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# Threshold Mathematics V8.01

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[www.pathwayinitiatives.co.uk](http://www.pathwayinitiatives.co.uk)  
[info@pathwayinitiatives.co.uk](mailto:info@pathwayinitiatives.co.uk)

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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 reveals how each author seemed intuitively to sense something special here which inspired him to write. Yet none was able to grasp what actually makes the prime numbers so significant.

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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 symbolise the fascinating story of the *prime numbers*, the oldest unresolved mystery in mathematics (over 2000 years), on which perches the *Riemann Hypothesis (1859)*, still neither proven nor disproven, and the even older *Goldbach Conjecture (1742)*.

The essence of the mystery has been the question of what's lacking in all three.

- (1) The '*distribution of the prime numbers*', ie a pattern in their occurrence in the normal number series of 1, 2, 3 etc, has long been awaiting discovery and a clear explanation.
  - (2) The related and legendary *Riemann Hypothesis* still awaits a proof or disproof.
  - (3) *Goldbach* sought a proof, still awaited, of a fact about even numbers and primes.
- Together, these seem to suggest an absence of something vital in mathematics.

From the **Threshold** perspective, questions arise, such as:

*Could these long running failures have been the inevitable consequence of asking the wrong questions, 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 concerned with how humanity has 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 understanding how the cosmos was and continues to be formed. So this aspect will be central throughout. At least a temporary acceptance of the basic *Threshold* principles 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 is a re-examination of certain apparently unquestioned assumptions and habits of thinking. It is suggested that these may have been contributing to the problems all along, having been embedded in normal' mathematical practice for many years.

Other broader questions persist. *What vital factor is 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 people experience as willing and feeling?*

For such an omission leaves just the sterile, lifeless, mathematics most were taught at school and that Western science has adopted as its official language of authentication. Mathematics is, after all, just another human pursuit, a language, although a highly developed and specialized one.

The *Threshold* approach reveals that fascination with the *primes* and *Riemann* enigmas continues to grow because the primes actually are the key to some very profound issues. They raise questions of a kind people are discouraged from addressing or even contemplating in current fragmented and distracted cultures. Yet many well documented, speculative quotations from leading 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*, *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? Albert Einstein is quoted as saying, "*We can't solve problems by using the same kind of thinking we used when we created them.*"

# 1. The Threshold is...

This part of a broader **Threshold** work focuses on a few key enigmatic features of mathematics. They include *zero*, *one*, *pi*, *the Golden Ratio*, *the Fibonacci Series*, *imaginary numbers*, the *prime numbers* sequence and the *Riemann Hypothesis*. In so doing, it reveals a coherent pattern in the cosmos, an overall order within which numbers labelled as '*irrational*' are found to perform an essential, rational function.

For example, once it's realised that the apparent irrationality of the *prime numbers* 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 it's clear what the prime numbers do signify, it follows that *Riemann's* intuitively sensed hypothesis, unproven since 1859, is essentially sound, although mathematically invalid and unprovable – for reasons which will be explained.

## First: Overview + Insight

One way to resolve any apparently insoluble problem 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, the heart or core of the situation.

Combining these two polar opposite views reveals the primary dynamics of the system and thus its essential *meaning*, ie what it's *meant* to be and do.

In this particular work, the fundamental questions regarding who or what human beings and humanity 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* of mathematics and all other disciplines.

## 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. However, the concept of *randomness* can be seen as a convenient label, used to cover up an inability to handle certain degrees of complexity in how a few simple cosmic principles work out.

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, but 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 and internal influences. So in attempting to accurately repeat experimental situations for comparison, physical scientists can only ever achieve approximations. So they employ mathematics which creates a seductive but artificial impression of precision, consistency and authenticity.

And mathematics, as will be shown, uses a number system which *mimics* the material realm of identically manufactured objects such as coins or bricks. Thus has arisen an unwholistic alliance of mutual compensation for each others' 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***, ***phi*** (*the Golden Ratio*), ***i*** (imaginary numbers), ***e*** (the constant of growth) and sequences of numbers such as the *Fibonacci series* and the *prime numbers*. These are labelled *irrational* because they don't fit into the orthodox *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*? And these inevitably lead to fundamental issues such as:

*Which is primary: Consciousness or matter? Subjective or objective? Quality or quantity?*

The *Threshold* approach, effectively, views current mathematics from 'outside the box', from a dimension 'beyond'. It embraces the continuity, polarity and movement of the reality behind all the frozen fragmentation, and so reveals pattern and coherence not apparent from within that box. It's an extension of the principle that some problems, insoluble in a two dimensional format, can be solved within 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 mathematics is seen as a system, a language, a code. Its validity will be tested in seeing how well it helps us resolve problems and understand observations. For present purposes the model is much simplified. It's also based on a couple of significant explicit assumptions, as follows.

