Modern Physics Ignorance of Newton's Theory Unification of Gravity with QM The Beauty and the Beast

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Abstract

Isaac Newton did not invent the gravity constant G, nor did he use it, and nor did he have any use for it. Newton's formula was $F = \frac{\tilde{M}\tilde{m}}{r^2}$ and not $F = G\frac{Mm}{r^2}$. Newton's formula can easily be unified with quantum mechanics, while the ugly modification of modern physics can only be unified with quantum mechanics by adding similar ugliness to the rest of physics. Modern physics in reality uses two different mass definitions, one for gravity and another for the rest of physics. This, we will prove, has made it impossible to unify quantum mechanics with gravity. It is first when one understands the cause of the problem that one easily can fix it. It can be fixed either by going back to the key insight given by Newton, which leads to a beautiful simple unified theory, in conception and in notation. Alternatively, one can arrive at the same theory, but with very ugly notation that hides the beauty at the depth of reality.

We will show a beautiful way to unify gravity and quantum mechanics and also an ugly way. Both are the same way, but only one way, the Newton way gives the deep insight on matter, energy, time, space, and gravity and even quantum mechanics. Modern physics ignored Newton's insight on matter and altered the mass definition, and therefore had to modify Newton's gravity formula, such that a unified theory seemed to become impossible. Newton himself would probably not have approved of the gravity constant; it is a flaw on the foundation of his theory and his gravity formula. Still, when one understands what the gravity constant really represents, one can also unify standard physics, by adding the ugly gravity constant in other places as needed.
Key Words: Quantum gravity, granular matter, unification of QM and gravity and special relativity.

1 Introduction

We will add many more pages later on to this paper, with explanations and discussions. This is just an early draft. Still, this first draft contains a unified quantum gravity theory. That is a theory that unifies gravity with quantum mechanics and a slightly modified special relativity. This paper shows both how standard physics formulas must be altered if one wants to hold on to the gravity constant G and the kg definition of mass and at the same time get a unified theory. On the other hand, if one truly understands what G represent, then this is not needed, and one can then write the unified theory with much nicer notation that offers beauty and simplicity. Both approaches give exactly the same result and are at the deepest level one and the same theory. However, I call the two approaches, the Beauty and the Beast. The Beauty is the theory derived from truly understanding what mass is and why one ended up adding a G to the Newton formula. The Beast is how one can get the same unified theory by holding on to G and the kg definition of mass.

In short, Newton [1] never suggested a gravity constant, nor did he use one, nor did he need to use one. The gravity constant was first introduced in 1873 in a footnote [2], with notation f that later become G. The gravity constant was needed as an adjustment to Newton's gravity formula in order to be consistent with such a definition of mass. The mass actually used in the modified Newton formula is $\frac{G}{c^3}M$, that is part of the G is there simply to convert the mass into a mass of the right form. Be aware that only one of the two masses in the Newton formula actually are used for any gravitational predictions that we actually can observe. The small mass is only used for derivations where it cancels out against another small mass, such as when deriving escape velocity. However, the same mass definition was not applied elsewhere, e.g., gravity that is directly linked to the Planck scale was not incorporated, for example, in special relativity or quantum mechanics, where it also is needed to get a consistent theory that unifies. One got the Planck scale into the standard mass by using an ad-hoc constant G that was calibrated to observations, without having truly deep insight. This is very difficult to see, as it has been concealed for more than 100 years. However, after working with atomism, in a series of steps over many years, we were able to uncover what went wrong and what is needed to arrive at a unified theory.

In standard physics, one is also using a momentum definition that at a deeper level is rooted in the de Broglie wave [3, 4], the standard momentum. Actually, the de Broglie wave is derived from the standard momentum. The standard momentum was a construct one came up with long before understanding the quantum world. However, the de Broglie related momentum is not a fundamental, directly observable momentum; it is in reality a derivative of what we call the Compton momentum. The Compton wave [5] is the true matter wave, and it has a corresponding momentum, that we can call the true momentum. Both the de Broglie wave and the standard momentum are mathematical derivatives of something more fundamental, namely the Compton wave and the Compton momentum.

