

$$ic\left(\frac{\alpha_M}{r}\right)^{\frac{1}{2}}$$

along its path, the wave velocity of the energy wave sphere never becomes imaginary assuming any energy lost by the wave goes into the velocity of the energy wave sphere. This is the only clue that we have and the rule on *only clues* is to take them.

Taking the non-imaginary wave velocity clue amounts to assuming it holds for all real energy wave spheres and, as a consequence, that the absolute velocity of a real energy wave sphere cannot exceed c. Knowing that the source of this velocity is the energy wave sphere itself, we should have already concluded this anyway.

Thus, a real energy wave sphere always has a finite velocity and the singularity at $r = 0$ does not apply since the velocity is well-defined. Any imaginary energy wave sphere becomes part of the imaginary kernel at radius α_M, so the absolute velocity of an imaginary energy wave sphere is well defined and never exceeds c. As for a real kernel for the mass M for some radius $r < \alpha_M$, no real energy wave sphere has an imaginary energy wave sphere to hold it together for such a radius.

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