## 2. Scenario: the *Becoming*

### Assumption 1: Being at the *Threshold*

To gain the power of *overview* and *insight* requires being consciously present at the critical *threshold* where the fundamental polaric forces of the cosmos, **gravity** and **levity**, or *contraction* and *expansion* 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 its original audio CD-ROM ***Aether - Knowledge is Power***. These publications explain 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 considered very much a living reality.

This *Threshold* is not a definable location in space, but has the vital, turbulent, energetic and transforming characteristics of what has been called 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 by Western science, somewhat awkwardly and one-sidedly, in pairs such as *matter/anti-matter* or *gravity/anti-gravity*.

A powerful benefit gained from awareness of this *Threshold* is a simultaneous *two-way perspective* on the world:

- (1) Attention radiating outwards in any direction from any physically located, uniquely individual point of consciousness.
- (2) Consciousness, expanding indefinitely, can focus inwards as if from a universal plane, giving a kind of reverse panoramic view from all directions at once. This provides the option to zoom in and *focus* on any particular point. In a practical way, this ability unites the ideas of the *absolute* and the *relative*, *whole* and *part*, *general* and *specific* etc. The *Google Earth* program represents a simplified version of this capacity.

The fundamental polarity of *inward/outward* is of primary significance in this work. The *inward* seeing enables the expanded, 'greater, *universal I*' to view the contracted, 'little, *individual I*' in as wide a context as seems appropriate. This is like viewing a whirlwind from the *stillness* both high above and at its centre, the 'eye of the storm' – each qualitatively different from the turbulence in between.

*Mathematics* can also be viewed this way. So the *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*' enigmatically implies a *polarity* – less of the gross, physical-material means *more* of the subtle, mysterious 'something else' quality... and vice versa.

## **Assumption 2: Own presence included**

Essential to the wholeness of any situation in which a person is involved is his or her own conscious presence. So there is always (a) the observer (subject), (b) the act of observing and (c) that which is observed (object). To ignore any of these three essentials from an investigation would leave an incomplete, false picture.

Such is the case with the so-called 'objectivity' of materialistic Western science, despite the contrary findings of Quantum physics. The resulting paradoxical dilemma is resolved by explicitly acknowledging the presence and unavoidable participation of the observer, the *subject*, who then has an *objective* presence in the situation.

## **Scenario**

The first assumption is an unlimited *void*, in the physical sense, full and consisting 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 state of consciousness, there would be no shared objective awareness amongst individuals of all the phenomena treated as the content of 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 20<sup>th</sup> century physicist, Eugene Wigner, who asserted that '*...the content of consciousness is an ultimate reality.*'

Next comes a *pre-physical* stage of that universal consciousness, an intermediate level of *potential* existence, prior to manifestation. It's the continuously changing, indefinable, vital state of being, long known in the Western world as the *aether*, which 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 abstract 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 aethereal 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*. This sphere constitutes a kind of pre-physical *resonant cavity* (RC) in which is generated rhythmic pulsating waves of *contracting* and *expanding* movement. Herein lies a significant clue to resolving the *wave-or-particle* dilemma of modern physics. The dynamic relationship between periphery and centre point indicates a universal tendency towards re-establishing an equilibrium state. And this dynamic, pre-physical potential is, in essence, what is known as ***energy***.

Meanwhile, as the pulsating proceeds inwards and outwards, *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 and the higher its tone or 'frequency'.

## **Rhythm or frequency?**

A distinction is drawn here between the *tempo* of a *rhythm* and a fixed *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.

### **Matter forms**

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 is 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 occurs at the critical *threshold* between the two distinct realms, all 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. An earthly parallel would be the *water cycle* between airborne vapour and surface liquid.

### **Rarity/density**

The *rarity/density* continuum results from the pre-physical 2D *outward/inward* dynamic of *levity/gravity* or *expansion/contraction*. This functions prior to and beyond the limits of 3D physical space. So there is no paradox in finding at the centre point of a sphere, where density approaches its maximum, an *inner threshold*, polar opposite to the *outer threshold*. This is a portal into the infinite *rarity* of the aether and universal consciousness. A clue may be found here concerning the physicalised concept of so-called *black holes*.

