The Wave Theory of Constants

Robert E. Grant
Strathspey Crown Holdings, Crown Sterling. Newport Beach, California, USA.

Abstract

Guided by the wave theory of numbers, we examine the fundamental constants of nature through the unique characteristics of its wave-matrix. The fractal nature of the matrix, with its 12-based periodicity, forms the kernels from which constants are generated thus enabling a better understanding of their origin as well as their unique numerical sequencing. Additionally, the inherent numerical and geometrical symmetries of the matrix will prove to be a powerful tool for discovering new fundamental constants not yet known to the scientific community.

I. INTRODUCTION

Most of the fundamental laws of nature rest upon a set of constants that govern their behavior and, consequently, determine the physical reality of the universe[1,2].

Still, there is no well-understood theory capable of explaining why these specific numbers became so fundamental to nature. One example to consider is the fine structure constant ($\alpha \approx 137$) described by the American physicist Richard P. Feynman as '*a magic number that comes to us with no understanding by man. You might say the 'hand of God' wrote that number, and 'we don't know how He pushed his pencil.*' [3]

Thus, finding the origin and reasoning behind these constants will open the doors for a much better understanding of the physical world and will enable science to cross boundaries never thought possible before.

The wave theory of numbers[4] have been developed to address this specific issue, among many others. Established upon the natural correspondence between numbers and the wave phenomenon, the wave/particle duality[5] manifested by light, elementary particles, etc., is generalized to accommodate the abstract numerical domain as well.

The advantage of this novel perspective is it enables the creation of a fundamental number-based interference pattern, a numeric wave-matrix that can correlate different physical phenomena in ways that are not readily apparent nor feasible through other theories.

This paper will demonstrate how mathematical and physical constants emerge as combinations of numeric amplitudes and phases embedded within the wave matrix' own fractal fabric.

This novel approach will enable a better understanding of the origin and structure of these constants. Furthermore, it has the capacity for discovering new ones that have not been yet identified.

II. NUMERICAL WAVES AND NUMBERS-INVERSE ANALYSES

There are countless numbers that exhibit wave-like behavior within their structure, especially irrational and transcendental ones.

One perfect example is the remainder formed by taking the inverse of number 7: $\frac{1}{7} = 0.\overline{148257}$ ...

The wavy nature of 148257 is illustrated by plotting its individual digits repeatedly, as shown below.

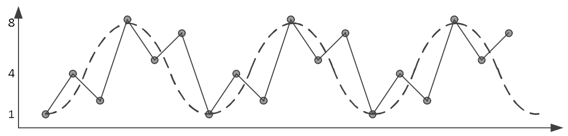


Fig.1: The wave-like nature of the remainder of 1/7 (148257) emerging from plotting its individual digits, and for three consecutive cycles.

The inverse operation is unique as it is not only an excellent method for creating remainders of infinite wave-like sequences, but also because when applied twice, it reverses or cancels its previous action; reproducing the original number again, e.g. $\frac{1}{7} = 0.148257 \ldots$ and $\frac{1}{0.148257\ldots} = 7$. No other arithmetic operation creates similar effects.

In this respect, the inverse process works like a mathematical mirror; reflecting back and forth between the number and its inverse, ad infinitum.

Some numbers (x) have unique relationships with their inverses ($1/x$). The best example is the golden ratio[6] $\Phi = 1.618\ldots$ with its ($1/x$) value returning itself minus 1:

$$\frac{1}{\Phi} = 0.618\ldots = \Phi - 1 = \varphi.$$

Another unique example is the square root of 10. This is because its inverse returns the same number, only one order of magnitude smaller. $\sqrt[2]{10} = 3.162277 \ldots$ and $\frac{1}{3.162277} = 0.3162277 \ldots$

The inverse value of π, $\frac{1}{\pi} = 0.318 \ldots$, is another very useful constant we always use, such as when we find the radius of a circle from its area or circumference for example.

