

A New Spin on Gravity

Michael Smith

5674 2nd Line, Orton, Ontario L0N 1N0, Canada

email: ms9994@gmail.com

Essay written for the Gravity Research Foundation 2023 Awards for Essays on Gravitation

Submitted: March 14, 2023

In this essay we explore how gravity may be described as spin direction when spacetime is modeled as a base-12 vibrational construct arising solely from the principle of geometric neutrality. This double-helix standing wave dynamic suggests conventional gravity occurs locally where the angular momentum spin vector is fully downward relative to an observer's perspective, dark matter where spin is away, black holes where spin is forward and dark energy as the projected amplitude of the spin vector itself. This simple scale-invariant model offers compelling explanations for atomic structure, the shape and motion of galaxies and suggests our universe is one half of a cyclic mirrored universe/anti-universe pair within a toroidal multiverse.

Reality as Geometric Neutrality

The quest to discern the fundamental nature of gravity has been ongoing for centuries, with Einstein's theory of general relativity coming closest to that end. However, even that landmark model which enabled us to see gravity at the cosmic scale in an entirely new and tangible way, as the geometry of spacetime, breaks down at the smallest and most energetic extremes of nature. The equally influential Standard Model of particle physics has, likewise, been unable to account for gravity's elusive nature within its microcosmic domain. As such, these two pillars of theoretical physics have been in a conceptual stand-off for some time now, awaiting either some new insight to bridge the explanatory gap between them or a single more comprehensive model which replaces both.

As relativity and quantum theory both essentially provide geometric descriptions of reality as wave-like and particle-like states, geometry being arguably the simplest conceptual way of describing nature, perhaps a novel way forward would be to build a geometric model of reality from scratch. To do this, we need a conceptual starting point from which to proceed that circumvents the notorious existential paradox of "something emerging from nothing" that has confounded science and philosophy for ages. One way of doing this is to establish *neutrality* as the defining state of reality, a reasonable supposition as neutrality doesn't imply any notion of pre-existence; quantitative, spatial or temporal. However, neutrality can equally apply to the formlessness of unmanifest potential or to manifest form, such as geometry, provided that form preserves neutrality. As such, *conservation of neutrality* will be our guiding principle and *geometric neutrality* our means to that end as we construct the simplest geometric model which satisfies this requirement.

The simplest geometric form is, of course, that of a zero-dimensional point. However, for point geometry as an inherently specific and non-neutral expression to retain overall neutrality, it would need to manifest as a polarized pair of equal and opposite points relative to a neutral origin. As such, a polarized point pair would be reality's first neutral physical expression, thereby establishing the idea of positive and negative polarity in a positional frame of reference of one-dimensional space and, thus, the one-dimensional real number line from +1 to -1. As polarity also imparts a positive and negative bidirectionality to space relative to a fixed origin, the notion of forward and backward sequence or time is established; of future and past relative to a neutral present.

The next logical step in our neutral geometric progression from a one-dimensional line spanning +1 to -1 would be all possible orientations of that line relative to the origin. This defines the geometry of the circle in two-dimensional space, specifically a unit circle of radius 1 centered about the origin. This introduces a second dimension perpendicular to the real number line which represents potentials not yet manifest into linear reality, thereby establishing the imaginary number line and, together with the real axis, the complex number plane. This characterizes complex numbers as the circular geometry of imaginary numbers only becoming real where circle intersects line, and necessarily doing so through the defining identity $i^2 = -1$ of imaginary numbers whereby rotation is equivalent to multiplication by powers of i . As each multiple of i corresponds to a quarter rotation around the unit circle, the idea of cycle and the base-4 cycle in particular enter into our geometric progression.