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

### **In animated suspension**

The pre-physical essence of each individual person can be seen as a point within universal consciousness, temporarily clothed in matter, formed around such centres. These are held in suspension at the critical border, the *Threshold* between the two cosmic polar forces – like bubbles floating between *levity*-raised air and *gravity*-laden water. And the more deeply such points of consciousness become embodied in solid, earthly matter, as energy trapped in inertia, the more they tend to interpret their world in terms of quantities of bits and pieces, particles, building blocks, mechanisms and so on.

The *Threshold* perspective does encompass the vast process of *cosmic and natural evolution* but, given the specific focus of this particular work, this is not addressed here.

### **The descent into matter**

This scenario is a much simplified account of how consciousness, both universal and individual, makes the '*descent into matter*'. As gravity prevails, movement becomes crystallised, flow becomes static, inert, frozen, solid form, and unity is fragmented. This model or scenario does not resemble a mechanical structure of assembled, standardised bits.

It can perhaps be seen more like a *stereogram* 2D image which, at first, looks like an amorphous mass of dots or small details. Then, if we 'get it', there begins to emerge before our eyes a recognisable form... and suddenly it's there, a visible 3D image which apparently wasn't there before, although nothing has physically changed.

So the *Threshold* approach doesn't start with numbers and symbols, which are the end products of evolving processes and mental activities. It starts with the dynamic, fluid, moving energy processes of the cosmos which *generate* the world of material forms.

### 3. EMU 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. In this work, such numbers are referred to 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 all things were made of some parallel kind of minute, identical *building blocks*.

However, this view does not coincide with the continuity, the fluid, pulsating, ever-changing reality of cosmic and natural *expansion/contraction* into *rarity* and *density*. Neither does it coincide with how minds and feelings function. There is a fundamental incompatibility here, for the cosmos is not an assembly of *unit measures* of cubic space or time-line duration. A mesh of squares can be wrapped around any object or space to enable it to be measured and calculated in terms of squares and cubes, but that only gives a 'map', a model or a 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 'see' a series of still images as movement and life... or the digital equivalents. The Greek word *kinema* means motion. This is perhaps the defining characteristic of current mathematics. It's the illusion, the shift in perception between the physical and the psychological that makes much of mathematics actually work. It is, therefore, both its strength and its 'fault-line' weakness.

The EMU system has, nonetheless, proved a very useful 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 beyond the extremes of space and time are those 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.

Consequently, the *Threshold* view reveals each number, and especially *zero*, *one* and *the primes*, as being *bi-polar* in having two aspects:

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

### **One implies two begets three implies four...**

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

### **The grid filter**

Part of the rigid EMU standardising process is what's here called the **grid filter** mentality. It's looking out at the physical world as if through a grid filter, and analysing it in terms of EMU cubes, squares, lengths, weights etc. This can lead to the belief that all forms are assemblies of micro building block particles, discrete *bits*, molecules, atoms etc.

Digital **bitmap** images, composed of mosaic-like squares, are an exaggerated version of this idea – especially when illustrating curves.

**Fractals** are iterative, identical, but ever smaller, 'worlds-within-worlds' images which artificially mimic nature, and are computer-generated by a simple mathematical formula.

The EMU system is now so familiar and useful for measuring, counting, calculating and constructing – ie controlling the physical world – that it has become for some a delusion, a false assumption of how the cosmos functions. So the end product of a process is sometimes treated as though it were the beginning. For example, curved lines may be defined as 'composed' of points – like imaginary building blocks – rather than as a *trail* following a curved movement.

This kind of mindset seems to arise in cultures which prioritise *measuring* and *quantifying* - as if *quantities* are more real than the primal *qualities* actually experienced first.

The *grid* can then become a mental trap, a prison, imposing rigid restrictions on imagination, inspiration and intuition. It can also 'conveniently' insulate minds from the less precise, less easily controllable, fluid and fiery realm of instincts and feelings.

So the *grid* way of thinking is very useful, but has harmful effects on the *quality* of life.

## 4. Threshold Numbers – the 'irrational' made rational

### The *binary* flaw

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 units or more than one.

