Planck unit Mathematical Universe Hypothesis from the fine structure constant alpha and $2\pi r$, $\pi r^2$ where $r = \Omega = \sqrt{\pi^e/e^{(e-1)}}$ = sqrt of Planck momentum

Malcolm Macleod

e-mail: mail4malcolm@gmx.de

The principal physical constants $G$, $c$, $e$, $k_B$, $\mu_0$, $m_e$, ... are defined in terms of the dimensions of mass, length, time, temperature and electric charge (the SI units: M=kg, L=m, T=s, K=kelvin, Ampere). There are also natural constants such as $\pi$ and the fine structure constant alpha which have no dimensions and so are presumed independent of the system of units used. These may be considered as natural or universal constants. Proposed here is a further natural constant which I have denoted Omega ($\Omega^2 \sim \pi^e/e^{(e-1)}$) as the sqrt of Planck momentum. Natural Planck units including the electron frequency can be defined in terms of the area and/or circumference of a circle whose radius $r = \Omega$, thus suggesting a geometrical Mathematical Universe. Replacing these natural units with our SI units gives solutions for the physical constants $G$, $c$, $e$, $k_B$, $\mu_0$, $m_e$, ..., results are consistent with CODATA 2010. The solution for the electron as a magnetic monopole is independent of the system of units used, this suggests that at the Planck level the units (M,L,T,K,A) are not separate and distinct but overlap converging at this monopole. A solution for alpha as $\alpha \sim 137.036$ is suggested.

1 Preface

J. Barrow et al noted in a Scientific American article... ‘Some things never change. Physicists call them the constants of nature. Such quantities as the velocity of light, $c$, Newton’s constant of gravitation, $G$, and the mass of the electron, $m_e$, are assumed to be the same at all places and times in the universe. They form the scaffolding around which the theories of physics are erected, and they define the fabric of our universe. Physics has progressed by making ever more accurate measurements of their values. And yet, remarkably, no one has ever successfully predicted or explained any of the constants. Physicists have no idea why they take the special numerical values that they do. In SI units, $c$ is 299,792,458; $G$ is 6.673e-11; and $m_e$ is 9.10938188e-31 -numbers that follow no discernible pattern. The only thread running through the values is that if many of them were even slightly different, complex atomic structures such as living beings would not be possible. The desire to explain the constants has been one of the driving forces behind efforts to develop a complete unified description of nature, or “theory of everything”. Physicists have hoped that such a theory would show that each of the constants of nature could have only one logically possible value. It would reveal an underlying order to the seeming arbitrariness of nature.’ [1]

2 Natural units

Natural units are "natural" because the origin of their definition comes only from properties of nature and not from any human construct. Proposed here is a natural unit Omega ($\Omega \sim 2.00713494975$) which relates to the sqrt of momentum.

$$\Omega^2 \sim \frac{\pi^e}{e^{(e-1)}}$$ (1)

From Omega we can construct the natural Planck units in terms of the geometry (area $\pi r^2$ and circumference $2\pi r$) of a circle and the fine structure constant alpha ($\alpha \sim 137.036$).

$$Q_u = \Omega, \ unit = \sqrt{M/L/T}$$ (2)

$$p_u = (\pi\Omega^2) + (\pi\Omega^2) = 2\pi\Omega^2, \ unit = M/L/T$$ (3)

$$c_u = (2\pi)\Omega^2 = 2\pi\Omega^2, \ unit = L/T$$ (4)

$$l_u = \pi c_u = 2\pi\Omega^2, \ unit = L$$ (5)

$$t_u = \frac{2l_u}{c_u} = 2\pi, \ unit = T$$ (6)

$$m_u = \frac{p_u}{c_u} = 1, \ unit = M$$ (7)

$$A_u = \frac{8c_u^2}{\pi\Omega^5} = \frac{2\pi^3\Omega^3}{\alpha}, \ unit = A$$ (8)

We can use these to construct another natural unit, the magnetic monopole $\sigma_u$ and so the electron frequency $E_{\sigma} = t_u\sigma_u^3$ (see electron as magnetic monopole).

$$\sigma_u = \frac{\pi^2}{3\alpha^2 A_u c_u^3} = \frac{\pi^2 \Omega_u^3}{24\pi^2 \alpha \Omega^8} = \frac{1}{27 \pi^3 \alpha \Omega^8}$$ (9)

$$E_{\sigma} = t_u \sigma_u^3 = \frac{2\pi}{(27 \pi^3 \alpha \Omega^8)^3} = \frac{1}{27 \pi^3 \alpha^3 \Omega^15}$$ (10)

To solve our physical (SI unit) constants $G$, $h$, $c$, $e$, $k_B$, $\mu_0$, $m_e$, ..., we can use the 3 dimensions of motion; $Q$ (sqrt of Planck momentum), $c$ (speed of light) and $t_u$ (Planck time).

