The Gravitational Constant and the Planck's Units
A Simplification of the Quantum Realm

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Abstract

In this paper, I suggest a new way to write the gravitational constant that makes all of the Planck units: Planck length, Planck time, Planck mass, and Planck energy much more intuitive and simpler to understand. Most importantly, this potentially opens up the way for several new interpretations in physics. By writing the gravitational constant in a Planck functional form, we can rewrite all of the Planck units (without changing their values) in a form that is much simpler and more intuitive.

The structural form given by the rewritten Planck constants is somewhat surprisingly also the same structural form as what recently has been derived by Haug (2014) from scratch from atomism. In atomism, the most fundamental particles have spatial dimension. This is in strong contrast to the view of modern physics that assumes the existence of point particles. It is not so long ago that the indivisible particles with spatial dimensions (used by Newton, for example) were abandoned by modern physics in favor of point particles. We will not conclude in this paper if the most fundamental subatomic particles are point-like or have spatial dimension, but we will mainly focus on how we can simplify the Planck units within the framework of mainstream modern physics. Hopefully this can help us get one step further in the interpretation of the quantum world.

Key words: Gravitational constant, Planck units: length, time, mass, energy, Quantum physics, Haug mathematical atomism.

1 A New Perspective

We suggest that the gravitational constant should be written as a function of Planck's reduced constant

$$G_p = \frac{\aleph^2 c^3}{\hbar} \tag{1}$$

where $\hbar$ is the reduced Planck's constant and c is the well tested round-trip speed of light. We could call this Planck's form of the gravitational constant. The parameter $\aleph$ is an unknown constant that is calibrated so that G_p matches our best estimate for the gravitational constant. Alternatively the $\aleph$ can be set equal to the Planck length. In other words, we can use the gravitational constant to find the Planck length, or the Planck length to set the gravitational constant, and vice versa. The Planck form of the gravitational constant enables us to rewrite Planck's constants in a form that, in our view, simplifies and gives deeper insight and potentially opens up the path for totally new interpretations in physics.

Based on this, the Planck length is given by

$$l_p = \sqrt{\frac{\hbar G_p}{c^3}} = \sqrt{\frac{\hbar \frac{\aleph^2 c^3}{\hbar}}{c^3}} = \aleph \tag{2}$$

Here the Planck length is simply our constant $\aleph$. Further, the Planck time in this context is

$$t_p = \sqrt{\frac{\hbar G_p}{c^5}} = \sqrt{\frac{\hbar \frac{\aleph^2 c^3}{\hbar}}{c^5}} = \frac{\aleph}{c} \tag{3}$$

*e-mail espenhaug@mac.com. Thanks to Victoria Terces for helping me editing this manuscript and to Harald Hoff for useful comments. In this version, I have moved some of the material I had on gravity into a new paper, "Planck Quantization of Newton and Einstein Gravitation" that can also be found on www.vixra.org. Further, I have deleted the speculative section on the Golden ratio. The similarities between the Golden ratio and the Planck length and the $\aleph$ factor in our theory is almost for sure a coincidence, due to the selected metric system of meter and seconds.

In this view, the Planck time is simply the time it takes for the speed of light c to cross the Planck length. Next the Planck mass in this context results in

$$m_p = \sqrt{\frac{\hbar c}{G_p}} = \sqrt{\frac{\hbar c}{\frac{\aleph^2 c^3}{\hbar}}} = \frac{\hbar}{\aleph}\frac{1}{c} \tag{4}$$

