Aq - The Universal Acceleration Constant.

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The Planck scales are dimensional artifacts rather than physical limits. The true minimum and maximum measurable spans of nature are **Tiny Length (ιl)**, **Tiny Time (ιt)**, **Maxi Density (ΩD),** and **Maxi Energy (ΩE)** all derived from the mattergy–acceleration coupling constant **Aq.** We replace **G,** the **Universal Gravitational Constant,** with **Aq**, the **Universal Acceleration Constant.**

Mathematics operates only on scalar quantities. Simple numbers participate in addition, subtraction, multiplication, and division. A scalar must be dimensionally uniform. Mathematics is structurally scalar-dependent. Any constant used in fundamental equations must behave as a scalar.

G is treated as a scalar though G is not a fundamental scalar. **The Universal Law of Gravity** contains two masses, m_1 **and** m_2, yet the gravitational constant G is not a fundamental two-body coupling. Although the dimensions of G correctly balance the units in Newton's law, its composite SI structure:

$$G = m^3\, kg^{-1}\, s^{-2}$$

carries no invariant or ontological meaning in **SR, QM,** or the **energy–momentum relation. G** is a stitched-together empirical scaling factor with **fudged units** rather than a fundamental constant of nature.

Aq behaves as a proper scalar. **Aq** carries inherent, uniform, textbook-clean dimensions that arise directly from the mattergy–acceleration coupling:

$$Aq = \mathbf{m^3 \cdot kg^{-2} \cdot s^{-2}}.$$

Aq carries $\mathbf{kg^{-2}}$**.** The **Law of Universal Acceleration** couples two mattergy terms directly to acceleration; a two-mass law requires a double inverse mass constant. **Aq** properly matches the two-mass structure of the **acceleration law.** The dimensional structure of **Aq** is uniform and inherent; **Aq** is not a composite product of unrelated units. **Aq** is a single, indivisible scalar quantity whose dimensions are natural to the coupling itself. **Aq** behaves as a scalar in algebraic operations without producing artifacts.

Law of Universal Gravity: $$F = G\frac{m_1 m_2}{r^2}$$

The gravitational constant ***G*** *was* first obtained experimentally by measuring the tiny attraction between known masses and solving by means of the Law of Universal Gravity.

The modern value of ***G*** is said to be $\boldsymbol{G \approx 6.674 \times 10^{-11}\ \mathrm{m^3 kg^{-1} s^{-2}}}$, a quantity that is notoriously harder to pin down experimentally than $\boldsymbol{\pi}$ is to compute numerically. G is not a scalar. Since $\boldsymbol{G}$ is not a scalar, the Cavendish experiment is best understood as providing empirical calibration data rather than a fundamental constant. The same data can be used to compute the acceleration constant $\boldsymbol{A_Q}$, which *is* scalar, invariant, and grounded in the full mattergy expression $\boldsymbol{(mc^2)^2 + (pc)^2}$.

The Cavendish result uses only mass, which corresponds to only one component of the mattergy invariant $\boldsymbol{(mc^2)^2 + (pc)^2}$. The acceleration constant $\boldsymbol{A_Q}$ is computed in the exact same way, using the exact same data. In Cavendish's static, low-velocity regime, the energy–momentum term $\boldsymbol{(pc)^2}$ is effectively zero and can be neglected without loss of accuracy. Consequently, the computation produces the same value (or extremely close to the value) attributed to $\boldsymbol{G}$.

Once the full invariant is taken into account**—where $\boldsymbol{(pc)^2}$ becomes significant—** the value of $\boldsymbol{A_Q}$ reduces accordingly. This produces marked and physically meaningful changes in the values of **Tiny Length, Tiny Time, Maxi Density** and **Maxi Energy.**

Law of Universal Acceleration: $$\mathbf{a} = \mathbf{A_Q} \frac{M_1 M_2}{r^2}$$

Aq is a primitive scalar constant that defines the coupling between mattergy and acceleration.