However, despite the geometric simplicity of the base-4 cycle with only two ways of partitioning itself, in half or in quarters, it offers reality little creative freedom in terms of versatility. With only four points of possibility in the context of complex numbers (1, -1, i , $-i$),

only two of which can be physically real (1 and -1), base-4 would be limited to physical expressions of simple polarity only. A finer base structure would, therefore, need to emerge which provides the best efficiency in terms versatility and size to account for the much greater complexity found in nature. That base must be divisible by 4 in order to retain the base-4 properties of the complex unit circle upon which our model of reality is thus far built. As such, base-8 and base-12 would be the next viable options, base-8 being factorable three ways (in half, quarters and eighths) and base-12 five ways (in half, thirds, quarters, sixths and twelfths). The next larger, more versatile alternative would be base-24 with six factors but at the cost of much greater size and complexity. As such, the base-12 cycle would seem to be the most logical and efficient choice, as summarized below:

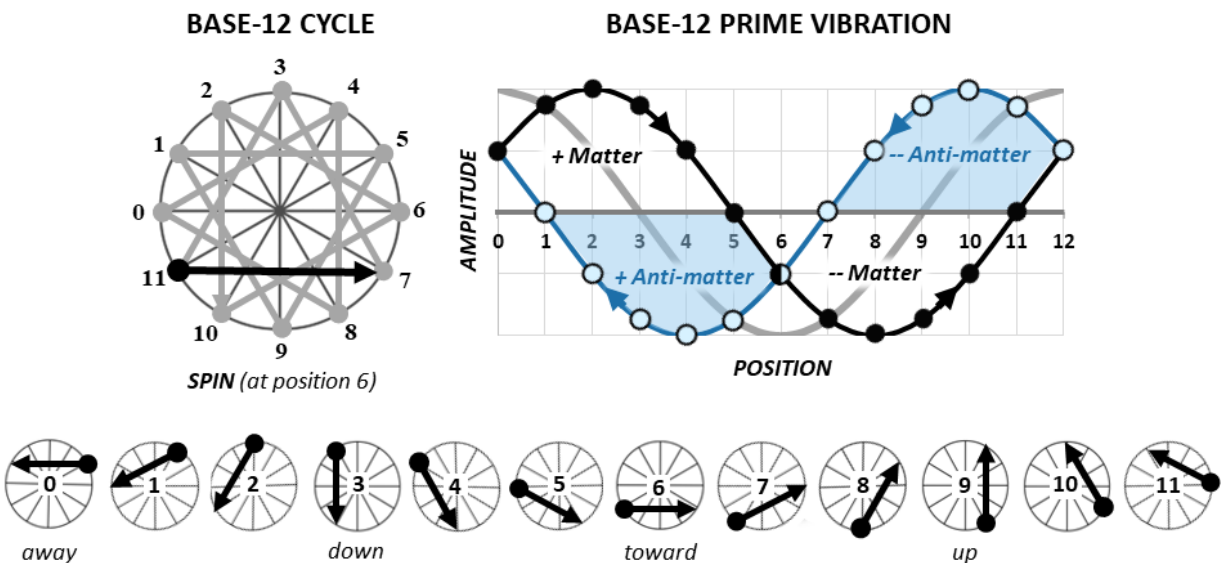
<u>size</u>	<u>factors</u>	<u>factorability/size</u>
base-8	2,4,8	$3/8 = 38\%$
base-12	2,3,4,6,12	$5/12 = 42\%$
base-24	2,3,4,6,8,12	$6/24 = 25\%$

Spacetime as the Base-12 Prime Vibration

As all possible integers can be generated by successive cycles of the base-12 positions from 0 to 11, the base-12 cycle depicts mathematics in a compact cyclical way. However, as every integer is either a prime number, only divisible by 1 or itself, or the product of primes, all that's needed to generate the integers are those positions on the base-12 cycle at which primes can occur in any given cycle: at 1, 5, 7 and 11. Note that positions 2 and 3 are excluded as cyclical prime positions as they are prime numbers in the first cycle only and, therefore, represent the structural factors of the base-12 cycle itself (i.e. $2 \times 2 \times 3$). Also excluded are positions which are products of 2 or 3 (i.e. 4, 6, 8, 9, 10). Position 1, however, is included as it is only non-prime in the first cycle. As such, the base-12 prime cycle of positions 1, 5, 7 and 11 is sufficient to describe reality.