A much more detailed explanation of our unified theory is given in our papers [6, 7]. However, in these papers we did not show how one also can get a unified theory if one insists on holding on to the gravity constant G without dissolving it into its composite parts. If one holds on to G, one can still get a unified theory, but with ugly notation that makes it hard to recognize much of what one actually has discovered in parts of physics, see Table 1. The alternative is beautiful and elegant and simple as also shown in Table 1. Table 2 shows that the two approaches at the deepest level are the same; it is only the notation that is different at a higher level. Much of the confusion disappears when one understands that G is a universal composite constant $G = \frac{l_p^2 c^3}{\hbar}$ that is actually not needed, as the Planck length can be found and measured without any knowledge of G or $\hbar$

Without such modifications, it is impossible to get a unified quantum gravity theory. This is the unified quantum gravity theory. And yes, we will come back with many more pages of explanations in the time to come.

The last table shows the deepest level, which is identical for the two notations of a unified quantum gravity theory.

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	Unified with G **If wants to hold on to G and kg** **The Beast**	**Unified the Newton Way** **Mass rooted in atomism** **The Beauty**
Mass	kg mass introduced 1800	Atomism mass: indivisibles Newton's philosophy behind everything Democritus and Leucippus
Time	??	Newton's indivisible time
Mass	$m = \frac{\hbar}{\bar{\lambda}}\frac{1}{c}$ kg	$\tilde{T} = \tilde{m} = \frac{l_p}{c}\frac{l_p}{\bar{\lambda}}$ Collision-time
Energy	$\tilde{E} = m\frac{G}{c^3}c = m\frac{G}{c^2}$ Collision-length	$\tilde{L} = \tilde{E} = \tilde{m}c = l_p\frac{l_p}{\bar{\lambda}}$ Collision-length
Speed of light	$c = \frac{\tilde{E}}{m\frac{G}{c^3}}$	$c = \frac{\tilde{E}}{\tilde{m}} = \frac{\tilde{L}}{\tilde{T}}$
Maximum velocity mass	$v_{max} = c\sqrt{1-\frac{Gm^2}{\hbar c}}$	$c = c\sqrt{1-\frac{l_p^2}{\bar{\lambda}^2}}$
Relativistic energy	$\tilde{E} = \frac{m\frac{G}{c^2}}{\sqrt{1-\frac{v^2}{c^2}}}$	$\tilde{E} = \frac{\tilde{m}c}{\sqrt{1-\frac{v^2}{c^2}}}$