Interestingly, the average of π and 10/ π is very close to $\sqrt[2]{10}$, with the trivial difference being around 0.2%: $\frac{\pi + \frac{10}{\pi}}{2} = 3.16234 \ldots$

Due to their polar nature, numbers and their inverses form two opposing, as well as complementary, sine/cosine wave-fronts as shown below.

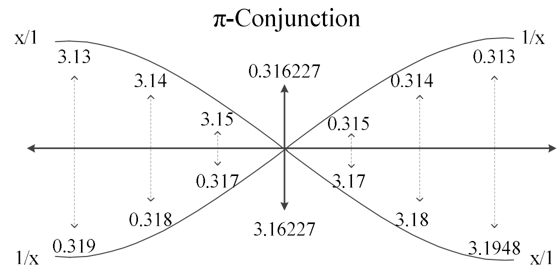


Fig.2: Two sine/cosine wave-fronts made by numbers and their respective inverses around the vicinity of number 3. The two waves intersect at the node 3.16235… where x and $1/x$ match up, except for their decimal point.

These two sinusoidal waves get closer and closer to each other until they cross at a point where the two values of x and $1/x$ become identical, as in the case of $\sqrt[2]{10}$ and its inverse (identical in their numerical sequencing, not in their relative magnitude).

The crossing point creates a singularity node where x and $1/x$ flip and continue along the wave pattern till the next node, which happens at $\sqrt[2]{100}$ and its inverse (not shown), where they flip again and so on, very similar to the helical form of a DNA strand.

The nodes get further and further away as the ratio between the singularity number and its inverse increases from 10 to 100 to 1000, etc.

The first 12 digits of the decimal system lie at the heart of the wave theory of numbers as we explain in the next section.

Along with their $1/x$ aspects, they generate one complete sine/cosine wave-front as shown in figure (3) below. (A more detailed image is available in Appendix A). Also indicated on the figure are some fundamental constants and their $1/x$ values.

When $x \geq 1$, $1/x$ will distribute uniformly, matching up with their x values. However, as we pass 1 toward 0, $1/x$ will get larger and larger diverging as we get closer to 0, eventually reaching infinity at 0. Thus, the relative distances between the $1/x$ numbers will get smaller and smaller with all numbers from 1 to ∞ packed within just one-twelfth quadrant of the whole circle.

In other words, new complete x-numbers are generated within a 1/12 part of the $1/x$ wave; a wave within a wave in an infinite fractal. (Interestingly, it is known that the infinite sum of all natural numbers is equal to the unexpected value of $-\frac{1}{12}$, first proven by Euler[7]. Thus, number 12 has a unique status among the rest, especially in its $1/x$ form.)

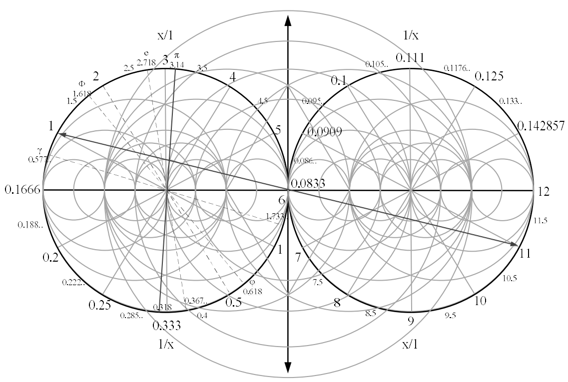


Fig.3: The sine/cosine wave pattern created by the first 12 numbers ($x/1$) and their inverses ($1/x$). Also indicated are some fundamental constants and their respective $1/x$ values. Numbers across number 6 on both circles add up to 12 as indicated for number 1 and 11.

One important property of this specific numeric wave formation is that across the node of 6, numbers complement each other to an exact 12. For example, by drawing a line from any number on the wave-front such that it passes through the node, the line will hit a second number where both add up to 12, as for 1 and 11 (indicated in the figure), 10 and 2, 4 and 8, etc.

