
Threshold Mathematics v8.00

What's missing that makes mathematics such a turn-off for so many and fascinating for a few?

And what's the deeper significance of *the Primes, Riemann's Hypothesis, Zero, One, Pi, the Golden Ratio, the Fibonacci series, Negative and Imaginary numbers*
... for a start?

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Prologue

“...The primes represent the most tantalising enigma in the pursuit of human knowledge...”

Cover blurb of *The Music of the Primes* by UK professor of mathematics Marcus du Sautoy (2004).

"Upon looking at these numbers, one has the feeling of being in the presence of one of the inexplicable secrets of creation."

Mathematician Don Zagier speaking of the primes, quoted in *The Mathematical Experience* by Philip J Davis and Reuben Hersh (1981).

Prime Numbers – The Most Mysterious Figures in Math.

Title of a 2005 book by mathematician David Wells.

God's Secret Formula – deciphering the riddle of the universe and the prime number code.

Title of a 1997 non-fiction book by scientist Peter Plichta.

“Prime Obsession ...the Greatest Unsolved Problem in Mathematics”

Title of a 2003 book about the prime numbers by mathematician John Derbyshire.

These quotes are included simply to illustrate the continuing fascination, particularly of mathematicians and scientists, with the primes. Reading these books revealed how each author seemed intuitively to sense something very special which inspired him to write his book. Yet none was able to grasp what actually makes the prime numbers so significant.

Marcus du Sautoy, in his book *The Music of the Primes*, laid it all out with masterful clarity and flair - the big tease about the *primes*, that is. All about to be revealed... but then... hold on. Not quite yet. Ever closer but never quite getting there. What mathematicians call *asymptotic*: the line and the curve that are converging ever closer, yet never quite make contact. And that seems to symbolize the fascinating story of the *primes*, the oldest and biggest unresolved mystery in mathematics, on which the *Riemann Hypothesis* perches, still neither proven nor disproven, as also does the even older *Goldbach Conjecture*.

The essence of the mystery has been the lack of:

- (a) any meaningful explanation, for over 2000 years, of the 'distribution of the prime numbers', ie some pattern in their occurrence in the normal number line of 1, 2, 3 etc, and
 - (b) any proof or disproof of the related and now legendary *Riemann Hypothesis (1859)*.
- This combination would seem to suggest an absence of something vital in mathematics.

Threshold Mathematics has looked at both in a radically different way and asked: Could these long running failures all along have been the inevitable consequence of asking the wrong questions, perhaps based on false assumptions, passed on unquestioningly through generations? And since the desired solutions have not been found after extensive expert analysis of the numbers, might it be more fruitful to look at their bigger context?

This work is, therefore, more about how we have come to think about quantifying and numbers than about mathematics itself and its various conundrums. It was mathematician, Kurt Gödel, in the 1930s who showed that there are some statements

which can neither be proved to be true nor untrue within mathematics, news which was not welcomed by many of the leading mathematicians of the time.

It is proposed in this work that the sequence of the *prime numbers* signifies something fundamental to human consciousness in our understanding of how the cosmos was and continues to be formed. So this aspect will be central throughout. At least a temporary acceptance of our starting assumptions is required in order to appreciate the resolutions reached. And since this is by no means an orthodox mathematical exercise, it may also involve some questioning of previously unquestioned ideas.

However, the attitude behind this work is not 'anti-mathematics' in any way. The approach taken here is a re-examination of certain apparently unquestioned assumptions and habits of thinking. It is suggested that having been embedded in normal' mathematical practice for many years, these may have been contributing to the problems all along.

Other broader questions persist. Is there a vital factor missing that makes mathematics such a turn-off for so many, yet deeply fascinating in its rationality, elegance, complexity and beauty for a small minority? How significant is its exclusion of those essential *living qualities* we experience as *willing* and *feeling*? For such an omission leaves us with the sterile, lifeless, mathematics most of us were taught at school and that Western physical science adopted as its official language of authentication. Mathematics is, after all, just another human pursuit, a language, although a highly developed and specialized one.

It's suggested here that one of the reasons why fascination with the primes and Riemann enigmas has taken on such significance is because the primes actually are the key to some very profound issues. They raise questions of a kind we are discouraged from addressing or even contemplating in our fragmented and distracted culture. Yet many well documented speculative quotations from mathematicians allude to this profundity. And to completely ignore a method that solves problems which orthodox mathematicians have been unable to solve through centuries would amount to a kind of *denial*, an irrational, emotional behaviour pattern familiar to psychologists and to many others.

In the text that follows it's proposed that Riemann's Hypothesis can neither be proved nor disproved because of two key factors: first, a lack of understanding of what the *prime numbers* signify in their bigger cosmic context; and second, an incomplete conception of what *zero*, *one*, *two*, *one half* and *imaginary numbers* mean combined with an inadequate appreciation of what *negative* and *positive* values signify. Such failings seem to have been due to some long established false assumptions in Western culture about the nature of the cosmos.

Du Sautoy has said that mathematics is essentially "*ethereal*" and that the primes are "*timeless numbers that exist in some world independent of our physical reality.*" That would seem to be a promising starting place. Or is it still a no-go area, a taboo subject?

1. The Threshold is...

This work is part of a broader **Threshold** work. Here we focus on a few enigmatic, features of mathematics. These include *Pi*, *the Golden Ratio*, *the Fibonacci Series*, *Imaginary Numbers*, *the Prime Numbers Sequence* and *the Riemann Hypothesis*. In so doing we find that there is a coherent pattern in the cosmos, an overall order within which each of them performs an essential, rational function, despite being labelled as 'irrational'.

For example, once it is realised, from the *threshold* perspective, that the apparent irrationality of the *prime number sequence* results from the artificial merging of two simple sequences based on one consistent rationale, the obvious key question arises:

What significant principle in the greater reality do these two sequences represent?

And once we grasp what the prime numbers do actually signify, it follows that Riemann's intuitively sensed hypothesis, unproven since 1859, is essentially sound although mathematically invalid and unprovable – for specific reasons which will be explained.

First: Overview + Insight

One way to resolve an apparently insoluble problem within any system is to bring to the **whole** situation an awareness of its inherent **polarity**. This involves gaining:

(1) an **overview** in order to see the system as a whole within its greater context, as well as how it has evolved into its present state, and

(2) some **insight** to penetrate to the effective centre, heart or core of the situation.

Combining these two views enables us to detect the primary dynamics of the system and thus its essential *meaning*, what it's *meant* to be and do.

In this particular work, the fundamental human questions regarding who or what we are – in the *individual* and *universal* sense, and what we're doing here, are not directly addressed. They are, however, implicitly acknowledged as essentials of the bigger psychological context in which mathematics and all other disciplines exist.

An unwholistic alliance: mathematics and science

Mathematics seems to be widely understood as the quest to discover ever clearer, more accurate and consistent patterns within this fragmented universe, to find order within apparent randomness. In this work, however, the concept of *randomness* is seen as a convenient label, to cover up our inability to handle complexity beyond certain levels in the working out of a few fundamental cosmic principles.

As a code or language, mathematics consists of various ways of ordering and quantifying information about the reality it serves to describe. It is, essentially, a *mental* discipline which means it has the potential for endless *abstraction*. As such, mathematics works with abstract *ideals*, ideas abstracted from physical reality. For example, 3 apples are 'equal' to 3 kangaroos or 3 years only in the abstract sense of their common *three-ness*.

Physical-material Science, meanwhile, studies the messy physical-material world which is subject to a continuously changing configuration of cosmic influences. So in attempting to repeat accurately experimental situations for comparison, physical scientists can at best only ever achieve approximations. Given this limitation, it employs mathematics which creates an impression of precision, consistency and authenticity. And mathematics, as we'll soon see, uses a number system which mimics the material realm of identically

manufactured objects such as coins or bricks. Thus we see an unwholistic alliance of mutual compensation for inherent weaknesses.