The Planck mass in this form is very interesting. In 2014, Haug showed that mass derived from scratch from postulates in ancient atomism had to be $\frac{H}{w}\frac{1}{c}$, where his H was the diameter of an indivisible particle and w the distance[1] between center to center of the indivisible particles in the mass of interest. Significantly in that work, Haug shows that to truly understand what mass (matter) is relative to energy, the very essence is in: $\frac{1}{c}$. This is what he defines or points out must be time-speed. Bear in mind that c is a velocity and a velocity is the length traveled divided by the time it takes for light to travel that distance. In other words, $c = \frac{L}{T}$ and this means $\frac{1}{c} = \frac{T}{L}$, that is how many seconds goes by per meter traveled. The time-speed of light is about 3 nanoseconds per meter. As discussed by Haug in 2014, the part $\frac{H}{w}$ only represents how much equivalent continuous mass (continuous time) this particular mass contains. Possibly the $\frac{\hbar}{\aleph}$ in the Planck mass can be considered in the same way. Still in the Planck mass the output for mass is kg and in the Haug mass the output is seconds per meter. In the Haug mass, all of the inputs in $\frac{H}{w}\frac{1}{c}$ have a physical counterpart: the diameter of the particle, the distance between particles, and the speed of light. In the Planck mass, $\frac{\hbar}{\aleph}\frac{1}{c}$ only the speed of light is easily recognized as something "tangible" in the real world. It is not clear from modern quantum physics what the Planck length truly represents and it is even less clear what the reduced Planck constant $\hbar$ truly represents in the physical sense. We do not question their usefulness and success in calculations and predictions, but we do question what they truly represent and if this could change our interpretation of the quantum realm.

Haug derives a completely new relativity theory from the postulates of ancient atomism and he obtains the same mathematical end results as Einstein did when using Einstein synchronized clocks; he also gets a long series of additional equations. In addition, Haug obtains the famous equation $E = mc^2$, as well as the same relativistic mass energy relationship given by Einstein; however, this is derived from the quantum realm of atomism in his work. That the quantum realm of atomism gives exactly the same structural form of the equations as that of Planck could be a coincidence or it could be that we are approaching a deeper understanding of the Planck units? Atomism assumes that the most fundamental particles are indivisible and have a spatial dimension, while modern particle physics assumes that even the most subatomic particles are point particles (without spatial dimensions). Not so long ago, Newton assumed that light ultimately had to consist of indivisible particles; could it be that Newton's view was abandoned too early? We will not reach a conclusion on that here, but move on to the other Planck units.

Based on the gravitational constant, the Planck energy can be simplified to

$$E_p = m_p c^2 = \sqrt{\frac{\hbar c}{G_p}} c^2 = \frac{\hbar}{\aleph}\frac{1}{c}c^2 = \frac{\hbar}{\aleph}c \tag{5}$$

From the derivation above, it seems like the c^2 factor in the famous Einstein formula $E = mc^2$ is just a conversion factor to convert time-speed to speed. Under atomism c^2 is just a conversion factor to convert from time-speed to speed or vice versa, Haug (2014). What c^2 truly represent in Einstein and Planck's theories are unclear.

And finally we will also rewrite the reduced Compton wavelength:

$$\frac{\hbar}{m_p c} = \frac{\hbar}{\frac{\hbar}{\aleph}\frac{1}{c}c} = \frac{1}{\frac{1}{\aleph}} = \aleph \tag{6}$$

I summarize a series of rewritten Planck units in Table 1. I will claim that I have substantially simplified the Planck units.

One interesting thing to note from the table is that in the Planck-form of the Planck constants, one has $c^{1.5}$, $c^{2.5}$, $c^{3.5}$ and $c^{4.5}$ as well as c^4, c^5 and c^7, it is very hard to find any intuition in c powered to such numbers. In the rewritten forms introduced in this paper, we only have c in most of the units, and c^2 only the Planck power and Planck intensity. We also have c^2 in the relationship between energy and mass, where we claim it is simply a transformation factor. We have gotten rid of the square root as well as all of the high powered non-intuitive notation in the Planck units; this alone should be interesting for people holding on to the standard interpretation of quantum physics. Rewritten in the way it is done

[1]What Haug (2014) calls the i-distance in his theory, which is the distance center to center, or front to front, or back to back between two indivisible particles; it is the equivalent to the wavelength in modern physics. This distance must be larger or equal to the diameter of the indivisible particle. One should not compare the indivisible particles in Haug's theory with the standard idea of particles in modern physics. The indivisible particles are very different than the particles in modern physics; please study some mathematical atomism before attacking the concept of indivisible particles. Haug uses a slightly different notation in his book.

