Journal of Physics and Astronomy

Research Article|Vol9 Iss8

The Mechanics of Gravity

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Received date: August 24, 2021; **Accepted date:** September 7, 2021; **Published date:** September 20, 2021

Abstract

A hypothesis is presented for the existence of omnipresent, Omnidirectional photon flux, to which matter is mostly transparent, from which equations of mass, energy, and motion are derived. This model is based on the original Fatio/Le Sage's shadow-gravity theories yet overcomes the numerous troubles that have plagued these theories.

Mass is measured when an object is accelerated relative to the flux and causes a momentary flux disturbance. In return, an imbalanced flux will accelerate the same mass if it is free to move or apply a pressure force if it is restrained. $E=mc^2$ is found as not only a measure of mass but also a measure of flux. A fraction of flux is absorbed into mass, resulting in a flux imbalance around mass and giving rise to the mechanics of gravity. From this premise, Newton's equation is derived from the first principles. Gravitational constant G is found to be a function of flux-absorption and flux-mass-friction coefficients combined with a measure of local flux. G is thus not a universal constant. Apparent 'instant action at a distance and 'curved space' are now understood through interpretations of this hypothesis.

Keywords: Omni-directional photon flux; gravitational constant; inertial mass; gravitational mass; flux absorption; flux coupling; Le Sage; push-gravity

Introduction

Push-gravity has previously been proposed in many forms; most notably by the publication of Le Sage, which was primarily based on the original idea (non-published) of Fatio. These, and other 'push gravity' and 'flow-of-space' or 'shadow-gravity' theories have been met with vehement resistance and thoroughly valid objections by many great scientists [1-11]. With a new outlook on the theory, these objections are overcome and dealt with in this document. Newtonian gravity, with its 'Instant action at a distance has been superseded by what is our best current understanding of gravity, Einstein's General Relativity (GR) (1916) [12], Quoting John Wheeler: "Mass tells space-time how to curve, and space-time tells mass how to move". Daniel Faccio's representation of 'space is sucked into the earth' in his river model [13], or Einstein's interpretation of 'earth is accelerating upward' both provide usable abstracts.

Quoting Ethan Siegel: "What we perceived as gravity was simply the curvature of space and the way that matter and energy responded to that curvature as they moved through spacetime" [14].

One can intuitively imagine how curved space could create a path for the matter to move, but the above still does not explain how 'matter bends space'. It is agreed that all matter and energy add to the stress-energy tensor which describes the gravitational field via Einstein's field equations, but descriptively this is not much different from 'mass and energy create gravity'. Yet the theory (GR) has been thoroughly tested and has proven that its accuracy is renowned [15]. A fully functional mechanistic explanation for the workings

Citation: Francois Zinserling, The Mechanics of Gravity, J Phys Astron.2021;9(8):232

of gravity still does not exist.

Introducing the Omni-directional, photon flux

It is known that different frequencies of radiation interact differently with matter [16]. As frequencies get higher, the energies are higher, but the probability of interacting with matter becomes less as the cross-section gets smaller. Compare Infra-Red *Vs* X-Rays. The first is mostly absorbed in the human body while for the other the body is mostly transparent. This document proposes a flux of even higher frequency where all matter is (almost) completely transparent to this flux.

Quoting Masud Mansuripur, where he describes a photon in a transparent medium: When the pulse first enters the dielectric slab, the positive force of its leading-edge accelerates the slab. The acceleration continues until the trailing edge enters, as soon as the leading edge of the pulse exits through the slab's rear facet, the trailing edge begins to slow down the slab's motion. By the time the trailing edge leaves the slab, the motion has come to a halt, and all the momentum initially acquired by the slab has returned to the light pulse [17].

Postulate: The void of space, 'vacuum' contains an Omni-directional photon flux. The flux is quantized in high-energy photons which have a low probability to be reflected or refracted in mass. The matter is transparent to the flux just as clear glass may be transparent to visible light photons. Flux is slowed in the matter, and momentum is transferred for the duration of transit. The Omni-directional photon flux is not to be confused with the static aether theory of Lorentz [18], nor with the corpuscles of the push-gravity theory of Le Sage [1,2], although the latter provided much inspiration toward this hypothesis.

Methods and Discussions

Method: Inertial mass as a measure of the flux

It is known that inertial mass can only be measured under a change in velocity. A relevant equation for force $F = m \times a$. Momentum $P = mv$ is useful under a change in velocity. However, gravitational mass exists in the field of a gravitation source and does not require a change in velocity. $F = m \times g$ applies.

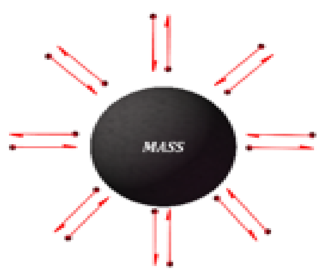

FIG. 1. **Mass is stable in a balanced Omni-directional flux. If not disturbed by external forces, acceleration = 0. (a very small mass may not be stable in a quantized flux, and may appear to have random movements).**

In **FIG.** *1* a composite mass is 'at rest' in an Omni-directional photon flux, with 'at rest' understood as there being no imbalance in the flux from any direction, i.e. the flux is equal from all sides, and no net acceleration is imposed on the mass. With the mass transparent to the Omni-directional photon flux, the mass has stable (or no relative) motion. From an observer in the same reference frame, for a small mass: $Sum(E_{in}) \approx Sum(E_{out})$, where *Ei* is the energies of the photons [14].

