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Could we physically replicate our universe?

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This essay challenges the notion that the universe developed according to the laws of physics. Instead, it is argued that in the beginning there were no laws of physics, rather the universe evolved from an initial condition into the present state via a process of (a geometrical) natural selection. The present laws of physics, the fundamental forces, constants and particles are those which 'survived' this process. Examples are given for the elementary charge, Planck mass and the electron mass. The Rydberg constant, accurate to 13 digits, is used to confirm the veracity of the results. It is this initial condition, and not the laws of physics, which constitutes the TOE. Furthermore, it may be possible to replicate (and not merely duplicate) our universe within a computer simulation if we are cognizant of this initial condition.

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, me, 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 me 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. (Scientific America 06/05, P57: CONSTANTS, J Barrow, J Webb)

In this essay, I propose that our universe has 'evolved' (and still is evolving) according to an 'organic' process. We may envisage our universe as an organic 'engineering' project that began with an initial set of conditions/rules (aka the DNA of the universe) and 'grew' into its present state using natural selection as the 'construction' tool. This is a continuous process; the universe is now larger, more massive and more complex than it was when I began this essay… and it will continue to grow and evolve until all the raw material for this growth is expended.

Life is the classic example of organic engineering whereby natural selection is employed in conjunction with an initial starting condition (DNA). Conversely, manufactured products invariably use a static (fixed) design… my laptop will never change… its CPU for example will never evolve from 1.2GHz to 2GHz.

If this universe uses an organic approach, it may be possible to program a computer with those initial conditions/rules (the universe DNA) and a description of the material upon which the universe 'feeds' and if we left the simulation to run long enough… ideally our simulation would go from big bang to planet earth. It would not be necessary for our program to include the laws of physics, the structure of particles, the 4 forces or other such minutiae as would be required by a static design. These details are all natural outcomes.

Our own DNA, for example, does not have embedded a physical description of arms or eyes; our DNA does however encode the information necessary so that arms and eyes are the outcomes of a natural growth. Likewise, our universe was setup so that the electron and proton would invariably appear… with their physical parameters dictating how and to what magnitude the fundamental forces may interact between them.

For example, in the early stages of our simulation, as the universe mass density is of Planck proportions, there would be a plethora of sub atomic 'species' formed… slowly however, as our simulation progresses and the mass density of the universe reduces, the stable forms (electrons, protons etc) would predominate… the less successful 'species' returning to the particle pool to be recycled.

Finally, if programmed correctly, after about 10^{61} computer clock cycles (corresponding to the number of units of Planck time between the big bang and now), our simulation would find a small planet capable of supporting life orbiting a mid-sized star in an obscure region of an obscure galaxy.

The primary point that I wish to make here is that, in the beginning, there were no laws of physics. There were no forces until there were particles, for forces are simply the interactions between particles. For the theoretical physicist, the laws of physics are simply the means by which those initial conditions/rules may be determined. Even a complete and total understanding of all the laws of physics will not comprise a TOE. The analogy is using our knowledge of the human anatomy (corresponding to our knowledge of the laws of physics) to decipher the human genome (corresponding to the actual TOE).

How valid would this computer simulation be in depicting a physical reality? Plato argued that we live in a universe of mathematical forms, his adherents may then argue that our computer simulation, in essence a series of programmed subroutines, is no less a physical reality than our visible universe. The question then becomes, is Plato correct? …is our own visible universe without material substance and if so, could life exist within our simulation?

In the next section, using elementary charge 'e', Planck mass and the structure of the electron, I will try to show how these could be natural occurring outcomes of an evolving universe… in so far as they are not defined by those initial conditions/rules but that their outcome could be expected given those initial conditions/rules. This is a geometrical theory, the principal (Planck) constants and particles are simply geometrical entities (predominately area or volume of a circle or sphere) that are 'stable' (symmetrical) outcomes and so 'survived'.

The SI units are presumed here to refer to fundamental geometrical 'Planck' forms or shapes. I have replaced G, c h with momentum Q, c, alpha and l[p] - denoting this momentum **Q** (Quintessence) to differentiate it from the momentum 'p = mv', for it is a Planck momentum. From the SI units for Q, c and l[p], the formula (function) and numerical value of the respective fundamental constants may be derived as geometrical forms. Space considerations prevent a derivation of the other constants but the same principal remains. Furthermore, the results have CODATA level accuracy and may be cross-referenced with the Rydberg constant, known to 13 digits and incorporating the main constants, to check their veracity.

$$R = \frac{1}{8}\ \frac{m_e\, e^4\, \mu^2\, c^3}{h^3}$$

It is the symmetrical nature of the fundamental constants that confers upon them that title and to which we owe our visible universe. The universe may be simpler than we imagine, yet the universe is not what it seems.