This specific complementary property applies to rational as well as irrational numbers, including the fundamental constants. Therefore, it will be used extensively in identifying the various constants of the wave-matrix, as explained in the next section.

III. THE WAVE MATRIX AND THE EMERGENCE OF FUNDAMENTAL CONSTANTS

In the wave theory of numbers[4], the numerical wave matrix is built upon the interference pattern generated from two point-like sources that create an infinite fractal of interfering circular waves having a periodicity of number 12 and its multiples.

This pattern is shown in figure (4) below and it can be accessed with greater details in Appendix B.

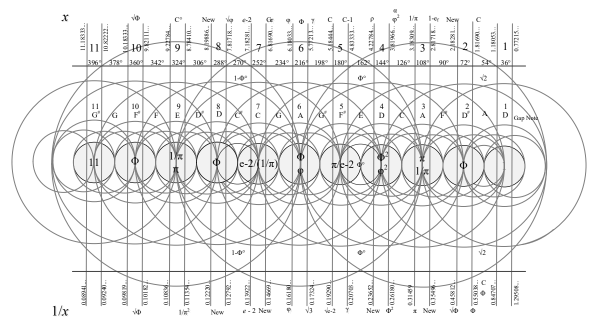


Fig.4: The numerical wave matrix. On the top row we find the numbers that bound the main 11 digits and their constants' affiliations. Next are the degree references for the main digits followed by their musical notes' assignments. At the bottom of the chart, we find the $1/x$ values of the top row along with their constants' affiliations.

However, before we start examining this numerical matrix, we need first to elaborate on two important points.

First, we are all used to considering numbers like 3.14, 0.134, 31.4, etc. to be different from each other, especially number 3.14, which in this example relates to π, which is used to calculate many mathematical and physical qualities, whereas the rest are not.

The same thing can be said about any other number, especially those that have unique mathematical properties such as e, Φ, etc.

While the decimal point is of importance in determining the magnitude of numbers, still it is

a *relative* quality. In other words, when we say that the speed of light $C = 3\times10^8$ m/s, the 10^8 factor indicates how fast light is compared to a speed of 1 m/s for example, or to the speed of sound, being around 343 m/s.
However, in this frame of units, the decimal point changes as the scale while the main number will not. So, for C again, if we were to use Km/s instead, the factor will reduce to 10^5 while the principle integer 3 will remain the same. Similarly, we can use 3.14… for π, or 10×.314… or 0.1×31.4…, etc.
In other words fundamental constants are unique to the universe mainly *for their numerical sequencing much more than for their relative magnitudes*. The decimal point only creates fractals of the same number.
Therefore we will handle numbers with some liberty in regards to their decimal point.

The second point concerns the numbers used to reference the various constants of nature. In general, fundamental constants have specific numeric references. For example, 3.14159… is the familiar form for π. However, we have already shown that $1/\pi = 0.3183\ldots$ is a different reference to the same constant, as 0.31415…, 31.415… etc. Similarly, $\Phi = 1.618$ and $1/\Phi = 0.618 = \varphi$ are both valid references to the same constant.

There are many other ways to reference constants depending on what mathematical operation we apply to them, such as squaring, square or cube roots, exponentials, etc.
One important method is to convert the decimal reference of the constant into an angular one that positions it around a unitary circle, as explained in reference[8].
So for a number like $\varphi = 0.618\ldots$ we find its angular reference by multiplying it by 360°:

$$0.618\ldots \times 360° = 222.48°\ldots$$

This new reference of Φ (222.48°) is no less informative than its formal value. In fact, this angular method is crucial in discovering the quadrant-relationships constants have with each other (more about this transformation in the next sections).

By explaining these two points, we hope to remove any ambiguity that might arise from our constants assignments policy, as many of the constants we are going to encounter across the wave-matrix will appear in one form or the other, however, all can be traced back to their familiar values.