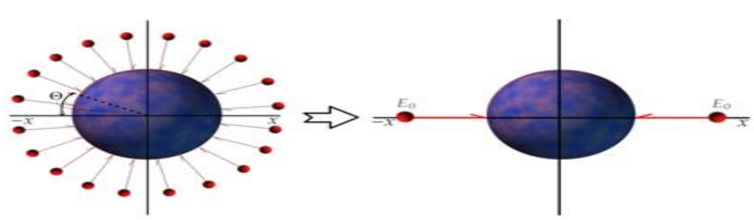

FIG. 2. **For this exercise, only the x-direction components of all inward photons are summed up, and then represented as +X and -X components.**

In FIG.2, only the effect in one dimension is shown, at a point P, where the x-components of all photons contribute:

$$\overrightarrow{E_0} = \sum_i \overrightarrow{E_i} \cos\theta_i \qquad (1)$$

Since the sum of all photons in a balanced flux will equal to zero, the flux is presented as two single photons approaching the mass, of equal energy but in the opposite direction so that the mass does not gain any momentum from these photons [17].
The energy vector of each initial photon, before entering the mass, can be represented as:
And,

$$\overrightarrow{E_{01}} = h \times f_0 \widehat{x} \qquad (2)$$

$$\overrightarrow{E_{02}} = -h \times f_0 \widehat{x} \qquad (3)$$

A force F is now applied to the mass m, in direction x. The mass will experience a relativistic change in momentum:

$$\overrightarrow{F} = y \times m \times \frac{dv}{dt} \widehat{x} \qquad (4)$$

$$y = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} \qquad (5)$$

For a mass accelerating from rest, after a single unit of time dt (dt=1), the velocity of the mass will be dv, in the +x direction.
At the instant of acceleration of the mass, the two photons $\pm E_0$ in the mass are transformed, so that they appear in the mass as shown in [18] [**FIG. 3**]:

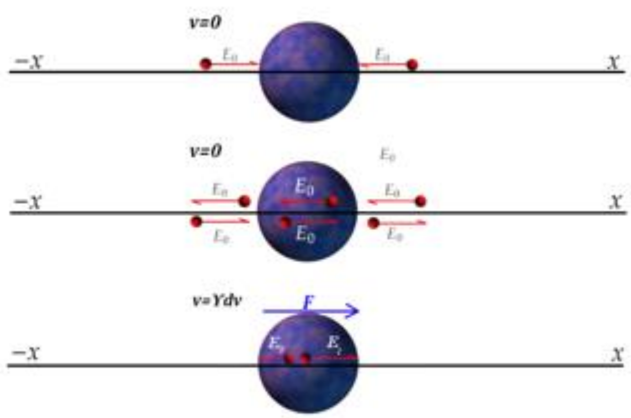

FIG. 3. **The flux photons in the mass are transformed when the mass is accelerated due to an external force. Top picture: the flux is shown around the mass as equal ± E_0. Mid picture: the mass is transparent to the flux and ± E_0 is also within the mass. Bottom picture: The mass is accelerated and the photons within are transformed to E_1 and E_2, blue-shifted and red-shifted respectively. (arrow lengths are not to scale, and represent vector strengths, not photon wavelengths).**

From the relativistic Doppler equation [19], we get the energy of the transformed photons, shown at the bottom of [**FIG. 3**] as E_1 and E_2:

$$|E_1| = h \times f_0 \times \sqrt{\frac{c + dv}{c - dv}} \qquad (6)$$

$$\left|E_2\right| = h\times f_0 \times \sqrt{\frac{c-dv}{c+dv}} \quad (7)$$

$$\frac{\left|E_1\right|+\left|E_2\right|}{\left|E_0\right|} = \sqrt{\frac{c+dv}{c-dv}} + \sqrt{\frac{c-dv}{c+dv}} \quad (8)$$

$$\frac{\left|E_1\right|+\left|E_2\right|}{\left|E_0\right|} = \frac{2}{\sqrt{1-\frac{dv}{c^2}}} \quad (9)$$

$$\left|E_1\right|+\left|E_2\right| = 2\times y\times\left|E_0\right| \quad (10)$$

Change in energy can be calculated by comparing with the energy of the original photons:

$$\left|E_1\right|+\left|E_2\right| - 2\times\left|E_0\right| = 2\times\left|E_0\right|\times\left(y-1\right) \quad (11)$$

It is known that for a relativistic mass, the change in energy is the kinetic energy gained:

$$\left|E_k\right| = \left(y-1\right)\times mc^2 \quad (12)$$

By setting change in energy of the photons equal to the kinetic energy of the mass, a well-known relationship is revealed:

$$2\times\left|E_0\right| = mc^2 \quad (13)$$

(Note:1 $E_0 = mc^2$ in this document because the starting photons each had E_0 energy, which is not unrelated to Einstein's derivation $E = mc^2$ since Einstein's choice of starting energy of the emitted photons as E/2 each [20].)