Kinetic energy	$\tilde{E}_k = \frac{m\frac{G}{c^2}}{\sqrt{1-\frac{v^2}{c^2}}} - m\frac{G}{c^2}$	$\tilde{E}_k = \frac{\tilde{m}c}{\sqrt{1-\frac{v^2}{c^2}}} - \tilde{m}c$
Kinetic energy	$\tilde{E}_k \approx \frac{1}{2}Gm\frac{v^2}{c^4}$	$\tilde{E}_k = \frac{1}{2}\tilde{m}\frac{v^2}{c}$
Relativistic Compton wave	$\bar{\lambda} = \frac{\hbar}{\frac{mc}{\sqrt{1-\frac{v^2}{c^2}}}}$	$\bar{\lambda} = \frac{l_p^2}{\frac{\tilde{m}c}{\sqrt{1-\frac{v^2}{c^2}}}}$
Relativistic de Broglie wave	$\bar{\lambda} = \frac{\hbar}{\frac{mv}{\sqrt{1-\frac{v^2}{c^2}}}}$	$\bar{\lambda} = \frac{l_p^2}{\frac{\tilde{m}v}{\sqrt{1-\frac{v^2}{c^2}}}}$
Rest mass Compton momentum	$\tilde{p}_r = m\frac{G}{c^2}$	$\tilde{p}_r = \tilde{m}c$
Total Compton momentum	$\tilde{p}_t = \frac{m\frac{G}{c^2}}{\sqrt{1-\frac{v^2}{c^2}}}$	$\tilde{p}_t = \frac{\tilde{m}c}{\sqrt{1-\frac{v^2}{c^2}}}$
Kinetic Compton momentum	$\tilde{p}_k = \frac{m\frac{G}{c^2}}{\sqrt{1-\frac{v^2}{c^2}}} - m\frac{G}{c^2}$	$\tilde{p}_k = \frac{\tilde{m}c}{\sqrt{1-\frac{v^2}{c^2}}} - \tilde{m}c$
de Broglie momentum	$\tilde{p}_b = \frac{m\frac{G}{c^3}v}{\sqrt{1-\frac{v^2}{c^2}}}$	$\tilde{p}_b = \frac{\tilde{m}v}{\sqrt{1-\frac{v^2}{c^2}}}$
Gravity	$F = c^3\frac{M\frac{G}{c^3}m\frac{G}{c^3}}{r^2}$	$F = c^3\frac{\tilde{M}\tilde{m}}{r^2}$
Orbital velocity	$v_o \approx \sqrt{\frac{GM}{r}}$	$v_o \approx \sqrt{\frac{c^3\tilde{M}}{r}}$
Escape velocity	$v_e = \sqrt{\frac{2GM}{r} - \frac{G^2M^2}{c^2r^2}}$	$v_e = \sqrt{\frac{2c^3\tilde{M}}{r} - \frac{c^4\tilde{M}^2}{r^2}}$
Schwarzschild radius	$r_s = \frac{2GM}{c^2}$	$r_s = 2\tilde{M}c = \tilde{E}$
Gravity acceleration	$g = \frac{GM}{r^2}$	$g = \frac{c^3\tilde{M}}{r^2}$
Energy momentum relation	$\tilde{E} = \tilde{p}_k + m\frac{G}{c^2}$	$\tilde{E} = \tilde{p}_k + \tilde{m}c$
Wave equation	$-i\frac{G}{c^3}\hbar\frac{\partial\Psi}{\partial t} + i\frac{G}{c^3}c\nabla = 0$	$-il_p^2\frac{\partial\Psi}{\partial t} + il_p^2c\nabla = 0$
Wave equation	$\frac{\partial\Psi}{\partial t} - c\nabla = 0$	$\frac{\partial\Psi}{\partial t} - c\nabla = 0$
Lorenz symmetry break down at the Planck scale	Yes	Yes
Heisenberg uncertainty break down at the Planck scale	Yes	Yes
Hidden?	Secrets hidden in G and $\hbar$	Nothing hidden
G	?	$G = \frac{l_p^2c^3}{\hbar}$ No need