Among the better known special features of this mathematical order would be its so called 'irrational' numbers, values such as those represented by the symbols *pi* (as 3.141...) and *phi* (The Golden Ratio), and sequences of numbers such as the *Fibonacci series* and the *prime numbers*. These are labelled *irrational* because they don't fit into its own limited *rationale*.

Among its most fundamental unresolved questions would be: 'What is actually meant by the symbols for *zero*, *one*, and the so-called *negative*, *irrational* and *imaginary numbers*? These questions inevitably lead to fundamental *polarity* issues such as: Which is primary: Consciousness or matter? Subjective or objective? Quality or quantity?

The *threshold* approach, effectively, views current mathematics from a 'higher' dimension. It embraces the continuity, movement and polarity within the reality behind the frozen fragmentation, and enables us to see pattern and coherence not apparent from the lower dimensional view. It's an extension of the principle by which some problems, insoluble in a flat two dimensional format, can be solved when set in a three dimensional context.

In context

In the tradition of Einstein's mind experiments, there follows next a *scenario*, a model serving as a context in which we can view mathematics as a system, a language, a code. The validity of this view will show in how well it helps us resolve known problems and understand ongoing observations. For present purposes the model is much simplified. It's also based on a couple of significant explicit assumptions.

2. Scenario: the *Becoming*

Assumption 1: At the Threshold

In order to gain the power of *overview* and *insight*, we have to mentally put ourselves at the critical *threshold* where the fundamental polaric forces of the cosmos, *contraction* and *expansion* or *gravity* and *levity*, are in a state of dynamic balance. That is, at the border, the interface, of the gross *physical* realm and the subtle, pre-physical, *aethereal* realm.

This *Aether* has nothing to do with the 19th century, materialistic, so called *luminiferous ether*, the existence of which was supposedly but falsely disproved by the Michelson-Morley experiments. More recently, the speculative notions of *dark energy*, a *zero point field*, *morphogenetic fields*, the *quantum vacuum* and physicist Professor Paul Davies' *quantum ether* all seem to be pointing to the need to re-acknowledge the ever-present, all-pervading *Aether*.

This quotation is from the 2006 book ***Aether - The Transcript*** ISBN 1-900034-10-7 and the original audio CD-ROM ***Aether - Knowledge is Power***. They include reasons why the *Aether* was written out of the script of Western science but has never actually gone away. Meanwhile, in the view of UK professor of mathematics, Martin Huxley, most mathematicians are Platonists, and in Plato's time – before the era of materialistic science – the *Aether* was very much a living reality.

Our *threshold* is not a specific location in space, but has the lively, turbulent, transforming characteristics of what some scientists call the *zero point field*. It's a kind of level, like the

critical temperature level at which water is transformed into vapour or ice and back. Its essential *polarity* is acknowledged, albeit rather awkwardly and in a negative way, by Western science in, for example, its paired concepts of *matter* and *anti-matter* or *gravity* and *anti-gravity*. The threshold is the balancing level at which they cancel out each other.

Perhaps the most powerful benefit to be gained from awareness of this threshold is a simultaneous *two-way perspective* on the world. I can look *outwards* from my unique, physically located, individual point of consciousness, my attention *radiating* outwards in any direction.

However, I also find that my consciousness can expand indefinitely so that I'm potentially able to look *inwards* from all directions at once, as if from a universal plane giving me a kind of reverse panoramic view. Then I can choose to zoom in and *focus* on any particular part of the world - a practical exercise in uniting the *absolute* and the *relative*.

A very simplified version of this capacity is perhaps the *Google Earth* program.

This fundamental inward/outward *polarity* is the kind with which we are primarily concerned in this work.

The *inward* seeing enables the expanded, 'greater I' to view the contracted, 'little I' in as wide a context as seems appropriate. We could liken this to viewing a whirlwind from the *stillness* found both high above it and at its centre, the eye of the storm - both qualitatively different from the turbulence in between. We can also look at mathematics this way.

So our *threshold* also represents a level of consciousness which transcends the limitations of the physical-material mentality, and extends beyond the intellectual, calculating, computing operations associated with the physical brain.

'*Less is more*' is an enigmatic yet common expression which carries the implicit notion of polarity. Less of the gross, physical-material means *more* of the subtle, mysterious 'something else' of the opposite quality and vice versa,

Assumption 2: Own presence included

We acknowledge our own conscious presence as an essential part of the wholeness of any situation in which we are involved. It therefore consists of (a) the observer, (b) the act of observing and (c) that which is observed. To ignore any of these three essential elements from our investigations would leave an incomplete, false picture, as is the case with the so-called 'objectivity' of Western science which persists with this unrealistic ideal, despite the contrary findings of Quantum physics. We can, however, transcend the dilemma by explicitly acknowledging the presence and unavoidable participation of the subject, ie the observer, who then has an objective and effective presence in the situation.

Scenario

Now to our *scenario*. Let's first assume an unlimited *physical void* consisting only of *universal consciousness*. To make this assumption is not to adopt any kind of religious standpoint. It's a strictly scientific view based on the consistent observation that without some ongoing overall consciousness, there would be no shared individual objective awareness of all the phenomena we treat as the subject matter of, say, science.

This 'parts-of-the-wholeness' relationship is somewhat like that of the individual lungfuls of air in relation the whole, shared atmosphere of the Earth. And it was an eminent 20th century physicist, Eugene Wigner, who asserted that '*...the content of consciousness is an ultimate reality.*'

Next, there is a *pre-physical* stage, prior to manifestation, of the universal consciousness, an intermediate level of *potential* existence. It's the continuously changing, indefinable, vital state of being, long known in the Western world as the **Aether**. This comprises a range of levels within its unity. Einstein explicitly asserted that space without the Aether is inconceivable, although he did not include it in his theory of Relativity. It was also integral to Newton's thinking, and appears throughout the history of science under variety of guises and names.

Within this ethereal medium or matrix is brought into being a specific *point* of focused consciousness, a *singularity*. The focal point automatically constitutes a *centre* around which there inevitably and simultaneously comes into being a pre-physical, pulsating *sphere*. The dynamic relationship between the periphery and the centre point indicates an overall tendency towards re-establishing an equilibrium state. And this dynamic, this pre-physical potential, is in essence what is known as **energy**,

This sphere then constitutes a kind of pre-physical *resonant cavity* (RC) in which is generated rhythmic pulsating waves of *contracting* and *expanding* movement. And herein lies a significant clue to resolving the *wave-or-particle* dilemma of modern physics.

Meanwhile, as the pulsating proceeds back and forth, *standing waves* (SWs) are propagated which themselves constitute progressively smaller sub-spheres within the original. The result is increasing *density* towards the centre point and *rarity* towards the periphery. The smaller the spherical resonant cavity, the faster the tempo of the rhythm of resonance within it, ie the higher its tone.

Rhythm or frequency?

A distinction is drawn in this work between the *tempo* of a *rhythm* and *frequency*. The *tempo* of the *rhythm* in a system implies continuous, subtle variation in the timing of movements due to the ever changing circumstances, cosmic and natural, inner and outer. *Frequency*, although more convenient for comparing and calculating, implies a fixed, regular, mechanised sequence of exactly equal periods. This means it's an idealised, abstract, average value. In this project we'll work with the more realistic tempo and rhythm.

The increasing density around the centre creates *interference* effects which impede the inward/outward wave movement. Eventually a critical level of obstruction or stasis is reached at which physical *matter* begins to form – first gaseous, then liquid, then solid. The process can be thought of as a kind of weaving between the active, vertical waves of 'weft' energy and the inert, horizontal, 'warp' resistance of the standing waves. This dynamic process happens at the critical *threshold* between the two distinct realms within the greater oneness.