Let's start exploring the wave pattern of figure (4).
The pattern is made of 11 numbers, with the 12th initializing the beginning of another cycle or fractal, being higher octave of number 1.
Thus the pattern is centered around number 6 which works as a geometrical mirror across which numbers add up to 12: 1+11, 2+10, 3+9, etc. (This is the same complementary behavior exhibited by the 12-based sine/cosine wave we explained in the previous section).

Almost all fundamental constants are irrational or transcendental, like π or *e*. Consequently each constant can be written as a principle integer representing its particle-like aspect, an amplitude, plus a sequence of randomly fluctuating digits representing its wave-like aspect, a phase[4].
So a number like π = 3.14159… can be decomposed into an amplitude of 3 and a phase of .14159… as shown in figure (5) below.

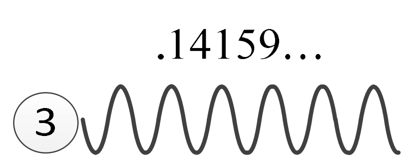


Fig.5: Number π expressed in a wave/particle fashion; the sum of an integer amplitude (3) and a phase of 14159…

By the same token, the golden ratio Φ = 1.618… emerges from number 1 by adding a phase of

0.618… which is also the value of its inverse: $\Phi = 1 + 1/\Phi$.

The square root of 2 ($\sqrt{2}$) emerges from the same number 1 by the addition of a different phase, 0.4142…

Thus, in theory, any number can be a potential amplitude for constants; we only need to attach a proper phase to transform it from its *static* form to a wave-like *dynamic* one.

Similarly, each of the 12 integers that define the periodicity of the numerical wave, works as a potential amplitude surrounded by a couple, or more, of mathematical and physical constants that emanate from these amplitudes as shown on the top part of the numerical matrix in figure (4). And as every number has its own $1/x$ aspect, the bottom part of the pattern is reserved for the inverse of the amplitude numbers and their corresponding potential constants.

Starting with the mirror-number 6, the two surrounding constants are $\phi - 1 = \varphi = 0.618…$ or 6.18… (as we agreed on the irrelevance of the decimal point), and Euler-Mascheroni[9] γ = 5.77… (formal value is 0.577…)

(Notice the mirror can be any fractal of 6: 60 or 0.6 or 0.06, etc. as shown in figure (6) below for the case of number 60 where it is surrounded by the fractals of Φ and γ also.)

The inverse aspects of these two constants are φ and 0.17324… which is almost identical to $\sqrt{3}$.

As explained earlier, number pairs on both sides of the central mirror (number 6) complete each other to 12, which also applies to the constants surrounding these numbers. So φ + γ should equal 12 also, which is, in fact, the case: 6.18… + 5.77… = 12.

Moving to number 7, its two bounding constants are $e - 2$ = 7.18… and *Gr* = 6.8169… = e/Φ which is a new constant (labeled Grant Constant) that is being investigated at the moment for its profound relationship to time.

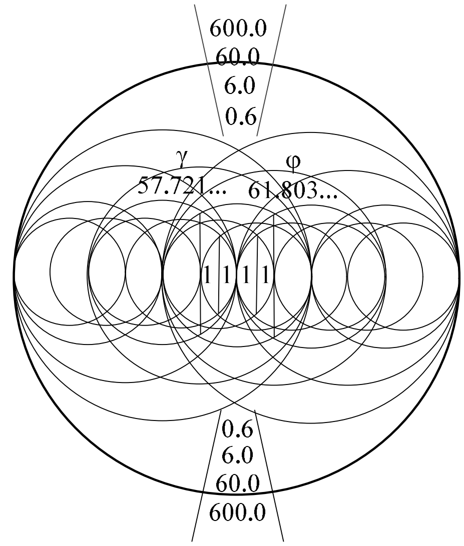


Fig.6: Numbers 60 or 600 or 0.6 etc. create the same mirroring effect number 6 does. For the case of 60, it will also be surrounded by fractals of Φ and γ as indicated.