This demonstrates **binary** thinking which, in its exclusive *yes-or-no*, *on-or-off* terms, fails to acknowledge that there is always a greater wholeness within which are included all *polar* opposites. Binary thinking is the fundamental flaw underlying the instability inherent in *digital* technology, with its sandcastle simulations always liable to disintegrate and fail.

### Zero: the living void and the infinitesimal

The *Threshold* view of **zero** shows a clear *polarity* linking the paired ideas of **infinity** and the **infinitesimal**. There's an *outward* infinity of ever expanding proportions disappearing into the beyond, and there's its polar opposite, an *inward* infinity, a *vanishing point* of unimaginable smallness, also sometimes known as the *infinitesimal*. These vanishing planes or points can be seen as *portals* on the inward and outward journeys between the pre-physical and the physical-material realms.

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 relates to the ancient Greek concept of the indivisible *atom* and to the *quantum* idea of the smallest quantifiable amount of energy. And these then offer a key to understanding the 'less is more' principle of *homeopathy* which works on the subtle, pre-physical level which then affects the gross physical body.

### The infinitesimals of Newton and Leibnitz

In the 17th century there was a historic dispute between Newton and Leibnitz on this theme which can now be seen 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 is experienced and recognised as a transitional moment or event. 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 has its own space in conventional number work as if it were just another number.

The symbol for *zero* can, therefore, be considered as representing either:

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

(b) a gap-filler, occupying 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 to be discussed later.

### **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 either the biggest or smallest number.

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

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

### **The Number Line**

From the *Threshold*, the traditional 'real number' line, with a *zero* at its midway point, raises questions. For the space occupied by zero seems to represent some kind of defined gap between -1 and +1, between the *negative* and *positive* dimensions.

Yet by contrast, in time measurement, 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 universal consciousness and 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 ideal in science of a so-called *perfect vacuum*, which doesn't physically exist in Nature and is therefore a meaningless term, except as an abstract idea.

Such anomalies 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.

Meanwhile, a revised number line could have its central balancing point serving as a portal through to the great void of pre-physical fullness also implied by zero. The inherent *ambivalence* and *polarity* of zero would then be acknowledged.

### **Negative Numbers plus derivatives**

To '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* and Imaginary Numbers**

*i* officially represents the *square root of minus one*. However, it can be re-interpreted in the context of a universal cosmic *polarity*. Mathematically, -1 is the product of combining, of multiplying together -1 and +1. There is no square or 'square root' here at all, but there is an *ambivalent* value, alternating between -1 and +1 and bestriding zero, So *imaginary* numbers seem anomalous because the EMU number system is inadequate 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 *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*. So *i* symbolises that ambivalent state of the cosmos, with the two polar opposite forces represented by the positive and negative realms. In physics there's 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.

### **The symbol *e*, constant of growth**

Given that a pulsating sphere retains its form through the rhythmic contracting and expanding, a constancy in the process has been identified by mathematicians, quantified and reduced down to a so-called *irrational* number 2.718... symbolised by the letter *e*, for calculating exponential growth or its polar opposite, shrinkage.

### ***Phi* : the Golden Ratio/Proportion/Mean**

The *Golden Ratio* represents a constancy of of proportion between the dimensions of ideal, potential forms in the *unmanifest*, pre-physical realm and those of actual, material forms in the *manifest* physical world. The numerical 'echo-ing' of the 'irrational' ratios, 0.618...:1 and 1:1.618... implies a significant relationship. And the widely acknowledged aesthetic quality of the *Golden Ratio* in architecture, art and design through the ages reinforces it as an intuitively sensed principle. This would seem to be because forms which are proportioned according to these ratios resonate harmoniously with the proportions inherent in the human body.

### **The Fibonacci Series**

The *Fibonacci Series* is a variation of the *Golden Ratio* principle. However, it only applies to the physical-material level of existence, after matter has come into being in the form of natural organisms. So it applies only in one direction, from *central* density towards *peripheral* rarity; ie in *growth*. This could be the growth of an individual organism, as 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 logarithmic *spiral* which generates rectangles. The differences between the two in this generating function diminishes the further out from the centre the spirals progress. This reinforces the earlier description of the increasing density, towards the centre, of ever more closely 'packed' sub-spheres as resonant cavities.

It also links the continuous, curved movement and change implied in the *spiral* with the frozen-moment snapshot, dead and straight, but precisely quantifiable, *rectangles...* and so demonstrates a connection between the aethereal and the physical.