Matter, then, is energy amassed into an endless variety of forms which are themselves in a continuous process of disintegration, being released and redeemed back into the ocean of cosmic potential energy, the *Aether*. An earthly parallel would be the 'water cycle' between airborne vapour and surface liquid.

Rarity/density

The *rarity/density* continuum is one of the 2D *pre-physical* realms which include *expansion/contraction* and *levity/gravity*. It functions prior to and beyond the limits of 3D physical space. So there is no paradox in finding at a centre point of a sphere - where density approaches its maximum and the fragments are the smallest – an *inner threshold*, polar opposite to the *outer threshold*. This is an *inner* portal into the *rarity* of the Aether. Perhaps there's a clue here to the nature of the rather physicalised 'black holes' concept.

Taking a much longer view, we can see our original sphere as one of countless interacting spheres, all spinning and spiralling through a yet greater cosmos. The resultant distorting effects of their combined influence give rise to the endless variety of physical forms and shapes of the physical-material world. Thus we have many partial forms or *parts* of that one *wholeness*, ie *quantity* and *diversity* within the primal *quality* of *unity*.

In suspended animation

We can also see our essential individual human selves as points within that universal consciousness, temporarily embedded/embodied in earthly matter formed around such centres. These are held in suspension at the critical border level, the *threshold*, between the two cosmic polar forces – like bubbles floating between *levity*-raised air and *gravity*-bound water.

The more deeply such a point of consciousness has become embedded in solid, earthly matter, as energy locked in gravity-bound inertia, the more it tends to interpret the world around it in terms of bits and pieces of matter, particles etc. Thus the present tendency to *quantify*, ie to classify, count and calculate, as a preferred way of attempting to gain some control over our earthly circumstances.

Our *scenario* does encompass the vast process of *cosmic and natural evolution* but, given the specific focus of this particular work, does not deal with it here.

The descent into matter

This scenario is a much simplified account of how consciousness, both universal and individual, makes what is sometimes called the '*descent into matter*' - as gravity prevails, movement becomes crystallised, unity is fragmented and flow becomes inert, frozen, solid form.

Our model or scenario, then, does not resemble a mechanical structure of assembled, standardised bits. It can perhaps be seen more like those *stereogram* images which, at first, look like an amorphous mass of small details to which we need to adjust our gaze. Then, if we 'get it', there begins to emerge before our eyes a recognisable form... and suddenly it's there, visible as a 3D image where it was not visible before, although nothing about it has physically changed.

Test it for yourself

Since the *threshold* worldview involves some ideas that run counter to current orthodox thinking, it's suggested here that the best way to test it out is to apply it oneself - over say 6 to 12 months. It's all too easy to instantly dismiss ideas that don't conveniently fit our existing mindset and require some time to evaluate. The *threshold* perspective took some years to evolve into a coherent, comprehensive worldview.

So, taking the *threshold* approach, we don't start with numbers and symbols, which are the end products of evolving processes and mental activities. We start with the dynamic, fluid, moving energy processes of the cosmos which *generate* the world of material forms.

3. EMU numbers / *Threshold numbers*

Equal Measure Unit (EMU) Numbers

Normal systems of numbers are based on the assumption that in all circumstances within a system, one specific *unit* represented by a number symbol is exactly equal in value to any other such *unit*, ie they are rigidly standardised. We'll refer to these numbers as *equal measure unit (EMU) numbers* .

Since humans have been able to reproduce standardised objects, such as bricks or coins, there seems to have been a strong temptation to look at the world around us as though it were similarly made up of some kind of minute, identical building blocks.

So we need to be constantly aware that this view does not coincide with the continuity, the fluid, ever changing, cosmic and naturally pulsating reality of expansion/contraction, rarity/density, levity/gravity. Neither does it coincide with how our minds and feelings function. There is a fundamental incompatibility here, for the cosmos is not an assembly of cubic measures, 'light years' or any other such units.

We can wrap a mesh of squares around any object or space to enable us to measure and calculate its shape in terms of squares and cubes, but what we obtain is only a 'map', a model or diagram of the actual reality.

So the EMU number system, like the binary digital bit system, is essentially an ingenious artifice for simulating and modelling reality. It is ultimately a *trick*, a deceptive device, which requires our *suspended disbelief* in order for its practical potential to be applied. As such, it can be likened to the trick of cinema, where we willingly 'see' a series of still images as movement and life. The Greek word *kinema* means motion.

It is perhaps the fundamental defining characteristic of current mathematics, even if not acknowledged as such. It's the illusion, the shift in perception between the physical and the psychological that makes much of mathematics actually work. It is, therefore, simultaneously both its strength and its fault-line weakness.

It has, nonetheless, proved a very useful mental device when applied within the physical-material realm and within the range of scales to which humans can readily relate. However, the incompatibility becomes increasingly problematical towards the extremes of the human scale of comprehension, in both time and space. Here a growing sense of meaninglessness is experienced in trying to come to terms with extremely large and extremely small numbers. And pointing beyond the extremes of space and time we have our vanishing limits, conveniently signposted as *infinity* and *eternity*.

All numbers are bi-polar

Because the aethereal realm is of a qualitatively different order from the physical-material basis of an EMU system, any alternative system would have to incorporate such qualities as the inclusive wholeness, continuity and fluidity of natural growth and transformation... for a start. Each number, and especially zero, one and the primes, consequently can be understood as being bi-polar in having two aspects:

- (a) Their *qualities* of *one-ness*, *two-ness* etc , in the bigger context of a continuous, subjective, all-inclusive reality,
- (b) Within the EMU number system, their strictly *quantitative*, objective, exclusive, 'discrete bit' characteristics.

Generating primes

It follows that the expression 'generating prime numbers' has two different meanings.

(a) It refers to an ongoing cosmic generative/formative process in which those values known as prime numbers are significant markers of proportion and resonance, as we'll see later.

(b) It means mathematically calculating them from other numbers.

So establishing the 'generating/formative principle' of the primes has to come first.

One implies two, two implies three, three implies four...

Included within the fullness of universal consciousness, *one*-ness bears the potential of *two*-ness, and *two*-ness implies *three*-ness. The third intermediary factor is then potentially 'polarised' between the two original poles until it becomes divided itself into two, which produces an overall *four*-ness.

An example in the evolution of the planet Earth would be the division of the previously single, third, intermediary, vaporous elemental substance into air (gas) and water (liquid). This *odd-even-odd...* process of subdivision is potentially infinite.

The grid filter

Out of the rigid, precise EMU standardisation emerged what we might call a *grid* mentality. It serves as a kind of filter through which we look out at the physical world and assess it in terms of EMU cubes, squares, lengths, weights etc. And we are led to believe that all forms are assemblies of 'building block' micro-particles, separate *bits* called molecules, atoms and so on.

This view is exemplified in digital computer graphics using '*bitmap*' images, composed of mosaic-like squares, whether illustrating curves or straight lines. And the iterative ever smaller, worlds-within-worlds images are known as fractals, generated by a mathematical formula.

The EMU system is so convenient for measuring, counting, calculating and constructing - ie controlling the physical world - that it can easily become a delusion, a false idea of how Nature and the cosmos actually are and function. This conception tends to treat the end product of the process as if it were the beginning. For example, natural curves are seen as composed of points rather than as the trail, the consequence of a curved movement.