The four prime positions of 1, 5, 7 and 11 in the base-12 cycle also possess a symmetric 2:1 rectangular geometry, something base-10 coincidentally lacks with its prime positions staggered at 1, 3, 7 and 9. Also, positions 1 and 7 being opposite each other on the base-12 cycle, as are 5 and 11, subtract when treated as vectors. This reduces to two equal net vectors of length 6 ($7 - 1$, $11 - 5$) at positions 7 and 11, rather than four vectors of differing lengths at 1, 5, 7 and 11. This reveals an even simpler cyclical embodiment of mathematics, that of a base-12 cycle of constant radius generated by prime positions 7 and 11 alone. Still, as any cycle is inherently restricted to one rotational direction, the base-12 prime cycle would necessarily manifest in a bi-rotational way so as to maintain dynamic neutrality overall.

This brings us to what logic would suggest is the final step in reality’s geometric emergence in the simplest neutral way, that of the bi-rotational base-12 prime cycle expressed over time as the 3D double-helix *base-12 prime vibration* shown below. To the right is the 2D front view an observer would perceive and to the left its side view, the base-12 cycle from which it emerges (shown at its “home” spin orientation of position 6). Also shown at the bottom are the individual spin orientations for the twelve matter positions along the black wave, the twelve anti-matter



positions following the opposite sequence along the blue wave. The prime vibration is, therefore, posited as the inevitable mathematical and dynamical embodiment of neutrality.

As the prime vibration is generated by the rotation of two points which are four positions apart on the base-12 cycle, it creates a standing wave projection consisting of two sine waves 120 degrees out of phase which, when combined, become a cosine wave (thick grey line). Wherever this 2D projection intersects the neutral real axis, at prime positions 1, 5, 7 and 11, is where “real” prime particles can occur relative to an observer’s perspective while all other positions within the waveform remain as “imaginary” potentials. This suggests that the observer effect of seeming wave function collapse in quantum mechanics doesn’t collapse anything, but simply imposes a frame of reference of specific intersection points between the probability wave and real number line relative to our line of sight, what we would perceive as fixed point-like particles. Unlike string theory which views particles as individual vibrating strings or loops, the prime vibration sees them as an octave of twelve vibrational states within the same vibration.

Although the base-12 cycle simplifies to two prime positions, all four are restored when expressed vibrationally in a bidirectional way: positions 1 and 7 as prime positions along the forward moving (black) wave and positions 11 and 5 on the backward (blue) wave. This agrees with matter and anti-matter being temporally opposite and why the up and down quarks and their anti-matter counterparts are the prime particles from which all composite matter and anti-matter are made. The outermost positions 0 and 12 as point geometries above the real axis would also manifest, but as solitary charged particles which remain at the perimeter, namely the electron and its anti-particle, the positron. Conversely, position 6 at the heart of waveform would remain hidden as it falls below the real axis with a non-zero potential. As a point of intersection between the two polarized prime waves and directions of time, position 6 would also be neutral, have zero

spin and serve as the point of self-reference for the entire waveform. This seems synonymous with the Higgs ground-state potential from which matter and anti-matter emerge and through which they acquire mass.