Quintessence:
I use 'Q' instead of 'p' to refer to this 'fundamental' Planck momentum for it occurs in 2 specific geometries. These are the mass domain (commonly known as Planck momentum with integer dimensions) and the charge domain (with non-integer dimensions). Note: α[d] ~ 137 is alpha (the Sommerfeld fine structure constant), [d] denotes derived. Q has the value:

$$Q = 1.01911343158360,\ units = \sqrt{\frac{kg\ m}{s}}$$

$$unit\ of\ Quintessence = 2\ \pi\ Q^2,\ units = \frac{kg\ m}{s}$$

$$charged\ Quintessence = \pi\ \alpha_d\ Q^3,\ \frac{kg\ m\ \sqrt{\frac{kg\ m}{s}}}{s}$$

Elementary charge:
Here I derive the formula for elementary charge using the SI units for 'charged' Q, c = 'm/s' and l[p] = 'm'.
*Note: Velocity is measured as a function of **2.c** in the charge domain and **c** in the mass domain.*

The ampere is presumed here to have the following units:

$$ampere_d^{\,2} = \frac{m^3}{kg^3\, s^3}$$

A (Planck) ampere then becomes the square root of the above

$$ampere_d = \frac{m^2}{kg\, s^2 \sqrt{\frac{kg\, m}{s}}}$$

As mentioned above, charged quintessence is found in the form…

$$charged\ Quintessence = \pi\, \alpha_d\, Q^3, \frac{kg\, m \sqrt{\frac{kg\, m}{s}}}{s}$$

To form the ampere SI units, we need to balance that charged unit with 3 units of velocity **(2.c)^3** = **8.c^3**

$$8\, c^3, units = \frac{m^3}{s^3}$$

$$ampere_d = \frac{8\, c^3}{\pi\, \alpha_d\, Q^3}, units = \frac{m^2}{kg\, s^2 \sqrt{\frac{kg\, m}{s}}}$$

…and as ampere * time = elementary charge "e"

$$Planck\_time = \frac{2\, \pi\, Planck\_length}{c}, units = s$$

$$e_d = \frac{16\, Planck\_length\ c^2}{\alpha_d\, Q^3}, units = \frac{m^2}{kg\, s \sqrt{\frac{kg\, m}{s}}}$$

Using:
alpha[d] = 137.035 999 253 899
l[d] = 1.616 036 696 6729 e-35m

elementary charge (textbook): **e = 1.602 176 53(14) e-19 C**
elementary charge (derived): **e[d] = 1.602 176 507 7146 e-19**

The permeability of vacuum and the Tesla may be derived using the same approach.

$$\mu_d = \frac{1}{32} \frac{\pi^2\, \alpha_d\, Q^8}{Planck\ length\ c^5}, units = \frac{kg^4\, s}{m^2}$$

Permeability of vacuum: textbook **mu = 12.566 370 614… e-7**
Permeability of vacuum: derived **mu[d] = 12.566 371 912 165 e-7**

Planck mass
The kg requires a unit of Quintessence (kg.m/s) divided by unit of velocity –c (m/s):
kg = 'kg.m/s' * 's/m'

$$m_d = \frac{2\,\pi\,Q^2}{c},\ units = kg$$

Planck mass textbook **m[P] = 2.176 45(16) e-8**
Planck mass derived **m[d] = 2.176 728 263 775e-8**

When solving the other mass constants, note that Planck length may occur as circumference or as radius (re: Diracs constant and Planck's constant).

Electron
Here I derive the wavelength of the electron. It is fundamentally a spherical ampere, this shape confers upon the electron its charge and mass (structure and attributes).

Our SI units are measured relative to 1 unit. 12Volts implies there are 12 of 'a Volt'; 5m implies there are 5 of 'a meter'. If we wish to convert Planck units to SI units, we require dimensionless constants. For example, we do not know the exact numerical value of Planck length l[p], therefore, if we wish to describe 1meter in Planck length units, the simplest approach is to assign a dimensionless variable 'lx' the numerical value of l[p] such that l[p]/lx = 1m

1m = l[p]/lx = 1.616…e-35m / 1.616…e-35
1 C = e/ex = 1.602…e-17C / 1.602…e-17
1 m/s = c / cx = 299792458 m/s / 299792458
1 second = t[p]/tx and so on…

There is a solution for the electron wavelength as the surface area of a 4D sphere whose radius incorporates an ampere-meter = e*c (re: magnetic monopole *http://en.wikipedia.org/wiki/Ampere-meter*).