### **Pi: Across the Threshold between sphere and cube, circle and square**

A straight line drawn radiating out from the centre point of a sphere or circle to any point on its periphery is known as the *radius*. The *polar opposite*, a line directed inwards from the periphery towards the focal centre point, could be called a *focus*.

In any sphere there will always be a direct and constant relationship between the length of the *focus/radius line* and other dimensions, 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 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* 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 there's little understanding of the dynamics involved without including the *context* of continuously changing, converging atmospheric forces.

### **Cardinals / Ordinals and Ambivalence about counting**

Along with the significant differences 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 marking out of *before-ness* and *after-ness* in a time *sequence*: 1st, 2nd, 3rd etc. They indicate a progressing process, more akin to the unmanifest, potential, living realm, implying a continuous, inclusive flow of changing conditions or stages, in both time and space.

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

9/11 refers to the 9<sup>th</sup> month and 11<sup>th</sup> day, whereas 24/7 refers to 24 hours, 7 days.  
*Chapter One* means the 1<sup>st</sup> chapter, and *Version 2* the 2<sup>nd</sup> version etc...

**Threshold numbers**, then, are those values – including *i*, *e*, *pi* and *phi* – which enable transition and transformation across the *Threshold*.

### **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 so 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 a convergence of *addition* and *multiplication*. The two functions were found to be working simultaneously, implying that they have a *dual* nature. Seen from the *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.

## 5. The Prime Numbers Enigma

### The primes: one basic question

Given their unique properties, what does the 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 - since it evidently seems to be true?

### Two-faced primes

The *Threshold* view reveals that the primes have their own inherent *polarity*. They have two aspects, so to speak. A physical analogy would be a valve or duct connecting two distinct spaces and thereby simultaneously being part of both. *Euler's Product*, regarding the *multiplication* and *addition* of primes, affirms this quality and the significance of the *ordinal/cardinal* number relationship.

1. In the pre-physical order of the cosmic formative process, the primes serve as *ordinals*: simply 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>... *resonant cavities*, bearing 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.

### 'Generating primes'

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

(a) an ongoing cosmic *generative/formative* process in which those values known as prime numbers are significant markers of proportion and resonance, and...

(b) mathematically *calculating* from other numbers.

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

### Harmonics on the cosmic fretboard

The line connects the periphery and the centre of the primal cosmic sphere, ie the original *resonant cavity*. The *standing waves* which constitute the inward series of concentric sub-spheres intersect the line at ever shorter intervals towards the centre. These intersections are marked out by the periphery of each such cavity, each resonating at a correspondingly faster rhythm or higher pitch.

The *focus/radius* line is taken here to represent a string stretched along the neck of an imaginary stringed musical instrument whose hollow body represents the original resonant cavity. 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 at the fret and thereby shortening the string.

A *harmonic order* means a series of notes in harmonious resonance with the *one* fundamental tone of the original resonant cavity. Another important distinction is that physical sound is objective and quantifiable whereas tone is a subjective, aetheric quality.

Significantly, what are known as '*harmonics*' can only be produced at certain frets. Harmonics are the subtle, higher, lighter sounding notes produced by plucking the string while lightly and momentarily touching it over one of the appropriate frets. This makes the whole string vibrate in harmony with the vibrating of its simultaneously shortened length – that is, instead of only the shortened length vibrating as a result of the string being pressed down hard at that fret. These special 'harmonic' fret positions would seem to correspond to those points on the focus/radius line where it's intersected by the resonant cavities which only resonate with the original 'cosmos' cavity.

At all other possible positions – or by implication, at all other possible sizes of resonant cavity – the result would be a clashing or subsuming and a consequent cancelling out of *resonance*. That leaves only the *prime/harmonic* positions. The 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*. This also relates back to Pythagorus' Harmonic Series, and Robert Fludd's *celestial monochord* in 1618 which pictorially summarised the musical 'harmony of the spheres'. Harmonics are produced on other types of musical instrument by other techniques.

### **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 might be called the 'architecture' of music. However, it has also inhibited the potential for certain kinds of subtly expressive music which is 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 seems to account for the discrepancy between: (a) the varying ratios of the *Fibonacci* series there where its number values are lower, and (b) the constant value of the ideal *Golden Ratio*.

Significantly, they begin to coincide more closely after several steps of the *Fibonacci* series – 'outwards' into the *levity/rarity* realm.