Further, the figure-8 flow of the prime vibration creates an elegant butterfly-like symmetry of two polarized half-cycles of 360 degrees each for a total lap of 720 degrees. This would explain why fermions exhibit a spin of $1/2$ at the quantum scale and suggests, at the cosmic scale, that our universe is one half of a mirrored universe/anti-universe pair, each subject to an opposite arrow of time. However, the geometry of each half-cycle on its own reveals a local asymmetry between matter and anti-matter as evident in the relative areas of the upper and lower quadrants. To illustrate, the left half-cycle begins at position 0 as a point probability within the unshaded upper quadrant of tangible matter, a seeming singularity from which spacetime emerges. From position 0 to 1 would be a “big bang” of rapid inflation in which only matter is possible (but not anti-matter) as reflected in the +1:0 polarity ratio of position 1, thereby seeding the universe with an initial excess of matter. The ratio between matter and anti-matter would then change to +2:-1 at position 2 in favour of matter, +1:-1 in equal balance at position 3, +1:-2 in favour of anti-matter at position 4, 0:-1 of anti-matter only at position 5 and, finally, fully rebalancing matter with anti-matter at position 6. This would explain the matter/anti-matter asymmetry exhibited by our universe, but without which anything would exist.

All infinitely-many possible cycles of the prime vibration’s figure-8 flow would create a 3D toroidal dynamic in which the perceptual gap over position 6 becomes a circular black hole or, in the extra-dimensional physicality we perceive as 4D spacetime, a spherical event horizon or nucleus within which remains hidden. This would explain the toroidal shape and imperceptible core of atoms, galaxies and perhaps multiverse. The V-shaped void above position 6 would,

likewise, explain asymptotic freedom within atomic nuclei. Positions 5 and 7 being oppositely polarized would create a strong probabilistic shell difficult to breach but increasingly free to move within as it converges towards the neutral intersection of position 6.

Gravity as Spin Direction, Dark Energy as Spin Amplitude

The prime vibration, as mentioned above, is the front view perspective of an observer. Its twelve positions appear from this vantage as varying probability amplitudes (mass), polarities relative to the neutral real axis (charge) and spin direction (angular momentum), up or down – the very same properties experimentally confirmed. However, this is just the projected edge view of the base-12 cycle as it rotates into the page, so to speak. Hidden from view is the perpendicular component of spin. So, what appears to be binary spin, up or down, may actually be full rotational spin – up, down, forward and back – through twelve rotational increments. This suggests rotational qualia are fundamental and only appear as discrete quanta to an observer.

This idea of extra-dimensional spin offers a remarkably simple interpretation of gravity as the localized direction of spin. Conventional downward gravity would be that of position 3, while dark matter would be the perpendicular spin as it varies through the other positions: fully away at position 0 (causing the perimeter of a galaxy or cluster to spin faster), none at position 3 (causing the mid-galactic bulge via conventional gravity) and fully forward at position 6 (causing the inward flow of a black hole). This would explain why the profile of galaxies and clusters closely resemble that of the prime vibration and also confirm that regular matter is all there is.

Likewise, dark energy may be that same undulating spin profile of the extra-dimensional spin vector when applied to space itself. As such, we can employ the same localized geometric progression used previously to describe the matter/anti-matter rebalancing cycle to the expansion/contraction cycle of space:

- The cycle begins at the point probability of position 0 with the spin vector pointing directly away. This would manifest as a tiny concentration of extreme energy and pressure from which spacetime would emerge, along with electrons corresponding to that point geometry.
- From position 0 to 1, the spin vector rotates partially into view causing a “big bang” of rapid inflation of space and slight cooling due to that expansion. The singularly polarized +1:0 polarity ratio of position 1 suggests that only individual particles of charged matter, namely quarks, would form as a hot plasma that slightly coalesces due to gravity.
- From position 1 to 2, the spin vector rotates further into view causing the expansion of space to decelerate and further cool. The +2:-1 polarity ratio of position 2 would cause quarks to combine according to this ratio whereby two +2/3 charged up quarks and one -1/3 charged down quark create the +1 charged proton.
- From position 2 to 3, the spin vector rotates fully into view causing expansion to cease and space to achieve its maximum size and coolest temperature. By virtue of the balanced +1:-1 polarity ratio of position 3, the +1 charged proton combines with the -1 charged electron to form hydrogen as the simplest atom of neutral stable matter. As position 3 represents the universe at its most stable, neutral and gravitationally attractive (due to its fully downward spin), the conditions we have today, this is presumably where we are in the cosmic cycle or just beyond. So, paradoxically, position 3 is both spin at its most attractive to matter *and* most repulsive to space – a posthumous consolation perhaps to the founder of this essay contest, Roger Babson, who had long sought an anti-gravity defense to gravity’s offensive.
- From position 3 to 4, the spin vector begins rotating back out of view, contracting space at an accelerating rate and heating up once again. However, as rotational and linear acceleration would be indistinguishable by redshift from within a rotating frame of reference, rotational