The $1/x$ aspects of these numbers are 0.13922, being the inverse of $e - 2$, and 0.14669, which is a new constant that has not been identified yet.

Number 5, on the other side of the mirror, is surrounded by constants that are the complementary pairs of those surrounding 7, being 12 – 6.8169… = 5.1844… and 12 – 7.1828... = 4.8333…

These two constants represent the speed of light (in miles/sec) *C* and *C*-1, respectively. This is because 0.5184 × 360 = 186.624, and 4.8333 is just 1 – 0.51844…

Their inverse aspects are 0.19290… and 0.20703, being $\sqrt[3]{e - 2}$ and γ respectively.

Moving to number 4, it is bounded to the left by $\rho = 4.227 ... = 10 - 5.7721 ...$ (a fractal of γ) and to the right we have $3.819 ... = \varphi^2 \times 10$ with $\varphi = 0.618 ...$

Their inverses are 0.2365…, which is a new constant, and 0.2618… being a fractal value of ϕ^2.

On the other side of the mirror, number 8 is bounded by 12 – 4.2278… = 7.8128… = $\sqrt{\varphi}$.

The values of their corresponding inverses, 0.1279… and 0.1222…, are new constants.
The table below lists the rest of the periodicity numbers and the constants that bound them along with their identities.

CONSTANTS		1	11	2	10	3	9
X	Left	1.180	11.183	2.1828	10.183	3.183	9.227
	Identity	New	New	New	New	$1/\pi$	New
X	Right	0.772	10.822	1.810	9.8211	2.817	8.784
	Identity	New	New	C	New	e_f	New
1/*X*	Left	0.847	0.089	0.4581	0.0981	0.3145	0.1083
	Identity	New	New	$\sqrt{\Phi}$	New	π	New
1/*X*	Right	1.295	0.092	0.5503	0.1018	0.3549	0.1135
	Identity	New	New	Φ	New	New	New

Therefore, the structure of the numerical wave-matrix, along with its unique symmetries, enable the positioning of the fundamental constants around their proper amplitudes, which work as point-like sources from which emanate the numerical phases that endow the constants with their unique numerical and mathematical properties.

For each main digit of the periodicity, there is a specific musical tone assigned to it, explained in greater details in reference 4. Basically, the 12-based periodicity of the wave-matrix is matched to the 12-notes of the musical octave, thus illustrating the correlation between numbers, music, as well as geometry, as each note corresponds to a specific polygonal geometry, as explained in reference 10.
The whole system therefore is a vibrating matrix of numbers, sounds, as well as geometry, that manifests into physical reality via the constants and their phases, and via musical tones and their frequencies.

IV. CONSTANTS TRANSFORMATION AND UNITY

As argued above, the many mathematical and physical constants are simple reflections or transformations of each other.

Therefore there must be some basic mathematical operation that is capable of transforming one constant into another, and vice versa.
One such operation we have already seen is related to the 12-based complementary property of the wave pattern; where the sum of each two constants paired around number 6 is equal to 12.
Another transformation is the inverse operation, where numbers on the upper part of the wave pattern are inverted to generate those at the bottom part.

A third method originates from the quadrant symmetry that constants exhibit when transformed into angular references across a unit circle, as explained in detail in reference[8].
By positioning a constant at a specific angle around a circle, three other angular references are automatically determined, as explained in figure (7) below, which illustrates the complementary angular relationship between the four elements of a quadrant set.

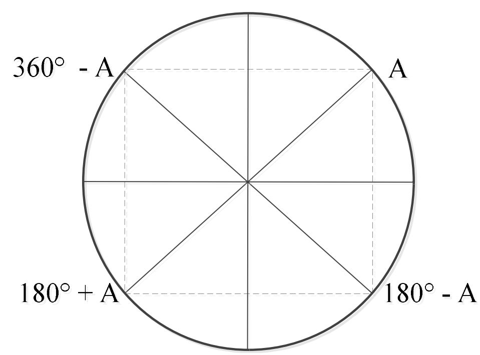


Fig.7: The definition of the quadrant angular complementary relationship between a set of four numbers.