This kind of mindset seems to arise in those cultures which prioritise *measuring* and *quantifying* - as if *quantities* are somehow more real than the *qualities* which we actually experience first, ie as primary. The *grid* can then become a trap, a prison, imposing rigid restrictions on imagination, inspiration and intuition. It can also insulate us from the less precise, less easily controllable, fluid, fiery realm of our instincts, intuition and feelings. In humankind's attempts to dominate and control our world, the grid way of thinking has proved very useful. But it ignores the wider and longer term harmful consequences of such an exclusively *quantifying* attitude on our *quality* of life.

Zero-ness and One-ness

The meaning of *zero*-ness and *one*-ness go right to the heart of all questions about quantity and, therefore, mathematics. The way orthodox mathematics uses the symbols for **zero** and **one** is symptomatic of the materialistic culture in which it has evolved.

For example, the materialistic version of *zero* signifies an empty space, representing an absence of any specific items, while *one* normally signifies a single unit of something, as opposed to no such units or more than one.

Such usage demonstrates *binary* thinking which, in its exclusive *yes-or-no, on-or-off* terms, fails to acknowledge that there is always a greater wholeness which includes all pairs of polar opposites. Binary thinking, it's suggested here, is the fundamental flaw at the root of the instability inherent in digital technology, with its sandcastle simulations always liable to disintegrate and fail.

Zero: the living void and the infinitesimal

Regarding **zero**, the *threshold* view reveals a clear *polarity*, inextricably linked with the paired notions of *infinity* and the *infinitesimal*. We can conceive of an *outward* infinity of ever expanding proportions disappearing into the beyond. Then there's its polar opposite, an *inward* infinity, a *vanishing point* of unimaginable smallness, also known to some as the *infinitesimal*. From our threshold we can sense these vanishing planes or points as *portals* between the aethereal and physical realms, on the inward and outward journeys.

The *infinitesimal* seems to imply the idea of both the *wormholes* of the physicists and the rabbit hole through which *Alice* entered her *Wonderland* (in a story written by a mathematics lecturer). It also seem related to the ancient Greek concept of the indivisible *atom* and to the *quantum* idea of the smallest quantifiable amount of energy. And these offer a key to understanding the 'less is more' principle of *homeopathy* which works on the subtle, pre-physical, aethereal level which then affects the gross physical body.

The infinitesimals of Newton and Leibnitz

In the 17th century there was a historic dispute on this theme between Newton and Leibnitz which we can now see as a *polarity* issue. They were both reaching for the *transcendent* level beyond the physical, but from polar opposite directions. Leibnitz, through the *infinitesimal*, emphasised *consciousness* which he expressed in the subjective terms of our irreducible *self* or *monad*. Newton raised the level of thinking from concepts set in physical *space* to the more aethereal dimension of *time*, with his *moments* as units abstracted from a context of continuous *motion* and *flux*.

Had there not been such personal animosity and national rivalry colouring all this, some greater inclusive wisdom might have emerged from a fusion of their insights.

Zero, then, from the *threshold*, represents what we experience and recognise as a transitional moment or event. Viewed from the physical side, it's inherently paradoxical - the something somewhere between the EMU building blocks or between the boxes in a grid. Yet it commands its own space in conventional number work as if it were just another number.

We can, therefore, consider the symbol for **zero** as representing either:

(a) the limitless void, full of the potential of universal consciousness in which no separate, discrete objects exist, or

(b) an empty gap-filler, a vacant space in our decimal-based, EMU number system to denote that there are no units, tens or hundreds etc in their allotted places. The zero point in the number line raises further anomalies which we'll discuss later.

Thus we have both the *pre-zero* void and the abstract *nominal zero* of the number system.

One: unity or unit

The number **one**, can be treated either as representing a *unity*, a wholeness, a wholon, inclusive of any number of parts OR as a single, separate *unit* of something, an exclusive

part of a greater wholon. This is the fundamental polarity of *whole* and *part* which are always *relative* terms. *One* can thus be considered the biggest and smallest number.

In the manifest world there is always a bigger, inclusive whole/wholon/oneness containing smaller parts. By contrast, in the aethereal realm, for example, the 'smaller' *point* can be seen as potentially containing or including all the 'larger' lines (and planes) that converge on it – like a town as the meeting point of a number of roads and railway lines.

A *wholeness* or *wholon*, in this work, is always taken to be a something with its own identity which is not merely the sum of its parts. Yet it is also a relative phenomenon, temporary, transient and in continuous interchange with the greater wholeness of which it is but a part. Simple examples could be a piece of ice floating in water or a vortex formed in moving water.

The Number Line

From our *threshold* position, the soundness of the traditional 'real' *Number Line* with a zero at its midway point begins to look questionable. For here the space occupied by zero seems to represent some kind of defined gap between -1 and +1, between the negative and positive dimensions. By contrast, the year 1BC ran directly into year 1AD, with no 'year zero' in between - only a critical, *infinitesimal* moment of transition.

Western science does not yet openly acknowledge the universal presence of the all-pervading Aether. So *zero*, implying a distinct empty space situated between the negative numbers and the positive numbers remains an artifice, an anomaly. This idea of zero is somewhat similar to the idea/ideal in science of a so-called *perfect vacuum*, something which doesn't physically exist in Nature and is therefore a meaningless term, except as an abstract idea.

Such anomalies will inevitably arise in a frozen abstraction like the number line - that is, an abstraction from a dynamic, ever changing reality in which two polar opposite forces are continuously and rhythmically interacting. Perhaps an updated version of the *infinitesimal* would be useful here.

Meanwhile, the central balancing point of a revised number line can be conceived as a portal through to the great void of aethereal fullness also implied by zero. The inherent *ambivalence* or polarity of zero would then be acknowledged. The notion of this balancing and cancelling out is pertinent to our solution of the Riemann Hypothesis enigma.

Negative Numbers plus derivatives

The word 'negate' means to deny the existence of something. *Negative* numbers express the *idea* of something not manifest or present in a *quantifiable* form, as opposed to the *actual* manifest presence of whatever it may be. That leaves a negative number as a *potential* or virtual something. A *debt*, for example, is the idea of a potential payment of a certain quantity of something. A seed holds, in non-physical space and form, the potential physical organism it's destined to become, given the right conditions.

This realm of an unmanifest, ie non-physical existence is the very nature of the *Aether*. Mathematical formulations derived from a *negative* value can therefore be understood as signifying the subtle, potential, aethereal realm - the polar opposite of the positive numbers which signify the gross, actual physical realm.

The symbol *i*, Imaginary Numbers

i officially represents the *square root of minus one*. However, we can now re-interpret it in the context of the universal cosmic *polarity*. Mathematically, -1 is the product of combining, of multiplying together, -1 and +1. As such, it's not really a 'square root' at all, but an ambivalent value, alternating between -1 and +1 and bestriding zero, So the apparently anomalous nature of imaginary numbers would seem to be the result of the materialistic EMU number system's inadequacy for dealing in a wholistic, inclusive way with the relationships of *negative* and *positive* numbers and with zero and one.

Being the product of -1 and +1 places *i* right at the interface, the border, the *threshold* between the numerically *negative* aethereal and *positive* physical realms. And significantly, given the rhythmic pulsating of the cosmic polar forces, *i* is much used in engineering formulations concerning *rhythm*.

From our *threshold* view, *i* symbolises that continuously rhythmic and ambivalent state of the cosmos, with the two polar opposite forces represented by the positive and negative numbers. Physics acknowledges this in the idea of matter as vibrating energy patterns and anti-matter as its polar opposite.

Complex numbers are peculiar combinations of *real* and *imaginary* numbers, quantities of ambivalence, and part of the bizarre *Alice through the Looking Glass* world referred to by Professor du Sautoy. We'll consider these when dealing with the Riemann Hypothesis.

The symbol *e* (representing *constancy* in contraction/expansion)

While the original cosmic resonant cavity retains its spherical form, as it rhythmically pulsates, its pattern of contraction and expansion remains constant. Mathematicians have identified that continuous quality of constancy, and then fragmented, quantified and reduced it down to a so-called 'irrational' number 2.718... symbolised as the letter *e*.

