

Assumed in this presentation as axiomatic are three universal principles: (1) *universal consciousness*, resulting in a coherent *order* throughout the cosmos, which finds expression through (2) *polarity* and (3) *resonance*, as in Pythagorus' *harmonic series* along with its mathematical parallel in Euler's *zeta function*. All mathematical constructs are thus abstractions drawn from and remaining within that greater context.

To start out with misconceived assumptions is to be destined for flawed conclusions, however ingenious one's methods. The assumptions in this work lead to clear and consistent resolutions of the related enigmas of the *prime numbers sequence*, the *Riemann Hypothesis* and the *Goldbach Conjecture*.

Any so called mathematical 'proof' has meaning only within the rules and conventions of mathematics. In the 1930s, mathematician, Kurt Godel showed irrefutably that the theory of numbers cannot be proved to be self consistent, ie without contradictions, and that there are some statements which can neither be proved to be true nor untrue within number theory. This indicates a reality way beyond the scope of mathematics.

EMU is an abbreviation used in *Threshold Mathematics* for *equal measure units*. This is usually a reference to the ordinary integers or 'real' numbers of conventional mathematics. EMUs are the basis of the 'building block' and 'grid' mentality which operates as if the universe were actually composed of such entities, when in reality it isn't – however convenient and useful such an assumption may be for calculating and theorising. It's like the consciously *suspended disbelief* at the cinema, when a series of still pictures is seen as movement. So the EMU concept is both a strength and a fundamental, fault-line weakness of mathematics.

1. The Prime Numbers Sequence

It's proposed here that the *primes* constitute a distinct and primal number system prior to and embedded within the conventional number system. They indicate the greater reality beyond abstract mathematics. However, when seen only from the physical-material perspective, they appear to occur in an 'irrational' order. Hence their 2000+ year 'enigma' status.

That greater, prior reality is about the cosmos being a vast, pre-physical *resonant cavity* (RC) within which is formed an infinite series of concentric sub-RCs, resulting from the formation of *spherical standing waves*.

From the *Threshold* perspective, the inward and outward movement in the rhythmical pulsation of the cosmos can be expressed mathematically as two *arithmetic progressions*. One starts from **-1** and the other from **+1**, *negative* and *positive* being vital qualities of universal polarity. The common difference in both is **6**, a so-called perfect number because both adding and multiplying together its three factors give the result **6**. An explanation of the significance to this work of **6** is not essential to this minimal summary, but can be found in *Threshold Mathematics* © and *The Primal Code* ©, at www.pathwayinitiatives.co.uk.

The two progressions can also be displayed as a *double helix*, two interweaving spirals, passing close to each other at every cycle of **6**, graphically resolving the previously 'mysterious' *twin primes*, eg 11/13, 29/31...

-1, 5, 11, 17, 23, 29, **35**, 39...
1, 7, 13, 19, **25**, 31, 37, 43...

As these progressions continue, each new RC/number that *resonates* with (is a multiple of) an RC/number already included is subsumed by that prior value, and so has no independent identity of its own. Thus it is automatically cancelled out, eliminated.

That leaves only those RCs which harmonically resonate with the fundamental 'note' of the one cosmos and those numbers which are divisible by *one*, ie the *prime numbers*. This is 'at-onement'.

Artificially merging the two progressions produces the previously 'irrational' sequence of prime numbers. *Euler's Product*, meanwhile, confirms the primes as signs of a primal, pre-physical *ordinal* system, prior to the EMU *cardinal* number system.

Thus the enigma of the distribution of the prime numbers is resolved.

2. The Riemann Hypothesis (1859)

'All non-trivial zeros of the zeta function have real part one-half.'

'All non-trivial zeros of the zeta function lie on the critical line.'

The *Riemann Hypothesis* is here taken to be an inspired speculation about a particular and significant pattern intuitively sensed by the outstanding 19th century mathematician, Bernhard Riemann. In 1859 he gave it expression in the form of a mathematical model, combining numerical and graphical elements.

The idea emerged as a spin-off, an unexpected by-product of other work on the prime numbers in which he was then engaged. He speculated the existence of a 'critical' infinite line of zeros generated by his modified version of the *zeta function*, incorporating *complex numbers*. This suggested a then unrealised order involving the prime numbers.

A doomed model / polarity ignored

It's suggested here that no one has been able to prove or disprove *Riemann's Hypothesis* because it is based on some long established false assumptions in Western culture about the fundamental nature of the cosmos. These have resulted in an incomplete conception of what *zero*, *one*, *half* and *i* (imaginary numbers) mean, as well as an inadequate appreciation of what *negative* and *positive* values signify in their broader cosmic context.