3 Q = Quintessence

Q as the sqrt of Planck momentum such that;

$$m_Pc = 2\pi Q^2 [5].$$

$$Q = 1.019 113 411... \sqrt{\frac{kg \cdot m}{s}}$$ (11)
4 Mass constants

Defining the mass constants in terms of Q (Planck momentum) instead of Planck mass;

\[ m_p = \frac{2\pi Q^2}{c} \]  \hspace{1cm} (12)

\[ G = \frac{l_p e^3}{2\pi Q^2} \]  \hspace{1cm} (13)

\[ h = 2\pi Q^22\pi l_p \]  \hspace{1cm} (14)

\[ t_p = \frac{2l_p}{c} \]  \hspace{1cm} (15)

\[ F_p = \frac{E_p}{l_p} = \frac{2\pi Q^2}{l_p} \]  \hspace{1cm} (16)

5 Ampere \( A_Q \)

(Proposed) Ampere \( A_Q \) [5]

\[ A_Q = \frac{8e^3}{\alpha Q^3}, \text{ units } = \frac{m^2}{kgs^2 \sqrt{kgm/s}} \]  \hspace{1cm} (17)

Note:
- Planck Temperature = \( A_Q c \)
- Elementary charge = \( A_Q l_p \)
- Magnetic monopole (quark) = \( A_Q c t_p = A_Q l_p \)
- Electron = \( t_p(A_Q l_p)^3 \)
- Magneton = \( A_Q l_p^2 \)

6 Elementary charge

\[ e = A.Q = A_Q l_p \]

\[ e = \frac{8e^3}{\alpha Q^3} \frac{2l_p}{c} = \frac{16l_pe^2}{\alpha Q^3} \]  \hspace{1cm} (18)

7 Vacuum permeability

The ampere is that constant current which, if maintained in two straight parallel conductors of infinite length, of negligible circular cross section, and placed 1 meter apart in vacuum, would produce between these conductors a force equal to exactly \( 2.10^{-7} \) newton per meter of length.

\[ \frac{F_{\text{electric}}}{A_Q^2} = \frac{2\pi Q^2}{\alpha l_p} \left( \frac{\alpha Q^3}{8e^3} \right)^2 = \frac{\pi \alpha Q^6}{64l_pc^5} = \frac{2}{10^7} \]  \hspace{1cm} (19)

gives:

\[ \mu_0 = \frac{\pi^2 \alpha Q^8}{32l_pc^5} = \frac{4\pi}{10^7} \]  \hspace{1cm} (20)

\[ \epsilon_0 = \frac{32l_pc^3}{\pi^2 \alpha Q^6} \]  \hspace{1cm} (21)

\[ k_e = \frac{\pi \alpha Q^6}{128l_pc^3} \]  \hspace{1cm} (22)

8 Planck length \( l_p \)

\[ l_p \text{ in terms of } Q, \alpha, c. \]

The magnetic constant \( \mu_0 \) has a fixed value. From eq.21

\[ l_p = \frac{\pi^2 \alpha Q^8}{2\mu_0 c^5} \]  \hspace{1cm} (26)

\[ \mu_0 = 4\pi.10^{-7} N/A^2 \]

\[ l_p = \frac{5^7 \pi \alpha Q^8}{c^5} \]  \hspace{1cm} (27)

giving;

\[ h = 2\pi Q^22\pi l_p = \frac{2^3 5^7 \pi^4 \alpha Q^{10}}{c^5} \]  \hspace{1cm} (28)

\[ e = \frac{16l_pe^2}{\alpha Q^3} = \frac{2^3 5^7 \pi^4 Q^5}{c^5} \]  \hspace{1cm} (29)

\[ G = \frac{l_pe^3}{2\pi Q^2} = \frac{5^7 \pi \alpha Q^8}{2c^2} \]  \hspace{1cm} (30)

9 Electron as magnetic monopole

The ampere-meter is the SI unit for pole strength (the product of charge and velocity) in a magnet (\( Am = ec \)). A Magnetic monopole [11] is a hypothetical particle that is a magnet with only 1 pole.