Fractions (from the same root word as *fragment*) express the *idea* of *oneness* divided into EMU *parts*, which then stand as separate symbolic units within that oneness.

Cardinals / Ordinals and Ambivalence about counting

Along with the significant difference between *odd* and *even* and *positive* and *negative* numbers, two basic kinds of numbers are *cardinals* and *ordinals*.

Cardinals represent *many-ness*, how many there are of whatever is being referred to: 1, 2, 3 etc. They imply a fixed, static, finite, condition, a state akin to the physical, spatial, material world of separate, exclusive entities.

Ordinals represent a kind of marking out of *before-ness* and *after-ness* in a *sequence*: 1st, 2nd, 3rd etc. They indicate a progressing, changing, non-finite process, more akin to the unmanifest, living realm, implying a continuous, inclusive flow of changing conditions or stages, both temporal and spatial.

The clear distinction of meaning between them has become con-fused in everyday usage, with cardinals being substituted for ordinals, which indicates the current dominance of the *materialistic* mentality. For example:

9/11 refers to the 9th month and 11th day - whereas 24/7 refers to 24 hours, 7 days.

Chapter One means the 1st chapter, and *Version 2* the 2nd version and so on...

An underlying lack of clarity about numbers and counting was highlighted in the dispute as to whether the recent millennium should have been celebrated a year later than it was.

The question here is whether to count from the start or from the completion of a period. Meanwhile, the *primes*, as we'll see later, seem to serve as both *ordinals* and *cardinals*.

The Focus/radius Line

Back with our original sphere, if we now envisage an imaginary straight line drawn radiating out from the centre point to any point on the peripheral plane, such a line would be what's known as the *radius* of the sphere. Conversely, looking inwards from the periphery towards the centre point, in the polar opposite direction, this line could also appropriately be called a *focus*, since it leads to the focal centre-point.

Pi : from sphere to cube, from circle to square – across the threshold

We can now see that there will always be a direct and constant relationship between the length of the *focus/radius line* and other dimensions of the sphere it spans, as measured in EMUs of length, area and volume. Translated into numbers, that constancy is expressed through applying in various formulae the familiar, unresolvable numerical value represented by the symbol *pi*, approximated to 22/7, or 3.141....

A *Threshold* definition: **Pi serves as the translator, converter or scaling factor between the 3D realm of the pre-physical *sphere* and that of the physical-material *cube*, and also between their flat 2D derivatives, the *circle* and the *square*.**

EMU calculations involving *pi* will always be approximations because of the fundamental *qualitative* difference between the rarefied, spiralling curves of the pre-physical *aethereal* realm and the dense, crystallised forms of the *physical-material* realm. A hurricane can be 'frozen' in a picture and reduced down to a pattern of quantifiable lengths, squares, cubes, velocities etc. But without its continuously changing *context* of converging atmospheric forces, we gain little understanding of the dynamics behind the phenomenon.

Phi : the Golden Ratio

Symbolized by the Greek letter *phi*, the *Golden Ratio* (or *Golden Mean*), represents a value which, it is suggested here, expresses **a constant relationship of proportion between unmanifest potential forms in the *aethereal* dimension and manifest forms in the *physical* dimension**. The *golden mean* is sometimes defined as 'the middle course between two extremes'.

The numerical symmetry of the ratios of 0.618... :1 and of 1:1.618... would seem to indicate a polaric balancing or *threshold* in this 2-way cosmic polar relationship of *transformation*. It may, however, vary at different levels of the rarity/density continuum in the cosmos, away from or towards Earth's centre.

Through the ages, humans have aesthetically appreciated this relationship of *proportion* between the two realms – as is widely evidenced in many structures, sacred and secular, in architecture, art and design, especially for example in ancient Greece. This would seem to be because forms which are proportioned according to these ratios resonate harmoniously with the proportions inherent in our our own human structure.

The Fibonacci Series

The *Fibonacci Series* is **a variation of the *Golden Mean* principle**, it is suggested here. However, it only applies to the physical-material level of existence, after matter has come into manifest being in the world of natural organic forms. As such it applies only in one direction, from central-physical density towards peripheral-aethereal rarity; ie in *growth*.

This could be the growth of an individual organism, as witnessed in various proportions of the physical body, or in the numbers of a breeding species.

The Golden Ratio and the Fibonacci series can each be expressed mathematically as a flat 2D *spiral* which generates rectangles. The differences between the two in this generating function diminishes the further out from the centre the spiral progresses. This reinforces our earlier description of the increasing density of ever more closely 'packed' sub-spheres/resonant cavities towards the centre.

Also we see, *linked*, a fundamental contrast between the continuous, curved movement and change implied in the *spiral* and the frozen-moment snapshot, dead and straight, but precisely quantifiable, *rectangles*. So here we have a demonstrable connection between the aethereal and the physical in the continuity of a spiral, a critical line, generating a series of separate quantifiable forms.

Threshold numbers, then, are those values – including *pi*, *phi* and *i* - which enable transition and transformation across the *threshold* we have been considering.

The Zeta Function

The *zeta function* is a mathematical device first applied to the primes by the great mathematician, Euler. It was later elaborated by Riemann. The simpler version produces an *infinite* series of decreasing *reciprocals* from 1, 1/2, 1/3, 1/4... when x , denoting the *exponent* or 'power' of the denominator, equals 1.

Significantly, it coincides with the musical *Harmonic Series*, first established by Pythagorus, and as such is relevant to our *inward* progression of diminishing resonant cavities. It also shows the primes to be an *infinite series*. From the *threshold* perspective, the zeta function symbolises the pattern of a real and fundamental process. It concerns the series of proportional *harmonic resonances* set up in the formation of the cosmos.

Euler also discovered in the primes an unexpected convergence of *addition* and *multiplication*. Both functions were found to be working simultaneously, implying that they have a *dual* nature. Seen from our *threshold*, multiplication, as in *geometric* progressions, is more about the *quality of proportion*, while addition, as in *arithmetic* progressions, is strictly about EMU quantities of units.

This would suggest that **the prime numbers represent values where the aethereal and physical realms coincide.**

4. The Prime Numbers Enigma

The primes: one basic question

Given their unique numerical properties, what does the apparently irrational sequence of the primes signify?

Four other longstanding questions about the primes

1. Is there a mathematically sound formula for predicting the next prime number?
2. How many primes are there up to any point in the normal Number Line?
3. Can *Riemann's Hypothesis* (1859) be mathematically proved or disproved and so shed light on the mystery of the primes?
4. Can *Goldbach's Conjecture* (1742) be proved true - which it evidently seems to be?

Two-faced primes

Our *threshold* view reveals that the primes have their own inherent *polarity*. They have two aspects, so to speak, as *Euler's Product* also indicates regarding multiplication and addition. A physical analogy would be a valve or duct connecting two distinct spaces and thereby simultaneously being an aspect of both.

1. In the pre-physical order and formative process, the primes serve as *ordinals*, simply 1st, 2nd etc resonant cavities, carrying no EMU number values, while...
2. Within the EMU 'real' number line, they stand as *cardinals* each with its distinct value. These two aspects of the primes are qualitatively different. So their connection cannot be established by quantitative calculation, only by inference from another perspective.

The cosmic fretboard

Let's return to our imaginary focus/radius line between the periphery and the centre of the cosmic sphere, our original resonant cavity (RC1). Moving inwards, the ever closer together standing waves (SWs) intersect our line at ever shorter intervals. The intersections are marked out by the periphery of each smaller, concentric sub-sphere contained within it, each resonating at a correspondingly faster rhythm or higher pitch.