In a different approach, the resulting photons indicate the state of motion (dv) of the mass, where $\left|E_1+E_2\right| = \left|E_1\right|-\left|E_2\right|$ since the photons are in opposite direction:

$$\left|E_1\right|-\left|E_2\right| = \frac{2\times dv}{c}\times y\times\left|E_0\right| \quad (14)$$

Consider for a particle in motion the momentum can be shown as:

$$P = \frac{\left|E\right|}{c} = y\times m\times dv \quad (15)$$

By taking the momentum of the photons as ($|E_1|$-$|E_2|$)/c of [Equation 14] and setting equal to P above, it reveals:

$$y\times m\times dv = \frac{2\times dv}{c^2}\times y\times\left|E_0\right| \quad (16)$$

And once again:

$$2\times\left|E_0\right| = mc^2 \quad (17)$$

The next approach takes the total energy of the transformed photons E_1 and E_2 [21]:

$$\left|E_1\right|+\left|E_2\right| = 2\times\left|E_0\right|\times\left(y-1\right)+2\times\left|E_0\right| \quad (18)$$

Then from [Equation 12] and [Equation 13] above,

$$\left|E_1\right|+\left|E_2\right| = \left|E_k\right|+mc^2 \quad (19)$$

Which is a well-known relationship.

A final approach confirms the relation $E^2 = \left(Pc\right)^2 + \left(mc^2\right)^2$ in terms of the flux photon energies [22]:

$$2\times y\times\left(\left|E_0\right|\right)^2 = \left(\frac{dv}{c}\times\left(\left|E_1\right|+\left|E_2\right|\right)\right)^2 + \left(\frac{\left|E_1\right|+\left|E_2\right|}{y}\right)^2 \quad (20)$$

Discussion

Inertial mass is a measure of the flux

The equations above reveal the relations of mass, kinetic energy, momentum, and total energy of a mass interacting with the photon flux:

Note 2: $E_1 + E_2 > 2E_0$ because γ>1 for all v<c and is indicative of the energy absorbed by the mass during acceleration. $E_1 > E_0 > E_2$ is typical in Doppler results. The premise of Einstein's $E = mc^2$ is that a photon inside an object of mass, adds to the mass of the object, equal to the energy of the photon. This is a well-established theory [20]. It has been argued in this section that the inertial mass of an object must ensue from photons in transit in the mass; an Omni-directional photon flux to which all mass is transparent will reveal the mass of the object in any direction that it is accelerated. Inertial mass is apparent for the duration of acceleration (or change in velocity) in any direction. During acceleration, the flux is perturbed, as in the E_1, E_2 argument above, in a direct ratio to the mass of the object. E_0 represents the prime reference frame. E_0 is only a linear representation of an Omni-directional flux. For a larger mass, it is not expected that E_0 would signify greater energy for each photon, but as shown in **FIG. 4**, that a larger mass would contain more flux photons in transit, proportional to the volume and density of the mass.

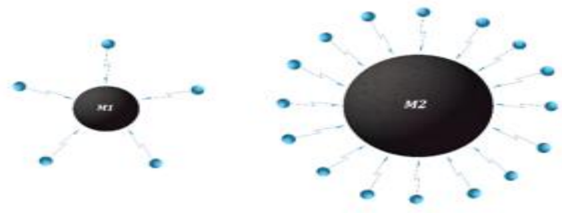

FIG. 4. **Small mass, fewer flux interactions; large mass, more flux interactions. Not 'bigger' flux for larger mass.**

All particles with mass interact with (perturb during acceleration) the flux. It is from this interaction that its mass is defined. If it does not interact, it does not have mass.

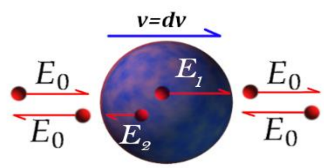

FIG. 5. **As seen from the viewpoint of an observer: Once the mass is no longer accelerating, the flux photons are not further perturbed. A mass in motion remains in motion unless another force enacts upon it. (Newton).**

Once acceleration ends, and the mass is in constant motion, an observer will continue to see the photons enter as E_0, transformed inside the mass as E_1 and E_2, and exit again as E_0. See [**FIG.** *5*]. Therefore, the flux does not resist constant motion, and no drag effect will ensue. {Newton's first law} The mass is now in a different reference frame in the flux, with unchanging momentum, relative to an observer that did not accelerate.

Method: Measurement and Units of G

NIST: $G = 7.67430\,x10^{-11}\,m^3\,kg^{-1}\,s^{-2}$ [21]

The Gravitational Constant G is prominent in both Newtonian and Einstein's General Relativity equations and presents a measure of the strength of gravitational interactions [12]. See [**FIG. 6**].