contraction could be mistaken for linear expansion. This would explain why the universe appeared to begin expanding at an accelerating rate approximately 5 billion years ago when, instead, it started contracting. The +1:-2 polarity ratio of position 4 would, through electron capture, reduce atomic matter into neutrons, consisting of one $+2/3$ charged up quark and two $-1/3$ charged down quarks, and electron neutrinos.

- Matter further disintegrates from position 4 to 5 into anti-quarks according to the 0:-1 polarized geometry of position 5 of strictly anti-matter. As position 5 also marks the start of the probability gap within which position 6 resides, the universe concludes as a black hole.
- From position 5 to 6, the spin vector rotates to the horizontal causing a rapid deflation of space and compression of the remaining anti-matter into a point-like concentration of energy. This would re-emerge from the polarity reversal of position 6 as another “big bang” that sparks the inflationary start of the next (anti-) universe cycle, and so on in cyclical perpetuity.

Charge as the Spin Geometry of Position 6

A further question possibly answered by the geometry of the prime vibration is why the twelve elementary fermion particles have the charges they do: the six quarks with fractional charges of $+2/3$ and $-1/3$ and the six leptons with binary charges of -1 and 0 . As the origin and neutral ground state of the prime vibration is position 6, it is the horizontal orientation of its spin vector, or more specifically the relative proportion of the base-12 cycle above and below, that would determine the charge characteristics of the entire waveform

Inspection of the base-12 cycle at its spin orientation of position 6 reveals that, from an observer’s front view perspective (i.e. perpendicular to the vertical imaginary axis), there are four positions above the spin vector and two below for a polarity ratio of $+2/3$ above and $-1/3$ below. These would, therefore, apply to the probability regions of the prime vibration through

which the black prime wave of matter passes, the upper left and lower right quadrants. Also, as polarities reverse from one side of position 6 to the other so as to maintain overall neutrality, the upper right and lower left quadrants through which the blue wave of anti-matter passes would be subject to opposite fractional charges of $-2/3$ and $+1/3$, respectively. This would explain the $+2/3$, $-1/3$ charges of the six quarks and $-2/3$, $+1/3$ charges of their six anti-quark counterparts.

As explained, the base-12 cycle is subject to the base-4 mechanics of complex number rotation whereby a 90-degree counter-clockwise rotation is, by virtue of $i^2 = -1$, equivalent to multiplying by the imaginary number i . This, therefore, necessitates an additional angle of perspective to fully describe the base-12 cycle, that of its perpendicular top view. From this vantage, looking down towards the real number line as represented by the 180-degree rotation of $i^2 = -1$, all we see is the portion of the base-12 cycle above the spin vector (i.e. -1) but nothing below (i.e. 0). This may explain the -1 , 0 charges of the six leptons (and $+1$, 0 charges of their anti-leptons), that they occur in a plane perpendicular to that of the quarks and why electromagnetism jointly manifests as electrical and magnetic waves perpendicular to each other.

It's quite surprising that such a comprehensive description of reality may be derived from as basic a principle as geometric neutrality, with complex number rotation the mathematical engine that powers it all. Through this conceptual lens, it is only where circle intersects line that reality physically "matters" – where imaginary becomes real, integer becomes prime, wave becomes particle and spin becomes gravity. As the observer's line of sight *is* the real number line in this framework, it is perception itself that establishes the neutral reference point relative to which the polarity of every experience is viewed, its position in space and time inferred and gravitational significance weighed.