The *Threshold* principle of *universal polarity* is here taken as assumed. So any particular aspect of the greater reality signified by a mathematical symbol will always have its polar opposite aspect. Failure to apply this principle can result in confusion.

The *Threshold* perspective thus reveals that *zero*, along with all other number values, has both a *major*, *qualitative*, *inclusive* and a *minor*, *quantitative*, *exclusive* aspect. However, in Riemann's era of increasingly materialistic thinking and still today, only the *minor* aspect, 'little zero' – as a gap between numbers – seems to have official recognition.

An exercise in unlearning

Consequently, this investigation of the Riemann Hypothesis enigma is very much an exercise in questioning old assumptions, unlearning and abandoning some redundant teachings and untangling knots resulting from these. All in all, it's a kind of opening up of previously locked doors and windows in order to benefit from a fresher, lighter, more expansive atmosphere. As in everyday life, this is not always welcomed by everyone.

A cautionary thought

Converting number patterns into geometric, quasi-physical/spatial structures, as Riemann did, can be a useful device for visualising connections etc. However, it can also result in potentially misleading false metaphors, ie rigid images where fluid patterns become established 'fixtures' as lines, distances, directions, areas etc.

Back with big and little zero

In the normal workings of the decimal number system, *little zero* occupies a position, a space in a grid, as if just another 'building block' number with its own specific value, ie nil.

By contrast, in a *number line*, which essentially represents an *order*, a zero serves as a marker, a transition point with no intrinsic quantitative value – just as in the practical world of normal thinking, outside of abstract mathematics, there is no gap between the years 1BC (-1) and 1AD (+1), ie no 'year zero'. Here zero marks only a crossover or transition point, a *threshold* in a greater flowing continuity.

So, given the universal principle of polarity, *little zero* serves as a space-filler, a symbolic point or portal of no substance or numerical value in the grid/column/EMU number system. Meanwhile, *big zero* represents the *threshold* or *border/interface/field/plane/line* of no substance or value at the transition level between:

- (a) the infinite, pre-physical, unmanifest, potential/virtual, *negative* realm, and
- (b) the finite physical-material, manifest realm of forms and positive numbers.

Zero does not, therefore, simply represent 'nothingness' in contrast to the 'somethingness' of the realm of positive numbers. It has an intermediary role in a number line, numerically midway between -1 and +1.

So, viewed from the physical 'side', beyond zero there lies the potential/virtual and essentially non-quantifiable *negative* realm. This is only made quasi-quantifiable ('as if' quantifiable) by artificially 'projecting' positive values on to it through an act of imagination, creating reflected images and a mathematical mirage.

And in this exercise of the imagination lies a clue to the meaning of the 'imaginary numbers', represented by the letter *i*.

The ambivalence of imaginary numbers

Riemann had already been working on the primes using *complex numbers*, combinations of *real* and *imaginary* numbers. *Imaginary number* values are signified by the letter *i* which officially represents the 'square root of -1'. But this is a piece of pure mathematical jargon. No actual square is involved, and so 'square root' is here a meaningless term.

-1 is the product of multiplying together -1 and +1. So *i* is an *ambivalent* value, *alternating* between -1 and +1 (across the 0 transition point). This alternating quality of *i* is key to its use in practical calculations involving phased and other rhythmical processes.

A simple model reveals...

Assuming a W/E number line of, say, -10 to +10, crossed at its *zero* marker point by a N/S line, all values on this N/S line would automatically be zero, since this line, midway between -1 and +1 graphically represents the interface, the *threshold* between the negative and the positive realms.

This critical N/S line can also be taken to represent a *plane* at the interface between:

- (a) the realm of *potential*, pre-physical manifestation, ie *negative values*, eg debt, seed power etc... and
- (b) the realm of *actual*, physical-material manifestation, ie *positive values* of discrete forms and objects.

Thus the mathematical symbols remain connected to the wider context and reality.

Riemann's 'landscape' model

Riemann's model comprised a triple axis graph which produces an artificial 3D image resembling a landscape within which his 'critical' infinite line of zeros is generated.

Axis 1 is the west/east real number line with west as the negative side, east as the positive side and the *zero* marker positioned midway between positions -1 and +1.

Axis 2 is a north/south line of *imaginary numbers* intersecting the W/E line at $+\frac{1}{2}$.

Axis 3 is a vertical line extending upwards and creating a further dimension stretched out along the N/S line. This represents the output of all *i* values along the N/S line, fed into Riemann's *zeta function* – which itself incorporates *complex numbers*, real and *imaginary* numbers added together.

Apparently, to Riemann's surprise, the intersection at $+\frac{1}{2}$ unexpectedly produced the 'critical' line of zeros which he then speculated is 'probably' an infinite series.