From $E = mc^2$ and $E = hv$ we have $m = h.v/ c^2$
2v = surface area of a 4D sphere (or volume of a symmetrical torus) = **$2.pi^2.r^3$**:

$$2\,v = 2\,\pi^2\,r_{electron}{}^3$$

$$electron\ \ mass\ second = \frac{h\,\pi^2\,r_{electron}{}^3}{c^2}$$

$$r_{electron} = \frac{2}{3}\frac{\pi}{\alpha_d{}^2\ ex\ cx}$$

$$me_d = \frac{8}{27}\frac{m_d\,\pi^5\,tx}{\alpha_d{}^6\ ex^3\ cx^3}$$

mass electron (CODATA) **m[e] = 9.109 382 6(+/-16) e-31 kg**
mass electron (derived) **me[d] = 9.109 383 235 5138 e-31 kg**

The mass of the electron becomes a unit of Planck mass m[d] and a dimensionless frequency component (the wavelength) whose geometry confers the electron structure and attributes. Therefore, if we know the electron charge with precision, we can determine the electron mass with equivalent precision… for the electron charge to mass ratio is fixed by the magnitude of an ampere-meter (elementary charge * c).

Rydberg
Cross-referencing our numerical results with the Rydberg constant:

$$Rydberg_d = \frac{1}{8}\frac{me_d\, e_d^{\,4}\, \mu_d^{\,2}\, c^3}{h_d^{\,3}}$$

Rydberg (CODATA) **R[∞] = 10 973 731.568 525(73) m^{-1}**
Rydberg[derived] **R[d] = 10 973 731.568 509**

We may also cross-reference our formulas with common formulas in physics:
Alpha:

$$\alpha = \frac{2\,h}{\mu\, e^2\, c}$$

Replacing with h[d], e[d], mu[d]

$$\alpha_d = \frac{2\,h_d}{\mu_d\, e_d^{\,2}\, c}$$

$$\alpha_d = 2 \cdot 2\,\pi\, Q^2 \cdot 2\,\pi\, l_d \cdot \frac{32\, l_d\, c^5}{\pi^2\, \alpha_d\, Q^8} \cdot \frac{1}{256}\frac{\alpha_d^{\,2}\, Q^6}{l_d^{\,2}\, c^4} \cdot \frac{1}{c}$$

$$\alpha_d = \alpha_d$$

Electromagnetism:

$$c = \frac{1}{\sqrt{\mu_0\, \varepsilon_0}}$$

$$c = \frac{1}{\sqrt{\mu_d\, \varepsilon_d}}$$

$$\mu_d\, \varepsilon_d = \frac{1}{32}\frac{\pi^2\, \alpha_d\, Q^8}{l_d\, c^5} \cdot \frac{32\, l_d\, c^3}{\pi^2\, \alpha_d\, Q^8}$$

$$c = c$$

Bohr energy levels:

$$En_d = -\frac{2\,\pi^2\, k_d^{\,2}\, me_d\, e_d^{\,4}}{h_d^{\,2}\, n^2}$$

$$En_d = -2\,\pi^2 \cdot \frac{1}{16384}\frac{\pi^2\, \alpha_d^{\,2}\, Q^{16}}{l_d^{\,2}\, c^6} \cdot {}^{me}d \cdot \frac{65536\, l_d^{\,4}\, c^8}{\alpha_d^{\,4}\, Q^{12}} \cdot \frac{1}{16}\frac{1}{\pi^4\, l_d^{\,2}\, Q^4}$$

$$En_d = -\frac{1}{2}\frac{me_d\, c^2}{\alpha_d^{\,2}\, n^2}$$

Conclusion:
Natural selection resembles probability in quantum mechanics in that it applies most successfully to a large group and least to a single individual, a corollary may be drawn.

I have tried to demonstrate with the above that from the geometry of momentum, from alpha and from c, the Planck constants and the basic particles could have formed as natural outcomes.

From charged momentum and the volume of velocity I derived the ampere, then by adding time, the elementary charge. From the ampere and alpha I derived the electron (ampere) sphere. As the proton has identical (reversed) charge to the electron, I conclude that it also has an ampere sphere and units of alpha. Planck energy and Planck mass reflect the orientation of Planck momentum to velocity. The structure of the electron implies a wave-state (electric) to point-state (mass) oscillation, this could account for the ratios of the electric and gravitational forces, suggesting there is only 1 force but manifest over different particle orientations.

Therefore, from the structure of this momentum, from alpha and from c (the velocity of momentum) and by reverse engineering the fundamental forces, the structures of the Planck constants and the particles, we may be able to define those initial conditions/rules.

And if our universe can be reduced simply to the geometry of momentum (with alpha as the scaffolding), how may we then distinguish it from a computer simulation?

Was Plato correct?

Note: The theory and derivation for the fundamental constants and electron in terms of Q and pi (including alpha, c and Planck length) can be found online via the website: http://www.pmmode.com/pcode/