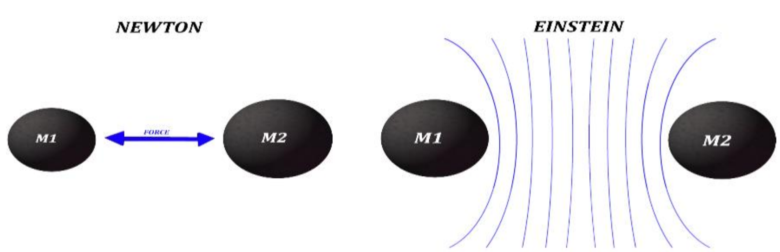

FIG. 6. **Comparing graphical representations of Newton's 'Action at a distance' to Einstein's 'Curved space'.**

Newton:

$$F = \frac{G \times M \times m}{r^2} \qquad (21)$$

, which explains the interaction of one mass with another across a distance ‘ r ’, but without a time component.
Einstein:

$$G_{\mu\nu} + \Lambda g_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu} \tag{22}$$

, which formulates how mass bends space, and how space tells mass to move.
In gravitational calculations encountered above, the values of G (Newton’s Gravitational Constant) and M (mass or energy of an object) are inseparable. In Newton’s equation $G \times M$ is found, as M a measure of mass. In Einstein’s equation $G \times T_{\mu\nu}$ is present, with $T_{\mu\nu}$ a measure of mass or energy. Even the equation for bending light $dN = 4GMc^2 r_p, G \times M$ is still inseparable. Orbital equations require $G \times M = v^2 / r,\ or\ G \times M = 3 \times \pi \times v / P^2$, and gravitational acceleration $g = G \times M / r^2 \times G \times M$ in each equation relies on G being a constant.

Discussion

Measurement and units of G

The SI units of G above, which can also be shown as ‘$N \times m^2/kg^2$’, show the units as required to balance Newton’s (and Einstein’s) equation and in Newton’s formula would result in a unit of force, measured in Newton. (1 N = 1 $kg \times m/s^2$).
Acquiring an accurate and reliable measurement value of G has been problematic [22-25], compared to the accuracy obtained for other physics constants. A comprehensive review on the history of measurements of G, and difficulties encountered, is presented by C. Rothleitner and S. Schlamminger [26], and also by Junfei Wu et al [27].

Method

Gravitational mass as a measure of the flux

Thought experiment: The flux photons E_1 and E_2 were transformed in the accelerated mass, see [Equation 10]. Mass is transparent to the flux photons, like the glass is to visible light, so momentum is transferred while flux photons are within the mass.
When the force was applied externally, the inertial mass attained kinetic energy related to a change in photon energy, where the change in photon energy was equal to the attained kinetic energy of the mass, from [Equation 11]:

$$|E_1| + |E_2| - 2 \times |E_0| = 2 \times |E_0| \times (y - 1) \tag{23}$$

Shown in [
FIG. 7], consider for a moment photons the initial photons E_1 and E_2 could be captured, and each reversed in direction. The resultant effect on the mass will be to negate the initial velocity (dv) and decelerate the mass back to rest. The equation [Equation 23] is thus reversed by applying the photons E_1 and E_2 back into the mass, for a time dt, to cancel the kinetic energy:

$$|E_1| + |E_2| - 2 \times |E_0| \times (y - 1) = 2 \times |E_0| \tag{24}$$

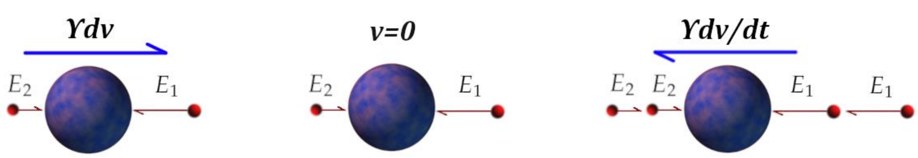

FIG. 7. **Reversing photons E_1 and E_2 will at first decelerate the mass, and if more photons arrive, accelerate in an opposite direction.**

Which leaves the mass at rest and the flux photons inside the mass ($2 \times E_0$) restored. In effect, E_1 and E_2 have applied the opposite force from the one that originally accelerated the mass [Equation 4] and brought it back to rest. The mass is restored to its original reference frame.
The mass is now stationary again in its original frame of reference. Let the exercise not stop here but apply another set of E_1 and E_2 photons to the mass. See [FIG.7] Where initially the $2 \times E_0$ photons represented a balanced flux, E_1 and E_2 now represent an imbalance in the flux, which would at first accelerate the mass to velocity dv (in the opposite direction). If E_1 and E_2 were to be a continuous stream of photons, the mass is in an imbalanced flux, it would continue to accelerate the mass in the opposite direction. If the mass is restricted from being accelerated, a push force is applied to the mass.

$$\vec{F} = y \times m \times \frac{dv}{dt} = \frac{2 \times dv}{c^2 dt} \times y \times |E_0| \tag{25}$$

This supports the equivalence principle [28,29], where there is no difference between being accelerated by an external force and being in a gravitational field. See [**FIG. 8**].

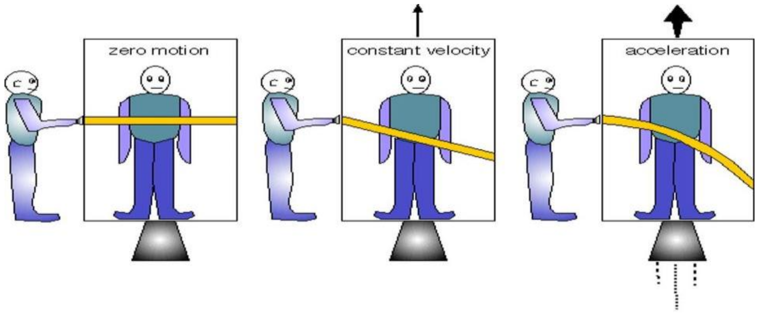

FIG. 8. **Visualization of equivalence principle shows acceleration to be similar to being in a gravitational field. Picture credit: Ethan Siegel and Nick Strobel at www.astronomynotes.com**

The result of E_1 and E_2 will be a net push force on the object, proportional to the mass and the strengths of E_1 and E_2. If the mass is unable to move, no acceleration ensues, such as would be the experience from the force from gravity.