Harmonics

Now let's imagine our line to be a string stretched along the neck of an imaginary musical stringed instrument whose hollow body represents the original RC1. A series of frets along the neck mark out the proportionate distances along the vibrating string for producing particular notes within a harmonic order. This is done by pressing and thereby shortening the string.

A harmonic order means a series of notes in harmonious resonance with the one fundamental tone of the original RC. And we note that physical *sound* is objective and *quantifiable* whereas *tone* is a subjective, aetheric *quality*.

Significantly, only at certain frets can we produce what are known as 'harmonics'. They are the more subtle, lighter sounding notes produced by plucking the string while lightly and momentarily touching it over one of the appropriate frets, so that the whole string itself vibrates in harmony with its simultaneously shortened length. That is, instead of just the shortened length vibrating as a result of the string being pressed down hard at that fret. These special fret positions would seem to parallel where our focus/radius line is intersected by the RCs, which themselves only resonate with the original RC1.

At all other possible positions – or by implication, at all other possible sizes of RC - the result would be a clashing or subsuming and a consequent cancelling out of resonance. Which leaves only the prime/harmonic positions. This direct relationship between the resonance of particular shorter lengths and the whole length of the string parallels the way that prime numbers are only divisible by, ie only resonate with, oneness. Parallel techniques of producing harmonics apply to other types of musical instruments.

The even tempered scale: an EMU imposition

Regarding harmonic systems, the Western 12 note, *even tempered scale* is an artificial, distorting, EMU, 'building block' modification. It has proved very convenient, useful and creatively empowering in many ways – in particular for what we might call the architecture of music. However, it has also inhibited the potential for some subtly expressive music, not possible when restricted by such a 'grid' system.

Inwards/outwards re *Fibonacci* and the *Golden Ratio*

The fundamental rhythmic alternating between periphery and centre produces two separate and differing sequences of standing waves and their resulting resonant cavities. These are the *inward* and the *outward* sequences.

The increasing density towards the centre would seem to account for the discrepancies between (a) the varying ratios of the *Fibonacci* series at its lower number values closer to the centre, and (b) the constant value of the ideal *Golden Ratio*. Significantly, they begin to coincide closely after about a dozen steps of the *Fibonacci* series.

So we now have two sequences going in polar opposite directions. What is the nature of these two progressions and what might they have in common?

And the primes?

To recapitulate, the continuity of the formative process can be summarised as follows.

-1: From the unlimited void/fullness of **negative Universal Consciousness**, beyond

0: the **zero** (*non-dimensional*) threshold, emerges

1: the **oneness** of a pre-physical *sphere of potential manifestation*, formed around a focal point (*one-dimensional*), the periphery and centre creating

2: the dynamic **two-dimensional two-ness** of the primal forces (contraction/expansion) out of which arises a pulsating matrix/medium of raw, potential *energy*, within which

3: **three-ness** is made up by the *threshold* between the two forces.

1-ness, 2-ness and 3-ness are thus fundamental principles and qualities of the pre-physical cosmic order, prior to its emergence and manifestation into physical-material form. And this process of *manifestation* is one half of the two part cyclic process which includes the polar opposite, complementary progression of *redemption* back to the original state of oneness. So one whole cycle consists of **six** phases or stages, comprising three pairs of polar opposites, three inward, three outward.

The universal principle of *polarity* also finds mathematical expression in, for example, the reciprocity of division and multiplication. To *divide* up the wholeness, the unity, of a pudding is to *multiply* the number of portions, ie units of, it by the same amount. Also, when considering the pre-physical realm, it's necessary to bear in mind that we are not dealing with discrete, separated items, but an ever changing continuity of different qualities, forces, tendencies etc – as those delving into the so called 'quantum' world have found.

So we can think of the formative process as *oneness* producing *two-ness* producing *three-ness* (division/multiplication) or as a simultaneous state of oneness plus two-ness plus three-ness (addition). Whether we multiply together or add together 1, 2 and 3, the answer comes to 6, product or sum. This property is unique to **6**, known in mathematics as a 'perfect number'.

Six-ness and the primes

So what is the significance of *six-ness* beyond the merely symbolic arithmetical statement $(1+2+3) = (1 \times 2 \times 3)$? From the *Threshold* view, it can be seen as evidence of a corresponding pattern in the greater universal *reality*, the ongoing, dynamic, formative process of the cosmos.

Here we find **one** cyclic process with a **two**-way rhythm of **three** distinct phases or stages. This process works out not as a closed circle, but in the open-ended, spiralling cyclic way of the *vortex* or *helix*.

From the meta-mathematical, *threshold* perspective of a cosmos in continuous change, *six-ness* can be understood as a unique quality of the cosmic transformative process. It represents one 'cycle' of a vortex traced out in the progressive formation of RC spheres.

Two arithmetic progressions contain all the primes

The polar opposite inward/outward directions in the *manifestation* and *redemption* of the physical cosmos can be expressed numerically as two *arithmetic progressions*. One starts from -1 and the other from +1, with the constant increment, also known as the *common difference*, being **6**. ($T_n = 6n \pm 1$)

As these progressions are extended, each new RC/value that resonates with an existing one is subsumed by that prior RC/value, disintegrates and is eliminated. So it has no separate identity or sound of its own. Eg 25 resonates with 5, 35 resonates with 5 and 7. Thus each new number generated that is a multiple of an already included number is automatically cancelled out, eliminated. That leaves only those numbers/RCs which resonate with the original oneness. **These are the prime numbers - no more, no less.**

To summarise, the pattern in the occurrence of the primes, within the EMU number system, is as follows. There are two sequences of numbers, representing the two polar opposite directions described earlier. One of these starts with -1, representing *potential* one-ness, and the other starts with +1, representing the original resonant cavity/cosmos. Each is an *arithmetic progression* with **6** as the constant increment.

Excluding 2 and 3 (the two factors of 6, other than 1), we have two sequences:

-1, 5, 11, 17, 23, 29, **35**, 41...

1, 7, 13, 19, **25**, 31, 37, 43...

When, after the exclusions, we artificially merge the two sequences into one, we have the familiar, apparently irrational, sequence of prime numbers.

The 'twin' primes

From the parallel layout of the two progressions, the occurrence of the previously 'mysterious' so called 'twin' primes becomes self-explanatory.

An obscured *double helix*

The process described earlier in the *Scenario* and the two progressions of numbers containing the primes can be represented graphically as a *double helix*, something very familiar to biologists studying the basic chemical structure of living phenomena, DNA. The helix is an idealised, abstract form, a pattern tracing a regular rhythmic orbiting movement around and along an axis. If that pattern is abstracted into a frozen series of EMU numbers - representing the constant pitch, radius etc, it can be expressed as an *arithmetic progression*. Meanwhile, the *double helix* indicates a *bi-polar* pattern.

Predicting the next prime eventually becomes merely a matter of deciding at which point it's no longer viable, technically and economically, to keep eliminating the ever increasing number of non-primes or composites, ie multiples of already included numbers.

The primes and the quantum (aethereal) realm

The prime numbers sequence has also been found to have correspondences with the so called *quantum* realm. The connection was famously made first in a historic meeting between mathematician, Hugh Montgomery, and physicist, Dyson Freeman. This is not so surprising when it's realised, from the *threshold* perspective, that the so called quantum world, with its various unfamiliar, non-physical and supposedly 'counter-intuitive' characteristics, is essentially an aspect of the pre-physical Aether.

Summary: re the significance of the primes

(A) Polarity-within-wholeness is the governing principle

Consciousness/matter, rarity/density, aethereal/physical, levity/gravity, outward/inward, contraction/expansion, focus/radius, negative/positive...

