The values of π (pi) and 2π are ubiquitous in fundamental physics. And, <u>no one</u> knows why, until now

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Abstract: THE PYTHAGOREAN RATIOS OF THE PLANCK HIERARCHY SCHEMATIC

From a mathematical perspective, the key to fundamental universal laws lie at the central tenet of Pythagorean thought – that the universe can be explained by pure numbers, i.e. dimensionless ratios. A Planck constants hierarchy is created that reveals an undiscovered Planck constant – the Planck circumference *, symbol Ⓟ. The Planck constants hierarchy produces dimensionless ratios, that allow for the first time the theoretical calculation of constants, e.g. the Planck momentum, Planck mass and Planck energy constants. The author honors Pythagoras, in naming the ratios of the 13/12 schematic (vixra: 1607.0172)

Pythagorean ratios defined as any dimensionless number as a ratio of two dimensional constants of fundamental physics.

Standard model (incomplete) **Planck hierarchy schematic:** [1]
(five well-known Planck constants in a hierarchical configuration)

$$(\text{Planck constant})\quad 6.626068909 \times 10^{-34}\qquad \underline{h}$$
$$(\text{reduced Planck constant})\quad 1.054571620 \times 10^{-34}\qquad \underline{\hbar}\,|\,2\pi$$
$$(\text{half reduced Planck constant})\quad 5.272858101 \times 10^{-35}\qquad (\underline{\tfrac{1}{2}\hbar})|\,2$$
$$(\text{missing Planck circumference* constant})\qquad \underline{\quad}\,|$$
$$(\text{Planck length})\quad 1.616181480 \times 10^{-35}\qquad \underline{l_p}\,|$$
$$(\text{Planck time})\quad 5.391001132 \times 10^{-44}\qquad \underline{t_p}\,|\,c$$

Proposed (complete) **Planck hierarchy schematic, with the postulated Planck circumference* constant, symbol Ⓟ, and two respective ratios: π and 1.038499006 (ration of attribute)** [4]

$$(\text{Planck constant})\quad 6.626068909 \times 10^{-34}\qquad \underline{h}$$
$$(\text{reduced Planck constant})\quad 1.054571620 \times 10^{-34}\qquad \underline{\hbar}\,|\,2\pi$$
$$(\text{half reduced Planck constant})\quad 5.272858101 \times 10^{-35}\qquad (\underline{\tfrac{1}{2}\hbar})|\,2$$
$$(\text{Planck circumference*})\quad 5.077383865 \times 10^{-35}\qquad \underline{Ⓟ}\,|\,1.038499006$$
$$(\text{Planck length})\quad 1.616181480 \times 10^{-35}\qquad \underline{l_p}\,|\,\pi$$
$$(\text{Planck time})\quad 5.391001132 \times 10^{-44}\qquad \underline{t_p}\,|\,c$$

The values of π and 2π are ubiquitous in fundamental physics. Because they are part of a mechanism (the Planck hierarchy schematic above and the 13/12 schematic that gives rise to the theoretical calculation of the constants, e.g. Planck momentum, Planck mass, Planck energy, etc.

(Please note: Planck circumference* as the central player in the fundamental equations below)

The theoretical calculation of fundamental constants via (Pythagorean) ratios of the Planck hierarchy schematic: [1][2]

Planck momentum

$$\text{MOp} = 2\left[\frac{(½)\hbar}{Ⓟ}\right]\pi = 6.525081696 \text{ kg m/s}$$

$\frac{(½)\hbar}{Ⓟ}$ = 1.038499006 (ratio of attribute)

½ℏ = 5.272858101 x10^{-35} J s (half of the reduced Planck constant)

Ⓟ = lp*π = 5.077383865 x 10^{-35} m (postulated Planck circumference*)

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Planck mass

$$\text{mp} = \frac{2\left[\frac{(½)\hbar}{Ⓟ}\right]\pi}{c} = 2.176532972 \text{ x10}^{-8} \text{ kg}$$

$\frac{(½)\hbar}{Ⓟ}$ = 1.038499006

½ℏ = 5.272858101 x10^{-35} J s (half of the reduced Planck constant)

Ⓟ = lp*π = 5.077383865 x 10^{-35} m (postulated Planck circumference*)

c = 299792458 (speed of light value) (the value of c, utilized as a ratio akin to c^2 in E= mc^2)