To convert Planck time \( t_p \), elementary charge \( e \) and the speed of light \( c \) to SI units \( 1s, 1C, 1m/s \) requires dimensionless numbers which are numerically equivalent \( (t_s, e_s, c_s) \).

\[ \frac{t_p}{t_s} = \frac{5.3912\times e^{-44}s}{5.3912\times e^{-44}} = 1s \]

\[ \frac{e}{e_s} = \frac{1.6021764\times e^{-19}C}{1.6021764\times e^{-19}} = 1C \]

\[ \frac{c}{c_s} = \frac{299792458m/s}{299792458} = 1m/s \]

We may thus form dimensionless formulas for a magnetic monopole \( \sigma_e \) and the electron frequency \( E_p = t_e \sigma_e = t_s \sigma_e \).

The electron frequency formula describes the number of units of (Planck) time corresponding to the electron frequency.

\[ \sigma_e = \frac{2\pi^2}{3\alpha^2 e_sc_s} = \frac{\pi^2 Q^4}{24a_lsc_s^3} \]  \hspace{1cm} (31)
\[ E_{\sigma} = t_\sigma \sigma_u^3 = t_\sigma \sigma_e^3 = \frac{1}{2^{2033/8} \pi^3 \Omega^{15}} = \frac{\pi^6 Q^9_1}{2^{83/3} \alpha^2 l_p^2 c^{1/2}} \]  

(32)

### Planck mass:

\[ m_p = m_p E_{\sigma} \]  

(33)

### Compton wavelength:

\[ \lambda_c = \frac{2\pi l_p}{E_{\sigma}} \]  

(34)

### Frequency:

\[ T_e = \frac{2\pi l_p}{E_{\sigma} c} = \frac{t_p}{E_{\sigma}} \]  

(35)

### Gravitation coupling constant:

\[ \alpha_G = \left( \frac{m_p E_{\sigma}}{m_p} \right)^2 = E_{\sigma}^2 \]  

(36)

### para-positronium lifetime:

\[ t_0 = \frac{\alpha \sigma}{\sigma_e^3} \frac{t_p}{c} \]  

(37)

### ortho-positronium lifetime:

\[ t_1 = \frac{9\pi \alpha^6}{4\sigma_e^3 (\pi^2 - 9)} \frac{t_p}{c} \]  

(38)

### Up-quark: \( \sigma^2 \)

### Down quark: \( \sigma^{-1} \)

i.e. UUD: \( \sigma^2 \sigma^2 \sigma^{-1} = \sigma^3 \)

### 10 Planck Temperature \( T_p \)

\[ T_p = \frac{8c^4}{\pi \alpha Q^3} = \frac{A_Q c}{\pi}; \text{units} = K \]  

(39)

### Boltzmann’s constant \( k_B \) [10]

\[ k_B = \frac{E_p}{T_p} = \frac{\pi^2 Q^5}{4c^3} = \frac{\pi m_p c}{A_Q}; \text{units} = J/K \]  

(40)

### Stefan-Boltzmann constant \( \sigma \) [6]

\[ \sigma = \frac{2\pi^4 k_B}{15h^3 c^2} = \frac{2\pi^2 m_p}{15t_p T_p} \]  

(41)

### Wien’s constant \( b \) \((w = 4.965114231744276...)\)

\[ b = \frac{2\pi l_p T_p}{w} = \frac{2l_p A_Q c}{w} \]  

(42)

### Larmor precession frequency \( f_L \) \((1 \text{ Tesla}) f_L = 28.025 \text{ GHz}) \( \gamma_B \) is the dimensionless Boltzmann constant and \( \gamma \) is the electron magnetic moment \( \gamma = 1.001 \text{ 159 652 180 73}(28) \)

\[ f_L = \frac{\gamma 2 \mu_B B_{1 \text{ Tesla}} T_p}{\pi^2 \alpha l_p Q^3 m_e} = \frac{\gamma c_e}{2 \kappa_B \sigma e^3} \frac{t_p}{c} \]  

(52)

### 11 Planck mass black hole

Black hole energy distribution of emission \( T_{mp} \) as described by Planck’s law for \( M = m_p \)

\[ T_{mp} = \frac{\hbar^3}{16\pi^2 G k_B m} = \frac{T_p}{8\pi} \]  

(43)

Hawking radiation has a blackbody (Planck) spectrum with a temperature \( T \) for an \( M = m_p \) black hole \((r_s = 2l_p)\) given by

\[ k_B T_{mp} = \frac{\hbar c}{8\pi^2 r_s} = \frac{E_p}{8\pi} \]  