Acceleration is: $\frac{\mathbf{m}}{\mathbf{t^2}}$ **... a = Aq (M) → Aq =** $\frac{\frac{\mathbf{m}}{\mathbf{t^2}}}{M}$ **...**

Aq is primitive and not reducible like **G;** the dimensions of **Aq** are fixed entirely by the relation it enforces between mattergy and acceleration:

$$[A_q] = \mathbf{m^3\ kg^{-2}\ s^{-2}}.$$

Conclusion:

G is an empirical constant tied to macroscopic gravitational behavior, not a fundamental coupling. It does not appear in Special Relativity, Quantum Mechanics, or the invariant energy–momentum relation. Although Einstein himself noted that **G** was an unsatisfactory and non-fundamental constant, he retained it in the field equations because no alternative coupling was available at the time.

Aq couples **mattergy** to **acceleration** directly. **Aq** is QM compatible by construction. Replacing **G** with **Aq** removes the dimensional artifacts that produce the traditional Planck scales and yields invariant-defined **minimum** and **maximum** scale constants **Tiny Length (ιl), Tiny Time (ιt), Maxi Density (ΩD),** and **Maxi Energy (ΩE)** without additional assumptions. In the acceleration-based formulation, all dimensional factors cancel cleanly, leaving **Aq** as the sole scalar coupling between two mattergy invariants; this is precisely what makes the Modern Newtonian Framework fundamentally different from Newton's force-based formulation.

The invariant **mattergy** expression $(\mathbf{mc^2})^2 + (\mathbf{pc})^2$ defines the **Tiny** and **Maxi** constants through the acceleration coupling $\mathbf{A_q}$. The traditional Planck constants do not arise from the SR invariant; those constants are dimensional constructs formed only from $\mathbf{G}$, $\hbar$, and $\mathbf{c}$. The contrast shown next demonstrates that replacing $\mathbf{G}$ with $\mathbf{A_q}$ shifts the **minimum** and **maximum** measurable spans from pre-relativistic dimensional artifacts to proper scalars.

Mattergy is invariant. $(mc^2)^2 + (pc)^2$

Minimum Scale

Planck Length $l_p = \sqrt{\frac{\hbar G}{c^3}} \rightarrow G = \frac{c^3}{\hbar} l_p^2$

Planck Time $t_p = \sqrt{\frac{\hbar G}{c^5}} \rightarrow G = \frac{c^5}{\hbar} t_p^2$

Tiny Length $\imath l = \hbar^2 A_q \rightarrow A_q = \frac{\imath l}{\hbar^2}$

Tiny Time $\imath t = \frac{\hbar^2 A_q}{c} \rightarrow A_q = \frac{c\,\imath t}{\hbar^2}$

These are minimum scale constants where:

G is the Universal Gravitational Constant.

A_q is the Universal Acceleration Constant.

$\hbar$ (h-bar) is the reduced Planck Constant.

c is the speed of light in vacuum.

Mattergy is invariant. $(mc^2)^2 + (pc)^2$

Maximum Scale

Planck Density $D_p = \dfrac{c^5}{\hbar G^2}$ --> $G = \sqrt{\dfrac{c^5}{D_p \hbar}}$

Planck Energy $E_p = \sqrt{\dfrac{\hbar c^5}{G}}$ --> $G = \dfrac{\hbar c^5}{E_p^2}$

Maxi Density $\Omega D = \dfrac{\hbar A_q^4}{c^9}$ --> $A_q = \left(\dfrac{\Omega D c^9}{\hbar}\right)^{1/4}$

Maxi Energy $\Omega E = \dfrac{\hbar A_q}{c}$ --> $A_q = \dfrac{c\,\Omega E}{\hbar}$

These are maximum scale constants where:

G is the Universal Gravitational Constant.

A_q is the Universal Acceleration Constant.

$\hbar$ (h-bar) is the reduced Planck Constant.

c is the speed of light in vacuum.

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