Discussion

Gravitational mass as a measure of flux

$E = mc^2$ is not new. It has long been known that photons transfer momentum into a mass by Einstein [20] and also by Abrahams and Minkowski [17]. If a photon transfers momentum to a mass [30,31] a force is applied when the photon enters the mass.

To describe the mechanics of gravity, what remains to be shown is that an object of mass could create such an imbalance in the omnidirectional photon flux. See [**FIG. 9**].

If it can be shown that flux(in) > flux(out) for an object of mass, such that E_1 (flux in) > E_2 (flux out), then a gravitational field has been formed around such mass. In this equivalent E_1 and E_2 of imbalanced flux, inertial mass and gravitational mass would be the same.

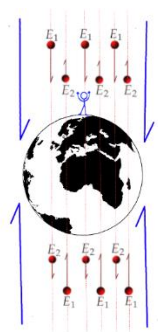

FIG. 9**. An imbalance in flux above the earth's surface, with flux inward greater than a flux outward, results in a net flux inward and, will push a nearby mass down onto the earth.**

Gravity results from a flux imbalance around a mass

As an example of flux, the force of the sun’s radiation on earth reveals an equation that is proportional to the intensity of the solar radiation [31].

$$F = I \times \frac{A}{C} \qquad (26)$$

With, F- the force of the radiation on the surface

A- the area where the radiation is absorbed

c - the speed of light

If gravity were to originate from a flux, then the units of G in Nm^2/kg^2 may be expected to be flux-like, in that G should be an indication of the strength of the flux, and a higher flux would mean a higher G. The units of G do not immediately reveal such a reference.

Reconsider the units of G now represented as:

$$Units\,of\;G = \frac{m^2}{kg} \times \frac{N}{kg} \quad (27)$$

, where m^2/kg is a typical unit of a specific absorption coefficient, and N/kg is the unit of a force applied per mass (or the acceleration of a mass, if simplified), as would typically be applied to a friction coefficient. From the solar flux equation [Equation 26], an increase in flux is associated with an increase in force. Since gravity effects appear as a 'pull' and not a 'push', and flux provides a 'push' unto mass, a flux solution for gravity may rather be found by finding attraction as a 'lack of flux'.

If an Omni-directional flux exists, to which all mass is transparent, then, if some flux energy is absorbed in the mass, the outgoing flux will be weaker. The appearance is of a net 'inflowing' flux. The absorbed component of flux must necessarily be dispersed and cannot be ignored. However, it will be considered to not contribute against the gravitational effect but be dissipated as heat.

Thus, a mechanistic description of gravity begins to form. The measure of gravitational strength 'G' will then be (in part) a measure of the 'flux absorption' into objects of mass. G must act (in part) as an absorption coefficient of the flux.

Two body gravitational interaction

A standard Newton equation for gravitation is:

$$F = \frac{G \times m_1 \times m_2}{r^2} \quad (28)$$

Where it is assumed, G is a constant, and m_1 and m_2 represent the masses of the 2 bodies in the gravitational interaction. The distance between the centers of mass is r, and the force F enacts equally on both masses.

To calculate the acceleration of each mass in the interaction, the equation would be shown as:

$$F = m_1 \times a_{m_1} = m_1 \times \left(\frac{G \times m_2}{r^2} \right) \quad (29)$$

With an equal and opposing force toward the other mass, with its acceleration:

$$F = m_2 \times a_{m_2} = m_2 \times \left(\frac{G \times m_1}{r^2} \right) \quad (30)$$

This has been tested to high precision [24].

Gravity is a result of the absorption of flux into mass. For a gravitational effect to occur, two masses need to be in 'gravitational sight' of each other. If 'G' is in part a measure of absorption, which mass gets the 'G' when the interaction must require both masses to absorb flux, possibly in unequal measures due to unequal compositions? 'G' must be shared between the two masses in ratio to mass. This means for the 2 masses in the test for the value of G:

$$G = (G_1 + G_2) \quad (31)$$

Where G_i is (in part) the absorption vectors for each mass.

The use of G has until now not been found to be problematic because the combination $M \times G$ is always used in calculations. But whereas $M \times G$ may be calculated and used correctly, an error in G will result in an error in M.

For this flux gravity theory to bring new predictions though, the masses need their absorption coefficients. See [**FIG. 10**].