(44)

From eq.45 and eq.48

\[ k_B T_{mp} = \frac{\pi^2 \alpha Q^5}{4c^3} \]  

(45)

### General relativity

\[ \frac{c^4}{8\pi G} = \frac{F_p}{8\pi} \]  

(46)

### Bekenstein–Hawking entropy \( S \) for \( M = m_p \)

\[ A = \frac{16\pi Q^2 m_p^2}{c^4} \]  

(47)

\[ S = \frac{2\pi k_B c^3 A}{4Gh} = 4\pi k_B \]  

(48)

### 12 Bohr magneton

\[ \mu = \frac{e\hbar}{4\pi m_e} = \frac{8m_p c^3}{\pi^3 m_e} = \frac{A Q^2 c^2}{E_{\sigma}} = \frac{A Q^2 c^2}{\sigma_e^3} \frac{t_p}{c} \]  

(49)

\[ \mu = Am^2 \]  

(53)

### 13 Radio wave

\[ B_{1 \text{ Tesla}} = \frac{B_{1 \text{ Tesla}}}{c} = \frac{c^2 Q^5}{P_c} \]  

(50)

\[ \mu_B = \frac{e\hbar}{4\pi m_e} \]  

(51)

The presence of the Boltzmann’s constant is a consequence of the SI unit 1 Tesla. A Planck \( B_p \) \((R_p = \text{Planck Rydberg})\)

\[ B_p = \frac{m_p}{a^2 A_Q l_p^2} \]  

(53)
\[ f_p = \frac{2\mu_B B_p}{\hbar} = \frac{1}{2\pi^2 \alpha^2 t_p} = \frac{c}{4\pi^2 \alpha^4 t_p} = R_p c \]  

(54)

A Planck electron \( B_e \) (\( R_\infty \) = Rydberg constant)

\[ B_e = \frac{m_e \mu_e^2}{\alpha^2 A_{\ell p}^2 m_p} = \frac{m_e \mu_e^2 c^3}{\alpha^2 A_{\ell p}^2} \]  

(55)

\[ f_e = \frac{2\mu_B B_e}{\hbar} = \frac{m_e c}{4\pi^2 \alpha^4 t_p m_p} = R_\infty c \]  

(56)

14 Quintessence momentum

The electron mass formula, replacing \( t_p \) (eq.26)

\[ m_e = m_p \frac{\pi^4}{2^{8/3} 3^{1/2} 10^5 Q_e^7} \]  

(57)

The Rydberg constant \( R_\infty \)

\[ R_\infty = \frac{m_e \mu_e^2 c^3}{8h^3} = \frac{\pi^2 c^5}{2^{10/3} 3^{21/2} 18^3 Q_e^5} \]  

(58)

The Rydberg constant \( R_\infty = 10973731.568 \, 539(55) \) [12] with a 12-digit precision is the most accurate of the natural constants. Consequently we may re-define \( Q \) in terms of this constant, \( c \) and \( \alpha \).

\[ Q^{15} = \frac{\pi^2 c^5}{2^{10/3} 3^{5/3} \alpha^8 R_\infty} \]  

(59)

\[ Q = \left( \frac{\pi^2 c^5}{2^{10/3} 3^{5/3} \alpha^8 R_\infty} \right)^{1/15} \]  

(60)

15 Planck time

The 3rd dimensional quantity used here is Planck time; \( c \) has an exact value. \( Q \) is solved using \( \alpha \) and \( R_\infty \). Via the vacuum permeability (eq.26), also an exact value, we can solve \( t_p \):

\[ t_p = \frac{5^{7/2} \pi \alpha Q^8}{c^6} \]  

(61)

16 Magnetic monopole

The frequency of the electron is numerically constant regardless of units used. This relationship can be used to define the value of \( Q \) for non-SI units, for example length = ft and velocity = ft/s.

\[ E_\alpha = t_u \left( \frac{\pi^2}{3 \alpha^2 A_{\ell p}} \right)^3 = t_j \left( \frac{\pi^2}{3 \alpha^2 A_{\ell p}} \right)^3 \]  

(62)

\[ \frac{8\pi^2 \mu_e^2 c^{10}}{Q^9} = (2\pi\Omega)^{15} \]  

(63)

\[ E_\alpha = \frac{2^{25/3} \alpha}{\pi^4} (2\pi\Omega)^{15} \]  

(64)

17 Alpha and Omega

The CODATA \( \alpha = 137.035999074(44) \) [14], however this value depends on certain QED assumptions.