So, given two sequences going in polar opposite directions, the question arises as to what the nature of these two progressions is and what they might have in common.

### **And the primes?**

To recapitulate, the cosmic *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 them, which is also the original *void*.

1-ness, 2-ness and 3-ness are thus fundamental principles and qualities of the pre-physical cosmic order, prior to its 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 and three outward.

The universal principle of *polarity* is also found in 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.

And regarding the *pre-physical* realm, it's necessary to bear in mind that it does not consist of 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 the cosmic formative process can be seen as a oneness producing two-ness producing three-ness (division/multiplication)... OR as a simultaneous state of oneness plus two-ness plus three-ness (addition).

Whether multiplying or adding 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 is one cyclic process with a two-way rhythm of three distinct phases.

This 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.

### **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**. Their combination is expressed in the formula  $T_n = 6n \pm 1$ .

As these progressions are extended, each new value that resonates with an existing one is subsumed by that prior value, and as a resonant cavity, 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.

So each new number generated that is a multiple of, ie resonates with, an already included number is automatically cancelled out, eliminated. That leaves only those numbers and resonant cavities which resonate with the original oneness.

**These are the primal values, the primes - 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 actual resonant cavity, the cosmos. Each is an *arithmetic progression* with 6 as the constant increment. Excluding 2 and 3 (the two factors of 6, along with 1), the outcome is two sequences:  
-1, 5, 11, 17, 23, 29, **35**, 41...  
1, 7, 13, 19, **25**, 31, 37, 43...

**When, after the exclusions, the two sequences are artificially merged into one, the result is the familiar, previously 'irrational', sequence of prime numbers.**

### **The 'twin' primes**

From the parallel layout of the two progressions, as above, the previously 'mysterious' occurrence of the so called 'twin' primes – 5/7, 29/31 etc – becomes self-explanatory.

### **An obscured *double helix***

The two progressions of numbers containing the primes can be represented graphically as a *double helix*, something familiar to biologists studying the basic chemical structure of living phenomena, DNA. The *double helix* also indicates a *bi-polar* pattern.

**'Predicting the next prime'** eventually comes down to deciding at which point it's no longer viable, technically and economically, to keep eliminating the infinitely 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 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.

### **A Summary (of the significance of the primes)**

(A) **Universal Consciousness, Polarity and Resonance** are the governing principles. *Consciousness/matter, radius/focus, levity/gravity, outward/inward, expansion/contraction, rarity/density, aethereal/physical, negative/positive...*

### **(B) The formative process**

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

The resonant cavities, in order of decreasing size 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* resonant cavity, the cosmos.

The **primes**, mathematically, are:

- (a) *ordinal* numbers constituting a distinct system of **primal values**, and
- (b) *cardinal* numbers resonant only with number one

(NB: All EMU cardinal numbers can be reduced down to combinations of primes).

So the **prime numbers**, in their dual/polaric role, are:

- (a) an ordinal series of resonant cavities, resonant only with the original one, 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-material 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, which leaves the non-prime 'composite' numbers as subsidiary.

### **Ad infinitum = ad absurdum**

Moving into the extremely large numbers and the fast vibrational rhythms of very small RCs, it all becomes inconceivable, inaudible, meaningless and irrelevant to the 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. The *Threshold* explanation of the coherence of the primes is not reducible down to either a concise algorithm or a formal 'proof', which emphasizes their significance beyond current mathematics. Trying to so reduce it ends up in typically vain searches for some mathematical 'holy grail', as do attempts to prove or disprove the *Riemann Hypothesis*.

As a coherent, rational and consistent explanation of the order of the primes, the *Threshold* account also amounts to significantly more than a mere technical operation of *elimination*, such as *Eratosthenes' Sieve*.

In the bigger context which the *Threshold* view opens up, an overall pattern of principles governing several previously enigmatic, and so called 'irrational' features of mathematics can now be appreciated, bringing coherence and meaning, as opposed to merely uniqueness and utilitarian value.

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 and 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.

## 6. 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 19<sup>th</sup> 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. 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*.

### **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  $+1/2$ .

**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.**

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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*.

## 7. 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 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/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 odds or evens. *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,
- in mental, abstract, ideal *mathematics*, 'identical' equality and *even-ness* is possible.

So ***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.