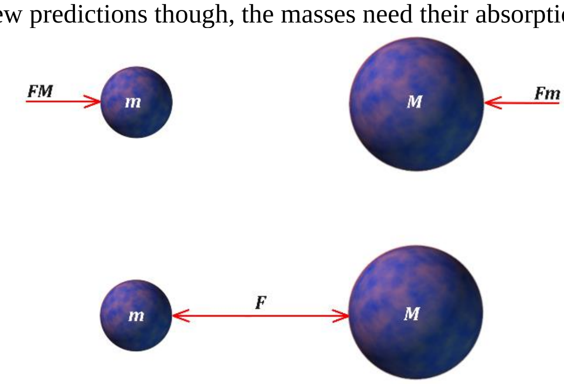

FIG. 10. **Mass m enacts a force unto mass M, and so also M unto m. It results in a perceived force that enacts on both masses equally. What is perceived as a 'pull force' between masses, is a result of a net push force on each mass.**

Where each mass establishes an imbalanced flux field, (note: g_1, g_2 are not the total accelerations of the masses)

$$g_1 = \frac{(G_1 \times m_1)}{r^2} \quad (32)$$

$$g_2 = \frac{(G_2 \times m_2)}{r^2} \quad (33)$$

which can only be enacted by bringing another mass into measurable range, where each field acts unto the other mass, and the total force results from their combined flux imbalance fields.

Here, a note needs to be inserted to explain the apparent 'instant action at a distance which ensues from Newton's equation. It has already been established that gravity moves at the speed of light [32], yet Newton's equation does not seem to rely on the speed of light. It is as if the mass 'knows' where the other mass is. Understanding the imbalance created by the absorption of flux takes the mysticism out of this effect. A mass can establish an imbalanced flux field before another mass might approach. When the other mass approaches, it seems as if there is an instant gravity between the masses. The masses are moving into each other's 'imbalance fields', which is already there, hence the instant action. (Relativism still needs to be accounted for)

From [Equation 32]and [Equation 33] Newton's equation could become:

$$F = F_1 + F_2 = \frac{G_1 \times m_1}{r^2} \times m_2 + \frac{G_2 \times m_2}{r^2} \times m_1 \quad (34)$$

$$F = \frac{(G_1 + G_2) \times m_1 \times m_2}{r^2} \quad (35)$$

, which is noticeably Newton's equations if $G_1 + G_2 \approx G$. Newton's equation is thus recognized to be a general solution for 2 bodies of similar composition only.

Method

Flux absorption

For an omnidirectional photon flux to result in a gravitational 'attraction', a portion of flux must be absorbed in a mass:

$$Flux_{out} = Flux_{in} - Flux_{absorbed} \quad (36)$$

Flux is measured in units of several photons/m^2/s', and no reflection or scattering is considered. The momentum transferred by absorbed flux (after absorption and re-emission) is considered negligible.

The gravitational constant 'G' [Equation 27] is associated with the absorption of flux. An imbalance in flux (due to absorption by mass) causes a net inward flux potential.

Absorption of x-rays follows an exponential decay curve [33-35] as shown in [**FIG. 11**] and [Equation 37]:

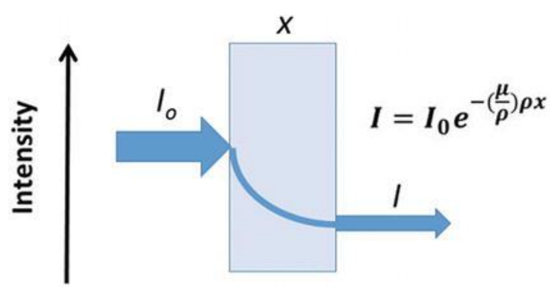

FIG. 11. **Typical X-Ray absorption curve over a distance x. Picture from: http://physicsopenlab.org/2018/01/20/x-ray-absorption/**

$$I_{(x)} = I_{0x} \times e^{\left[-\left(\frac{\mu}{\rho}\right)\rho X\right]} \quad (37)$$

where ρ is the density of the element (g/cm^3), μ is the linear attenuation coefficient, and μ/ρ is the mass attenuation coefficient given in cm^2/g. Note that x-ray absorption is not influenced by the crystal structure of the pigment, but only by the number of atoms/cm^3 and the thickness of the pigment layer [33].

From [Equation 37], absorbed flux into a mass equals:

$$I_{abs(x)} = I_{0x} - I_{(x)} \quad (38)$$

, where ρ is the density of the element (kg/m³), (μ/ρ) is the mass attenuation coefficient given in m²/kg, I_0 and $I_{abs(x)}$ have units of

$$I_{abs(x)} = I_{0x}(1 - e^{\left[-\left(\frac{\mu}{\rho}\right)\rho X\right]}) \quad (39)$$

'number of photons/m²/s'. Again, we consider only the x-components of flux, as was done in [Equation 1], so that for any point [31,32]:

$$\overrightarrow{I_{0x}} = \sum_i \overrightarrow{I_{xi}} \cos\theta_{xi} \quad (40)$$

[Equation 39] is seen to be the result of an integral of an exponential function with boundaries (0 – x); thus, equalling the total linear absorption of flux across a linear distance x, in one axis of x only. See [**FIG. 12**] [33].

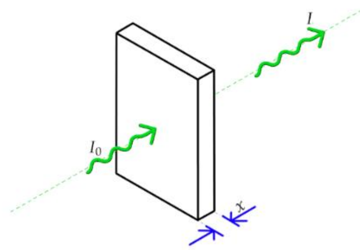

FIG. 12. **Representation of absorption of a unit of flux through a thickness of 'x'.**

Since $I_{abs(x)}$ is the absorption of photons per m² per second, absorption through a surface area (A), will be the absorption multiplied by area (A), resulting in the total absorption of flux into a cubic volume; through an area $A = Y \times Z$, across distance x, resultant $I_{abs(vol)}$ has units of 'the number of photons/s'. See [**FIG. 13**].