Experimental results:

The von Klitzing constant reduces to \( \alpha \) and \( c \) and so has the potential to provide the most definitive solution for \( \alpha \).

\[ R_K = \frac{h}{c^2} = \frac{\pi \alpha c}{5000000} \]  

(65)

\[ R_K = 25812.807 \, 557(18) \] [4]

\[ \alpha = 137.035 \, 999 \, 677(96) \]

Atom-recoil measurements:

\[ h/R_B = 4.5913592729e - 9 \text{amu} \]

\[ 87R_B = 86.909180527 \text{amu} \]

\[ m_e = 0.000548579909067 \text{amu} \]

\[ \alpha = 1 / \sqrt{(2R_\infty/c)(h/R_\infty)(87R_B/m_e))} \]

\[ \alpha = 137.035 \, 998 \, 998 \]

\[ h/\text{neutron ratio} [7] \]

\[ h/m_n = 3.95603332e - 7 \text{amu} \]

\[ m_n = 1.00866491600 \text{amu} \]

\[ \alpha = 1 / \sqrt{(2R_\infty/c)(h/m_n)(m_n/m_e))} \]

\[ \alpha = 137.036 \, 010 \, 857 \]

Omega is a theoretical constant, alpha can be determined experimentally, we may therefore express Omega in terms of alpha.

\[ \Omega^{15} = \frac{5^{14} \alpha^2 Q^7}{2^{12} \pi^{12}} \]  

(66)

\[ \Omega^{225} = \frac{5^{63} \alpha^{35}}{2^{250} \pi^{106} \alpha^{26} R_\infty^7} \]  

(67)

Alternatively setting Omega;

\[ \Omega^2 = \frac{\pi^e}{e^{e-1}} \]  

(68)

gives \( \alpha = 137.035 \, 996 \, 3687(5) \)

18 Numerical solutions

CODATA 2010 values

\[ \alpha = 137.035 \, 999 \, 074(44) [14] \]

\[ R_\infty = 10 \, 973 \, 731.568 \, 539(55) [12] \]

\[ h = 6.626 \, 069 \, 57(29) \] e – 34 [13]

\[ e = 1.602 \, 176 \, 565(35) \] e – 19 [16]

\[ m_e = 9.109 \, 382 \, 91(40) \] e – 31 [17]

\[ G = 6.673 \, 84(80) \] e – 11 [19]

\[ \mu_0 = 4.\pi/10^7 \]

\[ k_B = 1.380 \, 6488(13) \] e – 23 [20]
using
\[ \alpha = \frac{137.035}{999.074} \]
\[ R_{\infty} = 10.973 \times 731.568 \times 539 \]
gives [5]
\[ h = 6.626 \times 069 \times 148 \times e - 34 \]
\[ e = 1.602 \times 176 \times 513 \times e - 19 \]
\[ m_e = 9.109 \times 382 \times 323 \times e - 31 \]
\[ G = 6.672 \times 497 \times 199 \times e - 11 \]
\[ k_B = 1.379 \times 510 \times 149 \times e - 23 \]
\[ f_L = 28.024 \times 953 \times 555 \times GHz \]

\( G \): The same inputs were used to solve Planck constant, the electron wavelength and electron mass and so by extension the Rydberg constant; and these 4 values all have the requisite precision. We may also note that the calculated \( G \)
agrees with the Sandia National Laboratories \( G \); Parks et al \( G = 6.672 \times 34(21) \times e - 11 \) [2]

\( k_B \): Accuracy is within 1.00825 of CODATA 2010 value. However dividing the Larmor frequency \( f_L \) (which uses \( k_B \)) by the free electron gyromagnetic ratio \( \gamma_e/(2\pi) \), the accuracy improves to 28.024954/28.024944 = 1.000000357.

## 19 Key:

Natural Planck constants:

\[ Q_u = \Omega, \text{ unit } = \sqrt{ML/T} \]  
\[ c_u = 2\pi \Omega^2, \text{ unit } = L/T \]  
\[ l_u = \pi c_u = 2\pi^2 \Omega^2, \text{ unit } = L \]  
\[ m_u = \frac{2\pi Q_u^2}{c_u} = 1, \text{ unit } = M \]  
\[ t_u = \frac{2l_u}{c_u} = 2\pi, \text{ unit } = T \]  
\[ A_u = \frac{8c_u^3}{\alpha Q_u^3} = \frac{2^6\pi^3\Omega^3}{\alpha}, \text{ unit } = A \]