For example, the angle of 261.8° corresponds to $\Phi^2 = 2.618$. The complementary value of this angle across the north/east axis is 98.2°.
By normalizing these values with respect to the 360° of a full circle, their sum will equal to 1: $\frac{261.8}{360} = 0.727\overline{22}$ and $\frac{98.2}{360} = 0.272\overline{77}$.

What is interesting is that the value of 0.272 is nothing but $\sqrt{\phi} - 1$. Therefore, we have Φ^2 on

the left quadrant, while on the right quadrant it is $\sqrt{\Phi}$.
These two opposing aspects, square and square root, create an action/reaction dynamic across the two sides of the circle.

The quadrant complementary value of 261.8° across the east/west axis is 278.2°. $\frac{278.2}{360} = 0.772\overline{77}$. This angular reference is related to π through the following relation: $(1 + 0.772\overline{77})^2 = \pi$.
The final angle of this quadrant set is 81.8° with $\frac{81.8}{360} = 0.227\overline{22}$. Now, $0.227\overline{22} \times 432° = 98.16$, and $\frac{98.16}{360} = 0.273 = \frac{4}{\pi} - 1$.
The above quadrant set, along with its corresponding angular and constants references, is shown below in figure (8).

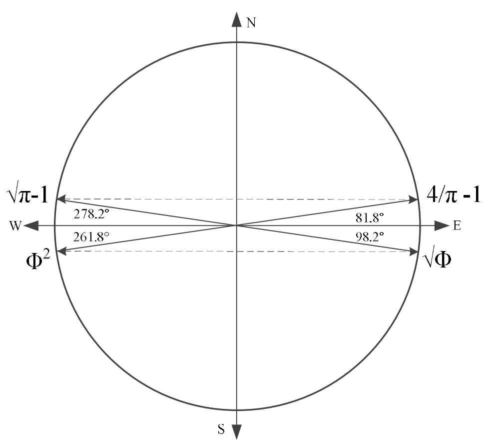


Fig.8: One quadrant set corresponding to the two constants π and Φ and their mirror images.

We used the angular reference of 432°, along with 360°, due to its connection to the tuning frequency of 432Hz, which has been shown to be crucial in illustrating the geometrical aspects of the 12 notes of the octave[10,4]. Consequently, this angular reference is also very important for detecting the various numbers/constants relationships.

The table below illustrates how some of the most fundamental constants can be derived from each other by using very simple mathematical operations.

CONSTANT	SYMBOL	CALCULATION	VALUE
LIGHT SPEED	C (mile/sec)	$(\frac{e}{\pi} + 1) \times 10^5$	186.525
EULER	e	$9 - 2 \times \pi$	2.71681
FINE STRUCTURE	α	$137.5 - \sqrt{(\frac{\varphi \times 360}{1000})}$	137.036
PI	π	$\Phi^2 \times \frac{432}{360}$	3.14150
EULER-MASCHERONI	γ	$\frac{\left(\frac{\Phi}{10} \times 360\right) - (1 - \sqrt{\left(\frac{\varphi \times 360}{1000}\right)})}{10^2}$	0.57721
1/PHI	φ	$\frac{\left(\frac{e-1}{10} \times 360\right) - \frac{\sqrt{C}(\frac{km}{s})}{10^4}}{10^2}$	0.61803
PLANCK LENGTH	p_l	$\frac{\sqrt{10} + 3}{10} + 1$	1.61622

From all the above, it would not be that far-fetched to speculate that there is, in reality, only one constant, with all others being nothing but simple transformations of it, transformations that rest upon the various symmetries of the numerical wave matrix, along with the quadrant angular references of these constants and their $1/x$ aspects.

One perfect candidate for this quintessential constant is the golden ratio Φ and its inverse φ, as they both reside at the core of the wave matrix, emanating from the central mirror of number 6. It is a constant that defines everything in nature from the geometry of the farthest galaxies to the proportions and growth-rates of all living things, to the energy levels of tiniest atoms[11], etc.
It definitely deserves to be referred to as the primordial constant; the first one to be generated and the origin of all other constants.