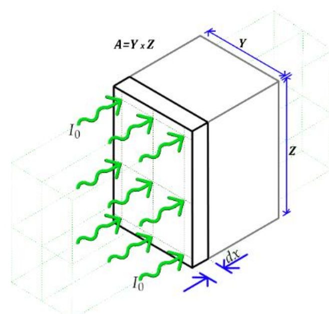

FIG. 13**. Representing absorption of a measure of flux across an area A, through a distance x.**

Absorbed flux for the volume:

$$I_{abs(\mathrm{vol}_x)} = I_{0x}\left(1 - e^{\left[-\left(\frac{\mu}{\rho}\right)\rho X\right]}\right) \times A \quad (41)$$

$$I_{abs(\mathrm{vol}_x)} = Y \times Z \times I_{0x}\left(1 - e^{\left[-\left(\frac{\mu}{\rho}\right)\rho X\right]}\right) \quad (42)$$

A Taylor expansion for e^{-ax}

$$e^{\left[-\left(\frac{\mu}{\rho}\right)\rho X\right]} = 1 - \left(\frac{\mu}{\rho}\right)\rho X + \frac{\left(\frac{\mu}{\rho}\right)^2 \rho^2 X^2}{2!} - \frac{\left(\frac{\mu}{\rho}\right)^3 \rho^3 X^3}{3!} + \dots\dots\dots(43)$$

Which simplifies for small values of $\left(\frac{\mu}{\rho}\right)\rho X$ to:

$$e^{\left[-\left(\frac{\mu}{\rho}\right)\rho X\right]} = 1-\left(\frac{\mu}{\rho}\right)\rho X \qquad (44)$$

Simplifying [Equation 42]:

$$I_{abs(\text{vol}_x)} = Y \times Z \times I_{0x}\left(1-\left(1-\mu\rho X\right)\right) \qquad (45)$$

$$I_{abs(\text{vol}_x)} = \rho \times XYZ \times \mu I_{0x} \qquad (46)$$

, which XYZ equates to a volume of a cube, and ρ is density, hence $\rho \times XYZ = Mass\left(M\right)$.

$$I_{abs(\text{m}_x)} = \mu I_{0x} \times M \qquad (47)$$

Here $I_{abs(m)}$ is in units of 'number of photons/s' (or vector components there-of) from any single direction.

From [Equation 47] it is seen that there is a net absorbed flux into the mass (per second). It is postulated that for any mass, total flux absorption, from all directions, is:

$$Flux_{abs(\text{M})} = \mu \times Flux_{in} \times M \qquad (48)$$

A non-uniform, or non-symmetric, shape of mass e.g. a rod, will not have a uniform absorption.
This imbalance of flux (in > out) formed around a mass (M) causes acceleration of other masses in the vicinity.

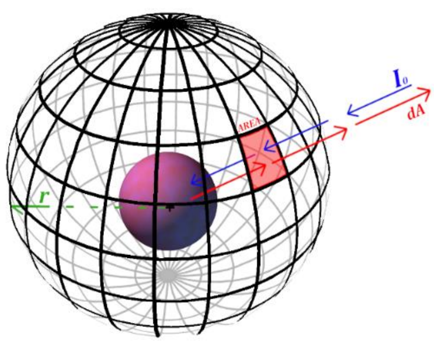

FIG. 14. **Gaussian sphere depicting measurement of flux at distance (r) through an area (A).**

To predict the effect of this interaction over a distance, since the imbalanced flux is a vector field pointing in toward the (center of) mass, invoking a Gaussian sphere, see [**FIG. 14**], to measure the absorbed flux through an area (A) at a distance (r) from the center of the mass:

$$\frac{Flux_{abs}(r)}{A} = \frac{\mu \times Flux_{in}}{4\pi r^2} \times M \qquad (49)$$

Or,

$$Flux_{abs}(r) = \frac{\mu \times Flux_{in} \times \text{M}}{4\pi r^2} \times A \qquad (50)$$

Result: Gravity from Flux absorption
[Equation 48] shows that a fraction of the Omni-directional flux is absorbed into a mass.
Should another mass (m) be in proximity of (M), (also contributing its flux-imbalance through absorption), the imbalances in flux will interact on objects of mass (m) and mass (M) to accelerate toward each other, as already discussed in the section [Method Gravitational mass].
Danilatos argues that gravitational attraction results from momentum transfer due to absorption within this imbalance [8]. However, it is expected that this component will be negligibly small for this document. If it were not small, this hypothesis would still suffer

from the energy crisis of Le Sage.

It is rather argued, as in [Method: Gravitational mass as a measure of the flux], that there is a direct momentum transfer from the net flux imbalance traversing through, and coupling with, the entire mass. To note here: The flux imbalance of one mass enacts a momentum transfer onto the other mass.