(B) The formative process

Pulsation between periphery and centre of the original cosmic sphere and resonant cavity, RC1, creates standing waves which form, within that original *one* sphere, a series of concentric sub-spheres, RCs which are in resonance only with RC1.

The RCs - in order of decreasing magnitude and faster rhythmic resonance - correspond to the musical *Harmonic Series* (HS).

The HS is known to coincide with the mathematical *Zeta Function* (when $x=1$).

The Zeta Function (when $x=1$) is an *infinite* series starting from *one*.

The HS is, therefore, an infinite sequence of resonances, its fundamental (lowest) tone being that of the original *one* RC1.

The primes, mathematically, are:

- (a) *ordinal* numbers constituting a distinct primal number system in themselves, and
- (b) *cardinal* numbers resonant only with number one (remembering that all EMU cardinal numbers can be reduced down to combinations of primes).

The **prime numbers** in their dual role, are:

- (a) a series of resonant cavities (RCs) which are resonant only with the original RC1, and
- (b) those EMU *cardinal* numbers only divisible by (ie resonant with) the number *one*.

Working definition of the primes

*The primes, as EMU numbers, represent a scale of markers or measures of the **cosmic formative process** from the potential pre-physical aethereal realm to the realm of actual physical forms through the principle of **harmonic resonance**.*

As such, they constitute a distinct, bi-polar, cosmic number system, **a primal code** within the EMU number system, leaving the non-prime 'composite' numbers as subsidiary.

Ad infinitum = ad absurdum

However, as we move into the extremely large numbers and the fast vibrational rhythms of very small RCs, it all becomes inconceivable, inaudible, meaningless and irrelevant to our human scale of experience and appreciation. Which raises the question as to what benefit there might be in trying to explore the sequence of primes *ad infinitum* - except perhaps as an exercise in obsessive counting or for devising ever harder-to-crack encryption codes. However, both of these suggest an endless spiralling off into absurdity.

Beyond mathematics

In the 1930s mathematician, Kurt Gödel, established that some axiomatic principles can neither be proved nor disproved from within the existing discipline of mathematics. That our account of the primes is not reducible down to either a concise algorithm or a formal 'proof' emphasizes a significance beyond current mathematics. If we try to so reduce it, we find ourselves locked into a vain search for some mathematical 'holy grail'. The same seems to apply to the attempts to prove or disprove *Riemann's Hypothesis*.

And as a rational, consistent explanation of the sequence, the order, of the primes, the *threshold* account also amounts to significantly more than a mere technical process of elimination, such as *Eratosthenes' sieve*.

In the bigger context which our *Threshold* view opens up, we can now appreciate an overall pattern of principles governing several previously enigmatic, and so called 'irrational', features of mathematics. We find *meaning* and consistency, as opposed to merely uniqueness and utilitarian value, in *pi*, *the Golden Ratio*, the *Fibonacci* series, *imaginary numbers* and the *primes*. Other significant numerical values can also perhaps now be re-assessed on this basis.

In terms of **Quality Maths** (part of *Threshold Mathematics*):

One-ness is a mathematically intrinsic quality solely of the number *one* and the *primes* (which are only divisible by/resonant with *one*).

Composite numbers (non-primes), although each is unique and thus has a superficial quality of one-ness, do incorporate other quantitative qualities.

5. 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*, a *half* and *i* (imaginary numbers) mean, and an inadequate appreciation of what *negative* and *positive* values signify.

Taking as assumed the *Threshold* principle of *universal polarity*, then any particular aspect of the greater reality signified by a mathematical symbol will always have its polar opposite aspect. Failing to acknowledge 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 through to today, only the *minor* aspect, 'little zero', seems to have been officially acknowledged.

An exercise in unlearning

Consequently, this investigation of the Riemann Hypothesis enigma is very much an exercise in questioning old assumptions, unlearning and abandoning any 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, rigid images – ie false metaphors where perhaps fluid patterns become '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, the transit 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 a 'nothingness' in contrast to the 'somethingness' of the realm of positive numbers. It has an intermediary role. It stands 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* and based on the so-called 'square root of -1'.

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...

If we assume 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 we keep the mathematical symbols connected to the wider context and reality.

Riemann's 'landscape' model

Riemann's model comprised a triple axis graph which produces an artificial 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 +½ .

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 + ½ 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 position 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 bigger picture he'd intuitively sensed.

Also, the idea seems to have come to him only when he was already mentally in the (mathematical) 'territory' requiring a longer route, and so perhaps didn't even consider the possibility of a simpler, more direct one.

The bigger picture

When his visionary infinite *line* of zeros is seen as graphically representing a *plane*, it implies 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. It can also be understood as one 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 neither provable nor disprovable *Riemann Hypothesis* is resolved.

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*.

5. The Goldbach Conjecture (1742)

A brief summary of the *Threshold Mathematics* resolution.

'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 affirms the assertion of 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, and the two systems are 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.

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.

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

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 much limited mentality.

Threshold Mathematics shows how the familiar but limited EMU number system we unquestioningly use every day emerged from a prior situation with which we are not so familiar. If we wish to empower ourselves, we need to expand our current limited worldview, including our mathematics, to include the pre-physical world as best we can. Addressing *Goldbach's Conjecture* at least opens this up as a possibility.

Even numbers

- *Even numbers* indicate the abstract idea of a *pair*, yet do not specify or explain the actual constituents of the pair as 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 $3+5=8$.

The Becoming (in *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 from the *descent into matter*.

No pure 'equality'

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

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

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

- (a) *Ordinal* symbols, signifying a sequence of cosmic resonant cavities as *primal values* and
- (b) *Cardinal* values, expressed in abstract, EMU, *prime number* symbols.
(*Primes* larger than 2, within the EMU number system, are all *odd cardinal* numbers.)

Euler 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.

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- 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 of the *primes* (each prime is a 'one-off').
Therefore, every *even* number (a *two-ness*) can be represented by two primes. (*Goldbach's Conjecture*)
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7. Mathematics at the Threshold

Curves and corners

In our *threshold* view of the inward/outward pulsation between the aethereal and the physical realms, two similar but not identical spirals which track that process come to mind: the *Golden Ratio* and the *Fibonacci* spirals. These each generate a series of rectangular figures which represent the freezing or crystallising of moving, aetheric, potential energy into discrete physical-material forms. And the rectangles are generated at a rate proportional to the turning of the spiral. Thus is produced a progression of fixed, quantifiable forms from continuous movement.

The rectangular forms could represent our resonant cavity (RC) spheres, now collapsed and reshaped under the force of *gravity* where it exceeds *levity*. The two polar opposite aspects of the one process would thus be expressed in two ways:

1. A continuous spiralling/vortexing, representing the aethereal dimension.

2. A series of discrete steps or numbers, representing the physical dimension.

So, what vital factor is missing that makes mathematics a turn-off for so many?

The brief answer is: *What's missing is one side of the great cosmic equation - the equation, that is, which expresses the balancing out of the inherent polarity of our whole cosmos. Missing is the pre-physical dimension, the Aether.*

All energy, power and forms arise out of the rhythmic interplay of the universal polaric forces of the cosmos. And all force must originally at some level of existence be *exerted* by some motivating source or act of will (which is not to imply any religious notions).

In recent centuries the objective, physical-material aspect of our world has been studied in great detail by scientists, but to the neglect of *consciousness* and the aethereal dimension. So, regarding mathematics, the missing half is all about how we *subjectively* experience and appreciate the *qualities* of quantities, as opposed to how we merely measure, count, name and calculate quantities in an *objective* way.

Archimedes and Plato

Recently, a UK professor of mathematics responded to an earlier version of *Threshold Mathematics* by quoting Archimede's famous statement about leverage, '*Give me somewhere to stand, and I will move the earth.*' His point was that this principle can be applied to changing our perspective so that everything shifts and we gain a whole new understanding. The professor also said he thought most mathematicians are platonists, and in the collective consciousness of Plato's time, the *Aether* was very much a reality.