***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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## 8. Mathematics at the Threshold

### ***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 inherently balanced polarity of the whole cosmos. Missing is the pre-physical dimension: universal consciousness and 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 mystical 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 to *subjectively* experience and appreciate the *qualities* of quantities, rather than 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 one's perspective so that everything shifts and a whole new understanding is gained. The professor also said he thought most mathematicians are *platonists*, and in Plato's time, the *aether* was considered very much a reality.

### **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 with orthodoxy is a huge 'cloud' of abstract thoughtforms hovering over mountains of speculative academic papers. This seems to represent the collective attempt to rediscover the longed for *coherence* elegance and clarity by many agile and creative minds, intuitively aware that it exists 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.

### **What is it about mathematics?**

Only when the human mind rises above the current mathematical mindset – with its 'building block' and 'grid-filter' thinking – does it become aware of just how trapped it has been in the *abstract/materialistic* culture of quantifying and numbers. This has been absorbed from infancy when there would have been no awareness of the process. A youthful talent for numbers and calculating is often encouraged, but lives can become distorted without a counterbalancing development of the sense of wholeness, continuity, quality and so on. And all the more so in cultures where people are programmed to admire *cleverness* or *smartness* but devalue *wisdom*, and where an over-emphasis on

*analysis* at the expense of *synthesis* is rewarded with certificates, prizes and praise, leading to career and financial advantages.

The flip side of this, meanwhile, shows in the idealised yearnings and tendencies of some mathematicians – as if to find some kind of compensation for their entrapment. They intuitively know that there are higher, coherent principles at work, beyond what is translatable into the highly complex but still 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-material worlds of distorted, compromised ideals. For the obvious passion with which some mathematicians seek to discover new truths and resolve mysteries speaks of something much more than just mathematics. Professor Marcus du Sautoy refers to the high proportion of musicians who study 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 broad genre of 'science fiction' indicates. Perhaps this is why materialistic science in general has been seduced by the mystical magic and power of abstract mathematical symbols, numbers, formulae and so on.

These help create an *idealised* world of controlled, ordered procedures – unlike the *real*, chaotic, tangled, messy and unpredictable *physical* world of continuous change. Also, the more that *uncertainty* prevails, the more refuge scientists seek in mathematics, quantum physics being an outstanding example.

### **Entranced by numbers**

Also, becoming fascinated and bewitched by the endless potential permutations mathematics offers can lead to a 'not seeing the forest for the trees' – as well as to a 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 in the year 2000 for its solution and a number of books and websites confirm.

The flawed assumption has been that *the answer must lie in the numbers* – an approach taken to painfully obsessive extremes in Darren Aronofsky's film *Pi*. For the central character, a mathematician, numbers took on a hugely inflated significance. His quest to find answers to big questions by endlessly analysing stock market statistics and other numbers proved futile and frustrating, driving him to the point of insanity.

## 9. Postscript

So the *Threshold* view is not merely a fanciful idea, but does provide a useful perspective on how human beings fit into the bigger cosmic picture. And it also provides clear, coherent, consistent solutions to some longstanding enigmas of mathematics.

### Intuition + intellect

At the *Threshold*, the *subjective/objective* divide is transcended 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 this reaches 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, for example, the rational consistency of the prime numbers, as demonstrated, provides such validation.

### Mathematical models: how real?

The limitations of abstract mathematical models, as tools for scientific investigation into the real world, can induce 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 accepted as unquestionable dogma, a false 'fact' or theory.

### Reality beyond matter and mathematics

From the *Threshold*, humans can see themselves embodied in dense matter, as a result of the *descent* described earlier. Some act as though matter is the ultimate reality rather than consciousness, despite apparently accepting Einstein's teaching that all matter is condensed *energy*.

Meanwhile, energy itself still remains an enigma, as Nobel laureate physicist, Richard Feynman stated – that is, until scientists acknowledge its essential nature as the cosmic *levity/gravity* dynamic within universal consciousness.

The crucial move into thinking beyond mathematics involves recognising the continuously shifting, dynamic 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 an extended vision of wholeness, polarity and resonance. 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, it's also clear that the mathematical quest to find ever more pattern and order in the cosmos is, in principle, a sound one, since it has been found to be coherent and ordered behind the apparent *randomness* – which really only speaks of an inability to comprehend the many factors affecting particular situations and outcomes.

Consequently, mathematics will evolve to include such fundamental qualities as consciousness, wholeness, continuity, universal polarity, resonance and proportion – and in more than just a sterile, quantitative way.

And finally, 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.

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