From [Equation 50] and [**FIG. 15**], choosing spheres as interacting objects: Mass (M) creates an imbalanced flux around itself due to flux absorption. The mass (m) presents itself with a cross-section area $A = \pi R^2$ through which the imbalanced flux (of M) will enact a push (toward M). [This covers one side of the interaction only]

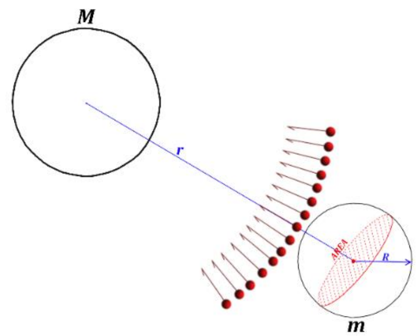

FIG. 15. **From the vantage point of mass M, mass m presents to it with a cross-section of surface area: $\mathbf{A = \pi R^2}$**

The mean free path of a photon through a sphere is equal to [36,37]:

$$L_{eff} = \frac{4R}{3} \qquad (51)$$

For this interaction of flux through the mean free path length, across the area (A), a friction coefficient (f_z) of interaction is required, where the flux will enact an acceleration (push force) unto mass-density, in units of Nm^2s/kg or m^3/s. Since the flux I_0 is measured in (number of photons/m^2/s) the resultant units $I_0 \times f_z$ are in (N/kg).

From [**FIG. 15**], a force is perceived to exist from one mass (M) to another (m) as the imbalanced flux, caused by (M), traverses through (m). Mass (m) has a radius R_m and density ρ_m:

$$F_m = Flux_{abs(\mathrm{M})}(r) \times f_z \times L_{eff\,(\mathrm{m})} \times \rho_m \, \frac{(\mu \times Flux_i\ \mathrm{n}) \times \mathrm{M}}{4\pi} \times \pi R_m^2 \times f_z \times \frac{4R_m}{3} \times \rho_m$$

$$\left(\frac{(\mu \times Flux_i\ \mathrm{n}) \times \mathrm{M}}{4\pi} \times \left(\frac{4\pi R^3 m}{3} \times \rho_m \right) \times f_z \right) = \frac{\left(\frac{(\mu \times Flux_i\ \mathrm{n})}{4\pi} \times M \right)}{r^2} \times m \times f_z \qquad (52)$$

There is thus no pull force acting between the masses. The imbalance in flux, caused by absorption into each mass, is enacting a friction push force directed toward the other mass, which may have been thus far perceived as a ‘pulling force’ from the other mass. The perceived force from mass M unto mass m, measured in Newton (N) is thus:

$$F_m = \frac{Flux_{abs(\mathrm{M})}(r) \times f_z \times m}{Area} = \frac{\left(\frac{(\mu \times Flux_{in} \times f_z)}{4\pi} \times M \right)}{r^2} \times m \qquad (53)$$

, while, assuming a uniform (balanced) local surrounding flux, the mass m also exerts a force unto mass M:

$$F_M = \frac{Flux_{abs(m)}(r) \times f_z \times M}{Area} = \frac{\left(\frac{(\mu \times Flux_{in} \times f_z)}{4\pi} \times m \right)}{r^2} \times M \qquad (54)$$

Since the masses will be accelerating toward each other, the perceived total force is the sum of the forces between two masses M and m, which causes the total acceleration toward each other. From [Equation 35]:

$$F = \frac{\left(\frac{(\mu \times Flux_{in} \times f_z)}{4\pi}\right) \times M \times m}{r^2} + \frac{\left(\frac{(\mu \times Flux_{in} \times f_z)}{4\pi}\right) \times m \times M}{r^2} \quad (55)$$

$$F = \frac{\left(\frac{(\mu \times Flux_{in} \times f_z)}{2\pi}\right) \times M \times m}{r^2} \quad (56)$$

, or shown as the familiar Newton's equation:

$$F = \frac{G \times M \times m}{r^2} \quad (57)$$

, revealing gravity because of flux absorption, flux intensity, and a friction interaction between photons and mass, and G as a non-constant function of the local flux:

$$\mathrm{G} = \frac{(\mu \times Flux_{in} \times f_z)}{2\pi} = 6.67 \times 10^{-11} \frac{m^2}{kg} \times \frac{N}{kg} \quad (58)$$

Newton's equation must thus be a 2-body approximation for 'low' values of G×M since the term $e^{-\mu\rho x}$ from [Equation 42] does not reappear in the equations above but remains simplified. The value of μ likely varies for different materials. Variations in local flux $Flux_{in}$, or imbalances in local flux, must cause variations in perceived gravity.

Conclusion

Through interaction with the omnidirectional flux, mass is measured. If a mass is accelerated in a balanced flux, its mass arises as a function of the strength of the local flux. If a mass exists in an imbalanced flux, it is accelerated by the flux, and its mass is revealed as a function of the strength of the local flux. Inertial and gravitational mass is unified.

Gravity ensues from a 'lack of' outgoing flux from a mass. A fraction of flux is absorbed in all mass, which results in a surrounding flux imbalance. In a balanced flux, a mass remains at rest (or at constant velocity), but it will accelerate in an imbalanced flux. From the Omni-directional flux a mechanistic understanding of gravitation thus arises, which leads to a conclusion that 'G' is not a universal constant.

Further understanding of the workings of this model, by including relativism, will inevitably lead to a solution for quantum gravity and the current dark matter dilemma.

Acknowledgments and affiliations

The author has no affiliation to any academic institution and has not received sponsorships. Special thanks to Ciandri Zinserling, Heinrich Zinserling, and Michael Halse for concept discussions and Michael Halse for preparing graphical representations.

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