Secondary constants:

\[ f_e = t_u \left( \frac{\pi^2}{3\alpha^2 A_u l_u} \right) ^3 = \frac{1}{2^{20}3^3\pi^8\alpha^3\Omega^5} \]  
\[ E_u = m_u c_u^2 = 4\pi^2 \Omega^4 \]  
\[ T_{p-u} = \frac{A_u c_u}{\pi} = \frac{2^7\pi^3\Omega^5}{\alpha} \]  
\[ \mu_{0-u} = \frac{\pi^2\alpha Q_u^8}{32l_u c_u^3} = \frac{\alpha}{2^{11}\pi^5\Omega^4} \]  
\[ \epsilon_{0-u} = \frac{1}{\mu_{0-u} c_u^2} = \frac{2^6\pi^3}{\alpha} \]

\[ e_u = \frac{16l_u c_u^2}{\alpha Q_u^5} = \frac{2^7\pi^4\Omega^3}{\alpha} \]  
\[ h_u = 2\pi Q_u^2 2\pi l_u = 8\pi^4 \Omega^4 \]  
\[ k_{B-u} = \frac{\pi^2\alpha Q_u^5}{4c_u^3} = \frac{\alpha}{2^5\pi\Omega^2} \]  
\[ \sigma_u = \frac{2\pi^2 m_u}{15l_u T_{p-u}} = \frac{\alpha^4}{2^{30}15\pi^3\Omega^{20}} \]

From SI constants \( Q, c, t_p; \)

\[ m_p = \frac{2\pi Q^2}{c} \]  
\[ l_p = \frac{t_p c}{2} \]  
\[ A_Q = \frac{8c^3}{\alpha Q^3} \]  
\[ f_e = \frac{t_p \left( \frac{\pi^2}{3\alpha^2 A_Q l_p} \right)^3}{50^2 A_Q l_p} \]  
\[ E_p = \frac{2\pi Q^2 c}{\alpha} \]  
\[ T_p = \frac{8c^4}{\pi \alpha Q^5} \]  
\[ \mu_0 = \frac{\pi\alpha Q^8}{32l_p c^5} \]  
\[ \epsilon_0 = \frac{1}{\mu_0 c^2} \]  
\[ e = \frac{16l_p c^2}{\alpha Q^3} \]  
\[ h = 2\pi Q^2 2\pi l_p \]  
\[ k_B = \frac{\pi^2\alpha Q^5}{4c^3} \]  
\[ \sigma = \frac{2\pi^2 m_p}{15l_p T_p^4} \]

## 20 Summary

I have proposed a solution to the physical constants \( G, h, e, k_B, \mu_0, m_e... \) in terms of the geometry of \( Q \) (the sqrt of Planck momentum), \( c \) and \( l_p \).

The precision of the numerical solutions (online calculator [5]) derives from the 4 most accurate constants; \( c, \alpha, \) the vacuum permeability (from which I derived \( l_p \) and \( t_p \)) and the Rydberg constant (which gives \( Q \)).

I have also proposed a series of natural Planck units based on the geometry of the constant Omega. The 'electron as magnetic monopole' was used to test this hypothesis as it is unit invariant. If our (M, L, T, A, K) constants are simply the geometry of this Omega, then it may be that Omega is...
the fundamental property of the universe. Arguably it can be linked to the sqrt of momentum suggesting ours is a universe of motion. The other natural constant alpha appears to have a geometrical role similar to \( \pi \).

The numerical solution for \( \Omega \) was chosen for its symmetrical elegance, for it resembles Euler’s identity \( e^{i\pi} + 1 = 0 \), perhaps the most famous formula in all mathematics. As the range of possible values for \( \Omega \) is extremely limited, the value of \( \Omega \) is fixed by the value of \( \alpha \) (and vice-versa), this formula \( \pi^e/e^{(e-1)} \) is quite likely the only non-complex solution within this range. In a previous paper [6] I submitted that the universe may be expanding in regular integral steps from which we obtain the concept of time (Planck time and the arrow of time, aka entropy). As \( \pi \) and \( e \) can be constructed from integers in series, constants based upon \( \pi \) and \( e \) could be natural occurring, the precision of \( \pi \) and \( e \) and so the precision of the physical constants improving as the universe grows.

References

1. SciAm 06/05, P57: Constants, J Barrow, J Webb
10. private correspondence (Marian Gheorghe)
11. en.wikipedia.org/wiki/Magnetic-monopole
17. http://physics.nist.gov/cgi-bin/cuu/Value?me