IV. CONCLUSION

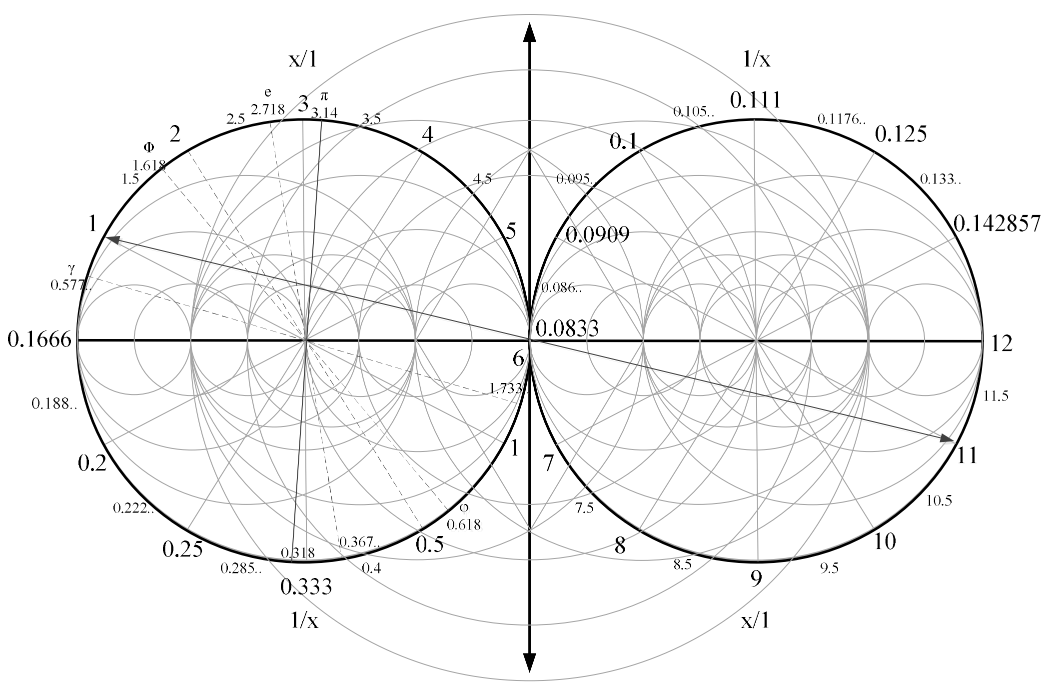
When treating numbers as wave generators, similar to point-like sources, they create a numerical interference pattern of fractal nature, labeled here the wave-matrix.

By decomposing the fundamental constants that govern the physical laws, along with their inverse values (1/*x*), into integer amplitudes and phases of trailing digits, we are able to couple them to the numeric periodicity of the wave-matrix, which rewards us with a much deeper understanding of the origin of these constants as well as their numerical structure and how they all relate to each other.