What is a half?

The abstract mathematical term *one half* ($\frac{1}{2}$) signifies the *quality* of *half-ness* which is a relationship of proportion or ratio between one-ness and two-ness. It does not itself represent any specific quantity or entity. Like such terms as *majority* or *minority*, it can only describe a particular *quantitative quality* of something. In this respect, $\frac{1}{2}$ describes an entity as being one of a pair of two equal component parts which comprise a greater single entity. In the physical world, two halves add up to one whole only when they are both halves of the same thing. Only in the abstract world of mathematics can two halves of nothing in particular add up to one.

The principle of $\frac{1}{2}$ signifying the dividing of one entity into two equal parts (halves).

is universally applicable to the physical world. So there can be a half of just about anything: a half-litre, a half-century, a halfway point of a journey etc. But the symbol $\frac{1}{2}$ on its own does not itself represent an actual quantity of anything: amount, size, weight, duration, power etc. Only when it's applied to a specific substantive situation will the result be a quantifiable value, ie $\frac{1}{2}$ of something.

Mathematically, this involves multiplication by $\frac{1}{2}$ (or division by 2). An abstract half (ie of nothing) cannot meaningfully be added to anything else, such as an imaginary number.

Confusion in a number line?

Confusion seems to arise when the symbol $\frac{1}{2}$ appears on a *number line*, ie as a *marker* in the way that zero

marks the midway point between, say, -1 and +1. The role of the abstract symbol $+\frac{1}{2}$ is to indicate a location midway between the points marked 0 and +1, and as such a marker, it has no inherent quantitative value itself – just as the point between years 1BC and 1AD has no inherent numerical value.

It seems that Riemann took the $\frac{1}{2}$ marker on his W/E number line to have an intrinsic numerical value. This was then combined with, ie added to, the series of values produced above the N/S line which crosses the W/E line at the point marked $+\frac{1}{2}$. These values are derivatives of *imaginary numbers* – which have an ambivalent value alternating between *negative* and *positive*, as shown earlier – and the combinations are *complex numbers*.

The result, according to Riemann, was 'probably' an infinite series of *zeros*, forming his *critical line* - which does not seem surprising, since $\frac{1}{2}$ of nothing plus an indeterminate 'imaginary' value would seem inevitably to have no numerical value, ie to equal zero.

The *critical strip* in Riemann's model designated by contemporary mathematics, within which all the zeros are supposedly proven to lie, extends $\frac{1}{2}$ unit either side of the line at $+\frac{1}{2}$, and so just about includes at its western extreme the N/S line at zero proposed by *Threshold Mathematics*. This 'zero' position for the line of zeros would also seem to resonate with Euler's logic.

For Riemann's inspired idea of a critical infinite line of zeros - his envisioned *destination* of a metaphorical sea level path in his 'landscape' - was all the while accessible via a much more direct and simple route, already implicit in Euler's zeta function. But the mathematical complexities of Riemann's artificial landscape appear to have distracted him and others from grasping the simpler, bigger picture he'd intuitively sensed. The idea also seems to have come to him only when he was already mentally in the (mathematical) 'territory' requiring a longer route to 'zero level', and so perhaps didn't even consider the possibility of a simpler, more direct one.

The bigger picture

When Riemann's visionary infinite *line* of zeros is seen as graphically representing a *plane*, it suggests an early intimation of what's recently become known as the *zero point field*, the turbulent interface between the pre-physical (-) and the physical (+) realms.

As such, it can also be understood as an illustration of the ***Threshold*** which is the basis of this work.

So the 150 year old intractable problem of no one being able to prove or disprove Riemann's hypothesis now looks to be a question of whether or not his complex route can somehow be mathematically validated. It would seem not so - whereas, according to the principle of *Occam's Razor*, the shorter route, indicated by the *Threshold* perspective, offers the most efficient way of clearly stating the fundamental principles involved.

Thus the enigma of the *Riemann Hypothesis* is resolved, as neither provable nor disprovable.

In terms of ***Quality Maths***:

one-ness is the quality of *prime-ness*, ie is primal;

zero-ness represents the unquantifiable pre-physical, infinite void, both peripheral/large and central/small;

half-ness is the reciprocal of *two-ness*, ie two *one-nesses*.

3. The Goldbach Conjecture (1742)

'Every even number over 2 can be represented by 2 prime numbers.'

Goldbach asked the great mathematician, Euler, if he could prove this apparently true statement. But Euler couldn't, and no one since then has. So given that mathematical 'proofs' only have meaning within the rules and logic of mathematics, this would seem to affirm the assertion of another great mathematician, Gödel, that new axioms may be required in such cases.