Disconnected = polarised

From our *threshold* view, a general lack in any culture of a deep, direct conscious connection with its vital cosmic environment suggests that there'll inevitably be fragmentation and a split into extremes. In the rarefied mathematical world of dedicated primes specialists, this does seem to have been the case.

Assumptions not questioned

The whole *primes/Riemann* saga seems to have arisen from a lack of willingness or ability to question some basic assumptions behind what is taught as mathematics. The result of this compliance is one huge cloud of abstract thoughtforms hovering over mountains of speculative papers. This seems to represent the collective attempt of many agile and creative minds to rediscover the longed for coherence, elegance and clarity, knowing intuitively that it's there but lacking the right tools for the job.

The advent of the binary, digital computer hugely boosted mathematical pursuits, both in scale and speed. But perhaps, in the rush, other ways of thinking, not reducible to binary logic, have become further neglected resulting in an even more distorted imbalance. Constructing a system, a world, of mathematics with EMU building blocks and grids has proved very useful and also an endlessly fascinating subject in itself for some. However, to expand mathematics beyond the limits of that constricting worldview would require a much more inclusive, flexible, organic and aethereal way of thinking.

Whatever happened to the Aether?

Has the indoctrination process known as education rendered us unable or unwilling to seriously consider the possibility that the timeless, universal Aether does in fact exist?

If either, then we are left with the incoherent multitude of substitutes already indicated. Even the highly acclaimed systems theorist and writer, Ervin Laszlo, affirms the Aether in his 2004 book *Science and the Akashic Field*, in which he treats the ancient Sanskrit term *akasha* as a straight synonym for the Aether.

So it's neither something religious nor materialistic. But in this divided and ruled world, it's what both of those entrenched camps lack. The challenge seems to be more one of unlearning redundant mental habits, by freeing up our thinking and letting our intuition grow, rather than of adding on more complications.

What is it about mathematics?

Only when we raise ourselves above the current mathematical mindset - with its 'building block' and 'grid-like' thinking - do we become aware of just how trapped we are in the materialistic culture of quantifying and numbers. We've been absorbing it from our infancy when we would have had no awareness of this process going on.

Certainly, any youthful talent for numbers and calculating is something to be encouraged. But without a counterbalancing development of our sense of wholeness, continuity, quality and so on, thinking becomes distorted - and all the more so when an over-emphasis on *analysis* at the expense of *synthesis* is rewarded with praise, prizes and certificates, leading to career and financial advantages. We're programmed to admire *cleverness* or *smartness* and to ignore or devalue *wisdom*.

The other side of this, meanwhile, seems to be the idealised, platonic yearnings and tendencies of some mathematicians, which serve as a kind of compensation for their entrapment. For they intuitively know that there are higher, coherent principles at work beyond what is translatable into the complex but limited language of mathematics.

The cold, sterile, precise, idealised, abstract qualities mostly associated with mathematics - which make it such a pure, detached, feeling-free discipline - evidently have their appeal to a small minority of humans. But this attraction can also be seen as a means of escape from the messy, emotional and physical worlds of distorted and compromised ideals. For the obvious passion with which some mathematicians seek to discover new truths and resolve mysteries does seem to speak of something much more than just mathematics. Marcus du Sautoy refers to the high proportion of musicians studying mathematics.

Seductive to scientists

Materialistic scientists who deal with the untidy, physical-material world often seem to have a strong sense of higher/deeper principles at work in the cosmos, as the extensive genre of 'science fiction' indicates. Perhaps this is why materialistic science in general has been seduced by the mystical magic and power of mathematical symbols, numbers, formulae and so on.

That would be because they help create an *idealised* world of controlled, ordered procedures - unlike the *real*, chaotic, tangled, messy and unpredictable *physical* world of continuous change. Also, it seems, the more that *uncertainty* prevails, the more refuge scientists seek in mathematics, quantum physics being an outstanding example.

Entranced by numbers

Also, becoming fascinated, captivated and bewitched by the endless possible permutations mathematics offers can lead to a 'not seeing the forest for the trees' - as well as to our confused culture of endless statistics and counter-statistics. It's as if there is

a heartfelt, intuitive knowing and longing for a deeper understanding of this world. Yet most seem trapped in the grid-view, building block mindset, within a career structure and culture that eventually sabotage that driving, creative urge.

The great fascination with the enigma of the prime numbers and the Riemann Hypothesis seems to be a case in point, as a \$1 million reward for its solution and a number of learned and popular books and websites confirm.

It's here that we clearly see in action the flawed assumption that *the answer must lie in the numbers* - an approach taken to painfully obsessive extremes in Darren Aronofsky's film *Pi*. Numbers took on a hugely inflated significance for the central character, a mathematician. His quest to find answers to big questions by endlessly analysing stock market statistics and numbers proved futile and frustrating to the point of insanity.

8. Postscript

So our *threshold* view and *scenario* are not merely fanciful ideas, but do provide a useful perspective on how we human beings fit into the bigger cosmic picture. And as we have found, they also provide clear, consistent solutions to some longstanding enigmas of mathematics.

Intuition + intellect

At the *threshold* we transcend the subjective/objective divide through realising the ultimate identity of our *individual* consciousness with the *universal* consciousness. This is an *intuitive* mental process beyond intellectual, rational or computational operations. And since we are here venturing into realities beyond the physical-material realm, certain precautions are required. Any conclusions reached must be subjected to intellectual scrutiny to test their practical validity. In the present work, the rational consistency of the prime numbers at which we arrived provides such validation.

Mathematical models: how real?

We also need to beware of the limitations of abstract mathematical models, when employed as tools for scientific investigation into the real world. Here there can be a strong temptation to make observations fit the model, especially when the model offers an attractively self-consistent approximation which may itself start to become an item of unquestionable dogma, an established but false 'fact' or theory.

Reality beyond matter and mathematics

From our *threshold* we can see ourselves embedded, ie embodied, in dense, static matter – as a result of the 'descent' described earlier. Some still act as though matter is the ultimate reality rather than consciousness, despite apparently accepting Einstein's teaching that all matter is condensed *energy*. And energy itself still remains an enigma, as Nobel laureate physicist, Richard Feynman stated – that is, until its essential meaning as the cosmic *levity/gravity* dynamic within universal consciousness is acknowledged. The crucial move into thinking beyond mathematics involves recognising the dynamic, continuously shifting processes going on behind all illusions of a static, crystallised world - that is, beyond the safety of idealised, controllable, manipulable, abstract symbols representing artificially standardised quantities.

New thinking, new terms

Inevitably, the *threshold* perspective requires some new terms and symbols to handle its extended vision of wholeness and polarity – for a start, to handle the polar opposite qualities of both *zero* and *one*. However, that's beyond the scope of this particular paper, the intention of which has not been to reject current mathematics but to introduce the power of the timeless *threshold* perspective.

From this perspective we also reach the wider conclusion that the mathematical quest to find ever more pattern and order in the cosmos is, in principle, a sound one. For we have found that this is a coherent, ordered cosmos, behind the apparent 'randomness' which really only speaks of our inability to comprehend the multiplicity of factors affecting any particular situation and its outcomes.

It is hoped that mathematics will evolve to include such fundamental qualities as consciousness, wholeness, continuity, universal polarity, harmonic resonance and proportion in more than just a sterile, quantitative way.

And a final statement: because this *threshold* view cannot be reduced down and forced to fit into the narrow confines of the materialistic-mechanistic, 'boxed in' way of thinking, that does not invalidate it in the greater context of humanity's evolving consciousness.