Table 1: The table shows two unified theories of physics, the only difference is notation. If one wants to hold on to G and the kg definition of mass, then one get an ugly notation where the deeper logic is hard to see (hidden inside G and the kg definition of mass). If one, on the other hand, switches to a mass definition rooted in atomism and in Newton's philosophy, then one get a beautiful notation and simplicity. Here we show the simplest version

	Unified deepest level	
Mass	$\tilde{T} = \tilde{m} = \frac{l_p}{c}\frac{l_p}{\bar{\lambda}}$	Collision time
Energy	$\tilde{L} = \tilde{E} = \tilde{m}c = l_p\frac{l_p}{\bar{\lambda}}$	Collision-length
Speed of light	$c = \frac{\tilde{E}}{\tilde{m}} = \frac{\tilde{L}}{\tilde{T}} = \frac{l_p\frac{l_p}{\bar{\lambda}}}{\frac{l_p}{c}\frac{l_p}{\bar{\lambda}}}$	
Max velocity mass	$v_{max} = c\sqrt{1-\frac{l_p^2}{\bar{\lambda}^2}}$	
Relativistic energy	$\tilde{E} = \frac{\tilde{m}c}{\sqrt{1-\frac{v^2}{c^2}}} = l_p\frac{l_p}{\bar{\lambda}\sqrt{1-\frac{v^2}{c^2}}}$	
Kinetic energy	$\tilde{E} = \frac{\tilde{m}c}{\sqrt{1-\frac{v^2}{c^2}}} - \tilde{m}c = l_p\frac{l_p}{\bar{\lambda}\sqrt{1-\frac{v^2}{c^2}}} - l_p\frac{l_p}{\bar{\lambda}}$	
Kinetic energy	$\tilde{E} = \frac{1}{2}\frac{l_p^2}{\bar{\lambda}}\frac{v^2}{c^2}$	
Relativistic Compton wave	$\bar{\lambda}_r = \bar{\lambda}\sqrt{1-\frac{v^2}{c^2}}$	
Relativistic de Broglie wave	$\bar{\lambda}_{b,r} = \bar{\lambda}_b\sqrt{1-\frac{v^2}{c^2}}$	A derivative of Compton
Relativistic Compton momentum	$\tilde{E} = \tilde{p}_t = \frac{\tilde{m}c}{\sqrt{1-\frac{v^2}{c^2}}} = l_p\frac{l_p}{\bar{\lambda}\sqrt{1-\frac{v^2}{c^2}}}$	True momentum
Relativistic kinetic Compton momentum	$\tilde{E}_k = \tilde{p}_k = \frac{\tilde{m}c}{\sqrt{1-\frac{v^2}{c^2}}} - \tilde{m}c = l_p\frac{l_p}{\bar{\lambda}\sqrt{1-\frac{v^2}{c^2}}} - l_p\frac{l_p}{\bar{\lambda}}$	True momentum
Relativistic de Broglie momentum	$\tilde{p}_b = \frac{\tilde{m}v}{\sqrt{1-\frac{v^2}{c^2}}} = l_p\frac{v}{c}\frac{l_p}{\bar{\lambda}\sqrt{1-\frac{v^2}{c^2}}}$	Derivative, not needed
Gravity	$F = c^3\frac{\tilde{M}\tilde{m}}{r^2} = \frac{l_p^4 c}{\bar{\lambda}^2 r^2}$	
Orbital velocity	$v_o \approx \sqrt{\frac{c^3\tilde{M}}{r}} = \sqrt{\frac{c^2 l_p^2}{\bar{\lambda}r}}$	
Escape velocity	$v_e = \sqrt{\frac{2c^3\tilde{M}}{r} - \frac{c^4\tilde{M}^2}{r^2}} = \sqrt{\frac{2c^2 l_p^2}{\bar{\lambda}r} - \frac{c^2 l_p^4}{\bar{\lambda}^2 r^2}}$	
Schwarzschild radius	$r_s = 2c\tilde{M} = 2\frac{l_p^2}{\bar{\lambda}}$	
Gravity acceleration	$g = \frac{c^3\tilde{M}}{r^2} = \frac{c^2 l_p^2}{\bar{\lambda}r^2}$	
Energy momentum relation	$\tilde{E} = \frac{l_p^2}{\bar{\lambda}\sqrt{1-\frac{v^2}{c^2}}} - \frac{l_p^2}{\bar{\lambda}^2} + \frac{l_p^2}{\bar{\lambda}^2} = \frac{l_p^2}{\bar{\lambda}\sqrt{1-\frac{v^2}{c^2}}}$	
Wave equation	$\frac{\partial\Psi}{\partial t} - c\nabla = 0$	
Lorenz symmetry break down at the Planck scale	Yes	Detected as gravity
Heisenberg uncertainty break down at the Planck scale	Yes	Detected as gravity
G	$G = \frac{l_p^2 c^3}{\hbar}$	G is not needed

Table 2: Here we have just simplified the two unified quantum gravity theories in Table 1 to their deepest level; they are then both identical. It is only notation that distinguishes the two theories in Table 1