Table 1: Table1: The table shows the standard Planck constants and those as rewritten by Haug.

Units:	**Planck-form:**	**Haug-form:**
Gravitational constant	$G \approx 6.67408 \times 10^{-11}$	$G_p = \frac{\aleph^2 c^3}{\hbar}$
Planck length	$l_p = \sqrt{\frac{\hbar G_p}{c^3}}$	$l_p = \aleph$
Planck time	$t_p = \sqrt{\frac{\hbar G_p}{c^5}}$	$t_p = \frac{\aleph}{c}$
Planck mass	$m_p \sqrt{\frac{\hbar c}{G_p}}$	$m_p = \frac{\hbar}{\aleph}\frac{1}{c}$
Planck energy	$E_p = \sqrt{\frac{\hbar c^5}{G_p}}$	$E_p = \frac{\hbar}{\aleph} c$
Relationship mass and energy	$E_p = m_p c^2$	$E_p = \frac{\hbar}{\aleph}\frac{1}{c} c^2$
Reduced Compton wavelength	$\frac{\hbar}{m_p c}$	$\aleph$
Planck area	$l_p^2 = \frac{\hbar G_p}{c^3}$	$l_p^2 = \aleph^2$
Planck volume	$l_p^3 = \sqrt{\frac{\hbar^3 G_p^3}{c^9}}$	$l_p^3 = \aleph^3$
Planck force	$F_p = \frac{E_p}{l_p} = \frac{\hbar}{l_p t_p} = \frac{c^4}{G}$	$F_p = \frac{\hbar}{\aleph}\frac{c}{\aleph}$
Planck power	$P_p = \frac{E_p}{t_p} = \frac{c^5}{G}$	$m_p = \frac{\hbar}{\aleph}\frac{c^2}{\aleph}$
Planck mass density	$\rho_p = \frac{m_p}{l_p^3} = \frac{c^5}{\hbar G_p^2}$	$\rho_p = \frac{\frac{\hbar}{\aleph}\frac{1}{c}}{\aleph^3} = \frac{\hbar}{\aleph^4}\frac{1}{c} = \frac{\hbar}{\aleph}\frac{1}{c\aleph^3}$
Planck energy density	$\rho_p^E = \frac{E_p}{l_p^3} = \frac{c^7}{\hbar G_p^2}$	$\rho_p^E = \frac{\frac{\hbar}{\aleph} c}{\aleph^3} = \frac{\hbar}{\aleph^4} c = \frac{\hbar}{\aleph}\frac{c}{\aleph^3}$
Planck intensity	$I_p = \rho_p c = \frac{c^8}{\hbar G^2}$	$I_p = \frac{\hbar}{\aleph}\frac{c^2}{\aleph^3}$
Planck frequency	$\omega_p = \frac{1}{t_p} = \sqrt{\frac{c^5}{\hbar G}}$	$\omega_p = \frac{1}{\frac{\aleph}{c}} = \frac{c}{\aleph}$
Planck pressure	$p_p = \frac{F_p}{l_p^2} = \frac{\hbar}{l_p^3 t_p} = \frac{c^7}{\hbar G^2}$	$p_p = \frac{\hbar}{\aleph}\frac{c}{\aleph^3}$

here, the Planck units simply seem to be in a simpler form to remember and work with. One way to interpret this paper is that it has introduced a trivial but simpler notation of the Planck units. However, we mention again that formulas in the same functional form have recently been derived from scratch based on particles with spatial dimension, namely atomism. Can modern quantum physics truly exclude particles with spatial dimension, or is the lack of a fundamental particle with spatial dimension the reason for some of the bizarre interpretations in quantum physics? Are modern physicists truly certain that Newton was wrong in his assumption of indivisible corpuscular particles?