Planck energy

$$\text{Ep} = 2\left[\frac{(½)\hbar}{Ⓟ}\right]\pi c = 1.9561 \text{ x10}^9 \text{ J}$$

$\frac{(½)\hbar}{Ⓟ}$ = 1.038499006

½ℏ = 5.272858101 x10^{-35} J s (half of the reduced Planck constant)

Ⓟ = lp*π = 5.077383865 x 10^{-35} m (postulated Planck circumference*)

Planck Temperature

$$T_p = \frac{2\left[\frac{(\frac{1}{2})\hbar}{\text{\textcircled{P}}}\right]\pi c}{k} = 1.41684693 \times 10^{32}\ K$$

$\frac{(\frac{1}{2})\hbar}{\text{\textcircled{P}}} = 1.038499006$

$\frac{1}{2}\hbar = 5.272858101 \times 10\text{-}35$ J s (half of the reduced Planck constant)

$\text{\textcircled{P}} = lp*\pi = 5.077383865 \times 10\ ^{-35}$ m (postulated Planck circumference*)

$k = 1.38065048 \times 10^{-23}$ J K^{-1} (Boltzmann constant)

$c = 299792458$ (speed of light value; utilized as a dimensionless constant, same as c^2 in $E=mc^2$)

Planck time

$$t_p = 2\pi\left[\frac{(\frac{1}{2})\hbar}{\text{\textcircled{P}}}\right]\left(\frac{G}{c^4}\right) = 5.391001132 \times 10^{-44}\ s$$

$\frac{(\frac{1}{2})\hbar}{\text{\textcircled{P}}} = 1.038499006$

$\frac{1}{2}\hbar = 5.272858101 \times 10^{-35}$ J s (half of the reduced Planck constant)

$\text{\textcircled{P}} = lp*\pi = 5.077383865 \times 10\ ^{-35}$ m (postulated Planck circumference*)

Newtonian constant of gravitation

$$G = \frac{lp*c^3}{2\pi\left[\frac{(\frac{1}{2})\hbar}{\text{\textcircled{P}}}\right]} = 6.673693866 \times 10^{-11}\ m^3\ kg^{-1}\ s^{-2}$$

$\frac{(½)ℏ}{ℙ}$ = 1.038499006

½ℏ = 5.272858101 x10^{-35} J s (half of the reduced Planck constant)

ℙ = lp*π = 5.077383865 x 10^{-35} m (postulated Planck circumference*)

note: although not a Planck constant, the Newtonian constant of gravitation equation demonstrates the fundamental nature and relationship of the Pythagorean ratios i.e., 2π and $\frac{(½)ℏ}{ℙ}$ (1.038499006) [1}

Dimensionless constants

where: 2π = 6.283185307

$\frac{(½)ℏ}{ℙ}$ 2 = 1.038499006

π = 3.141592653

c = 299792458 (speed of light value; utilized as a dimensionless constant, same as c^2 in $E=mc^2$)

Dimensional constants

where: ½ℏ = 5.272858101 x10^{-35} J s (half of the reduced Planck constant)

ℏ = 1.054571620 x10^{-34} J s (reduced Planck constant)

k = 1.38065048 x10^{-23} J K^{-1} (Boltzmann constant)

lp = 1.616181480 x10^{-35} m (Planck length)

ℙ = lp*π = 5.077383865 x 10^{-35} m (postulated Planck circumference*)

G = 6.673693866 x10-11 m3 kg-1 s-2 (Newtonian constant of gravitation)

Conclusion

The proposal of a new paradigm. A Planck constants hierarchy schematic is constructed, which allows for the first time, the theoretical calculation of constants, something that has never been done before. Prior to this paper, all constants have been calculated experimentally. If the simple math works an investigation is warranted. [2][3][4]

"Fruition is the ultimate arbiter of truth"

Vito R. D'Angelo

References

[1] National Institute of Standards and Technology, Fundamental Physical Constants
[2] SAO Encyclopedia, Swineburne University of Technology, September 2015
[3] The 13/12 Schematic, Vito R. D'Angelo, Vixra: 1607.0172, 7/14/2016
[4] The Calculation of the Planck Circumference, Vito R. D'Angelo, Vixra: 1505.0090