The **even number** is an EMU concept. The EMU number system, as explained in *Threshold Mathematics*, is one expression of the materialistic 'grid' and 'building block' mentality regarding space, time, quantity and the universe.

Primal values, as also outlined in *Threshold Mathematics*, are *ordinal* values representing the pre-physical 'inward' series of concentric spheres, *resonant cavities*, generated by *harmonic resonance* in the formation of the cosmos. They are the original essential forms which can be abstracted and symbolised as the *prime numbers*.

The *primal value* system is thus prior to and beyond the EMU system of *cardinal* numbers, making the two systems mathematically incompatible.

The **Primal Code** which links them is an ordered, infinite sequence of both *primal values* and *prime numbers*, marking out a cyclic process of cosmic *manifestation* and *redemption*.

From the **Threshold** perspective, the logic then works out as follows:

What makes the *primes* extraordinary numbers – apart from their being not divisible by any number other than one – is the extra quality they possess beyond the scope of the EMU cardinal number system. That is, their significance in the cosmic formative process.

The Primes are explained in *Threshold Mathematics* as both:

(a) *Ordinal* symbols, signifying a sequence of cosmic resonant cavities, ie **primal values**, and

(b) *Cardinal* values, expressed as abstract, EMU, **prime numbers**.

(*Primes* larger than 2, within the EMU number system, are thus all *odd cardinal* numbers.)

This gives them their dual identity and function, ie their two distinct but complementary aspects, like a valve or duct which works simultaneously in two 'worlds'. This is *polarity*.

To try to define primes in terms of only one of their aspects would inevitably produce inadequate, confusing and paradoxical results. So what fundamentally distinguishes primes from non-primes is their extra, pre-EMU dimension.

Even numbers

- *Even numbers* indicate the abstract idea of a **pair** – but as such, do not specify or explain the substance or constituents of the pair as actual, real entities.

- *Even numbers*, in EMU terms, can comprise a pair of equal values or other combinations of EMU numbers, namely:

- *Symmetrical* pairs of identical *evens* or *odds*, eg $2 + 2 = 4$ and $3 + 3 = 6$,

- *Asymmetrical* pairs of non-identical *evens* or *odds*, eg $2 + 4 = 6$ and $3 + 5 = 8$.

So every even number can be represented by a pair, a *two-ness*, of odd or even numbers.

Two-ness is essentially two *one-nesses*.

One-ness is a quality solely of the number *one* and the *primes* (each prime is a 'one-off').

Therefore, **every even number** (as a *two-ness*) can be represented by two primes.

The Becoming (of Cosmos) (see *Threshold Mathematics*)

distinguishes pre-physical time from physical-material *space*, and thus:

(a) how *quality* is prior to *quantity*,

(b) how the *one* original sphere is prior to the *many* sub-spheres,

(c) how the idea of *numbers* developed out of the *descent into matter*.

No pure 'equality'

The process of *universal consciousness* focussing and creating 1-ness, 2-ness, 3-ness... which involves rotating, spinning, vortexing, ie continuous *movement*, affirms that:

- in cosmic reality, no two physical entities can be exactly equal – only approximately so;
- in mental, abstract, ideal *mathematics*, 'identical' equality and *even-ness* is possible.

Euler thus could not prove the correspondence of EMU *even* numbers with *prime* numbers because the *primal value* system underlying the primes is *ordinal*, prior to and beyond the EMU system of *cardinal* numbers... and the two systems are thus incompatible.

Goldbach's Conjecture, limited to EMU number logic, consequently has the paradoxical quality of being demonstrably true but not 'provable' within the logic of mathematics, affirming Gödel's 1930s irrefutable assertion.

A longer view

Imagine a child who has not experienced, directly or indirectly, a 'nuclear' family situation comprising two parents and their offspring, and who is also ignorant of the process of biological reproduction. It cannot be convincingly 'proved' to the child that every individual person has two progenitors, a particular male and a particular female – for this is an alien concept to the child's worldview. The child's mind is not yet developed or informed sufficiently to comprehend the bigger picture and its governing principles.

A person with a mathematical worldview that has not extended beyond the abstract EMU system taught in childhood is not yet opened up to the bigger, prior picture within which the limited EMU system arose, and so functions, in this respect, with a limited understanding.

Threshold Mathematics shows how the familiar but limited EMU number system, unquestioningly used worldwide every day, emerged from a prior situation with which humanity is not so familiar. In order to overcome this limitation, humanity needs to expand its current worldview, including its mathematics, to incorporate an awareness of the pre-physical world. Addressing *Goldbach's Conjecture* here has opened up this possibility.

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