As shown more elegantly by Haug (2014), the factor $\frac{1}{c}$ in the mass is time divided by distance, that is $\frac{T}{L}$ and c is $\frac{L}{T}$. This means that in its most pure form, the relationship between energy and mass is nothing more than $\frac{L}{T} = \frac{T}{L}\frac{L^2}{T^2}$ that can be written on the compact form $c = \frac{1}{c}c^2$. Einstein (1905) famous formula $E = mc^2$ is ultimately nothing more than $c = \frac{1}{c}c^2$, but this is also the extreme beauty of the formula. Time is indivisible particles traveling back and forth counter-striking (creating or we could say maintaining the mass) and energy is indivisible particles freed from this. This explains why a small amount of mass can give so much energy. Continuous pure energy can be described as time-speed times c^2. Again c^2 is simply a conversion factor between mass (time-speed) and energy (speed). This is hard to fully understand at the deepest level without seeing how this can be derived from atomism as published by Haug in 2014. Bear in mind that based on atomism $\frac{\hbar}{\aleph}$ is likely just a factor adjusting for how much equivalent continuous mass or continuous energy there is in this particular mass or energy. The continuous mass and continuous energy are an efficient way to standardize mass and energy that make it easy to compare any mass and energy.

As I am Haug, I have to admit I had no idea that the energy and mass relationships I derived years ago directly from atomism basically seem to be in the same structural form as the Planck's formulas. That is the end result seems to have the same structural form (after rewriting the Planck units). From atomism we automatically get quantization, but we do not get the point particles of modern physics, rather we obtain indivisible spatial particles. It is still unclear how the exact values of the Planck constant are potentially linked to atomism. Is it a mere coincidence or could there be more to it?

Again the term $\frac{\hbar}{\aleph}$ is from atomism likely just a term showing how much pure continuous energy or pure continuous mass there is in given "object". When looking at the very fundament of physics in its purest forms we can remove this constant to see the true beauty and extreme simplicity of fundamental physics derived and as understood from mathematical atomism as shown in Table 2.

Table 2: Table 2: This table show the purest forms of the fundaments of physics given by insight from atomism Haug (2014). With purest form I mean the densest possible forms of energy and mass as observed from the rest frame. Whether or not this holds true in the Planck world interpretation of modern physics is unclear.

Unit name:	**The Haug pure forms from atomism:**
Gravitational constant	$G_p = \aleph c^3$
Diameter indivisible (= Planck length??)	$l = \aleph$
Time to cross particle diameter	$t = \frac{\aleph}{c}$
Pure continuous mass (time-speed)	$m = \frac{1}{c}$
Pure continuous energy (speed)	$E = c$
Relationship mass and energy A)	$E = mc^2$
Relationship mass and energy B)	$c = \frac{1}{c}c^2$
Area	$l^2 = \aleph^2$
Volume	$l^3 = \aleph^3$
Force	$F = \frac{c}{\aleph}$
Power	$m = \frac{c^2}{\aleph}$
Density	$\rho = \frac{1}{c\aleph^3}$
Energy density	$\rho^E = c\aleph^3$
Frequency	$\omega = \frac{c}{\aleph}$

2 Conclusion

By making the gravitational constant a functional form of the reduced Planck constant, we can rewrite the Planck equations into simpler and more intuitive forms. We encourage the physics community to strongly consider the possible links between mathematical atomism and modern physics. Haug has shown that a new mathematical physics derived from atomism gives all of the same mathematical end results as Einstein's special relativity theory when using Einstein synchronized clocks, but with much deeper insight. With this paper, he has proven that the energy and mass equations he has derived from scratch from postulates rooted in ancient atomism seems to be the same equations as given by Max Planck at a structural level, but with somewhat different input and therefore different output.

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