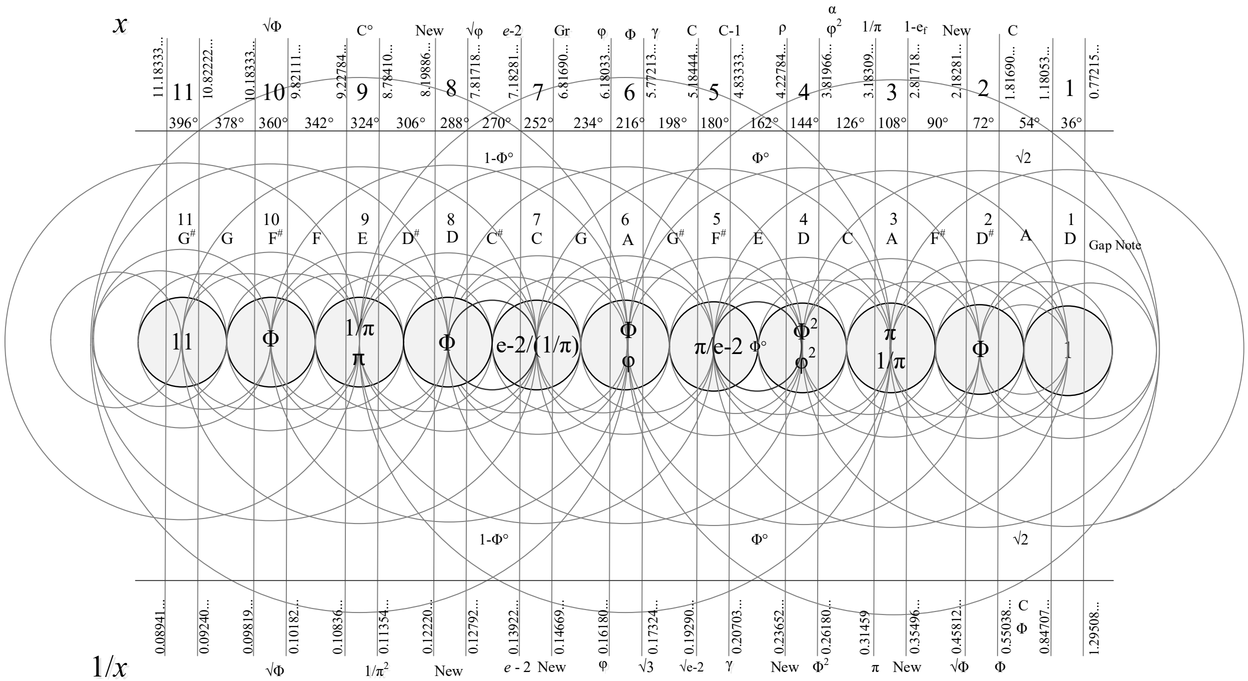
Additionally, the unique symmetries of the wave matrix enable the discovery of many unknown fundamental constants while at the same time emphasizing their unity and oneness. More work is needed to identify the properties of these new constants and to what branch of science they pertain.

APPENDIX

A- Larger rendering of figure (3)



B- Larger rendering of figure (4)



References

[1] Martin Rees. Just Six Numbers: The Deep Forces That Shape the Universe. Basic Books (2001).

[2] Savely G. Karshenboim. Fundamental Physical Constants: Looking from Different Angles. arXiv:physics/0506173 (2005).

[3] R.P. Feynman. QED: The Strange Theory of Light and Matter. Princeton University Press (1985).

[4] Robert E. Grant & Talal Ghannam. The Wave Theory of Numbers. www.Archive.org, ark:/13960/t2n66811t (2019).

[5] Brian Greene. The Elegant Universe: Superstrings Hidden Dimensions and The Quest For The Ultimate. WW Norton, 2nd edition (2010).

[6] Mario Livio. The Golden Ratio: The Story of PHI, the World's Most Astonishing Number. Broadway Books, Reprint edition (2003)

[7] Lepowsky, J., Naihuan Jing, and Kailash C. Misra. Vertex operator algebras and the zeta function. Contemporary Mathematics. Vol. 248, (1999).

[8] Robert E. Grant & Talal Ghannam. Four-Fold Mirror-Symmetry Inherent to the Icositetragon Distribution of Numbers. www.Archive.org, ark:/13960/t5w745v3w (2018).

[9] Duane W. DeTemple. A Quicker Convergence to Euler's Constant. The American Mathematical Monthly, Vol. 100, No. 5 (1993).

[10] Robert E. Grant & Talal Ghannam. Precise Geometrical Correspondence to the Perfect 5th Tuned to the 432Hz Frequency. (Awaiting Journal Approval).

[11] Talal Ghannam. The Mystery of Numbers: Revealed through their Digital Root. CreateSpace, 2nd edition (2012).